

DISSERTATION

**SPATIALLY EXPLICIT VALUES ON THE PIKE AND SAN  
ISABEL NATIONAL FORESTS IN COLORADO**

Submitted by  
Jessica M. Clement-Potter  
Department of Forest, Rangeland and Watershed Stewardship

In partial fulfillment of the requirements  
for the Degree of Doctor of Philosophy  
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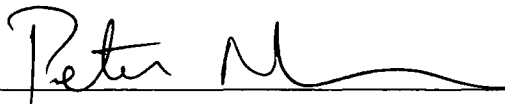
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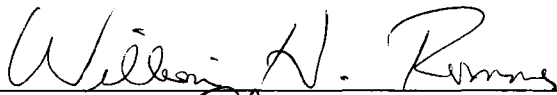
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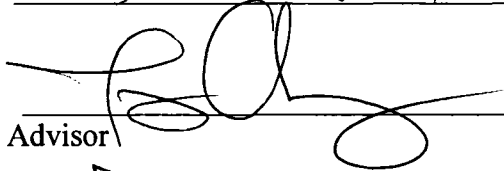
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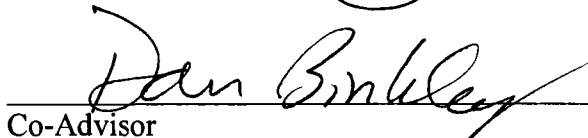


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Advisor

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Co-Advisor

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ABSTRACT OF DISSERTATION

**SPATIALLY EXPLICIT VALUES ON THE PIKE AND SAN  
ISABEL NATIONAL FORESTS IN COLORADO**

The study of human values in relation to natural resources is rich and several decades old. This study represents the study of human values in relation to a National Forest in Colorado utilizing two methods: R-methodology, in the form of a survey with a mapping component, and Q-methodology, using respondents' own language to discover the discourses that prevail in one county of Forest constituents regarding their forest values. The survey was also a validation effort of a methodology first applied to the Chugach National Forest in Alaska in 1998. The survey methodology could be validated using five statistical analyses. Generally, the values respondents held as most important in relation to the Pike and San Isabel National Forests (PSI) were aesthetic, future, biodiversity and recreation values. The survey sample had been stratified to discover differences between urban and rural populations, which were relatively few. Survey respondents were also asked regarding their attitudes and preferences in relation to issues specific to the PSI. The 658 respondents (33%) indicated 2680 places on the PSI that were important to them, what value they represented, and the intensity with which they were valued. The Q-study resulted in five discourses. Q-methodology is a more multi-dimensional research approach than R-methodology, allowing the researcher to explore the combination of values that each discourse contains in addition to the general trend that the survey brought to light. The combination of survey, mapping component and Q-study are concluded to provide potentially helpful tools for place-based collaboration.

Jessica Clement-Potter  
Department of Forest, Rangeland and Watershed Stewardship  
Colorado State University  
Fort Collins, CO 80523  
Fall 2006

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## **Introduction to Dissertation**

After many hours of delightful discussion exploring the world of natural resource policy and related research during my first period of doctoral studies, Dr. Cheng returned from a workshop in Portland in 2003 and told me: “Jess, a new way of measuring values has been tried in Alaska, where they actually map the values on the landscape. The method needs to be validated, and you’re going to do it. You’re all about values, it’s what you’ve hung your hat on, so this will be your dissertation”. I was delighted. I had measured values before with different researchers with mixed results, in my and others’ opinions. Having a chance to measure spatially explicit values using a brand new methodology, statistically and graphically connecting a landscape to its people, would be an exciting study.

In fact, validating this survey methodology, and combining it with a Q-study, has delivered not only interesting results but potentially very helpful, hands-on tools for collaborative learning. Some previous values research was sometimes perceived to have suffered of validity issues (explained in Chapter 1) and there was concern that values research methods were too linear, perhaps too simple to adequately measure such a complicated, three-dimensional construct (Chapter 2). Pat Reed and Greg Brown, when they first used their new values research method in 1998 (The Chugach Method), developed a methodology that may have successfully addressed both concerns. However, a validation effort was necessary to determine more closely whether this really was the case, one of the objectives of this study. If validated, this methodology’s statistical and landscape-based results can combine to provide small-scale and large-scale

spatial tools to collaborative and planning groups (Chapter 3). These tools allow a diverse group of stakeholders to look at “their” landscape together, and discuss that area, their desires and concerns for it, and possible solutions, shoulder to shoulder, rather than face to face, as described by Dr. Wallace in “Authority of the Resource” (Wallace 1990;Wallace 1990;Wallace 1991). Within the nitty-gritty personal dynamics of collaboration, it is helpful to have tools that guide participants to look at the prime reason they are at that table in the first place, the landscape, certainly in the initial stages when fears and stakes appear high, and a breakthrough may be required to allow participants to discuss not only their stakes, but also to discover all the potential solutions. The discovery of these solutions will be greatly enhanced by exploring the values the group has in common, in relation to a landscape. This methodology can provide tools that reveal the many connections a community/group has with a landscape, and the values underlying those connections.

The objectives of this Colorado study were to:

1. Apply the Chugach methodology to the Pike and San Isabel National .
  2. Attempt to validate the Chugach methodology as applied in Colorado.
  3. Study the prevailing discourses regarding forest values on the Pike and San Isabel National Forests from a smaller-scale perspective of one county: Lake County.
- Explore the spatially explicit data resulting from the PSI-wide survey and the small-scale application of survey and Q-method, and their usefulness to collaborative efforts, including forest planning.

This dissertation contains three chapters. The first chapter describes the validation effort of the survey methodology, and reports on respondents' value orientations in relationship to the Pike and San Isabel National Forests. The second chapter describes the Q-study that was conducted in Lake County, and discusses the five discourses that resulted, the uses of Q-methodology in concert with the Chugach methodology, and its application to collaborative efforts. The last chapter attempts to combine the spatial values data that resulted from both the large scale survey and the small scale Q study, again exploring the benefits of these methods to collaborative learning. During the years of Ph.D. research and writing, I have been involved in various collaborative efforts in Colorado, and have explored specifically the role of science, as well as values, in collaboration. Some thoughts on these subjects and their relationship to this study will conclude the dissertation.

### **Acknowledgements**

To Dr. Antony Cheng, heartfelt thanks for many hours of spirited, sparkling and inspiring conversations, whether in his office, in a busy Chinese restaurant in China Town, Vancouver, B.C. or in a yellow convertible in the wilds of Wyoming. When I met Tony, I was enthused about environmental history in relation to Irish peat bogs, which did not seem to thrill Tony very much. And the fact that surveys are not the bees' knees for him either attests to the level of big-hearted support I received, whereby his wariness has helped to increase the rigor of my research by acting as a supportive devil's advocate as well as make my study more creative and applied by adding the Q-study. Neither

his joyful marriage, nor arrival of beautiful daughter Jasmine nor stressful work ever interfered with my sense of being a supported and productive graduate student. My Ph.D. has been a positive and intellectually satisfying process, setting the stage for the potential of a future filled with good work, in large part due to Tony. I'm very grateful.

To Dr. Dan Binkley, enormously supportive and helpful Co-Advisor. His ideas and opinions have added greatly to my understanding of science and offered me alternative perspectives that have enhanced my learning. There isn't enough Diet Dr. Pepper (or Belgian chocolate) in the world to show my gratitude.

To Dr. William Romme, Committee Member and fellow traveler in the wide, wild world of place-based conservation. Like many social scientists, I started my natural resource studies and work in ecology, and concluded after my Bachelors' that there was really only one species that defied comprehension (everything else in Nature seemed pretty well organized) and became a social scientist. Or wildlife biologist, as I tend to think of myself. Studying *Homo sapiens* is a fascinating and worthwhile endeavor but being able to study forest ecology with Bill during my Ph.D. journey has helped me stay "rooted" and enhanced my understanding of the connections, or barriers thereto, between humans and this planet. A little Plato didn't hurt either. Thank you, Bill.

To Dr. Peter Newman, recent Committee Member, great thanks for being willing and flexible enough to lend expertise and time to this Candidate. Your insights and comments have helped to increase the quality of my dissertation considerably. It has been a pleasure to be able to work with you, albeit late in the process.

To Dr. Joyce Berry, Committee Member and long-time supporter, many thanks

for spending time with me despite an incredibly busy Dean schedule, and now possibly even crazier VP schedule. Having had access to her wisdom and perspective has been very helpful.

My thanks also to wonderful and dedicated people in the USDA Forest Service, notably Julie Schaefer, Barbara Masinton and Lisa Leeman, who entered all the GIS data, made beautiful maps and provided GIS statistical support in Chapter 3.

To Mandy and Asger, my love and thanks to you both for your support, interest, never-ending hospitality and a memorable 2002 Christmas. You are very dear friends and family.

To Donna many thanks for huevos rancheros, great books, Washington State wine, hours fantasizing about Pacific Northwest paddles, many miles walking with dogs and wonderful friendship.

To my darling Kent, to whom I am so grateful for so many things, I don't know where to start. But certainly in those things would be included all the beautiful places you take me, all the love you give, for being true to yourself and for helping me achieve (never mind edit) this whole darn thing. There's a lot more though. Let's talk.

Wallace, G. (1990). The Authority of the Resource: an Interpretive Law Enforcement Technique In Interagency Wilderness Management Course, Bureau of Land Management, Colorado State University, Ft. Collins.

Wallace, G. (1990). "Using the Authority of the Resource as an Interpretive Technique." Legacy 1(2): 4-9.

Wallace, G. (1991). Law Enforcement, Interpretation and the Authority of the Resource Technique. Proceedings, National Interpreters Workshop, Vail Colorado, National Association for Interpretation.

## **Chapter 1: Validating a Values Research Methodology**

### **Introduction**

In 1998 a new values methodology was tested in Alaska in relation to the Chugach National Forest planning process. The study sought to discover respondents' value orientations, their attitudes toward forest uses and their preferences related to specific forest management decisions (Brown and Reed 2000; Brown, Reed and Harris 2002; Reed and Brown 2003; Reed and Brown 2003). The present study was also conducted within the context of forest planning, in this case in relation to Colorado's Pike and San Isabel National Forests, which has recently initiated planning procedures under the 2005 planning rules (Revised 36 Code of Federal Regulations Part 219). Under this new rule, the planning process includes not only the determination of desired conditions and a larger picture determination of what goals a forest plan should aim to achieve, rather than e.g. measurable objectives, but also mandates the use of collaboration as a public participation process. In this context, the assessment of value orientations, attitudes, and preferences have arguably increased in salience due to the role that these studies can play as tools to design a collaborative process as well as hands-on tools to use with collaborative partners in meetings (Cheng, Kruger and Daniels 2003). The results of such studies can act as aids in designing a collaborative process that matches local circumstances and concerns, and as blueprints from which communities and other collaborative groups can work toward determining desired conditions. In the Chugach National Forest study, an important contribution made by this new methodology was the linking of value orientations to the landscape by requesting respondents to identify valued places on a map, which in turn were digitized using Geographic Information Systems

(GIS) technology to create maps that reflect constituents' values on the landscape, also known as spatially explicit values. This article will report specifically on the attempts made in this study to validate the Chugach methodology by applying it to residents in and around the Pike and San Isabel National Forests in Colorado, USA.

### *Study Context*

The Pike and San Isabel National Forests (PSI) are situated along the Front Range in central Colorado. These forests border large metropolitan areas such as Denver, Colorado Springs, Pueblo and Summit County, one of the fastest growing counties in the U.S. (USFS Pike & San Isabel National Forests 2006). These forests are also home to the highest peaks in Colorado, the highest communities in North America, nine wilderness areas and the third highest visitation rate of any forest in the National Forest System. These PSI forests and the surrounding areas have seen a number of significant demographic changes take place over the last fifteen years, notably a high level of immigration in both rural and urban areas, accompanied by a change in demographic profile. Between 1990 and 2000 the population of Colorado increased 31% and is the third fastest growing state in terms of population (Census 2000). This has resulted in significant in-migration into rural areas of Colorado, predominantly by people who enjoy larger incomes and higher education levels than the traditional rural Colorado population (McGranahan 1999; Stein 2001; USDA Economic Research Service 2005). A number of studies conducted during this period found significant differences between urban and rural residents' attitudes and/or values for national forests and national forest management (Howell and Laska 1992; Steel, List and Shindler 1994; Manfredo and Zinn

1996; Vaske, Donnelly, Williams and Jonker 2001). The present researchers were additionally interested in exploring value orientations in light of these demographic changes in and around these forests.

Since the original methodology was first tested in 1998, a number of important policy developments have taken place specifically in relation to public forest management, which affects especially the rural public in relatively novel ways. The Healthy Forest Initiative and the Healthy Forest Restoration Act of 2003 have been nationally debated and implemented in recent years, introducing a focus on forest health, fire ecology, concepts such as historic or natural range of variability and new ways of integrating communities with forests through collaboration. Additionally, communities are mandated to be involved in stewardship contract procedures and wildfire risk assessment and abatement programs such as Community Wildfire Protection Plans. In the course of these forest-related efforts, communities and the public find themselves experiencing a learning process that touches on various kinds of ecological science, institutional and community capacity, geographical concepts, agency and property finances, and many other fairly complex natural resource management components.

Bearing these developments in mind, the “enduring” nature of values, the passage of several years since the last application of the Chugach methodology and the described demographic changes, this study: 1) sought to validate the values methodology first applied to the Chugach National Forest (hereafter called the Chugach Methodology), 2) explored the value orientations, the intensity of those values and the valued places of residents in and around the Pike/San Isabel National Forests in Colorado, USA in the context of the PSI forest plan revision and 3) attempted to triangulate the validity of the

values methodology, as well as explore the forest community relationship with the PSI, utilizing the Q-methodology. The data gathered in this study were rich in terms of the breadth of subjects treated and are consequently too broad to cover in one article; therefore this article will specifically concentrate on:

1. The validation of the Chugach methodology in terms of internal and external validity.
2. The nature of the value orientations of residents in and around the PSI, specifically urban and rural residents.
3. The relationship between residents' values and forest policy preferences in relation to urban and rural residents.

#### *Theoretical Framework*

Values research has been able to contribute an understanding of people's fundamental values in relation to natural resource issues, in turn providing an explanation for attitudes, norms and behavioral intentions regarding the specific natural resource decisions and policies that are prevalent in society at any given time. Values form the foundation for the cognitive hierarchy described in the Theory of Reasoned Action that has been found useful as a psychological framework to explore human decision-making processes (Fishbein and Ajzen 1975; Ajzen and Fishbein 1980). This framework and its predictive value has been tested and confirmed in many studies over the last five decades. To read an in-depth review of this hierarchy, studies by Vaske and others provide several clear descriptions (Fulton, Manfredo and Lipscomb 1996; Vaske and Donnelly 1999; Bright, Manfredo and Fulton 2000). To summarize, values (see definition below) underlie attitudes in this framework, which are considered to be an individual's consistent

tendency to respond favorably or unfavorably toward an object in question. Attitudes in turn can predict behavioral intentions, which are considered the strongest predictor of behavior (Vaske et al. 1999). In this study, values are explored as predictors of attitudes, which are measured as general dispositions, i.e. favor vs. oppose, toward general forest management activities related to forest health treatments, motorized recreation, etc. Values are also explored as predictors of preferences, which are a combination of attitudes and beliefs about specific forest plan allocations, predominantly related to forest use, e.g. more, less or the same amount of board feet logged on the PSI (Brown et al. 2000). Since values are held to underlie attitudes and preferences, they are important to discover for forest planning or arguably any kind of public interest planning, because they are relatively stable and provide an important and reliable indicator whether policy decisions or planning alternatives will be considered viable to the public. They will also provide a good indicator as to the acceptability of more specific issues, especially when combined with attitudes (Homer and Kahle 1988;Fulton et al. 1996;Vaske et al. 1999).

Environmental values and value orientations have been studied for more than four decades, providing a rich literature and generating a variety of methodologies to study these subjects (Dunlap 1992;Bengston, Webb and Fan 2004). Values have been studied on local, regional, national and international scales, or a combination thereof, in relation to natural resource issues such as forests, wildlife and or the environment generally (Dunlap 1992;Shindler, List and Steel 1993;Steel et al. 1994;Xu 1997;Manning, Valliere and Minter 1998;Vaske et al. 1999;Bright et al. 2000;Brown et al. 2000;Shields, Martin, Martin and Haefele 2002;Tarrant and Cordell 2002;Reed et al. 2003;Tarrant, Cordell and Green 2003;Bengston et al. 2004). A number of methodologies have been developed

and tested during this process, all indicating the same change in the US public's value orientation regarding forests and the environment, from more anthropocentric (human-centered), to an increasingly biocentric (nature-centered) point of view.

The preponderance of values studies defines a value as “an enduring belief that a specific mode of conduct or end-state of existence is personally or socially preferable to an opposite or converse mode of conduct or end state of existence” (Rokeach, 1973, p. 5). A similar definition, more specific to forests is provided by Bengston et al., and will be used here, where forest value orientations are defined as relatively enduring and fundamental concepts of good related to forests and forest ecosystems (2004).

#### *Values in this Study*

The cognitive hierarchy consists of three interlinked constructs, values, measured by value orientations or basic beliefs, attitudes and behavioral intention that work together to predict actions. In this study value orientations and attitudes were measured.

The first construct, values, are antecedent to value orientations in the cognitive hierarchy research. The importance of values in social science research has been described as being four-fold:

1. Values are at the foundation of the cognitive hierarchy and therefore guide an individual's thoughts and actions. They are the lowest construct in the hierarchy, and the mutability of the constructs in this cognitive hierarchy increases with each succeeding construct (Rokeach 1973; Schwartz and Bilsky 1987; Schwartz and Bilsky 1990; Stern, Dietz and Guagnano 1995; Fulton et al. 1996; Bright et al. 2000)

2. Values are relatively stable and are unlikely to change unless under extreme duress. The opinions held in regard to a particular issue can be linked to a relatively small set of fundamental, general values which are deeply rooted in a person's cognitive structure. If they do change, the person's entire cognitive hierarchy will change also, specifically beliefs, norms, attitudes and behavioral intentions.
3. Values guide the selection or evaluation of behavior and events in society. Thus the values that underlie attitudes and beliefs society has regarding forest uses are important to consider when developing e.g. forest plans.
4. Values cannot be questioned in terms of accuracy or truthfulness, whereas one's beliefs, for example, can change with additional information, if the subject is of enough importance to the respondent (Bright and Manfreda 1995).

Basic beliefs are used to measure respondents' value orientations. A number of several basic beliefs, which together form a value orientation, focus an individual's values on an issue and provide a measurable construct. Thus, the actual value is not measured, as much as its orientation to a particular issue (Rokeach 1973; Fulton et al. 1996).

The trend that is most apparent when reviewing four decades of values literature is that United States citizens' value orientations related to environmental issues or natural areas are changing to more amenity-oriented and more nature-oriented values. These value orientations are more closely related to quality of life and environmental protection, than economic needs or aspirations. These studies' results indicate a high level of convergence on this issue, irrespective of geographical scale, place, or methodology utilized. Recent studies exploring longitudinal trends in the U.S. public's value

orientations regarding forests reported that between 1980 and 2001 a decrease in anthropocentric value orientations and an increase in biocentric value orientations had taken place (Cramer 1993;Bengston 1994;Manfredo et al. 1996;Vaske et al. 1999;Bright et al. 2000). This supports others' conclusions when studying longitudinal trends in value orientations (Dunlap 1992;Dunlap 2002;Bengston et al. 2004). Another longitudinal study to review on this score is the National Survey on Recreation and the Environment by the USDA Forest Service (Cordell 2000).

It should be noted that one can argue, with some justification, that although the values research of the last several decades does show a shift from anthropocentric to biocentric, there is also an increase in wood product consumption. This discrepancy may be more related population growth and/or other variables than incompatible management or an inconsistency between values and behavior. Nevertheless, this is an important subject that warrants examination. A suggestion for future research would be to investigate the knowledge that US citizens have regarding wood product consumption options, the trade-offs involved in these issues and other related topics. It may be that although the shift in values that has been detected in several studies in relation to forests is valid and reliable, US citizens neither have the knowledge nor the opportunity to act accordingly. As in many other topics in US society, due to the manner in which political and economic decisions are made (e.g. our constitution was written with the intent not to encourage direct citizen engagement) public values are not always reflected in governmental and corporate decisions, in turn leading to a public sense of distrust and disenchantment with governmental, business and other entities (Kemmis 1996;Cordell 2000;Wondelleck and Yaffee 2000).

Nevertheless, continuing to understand the values that taxpayers and stakeholders have in relation to certain subjects, as mentioned previously, is more salient than ever because now a form of direct public engagement is being encouraged in natural resource management: collaborative learning. In any kind of public engagement, policy solutions will be found based on the values that stakeholders have in common and the decision space to act on them. In collaboration, a very involved form of public participation that may involve shared decision making with an agency, the imperative to discover stakeholders' values becomes greater to allow collaboration participants to discover the realm of possible solutions that lie before them (Cortner and Moote 1999; Daniels and Walker 2001).

Reed and Brown (1998) studied the values that local residents held in relation to the CNF in Alaska. Their methodology is rooted in the theory of reasoned action (Fishbein et al. 1975; Ajzen et al. 1980) and on Rolston's "Taxonomy of Wildland Values" and Rolston and Coufal's forest values typology (Rolston 1989; Rolston and Coufal 1991)

Both these theoretical approaches have to some extent been used in other values studies, e.g. Steel, Shindler and List (1994) and Vaske and Donnelly (1999) who measured value orientations and gauged their predictive value in relation to attitudes. In these cases values were measured using statements which reflected various kinds of biocentric and anthropocentric value orientations. The statements were derived from sources which are commonly held to be representative of the anthropocentric and biocentric viewpoints, e.g. Aldo Leopold in "Sand County Almanac" for biocentric statements and Gifford Pinchot in "The Fight for Conservation" for anthropocentric

statements (Nash 1989). In each case, scales were compiled through factor analysis, to form a value orientation continuum from anthropocentric to biocentric (Pinchot 1910; Leopold 1948; Shindler et al. 1993; Steel et al. 1994; Shindler and Cramer 1999).

Although the value statements used in these studies have historical roots (some quite lengthy) written by authors whose influence prevails today in governmental (e.g. USDA Forest Service) and non-governmental (e.g. The Wilderness Society) organizations and are generally acknowledged sources of biocentric and anthropocentric value orientations, the question of content validity has surfaced among researchers: the meaning that respondents' may attach to a value orientation statement may differ from e.g. Leopold, Pinchot or the researchers' (Nash 1989). It is difficult to establish whether respondents read the same meaning into the value statements. Using a different approach in the Chugach methodology, the values described by Rolston and Coufal (1991) were listed with simple definitions behind each value, not phrased as statements. The values were listed with a few slight additions and changes to make the values typology more reflective of geographical and social realities e.g. in Alaska subsistence value was found after pretests to have real meaning to native residents. Subsistence value was not used in Colorado because pretests showed it did not have meaning there. The values were defined in a way that allows for little or no guesswork regarding the precise meaning of the value. By providing definitions of each value, respondents are hypothesized to have little chance to interpret the value in their own way, reducing any differences of interpretation among respondents, and securing a higher degree of content validity.

Due to the concerns that have been raised in relation to previous values measurement methods and the potential benefits of a values methodology if it is shown to

provide valid and reliable results, this research also sought to test both the internal and external validity of the values typology. Internal validity indicates the extent to which other variables, or biases, may provide alternative explanations (Babbie 2001). In this case this would mean that if internal validity is low, there would be alternative reasons, e.g. socio-demographic considerations or methodological issues, to explain the results when using this method's values typology because the typology by itself does not explain the resulting variance. If internal validity is high, then the values typology, the independent variable, will explain the greater majority of results in relation to dependent variables, in this case attitudes. An added interest in this study was content validity, a form of internal validity which indicates the accuracy with which that results reflect the situation under study (Leedy 1993). Thus, if researchers are wanting to measure values, the content validity will be high when it can be established that values are indeed being measured, not e.g. a different construct. External validity indicates the extent to which test results can be generalized to other people and settings. Non-response bias tests and other checks can help to establish whether sample results can be extrapolated to the sample's larger population (Leedy 1993;Babbie 2001)

## **Methods**

### *The Chugach Methodology applied to Pike/San Isabel National Forests*

To allow for comparison in this validation effort, the methods applied to the Pike/San Isabel National Forests (PSI) in Colorado closely followed those applied by Reed and Brown to the Chugach National Forest in Alaska. A mail survey was sent to a random sample of 1000 urban and 1000 rural residents in and around the PSI using

Dillman's (1978) total design method. The sample was obtained from direct mailing address lists which are updated every month. The first two and the fourth mailings consisted of the survey, a map of the PSI, and a self-addressed return envelope with a letter. The third mailing consisted of a reminder postcard. The survey contained five sections: 1) questions regarding familiarity and use of the CNF, 2) questions that measure attitudes to 19 forest uses with a 5-point Likert scale, 3) a series of policy questions specific to the CNF forest plan revision, 4) a values typology with 13 forest values, requiring respondents to divide a hypothetical \$100 between the values listed, and a map on which to mark valued places and 5) demographic information. This paper explores the results related to the values typology in particular.

**Table 1: Forest value definitions used in the Colorado validation study**

<p><b>Aesthetic value (A)</b> — I value these Forests because I enjoy the scenery, sights, sounds, smells, etc.</p> <p><b>Biological diversity value (B)</b> — I value these Forests because they provide a variety of fish, wildlife, plant life, etc.</p> <p><b>Cultural value (C)</b> — I value these Forests because they are a place for me to continue and pass down the wisdom and knowledge, traditions, and way of life of my ancestors.</p> <p><b>Economic value (E)</b> — I value these Forests because they provide timber, fisheries, minerals, and/or tourism opportunities such as outfitting and guiding.</p> <p><b>Future value (F)</b> — I value these Forests because they allow future generations to know and experience the Forests as they are now.</p> <p><b>Historic value (H)</b> — I value these Forests because they have places and things of natural and human history that matter to me, others, or the nation.</p> <p><b>Intrinsic value (I)</b> — I value these Forests in and of themselves, whether people are present or not.</p> <p><b>Learning value (L)</b> — I value these Forests because we can learn about the environment through scientific observation or experimentation.</p> <p><b>Life Sustaining value (LS)</b> — I value these Forests because they help produce, preserve, clean, and renew air, soil, and water.</p> <p><b>Recreation value (R)</b> — I value these Forests because they provide a place for my favorite outdoor recreation activities.</p> <p><b>Spiritual value (S)</b> — I value these Forests because they are a sacred, religious, or spiritually special place to me or because I feel reverence and respect for nature there.</p> <p><b>Therapeutic value (T)</b> — I value these Forests because they make me feel better, physically and/or mentally.</p>
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The value typology devised by Rolston and Coufal (1991) provides ten possible values related to forests that an individual may find important to some degree. The typology was somewhat modified by Brown and Reed: “scientific value” became “learning value”, “natural history value” became “history value”, incorporating the concept of “cultural value” (Rolston 1989) and “life support value” became “life sustaining value”. Rolston and Coufal’s “wildlife value” was dropped because the authors determined it focused too greatly on an object of value, which conflicts with the theoretical nature of values. “Therapeutic value” was also added to the typology, following a suggestion made by Rolston (1989). These changes were made to allow the typology to be as instrumentally practical as possible, while retaining the meaning that Rolston described for each value. In the Colorado study, the Alaskan “subsistence value” was dropped since its relevance is socially, legally and politically far less relevant in Colorado, resulting in the twelve values presented in table 1.

The forest value typology question in the Colorado study was formulated very similarly to the Chugach model, although more concise.

**Table 2: Forest Value Typology Question**

Q-20 The PSI holds different values for each person. We would like to know how important each of the following values of the PSI is to you and where these values are represented on the map.

*Imagine that you could “spend” \$100 to ensure that the PSI keep their existing values. You may allocate or spend the \$100 in any way you like, but your total spending may not exceed \$100. You might spend all \$100 on one value (and \$0 on all others), or you might spend \$50 on one value, \$25 on another value, and \$25 on yet another value. Remember, the total dollars you spend should equal \$100. (Reference to money is not made to actual money, your own or the USDA Forest Service’s budget).*

Remaining consistent with the theory of reasoned action, where attitudes follow value orientations in the cognitive hierarchy, respondents’ attitudes toward a certain behavior are defined as the judgment that people have as to whether performing a

behavior is good or bad; whether respondents are in favor or against performing the behavior (Ajzen et al. 1980). Attitudes have also been successfully used to follow basic beliefs or value orientations, as in the present study (Ajzen et al. 1980;Shindler et al. 1993;Steel et al. 1994;Fulton et al. 1996;Manning et al. 1998;Vaske et al. 1999;Bright et al. 2000;Stein 2001;Vaske et al. 2001;Tarrant et al. 2002;Tarrant et al. 2003).

In this study, following the Chugach model, respondents' attitudes were measured regarding 17 forest uses, and 12 PSI-specific forest policies. The PSI forest uses and policies were elicited through a survey submitted to the six district rangers on these forests which asked them about subjects that were part of natural resource discourses on their districts, which were likely to continue for some time in the future, and were therefore good candidates for discussion during the forest planning process. Forest policy subjects identified by district rangers were related to forest health (types of treatment, acres to be logged, reasons for treatment), number of additional acres to be designated Wilderness, road building (determination of need, type of roads needed, for what purposes), approval of usage of USFS lands for reservoirs and tradeoffs between environmental quality, motorized recreation and commercial recreation. Most of these variables used 1 through 5 Likert-scales ranging from Strongly Agree to Strongly Disagree. In this article we will concentrate on the values-attitude relationship, and the external and internal validity of the values typology, the direction of prevailing value orientations and their relationship with demographic factors.

### *Statistical Procedures*

A series of statistical analyses were performed using SPSS 13.0 to explore the forest value and attitudinal data. These analyses to a great extent follow those of Brown and Reed (2000) in order to test validity. First, descriptive statistics on the value data were obtained, specifically frequencies and mean values for the twelve value statements. The frequencies demonstrate how relatively common a value may be to respondents, the mean scores demonstrate the relative importance of a value, e.g. a value may have a high frequency count among respondents, but relatively low mean score, showing that it is a perhaps generally acknowledged value of the PSI, but not held with great intensity.

Then the significance of relationships between the values and socio-demographic factors were explored using analysis of variance, specifically age, gender, level of education, and rural/urban residency.

The third analysis consisted of factor analysis using principal components to explore whether there were any latent constructs within the twelve values of the forest value typology. Using three criteria, eigenvalues, scree plots, and the Kaiser-Meyer-Olkin statistic, the possibility was explored of reducing the typology to less than 12 values.

Then, using Pearson product moment correlations, relationships were examined between the 12 forest values and 17 forest use attitudes e.g. motorized recreation, various forest treatments and fish and wildlife habitat.

The last data examination consisted of discriminant function analysis to explore the predictive value of the values typology in relation to forest policies. Discriminant function analysis is suitable for modeling relationships between a categorical dependent

variable and one or more scale independent variables (Stevens 2002). Using a set of independent variables, discriminant function analysis attempts to find linear combinations of those variables, in this case the twelve forest values that optimally separate the groups of respondents. Thus, if forest values have predictive power, we would expect these values to fall into one or more discriminant functions. The first discriminant function usually explains the majority of the variance and Wilks' lambda is the statistic used to test the null hypothesis. If the p-value of Wilks' lambda is less than .05, then the discriminant function would provide us the key forest values that help distinguish between groups of respondents (Brown et al. 2000;Stevens 2002;SPSS 2004).

For example, an important forest policy issue on the PSI is amount of acreage to be logged: discriminant function analysis allows us to distinguish, or discriminate, between groups that favor logging the same amount of acreage as the 1982 PSI Plan outlined, more than that amount, less, or none at all, using all twelve values as predictor variables. This statistic will tell us which forest values have the most predictive power in relation to this issue and the amount of variance explained by the predictive function and the forest values that fall into it. As the Chugach method researchers had done, we too selected a number of forest policy issues that were not only pertinent to the PSI but are important to many national forest planning efforts, i.e. amount of logging, amount of new road building, amount of wilderness to be designated and disposition toward motorized recreation. The discriminant function analysis was also conducted in the two ways that Brown and Reed reported: 1) with only the forest values and 2) with forest values and forest use attitudes as predictor variables, entering all predictor variables simultaneously in each case.

## **Results**

The response rate of the survey was 33%, which provides an n of 658. The stratification of the sample resulted in 300 urban and 358 rural responses. Although these response rates do not differ greatly, they mirror the results of the Chugach study, where communities closer to the forests had a higher rate of response. A telephone survey with 50 non-respondents tested differences between respondents and non-respondents regarding attitudes, value orientations, forest policy preferences and demographic variables. This non-respondent survey revealed only one statistically significant difference with respondents: respondents were more likely to have visited the Pike/San Isabel National Forests, and to have done so more often in the last 12 months.

### *1. Frequency and Intensity of Values*

In the Colorado study, frequency scores resulted in aesthetic, life sustaining, future and biologic diversity being the four most acknowledged values (Table 3). Rank mean scores showed the four most intensely felt values were aesthetic, recreation, life-sustaining and future values. Where biodiversity ranked fourth as a value for the whole sample, it ranked fifth in value intensity, i.e. the dollars respondents allocated to it. Also, recreation ranked fifth as a value for the whole sample, and second in value intensity. Recreation value showed the greatest gap in frequency and mean intensity score ratings of all twelve values.

**Table 3. Frequencies and Mean Scores for Complete Sample**

<b>Values</b>	<b>Frequency Count</b>	<b>%</b>	<b>Frequency Rank</b>	<b>Mean Intensity</b>	<b>Mean Intensity Rank</b>	<b>Std. Deviation</b>
<b>Aesthetic</b>	487	74.5	1	14.09	1	13.772
<b>Biologic Diversity</b>	440	66.4	4	11.49	5	12.305
<b>Cultural</b>	209	31.7	12	3.62	12	7.676
<b>Economic</b>	220	33.4	10	4.45	9	8.944
<b>Future</b>	453	68.8	3	11.75	4	12.788
<b>Historic</b>	268	40.7	8	4.75	8	8.266
<b>Intrinsic</b>	280	44.5	7	6.24	7	10.666
<b>Learning</b>	260	39.8	9	4.11	11	6.396
<b>Life Sustaining</b>	456	69.3	2	13.96	3	15.922
<b>Recreation</b>	426	64.7	5	14.01	2	17.013
<b>Spiritual</b>	211	32	11	4.15	10	8.698
<b>Therapeutic</b>	321	48.8	6	6.55	6	9.058

These results correspond with those of the Chugach study where three of the top ranking values in terms of frequency were also aesthetic, life sustaining and biological diversity. Recreation, life sustaining, aesthetic and economic values were the most deeply felt values for Chugach respondents, the first three corresponding with the PSI results.

In this study we also explored rural and urban differences in value orientations, of which there were few (Table 4). Aesthetic, life sustaining, future and recreation were the highest acknowledged values for rural respondents, for urban respondents these values were aesthetic, biodiversity, future and life-sustaining values. Most deeply held values for rural respondents were the same four values and for urban life-sustaining, aesthetic, recreation and biological diversity values were the most deeply held. The same five values are generally important to both rural and urban respondents and the differences in frequency numbers and mean scores are slight. However there is a weak, but significant

difference between rural and urban populations where only two forest values were concerned, biological diversity and future values, where in each case urban respondents had allocated more dollars to them.

**Table 4. Frequencies and Mean Scores for urban and rural stratifications.**

Values	Urban		Intensity		Rural		Intensity	
	%	Rank	Mean	Rank	%	Rank	Mean	Rank
<b>Aesthetic</b>	77	1	14	2	71	1	14	2
<b>Biodiversity</b>	71	2	12.5	4	62	6	10.7**	5
<b>Cultural</b>	27	12	3.2	12	33	12	3.9	11
<b>Economic</b>	29	10	3.6	11	35	10	5.1	8
<b>Future</b>	70	3	12.5	5	67	3	11.3*	4
<b>Historic</b>	39	9	4.8	8	41	8	4.7	9
<b>Intrinsic</b>	62	6	5.8	7	44	7	6.6	7
<b>Learning</b>	42	8	4.5	9	36	9	3.8	12
<b>Life Sustaining</b>	70	4	14.4	1	67	2	13.3	3
<b>Recreation</b>	66	5	13.9	3	63	5	14	1
<b>Spiritual</b>	28	11	4.2	10	33	11	4.2	10
<b>Therapeutic</b>	46	7	6.2	6	50	5	7.1	6

\*  $p < .05$ , \*\*  $p < .01$  urban respondents favor more

## 2. Socio-Demographic Factors

ANOVA analyses resulted in several significant differences detected between within socio-demographic demographic variables and forest values (Table 5). Where age is concerned, a significant difference existed between younger residents and learning, life-sustaining, recreation and spiritual values and other age cohorts. Also, age cohorts in the middle, between 31 and 64, were more closely associated with aesthetic, recreation and therapeutic values, while residents over 64 were more closely associated with life sustaining and therapeutic values.

The number of years residents lived in Colorado only showed a significant difference where cultural value was concerned: respondents who had lived in Colorado 1-5 years, or more than 46 years, rated cultural value as more important. Female residents' means were significantly higher for historic, intrinsic, learning and spiritual values, while male residents' means were significantly higher for recreation value. Residents who had not completed high school or GED education showed a significant relationship with cultural and spiritual values. Respondents whose education had included some graduate study also showed a significant relationship with spiritual values, although respondents with one or more graduate degree ranked lowest with spiritual value. Lower to middle-income residents were significantly tied to cultural, intrinsic and spiritual values, while recreation value was significantly tied to an income of \$ 25,000 or more.

Although not reliable because the number of respondents is statistically too small, we compared ethnicity and race value orientations as Brown and Reed did (2000). Aesthetic and cultural value means were significantly higher for Hispanic or Latino respondents (n=24) than for non-Hispanic or Latino respondents (n=634). Biodiversity value was significantly more important to Asian American (n=11) and African American respondents (n=3), life sustaining value more important to Native American (n=17) respondents, when compared to white respondents ( $p < .05$ ).

The Chugach study did not provide significant value orientation differences for years of residence or income. Alaskan Natives had a significant relationship with subsistence and cultural values. Economic value in Alaska was the only value where age groups significantly differed, where in the Colorado study more differences surfaced. Gender provided seven significant differences in relation to value orientations in Alaska,

with a more even distribution of these significant value differences between men and women – in Colorado the differences were weighted more on the female side. A lower formal education level was weakly related to subsistence value in the Chugach study, which is similar to the combination of spiritual and cultural values also tied to lower formal education in Colorado.

**Table 5. Significant Relationships between forest values and socio-demographic factors.**

<b>Variable</b>	<b>Forest Value</b>	<b>F</b>	<b>p</b>	<b>Valued more by respondents who:</b>
<b>Age</b>	<b>Aesthetic</b>	3.045	.028	> 31
	<b>Learning</b>	2.665	.047	18-31
	<b>Life Sustaining</b>	3.176	.024	18-31 and >65
	<b>Recreation</b>	5.722	.001	18-64
	<b>Spiritual</b>	3.342	.019	18-31 and 46-64
	<b>Therapeutic</b>	5.167	.002	31-64
<b>Years in Colorado</b>	<b>Cultural</b>	3.198	.013	0 - 5 or >46 years
<b>Gender</b>	<b>Historic</b>	5.632	.018	Female
	<b>Intrinsic</b>	5.429	.020	Female
	<b>Learning</b>	13.366	.001	Female
	<b>Recreation</b>	18.470	.000	Male
	<b>Spiritual</b>	9.294	.007	Female
<b>Education</b>	<b>Cultural</b>	5.421	.000	High school unfinished
	<b>Spiritual</b>	2.376	.028	“High school/GED”, “Some Graduate Work”
<b>Income</b>	<b>Cultural</b>	2.489	.016	< \$ 75,000
	<b>Intrinsic</b>	2.026	.05	< \$ 50,000
	<b>Recreation</b>	2.092	.043	> \$ 25,000
	<b>Spiritual</b>	2.189	.034	< \$ 75,000

### 3. Factor Analysis

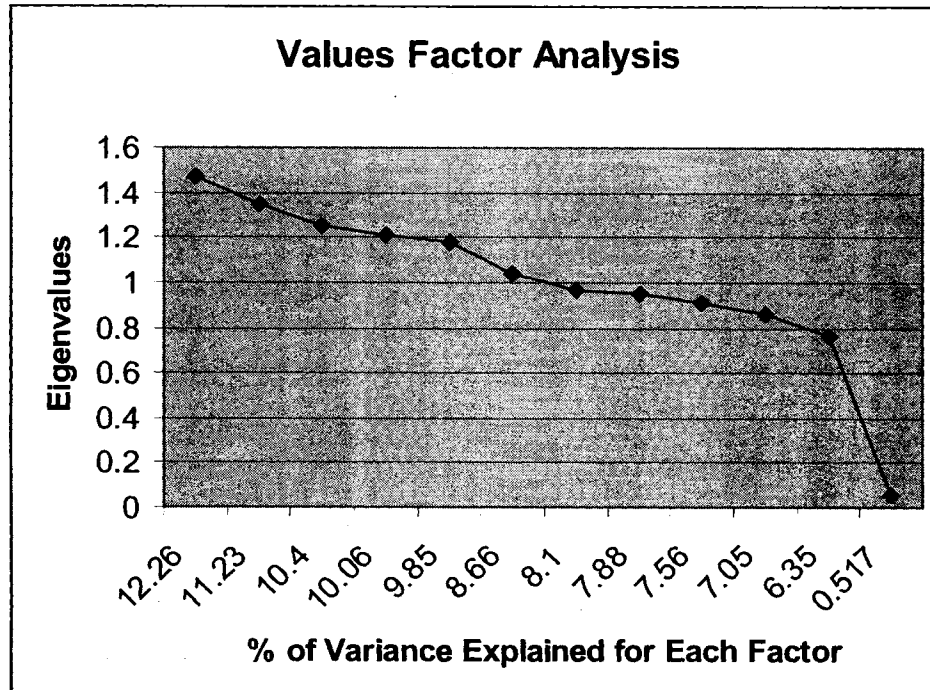
To explore whether the 12 values together form a complete typology, i.e. whether other factors explain the variance (latent structure) or the values could be reduced in number to explain more variance, principal component analysis was performed on the 12

forest values. The criteria Brown and Reed used to explore latent structure, which were used here too, were eigenvalues over 1, scree plot and Kaiser-Meyer-Olkin statistic.

**Table 6a. Factor Analysis results using Principal Components**

Factor	Eigenvalue	% of Variance	Cumulative %
1	1.471	12.262	12.262
2	1.347	11.225	23.487
3	1.248	10.396	33.884
4	1.207	10.061	43.945
5	1.182	9.852	53.797
6	1.040	8.664	62.461
7	.969	8.073	70.534
8	.946	7.883	78.417
9	.908	7.564	85.981
10	.858	7.149	93.130
11	.762	6.353	99.483
12	.062	.517	100.000

**Figure 1. Scree Plot Showing Whether Data Reduction is Possible**



Six factors resulted with eigenvalues over 1, together explaining 62.5% of the variance, in comparison with also six factors in the Chugach study which explained 60.3% of the variance. As with the Chugach study, experimentation with various rotations did not clarify factor loadings or providing logical results. In the scree test developed by Cattell (1966), the eigenvalues are plotted to see if there are any large differences in the variance explained by each factor, which would indicate that data reduction might be feasible. Similar to the Chugach study again, no kinks or elbows associated with a significant amount of variance appeared in the scree plot, which showed generally a subtle and consistent decline of eigenvalues on a gentle down-ward trajectory. A drop in relation to the twelfth factor can be seen but the variance associated with that factor is too small to create a data reduction opportunity. The last criterion to explore the validity of the forest typology was the Kaiser-Mayer-Olkin (KMO) statistic, which explores the underlying correlation matrix. The KMO statistic tests whether partial correlations are small, which would not be the case if there were latent factors. A number of high correlations in each factor would indicate latent factors, and would result in a high KMO statistic value. In this case, as in the Chugach study, partial correlations were small with no positive or negative correlation values higher than 0.23. Kaiser (1974) stipulated that KMO statistic values less than 0.5 indicated that factor analysis was inappropriate. In the Chugach study the KMO statistic was 0.02, in this study it was a higher value, 0.3, which by itself, and combined with the other criteria, would indicate factor analysis in this case will not result in any data reduction possibilities.

The results of the factor analysis and the three criteria used to test the typology would indicate that no superfluous forest values were used in the forest typology, and that

each value plays a role in explaining the variance regarding respondents' value orientations, both in the Chugach and the Pike/San Isabel Forests planning studies.

The results from both the Chugach and this Colorado study are similar: both provided the same number of factors, explaining about the same amount of variance, and further testing does not allow for data reduction of the typology. In both studies, the twelve values form an internally consistent values orientation measurement tool that works optimally with all 12 values included. To test for internal consistency, a reliability analysis was run, which resulted in a Cronbach alpha of .89. A minimum of .80 is necessary to indicate high reliability (Stevens 2002).

#### *4. Correlations between Forest Use Attitudes and Value Orientations*

A larger number of significant relationships resulted from correlating forest uses with value orientations than in the Chugach study (Table 6.) Of the 204 resulting correlation coefficients, 70 indicated a significant relationship. On the PSI, economic and recreation values were significantly correlated to many extractive uses, motorized recreation, sport fishing and hunting. These same values were negatively correlated to both wilderness designation and fish-and-wildlife habitat. Intrinsic value was negatively correlated with sport fishing and hunting, motorized recreation and a number of extractive uses. Aesthetic value was also negatively correlated with two extractive uses in particular, oil and gas winning and commercial mining, which resulted in the two of the three highest correlation coefficients. The third of the three highest coefficients was a positive relationship between economic value and sightseeing.

**Table 7. Correlations between forest uses and forest use attitudes**

	Aesthetic	Cultural		Future	Learning		Recreation		Therapeutic		%	
		Biodiversity	Economic		Intrinsic	Life Sustaining		Spiritual			Favor	
<b>Sightseeing</b>		0.13*	0.1	0.81		0.09			0.09		93	
<b>Sport Fishing</b>					-0.1			0.13*	-0.09		90	
<b>Non-Motor</b>		0.12*						-0.12*			95	
<b>Hunting</b>	-0.12*			0.2*	-0.1			0.19*	-0.1		65	
<b>Heliski</b>			0.08	0.1	-0.12*	-0.08		0.1			31	
<b>Wildlife View</b>		0.08	0.1								97	
<b>Motor</b>				0.2*	-0.08*	-0.12*		-0.12*	0.32*	-0.09	36	
<b>Fuels Red.</b>				0.26*				0.23*			56	
<b>Mining</b>	-0.77			0.33*		-0.1		0.12*			16	
<b>Gathering</b>				0.11*							70	
<b>H2O logging</b>				0.27*		-0.08		0.16*	-0.12*	-0.12*	38	
<b>Oil/gas</b>	-0.89			0.3*		-0.08		-0.1	0.19*	-0.09*	-0.12*	21
<b>Woodprod.</b>				0.35*		-0.09		-0.12*	0.18*	-0.11	-0.09	35
<b>Outfitting</b>				0.21*				0.08			60	
<b>Utilities</b>				0.25*				0.09	0.1	-0.1	33	
<b>Wilderness</b>	0.13*	0.12		-0.23*	0.12*		0.12*	-0.25*	0.11*		85	
<b>Fish &amp; Wild</b>		0.13		-0.17*				0.13*	-0.1		97	
<b>Frequency</b>	487	440	209	220	453	280	260	456	426	211	321	

No asterisk =  $p < .05$ , \* =  $p < .01$ . Blank space indicates no significant results.

### 5. Discriminant Function Analysis

To explore the predictive abilities of the 12 values within the forest typology, discriminant function analysis was used in relation to forest policies that are important to the PSI and to forest planning on a national scale. In this analysis, three dependent variables were used which coincided with the Chugach study, road building, amount of logging, and wilderness designation. A fourth dependent variable that is an important subject on the PSI and other forests is motorized and non-motorized recreational use.

**Table 8. Discriminant Analysis on motorized/non-motorized recreation and new road building issues.**

# of variables used to predict favor toward the issue	a. Motor/Non Motorized Rec.		b. Amount of new road building	
	12: Values only	29: Values and Attitudes	12: Values only	29: Values and Attitudes
Eigenvalue	0.306	0.581	0.091	0.383
% variation explained	90	86	78	85
Classification by probability	25%	25%	33.3%	33.3%
% grouped cases correctly classified	53%	60%	47%	58%
Most important predictors	Recreation Economic Life-sustaining Intrinsic	Wilderness Motor Rec. Recreation Value Oil/Gas Drilling	Economic Recreation Spiritual Intrinsic	Logging for H2O Oil/Gas Drilling Motorized Rec. Wood products
Most important value predictor	Recreation	Recreation	Recreation	Aesthetic
Wilks' Lambda	.734, p < .000	.547, p < .000	.676, p < .000	.894, p < .000

With each forest policy issue, discriminant function analysis was first run with the 12 forest values, and then with forest values and forest use attitudes combined. In discriminant function analysis the null hypothesis is that a set of variables will not

increase the amount of variance explained over random chance (classification by probability) whereby Wilks' Lambda is the multivariate statistic used to test the hypothesis. In all four cases where values were tested for predictive power, the null hypothesis was rejected because the percentage of grouped cases that were correctly classified over random chance increased, while adding forest use attitudes increased predictability sometimes considerably.

**Table 9. Discriminant Analysis on Wilderness designation and timber harvesting issues.**

# of variables used to predict favor toward the issue	c. Wilderness Designation		d. Timber harvesting	
	12: Values only	29: Values and Attitudes	12: Values only	29: Values and Attitudes
Eigenvalue	.254	.941	.15	1.009
% variation explained	91	86	72	83
Classification by probability	25%	25%	25%	25%
% grouped cases correctly classified	41	52	39	59
Most important predictors	Recreation Economic Life-sustaining Future	Wilderness Oil/Gas Drilling Motorized Rec. Fuel Reduction	Economic Recreation Life-sustaining Intrinsic	Wood products Fuel Reduction Logging for H2O Oil/Gas Drilling
Most important value predictor	Recreation	Learning	Economic	Recreation
Wilks' Lambda	.777, p < .000	.444, p < .000	.822, p < .000	.408 p < .000

For example, when running this test using a variable that queried respondents about the tradeoffs they felt were reasonable when having to choose between motorized, and non-motorized recreation versus environmental quality, the forest value typology

increased the ability to correctly classify groups by almost 30%, with attitudes included this went up to 35%. While recreation value was the most important predictive value in this case, recreation, economic, life-sustaining and intrinsic values proved to significantly add to the predictive power of the typology.

As the frequency ratings and mean scores in the first statistical tests indicated, the recreation, aesthetic and life sustaining values were important predictors in each discriminant function analysis, with the addition of intrinsic and economic values adding to the predictive power of the forest values typology. The recreation and economic values appeared to be important in each case, appearing to be the most powerful in distinguishing groups in favor or against a particular forest policy issue.

## **Discussion**

### *1. Internal and external validation of the values typology.*

In relation to internal validity, this study sought to explore whether other variables may provide an alternative explanation for the results or whether the values typology by itself provides an accurate measurement of forest values on the PSI. Thus, to reduce any socio-demographic bias a test is applied to a random sample of sufficient size to reduce any error to .05, as was done in both the Chugach and the PSI studies. However as previously mentioned, in this case the concern raised in relation to values measurements have been directed more at content i.e. whether what a researcher thinks he/she is measuring, is really being measured. This has been an informal topic in relation to previous values studies because statements were designed which were assumed to resonate with the same meaning with respondents. However, the validity of this has not

been tested. This question may be resolved in this method by providing a description that can be understood by all respondents, and within that understanding, responses are provided. Here, statistical methods were used to explore the underlying structure of the values typology and whether the values typology, or other variables, are indeed the source of variance, in this case tests 1 and 3 in the Results section in relation to frequencies, mean scores and factor analysis.

In Test 1 five values were most frequently ascribed to by respondents, which were also rated high in intensity: aesthetic, life sustaining, future, biological diversity and recreation. This general agreement about which values are most relevant to respondents on the PSI, and their intensity, was consistent for all values in the typology (Table 1). The least prevalent and important values were cultural value, learning and economic values. This ranking of the values generally also coincides with the views of respondents to the Chugach survey. The factor analysis in Test 3 produced also very similar results to the Chugach study: the amount of variance explained by the eigenvalues was very similar to the Alaskan results. Additionally, when exploring whether factor rotations might provide more clear results with higher variances explained, the result was negative. Lastly, both the scree plots and KMO tests indicated clearly that the typology does not lend itself to data reduction. The relatively low correlations between the values in the typology, combined with the almost two thirds of the variance explained in two studies, would that each value is unique and salient enough to contribute to the explanation of variance. As Brown and Reed observed, removing even the least acknowledged forest value will decrease the efficacy of the value typology which in this case means that the

frequencies alone would indicate that cultural value needs to remain in the typology since, 31% of the respondents allocated some importance to it.

At the time of writing this article, we are aware of other studies being conducted utilizing this values typology in Oregon, Canada and Australia, the results of which may strengthen confidence in it. Until then, the current study would indicate that confidence in the internal validity of this methodology is indeed warranted since the different statistical methods results indicate that respondents and researchers have a common understanding of what is being measured (content validity specifically) and that no other variables (or bias) can explain the results that arise from the use of this values typology (general internal validity).

To test external validity and the extent to which results can be generalized to the population from this sample. random sampling of sufficient size is the critical method to provide the power to generalize to a population and to reduce error (Babbie 2001). In this case our response rate was 687 when 384 would have been sufficient to generalize to our population of approximately 3.5 million. Additionally a non-response bias test was conducted to test whether there were significant differences in responses between respondents and non-respondents. If there are significant differences, this could cause concerns regarding extrapolation of the results to a larger population. As mentioned, the only difference between non-respondents and respondents was that respondents were significantly more likely to have visited the PSI in the recent 12 months, and where all other value and attitude items were concerned there were no significant differences. When compared to the results of the National Recreation Survey, the demographic profile of the PSI sample overlaps greatly with that of visitors to National Forests on a national

scale in terms of race (predominantly white), gender (male) and income (higher) (Cordell, 2001). When compared with Colorado demographic profiles reported in the Census 2000 and 2004 numbers, the PSI sample is older, enjoys a higher income, gained a higher education level, and is similar in ethnic diversity, which again agrees with the state recreation numbers for Colorado in the National Survey on Recreation and the Environment. This information indicates that the PSI sample can be generalized to both state and national PSI visitor profiles, and thus to the segment of the population that tends to be engaged in PSI forest issues.

Another measure of external validity is the extent to which, in this study, the values typology can be applied to e.g. predict respondents' attitudes to forest uses and policies. The correlations between forest value and forest use attitudes, and the discriminant function analyses are tests which can provide an indication of the level of external validity if there are linear relationships between values and attitudes. The correlations between forest values and attitudes provided 70 significant correlations out of a possible 204 whereby the predictive power of some values in the typology appeared greater than others, resulting in more correlations. The economic and recreation values each provided 14 significant relationships of both positive and negative nature. These same values also proved important when discriminating between groups on forest policies in the discriminant function analyses. The one policy issue that was explored that is most associated with economic gain, is timber harvesting. The values typology would prove accurate, in an external validation context, if the economic value in the typology proved to have the predictive power to discriminate between groups. When using values alone, the economic value orientation indeed proved to be the most

important value when discriminating between groups, and helped improve predictability by 14% over random chance.

On the one hand the ability to predict respondents' policy attitudes or beliefs with 39% accuracy is an improvement over the 25% that would have resulted with random chance. When adding the attitude variables, that accuracy increases to 59%. These results confirm the findings from other studies, including the Chugach study, where value orientations are important in predicting behavioral intentions but are more powerful if mediated by attitudes (Vaske et al. 1999; Bright et al. 2000). The values typology is helpful in predicting attitudes and when combined with attitudes, provides a more powerful predictive tool for understanding cognitive constructs higher in the cognitive hierarchy such as behavioral intentions in relation to natural resource management issues. In this case values and general forest attitudes are observed in relation to a third construct, specific forest preferences, a more narrow type of attitude. When using values or attitudes alone, the predictive power is less optimal than when combined. Attitudes mediate and can be compared to an ocular instrument, an additional lens on which to focus values, creating greater clarity. This is in keeping with the theory behind the cognitive hierarchy: one construct builds on the previous one and is in its own right an important contributor to explaining variance, not only in quantity but also in quality. Without exploring the values that underlie attitudes, our contextual understanding of those attitudes would be severely limited and could lead to incorrect conclusions.

Finally, gauging external validity can also be done by comparing results with other studies. The value typology used here and in Alaska provides results which parallel those of many other values-related research for the past four decades: respondents were

generally biocentric in their value orientations, both in quantity (frequencies) and in intensity (mean scores). The more human centered values, i.e. economic, cultural, learning and historic, ranked lowest whereas the more nature centered values, biological diversity, life-sustaining, aesthetic were the highest ranked values. This value orientation is reflected consistently in forest uses and forest policies within the study itself, and mirrors the results of the Chugach and other values studies, in turn indicating a high level of external validity.

## *2. Nature of the value orientations of residents in and around the PSI, specifically urban and rural residents.*

Table 4 illustrated the rankings of frequencies and mean scores for urban and rural residents in and around the PSI, which differ significantly only where two values are concerned, biological diversity and future values. These differences are muddled somewhat by the fact that one is a pronounced nature-oriented value and the other oriented to future generations of humans, but arguably other species as well. Urban residents put more emphasis than rural residents on these, however due to the differing nature of the values, the implication is not clear.

The top ranking values were similar for both urban and rural residents: aesthetic, biodiversity, future, life sustaining and recreation, although there are differences between frequency and mean score rankings, within the urban and rural stratifications and within the stratifications themselves. Both stratifications are generally more nature-oriented, with the rural population reflecting a slightly less high score.

We conclude that although studies carried out in the nineties and recently in eastern parts of the country showed a significant difference between urban and rural populations, this Coloradoan study does not (Steel et al. 1994;Manfredo et al. 1996;Tarrant et al. 2003). Although urban populations are still slightly more biocentric in their value orientations than rural populations, it may be the demographic changes of the last 10-15 years are reflected in a now also generally rural biocentric value orientation. Alternatively, long-time rural residents will have experienced many dramatic changes in their habitual landscape, certainly on the PSI, and in the Front Range and mountain areas of Colorado generally. These changes may be affecting rural value orientations and inducing a more protective stance to forested landscapes as a result. The Q-methodological component of this study will discuss this further in another Chapter 2.

### *3. The relationship between urban and rural resident' values and their forest policy preferences.*

When exploring differences in value orientations along socio-demographic lines, interesting differences were observed. Intrinsic value, which is generally held to be the most nature-oriented value because it puts the emphasis completely on nature, was held slightly more by female respondents and those with an income lower than \$50,000. Education has been shown to play a role in determining the groups that value forests intrinsically, but since the respondent profile in this study is already above average in the education category, this may explain why no significant differences are present (Vaske et al. 2001;Tarrant et al. 2002). Age was the only weakly significant socio-demographic characteristic for life sustaining value (3.176,  $p < .05$ ). These few, weak differences would

confirm the increasingly ubiquitous nature of the biocentric value orientation for the complete sample. As a result, the differences in value orientations that could be distinguished by socio-demographic characteristic tended to be human-centered: learning, aesthetic, recreation, spiritual, therapeutic, cultural and historic.

Forest use attitudes reflected this nature orientation. The top five forest uses for all respondents, with no significant differences between rural and urban residents, were sight-seeing, sport fishing, non-motorized recreation, wildlife viewing and fish and wildlife habitat, with a close sixth place for wilderness designation. Because the more nature-centered value orientations are so pervasive throughout the sample, the more anthropocentric value orientations were most effective at distinguishing respondents' forest use attitudes. Hence, significant positive correlations were found between two human-centered values, economic and recreation and uses such as motorized recreation, outfitting and guiding, commercial mining, oil and gas winning, and logging for fuels reduction, wood products and to increase water collection (Table 7). On the other hand, looking at the same values, strong negative relationships are found with wilderness designation, fish and wildlife habitat and non-motorized recreation. Aesthetic values were negatively correlated with commercial mining, oil and gas winning and hunting, while intrinsic value was negatively correlated to the same forest uses and other more utilitarian uses of the PSI.

Lastly, exploring the way value orientations predict respondents' attitudes to forest policies, the discriminant function analysis again relies most on recreation and economic values as the "splicers". A look at the way the values typology performed when distinguishing between groups who were more or less in favor of motorized

recreation, the economic and recreation values were most valuable at identifying respondents in favor of motorized recreation, and the life-sustaining and intrinsic values helped identify respondents who preferred either non-motorized recreation, or environmental quality above both. Of the four policy issues explored, groups preferring different amount of wilderness to be designated were discriminated better by the values typology alone which explained 91% of the variance whereby recreation and economic values acted as the negatively related splices and life sustaining and future values as positive ones.

### **Conclusion**

Given the evidence provided in relation to the first objective of this study, internal and external validity, this study concludes the Chugach methodology could be used in relation to two forests in Colorado with a high measure of confidence. Other studies are being conducted in Oregon and Idaho whose results will be published soon, whose findings will be able to provide further insights as to the confidence level that was achieved with this methodology, as well as lessons learned to perhaps improve on it.

This study finds with regards to the second objective that residents interested and involved in the Pike/San Isabel National Forests are generally nature-oriented in their values, and that these values are consistently reflected in forest uses and forest policies. Regarding the last objective, exploring differences in value orientations between rural and urban residents, these results indicate that in Colorado these differences are decreasing. Of the twelve values in the typology, only two were significantly different,

biodiversity and future values, but by a small percentage, 9 and 6 percentage points respectively.

The findings also confirm the importance of values related research. For example, the survey included questions regarding respondents' preferences for logging in certain contexts resulting in the following levels of agreement: for commercial profit only (17%), to protect life and property (89%), to remove dead or insect-infested trees (93%), to create or improve wildlife habitat (87%) or did not support logging at all (7%). Superficially it might appear that respondents are generally in favor of logging on the PSI. Alternatively, when combining these frequencies with responses to further questions regarding specific treatment questions, socio-demographic questions and correlated with forest use attitudes, a different picture results. This interpretation sees respondents as fairly sophisticated in their distinctions between these different reasons for doing logging, whereby commercial logging alone is generally disapproved, as well as no logging at all. When in the context of protecting human property as well as forests and wildlife, there is high approval, and further information in the survey also reveals that respondents have definite preferences in treatments, e.g. respondents disapprove of clear cutting and approve of thinning. Combined with the high preference for non-extractive or even protective forest uses, e.g. wildlife viewing and designation of wildlife habitat, and the lower approval numbers for no logging at all, this interpretation would allow for treatments on the PSI in a narrower context. Underlying this interpretation are values which, when oriented through this forest value typology, are generally nature-oriented for both urban and rural residents. Thus, the detail and validity of the information that surveys such as these provide is enhanced by a values component to understand more in-

depth the underlying values and motivations of respondents when soliciting preferences and attitudes regarding specific issues. This information in turn can be extremely valuable to forest planning and collaborative efforts where meaningful public participation is one of the goals.

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## **Chapter 2: Exploring Forest Value Discourses in the Colorado Rocky Mountains**

### **Introduction**

The way humans value forest and other environmental components have been the subject of much research in recent decades, providing a large body of evidence on the subject (Rolston and Coufal 1991;Shindler, List and Steel 1993;Bengston 1994;Steel, List and Shindler 1994;Fulton, Manfredo and Lipscomb 1996;Xu 1997;Manning, Valliere and Minter 1998;Vaske and Donnelly 1999;Bright, Manfredo and Fulton 2000;Brown and Reed 2000;Reed and Brown 2003;Tarrant, Cordell and Green 2003;Bengston, Webb and Fan 2004). This body of evidence suggests that United States' citizens find these natural aspects of their society important, for a wide range of reasons. Recently, new methodologies were used to explore the values residents have in relation to a specific forest, the Chugach National Forest in Alaska, on a landscape scale utilizing both survey and mapping components (Brown et al. 2000;Reed et al. 2003). The present study sought to validate this Chugach methodology (Clement and Cheng, in press) while applying it to the Pike and San Isabel National Forests in Colorado (PSI).

The Brown and Reed survey approach on the PSI represents a form of R-methodology, i.e. factor analyses which correlate and factor traits between people (Brown 1980;McKeown and Thomas 1988). In addition to validating the Chugach survey method, this study used Q-methodology, the correlating and factoring of persons across traits, in relation to one community in the PSI, Lake County (Brown 1980). By combining survey and Q-method results, this study discovered not only what value

orientations residents have regarding the PSI in general and Lake County in particular, but also the context and reasons behind those value orientations.

The community where the study took place is located within a forest that has initiated planning efforts under the National Forest Management Act (1976) and will be doing so using the 2005 planning rules (Revised 36 Code of Federal Regulations Part 219). Under these planning rules, collaboration becomes an important component for not only planning purposes, but also to create long-term collaborative relationships between USDA Forest Service entities such as forests and forest districts, and local communities and other constituents. Having a more thorough understanding of the values held in relation to national forests by local communities than can be provided by R-methodologies such as surveys alone, may prove useful in creating sustained and productive relationships between an agency and its constituents.

In this article, the values that result from the Lake County Q-method and the R-method survey will be explored and the discourses featured in the Q results regarding those values and the community will be presented.

### *The Nature of Values*

Values are defined as “an enduring belief that a specific mode of conduct or end-state of existence is personally or socially preferable to an opposite or converse mode of conduct or end state of existence” (Rokeach, 1973, p. 5). A similar definition, more specific to forests, is provided by Bengston et al., where forest value orientations are defined as, “relatively enduring and fundamental concepts of good related to forests and forest ecosystems” (2004). A “value” is defined as the kind of enduring belief that is more

general, can be applied to many different topics, is deeply felt and difficult to articulate, a “value orientation” is the application of those values to a specific subject. To measure subjects’ forest values, the researcher attempts to focus respondents’ values to the specific aspect of the forest, and thus measures their value orientation in relation to forests. Values have been found to be enduring in the sense that they are not subject to change the way beliefs may be. In the cognitive hierarchy that usually forms the theoretical foundation behind R-methodology values research, values are the foundation of the cognitive hierarchy, which allow a person to develop beliefs, then attitudes, behavioral intentions, finally leading to actual behavior (Rokeach 1973; Ajzen and Fishbein 1980; Vaske et al. 1999). As the foundation of a person’s cognitive hierarchy, values are intensely personal, and therefore intensely subjective. Values form early in life, and will change only when a profound experience forces a change, and not due to something relatively superficial such as new and different information (Manfredo and Zinn 1996). Values allow a person to take in new information, and assimilate it in such a way that beliefs may change, but the values generally stay the same. Hence, measuring values, and value orientations, and using them as predictors of respondents’ attitudes, beliefs and in turn of behavioral attentions usually provides reliable and valid information, often explaining a large amount of variance (Shindler et al. 1993; Manning and Valliere 1996; Vaske et al. 1999; Tarrant et al. 2003). However, in R-methodology researchers do not know what the context and circumstances within which respondents are operating and other theoretical frameworks not based on the principles of cognitive hierarchy, such as Q-methodology, may provide these additional insights and play a complementary role to a R-methodological survey.

### *The Nature of Q-Methodology*

R-methodologies utilize surveys to elicit specific responses from participants, which are then correlated and factor analyzed, allowing for the creation of scales which are in turn used to explore predictive relationships with attitudes and other cognitive constructs. Several studies used these procedures and described values as being on a scale from anthropocentric, where values are based more on the needs of humans, to biocentric, where values are based more on the needs of nature (Shindler et al. 1993; Manning et al. 1998; Vaske et al. 1999; Tarrant et al. 2003). However these survey methodologies do not easily facilitate the exploration of the multi-faceted nature of values, since most values in relation to natural resources contain various degrees of anthropocentrism and biocentrism and are not purely anthropocentric or biocentric (Shindler et al. 1993; Steel et al. 1994; Fulton et al. 1996; Vaske et al. 1999). Additionally in survey-only research, questions are put to respondents outside of any context in terms of local culture, geography, current issues, changing demographics and a host of other factors which inform participants' value orientations.

R-methodologies usually require the a priori determination by the researchers of, in this case, the values to be measured, and how to differentiate between them (Brown 1980). Where values in particular are concerned, a methodology that allows the subjects themselves to state what is valued and why, may increase content validity by measuring not what researchers a priori think might be important to respondents, but what is actually is important. One methodology that has been demonstrated to lend itself well to allowing research participants to express their views in their own words is Q-methodology.

Q-methodology was designed by William Stephenson in 1935 who had earned doctorates in both physics and psychology in England (Zagwell, 1972). Stephenson intended to “bring the method of physics into the realm of personality measurement” (Stephenson, 1936 in Brown, 1993, pg. 9) by applying quantum physics principles and Spearman’s “r” to describe people, and the discourses that groups of people have in relation to any subject (Brown 1993). In Q-methodology, a discourse is “a pattern of subjective views held by a certain group of people” or can be defined as a “a way of seeing and talking about something” (Addams, 2000).

Two principles which distinguish quantum physics from classical physics, also distinguish R from Q methodology: the uncertainty principle and subjectivity. Stephenson proposed that, as in quantum physics, to understand people in more depth, subjectivity and uncertainty needed to be embraced, but in a systematic method that provided results with little error. As a protégé of Spearman, and a psychologist and a physicist, he proposed a method based on correlation and factor analysis to gain systematically derived results which incorporated both uncertainty (how unknown, unique observers will observe) and subjectivity (what observers observe) whereby the observers are the participants in a study. In Q-methodology, he proposed the use of factor analysis, mathematically identical to factor analysis used in R-methodology, but in application to people and their subjectivity, not separate traits. If R-methodology measures human traits, Q-methodology measures states of the human mind. “R” (from Spearman’s r) which in social sciences is used to study human traits, is converted to the “Q” (from “quanta” in physics) of people and their complete subjectivity (Brown 1993). When applied to people, Q-methodology provides a systematic measurement of subjectivity whereby, in this case, values are measured from the viewpoint

of the observer, the participant, not from a priori assumptions made by researchers to test hypotheses. As in classical physics, R-methodology requires the establishment of a priori assumptions in order to seek predictive relationships, and the isolation of the observer from the measurement. Thus an R-methodological values social science study will establish a priori research assumptions regarding how the observer, or research participant, views forest values, with the intent to isolate the researcher, thereby reducing bias. Q-methodology, as in quantum physics, does not make the assumption that there is a predictive relationship between different human traits, e.g. that understanding values will help predict attitudes or beliefs. Q-methodology studies humans in their entirety, including their environment and circumstances, not the relationship between their separate cognitive constructs or socio-demographic variables. Q-method studies not only what observers (participants) perceive regarding certain subjects, but the context behind these perceptions, embracing a person's full subjectivity including their socio-economic, geographic and other factors. No researcher makes a priori assumptions because the method asks participants to inform a study directly regarding the nature of the issue under study and uses participants' language in the study to explore the various dimensions of an issue, not researchers'.

Additionally, where R-methodology can generalize about a population from a sample by using a large enough random n to increase power, Q-methodology does not seek to predict. In quantum physics the object is not to statistically determine predictive relationships between particles and position or velocity, because there are none. Nor does Q-methodology produce predictive relationships between e.g. values and other human traits in relation to an issue but instead describes how people view an issue within context, resulting in the various discourses that prevail among a group of people regarding a subject.

The reason why different people take part in different discourses is closely related to their values, attitudes and other social-psychological constructs, as well as their experiences, and perception of contextual environmental factors (Vaske et al. 1999; Winter, Vogt and Fried 2002; Kneeshaw, Vaske, Bright and Absher 2004). Thus, the reasons for different value orientations are by definition subjective, and for each individual, unique and unpredictable. Q-methodology embraces this subjectivity and uncertainty by allowing those involved in the discourses, the P-sample, to describe the nature of the discourses, and the language used to differentiate between them, the Q-sample or Q-sort. And since the discourses which emerge include the contextual social, political, economic and natural environment, researchers are able to learn about the existing discourses, while including that environment in the observation and measurement. Particularly where values are concerned, this embracing of subjectivity can thus provide a higher degree of internal validity: by avoiding a priori assumptions made by researchers, there can be a higher degree of confidence that what researchers seek to measure is actually being measured, unhampered by possible linguistic misconceptions (Brown 1980; Gibben 1984; McKeown et al. 1988; Brown 1993; Addams H. Addams and J. Proops 2000; Daniel, Valdiserri, Daniel, Barro and Jakes P. Jakes and S. Barro 2005).

Since its conception in 1935, Q-method studies have been applied to numerous subjects worldwide and number in the hundreds (Brown 1980; McKeown et al. 1988; Brown 1993; Addams H. 2000; Addams and Proops 2000). In relation to natural resources and the environment, recent examples of Q-method studies are in relation to ecological restoration (Woolley and McGinnis 2000) environmental controversy about airport expansion (van Eeten, Addams and Proops 2000), national forest planning (Steelman and Maguire 1999),

perspectives on good public participation processes (Webler, Tuler and Krueger 2001) and non-participation in national forest planning (Cheng and Detmar 2005). There are many more Q-studies of note. Indeed, in one 1986 search for bibliographic entries counted 1500 Q-studies alone (McKeown et al. 1988). A thorough review of both Q-methods and studies related to environmental policy can be found in Addams and Proops (2000).

### *Study Objectives*

In this study, the first objective was to explore the forest value discourses of residents who were active in forest and natural resource issues in Lake County, Colorado, and the way contextual factors such as socio-economic and environmental factors, were perceived within those discourses. Some examples of the socio-economic factors that emerged were income gained from the forest during the mining era, types of income currently gained, the changing relationship with the USDA Forest Service and challenges adjusting to new types of residents and their forest values. Lake County's forests are managed predominantly by the Pike and San Isabel National Forests, which have initiated planning procedures under the National Forest Management Act and under recent forest planning rules (USDA Forest Service E. M. C. Staff 2005). Since collaboration is an important component of planning under these new rules, the second objective of this study was to explore whether Q-methodology can benefit collaboration by providing meaning to the results of a previous survey (see below) in defining the community's relationship to its surrounding forests. The results of this study might provide a forest values blueprint for stakeholders to use in their collaborative work, since stakeholder value identification and

accommodation is considered an important factor in successful collaborative learning efforts (Daniels and Walker 2001).

### *Context of Study*

The Q-method study took place in Lake County which contains the city of Leadville and the unincorporated town of Twin Lakes. The area's history is tightly tied to gold, silver, lead and molybdenum mining, which left a legacy of historic buildings, old mines, and water and soil quality issues as a result. Currently there are no active mines and the county's main forms of income are recreation and tourism. Lake County is in transition: in the 1980's the largest mining employer the county ever had, the Climax Mine, closed, thereby depriving county coffers, businesses and educational institutions of customary funding sources. Since then, many families have left, businesses have closed, and parts of the county were declared a Superfund site, which created additional challenges to the fabric of a community which had always regarded mining with pride. However, the county's population is gradually increasing again, many buildings have been renovated with state and national historical funding, new businesses have been established and demographics are shifting. Approximately 60% of Lake County's workforce works "over the hill", i.e. on the other side of a mountain pass in Summit or Eagle counties where ski resorts and related businesses provide predominantly service industry positions (U.S. Census Bureau 2002). There is also an increasing amount of younger, enterprising people moving into the area, attracted by the Sawatch and Mosquito ranges and the scenery and outdoor recreation opportunities they provide. This newer cohort has taken advantage of these amenities to create related educational opportunities. The older educational institutions, Outward Bound

and Colorado Mountain College, have produced a generation of skilled outdoors professionals who have in turn contributed to newer outdoor educational institutions related to youth at risk, wilderness adventure and intensive environmentally oriented high school programs (Klucas 2004).

Another change in the community is the increasing amount of retired residents who are attracted to outdoor opportunities and scenic beauty. They tend to have achieved an advanced education level, and enjoy a higher income than the average resident (Riebsame, Gosnell and Theobald 1996).

These newer residents in turn offer markets for businesses that are not traditional in mining communities, such as coffee and health food shops, French cuisine restaurants and massage therapy. These developments are evidence of the transition that Lake County is gradually making from a community whose values, self-image and income were firmly tied to mining, to one that is more multi-faceted and hardly dependent on extractive uses of natural resources. The discourses regarding the held forest values may change during this transition process, reflecting the decrease in dependency on extractive, utilitarian uses and an increase in enjoyment and use of amenities that the forests provide.

The transition that Lake County is experiencing is described by Campbell (2006) and the Natural Resource Working Group of the White Mountains (2005). They describe the evolution of many rural economies in the West from a Resource Extractive economy, based on the export of natural resources or products out of the community, to a Resource Amenity economy which is based on the maintenance of local amenities such as rural life style, scenic beauty, historical aspects and seclusion. When an amenity-based community becomes more familiar with the realities of living in a natural ecosystem where windfall,

insects and fire are important dynamics and regains a renewed appreciation for the skills and infrastructure which once prevailed, a community may evolve into a Symbiotic-Resource-Based Economy which balances the utilitarian focus of Extractive with the more preservationist approach of an Amenity economy (Natural Resource Working Group of the White Mountains 2005;Campbell 2006).

Lake County was identified as suitable for a Q-methodological study as a community in the Pike and San Isabel National Forests that attracts thousands of visitors each year who enjoy many forms of recreation on the PSI, creating the largest source of direct and indirect income into the county, and where the different discourses may reflect these community changes and its changing relationship with the surrounding Forests might be distinguished.

## **Methodology**

### *The Survey*

Before the Q-method study took place, a survey was conducted as part of a larger study to explore values and attitudes of residents in and around the Pike and San Isabel National Forests (N=2000) with a final response of 658 usable surveys (33%). Two parts of this survey were used in connection with this Q-methodology study: the values and the general comments sections. The values section was based on a typology that was also used in this Q-study, which identifies twelve different values (Rolston 1989;Rolston et al. 1991). In the survey, a listing was provided of the twelve values that can be held in relation to forests, and their definitions. Respondents were asked to distribute a fictional sum of \$100 between the twelve values (Tables 1 and 3 provide survey results based on this typology, and definitions

for the twelve values in it). This survey section provided an understanding of what values emerge as important to respondents, and with what intensity, as expressed by the assignment of the fictitious dollars and how the values are ranked.

**Table1: Mean dollar allocation/value intensity to values - PSI Survey Results**

Values	Mean \$ Allocation Pike/San Isabel NF Residents	Ranking	Mean \$ Allocation Lake County Residents	Ranking
Aesthetic	14.09	1	11.42	5
Biodiversity	11.49	5	11.58	4
Cultural	3.62	12	4.66	12
Economic	4.45	9	11.4	6
Future	11.75	4	12.25	3
Historic	4.75	8	7.14	9
Intrinsic	6.24	7	8.94	8
Learning	4.11	11	6.16	10
Life Sustaining	13.96	3	14.71	2
Recreation	14.01	2	15.9	1
Spiritual	4.15	10	6.13	11
Therapeutic	6.55	6	9.23	7

The general comments section was used by more than one third of the respondents to provide their thoughts regarding forest issues on the PSI. Many of the comments were framed as value-statements, i.e. an expression of one or more aspects of the forests that were important to that respondent, and a selection of these were used in the Lake County Q-study (see below).

### *Q-Methodology*

This methodology quantitatively discovers the various discourses that prevail regarding a subject through correlation and factor analysis, and qualitatively discovers the context of those prevailing discourses through interviews. In the quantitative component, the researcher provides participants with a set of cards with statements, photographs, or other ways of portraying one aspect of an issue. The statements on the cards are derived from the issue-specific language that society is using to describe the various discourses in relation to an issue. Some studies have used the language in newsprint, brochures and other printed materials to reflect all the aspects that are considered regarding an issue. For example, Burns and Cheng used this method to discover the language that Coloradoans use to describe their views regarding forest restoration (Burns and Cheng 2003). In this study, the statements were derived from survey participants (see below).

Participants (P-sample) are asked to sort the cards according to their level of agreement or disagreement with them, also known as the Q-sort. The Q-sort is the key part of the Q-methodology where a participant sorts the statements according to their level of agreement, which runs along an 11 point scale from strongly disagree (-5) to strongly agree (5) (Figure 1). This exercise allows the researcher to collect data based on respondents' complete subjectivity, i.e. participants distribute the statements according to their own value orientations, which together represent the community's predominant discourses regarding the values held in relation to this specific forest. Thus, in a Q-sort, respondents become more involved, and are more participative than in a survey by being able to relate the value statements to each other in the context of relevant issues, thereby providing a more complete picture of their own, individual, value orientations and the reasons for them.

The statements are numbered and entered into software which is designed specifically for Q-methodological statistical analysis. The software runs correlation and factor analyses, and the results provide the factors, or discourses, that result from the Q-sorts. The software provides information regarding the participants who loaded significantly on each discourse, and the statements that formed the basis of agreement or disagreement with that discourse for participants.

After analyzing this quantitative data, the researcher can go back to the interviews to review the reasons for participants to agree or disagree with statements, which in turn provides the context in which participants prioritized the statements in the Q-sort. In this manner results are supported by a systematic ordering of a population of statements with regards to an issue, and the discourses that arise are illuminated and triangulated with the qualitative data provided by the interviews (Brown 1980;McKeown et al. 1988;Brown 1993).

#### *The Participants in the Q-Study: P-sample*

Since this is a study of prevailing forest value discourses in Lake County, participants were selected for their participation in forest and natural resource related issues in that community. Thus participants were sought among the community members who were involved in these discourses, and who are most likely to represent the array of values and interests that are represented at the table on these issues. As mentioned previously, Q-methodology does not seek to generalize to the larger public, because the object of study is not the public but the prevailing discourses regarding, in this case, Lake County forest relationships. Specific person-sampling procedures in Q-studies focus on the researcher's

ability to ensure that he or she interprets the respondents' contexts correctly. In R-methodology attitude research validity and reliability tests are necessary to ensure that research bias and measurement error are kept to a minimum, hence the need for large random samples to provide adequate power. In Q-method there are no a priori assumptions made by the researchers and research bias is difficult to insert into the process: the participants themselves provide the population of statements (the Q-sort), which in turn acts as the measurement tool for participants to sort according to their own frame of reference. Participants are therefore not selected randomly or in large numbers but are, in this case, selected specifically for their participation in community discourses related to natural resources (McKeown et al. 1988).

The first step was to identify the individuals who are most involved in this discourse in Lake County. Participation lists of natural resource related meetings held in 2004/2005 were obtained from the local community college, the county and the local forest collaboration group. This provided a list with 183 names.

Second, as a Western mining community in transition, there were three demographic factors that were considered important to identifying participants: association to the mining industry, length of residence, and gender. Mining is important to the socio-economic foundation of this community. Mining, as any other economic activity, brings with it a range of socio-cultural factors such as the ethnicity, religion, socio-economic circumstances including education level, which in turn may form important explanations for the value-orientation discourses in that community (Riebsame et al. 1996; Vaske, Donnelly, Williams and Jonker 2001; Atkinson 2002). The second factor was length of residence in the community. The largest mine in Lake County closed in 1986 (the last mine closed in 1999),

which had a significant impact on the community and was the original cause for the transition from mining to recreation and tourism as the primary economic force. Census 2002 numbers show that all forms of revenue generation combined in Lake County totaled \$57 million dollars that year, while in the early eighties, county revenue was \$250 million from the largest mine alone (pers. comm. County Assessor, 2005). Of the 2002 county income, 85% was generated by tourism related enterprise: retail, recreation, accommodation and food provision. These businesses accounted for 83% of employment in the county (U.S. Census Bureau 2002).

When mines closed, thousands of people left the county in search of lives based on mining elsewhere, and thousands more have moved into the county for different reasons. The demographic characteristics and value orientations of newcomers differ from the original population (Fulton et al. 1996; Haynes, McCool, Horne and Birchfield 1996; Riebsame et al. 1996; McGranahan 1999). For example, the reasons for living in Lake County for the newcomers are not associated with mining, other than perhaps historical interest. As described before, Lake County is still transitioning between an extractive economy and an amenity economy. By selecting mining and non-mining associated participants, this study hoped to discover the relevance of these economic distinctions on forest values in Lake County.

The last factors that were taken into account in the selection of participants were gender and education. Gender and education have been demonstrated to influence environmental related value orientations (Vaske et al. 2001; Tarrant and Cordell 2002).

To reduce bias, every fourth name on the list of 183 people was selected. Additionally, to the extent possible, participants were selected in proportion to the

distribution of 183 men and women, who had earned degrees or not, and were listed as citizens involved in natural resource issues. After picking the first round of participants by picking every fourth person, a second and third round was done until the list of participants proportionately mirrored the complete list in terms of the four selection factors. See Table 2 for the characteristics of the final list of study participants.

**Table 2: Person Sample Characteristics**

<b>Education</b>	<b>Gender</b>	<b>Mining Background</b>	<b>Years of Residence</b>
No College: 8	12 Women	18 Mining	21: > 20 years
College Degree: 31	27 Men	21 Non-Mining	18: < 20 years

After the list of participants was compiled, invitation letters were sent to community members in which the purpose and procedure of the study was explained. The letter was followed by a telephone call to discuss the study. Although no community members declined to participate, there were two who became unavailable due to relocations to other communities. The final list of participants was 39, which included all county commissioners, several city council members, Planning and Zoning members for both city and county, the heads of emergency medical services and fire department, people who perform other county and city functions, Chamber of Commerce, Lake County Open Space Initiative and other non-profit members, business owners and members of the public who regularly attend natural resource related meetings.

*The Q-sort*

The statements that form both the population and the research instrument (also called the Q-sample) were obtained following procedures that are considered naturalistic, i.e. generated by the respondents themselves rather than the media or other external sources

(McKeown et al. 1988). In order to allow residents in and around the PSI to provide the language for the Q-sample, the researcher took advantage of the earlier survey that had been conducted the same year (2005). In this case the sample is more accurately described as quasi-naturalistic because the statements were elicited from the larger sample in relation to the same subject (i.e. value orientations regarding the PSI) but used by a subset of that sample in Lake County (McKeown et al. 1988).

The survey resulted in 235 general comments, 96 of which discussed a value they perceived related to the Pike and San Isabel National Forests. A panel of social scientists was asked to review these 96 value statements, and indicate which value statements were most usable in terms of clarity and representativeness of the twelve values used in the original survey. The panel determined the best fit for the statements according to the above definitions, after which the panel chose the statements that were considered the most unambiguous and clear. This process resulted in 36 statements.

The statements were sorted according to the forest values typology by Rolston and Coufal, which had also been used in the survey as a values measurement tool (Rolston et al. 1991). Organizing statements based on this methodology is also known as a deductive structured sample design, whereby the statements are ordered based on categories that have previously been tested, not on the organization that researchers alone may have generated based on the statements themselves (McKeown et al. 1988). The Rolston and Coufal typology has been used in a number of R-methodological studies to identify respondents' value orientations in relation to forests (Shindler et al. 1993; Steel et al. 1994; Vaske et al. 1999; Brown et al. 2000; Brown, Reed and Harris 2002; Reed et al. 2003). In the PSI survey, respondents had distributed 100 dollars to

one or more of the twelve values and their definitions according to their own individual value orientation (Tables 1 and 3).

**Table 3: Forest Value Definitions used in the PSI study and Q-Sample Statements**

<p><b>Aesthetic value (A) — I value these Forests because I enjoy the scenery, sights, sounds, smells, etc.</b></p> <ul style="list-style-type: none"><li>• I consider these forests some of the most beautiful we have ever seen.</li><li>• Don't compromise this beauty over commercial and short term gains!</li></ul>
<p><b>Biological diversity value (B) — I value these Forests because they provide a variety of fish, wildlife, plant life, etc.</b></p> <ul style="list-style-type: none"><li>• I want more wildlife: wolves, mountain lions, bears, everything!</li><li>• I want wildlife habitat made the number 1 priority.</li></ul>
<p><b>Cultural value (C) — I value these Forests because they are a place for me to continue and pass down the wisdom and knowledge, traditions, and way of life of my ancestors.</b></p> <ul style="list-style-type: none"><li>• I am concerned about the barriers imposed on grazing permits because it's a way of life for many ranchers.</li><li>• I am concerned about the barriers imposed on logging opportunities because it's a way of life for many loggers.</li></ul>
<p><b>Economic value (E) — I value these Forests because they provide timber, fisheries, minerals, and/or tourism opportunities such as outfitting and guiding.</b></p> <ul style="list-style-type: none"><li>• The Forests are important because the town I live in counts on the tourist dollars of people traveling to the PSI. This keeps our community alive.</li><li>• With the energy crisis – if gas or oil are discovered, we should be able to go into the PSI to recover.</li><li>• I strongly feel that larger and more reservoirs are needed for water to aid Colorado's continued growth and prosperity.</li><li>• Water needs can be met and still allow for man to use the forests.</li><li>• Proper management can allow for more water and individuals will still be able to use public lands.</li><li>• Recreation helps man and economy.</li><li>• Recreation is an important value of the PSI so more commercial outfitting permits should be issued.</li><li>• I feel that these areas should NOT be open to economic exploitation for minerals and energy needs.</li><li>• Remove all commercial profit from PSI!</li></ul>
<p><b>Future value (F) — I value these Forests because they allow future generations to know and experience the Forests as they are now.</b></p> <ul style="list-style-type: none"><li>• The PSI is a beautiful area which I hope will be kept that way for future generations.</li><li>• No priority is more important than saving our natural lands for future generations. Once our forests are gone, they are gone forever.</li></ul>

**Historic value (H) — I value these Forests because they have places and things of natural and human history that matter to me, others, or the nation.**

- People don't know the history (or don't care) - more people should have this kind of information.
- Preserve historical sites on the PSI.

**Intrinsic value (I) — I value these Forests in and of themselves, whether people are present or not.**

- These forests belong to all, including non-human life, and should be protected.
- It is necessary that we adapt our lives to fit in with the natural world instead of adapting the natural world to fit into ours.

**Learning value (L) — I value these Forests because we can learn about the environment through scientific observation or experimentation.**

- I believe the PSI is important to educational organizations and the kids.
- An important priority for the Forest Service on the PSI should be research regarding the role forests play in global climate issues.

**Life Sustaining value (LS) — I value these Forests because they help produce, preserve, clean, and renew air, soil, and water.**

- Water quality and quantity should be preserved or improved.
- I feel protecting our national forests will help combat global warming.
- We must curb the destruction of forests because we are entirely dependent on nature and climate balance for survival.

**Recreation value (R) — I value these Forests because they provide a place for my favorite outdoor recreation activities.**

- The roads are wonderful - it allows us access.
- I appreciate what is being done to preserve these areas while providing recreation for people to enjoy.
- Our footprint on the forest/wilderness should be minimized as much as possible while still allowing access and use.
- Don't hire employees who favor non-motorized recreation over motorized recreation.
- It is important to maintain our great forest areas for all motorized and non-motorized groups to enjoy.
- This is a big world. There is no good reason why more areas need to be blocked from motorized recreational access.
- It is important for the public to enjoy the forests but this becomes difficult when roads are closed and never reopened.

**Spiritual value (S) — I value these Forests because they are a sacred, religious, or spiritually special place to me or because I feel reverence and respect for nature there.**

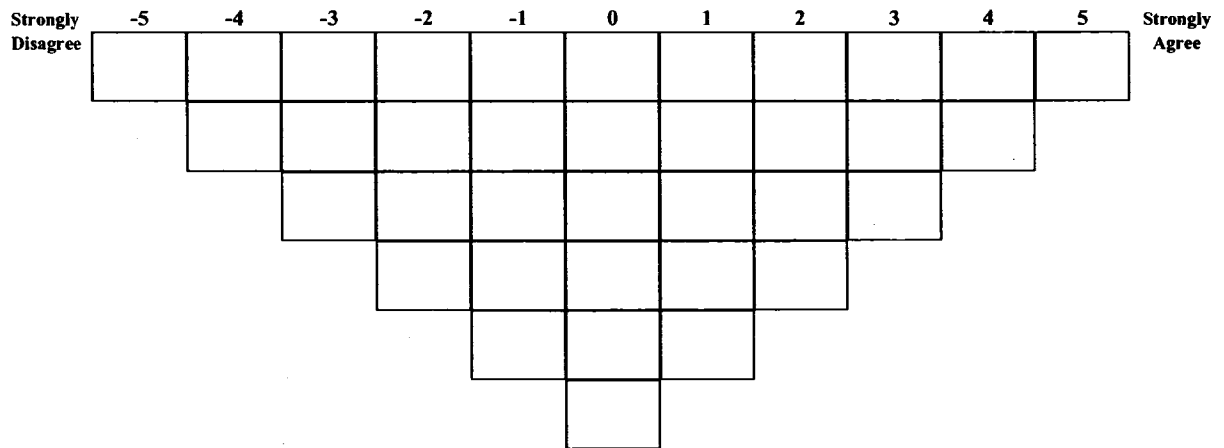
- The forests are my spiritual home, nothing man can create can compare to nature and the sheer power of its majesty.

**Therapeutic value (T) — I value these Forests because they make me feel better, physically and/or mentally.**

- Having wild and free open spaces for exploring and relaxing is my hope for the future.
- We need to allow people the freedom of recreation to help the mind and body.

During data collection, participants were asked to 1) complete the survey, 2) do a Q-sort with the 36 statements and 3) provide further information in a follow-up survey. The Q-sort, where a participant sorts the statements according to their level of agreement, runs along an 11 point scale from strongly disagree (-5) to strongly agree (5) (Figure 1).

**Figure 1. Q-Sort: Placement Cards with Statement**



After a participant has sorted the statements according to their own preferences, the position of each statement is recorded by means of numbers on the back of the cards containing the statements. The Q-sort was followed by a semi-structured interview to ensure that all the values that can be expressed regarding forests were included in the statement population, and that each participant felt their values were completely and accurately represented by their Q-sort (Figure 2).

## Figure 2: Interview Guide

1. While deciding what statements you agreed or disagreed with, were there any trade-offs that were particularly difficult?
2. Considering that these statements represent a discourse or conversation regarding all the reasons why the PSI is important to people, do you feel your values are correctly represented? Is there anything missing?
3. What statements did you most agree with and why?
4. What statements did you most disagree with and why?
5. What statements wound up more in the middle section and why?
6. This part of our study is really concentrating on the connectivity between the PSI and Lake County. What ways can you identify that the PSI is important to Lake County?
7. Considering that this study is being conducted in the context of PSI's planning efforts, when thinking of the next one or two decades, what would you like to see happen, change or stay the same regarding the PSI?
8. Are there any other aspects regarding the importance of the PSI that we haven't discussed? Anything you'd like to add?

### *Analyses*

Analyses were performed using PQMethod version 2.11 (Atkinson 2002), which is available on the web as freeware. This software was specifically designed for Q-method studies, allowing the user to use centroid or principal component analysis, varimax and/or manual rotations, provides analysis of the statements on which participants converged in each factor. In R-methodology, a factor will consist of a group of variables, which have certain people in common. In Q-methodology, a factor will consist of a group of people, who have a number of variables in common. In this case these variables are the value statements, and they are the source of the factor, or discourse. The PQ-method analysis (see below) provides the forest value discourses that emerged in Lake County, and the follow-up interviews provide the context for those discourses.

First a 39 x 39 correlation matrix was assembled, after which principal component analysis with factor rotation using the varimax technique was performed, resulting in 8 factors. Each factor had an eigenvalue  $>1$ , and the number of factors were verified with

scree plot results. Factor loadings indicate the extent to which a person's Q-sort agrees or disagrees with the "idealized Q-sort" of that factor, or the factor array (see below). The expression for a zero-order factor loading is  $SE = 1/\sqrt{N}$ , where  $N$  = the number of statements, in this case 36 (in Q-methodology the statements are the population). In this study the standard error of the loadings was  $1/\sqrt{36} = 0.16$ . Loadings in excess of  $1.98(SE) = +/- .33$  are statistically significant at the  $p < .05$  level and loadings in excess of  $2.58(SE) = +/- .41$  are significant at the  $p < .01$  level (McKeown et al. 1988). Three of the factors had two or less participants loading on them, each of whom loaded significantly on other factors. Although it is sometimes recommended that the three factors should therefore be dropped, the alternative of additional slight manual rotation was possible to allow these participants sorts to contribute to the discourses (Stevens 2002).

This is a subjective component inherent in the Q-method: the researcher has worked with the participants to obtain Q-sorts and interviews and will have an understanding by this time of the different discourses and the participants who load on them. Additionally, the researcher will have an understanding of the role participants play in these discourses. For example, in this case a fourth-generation local rancher, who is a large animal veterinarian, president of the local Soil Conservancy organization and key member of the Lake County Open Space Initiative, as well as the person instrumental for calling attention to Lake County's water pollution issues, and thus designation of the Superfund Site by the Environmental Protection Agency in the 1980's, occupied a factor by himself due to his unique placement of one statement. In R-methodology his factor, and the small amount of variance explained by him, would not be considered useful. However, due to his prominence in the community, and his unique voice as rancher in a mining community, as

well as his clear agreement with many statements in one particular discourse, dismissing his factor would disregard an important contributor to forest related discourses in Lake County. If there is no statistical correlation between his sort and another discourse, no amount of manual rotation will work. In this case, with slight manual rotational adjustments, the factors were clarified to allow almost all participants to be included with significant loadings, including this rancher. Manual rotation is consistent with Q-methodology: the self-assessment which participants provide in a Q-study needs to be allowed full expression in order to capture discourses clearly. Manual rotation of factors allows the researcher to ensure this full expression, which cannot be done by mathematical calculation alone (as in simple varimax rotation) (Brown 1980;McKeown et al. 1988;Brown 1996;Addams et al. 2000).

## **Results**

In Lake County, five factors representing five discourses emerged from the 39 Q-sorts (Table 4). Because of the lack of any a priori assumptions, Q-methodology is an exploratory use of factor analysis rather than confirmatory. In this particular exploratory factor analysis (EFA), the objective is to discover the number and character of discourses related to forest values. The results show that a number of Q-sorts loaded significantly on several discourses, which is not uncommon in EFA (Stevens 2002). As a result, Table 4 lists 46 Q-sorts, instead of 39, since 2 participants did not load on any factor, and eight participants loaded on two factors.

One discourse was clearly predominantly nature-oriented, another clearly the most human utility oriented, and three were in the middle of this scale. Due to the nature of Q-

methodology, it is possible to explore the three in the middle in more detail and distinguish the characteristics of each, which is a far more difficult proposition when using R-methodologies because there is neither context, nor relational information to clarify them. In this case, each of these three factors may be considered amenity oriented in their general value orientation, but with different associations with economic, recreational and more nature-oriented values, which in turn provide a better picture of the values that are important to this particular mining community in transition, surrounded by a large federally managed, forested landscape in 2005.

**Table 4: Loadings for Five Factors/Discourses**

<b>Participants</b>	<b>1.00</b>	<b>2.00</b>	<b>3.00</b>	<b>4.00</b>	<b>5.00</b>
	<b>Steward</b>	<b>Extract</b>	<b>Preserve</b>	<b>Leadville</b>	<b>Amenity</b>
12	<b>0.85</b>	0.11	0.03	0.23	-0.01
39	<b>0.74</b>	-0.07	0.16	0.16	0.34
14	<b>0.68</b>	0.22	0.43	0.17	0.12
33	<b>0.63</b>	-0.13	0.36	0.38	0.10
1	<b>0.59</b>	-0.11	0.18	0.29	0.32
11	<b>0.56</b>	-0.14	-0.10	0.33	0.29
9	<b>0.54</b>	-0.13	0.39	0.51	0.07
36	<b>0.43</b>	0.10	-0.14	0.55	0.45
28	<b>0.42</b>	-0.23	0.61	0.01	0.32
6	0.06	<b>0.54</b>	-0.61	0.20	0.31
10	0.13	<b>0.51</b>	0.33	0.61	0.07
19	0.11	<b>0.37*</b>	-0.52	0.33	0.38
32	0.05	0.03	<b>0.88</b>	-0.06	-0.04
3	0.03	-0.08	<b>0.84</b>	0.09	0.00
29	-0.05	0.17	<b>0.83</b>	0.09	-0.01
26	0.23	0.01	<b>0.83</b>	0.37	0.03
13	0.22	-0.20	<b>0.77</b>	0.18	-0.05
30	0.26	-0.18	<b>0.72</b>	0.21	0.20
28	0.42	-0.23	<b>0.61</b>	0.01	0.32
20	0.34	-0.16	<b>0.58</b>	0.23	0.19
37	0.11	-0.06	<b>0.54</b>	0.47	0.20

21	0.38	-0.13	<b>0.50</b>	0.35	0.13
15	0.25	-0.26	<b>0.47</b>	0.50	0.33
14	0.68	0.22	<b>0.43</b>	0.17	0.12
18	0.14	-0.71	<b>0.42</b>	0.29	-0.01
2	0.19	0.31	<b>0.39*</b>	0.39	0.22
8	0.20	-0.10	0.18	<b>0.74</b>	0.12
25	0.29	0.08	0.02	<b>0.67</b>	0.34
24	0.33	-0.20	0.09	<b>0.67</b>	0.38
22	0.10	0.12	-0.31	<b>0.64</b>	0.13
10	0.13	0.51	0.33	<b>0.61</b>	0.07
27	-0.04	0.19	0.18	<b>0.57</b>	0.02
36	0.43	0.10	-0.14	<b>0.55</b>	0.45
9	0.54	-0.13	0.39	<b>0.51</b>	0.07
38	0.04	0.01	0.21	<b>0.51</b>	0.29
15	0.25	-0.26	0.47	<b>0.50</b>	0.33
34	0.38	0.12	0.15	<b>0.47</b>	0.01
37	0.11	-0.06	0.54	<b>0.47</b>	0.20
31	0.11	0.16	-0.38	<b>0.46</b>	0.00
2	0.19	0.31	0.39	<b>0.39*</b>	0.22
19	0.11	0.38	-0.52	<b>0.33*</b>	0.38
23	0.09	0.10	0.27	0.24	<b>0.76</b>
16	0.27	-0.12	0.19	0.15	<b>0.69</b>
7	0.08	0.09	-0.25	0.27	<b>0.59</b>
17	-0.02	0.35	-0.25	0.15	<b>0.58</b>
36	0.43	0.10	-0.14	0.55	<b>0.45</b>
19	0.11	0.38	-0.52	0.33	<b>0.38*</b>
5	-0.17	0.08	-0.66	0.14	<b>0.37*</b>
% Variance	12	5	21	15	10
Bold Numbers: Two tailed, critical value = 0.41, p<.01, * critical value = 0.33, p<.05					

Factor array results are expressed by rank scores, z-scores, and significant z-scores.

PQMethod provides the normalized Z-scores for all statements in each factor. These are converted to weighted, averaged coefficients, or rank scores, for each statement in the idealized factor arrays for each discourse (Table 5).

**Table 5: Factor rankings for each Q-sort statement**

Q-Sort Statement	Factor				
	1	2	3	4	5
1. I consider these forests some of the most beautiful I have ever seen.	0	1	0	0	1
2. Don't compromise this beauty over commercial and short term gains!	1	-4*	3*	1	-2*
3. The PSI is a beautiful area which I hope will be kept that way for future generations.	3	2	2	5	2
4. I want more wildlife: mountain lions, bears, wolves, everything!	-1	-3	2*	-1	-4
5. I want wildlife habitat made the number 1 priority.	-1	-5*	1*	-2	-3
6. I am concerned about the barriers imposed on grazing permits because it's a way of life for many ranchers.	-2	-1*	-2	-3	0*
7. I am concerned about the barriers imposed on logging opportunities because it's a way of life for many loggers.	-3	2*	-3	-3	-1*
8. The Forests are important because the town I live in counts on the tourist dollars of people traveling to the PSI. This keeps our community alive.	0*	3	-1*	4	4
9. With the energy crisis – if gas or oil are discovered, we should be able to go into the PSI to recover.	-3*	4*	-5	-4	0*
10. I strongly feel that larger and more reservoirs are needed for water and for Colorado's continued growth and prosperity.	-2	-1	-3	-5*	-4
11. No priority is more important than saving our natural lands for future generations. Once our forests are gone, they are gone forever.	3	3*	3	2*	0*
12. People don't know the history (or don't care) – more people should have this kind of information.	-1	-1	-1	0	-1
13. These forests belong to all including non-human life.	3	-3*	5	4	1*
14. It is necessary that we adapt our lives to fit in with the natural world instead of adapting the natural world to fit into ours.	0	-2*	4*	0	0
15. I believe the PSI is important to educational organizations and the kids.	2	0	1	1	3*
16. Water quality and quantity should be preserved or improved.	4*	-1	0	1*	0
17. The roads are wonderful - they allow us access.	1	1*	-4	-1	-3
18. Remove all commercial profit from PSI!	-5	-2*	0*	-4	-5*
19. I appreciate what is being done to preserve these areas while providing recreation for people to enjoy.	5*	1	1	2*	1

Q-Sort Statement	Factor				
	1	2	3	4	5
20. The forests are my spiritual home, nothing man can create can compare to nature and the sheer power of its majesty.	-1	3	3	1*	0
21. Having wild and free open spaces for exploring and relaxing is my hope for the future.	2	1	2	3	1
22. Preserve historical sites on the PSI.	1	0	-1	3	3
23. An important priority for the Forest Service on the PSI should be research regarding the role forests play in global climate issues.	1	-1	1	-1	-2*
24. I feel protecting our national forests will help combat global warming.	1	0	2*	-2	-2
25. We must curb the destruction of forests because we are entirely dependent on nature and climate balance for survival.	1*	-2	4*	-1	-1
26. Our footprint on the forest/wilderness should be minimized as much as possible while still allowing access and use.	4	0	1	2	4
27. Don't hire employees who favor non-motorized recreation over motorized recreation.	-4*	0*	-2	-1	-1
28. It is important to maintain our great forest areas for all groups to enjoy, including motorized recreation.	0	3*	-2*	2*	1
29. This is a big world. There is no good reason why more areas need to be locked to motorized recreational access.	-3	2*	-3	-3	-2
30. It is important for the public to enjoy the forests but this becomes difficult when roads are closed and never reopened.	-2*	5*	-4*	0*	-1*
31. We need to allow people the freedom of recreation to help the mind and body.	2	4*	0	1	2
32. Water needs can be met and still allow for man to use the forests.	0	-1	-1	0	2*
33. Proper management can allow for more water and individuals will still be able to use public lands.	2	-2	-2	0*	3
34. Recreation helps man and economy.	0	2	0	3*	5*
35. Recreation is an important value of the PSI so more commercial outfitting permits should be issued.	-2	0*	-1	-2	2*
36. I feel that these areas should NOT be open to economic exploitation for minerals and energy needs.	-4	-4	0*	-2	-3

Bold indicates significance at p<.05, \* indicates significance at p<.01

In this case, the highest rank score for a statement is 5, which means the participants who loaded at the .05 or .01 significance level on a particular discourse/factor, strongly agreed with that statement regarding forest values. The lowest rank score is -5 signifying strong disagreement among the participants loading on that factor regarding that statement. If it was 0, it meant that the statement was not agreed or disagreed with to any extent. If the statement carried a ranking of -3 then it was to some extent disagreed with by the participants in that discourse. Additionally, the software produces the distinguishing statements for each discourse, which are statements whose z-scores were significant at the  $p < .05$  and  $.01$  level (bold in Table 5).

PQMethod compiles the distinguishing statements on which people loaded in each factor into scales, for which reliability coefficients are provided. All reliability coefficients for the five factors were above .95. Reliability coefficients in Q methodology provide an indication of how often people can be assumed to render the same Q-sort at different times (in this case more than 95% of the time). Reliability coefficients upwards of .80 are considered acceptable (McKeown et al. 1988; Addams H. Addams and J. Proops 2000; Stevens 2002).

To provide a graphic representation of how the discourses related to each other in terms of value orientation, a scale was devised that runs from one extreme where nature-oriented values are more important than any human-oriented values (purely biocentric), to the other extreme where human oriented values are more important than any nature-oriented values (Figure 3). The results of this study indicate that the five discourses lie somewhere in between, each featuring anthropocentric and biocentric characteristics to some degree. They have been placed on the scale according to the degree of biocentric or anthropocentric

characteristics. As indicated above, various shades of amenity-oriented values can be found in the middle, with extractive, utilitarian value orientations found to the extreme left of the scale, and pure ecocentric value orientations found to the extreme right. The discourses are placed in relation to each other based on the value orientations that emerged in the idealized factor arrays for each discourse. This means that the placing of the factors/discourses on this scale takes the values into account with which participants agreed with as well as disagreed. Additionally, the interviews illustrate the reasons for the placement of statements in the sorts and the contextual relationship of the sorted statements to each participant, in turn increasing the accuracy of the placement of discourses along the value orientation scale below.

**Figure 3: Lake County Forest Value Discourses**

<b>Anthropocentric</b>			<b>Biocentric</b>	
<b>Human Utilitarian Values</b>		<b>Amenity</b>		<b>Nature-Oriented</b>
Discourse 2 Extractive Economic	Discourse 5 Amenity Economic	Discourse 4 Leadville	Discourse 1 Stewardship	Discourse 3 Preservation
Older, long-term residents. Agree with logging, grazing, energy extraction, motorized recreational, therapeutic values. Disagree with aesthetic, biodiversity, life sustaining, intrinsic and future values.	Business sector. Favors amenity economic, non-motorized recreation, outfitting and educational values. Opposed to biodiversity, extractive economic and motorized recreation.	County commissioners and other involved residents. Aesthetic, amenity economic, intrinsic and historic values. Disagree with extractive economic values related to forests e.g. reservoirs, logging, energy (not minerals).	Cohort is most involved in local NRM issues. Favors amenity oriented economic, future, life sustaining and non-motorized recreation values. Disagree with extractive economic values related to forests e.g. energy and logging, and motorized recreation values.	Ecocentric, frequently more protective of nature over human needs. Only discourse which rates biocentric statements positively. Intrinsic, biodiversity and life sustaining values score highest. Against all extractive economic and motorized uses. Conditionally favors non-motorized recreation.
<b>Variance Explained (%)</b>				
5	10	15	12	21

## *The Discourses*

### Factor One – Stewardship Discourse

The first factor can be called the Stewardship Discourse (Table 4). The values that ranked most positive in this discourse were recreation, life-sustaining and future values. At the negative end were values also related to recreation, pro-economic and, at first glance confusingly, anti-economic value statements. Upon closer inspection, a relationship was discerned between economic and recreation values that played an equally important role in other discourses: participants in all discourses made a clear distinction between statements with motorized and non-motorized recreational values, and between statements that referred to amenity and extractive economic values. In all discourses, motorized recreation value statements were positively linked to extractive economic value statements, and non-motorized recreation value statements were linked with amenity economic value statements. Using ranking scores to indicate degree of agreement or disagreement within a discourse, participants who loaded on the Stewardship Discourse did not agree with any pro-economic statements of either kind, but disagreed with statements that were in general negative about the economic value of forests (-5), and also disagreed with statements favoring extractive economic uses of the forest such as oil and gas exploration (-3) or logging (-3), and motorized recreation (-4). Recreational statements that found positive agreement among participants in this discourse related to the preservation of areas for enjoyment (5), and “the minimizing of our footprint as much as possible while still allowing access and use” (4). Also, statements related to the importance of forests for future generations (3), life sustaining values such as water quality and quantity (3) and the intrinsic value of forests (3) rated highly among these participants. Thus, this discourse allocates some importance to

the value of nature for nature's sake alone, not always for human purposes, but in a general sense because preservation for biodiversity or wildlife values specifically does not rate highly (-1). This group appears to rate highly values related to stewardship generally, indicated by allocating a positive value to the minimizing of impacts, the importance of forests for the future and the preservation of water quality and quantity while disagreeing with extractive economic values related to energy winning, logging, grazing and with motorized recreation.

In this group of thirteen participants, 3 were female, 5 had strong mining relationships and 6 people had lived in Lake County longer than 20 years. This discourse is therefore not one embraced strongly by the mining community, but does seem to reverberate equally among participants who have lived shorter or longer periods in Lake County.

#### Factor Two – Extractive Economic Discourse

Factor 2 provided a discourse that was concerned with the more extractive economic values of forests. The four participants who loaded significantly on this factor all had mining associations, had lived in Lake County more than 20 years, and were predominantly women with an even mix of education levels. The value statements that these participants rated most highly were related to motorized recreational (5), and therapeutic values (4), and economic values related to energy extraction (4). The values they disagreed with most were biodiversity (-5), aesthetic (-4), future (-3) and intrinsic (-3). An example of the sentiments related to wildlife and biodiversity: "If we make wildlife the number one priority, we make the PSI a zoo and we should leave. It's there, we take care of it but I don't agree that we

should manage for wildlife over humans. We have to have economic activity, that's how we survive."

Motorized recreation was important in this Extractive Economic discourse, both in an economic and a personal recreational sense. All four participants owned businesses that were dependent on tourism and recreation and felt strongly that motorized recreation was important as long as it took place on well established and maintained roads. One participant provided a summary of these concerns: "Roads are important for blue-collar people, who want access after work for hunting, for example. They also allow older people to have access. Not having roads would discriminate against local blue collar workers". On the other hand, the participant said: "I like (the roads), but it has to be well-thought out. It's not that simple. Went from agree to disagree on that one as I sorted the deck. It has to be done carefully. Things like turbidity have to be considered". Local perspectives were prevalent in this discourse such as: "We don't have forest fires here because there's no oxygen. Leadville doesn't burn for the same reason – 9 people in a fire department is ridiculous." and "The reason why there is so little water is because of Vail (ski resort north of Lake County). Vail uses up all the water with their cloud-seeding, they draw all the water their way. There's only so much fresh water to go around, it's limited. Where are the realtors thinking they're going to get the water? We don't need more reservoirs, people need to conserve, stop growing grass". Related reservoir expressions were noted in all discourses.

The Extractive Economic discourse was unique in two other respects: it was the only discourse that agreed with the value of logging on the PSI to any degree, and it was also the most wary of federal government involvement. The reason why there was mild

agreement regarding the positive value of logging (2) in this discourse only, was explained by one of its participants: “The reason why there are no local loggers is because of changes demographically. Originally people in Leadville were miners, not loggers, and now recreation has become very important, or they work in other counties”. The distrust of federal government agencies featured strongly in this discourse. One participant spoke for an hour in an interview of her discontent with federal agencies in respect to the building the of the Bureau of Reclamation’s (BoR) Fryingpan-Arkansas Project in the 1960’s and 70’s, which includes the Turquoise and Twin Lakes and their dams, and transfers water from the Western Slope to the eastern slope of the Sawatch Range near Leadville. From there the water is transported to cities and agricultural areas on the Front Range of Colorado. To enable this Project, an amount of private land was declared eminent domain by the Federal government and caused the cessation of a number of local, recreation oriented businesses in the town of Twin Lakes. Older residents and their children discussed the economic and cultural costs to the community of this Project, and cited it as one source of distrust of federal agencies. One of this discourse’s participants said: “I’m against this statement: “Don’t sacrifice aesthetics for commercial gain”. The USFS needs to give land back. They took 7198 acres of private land, ten percent of Lake County’s private tax base, for the Fryingpan Arkansas project. They promised us full hook-ups, showers, marina, a swimming pool, sewer disposal, all for Twin Lakes. They acquired homes, mobile home parks, 25 private cabins, subdivisions, stores, service stations, everything. I researched this for three years. Charlie (late husband) used to spend all day bringing milk on the weekends to Twin Lakes. The EIS promised us all these things, but they never happened. (*Showed EIS*

*documents dated 1971*). When the Hunter-Frying Pan project happened, we were a booming mining town, people didn't care that much. Now we're losing \$1 million annually in taxes because of loss of private land." A related comment from another participant was: "Also, there is distrust of anything involving the federal government e.g. the BoR project at Twin Lakes. Then EPA. Anything the USFS proposes is met with skepticism. I would like to see the government out, and the private sector in. As long as the government is there, it's about politics. The environment shouldn't be mixed in with politics, it's too important. The private sector can mitigate damages and foresee consequences much quicker."

#### Factor Three – The Preservation Discourse

Factor 3 is the most biocentric and has been named the Preservation Discourse. Participants who loaded on this factor were often educators, involved in the local community college or one of the outdoor schools, and often had at least one scientific degree. Nine of the 18 participants who loaded on this discourse were or had been involved with city or county administration or planning and zoning commissions. Interestingly, this was the only discourse that had a cohort of participants who also loaded significantly but negatively on it, and those four participants were the ones who loaded positively on Factor 2, the extractive economic discourse. Seven of the participants had mining associations in their past, three of whom were at least second generation Lake County residents. Six of the participants in this discourse and the participants who loaded negatively on this factor had lived in Lake County 20 or more years.

The statements that expressed values that were most agreed with were intrinsic (5 and 4), life sustaining (4), future (3), aesthetic (3) and spiritual (3) value statements. Statements most disagreed with were economic extractive (-5), and motorized recreational (-4 and -3), as well as statements in favor of the cultural value related to logging (-3) and economic values in favor of reservoirs (-3).

One person expressed the thoughts regarding the importance of intrinsic, life sustaining and spiritual values as follows: "Forests and wildlands are home, and they're home because of non-human life. Due to man's excesses, humans are coming first, which should be reversed. Non-human life and their intrinsic importance is related to evolutionary importance. I'd almost call it a spiritual and intrinsic value, because it's about something that's more than us humans". Another related statement: "We should adapt our lives to nature because we are dependent. It is essential to my life and to humanity in general to have these places. We'll never be able to have places like it was 10,000 years ago but it is important to have these places to remind us of who we are".

Statements that found general disagreement among these discourse participants such as oil and gas exploration were explained as follows: "This goes back to my disagreement regarding growth, i.e. whatever we think we need, we should be able to have, regardless of the cost. Our way of life is killing the planet. My idea of a public good is clean air and water: that is what the forests are for. Not for access to oil and gas. We don't need to go in for oil and gas and then also spend most of our taxes on military purposes and war. This statement simply supports a dysfunctional way of life." Another statement indicates the spatial and temporal scales that function in the Preservation Discourse; in response to a statement in the Q-sort that argues in favor of motorized

recreation because “it’s a big world”, one participant noted: “It’s a small world! I went to a snow workshop at Copper Ski Resort, and listened to climatologists explain how dust from Siberia is collecting on glaciers and increasing glacial melt. Deforestation and drought are causing dust storms. It’s not a big world. Whoever wrote that statement needs to get out more and look around.”

One interesting observation was made regarding the unique values that are indeed important to Lake County residents, as seen in Factor 4: “Mountain dwellers have skewed ideas. We extractors live here for the quality of life, we like the space and we also want to do mining but it’s a conflicting array of values. It’s a lifestyle choice. It’s similar to rock climbers who can’t think of sunsets because they’re too busy climbing. Still, at some point most people enjoy those sunsets at Mount Massive.”

#### Factor Four – The Leadville Discourse

Five participants who are or were county commissioners or city council members loaded on the fourth factor, the Leadville Discourse. All 18 respondents who loaded on this discourse participate in more than the natural resources aspect of the community. Half of these participants have close mining associations, half lived in Lake County more than 20 years, and those with shorter residences are individuals who are deeply integrated into the community. Six women loaded significantly on this factor, which is the largest female membership of all the discourses. A number of the members of this discourse were involved in real estate business, the Chamber of Commerce and other aspects of the business sector. In general, this discourse found agreement among the cohort of people who are deeply committed to the economic welfare of Lake County.

This discourse appeared the most connected with Lake County and Leadville as places. The participants in the Leadville discourse put the aesthetic value of the forest as their highest ranking value (5), followed by local amenity economic value, which corresponds with the interests of many of these participants (4), but equally important was the intrinsic value of forests (4), followed by the therapeutic, historical and non-motorized recreational values (3). A statement regarding favor for all uses, including motorized recreation received mild agreement in this discourse (2). This discourse ranked historical value highest among the five discourses, which is in keeping with the value a mining community would place on the historic character of its community and surrounding forests. The city of Leadville and Lake County are proud of their historical mining legacy, many restored Victorian buildings and National Historic Registration. This historical value is not only important economically to residents, but is also part of the living memory of Lake County and Leadville as places. Participants disagreed with value statements addressing more extractive economic uses such as reservoirs (-5) and gas and oil exploration (-4), but disagreed also with statements that opposed any economic use of forests (-4). Additionally, Leadville discourse participants disagreed with cultural values related to grazing and logging (-3), and motorized recreation (-3).

The way economic value is allocated to forests in this discourse was exemplified by a real estate professional: "Tourism is important to our community, and it's important for people to come here. I would like to see more people live here so we have a larger tax base, and if we have more visitors, they will act as advocates for the Forest. I don't want Lake County to explode into a resort either. We're here because it's a small, quiet community. I'm also here for the forests, the mountains and the history. I drive, fish,

hike and enjoy the views. It's really the views that make this place." More extractive uses of the forest, such as oil and gas winning were viewed negatively, not only because of the area under discussion but also in general: "I think there's other places to go, e.g. go private first, not ANWR (Alaska National Wildlife Refuge oil winning proposal), not public forests. And I'm not sure the crisis is so big that it warrants this." Reservoirs were viewed similarly: "I'm not sure that's the answer. People need to use water more responsibly. I don't like the idea of flooding a valley, or taking away forest land." Grazing and logging were generally disagreed with as important values on the PSI: "For example, I agree with grazing, but I do feel there have to be limitations. Same for logging. They're making a statement re. logging and grazing in regards to lifestyles, and in some areas the economy is logging and grazing. Here it is more about tourism. Where small wood products are concerned for example, there's a lot of dissent in our community. Old timers are more okay with it, but newcomers absolutely not." One participant who has strong ties to the economic aspects of Lake County provided a comment typical of this discourse in relation to recreational values: "Non-motorized recreation in our area is really nice and it's important economically, just as motorized recreation is important. But non-motorized recreation is the bigger draw in this area, certainly in the last 10 years. It surpasses by far motorized recreation in terms of popularity. We get a lot of people coming in during the winter asking for the cross-country ski map, and during the summer people are interested in hiking and biking trails, and climbing the 14'ers. Biggest of all is the Mineral Belt Trail. I think motorized recreation has its place but they have to respect the environment, for example around

Ptarmigan Pass alpine area and non-motorized users. I do both motorized and non-motorized recreation myself.”

Lastly, the dichotomy in Lake County regarding mining, as noted by the participant in the Preservation Discourse, was discussed in the Leadville Discourse. Most participants made a distinction between mineral mining and oil and gas mining, the former in a far more favorable light, but also with the caution of experience: “People always say “You either grow it or you mine it” and that’s true. I agree with mining but don’t agree with mining on national forests, period. Some places should not be open to mining. E.g. ANWR – that’s an area that needs to be left alone. I care about the loss of animal life. For example if they have an oil spill, you never quite recover from that. The trauma the animals go through – I don’t like seeing dead animals either. And it’s not just animals, it’s also financial. Same thing with water – there’s a responsibility everyone has to the people downstream because we are the headwaters and you can’t take that lightly. Again, that’s economically a concern too.”

The Leadville Discourse resonated with many residents who have close ties to mining in the community, either personally or through their parents, and have also been active in the transition from an extractive to amenity oriented economy in Lake County. When the Climax Mine closed in the 1980’s, thousands of people left for mining positions elsewhere. Despite the decrease in locally available employment, many also decided to stay due to their connectivity to Lake County, and made a switch in livelihoods instead. One participant sorted the statements in relation to logging and grazing as “a way of life” in the “disagree” section, explaining that although she disagreed with logging and grazing, she identified to some extent with the argument of a

way of life because to her it was: “also important because when Climax closed, we decided to stay here. We’re part of the community, we lived with the people. We used to come here before we lived here, from Denver. When Climax closed, it was Winnemucca Nevada, or Leadville. So of course, it was Leadville. For the same reason, when they were proposing gambling in Leadville, I opposed it. People stayed because of community and landscape – people are very passionate about it.”

Although amenity-oriented economic values feature highly in the Leadville discourse, they were most important to the business sector that predominated in Factor 5, the Amenity Economic Discourse. All eleven participants in this discourse were either business owners, or professionally supported business interests. Four of these participants had close mining ties, four were women and six had lived longer than 20 years in Leadville, three of those were elderly people who themselves were the descendents of Leadville residents.

#### Factor Five – Amenity Economic Discourse

In this discourse, recreation statements related to amenity economic value of forests ranked highest (5), followed by recreation and economic values (4), and again the recreational and also educational and historic values of forests (3). Participants most disagreed with statements related to the removal of all profit on the PSI (economic, -5), the addition of more reservoirs (economic, -4) and more wildlife (biodiversity, -4), and again wildlife (biodiversity, -3), motorized recreation (-3) and anti-economic statements (-3).

Although both logging and grazing were not recognized in this discourse as important values of the PSI, this is the only discourse that can claim the membership of all

local ranchers, including one who is a fourth generation Lake County citizen, who is held in very high regard, and who has been key to a number of important local natural resource issues. His perspective on logging and grazing as opposed to mining and recreation was: “I view forest and timber as a resource like a vegetable garden. It should be maintained and used to make better stands, it’s a capital, it has value on the market place and harvested towards that end. Both logging and grazing are important as ways of life, being active on a national forest benefits the forest because there’s a likelihood that the ranch or logging company is apt to go longer than one generation. I differentiate these economic units from recreation. Outfitters are limited in numbers and the continuity in what visitors will see will be different. Multi-generational working families are stable, working families will take better care of the forest. Miners only work during war. Henderson (Mine) can’t train folks to work underground but the Chinese want molybdenum. That need may open up mines. But it’s much less a steady production than ranching and logging.”

Another older resident, and fourth generation miner, provided additional insights regarding socio-economic changes in recent decades, which affect both the way this discourse regards the importance of forests and their role in the community’s transition from an extractive to an amenity economy county. His comments mirror many of those by other participants in this discourse: “Regarding the statement ‘Recreation helps man and economy’: it’s becoming the most valuable resource we have – it helps the economy. It helps man because we do less clearcutting. E.g. when settlers came, they used the forest for charcoal and wood but now we use it for skiing, hunting, snowmobiling etc. which is good for man because we are part of the environment. We wouldn’t be here if it was a moonscape.” The apparent paradox of being miner and environmentalist, as this

participant called himself was also discussed: “There was a big mining rush that took place at Kokomo (nearby town, now covered by Climax Mine tailings). This happened in other areas surrounding Leadville – there would be a find and then a rush to stake claims, and build mines and buildings, which meant there was also a rush to get the timber. Aspen is another rush from Leadville, a flurry of activity of staking claims, cutting trees, etc. Wildlife was affected – they took everything out: bear, sheep, elk. The woods and wildlife suffered. This area used to be summer hunting grounds for the Utes, who had no big weapons. Now we have parts that are in better condition but there are also parts which are crowded due to encroachment. The parts that are better, that’s where the wildlife can be found. Vail encroachment affects wildlife greatly, it’s kind of sad. We are miners and also environmentalists. The miners are still here because of their devotion to the landscape. I used to work at Gilman (mine) – now nice ranches are gone, and there are condos, trailer courts and horse farms. There used to be herds of elk. Eagle County used to be very sparse, a natural wonderland. I regret they didn’t find a different route for I-70. Why does a ski area have to include trophy homes? It can be done in a simple way, you don’t have to show you’re a big wheeler dealer needing an under-class person to maintain your trophy home, who in turn affect the surrounding communities, which affects Leadville. But Beaver Creek people can’t handle the Mexicans and a lot of social equality is going by the board. Recreation brings with it some problems. Second homes another big problem. Miners had families, had kids in schools. Mine owners used to live simply, in town. Now there are more temporary kinds of people like green card people, ski-bum/student types. The sense of community is not on a plus side anymore – it’s hard to get candidates for political office now. We need balance in the community, to

preserve what we have so we don't become a Breckenridge. There's not a lot of private land here so that makes us a bull's eye. It wouldn't take much money to change this place completely. It's a miracle that radical development hasn't happened. But things like (a local, fairly new educational institution) is good."

## **Discussion**

The first objective of this study was to explore the values discourses on the PSI that prevail in Lake County, and the context within which those discourses take place utilizing Q-methodology. This study resulted in five discourses, providing information regarding the most anthropocentric and biocentric discourses as well as the three discourses in the middle of this spectrum. Each discourse illuminates a particular approach to forest values and forest uses in great detail. One of these discourses appears to be particularly place-based, the Leadville discourse, on which county officials and numerous other city and county government-related participants loaded. Another appeared to be a combination of amenity oriented economic values combined with stewardship approaches. The third was an especially business oriented discourse which focused particularly on amenity oriented economic values and on non-motorized recreation values. Motorized recreation appeared particularly important to the participants who loaded on the most anthropocentric discourse, the Extractive Economic discourse. This discourse's participants agreed more with extractive related uses of the forest than any other including logging, oil and gas winning and mineral mining.

The second objective was to explore the usefulness of Q-method studies in addition to R-methodology surveys to discover forest values and their contexts. Utilizing

Q-methodology in addition to a survey helped discover in greater depth the components that participants have in common, as well as their differences. Where the R-methodological study provided valuable information regarding what values were important and with what intensity, and could be generalized to the greater Pike and San Isabel National Forests residents, the Q-methodology provided in-depth information on a smaller scale regarding the reasons and contexts for those values. With this additional information it is possible to understand not only the values discourses that prevail, but the rationale behind the discourses, and the interrelationship between values in each discourse.

In this study, there were nine value statements with which all participants either agreed or disagreed (statement numbers refer to Table 5, page 69). From z-scores and rank score results for each statement in each discourse, results showed that the highest ranked statement (3) with which all participants agree is the aesthetics statement “The PSI is a beautiful area which I hope will be kept that way for future generations”. The next at number 10 was an economic value statement with which all discourses disagreed: “I strongly feel that more and larger reservoirs are needed for water and for Colorado’s continued growth and prosperity”. The third (15) addresses the value of forests for learning “I believe the PSI is important to educational organizations and the kids”. Ranked 18 and 36 are negative economic value statements with which all discourses disagreed: “Remove all commercial profit from the PSI!” and “I feel that these areas should NOT be open to economic exploitation for minerals and energy needs”. After this are listed two recreation-related statements with which all discourses agreed (19 and 26): “I appreciate what is being done to preserve these areas while providing recreation for

people to enjoy” and “Our footprint on the forest/wilderness should be minimized as much as possible while still allowing access and use”. Last are two therapeutic value statements (21 and 31) “Having wild and free open spaces for exploring and relaxing is my hope for the future.” and “We need to allow people the freedom of recreation to help the mind and body”. These statements combined indicate that to some extent, considering the discourses’ differing contexts, the therapeutic, aesthetic, economic and educational values of the PSI are positively evaluated on the PSI in Lake County. Where economic value is concerned, the discourses distinguish between the value of the PSI for general economic value which includes mineral mining and is regarded favorably by all, and the economic value of forests for the creation of reservoirs to accommodate Colorado’s growth, which is not regarded favorably by any of the discourses. This distinction has its roots in Lake County’s history: on the one hand it is a community with a living memory of a proud mining tradition, on the other it is a community that has mixed perceptions regarding the creation of reservoirs in the past and is deliberating the prospect of an additional reservoir which would serve the expanding urban area of Aurora.

The two differences that seemed to create the clearest dividing lines between the discourses were motorized and non-motorized recreation value, and amenity and extractive economic value. This was first observed in the forest-wide survey, where a link appeared in between non-motorized recreation and amenity-oriented economic values, and motorized recreation and extractive-economic values. Table 6 provides PSI survey results showing the percentage of respondents in favor of a number of values and forest uses, and the Pearson’s  $r$  coefficients for values that are considered more

anthropocentric and more biocentric, and a number of more extractive and amenity oriented forest uses (Shindler et al. 1993; Vaske et al. 1999). The assumption might be made that the recreational value attributed to forests would correlate positively with both motorized and non-motorized recreation, but this is not the case here. Recreational value appears to be positively, and significantly, correlated with more intensive and extractive economic uses such as motorized recreation, oil and gas winning and commercial mining, but negatively correlated to non-motorized recreation. More amenity oriented uses of the forest (where the forest is used and enjoyed on the spot, nothing is physically exported from the place) such as wilderness, fish and wildlife habitat, wildlife viewing and non-motorized recreational uses are overwhelmingly supported by respondents, but there is a negative relationship or weak relationship between these uses and recreational and economic values. Where wildlife viewing is concerned it should be noted that results showed that by far the larger majority of respondents were in favor of this use, irrespective of values they favored on the Forests.

In the Q-method study, this trend was observed again and by nature of the methodology, could be explored further. One discourse was clearly favorable toward both extractive economic and motorized recreation values. Three discourses, Stewardship, Preservation and Amenity Economic generally disagreed with both motorized recreation and extractive economic values. The Leadville Discourse was clearly in favor of both motorized recreation and extractive uses on the PSI.

**Table 6: PSI Survey Correlation results between Values and Forest Uses**

Forest Use	n = 648	Values			
	% Favor	Recreation 65	Economic 33	Intrinsic 42	Biodiversity 67
<b>Pearson's r Correlations</b>					
Favor Fishing	90	.11**	N/A	-.13**	N/A
Favor Non-motorized Recreation	95	-.23**	N/A	N/A	N/A
Favor Hunting	65	.17**	.16**	-.10*	N/A
Favor Wildlife Viewing	97	N/A	N/A	N/A	N/A
Favor Motorized Recreation	36	.35**	.19**	-.10**	-.10*
Favor Logging for Fuel Reduction	56	.21**	.21**	N/A	N/A
Favor for Commercial Mining	16	.12**	.33**	-.09*	N/A
Favor Logging for Water Collection	38	.14**	.28**	-.09*	N/A
Favor for Oil and Gas winning on PSI	21	.19**	.32**	-.08*	N/A
Favor for Logging for Wood Products	35	.16**	.33**	N/A	N/A
Favor for Outfitting and Guiding	60	N/A	.17**	N/A	N/A
Favor for Wilderness designation	85	-.34**	-.26**	N/A	.08**
Favor for fish and wildlife habitat	97	-.14**	-.20**	N/A	.12**

Two tailed significance \* p<.05, \*\* p<.01

This discourse reflects the state of transition that the community finds itself in: it is agreeable to all forms of amenity economic use on the forest but both agrees and disagrees with motorized recreational value statements. It also is positive regarding mineral mining on the PSI, but negative regarding statements discussing oil and gas, reservoirs, logging and grazing related extractive economic values. This may reflect Leadville's situation as a community that is still discovering its potential as a tourism and

recreation destination, rather than a globally known site for spectacular mining profits. While demonstrating a deep appreciation for their landscape and their unique culture, the long-time residents and their descendants who participated in this discourse, are beginning to consider the advantages and disadvantages of motorized recreation.

Where the survey provided valuable information into what could be observed where forest values were concerned among residents in and around the Pike and San Isabel National Forests, the Q-methodology allowed the exploration of the context behind that information and the discovery of the reasons for what was observed. The survey's results are replicated in the discourses: the majority of them are more favorable toward amenity economic and low intensive recreational values on the forest, and there is a distinct difference with one discourse which clearly favors motorized recreational and extractive economic values. The latter explains far less variance in the Q-method study than the other discourses, but it is as distinctive in this study as it is in the R-method survey.

#### *Limitations and Further Research*

A limitation in the methodology may create a future research opportunity: participants in both the survey and the Q-study distinguished between different kinds of recreation and different kinds of economic values. Additionally, it appeared that if these distinctions are made, participants will be able to identify the kinds of recreational and economic values they support, and the connections between them. For example, in Lake County the Q-study respondents were all to some degree in favor of economic uses on the PSI, and while most made a connection between amenity resource types of economic activity, and

non-motorized recreation, there was a strong but important minority that agreed more with extractive economic activity motorized recreation. While most participants personally enjoy the PSI for recreational, spiritual and therapeutic values, many also made a living from amenity economic activities such as catering to anglers, renting bicycles and other human-powered gear, or teaching skills and guiding for example climbing. Rolston's values taxonomy does not distinguish between motorized or non-motorized recreation or between extractive and amenity economic values, and yet these are key issues on the PSI and other forests. Additionally, many communities in the West are economically closely related to forests and other public lands, and are experiencing the transition from extractive to amenity to a symbiotic resource economy. A taxonomy that made these distinctions could enhance the power of both surveys and Q-methodology by allowing researchers to discover more specifically the values that correlate to these different kinds of recreational and economic uses, and their contexts, which in turn would enable collaborative processes to understand these important dynamics more clearly and identify feasible solutions.

## **Conclusion**

Lake County, as a community surrounded by the Pike and San Isabel National Forest, will participate in forest planning collaboration under the new forest planning rules. This study has shown that combining a larger scale R-methodological mail survey with one or more Q-studies to discover in more detail geographically and socio-economically important information and relationships can be accomplished to provide valuable data in support of collaborative efforts. The survey results related to the PSI

provide valuable information regarding general trends among these residents regarding forest uses and forest values. The Q-method study digs deeper to explore the reasons for those values, and to discover the prevailing discourses and their contexts. In this case one Q-study was conducted but public lands managers may want to consider applying using a large scale survey in concert with a number of Q-studies to benefit either place-based or issue-based collaboration, or both.

In this way, forest values can contribute to an understanding of the relationship of this particular community to its surrounding forests, but also to Lake County as a “place”. It is clear from these results that the residents of Lake County consider the PSI forest landscape crucial to their community, economically but also in a quality of life sense. Arguably quality of life may trump economics in this community. It is so important that many did not leave when employment opportunities were drastically reduced in the 1980’s, and have instead adapted their lives to allow them to remain in this place. As one respondents mentioned, they would not be here “if this looked like Kansas”. The sharing of this kind of information in a collaborative effort is key to not only finding solutions that work for the sake of a forest planning effort, but also in the long run, for the sake of the community’s wellbeing and that of the surrounding landscape, whereby Q-studies can contribute significantly to both the short-term forest planning goals, as well as the long-term community relationships. Understanding not only what values people have, but also in what cultural, socio-economic, historic and geographic contexts they exist may allow future collaborative learning to be initiated with more community and contextual knowledge than would otherwise be available. This combination of R- and Q-methodologies can provide both the large scale general trends and the smaller scale,

explanatory data that can facilitate learning related to individual and community values, relationships and meaning of the surrounding landscape and geographical, historical and ecological knowledge. Under the new forest planning rules, this in turn can be used to determine desired conditions, objectives, guidelines and assist in the suitability analyses.

In Lake County, we were able to distinguish the five prevailing discourses in relation to forest values, establish what values are important in each discourse, what values the discourses have in common, and what values separate the discourses. This can provide a valuable starting-off point for collaborative efforts, increase the potential for its success and in the long run help create sustained relationships between agencies and local constituencies.

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## **Chapter 3: Creating Collaborative Tools with Multi-Spatial Forest Values Data**

### **Introduction**

In several articles in 1999, Shindler and others explained the nature of “wicked problems” and “adaptive management” to argue that social scientists could benefit collaborative and other public forums by not only providing values-related data, but also tools that aid in the public in “working through value differences and preferences” (Shindler and Aldred Cheek 1999; Shindler and Cramer 1999). The authors stated that public forums that allow the public, organizations and natural resource management agencies to engage in collaborative processes which allow these different values to be explored and worked through, can provide the greatest chance of sorting through the complexity and interconnectedness present in wicked problems. Wicked problems can be described as “interrelated (problems) of organized complexity that cannot be solved in isolation from one another” (Shindler et al. 1999; Shindler et al. 1999). In relation to values specifically, Shindler et al. cite Rittel and Weber (1973), which bears repetition here:

“Diverse values are held by different groups of individuals – that what satisfies one may be abhorrent to another, that what comprises problem-solution for one is a problem-generation for another. Under such circumstances, and in the absence of overriding social theory or overriding social ethic, there is no determining which group is right and which should have its ends served. (pg 2)”.

According to Shindler and others wicked problems arise when socio-political and moral-spiritual aspects become interwoven in the discourse (Rittel and Webber 1973;Shindler et al. 1999;Shindler et al. 1999). The authors make the case that “if people are to come to an understanding of, if not agreement on, the problems and choices that confront public lands management, it is likely to be in public forums where open and honest discussion can occur” (Shindler et al. 1999;Shindler et al. 1999). The authors also argue that “When politics is the forum for choosing among values, (scientists) must go beyond simple identification of values to improving our capacity to sort through complexity and uncertainty” (pg. 2). To do this, the scientific community can help develop forums which facilitate discourse between policy makers, constituents and agencies and provide tools that promote collaboration, learning and trust. The trade-off that exists in this kind of greater public involvement in natural resource management decisions is that participants will need to invest time, effort, perhaps money, when becoming engaged in their community and the landscape in question, which is where the importance of learning tools comes in. In order to improve the capacity of communities and other collaborative efforts to sort through complexity and uncertainty, learning tools can help level the playing field among participants by creating a common knowledge base. These tools will need to include substantive materials which allow participants to learn about each other, their landscape, socio-political and institutional aspects and other subjects. Since values are fundamental to human choice, tools are needed that reflect the values that are represented around a table regarding the relationship of a community to each other and a landscape, the context behind those values, the way values shape participants’ perspectives and preferences on the landscape (Rokeach 1973;Vaske and

Donnelly 1999). This article will present survey and Q-method results which were mapped on the landscape, and both study and mapping results can be used to aid in increasing collaborative capacity.

A survey was conducted in 2004 and 2005 which measured spatially explicit values. Additional data from a Q-study was collected on a smaller scale to discover the context behind and the spatial location of values in a community within the forest. The study was conducted as a preplanning data collection exercise on the Pike and San Isabel National Forests (hereafter referred to as PSI or the Forests) in Colorado, which has entered planning procedures under the most recent National Forest Management Act planning rule (Federal Register, 2005).

The 2005 Final Planning Rule provides forest planning guidelines under the National Forest Management Act. In this Planning Rule, collaboration was emphasized as the public involvement methodology of choice (Revised 36 Code of Federal Regulations Part 219). In the words of the planning rule: “the proposed plans that the Forest Service will present for public comment will be plans jointly and collaboratively developed with the public. The Department (of Agriculture) hopes this approach to plan development will serve to encourage people to work together to understand each other and find common solutions to the important and critical planning issues the agency faces. In summary, the final rule emphasizes collaboration and provides for effective public involvement (Revised 36 Code of Federal Regulations Part 219(3)).” The final rule also encourages that the public is involved in all stages of forest planning, from the initial stages of plan development through monitoring.

This study replicated the values measurement method with as one objective, the provision of collaboration tools to aid of PSI's planning process. The methodology was initiated by Reed and Brown in 1998 on the Chugach National Forest, which identified the values important to respondents using Rolston's forest value typology, the intensity with which the values were felt and the places on the landscape which represented those values the most to those respondents (Rolston 1989; Rolston and Coufal 1991). In this article we will 1) compare our results with some provided by Brown and Reed (2002), 2) provide additional spatial results which were collected in the course of the Q-study and 3) explore the usefulness of these results, or tools, in the context of collaborative and other public forums (Rolston et al. 1991; Brown and Reed 2000; Brown, Reed and Harris 2002; Reed and Brown 2003; Brown 2005; Brown and Alessa 2005).

*The role of values in public discourse in forest planning and management*

In the last two decades numerous studies have been conducted regarding the values the public holds in relation to a number of environmental issues, including forests generally (Shindler, List and Steel 1993; Steel, List and Shindler 1994; Fulton, Manfredo and Lipscomb 1996; Xu 1997; Manning, Valliere and Minter 1998; Vaske et al. 1999; Bright, Manfredo and Fulton 2000; Brown et al. 2000; Vaske, Donnelly, Williams and Jonker 2001; Brown et al. 2002; RMR 2003; Tarrant, Cordell and Green 2003; Bengston, Webb and Fan 2004; Reser and Bentrupperbaumer 2005). Values are most frequently defined in the environmentally-related social science literature as "an enduring belief that a specific mode of conduct or end-state of existence is personally or socially preferable to an opposite or converse mode of conduct or end state of existence"

(Rokeach 1973;Reser et al. 2005). Thus, the actual value is not measured, as much as its orientation to a particular issue (Rokeach 1973;Fulton et al. 1996). A number of basic beliefs together act as a proverbial lens through which values are focused on an issue. In this way a group of basic beliefs together discover a respondent's value orientation toward an issue or object. In this article the more forest-specific definition of values provided by Bengston et al. will be used, where forest value orientations are defined as, "relatively enduring and fundamental concepts of good related to forests and forest ecosystems"(Bengston et al. 2004) . In this case basic beliefs are used to measure respondents' value orientations toward the Pike and San Isabel National Forests.

By measuring the value orientations that are prevalent regarding forests or any other natural construct, research can contribute an understanding of people's value orientations in relation to these landscape components, in turn providing an explanation for attitudes and opinions regarding the specific natural resource in question. However, as Shindler et al. have argued, social scientists have predominantly only reported value data, and contributed few further tools which may contribute to the learning that allows collaboration to be successful. For communities to be able to achieve a successful collaborative effort, data will need to become more accessible to residents who may have little or no training in any science. Accessibility not only means that participants have direct access to the information, but will be able to understand and interpret the information.

In practice, differences in values usually form the impetus for a collaborative process, and a collaborative process can lead to value formation as well (Wondelleck and Yaffee 2000;Daniels and Walker 2001). Land management practices in the past centered

on technological solutions in the belief that science and expertise would provide clear guidance toward natural resource management solutions. However, increasingly these solutions were found to be unacceptable to one or more group of stakeholders, despite the perhaps overwhelming scientific evidence indicating their wisdom. Different people with different relationships to a landscape often bring arguments to bear on an issue which are based on values and other human social-psychological constructs, not any particular scientific expertise, which often only receive a hearing in court. Where different value orientations have often been perceived as being the cause of conflict and “analysis paralysis”, proponents of collaboration argue that where values can be included in deliberations to the extent that collective learning takes place, solutions emerge which otherwise could not have been devised and social capacity may be increased (Richard and Burns 1999;Shindler et al. 1999;Shindler et al. 1999;Wondelleck et al. 2000;Daniels et al. 2001). Thus, when a natural resource management issue surfaces, such as the need for a forest plan, agencies now are increasingly incorporating the different value orientations in deliberations from the outset. If collaboration does take place, as well as the learning that will occur among participants about the values and landscapes attached to the forest, an emergent property may well be values-formulation. Common knowledge about the landscape in question, as well as the role it plays to various community cohorts, can allow a common value orientation to form among collaborative participants that did not exist before (Wondelleck et al. 2000). Additionally, the values that can now be discussed in such a public discourse, can provide a depth that previously would have been difficult to achieve: not only will the public be able to learn from an agency about the resources it manages, but agency has a chance to learn the values of the public on

whose behalf they are entrusted with the management of those resources. This kind of public discourse will allow a public to “see” itself in the issue, or forest, or coastal area, under discussion and the connections that exist with that issue or landscape. For example, the spatially explicit values data collected in this survey can be used to create a “Values Suitability Analysis”, similar to other biophysical suitability analyses which are required in the forest planning process (Reed et al. 2003). Tools related to values research can not only enhance all forms of public discourse, including a collaborative process, but can be used with biophysical suitability analyses using GIS to do gap or “hotspot” analyses. Overlaying social values with biophysical aspects can identify areas where less agreement exists, requiring extra time to discover possible solutions (hotspot analysis). Overlaying these sets of data can also help identify where different management approaches might be in order, e.g. an area held in high regard by the public for its biodiversity value, where increasing amounts of unregulated recreation are taking place. Spatially explicit values data can not enhance the quality of public discourse, but allow greater possibilities for interdisciplinary research (Sisk, Savage, Falk, Allen, Muldavin and McCarthy 2005).

In this study, researchers attempted to replicate a values-measurement methodology in such a way that the data could be used in different ways as collaborative learning tools for the purpose of forest planning on the PSI. The PSI is located in central southern Colorado and is composed of two national forests, the Pike National Forest and San Isabel National Forest. To the east, these Forests border predominantly urban areas on the plains, Colorado Springs, Pueblo and Denver. To the west of this Front Range, the forests stretch up to include approximately 2.2 million acres, together containing most of

the peaks in Colorado over 14,000 feet, including the tallest mountain, Mount Elbert, and approx. 445 thousand acres of designated Wilderness. The forests are ecologically diverse and consist of sagebrush, high altitude grassland, ponderosa pine, lodgepole pine and spruce/fir communities, containing important watersheds related to the Arkansas and South Platte Rivers (USFS Pike & San Isabel National Forests 2006). Both urban and rural areas are experiencing high growth rates, changing demographics in both areas, in turn changing land use patterns (Riebsame, Gosnell and Theobald 1996;McGranahan 1999).

Planning related to these forests was officially commenced in 2005. For planning purposes, the Forests were divided into three geographic areas following watershed lines: the Upper Arkansas, the Lower Arkansas and the Front Range. Collaborative efforts based on these three geographic areas will commence later in 2006. The spatial data in this article will hopefully contribute to these collaborative undertakings as learning tools and will be presented using the geographic approach of the PSI.

## **Methodology**

Results in this article are based on two studies and we will present a general description of them both: a Forests-wide survey and a Q-study conducted in one county in the Forests. The survey description will include the mechanics of the spatial data collection procedure based on Brown and Reed (2002). In their 2002 article, Brown and Reed structured their results on the spatial discounting theory or geographic discounting theory (Norton and Hannon 1997). In their 1997 article, the authors propose a spatial discounting theory which posits that what humans value most, will be located closer to

where humans live or “The intensity of environmental valuation is highest in the here and now; this intensity is discounted from the home perspective across both time and space” (Norton and Hannon, 1997, pg. 231). What is further away in space and further away in time, will be less intensely valued, and the more distance in time and space, the less intensity. To spatial values data produced in both studies will be explored following the first four research questions Brown and Reed used in their 2002 article which were based on the spatial discounting premise. Survey and Q-results will be presented separately in order to allow a comparison between Brown and Reed and these results on the one hand, and between survey and Q-study results on the other. The research questions and corresponding methods for testing them are:

1. H<sub>0</sub>: There are no significant differences in distances between geographic and discourse groups and the twelve types of value points.

a. Survey: explore distance of environmental values from zip codes in five geographic areas to various value points.

b. Q-study: explore distance of environmental values by discourse for the Leadville Ranger District.

2. H<sub>0</sub>: There are no patterns discernable among value points within the Forests. The value points are CSR (Completely Spatially Random).

a. Survey: explore spatial pattern of values by geographic area.

b. Q-study: explore spatial pattern of values by discourse.

3.  $H_0$ : There are no patterns discernable among value points within the five geographic areas and discourses.

a. Survey: explore spatial pattern of values across the entire Forests.

b. Q-study: explore spatial pattern of values for entire community.

4.  $H_0$ : More intensely held values will be located closer to communities than further away (based on Norton and Hannon's proposals regarding spatial discounting, 1997).

a. Survey: explore spatial discounting for the three geographic areas, and the urban and rural stratification within them.

b. Q-study: explore spatial discounting for Lake County based on five discourses.

### *Survey*

The methodology is described fully in Clement and Cheng (2005, in review) in Chapter 1 and a summarized version follows here. The survey was distributed to 2000 random sampled households using the Total Design Method (Dillman 1978). The sample was stratified evenly between urban and rural households, and households were located in zip codes in the Forests and in a 45 mile radius around the Pike and San Isabel National forest, to be able to include urban zip codes and zip codes on all sides of the Forests. The survey consisted of five parts: 1) variables exploring respondents' familiarity with the Forests, 2) Respondents' beliefs regarding appropriate uses on the forests, 3) Respondents beliefs regarding a number of issues related to the forests e.g. roadless and wilderness area designation, motorized recreational use and fuels treatments, 4) the values that respondents have in relation to the Forests, the intensity of those values,

and places on the landscape that represent respondents' values and 5) demographic information (See Appendix A). The survey followed the design by Brown and Reed (1998, 2000, 2002) as applied to the Chugach National Forest (AK), with a number of changes to adapt the survey to Pike and San Isabel National Forests conditions; e.g. the PSI has few issues relating to native or tribal constituents, which featured as one important issue in the Chugach version. Response rate was 33% (N=658) response rate. This response rate provides a sample that will allow extrapolation to the PSI's nearby 3.5 million residents with  $p < 0.001$ . Additionally a non-response bias check indicated no difference between respondents and non-respondents on any items other than frequency of visits in the last year: respondents were significantly more likely to have visited the PSI in the recent year. This provides added assurance of the results' validity.

Section 4 of the survey contained the methodology specifically designed by Brown and Reed to allow researchers to collect data not only on the types of values that respondents held regarding forests (Table 1), but also the intensity of those values, and the locations of places on the landscape that represented those values.

The above values were listed in Section 4 with space in front of each value in which respondents could place a number. The survey utilized the common method in social science of asking respondents to divide \$ 100 between the values to indicate how highly, or intensely, the value was rated. It was made clear to respondents that the \$100 were not representing actual dollars, but are meant to provide some kind of denomination, e.g. points could have also been used.

**Table 1: Forest value definitions used in the Colorado validation study**

<p><b>Aesthetic value (A)</b> — I value these Forests because I enjoy the scenery, sights, sounds, smells, etc.</p> <p><b>Biological diversity value (B)</b> — I value these Forests because they provide a variety of fish, wildlife, plant life, etc.</p> <p><b>Cultural value (C)</b> — I value these Forests because they are a place for me to continue and pass down the wisdom and knowledge, traditions, and way of life of my ancestors.</p> <p><b>Economic value (E)</b> — I value these Forests because they provide timber, fisheries, minerals, and/or tourism opportunities such as outfitting and guiding.</p> <p><b>Future value (F)</b> — I value these Forests because they allow future generations to know and experience the Forests as they are now.</p> <p><b>Historic value (H)</b> — I value these Forests because they have places and things of natural and human history that matter to me, others, or the nation.</p> <p><b>Intrinsic value (I)</b> — I value these Forests in and of themselves, whether people are present or not.</p> <p><b>Learning value (L)</b> — I value these Forests because we can learn about the environment through scientific observation or experimentation.</p> <p><b>Life Sustaining value (LS)</b> — I value these Forests because they help produce, preserve, clean, and renew air, soil, and water.</p> <p><b>Recreation value (R)</b> — I value these Forests because they provide a place for my favorite outdoor recreation activities.</p> <p><b>Spiritual value (S)</b> — I value these Forests because they are a sacred, religious, or spiritually special place to me or because I feel reverence and respect for nature there.</p> <p><b>Therapeutic value (T)</b> — I value these Forests because they make me feel better, physically and/or mentally.</p>
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In the next part of the survey, respondents were referred to a map that was included with the survey, and asked to indicate with a pen or pencil on the map places that the respondents valued, with an initial and a number next to it to indicate the kind of value place it was. For example, Mount Elbert might be the third of four places a respondent indicated on the map as being important for its aesthetic value, thus an A3 would be noted. In space provided, respondents could write down A3 – Mount Elbert (Table 2). Respondents were asked to send the map back with the survey. Of the 658 respondents, 362 (55% of respondents) sent mapping information back with their surveys which allowed researchers to record 2680 places important to residents on the PSI map.

**Table 2. Values Mapping: Survey Instructions**

In the previous question you told us **what values** are important to you related to these Forests. For this question, identify the places **that represent those values on the map**. Look at the two-sided Survey Map of the PSI. Note the map symbols and value abbreviations on each side. To identify the places that are important to you, follow these two steps:

**Step 1.** When you look at the value(s) you indicated in Question 20, what places do you think of in the PSI? You may think of one or more places (up to four places) for each value you indicated in Question 20.

- By drawing dots with a dark-colored pen directly on the map, mark the places that represent your important values.
- Mark what Value that Place represents by using the value abbreviations immediately following the name of the Value found in Q-20 or by referring to the same Value abbreviations as listed on the map.
- Then give the Place you marked a number of 1 through 4. This is now the Value Mark.

**Example:** You indicated Aesthetic Value (A) in question 20 as one of your important values related to the PSI. When you think of Aesthetic Value, you think of two places: Pretty Peak and Golden Pond (imaginary places). You make two dots on the map: one where you think Pretty Peak is located, and you Value Mark it with “A1” for Aesthetic Value, Place number 1. You make another dot where you think Golden Pond is located, and you Value Mark it with “A2”, for Aesthetic Value, Place number 2. Follow Step 1 for each Value you allocated money to in Q-20.

**Step 2:** Please list in the table below each Value Mark along with its corresponding Place name. If you don’t know the specific name of these Places, then write down an approximate location, e.g. “creek just south of Mt. Elbert”. Your specificity regarding Places will help the Forest Service in their planning purposes.

- You only need to mark dots for the values for which you allocated money in Question 20.
- It is not necessary for you to have visited or used the Forest location(s) where you place your dots. Some Values may be related to forest use while others are not.
- If you know the names of more than 14 Places, please add them to the list on the page 11.

**Example 1:** To follow the previous example, under Value Mark you would write “A1” and under Place Name “Pretty Peak”. For the second Place related to Aesthetic Value, you would write “A2” under Value Mark and “Golden Pond” under Place Name. **Example 2:** You indicated in Q-20 that Recreation Value (R) was important, and you can think of three Places that represent that Value to you: make Value Marks directly on the map with R1, R2 and R3 next to them. In the table below list them as Value Marks R1, R2, R3 with their corresponding Place names or approximate locations.

<b>List of Value Locations Marked on the Survey Map</b>					
#	Value Mark	Place Name	#	Value Mark	Place Name
<b>Example</b>	A1 A2	Pretty Peak Golden Pond	8.		
1.			9.		
2.			10.		

This section of the survey was altered to an extent in an attempt to resolve a methodological issues raised by the original designers: in the Chugach version colored dots were provided to respondents to place on the map, signifying value points, in turn representing polygonal areas. Due to the size of the dot, and the scale of maps used, a dot might indicate an area between 1.2 miles to 12 miles. Additionally, a subjective decision needed to be made whether the respondent meant a small point, e.g. a mountain peak or campsite, or a larger area like a valley (Brown et al. 2000; Brown et al. 2002; Brown 2005). Additionally, in the Chugach study, official USFS Chugach National Forest maps were provided. The cost of these maps for this study would have been a prohibitive factor, partially because the PSI consists of two forests, and therefore two maps would have had to be provided with three of the four mailings under Total Design guidelines. There was also concern that providing two USFS maps might be too valuable for respondents to want to return for data collection purposes. To overcome these financial and response concerns, the PSI generated maps themselves for this study which indicated in as much detail as possible ski areas, major roads, rivers and water bodies, wilderness areas, 14,000 or higher peaks, towns, county boundaries and camping and picnic areas. The scale of the southern San Isabel National Forest map was 8 miles for every inch, and on the Pike National Forest and northern part of the San Isabel National Forest, the scale was 6 miles for every inch. The maps were printed on 11 x 17 sheets in color which could be folded into 8.5 x 11 and fit into a manila sized envelope. The provision of colored dots was replaced by asking respondents to hand-draw points directly on the maps, and write in a designated area the value marks indicated on the map, and the names of the location.

The survey data therefore contained 2680 places on the PSI map that have intensity and value attributes attached to them. These attributes can be correlated to distances to communities and can be analyzed in terms of clustering or dispersal, using the null hypothesis that the patterns are completely spatially random (CSR), and therefore the related attributes to the value points are CSR also.

The survey data was entered into SPSS 13 and 14 ® and the mapping data digitized using ArcGIS ®. Related GIS methods and analysis will describe this in further detail below.

### *Q-Methodology*

A summary will be provided of this methodology and its use in this study, however for a more detailed discussion please refer to Clement and Cheng (2006, in review) pgs 53-64.

Q-Methodology has been used since the 1930's to systematically examine human subjectivity by exploring the discourses, and their related subjectivity, that prevail on a particular subject (Brown 1980). Where a survey measures patterns across separate traits, e.g. socio-demographic variables such as gender or age, Q-method establishes patterns between and across whole individuals (Brown 1996). Thus, in the survey, value orientations were measured across socio-demographic variables, beliefs, preferences and other characteristics, figuratively dividing respondents into their different parts. In the Q-study, respondents were not divided into their demographic and socio-economic parts. Instead the values that individuals have in relation to forests were divided into their different components for respondents to prioritize according to their own evaluation,

while leaving the respondents themselves intact, allowing researchers to explore respondents' complete subjectivity which is based on their experiences, personality and other factors. Thus, respondents' value orientations are measured using their prioritization of the statements, revealing patterns of agreement and disagreement among participants, which together form forest value discourses.

The first step in Q-methodology is to establish the domain of subjectivity. This was determined to be the relationships, measured through value orientations that one community (Lake County) has with its surrounding forest (the PSI). Lake County is surrounded by the northern part of the PSI. Lake County is known for its mining history and legacy, and although all of the mines at the time of data collection were closed, it increasingly benefited from a growing economic income through tourism and recreation, evidence of the transition it is making from an extractive economic to amenity economic community (Campbell 2006). Lake County is home to the headwaters of the Arkansas River, Colorado's highest peak Mount Elbert, and many other "Fourteeners" in the enclosing Mosquito and Sawatch mountain ranges. Although Lake County does not have an economic tradition related to the extraction of forest products, its forests were in the 1880's and early 1900's almost entirely removed for use in the mines, smelters and town of Leadville. Currently the mountain slopes are covered by second generation lodgepole pine forests with generous patches of aspen and high mountain grasslands in between. This study focuses on Lake County and its relationship with the surrounding forests because, like many other communities in western United States, it is experiencing major socio-economic, geographic and environmental changes and the usefulness of

utilizing this method in this context was of interest. The domain of subjectivity therefore became the values that Lake County residents have in relation to the PSI.

Next, a population of statements was created which were sorted by participants according to the extent that they agreed or disagreed with the statements, which is known as the Q-sort. The statements were generated by survey respondents when general comments were elicited in the last section. The ninety-six statements that resulted expressed different value orientations regarding the PSI, either in a positive or negative manner. Of the 96 value statements respondents provided in the survey, 36 were selected because they 1) represented one of the 12 values used in the survey's value taxonomy and 2) contained the least amount of ambiguity. The statements were ranked by participants from 5 (Strongly Agree) to -5 (Strongly Disagree), in an upside-down pyramid format that allows participants to sort only one statement under 5 and -5, two under 4 and -4, etc. In the middle, under 0, participants could place six statements. Participants are thus forced to prioritize, in this case, what is most or least agreed with in terms of values related to the PSI. Additionally, the inverted pyramid ensures a normal distribution of statements, an assumption underlying the statistics utilized in this methodology.

Participants, or P(erson)-sample, were invited to participate in the study based on their role in Lake County as participants in natural resource related discourses, and were not selected randomly (see Chapter 2 for further discussion). Researchers obtained three lists of attendants to community forest project meetings, county planning and zoning meetings and community college natural resource related seminars. These lists were combined into one list of 164 names. Every fourth name was picked, but attention was also given to having a representative sample in terms of gender, mining and non-

mining affiliation and length of residency above or below 20 years. A list of 39 participants resulted, 12 of whom were women, 18 mining affiliated and 21 had lived longer in Lake County than 20 years. Although not controlled for, only 8 of the 39 participants did not have a college degree, which is in keeping with other natural resource management research respondents' characteristics (Tarrant and Cordell 2002;Tarrant et al. 2003;Brown 2005). The 39 participants were asked to do three things: 1) rank the statements into the Q-sort described, 2) provide a follow-up interview to explore the deliberations participants went through to determine their prioritizations in the Q-sort and 3) fill out the values survey and values mapping component as respondents had done in the Forests-wide survey.

The Q-sorts were entered into a database using PQMethod version 2.11 (Atkinson 2002) and the interviews transcribed in Microsoft Word 2002<sup>®</sup>. Factor analysis was then performed using the PQMethod software to draw the discourses out of these 39 rankings of this population of forest value statements. Each discourse is a factor characterized by a number of statements that correlated significantly with it. The statements are rated for each factor, allowing the researcher to see which statements typify a discourse, to what extent, and the relationship between the discourses. The five discourses are summarized in Figure 1. In this article, the discourses have been analyzed spatially. The types of values, the intensity of the values and value points on the landscape provided by these 39 participants who are actively involved in natural resource management issues in Lake County, will be grouped according to discourse and analyzed accordingly.

Table 3: Lake County Forest Value Discourses

Anthropocentric Values			Biocentric Values	
Utilitarian			Amenity	Nature-Oriented
Discourse 2 Extractive Economic	Discourse 5 Amenity Economic	Discourse 4 Leadville	Discourse 1 Stewardship	Discourse 3 Preservation
Older, longer-term residents. Agree with energy extraction, motorized recreational, therapeutic values. Disagree with aesthetic, intrinsic and future values.	Business sector. Favor non-motorized recreation, outfitting and educational values. Opposed to anti-economic forest values.	County commissioners and other involved residents. Aesthetic, amenity economic, intrinsic and historic values. Disagree with extractive economic values related to forests e.g. reservoirs, logging, energy.	Cohort is most involved in local NRM issues. Favors amenity oriented economic, future, life sustaining and non-motorized recreation values. Disagree with extractive economic values related to forests e.g. energy and logging, and motorized recreation values.	Ecocentric, frequently more protective of nature over human needs. Intrinsic, biodiversity and life sustaining values rank highest, all extractive economic values lowest.
% Explained Variance:		15	12	21
5	10			

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## *Analysis*

Spatial analyses of the survey data were conducted based on the three geographic areas the Pike and San Isabel National Forests have outlined for planning purposes: the rural Upper Arkansas area, the Lower Arkansas area, which includes the southeastern urban areas along the eastern edge of the Forests, and the Front Range, which includes Denver and Colorado Springs on the northeastern edge of the Forests. Because the mail survey sample had been stratified for urban and rural comparisons, the results have been analyzed and are presented in what will be referred to as five geographic areas: the rural Upper Arkansas area, the urban and rural Lower Arkansas areas and the urban and rural Front Range areas.

Q-method spatial analyses were conducted and will be presented based on the five discourses that emerged from this study.

The value points were digitized and analyzed spatially using ESRI ArcGIS 9.0 software. Put in survey description. The value points and their attributes (see below) were converted for further t-test, ANOVA and correlation analyses on SPSS versions 13 and 14 ®.

### *GIS Analysis*

***(This section co-authored with Lisa Leeman, GIS Specialist with the Pike and San Isabel National Forests, who digitized the value points and conducted the analyses using GIS).***

Forest Value point and Q-method Value shapefiles were created using the Heads-up Digitizing method with ESRI ArcGIS 9.0 software. All related analyses used the same software. Digital PSI visitor's maps were used as a background to locate the point locations listed on each survey. Acceptable point data included a specific place name and

value that corresponded to a hand-drawn point on the provided map. Unacceptable point data included places that were too broad (e.g. “the entire forest”), place names that lacked a value, or place names that were not hand drawn onto the map. Certain locations throughout the PSI have the same name (e.g. “Sand Gulch”) and without pin pointing the correct location onto the provided map, we had no way of knowing where exactly the respondent intended the location to be. Along with the place name and value, the zip code of the respondent, the intensity of the value, the city type (rural or urban) and the geographic area were also included as attribute information for each point.

The ESRI Point Distance analysis tool was used to measure the distances between the respondent’s zip code and the value points from that zip code. Center points were created from a zip code polygon layer and the Point Distance tool measured the straight-line distance between those zip code center points and each value point from that zip code. The distances were measured in meters and later converted to miles.

Completely Spatially Random (CSR) hypothesis testing was accomplished by using the ESRI Average Nearest Neighbor statistic tool. The Average Nearest Neighbor tool calculates the average observed distance (OD) between each point and its nearest neighbor and compares that to the expected random distance (ED). The R-value or nearest neighbor index (NNI) is the ratio of the observed distance and the expected random distance. ( $Min(d_{ij})$  is the distance between each point and its nearest neighbor,  $N$  is the number of points and  $A$  is the fixed area)

$$OD = \sum_{i=1}^N \left[ \frac{Min(d_{ij})}{N} \right]$$

$$ED = 0.5 \sqrt{\frac{A}{N}}$$

$$NNI = \frac{OD}{ED}$$

An R-value closer to 0 indicates a clustered pattern. As the R-value gets closer to 2.149, the pattern is considered dispersed. Randomly spaced points have an R-value closer to 1. A Z-score is also calculated and is used to indicate whether the nearest neighbor ratio could be the result of random chance or is statistically significant ( $SE_{ED}$  is the Standard Error).

$$Z = \frac{OD - ED}{SE_{ED}} \quad \text{where} \quad SE_{ED} = \sqrt{\frac{(4 - \pi)A}{4\pi N^2}}$$

$$= \frac{.26136}{\sqrt{\frac{N^2}{A}}}$$

Due to the fact that the R-value and the Z-score for the Average Nearest Neighbor Statistic are sensitive to changes in the study area parameter, a fixed area was derived by digitizing a polygon around the PSI Forest. Calculations were based on Euclidean distances.

## Results

1. *H<sub>0</sub>: There are no significant differences in distances within geographic and discourse groups and the twelve types of value points (Tables 4 and 5).*

### a. Survey

ANOVA tests were run to explore significant differences in distances between the twelve kinds of value point distances. The ANOVA tests resulted in only two sets of differences (Table 4). One geographic area, Front Range rural, produced a significant

difference between future and biodiversity and recreation values whereby future values were further from Front Range communities than biodiversity and recreation values ( $F = 2.57, p=0.003$ ). The second significant difference was across all rural areas of the PSI, where future values were located at significantly longer distances than biodiversity value points ( $F = 2.14, p = 0.015$ ). The mean distances for each value in each geographic area were ranked (1) to (12) from the shortest to longest distance between zip codes and value points.

Also reported in Table 4, t-tests were conducted between the urban and rural stratifications of the Lower Arkansas and Front Range geographic areas, and the whole PSI, to discover whether there were differences in distances of value points. In this analysis, to account for the standard difference in distance for urban and rural areas to the PSI, z-scores were used rather than actual distances, although actual distances are presented to the reader in Table 4. No significant differences were found on the PSI and both geographic areas for historic and spiritual values. Significant differences between all rural and urban value point distances were found for biodiversity, life sustaining and recreational values. The Lower Arkansas area was found to have the most significant differences between rural and urban distances where aesthetic, biodiversity, cultural, economic, future, recreation and therapeutic value points were closer to rural communities than urban communities and intrinsic, learning and life sustaining values were further from rural communities than urban communities.

b. Q-study

In Table 5 the mean distances were ranked by discourse again from shortest to longest and ANOVA's were conducted within each discourse and for the whole study, and means were also produced for the five discourses combined. ANOVA's did not produce any significant differences in distances between zip codes and value points among the values across discourses within Lake County. However, ANOVA's run to test differences between discourses provided some significant results: The Stewardship discourse placed its aesthetic value points significantly further away than the Leadville and Amenity Economic discourses. Additionally, the Extractive Economic discourse participants placed their historic value places significantly further away than any other of five discourses.

Table 4: Average Distances (miles) from Zip code to the Value Points for PSI Survey Data. In parentheses: ranking of values within geographic groups based on z-scores.

Geographic Areas Values	Upper Arkansas <sup>b</sup>	Lower Arkansas			Front Range			PSI Forest		
	Rural	Rural	Urban	t	Rural	Urban	t	Rural	Urban	t
Aesthetic	44 (10)	46 (9)	69 (3)	-3.88**	53 (9)	64 (3)	-1.20	49 (10)	62 (1)	-1.8
Biodiversity	32 (2)	44 (6)	74 (5)	-5.43**	38 (1)	64 (4)	3.34**	39 (2)	64 (3)	2.19*
Cultural	36 (6)	53 (12)	71 (4)	-3.70**	42 (5)	62 (2)	0.38	44 (7)	64 (4)	.714
Economic	32 (4)	40 (3)	84 (10)	-2.88*	46 (6)	61 (1)	-1.60	41 (4)	63 (2)	-2.4*
Future	50 (12)	45 (7)	81 (6)	-2.63*	62 (12)	67 (7)	0.56	52 (12)	68 (8)	.276
Historic	32 (3)	43 (4)	86 (11)	.111	59 (11)	73 (11)	-1.44	51 (11)	74 (11)	-1.44
Intrinsic	42 (8)	45 (8)	69 (2)	9.80**	52 (10)	73 (10)	1.95	49 (9)	72 (10)	2.62**
Learning	49 (11)	34 (2)	95 (12)	5.30*	41 (4)	71 (9)	-1.82	41 (3)	70 (9)	-1.12
Life Sustaining	39 (7)	52 (11)	83 (9)	12.22**	48 (7)	65 (5)	-4.26**	48 (8)	66 (5)	-3.03**
Recreation	42 (9)	46 (10)	83 (8)	-16.5**	41 (3)	66 (6)	3.23**	43 (6)	66 (6)	2.14*
Spiritual	35 (5)	34 (1)	81 (7)	1.57	50 (8)	76 (12)	-1.20	41 (5)	78 (12)	1.74
Therapeutic	30 (1)	44 (5)	62 (11)	-4.42**	38 (2)	69 (8)	-0.20	39 (1)	67 (7)	-1.01
# of value points	311	475	108	-	764	1022	-	1550	1130	-
Mean Distance	41	45	77	-	47	66	-	45	67	-

\*  $p \leq 0.05$  and \*\*  $p \leq 0.01$  for values indicated.

<sup>b</sup> Upper Arkansas has no communities fitting urban definitions so no t-tests were performed.

ANOVA tests for mean distances between zip codes and value points across geographic areas within the Forests resulted in significant (Tukey HSD,  $p < 0.05$ ) differences in 1. Front Range rural areas, between future value and biocentric and recreation value: future value points were further away from communities, and 2. PSI rural respondents, where future value points were significantly further than biodiversity places.

Table 5 Average Distances from Zip code to the Value Points (Miles) for Q-Study in Lake County, CO						
Forest Values	Mean Distance from Leadville to each Value (miles)	Mean Distance (miles) from zipcode to value by discourse				
		Amenity	Extractive	Leadville	Preservationist	Stewardship
Aesthetic	11.37 (6)	9.85 (4)	8.79 (7)	9.78 (2)	13.82 (7)	16.29 (12)
Biodiversity	9.88 (2)	11.23 (8)	7.4 (4)	9.45 (1)	8.82 (3)	7.75 (4)
Cultural	10.83 (3)	15.96 (11)	0 (2)	11.88(6)	6.9 (1)	11.95 (8)
Economic	12.73 (8)	11.17 (7)	8.57 (6)	13.16 (9)	16.79 (10)	6.85 (2)
Future	11.20 (4)	12.33 (10)	13.32 (10)	11.89 (7)	10.76 (4)	11.13 (7)
Historic	14.56 (11)	11.17 (6)	20.74 (12)	12 (8)	22.99 (12)	9.85 (6)
Intrinsic	9.38 (1)	10.15 (5)	0 (1)	10.14 (3)	8.38 (2)	7.17 (3)
Learning	12.89 (9)	9.32 (2)	8.28 (5)	24.76 (12)	18.06 (11)	5.84 (1)
Life Sustaining	12.51 (7)	8.07 (1)	6.94 (3)	14.47 (11)	15.29 (9)	8.67 (5)
Recreation	14.6 (12)	18.25 (12)	11.07 (9)	11.13 (5)	11.34 (6)	13.37 (11)
Spiritual	11.36 (5)	12.04 (9)	10.28 (8)	10.6 (4)	11.23 (5)	12.35 (9)
Therapeutic	13.71 (10)	9.49 (3)	15.98 (11)	14.3 (10)	14.74 (8)	12.65 (10)
# of valuepoints	363	176	75	184	168	84
Mean Distance	12.53	12.58	11.08	11.68	12.92	12.27
% Explained Variance		10	5	15	21	12

ANOVA tests for mean distances between zip codes and value points across discourses within Lake County resulted in no significant (Tukey HSD,  $p < .05$ ) differences within discourses. Differences in distances between discourses were noticed for aesthetic value, where Stewardship value points were significantly further than Leadville and Amenity value places ( $p < 0.05$ ) and for historic value where value points were further away for the Extractive Economic discourse than any other discourse ( $p < 0.01$ ).

2. *H<sub>0</sub>: There are no patterns discernable among value points within the Forests. The value points are CSR (Completely Spatially Random (Tables 6 and 7).*

a. Survey

The null hypothesis for all geographic areas was rejected since none of these areas showed completely spatially random patterns (Table 6). R-values, which in this analysis are index scores not Pearson correlation coefficients, were all relatively close to 0, which indicates a strong clustering pattern in each case showing that respondents' value points are not randomly placed.

b. Q-study

Here too, the value point patterns within the discourses and combined in Lake County were tightly clustered and the null hypothesis was rejected in all cases (Table 7).

3. *H<sub>0</sub>: There are no patterns discernable among value points within the five geographic areas and discourses (Tables 8 and 9).*

a. Survey

Nearest Neighbor Analysis explored whether patterns were discernable by measuring the distance between the twelve types of value points for each geographic area, requiring 60 analyses. Within the geographic areas studied, the null hypothesis was rejected in 40 of the 60 CSR analyses (Table 5). In the Urban Lower Arkansas geographic area, eight out of the twelve analyses resulted in accepting the null hypothesis since the value points for those eight value types were distributed in a random pattern across the landscape, or not clustered enough to be reported with any significance.

Table 6. Patterns of value points within the three geographic areas, the forest and in rural and urban sub-areas.

		Ho: Values are CSR	N	Mean Nearest Neighbor Distance (Meters)	R-values *	z-values	Mean Distance point locations from community (miles)
Upper Ark	Rural	Reject	311	1.56839E+03	0.37	-21.32	41.10
Lower Ark	Rural	Reject	475	6.74736E+02	0.20	-33.53	44.85
	Urban	Reject	108	3.08937E+03	0.43	-11.39	77.19
Front Range	Rural	Reject	764	4.49105E+02	0.17	-44.14	47.45
	Urban	Reject	1022	5.18183E+02	0.22	-47.68	66.29
PSI Forest	Rural	Reject	1550	3.38608E+02	0.18	-62	45.38
	Urban	Reject	1130	4.85920E+02	0.22	-50.33	67.33

\* All R-values significant at  $p \leq .001$ .

Table 7. Patterns of value points for the five discourses in Lake County Q-Study.

Discourse	N	Mean Nearest Neighbor Observed Distance (Meters)	R-values*	z-values	Ho: Values are CSR	Mean Distance point locations from community (miles)
Amenity Economic	176	1.62497E+03	0.29	-18.1	Reject	12.58
Extractive Economic	75	1.04811E+03	0.12	-14.57	Reject	11.08
Leadville(Place- based)	184	1.35788E+03	0.25	-19.59	Reject	11.68
Preservationist	168	1.02898E+03	0.18	-20.4	Reject	12.92
Stewardship	84	6.13109E+02	0.07	-16.22	Reject	12.27
All Leadville Q points	363	7.00027E+02	0.18	-29.3	Reject	12.53

\* All R-values significant at  $p \leq .001$ .

As with Brown and Reed, this may be related to a low number of value points relative to the total number of value points in that area. The CSR analysis procedure on ArcGIS is sensitive to area size, and respondents in the urban Lower Arkansas geographic area provided the lowest number of valued places.

Values forest-wide that were distributed more often randomly or close to random were cultural, economic, intrinsic and learning values. Values that were clustered in four or more geographic areas were aesthetic, biodiversity, future, life sustaining, recreation and therapeutic values. This too may be related to relative number of value points, which were lower in the more random patterned values.

b. Q-study

In only six of the 60 analyses was the null hypothesis accepted, and in each of the six cases the respondents had placed either one value point or none. Cultural and intrinsic values received no points on the map in the Extractive Economic discourse, the Leadville discourse had one value point for intrinsic value and the Stewardship discourse had one point each for cultural, learning and life sustaining values. Except for learning value in the Leadville discourse, all other values in the five discourses resulted in significantly clustered patterns.



Table 9 -Leadville Q Method Data																
Value	Amenity Economic					Extractive					Leadville (place-based)					
	N	R	p	Pattern	H <sub>0</sub>	N	R	p	Pattern	H <sub>0</sub>	N	R	p	Pattern	H <sub>0</sub>	
Aesthetic	32	0.14	0.01	C	Reject	11	0.17	0.01	C	Reject	33	0.13	0.01	C	Reject	
Biodiversity	19	0.17	0.01	C	Reject	7	0.31	0.01	C	Reject	20	0.19	0.01	C	Reject	
Cultural	3	0.08	0.01	C	Reject	0					6	0.32	0.01	C	Reject	
Economic	26	0.18	0.01	C	Reject	12	0.14	0.01	C	Reject	19	0.44	0.01	C	Reject	
Future	12	0.23	0.01	C	Reject	5	0.34	0.01	C	Reject	13	0.26	0.01	C	Reject	
Historic	14	0.28	0.01	C	Reject	8	0.34	0.01	C	Reject	12	0.20	0.01	C	Reject	
Intrinsic	2	0.00	0.01	C	Reject	0					1					
Learning	6	0.39	0.01	C	Reject	4	0.27	0.01	C	Reject	3	0.99	none	R	Accept	
Life Sustaining	8	0.23	0.01	C	Reject	5	0.29	0.01	C	Reject	8	0.58	0.05	C	Reject	
Recreation	43	0.55	0.01	C	Reject	11	0.29	0.01	C	Reject	39	0.14	0.01	C	Reject	
Spiritual	5	0.29	0.01	C	Reject	6	0.32	0.01	C	Reject	11	0.25	0.01	C	Reject	
Therapeutic	6	0.32	0.01	C	Reject	6	0.58	0.1	C	Reject	19	0.18	0.01	C	Reject	
	Preservationist					Stewardship										
	N	R	P	Pattern	Ho	N	R	P	Pattern	Ho						
Aesthetic	23	0.43	0.01	C	Reject	14	0.49	0.01	C	Reject						
Biodiversity	18	0.20	0.01	C	Reject	9	0.15	0.01	C	Reject						
Cultural	3	0.04	0.01	C	Reject	1										
Economic	11	0.57	0.01	C	Reject	3	0.14	0.01	C	Reject						
Future	8	0.24	0.01	C	Reject	4	0.36	0.05	C	Reject						
Historic	7	0.29	0.01	C	Reject	4	0.28	0.01	C	Reject						
Intrinsic	7	0.10	0.01	C	Reject	2	0.03	0.01	C	Reject						
Learning	4	0.45	0.05	C	Reject	1										
Life Sustaining	12	0.50	0.01	C	Reject	1										
Recreation	33	0.23	0.01	C	Reject	29	0.39	0.01	C	Reject						
Spiritual	19	0.25	0.01	C	Reject	4	0.38	0.05	C	Reject						
Therapeutic	23	0.25	0.01	C	Reject	12	0.29	0.01	C	Reject						

4. *H<sub>0</sub>: More intensely held values will be located closer to communities than further away (based on Norton and Hannon's proposals regarding spatial discounting, 1997) (Tables 10 and 11).*

a. Survey

Correlations were run between value point distances and the amount reported by respondents as representing value intensity, which was expressed in dollar amounts (Table 10). In this analysis, the value point distances were those between communities in the five geographic areas and the valued places that respondents had identified. For Norton and Hannon's spatial discounting theory to hold, the most intensely held values would be located closer to respondents' communities (a negative correlation coefficient indicates an inverse relationship between intensity and distance). However, only seven of the 60 correlation coefficients for the five geographic areas showed a significant relationship between the value intensity, and only four of these seven coefficients indicate a positive relationship with value points closer to respondents' communities. Each coefficient was in a different discourse, and all were related to different values ( $p < .05$  or  $.001$ , Table 10).

Generally, biocentric, cultural and economic value points were located closer to communities in the Forests' geographic areas; historic, intrinsic, learning, spiritual and therapeutic values were mixed and aesthetic, future, life-sustaining and recreational values tended to be further from communities.

b. Q-study

Table 11 reports the same analysis for the Q-study value points, and for comparison the correlations are also provided between the urban and rural respondents on both forests. The Q study respondents located their value points for 10 values closer to the community in comparison with other rural respondents Forests-wide who located seven values closer to home. Both Q-study participants and PSI rural respondents placed biodiversity, cultural, economic, historic, learning, spiritual and therapeutic values closer to their communities. However, in the Q-study, none of the values were significantly correlated with distances further or closer from communities, and in the PSI rural areas economic and spiritual values was significantly correlated with shorter distances, while aesthetic value was significantly correlated with distances further from communities. In PSI urban areas cultural and historic values were closer to home, and intrinsic value was significantly correlated with longer distances.

Table 10: Correlations between distance of value points to zipcodes, and value intensity.

	Upper Arkansas Rural		Lower Arkansas Rural		Lower Arkansas Urban		Front Range Rural		Front Range Urban	
	Corr.	N	Corr.	N	Corr.	N	Corr.	N	Corr.	N
Aesthetic	0.44**	67	0.05	95	0.13	11	0.18*	168	0.1	232
Biodiversity	0.11	22	-0.16	61	-0.07	13	-0.18	78	-0.08	109
Cultural	0.86**	9	-0.17	13	-0.87**	9	-0.16	26	-0.08	24
Economic	-0.28	17	-0.58*	16	-0.48	6	-0.18	32	0.14	34
Future	0.11	41	-0.24	57	0.18	8	0.14	65	0.08	131
Historic	-0.1	8	0.17	19	0.13	8	-0.2	32	-0.27	49
Intrinsic	0.34	16	-0.11	22	-0.05	5	-0.22	46	0.29	43
Learning	-0.56	6	0.16	10	-0.69	3	-0.24	30	0.26	32
Life Sustaining	-0.42*	24	0.02	59	-0.27	4	0.06	79	0.06	103
Recreation	0.01	59	0.01	83	0.03	21	0.13	129	0.05	180
Spiritual	-0.47	7	-0.2	27	0.3	10	-0.35	30	0.31	24
Therapeutic	-0.34	15	0.08	30	0.24	10	-0.31*	52	0.02	61

\* p < .05, \*\* p<.001

Table 11: Correlations between distance of value points and value intensities for PSI Rural and Urban and Lake County.

	PSI Rural		Q Study Lake County (Rural)		PSI Urban	
	Corr.	N	Corr.	N	Corr.	N
Aesthetic	0.19**	330	0.08	60	0.96	243
Biodiversity	-0.13	161	-0.15	42	0.47	122
Cultural	-0.04	48	-0.56	9	-0.22	33
Economic	-0.3*	65	-0.11	36	0.09	40
Future	0.03	163	-0.43	18	0.09	139
Historic	-0.11	59	-0.28	24	-0.17	57
Intrinsic	-0.06	84	0.15	9	0.29*	48
Learning	-0.19	46	-0.31	11	0.27	35
Life Sustaining	0.05	162	-0.22	20	0.04	107
Recreation	0.06	271	-0.12	86	0.04	201
Spiritual	-0.3*	64	-0.26	20	0.26	34
Therapeutic	-0.08	97	-0.01	28	0.05	71

\*  $p < .05$ , \*\*  $p < .001$

## Discussion

### *Methodological Considerations*

Perhaps due to the timing of the mail surveys, during national elections, and perhaps due complexity of the spatial values section as applied in this case, the overall number of value points was relatively low. Brown provides an overview in one article of the results from various studies using this methodology, and he and his colleagues received greater number of value points than this study did (Brown 2005). On the other hand, GIS digitizing of the value points was easier and more accurate because of the complexity that was imposed on respondents. This variety of the Chugach methodology therefore may present a trade-off, the reverse, it seems of what Brown et al. experienced: fewer value points are derived, but the quality of the value points, i.e. accuracy and

specificity, increases. Finally, 2680 specific, clear value points are enough to provide maps and other learning aids in support of collaborative efforts on various scales and provides valuable information regarding the relationships between places of value, user trends and intensity of values. More experimentation with this aspect of the methodology would be helpful.

### *Spatial Discounting*

#### Survey

As Brown and Reed (2002) remark, Norton and Hannon's 1997 spatial discounting theory is intuitive and seductive. However, Brown and Reed's results did not conclusively support the theory because although they did find value patterns on the landscape, the patterns did not uniformly support the concept that as one moves further from a community, the intensity with which those residents value the landscape will decrease. They concluded that although distance is an important parameter to use when gauging landscape values, it is not the only criterion.

The present study largely supports Brown and Reed's findings. The first hypothesis (Table 1) resulted in two significant differences in distances from home to places of value, where the only apparent trend appeared to be in relation to future value places which were further than biodiversity places in both cases, and recreation places for all rural areas on the PSI. T-tests resulted in significant differences between the rural and urban distances, from value places to residential zip codes for several geographic areas and/or the PSI as a whole, for biodiversity, economic, intrinsic, life sustaining and recreation values. Discernible trends Forests-wide in the rankings of general distances of

value types from communities were observed although these appeared mixed when comparing rural and urban distances. For example, aesthetic value points were consistently ranked as the shortest distance away from urban residents and the furthest away for rural residents. Other consistent differences show up when comparing rural and urban geographic areas which would be important from a forest planning perspective and which would not show up if relying on Forests-wide numbers only (Table 12). Aesthetic value is ranked differently for different geographic areas, yet the mean distances between recreation places and residences ranked 6<sup>th</sup> Forests-wide but the intensity ranking of Forests-wide recreation value ranked 1<sup>st</sup>. The same variability is seen in other values, e.g. economic value, which one might assume would be uniformly related to closer distances to home and, according to the spatial discount theory, would therefore also be assumed to be a relatively highly valued aspect of the PSI. Where distance rankings are concerned, the spatial discounting theory does not seem to apply in many cases, and when looking further at smaller scales, hardly ever in a uniform manner.

Table 12: Spatial Discounting – Relative ranking of Value Intensity and Distance of value points from center of residential zip code within the PSI, and within the three geographic areas. I = mean intensity ranking, D = mean distance from zip to value point ranking, % = percentage of value points within that category.

Values	PSI			Upper Arkansas			Lower Arkansas			Front Range		
	I	D	%	I	D	%	I	D	%	I	D	%
Aesthetic	1	6	21	2	10	23	5	4	18	6	6	22
Biodiversity	5	1	11	5	1	8	7	7	12	5	2	11
Cultural	12	4	3	11	5	3	9	12	4	9	1	3
Economic	9	2	4	9	3	6	10	8	4	10	8	4
Future	4	10	11	4	11	14	8	6	11	3	11	4
Historic	8	12	4	10	2	3	1	11	5	12	12	5
Intrinsic	7	11	5	6	9	6	6	5	5	4	10	5
Learning	11	7	3	12	12	2	12	2	2	11	5	4
Life Sustaining	3	8	10	3	6	8	1	9	11	2	7	10
Recreation	2	5	18	2	7	20	3	10	17	1	4	17
Spiritual	10	9	4	8	4	2	2	1	6	7	9	3
Therapeutic	6	3	6	7	8	5	4	3	7	8	3	16
			100%			100%			100%			100%

Regarding the second and third hypotheses, on smaller geographic scales as well as Forests-wide scales value points were distributed in clustered patterns on the landscape and the relative few cases where the null hypothesis could not be rejected may have been more related to a low number of value points rather than landscape distribution. Looking at the fourth hypothesis where intensity was correlated with distance, only 7 out of the 60 analyses supported the spatial discounting theory with significant relationships between value intensity and distances closer to the related communities. On a Forests-wide scale, PSI rural showed significant relationships between value intensity and decreasing valuation over distance for economic and spiritual values, while aesthetic on PSI rural and intrinsic on PSI urban showed a significant relationship with increasing intensity with increasing distance away from residential zip codes. Thus only two of the 24 analyses on a Forests-wide scale support the theory.

These results therefore support Brown and Reed's conclusion that spatial discounting, the idea that places of the highest value will be closer to home, may apply to some values, when using this values taxonomy as a measurement tool in combination with GIS, but not all and not consistently. Additionally, spatial discounting results, or just value-intensity/distance from home relationships, will vary when exploring at different scales. It appears that the values which will have that type of spatial relationship will differ per community, geographic scale and demographics.

To reinforce the spatial scale that appears important in these results, these results also agree with Brown and Reed that on a larger Forests-wide scale, values that reflect more immediate and active human use on the landscape, e.g. economic value, may be found closer to home, and values that reflect indirect, passive human use, e.g. future and

intrinsic values, may be further away. However, between rural and urban areas or on smaller geographic scales, these trends may differ. For example, in geographic areas the two highest correlations between distance and value intensity were in relation to cultural value (Table 10), Upper Arkansas Rural having a positive relationship and Lower Arkansas Rural having a negative relationship. This means that for one rural area, the further away a cultural value place is, the greater the intensity appears to be whereas for another rural area the reverse is the case. Also, aesthetic value on these smaller geographic scales seems to confound both Brown et al. (2002) and Norton et al. (1997) because this more immediate, direct human evaluation of the PSI increases in intensity with greater distance, in two rural areas significantly. Thus, what is considered direct or indirect use of a landscape may differ between communities and geographic areas, and neither distance nor use, or both, seem to adequately explain these relationships or the lack of them.

Norton and Hannon (1997) also suggested that in relation to one's home, a valuer may use different scales for different values, some values being nearby, others being more on a regional scale, some on a planetary scale. However the assumption that the intensity of values is in relation to where a person lives may not hold where some values are concerned. With more research of this kind, researchers may find clearer trends regarding the relationship between home and valued places, shedding more light on Norton et al.'s proposals. In this study, intrinsic value does appear to defy time and space for valuers and can be held on a planetary scale, as Norton and Hannon theorized, however intensity does not dwindle with increasing distance from home, in fact the opposite seems to be the case with some types of values. Norton and Hannon also

hypothesized as values on landscapes are researched, we would observe that distance alone may not be an accurate indicator for the intensity with which values are felt, as Brown and Reed also suggested. In this case, biodiversity value, which is among the top five most intensely valued aspects both Forests-wide and on smaller scales (Table 12) does seem to be a closer to home-construct. However, considering the low correlation coefficients and lack of significance, this may reflect local knowledge and familiarity with surroundings more than relationship between distance and place. On the one hand residents may know the local flora and fauna and can pin-point where they are regularly seen in their daily lives or monthly outings, and value this local biodiversity greatly, but there is no evidence that places of biodiversity value further away are valued less. The ongoing national debate regarding the Alaska National Wildlife Refuge comes to mind, a place where the far greater majority of US citizens have never been, and yet consistently argue that oil drilling should not take place due to biodiversity issues. Near or far from home, biodiversity value may be felt intensely. The distance and intensity of values therefore appears to differ depending on different geographic scales, different demographics and perhaps different contexts, and may be best analyzed and applied at a fairly local scale.

#### Q-Study

Spatial results from the Q-study did not fully corroborate the spatial discounting theory either. Hypothesis 1 results showed that mean distances to value points varied between discourses, as did their rankings. Hypothesis 2 results showed that values were all patterned on the landscape, with very low R index values, indicating very clear

patterns (Hypothesis 3). The last hypothesis which explores relationships between intensity and distances of value points showed no significant relationships across the discourses. When comparing value intensities with value distances for the five discourses (Table 13) it is clear that intensity does not necessarily correlate with shorter distances, as Norton et al. (1997) theorize. In some cases, at this small, community scale, higher intensities approximate shorter distances, for example intrinsic value for the Preservation discourse and biodiversity value for the Leadville discourse, but not in all cases and in no discourses does the most intensely felt value relate to the shortest distance to the community. Here too, it seems more information is needed to explain relationships between value intensity and the location of valued places than distance and/or use.

Table 13. First four highest value intensity coefficients for Q-study discourses in Lake County and the four shortest mean distances between value points and zip codes (*italics*).

Values	Stewardship	Extractive Economic	Preservationist	Leadville	Amenity Economic
Aesthetic	7.5	13.75 (3)	10.1	8.75 (4) (2)	8.75 (4) (4)
Biodiversity	13.75 (3) (4)	10.75 (2)	10.19 (4) (3)	10.71 (2) (1)	12.5 (3)
Cultural	2.5	2	3.44 (1)	5	0
Economic	8.75(2)	18.25 (1) (4)	6.77 (4)	5.71	27.5 (1)
Future	6.25	3.25	6.85	15	5
Historic	12.5 (4)	4.5	3.77	7.14	2.5
Intrinsic	5(3)	2	15.19 (1) (2)	1.79 (3)	12.5 (4?)
Learning	8.75(1)	4.5 (3)	5.44	3.57	2.5(2)
Life Sustaining	13.75 (2)	11.25 (4) (1)	12.27 (2)	8.57	8.75(1)
Recreation	18.75 (1)	14.5 (2)	8.85	20.71 (1)	15 (2)
Spiritual	0	10.75	6.52	3.93 (4)	1.25
Therapeutic	2.5 (3)	4.5	11.27 (3)	8.93 (3)	3.75(3)

### *Use in Collaboration*

Daniels and Walker (2001) rely on Barbara Gray for a definition of collaboration that applies to public decisions: Collaboration involves a process of joint decision making among key stakeholders of a problem domain about the future of that domain. Five features are critical to the process: 1) the stakeholders are interdependent, 2) solutions emerge by dealing constructively with differences, 3) joint ownership of decisions is involved, 4) stakeholders assume collective responsibility for the future direction of the domain, and 5) collaboration is an emergent property (Gray 1989; Daniels et al. 2001). Put more simply, Gray describes collaboration as a process through which parties who see different aspects of a problem can constructively explore their differences and search for solutions that go beyond their own limited vision of what is possible (Gray 1989; Moote 2005).

As Daniels et al. have described, for a collaborative process to have joint ownership of decisions, all participants in a collaborative process will require joint ownership of knowledge. A common understanding of the landscape, the communities, contextual aspects and each other is essential to allow real collaboration to emerge, as well as solutions that are perceived by collaborators to benefit the landscape and associated communities from social, ecological and economic stand points. A number of researchers additionally recommend that participants in collaborative processes decide what information is required, perhaps even be involved themselves in the data collection (Fischer 2002; Smith Korfmacher and Koontz 2003). Under the 2005 planning rule, a forest plan will contain five components: desired conditions, objectives, guidelines, suitability of areas and special areas. Also, the role of science, while still being an

important informant of decisions, is explicitly described as one of many informants. In order to accomplish the five components, a collaborative effort will require scientists, natural and social, to work together with each other and with other participants in a more interactive fashion than has usually been the case in the past (Daniels et al. 2001). The final planning rule and collaboration both aim at a planning process based less on reaching technical solutions informed predominantly by science and experts, and more on a process that creates a common knowledge as one component allowing the public, land management agencies and other organizations to work through wicked problems to reach informed judgments (Shindler et al. 1999; Shindler et al. 1999; Daniels et al. 2001; Fischer 2002; Cheng, Kruger and Daniels 2003).

The data reported in this study can support efforts to create a common knowledge as described above. The results reported here also support Brown and Reed's observation that contextual factors will play a role in the distances to valued places, and the intensity with which the related values are held (2002). This survey methodology can be adapted to local geographic, demographic and issue specificity, allowing researchers to obtain spatially explicit values information which can support collaborative efforts in an immediate and practical manner and be generalized to the population in question. By adding Q-studies in relation to places or issues of importance to a collaborative effort, wicked problems can be unraveled and the additional information can support a deeper level of learning, in turn allowing for a larger spectrum of possible solutions. Adding Q-studies to a preplanning forest values inventory also creates data on larger and smaller scales, which can be directed to specific collaborative efforts, and yet be statistically valid, reliable and interactive.

To explain the importance of context, we provide one example from the Q-study: intrinsic value is ranked 4<sup>th</sup> place in intensity in the Amenity Economic discourse (see Table 12). Knowing the other participants who loaded on this factor and their prioritization of values, a closer inspection of the data was warranted. Upon review, it was determined that one respondent who allocated only one value place under the intrinsic value heading was heavily influencing the intensity ranking in the survey, while the person's Q-sort loaded significantly and negatively on the Preservationist, the discourse where intrinsic value is the most prominent value. Due to this seeming paradox, it would be tempting to treat this one value point as an outlier. Especially since the participant allocated half of his \$100 dollars to economic value, which is arguably the philosophical opposite of intrinsic value, while also allocating \$50 to intrinsic value, despite appearing very opposed to intrinsic values in the Q-sort. Additionally, he also clearly marked one of his two value places as having intrinsic value, making it more difficult to dismiss the value point as an outlier. Reviewing the interviews conducted in the Q-study, we found the gentleman to be a fourth generation Lake County resident, rancher, large animal veterinarian, chairman of the local Soil Conservation chapter, who was also instrumental in the Superfund designation of part of Lake County due to high levels of acid mine drainage. The place he has designated for its intrinsic value is at the foot of Mount Elbert, the highest mountain in Colorado, which has large aspen stands, many wetlands, and is an elk breeding ground and winter feeding area. The location borders on his ranch property. It may also become the future site of a large reservoir for Aurora, a growing community on the Front Range. Taking the person, the place and issues related to it into consideration, it becomes even more difficult to consider the value

point an outlier since one of Lake County's most established and prominent citizens has identified a statewide beloved landmark as having a particular value, an attribute that could be eradicated if the reservoir was indeed built. Although in the Q-sort his discourse does not support an intrinsic value orientation, it appears there is one place that nevertheless resonates with this participant for this very reason and forms an exception.

This level of contextual understanding was possible because of the addition of the Q-study to the survey; in turn, the survey allows the Q-study to be directly reflected on the landscape through maps. Whether collaboration takes place on a small or large scale, a number of applications of this methodological combination in support of collaboration could be:

1. Use maps in concert with generalizable values, preferences and beliefs generated through a random sample for various scales, depending on the study design (Figures 1 and 2).
2. Use maps in concert with smaller scale information obtained through Q-studies. The discourses that result from these Q-studies will allow a land management agency and its fellow collaborators to look at a landscape from a deeper historical, cultural, economical and ecological perspective, tying all these components to the landscape in question (Figures 3 and 4).
3. Use spatial values information to create a values suitability analysis, which fits well with the new planning rule (Reed et al. 2003).
4. Use spatial values information to conduct hotspot and gap analyses in combination with ecological data inventories (pg 105).

Figure 1

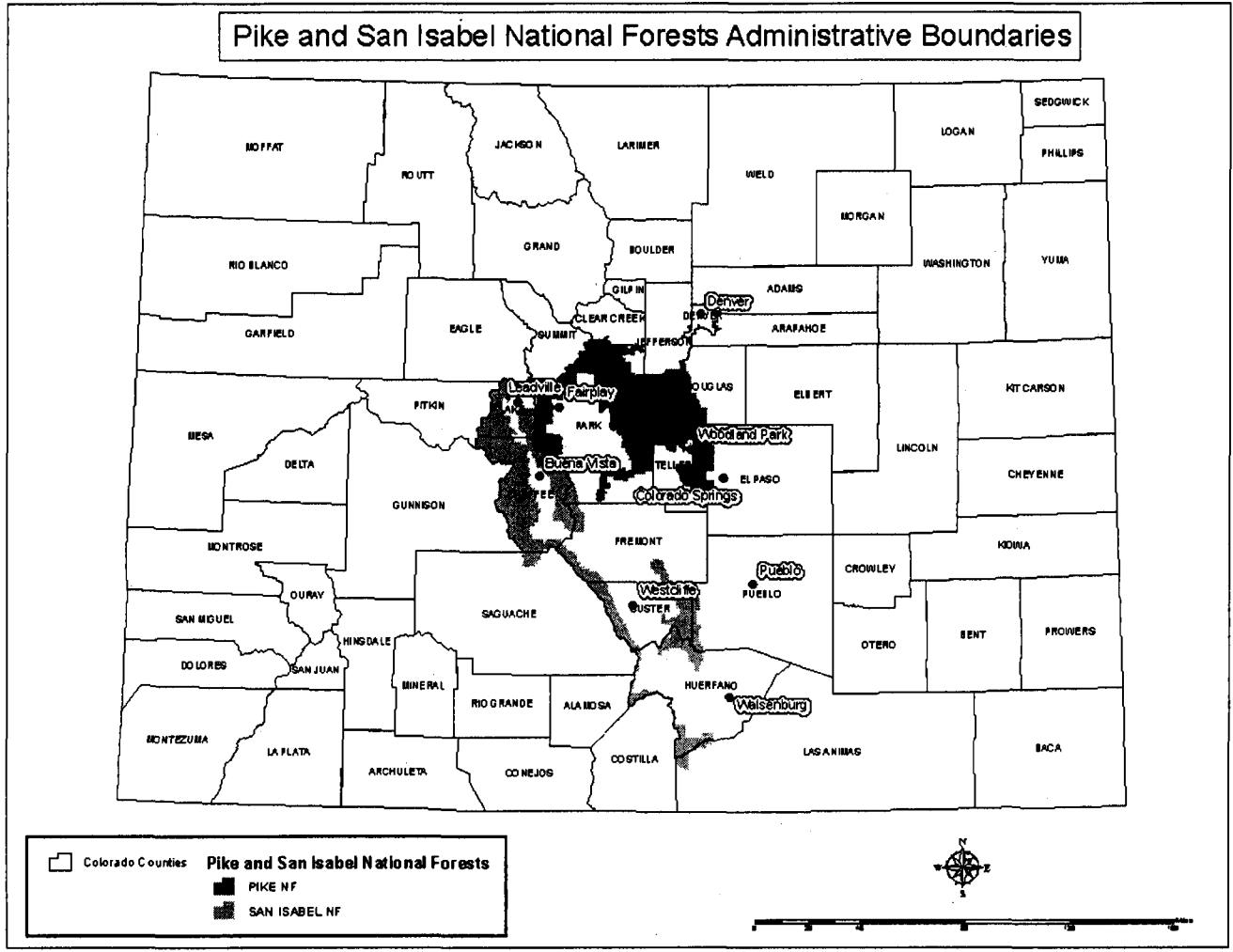


Figure 2

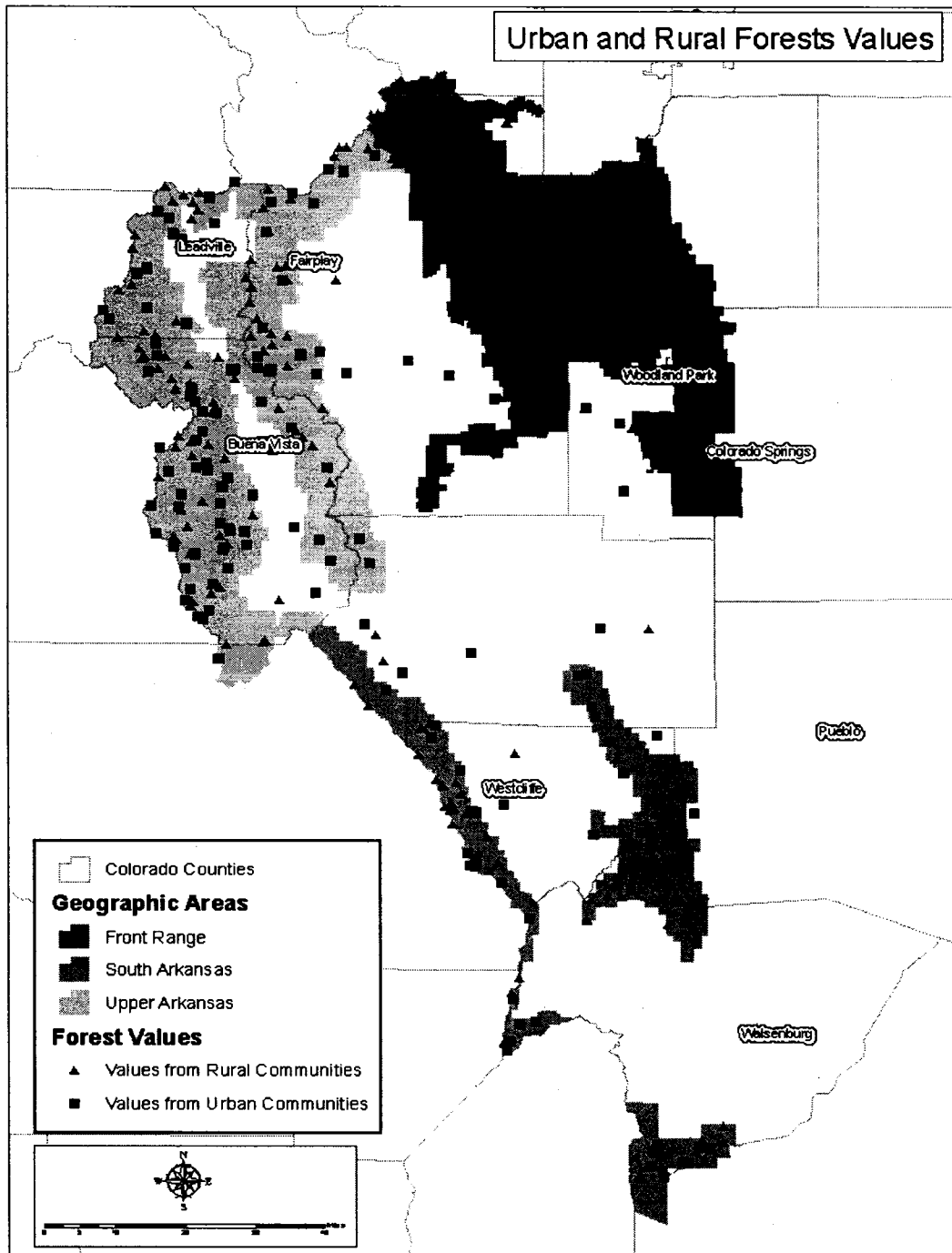


Figure 3: Legend

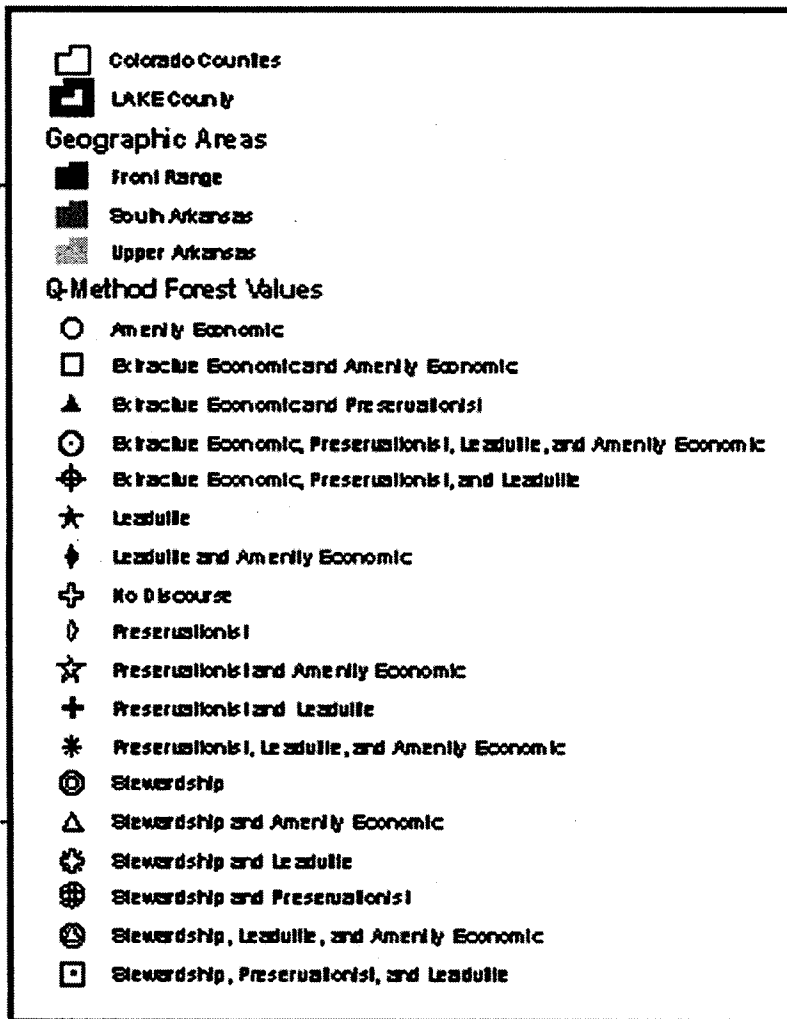


Figure 3

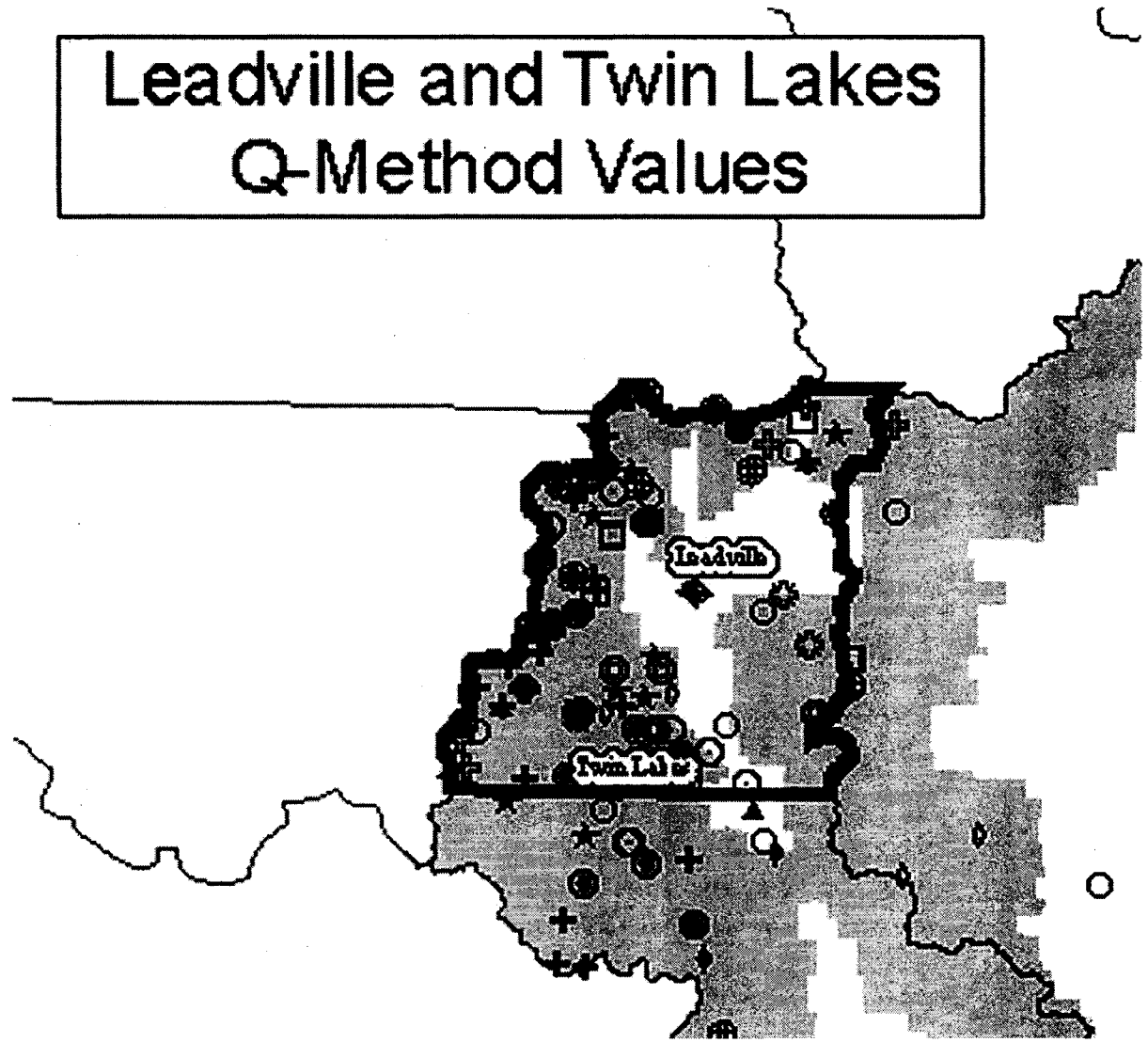



Figure 4: Legend



**Leadville Ranger District**

**Value Points**

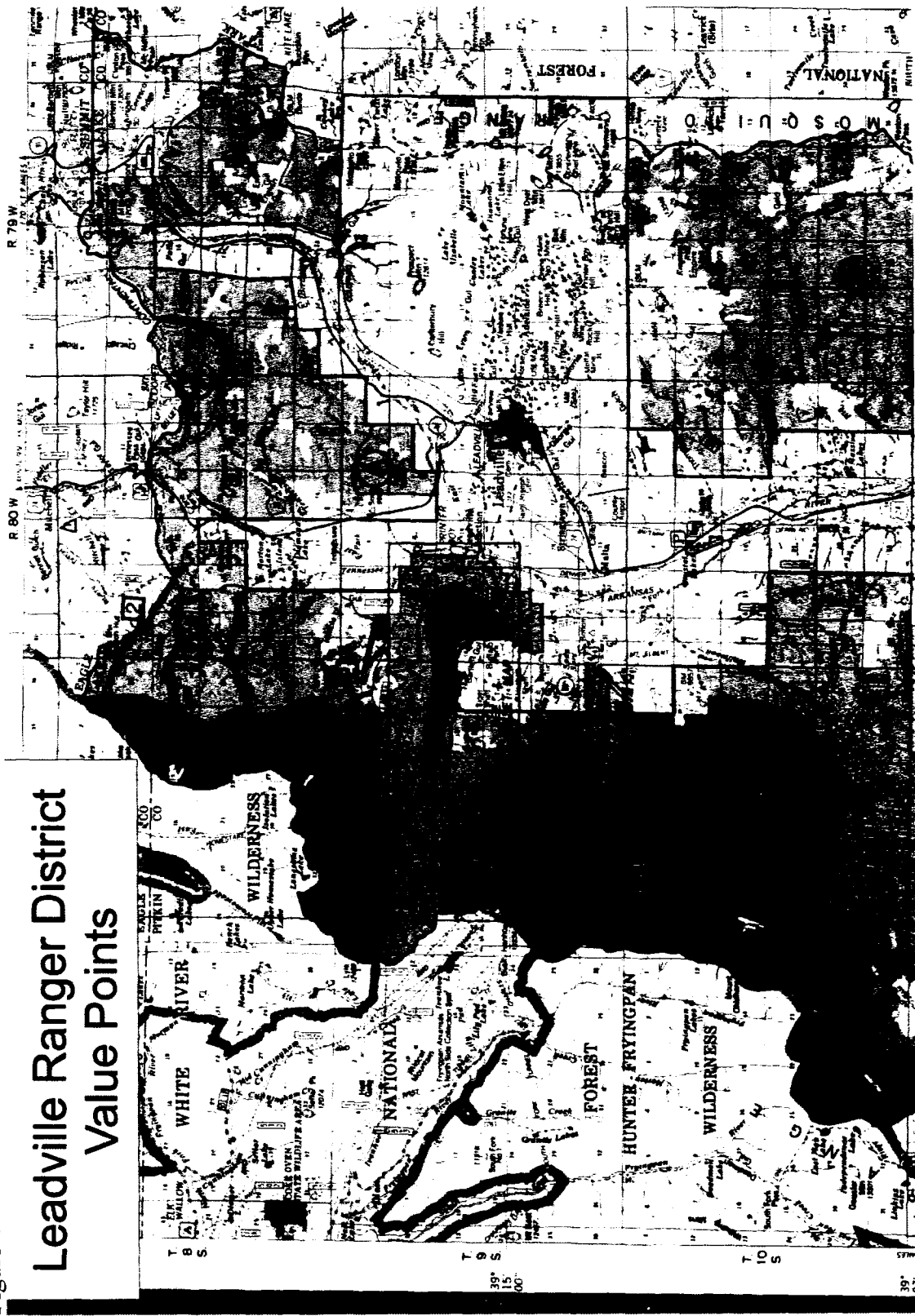
- Aesthetic Beauty
- Biological Diversity
- Cultural
- Economic
- Future
- Historic
- Intrinsic
- Learning
- Life Sustaining
- Recreation
- Spiritual
- Therapeutic

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<b>VALUE</b>	<b>TOTALS</b>
Aesthetic Beauty	101
Biological Diversity	45
Cultural	10
Economic	18
Future	63
Historic	19
Intrinsic	21
Learning	15
Life Sustaining	45
Recreation	91
Spiritual	14
Therapeutic	26
<b>Total</b>	<b>468</b>

Figure 4

# Leadville Ranger District Value Points



## **Conclusion**

Any forest planning or natural resource related planning effort is three dimensional: people, place and issues are tied together, whereby institutional, political and personal aspects also come into play. For such a complex undertaking to be tackled successfully, participants need to share the same knowledge about these dimensions and aspects. We agree with Shindler et al. (1999) that social scientists can play an important role in not only providing data, but putting that data into formats that are user-friendly, illustrative and reliable, helping participative forums, including collaborative efforts, unravel the “wickedness” that characterizes the relationships between humans and nature, as well as relationships between human and ecological communities. “Wickedness” may be a given in these efforts, and there is far more that social science can provide to assist in unraveling these messes than data only.

In fact, due to natural resource policy developments such as the Healthy Forest Restoration Act (2003), new forest planning regulations (2005), the formulation of Community Wildfire Protection Plans, and the emphasis placed on collaboration within these policies, it may be more incumbent upon science than ever to provide not only data, but data that is usable and interpretable by people whose relationship with a place is experiential and direct, not academic. For collaboration to be successful, the role of shared knowledge, both biophysical and social, on multiple scales, and its usability are key components.

Brown and Reed’s Chugach methodology may be one way for social science to provide hands-on tools for collaboration, which can be used in concert with biophysical data. Other methods used e.g. in Arizona, also lend themselves well to spatially exploring not only human constructs but ecological constructs as well, to find out where there may be conflicts, gaps, or

successful management strategies which should be continued (Sisk et al. 2005). GIS in general proves itself to be a flexible and valuable tool in mapping and illustrating human relationships with landscapes.

Besides survey (or R) methodologies, Q-methods can also provide a valuable tool for collaboration. Rather than providing results that discuss people, the results are formulated as discourses, by nature of its methodology, which may be beneficial for sensitive issue unraveling and trust-building efforts. Q-method results do not describe certain kinds of people specifically, or their traits, thereby helping to avoid the kind of unhelpful discussions that seek to assign blame, illustrate what is perceived to be “wrong” and generally create barriers to trust building. Instead the results are discussed in the framework of the conversations that are prevalent in a community, on a particular issue, and why. The explanatory nature of Q-method can assist in creating greater understanding within a community, illuminate what values are held in common, and thereby provide a foundation for a collaborative process. By combining Q-method with the Chugach methodology, the resulting discourses can be mapped on the landscape and this too may illuminate commonalities between participants and provide a starting point for collaboration, or suggest potential areas of conflict that require collaborative attention. As illustrated above, the combination of these methods provides several layers of contextual information that can be invaluable to resolving a wicked problem.

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## **Conclusion to Dissertation**

### **Science and Values**

This dissertation will be concluded with a few remarks about the context in which its research was conducted from a larger forest policy and forest ecological perspective. While collecting, analyzing and describing the data for this study, this researcher has been and still is involved in several collaborative efforts in Colorado. In the course of these professional experiences and graduate studies, the researcher explored subjects related to the role of biophysical and social sciences, as well as related natural resource policy issues. As a result, the author has come to the conclusion that values research in the context of collaborative efforts and as part of a larger social process in the United States, is perhaps more relevant than she originally perceived.

Many in the scientific community have observed resistance to scientific results in the natural and social disciplines, e.g. related to ecological historical range of variation, social values in natural resource management, and evidence regarding climate change. This resistance is often noticeable in “your science versus my science” discussions, e.g. in relation to evidence regarding potential advantages and disadvantages to ecological restoration of salvage logging in Oregon or the evidence regarding the potential for collapses of fish stocks in the world oceans (Worm et al., 2006). Similar discussions occur regarding to the role of large-scale thinning in lodgepole pine forests in Colorado due to increasing mountain pine beetle populations, and regarding appropriate restoration treatments in ponderosa pine forests in different locations.

The social science community is confronted with similar discussions regarding its findings, especially when the research question involves values related to natural

resources. The point has been made in this dissertation that there are at least four decades of social values research that indicates a noticeable shift in US citizens' value orientations toward natural landscapes of our society. This body of evidence is the result of different study methodologies, and generally the results point to the same, more biocentric direction. The evidence presented in this study is no different: PSI residents appear to prefer their forests healthy, with their aesthetic qualities intact, with a quantity and diversity of wildlife, available for future enjoyment of children and grandchildren and for amenity economic uses, of which recreation is the most important. The statistical data in this study indicates this and is supported by 235 survey comments and 39 interviews and Q-sorts in Lake County.

In another field, relatively new measurement techniques in forest ecology now employ GIS, remote sensing, more powerful statistical software and other new technology. Using these new techniques, the forest ecological scientific community in recent decades has generated a large amount of scientific evidence regarding ecological dynamics in forests on different spatial and temporal scales. This evidence sometimes conflicts with previous ecological understandings as well as the perceptions that the public and policy makers currently have regarding what a "healthy" forest looks like, how it develops, whether restoration is appropriate, and whether a particular treatment would in fact amount to restoration.

Both these large bodies of evidence such as those described above can become embroiled in "your science versus my science" types of discussions. These discussions bring to mind the fairy tale of the Emperor without clothes. At a certain point in any public discourse regarding a scientific issue, be it global fish stocks or public evaluations

of the importance of forests and parks, a discussion may be observed between a minority of non-scientists ostensibly about science, even though at this point both the related scientific community and the general public has absorbed, reviewed and generally accepted certain scientific evidence. When a scientific subject has reached this point, and yet there is a small, but noticeable, science vs. science discussion taking place primarily in the media, we may start exploring the possibility that the conversation is not really about science anymore, but values. It may be advisable then to recognize the Emperor's state of undress, identify the discussion as one based on values, not science, and continue it in a manner that at once contributes real substance to a discourse, while also avoiding the marginalization of science.

As the results of the Q-study in this dissertation illustrate every natural resource related discourse, solution or proposal has both anthropocentric and biocentric elements to it. The United States legislature has excelled at creative natural resource solutions that address numerous biocentric and anthropocentric values simultaneously, and continues to experiment in this vein. Many laws in this country, e.g. the National Environmental Policy Act, a law that mandates the consideration of as many values as possible, became an example to the rest of the world where environmental legislation is concerned. Howard Zahniser, lobbyist for the Wilderness Society in the 1950's, was literally a walking exploration of values, seeking commonalities (there were many) that would eventually create the National Wilderness Preservation System. The Healthy Forest Restoration Act, although critiqued for its application of science, nevertheless creates the opportunity for communities to explore their relationships to their landscape, and to use collaboration rather than centralized Washington DC, to find place-based solutions.

Thus, to narrow down important natural resource discussions to science ignores all the important and relevant values that underlie the various positions, and by pitting superficial scientific arguments against each other and not explicitly including those values in the discussion, opportunities are lost. Although constant and rigorous review of scientific methods is an essential aspect of the scientific process, at a certain point it may be helpful to acknowledge that the Emperor indeed has no clothes on and the reason why the discussion is taking place actually has little to do with science, and far more to do with competing value orientations.

### **Collaboration and Values**

The power and promise of collaboration is that it has the potential to break down barriers to finding solutions to wicked problems as Shindler et al. describe (1999). Collaboration has the potential to do this because it opens up the opportunity for learning, it directs the focus to a landscape, or an issue with respect to a landscape, it makes values explicit and it is a process that looks at a whole, not parts. Collaboration is a form of public participation, and can be a form of shared decision making. It is, in fact, a form of direct public involvement the majority of our founding fathers sought to avoid, much to the disappointment of some, e.g. Jefferson. As Kemmis explains (Kemmis 2001), US citizens have hardly ever been involved in direct public participation, by design. And here finally may lie the ultimate rub: collaboration, as a form of direct public involvement, will continue to run into institutional barriers, and frequently run into “conflicting science”, in fact values conflicts, with especially governmental, non-governmental and corporate organizations. The very federal government which

authorizes collaboration, is ill equipped to accommodate it. The Constitution, federal and state agencies, the White House, Congress, commercial enterprises and even the larger environmental NGO's are designed to protect their institutional values and organizations by budgetary means, and to this end, economic concerns will usually trump all other values (Wright, 1994). Institutions need to survive and preferably grow in order to meet their missions. When the requirements of existence conflict with the requirements of mission, existence is usually deemed most important, which is in turn dependent on financial well-being. No matter what the original public purpose of an institution may have been, it is the existence that becomes the prime motivator, not the public purpose. And in order to safeguard and enhance an institutions' existence, money becomes the most important value (Wright, 1994). However, this may not reflect US citizens' value orientations which can become evident in the course of collaborative efforts, ironically often thanks to federally mandated policies.

The unraveling of this particular wicked problem will probably not be quick or easy, and may depend on a number of interrelated factors, as all wicked problems do. One factor is whether the public will continue to favor place-based and collaborative processes, in which case these forms of more direct public involvement may prevail. And if they do prevail, US citizens' values will become evident in place-based natural resource solutions in ways that may surprise us, and even instigate some very interesting and potentially positive evolutions in democracy in this country, perhaps yet again providing a new example to the rest of the world (Kemmis 2001).

## **Science, Collaboration and Values**

If these forms of more direct public involvement prevail, the role of science will then need to adapt, or expand, in order to provide relevant information in accessible ways for collaboration participants to use. For example:

1. Collaboration includes the educational component of learning. Learning is done by participants together, it is not a didactic exercise, which androgogy tells us has little chance of being a successful educational approach with adults. Adult learners need knowledge presented in a hands-on, applied manner that is relevant to them as individuals. Educational transference is most likely to occur when the knowledge is shared, rather than “taught” (Matthews, 1995). If collaboration is to be successful, knowledge is shared in a manner that applies to participants and allows learning to take place.

2. For knowledge to be applied, it must be relevant to the circumstances at hand. Before a study takes place, participants may need to understand the various study methods that exist and may need to be involved in determining the appropriate research questions. In this process, the local knowledge already residing with the group may allow a study to be more effective. This in turn will not only provide appropriate information, but will lend the information the credibility necessary for its results to be used (Cheng et al., 2003).

3. Knowledge shared in a collaborative process needs to be complete and untrammelled. When presenting information regarding ecological dynamics or social science results, land managers, policy makers and scientists should refrain from deciding what the public can or cannot absorb, or which science is “the best” and perhaps only

presenting this perspective. The democratic nature of collaboration necessitates all participants to have access to all information, in order to allow them to trust each other and the process. This in turn allows the group to have access to all the potential solutions that can emerge from that information. By a priori deciding what information the public can or cannot receive or consider, a collaborative effort may be restricted in its decision making space to the point that all or some of its members have reason to distrust the process from the start.

The study described in this dissertation and its results is one manner of providing place-based information using the above criteria. It is relevant, because it is place-based and it can be adapted to different scales, different audiences and different purposes, it can be interpreted using graphic methods, and it can be used with biophysical data sets when converted to GIS. In this way, these data can contribute to the learning of a collaborative group seeking solutions that include as many values as possible. Additionally, the combination of quantitative and qualitative methods representing the paired R and Q methodologies as described in Chapters 2 and 3 serve to provide a far deeper understanding of what values are important in relation to this place and the reasons for those values.

However, the uses of values research may be considered in a larger context as well. The above observations regarding the value orientations underlying various arguments in the “your science versus my science” discussion are not based on empirical research. Nor does the writer advocate that scientists discuss their values when presenting evidence regarding fire dynamics, fish stocks or public values. However, when predominantly non-scientists maneuver a public scientific discourse into the “your

science vs. my science” arena, it may be time to allow the social scientists to take the values “pulse” and make the related values explicit, and help avoid discussions which only serve to marginalize science and scientists and are unhelpful to the public. To some extent social scientists have already done work toward this end, and continue to find ways of using values data in relation to small-scale collaborative groups, large-scale institutions, multiple institutions or other cohorts, in turn assisting a process in breaking down barriers. Providing institutional related values data, e.g. regarding an agency or NGO, to collaborative processes may contribute equally valuable learning tools, allowing participants to become more understanding of the decision making space of those institutions, and allowing those institutional members to participate without inhibition. This could, again, help to break down barriers, and contribute to the transparency which can be one of the main advantages of collaboration. The values underlying institutions are relevant, and making these explicit can potentially contribute more to decrease the complexity of the issue at hand, and allow more solutions to emerge.

Until then, the Chugach Methodology has been used in relation to a number of other collaborative processes in the United States and abroad, and it will be interesting to see their reports in the social science and natural resource management literature. Others, such as Thomas Sisk at Northern Arizona University, are creating their own innovative place-based, multi-spatial and interdisciplinary data sets, hoping to achieve similar objectives as this study. The author looks forward to continuing to explore these collaborative frontiers with interdisciplinary colleagues, in relation to many types of communities and landscapes, and will also continue to explore means of making values

explicit, with hopes of increasing transparency (no pun intended) and therefore trust and learning, and allow us to safely acknowledge the Emperors' state of undress.

Leadville, Colorado  
July 4, 2006

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## Appendix A: Public Values and Preferences regarding Forest Uses and Management on the Pike and San Isabel National Forests, Colorado

### Survey Results

#### Survey Questions and Responses

Responses are provided in percentages (%), with an asterisk (\*) denoting significant differences between urban and rural responses. All coefficients significant at  $p < .05$ . N signifies "neutral".

#### PART 1: Your familiarity with the Pike and San Isabel National Forests (PSI).

**Q-1** About how many times during the last 12 months have you visited the PSI? If you are unsure about the boundary of these Forests, see the enclosed PSI Survey Map. (Please circle one response).

		Urban	Rural*	Total
1	1 or 2 times	29	15	21
2	3 to 5 times	27	21	24
3	6 to 10 times	13	17	15
4	More than 10 times	11	38	26
5	Never	19	10	14

**Q-2** Please circle the seasons in which you most often visit the PSI.

		Urban	Rural	Total
1	Spring	21	13	17
2	Summer	63	45	53
3	Fall	31	28	29
4	Winter	6	6	6
5	All Seasons	21*	43	33

**Q-3** Do you or anyone in your household earn income from the sales of PSI products or from commercial services that depend on access to these Forests? (Please circle one response)

		Urban	Rural	Total
1	Yes.	1	3	2

**Q-4** What percent of your household's food is obtained from fishing, hunting, or gathering on PSI lands? (Please circle one response)

	Urban	Rural*	Total
1 1-25%	18	36	28
2 26-50%	1	3	2
3 51-75%	0	2	1
4 76-100%	0	1	1
5 None	81	59	69

**Q-5** In general, how interested are you in what happens to the PSI in the next 10-15 years? (Please circle one response).

	Urban*	Rural	Total
1 Very interested	54	75	65
2 Moderately interested	29	20	23
3 Somewhat interested	15	6	10
4 Not interested	2	0	1

**Q-6** In your opinion, what role should the public play in the planning of the PSI? (Please circle one response).

	Urb.	Rur	Total
1 None.	1	1	1
2 The public should provide suggestions for the Forest Service to consider.	50	48	49
3 Public should be full and equal partners in the planning process.	43	49	46
4 Don't know.	6	3	4

**PART 2: What do you think about the possible uses of the PSI?** **Q-7** There are many possible public uses of the PSI. Please tell us whether you favor or oppose the following uses on these Forests. (Please circle one response for each item). See next page:

Public Use	Urban			Rural			Total		
	Favor	N	Oppose	Favor	N	Oppose	Favor	N	Oppose
Sight-seeing (incl. driving for pleasure)	96	2	2	90	6*	4	93	4	3
Sport Fishing	88	10*	2	92	6	2	90	8	2
Non-motorized recreation (e.g. hiking, canoeing)	95	3	1	94	3	3	95	3	2
Sport Hunting	55	22*	23	72	13	14	65	17	19
Helicopter skiing/hiking	34	26	40	29	31	40	31	29	41
Wildlife viewing/observing	97	1	1	97	3	0	97	2	1
Motorized recreation (e.g. snowmobiles, ATV's, jet-skiing).	29*	14	56	41	9	51	36	11	53
Logging for Fuels Reduction	48	21*	31	63	12	25	56	16	28
Commercial Mining	13	18	68	18	17	65	16	18	67
Gathering forest products (e.g. berries, mushrooms)	65	26	9	73	20	7	70	22	8
Logging for increased water collection	36	29	35	40	26	34	38	27	34
Oil/gas Drilling	19	15	66	23	15	62	21	15	64
Logging for wood products	30	17	53*	38	14	47	35	16	50
Commercial outfitting/guiding	59	21	20	60	18	21	60	20	21
Communication sites/utility easements	29	37	34	37	31	32	33	34	33
Wilderness	89	6	5	83	8	10	85	7	8
Fish and Wildlife Habitat	95	4*	1	98	2	0	97	3	1

**PART 3: This section seeks your opinions about some important topics regarding the PSI in the next 10-15 years.**

**Q-8** Forest roads may be constructed for different purposes. Please indicate your level of agreement if roads would be built in the PSI for *each* of the following reasons:

Purpose of Road Building	Urban			Rural			Total		
	Agree	N	Disagree	Agree	N	Disagree	Agree	N	Disagree
Commercial uses (timber, grazing, mining)	21	22	57*	31	17	52	26	19	54
Access for recreational use.	74	15	10	67	14	20	70	15	15
Vegetation management for :									
• fuels reduction	65	21*	14	74	13	13	70	16	14
• fire suppression	82	12	7	85	7	8	83	9	8
• wildlife habitat improvement	92	5	3	88	6	6	90	6	5
No purpose is acceptable	7	22	72	11	17	72	9	19	72

**Q-9** In your opinion, how much new road building should occur on the PSI in the next 10-15 years? (Please circle one response).

	Urban	Rural	Total
1 More gravel roads and paved roads.	18	10	13
2 More paved roads only.	4	5	5
3 More gravel roads only.	35	32*	34
4 Fewer roads	24	29*	27
5 No new roads	18	25*	22

**Q-10** The PSI currently has 614 miles of paved, gravel and dirt roads. The Forests are also considering the increase in unmanaged, motorized vehicle use. In your opinion, how many of these Forest road miles should be open to off-highway vehicles?

	Urban	Rural	Total
1 All 614 miles of roads should be open to off-highway vehicles.	8	11	10
2 Most of the 614 miles of roads should be open to off-highway vehicles	10	15	13
3 To reduce conflicts, some of the roads should be open to off-highway vehicles only, others to non-motorized recreation only.	62	52	56
4 There should be no roads open to off-highway vehicles.	16	19	18
5 Don't know	5	3	4

**Q-11** As in Q-10, the PSI currently has 614 miles of paved, gravel and dirt roads, which also allow snow mobile use, when there is sufficient snow. Snowmobiling is an acceptable use of national forest lands under certain conditions. What would you prefer the PSI do for the next 10-15 years with respect to snowmobiling? (Please circle one response).

	Urban	Rural	Total
1 All 614 miles of roads should be open to snow mobile use.	8	12	10
2 Most of the 614 miles of roads should be open to snow mobile use.	15	15	15
3 To reduce conflicts, some of the roads should be open to snow mobile use only, others to non-motorized recreation only.	61	56	58
4 There should be no roads open to snow mobile use.	14	16	15
5 Don't know	3	1	2

**Q-12** On average the PSI have harvested 2.5 million board feet per year, which is enough lumber to frame about 325 (2100 sq ft) houses per year. How much timber would you like to see harvested per year on the PSI over the next 10-15 years? (Please circle one response).

	Urban	Rural	Total
1 More than the average amount harvested (2.5 million board feet per year).	9	13	11
2 The same amount as the average (2.5 million board feet per year).	52	49	51
3 Less than the average amount harvested (2.5 million board feet per year).	28	27	28
4 None	11	11	11

**Q-13** Timber harvesting (logging) occurs for any of several management purposes on the PSI. Under what conditions is logging acceptable to you? Please indicate your level of agreement with logging on the PSI for *each* of the following reasons:

Reasons for Logging	Urban			Rural			Total		
	Agree	NO	Disagree	Agree	NO	Disagree	Agree	NO	Disagree
Logging for commercial profit only.	14	20	66	20	17	63	17	18	65
Logging for fire prevention to protect life and property.	91	5	4	88	6	6	89	5	5
Logging to remove dead or insect-infested trees.	94	4	3	92	4	4	93	4	3
Logging to create or improve wildlife habitat.	87	8	4	86	8	6	87	8	5
Do not support logging for any reason.	6	22	71	8	21	71	7	21	72

**Q-14** Different types of forests require different approaches to treatments. Where communities are concerned, a trade-off decision sometimes must be made between treatments that may be displeasing in some way, e.g. aesthetically, and no treatments which may carry the risk of wildfire for example to private property. Considering the above, would you favor or oppose the following actions to **reduce the risk of wildfires close to communities**:

Risk Reduction Actions	Urban			Rural			Total		
	Favor	No Opin.	Oppose	Favor	No Opin.	Oppose	Favor	No Op.	Oppose
Clear cutting	34	12	55	33	6	61	33	9	59
Forest thinning	86	7	8	86	5	9	86	6	8
Prescribed fires	64	19	17	65	13	22	64	15	20
No Action	7	24	68	12	18	71	10	21	70

**Q-15** Considering the trade-off decision in Q-14, how would you rate your level of concern regarding wildfire?

	Concerned	No Opinion	Unconcerned
Urban	88	4	9
Rural	91	2	7
Total	89	3	8

**Q-16** Congressionally designated Wilderness Areas are devoted to recreational, scenic, scientific, educational, conservation, and historical purposes. In general, road-building, logging, mining, and permanent structures are prohibited in Wilderness Areas. Today nearly 389,000 acres or 17 % of the total combined area of the PSI, are managed as Wilderness Areas. What percentage of the **remaining** 83% of the lands managed by the PSI would you like to see recommended to Congress as Wilderness? (Please check one response).

	Urban	Rural	Total		Urban	Rural	Total
None	11	23	18	46-60%	15*	10	12
1-10%	10	10	10	61-75%	15*	8	11
11-25%	15	14	14	All the remaining lands	19	21	20
26-45%	16*	14	15				

**Q-17** As water needs increase for Colorado's Front Range towns and cities, the lands managed by the PSI may in the next 10 to 15 years increasingly serve as locations for larger or new reservoirs. Do you feel that this is an appropriate use of PSI? (Please circle one response).

		Urban	Rural	Total
1	Yes, without any reservations.	34	27	30
2	Not at all.	15	26	21
3	Don't know.	20	15	17
4.	Yes, but under some conditions (see list)	31	32	31

**Q-18** The PSI are located near the rapidly growing Denver/Colorado Springs/Pueblo metropolitan area. The PSI are near four of the fastest growing population centers in the US. Visitor use on the Forests for FY01 was estimated at 3.87 million visits, placing the PSI in the top 10 recreation forests nationally. This trend of increasing visitations is projected to continue over the next 10-15 years. Management decisions in the future may involve tradeoffs between environmental quality (related to soils, vegetation, wildlife, water and/or air quality) and access for recreation. If these decisions were up to you, would you (please circle one response):

		Urban	Rural	Total
1	Decide in favor of all forms of recreation over environmental quality.	4	5	5
2	Decide in favor of motorized recreation over environmental quality.	4	6	5
3	Decide in favor of non-motorized recreation over environmental quality.	11	14	13
4	No opinion.	6	4	5
5	Decide in favor of environmental quality over non-motorized recreation	8	7	7
6	Decide in favor of environmental quality over motorized recreation.	41	37	39
7	Decide in favor of environmental quality over all forms of recreation.	26	27	26
	None of the above. My preference would be (remarks, see list)	27	12	10

**Q-19** Another recreation decision is the increasing use on these Forests by commercial and institutional groups such as a hunting outfitter, a religious organization or an outdoor school. Currently issued permits include: 6 camps, about 15 facilities (ski areas, target ranges, rental services), 140 outfitter guides, and 40 recreation events (races and activities). To balance non-commercial and commercial use with environmental quality in the Forests, would you decide (please circle one response):

		<b>Urban</b>	<b>Rural</b>	<b>Total</b>
1	To favor commercial and non-commercial forms of recreation over environmental quality.	5	7	6
2	To favor commercial forms of recreation over environmental quality.	1	1	8
3	To favor non-commercial forms of recreation over environmental quality.	13	12	12
4	No opinion.	7	7	7
5	To favor environmental quality over non-commercial forms of recreation.	5	5	5
6	To favor environmental quality over commercial forms of recreation.	33	32	33
7	To favor environmental quality over commercial and non-commercial forms of recreation.	36	37	36
	None of the above. My preference would be (remarks, see list)	26	13	11

**Part 4: In what ways do people value the Pike and San Isabel National Forests?**

**Q-20** The PSI holds different values for each person. We would like to know how important each of the following values of the PSI is to you.

% Respondents	Total	No value		\$ 1-31		\$ 31 -100		Total Value	
		Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural
Aesthetic	74	21	28	38	32	41	40	79	72
Biodiversity	66	27	36	34	34	39	30	73*	64
Cultural	32	71	65	24	27	5	8	29	35
Economic	33	69	63	23	24	8	12	31	27
Future	69	27	31	36	40	36	28	73*	69
Historic	41	59	58	31	34	9	8	41	42
Intrinsic	42	59	54	25	30	16	14	41	46
Learning	39	56	63	35	32	9	6	44	37
Life Sust.	69	27	31	31	33	41	35	73	69
Recreation	65	32	36	29	30	39	36	68	64
Spiritual	32	70	65	19	26	10	30	30	35
Therapeutic	49	52	48	32	34	16	18	48	52

**Q-21** In the previous question you told us **what values** are important to you related to these Forests. For this question, identify the places **that represent those values on the map**. Results reported here represent the number of places respondents identified for each value.

% Value	Total	No Places		Places		1-2		3-4		>4	
		Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural
<b>Aesthetic</b>	71	26	32	74	68	45	38	21	18	9	12
<b>Biodiversity</b>	66	52	54	48	45	30	30	9	9	8	7
<b>Cultural</b>	18	85	81	15	19	11	12	2	2	3	6
<b>Economic</b>	21	79	79	21	21	14	16	4	2	3	3
<b>Future</b>	48	52	53	48	47	25	28	14	10	10	9
<b>Historic</b>	23	76	77	24	23	16	17	4	2	4	4
<b>Intrinsic</b>	27	78	70	22	30	13	17	3	6	4	8
<b>Learning</b>	21	76	81	24	19	14	14	4	1	6	5
<b>Life Sust.</b>	49	53	49	47	51	27	31	9	10	11	10
<b>Recreation</b>	56	43	45	57	55	27	26	22	18	8	12
<b>Spiritual</b>	21	82	77	18	23	11	16	3	2	4	6
<b>Therapeutic</b>	32	71	66	29	34	17	22	4	5	7	8

- No Significant Differences between Number of Urban and Rural Value Points

**PART 5: In this section, we would like to learn about you and your community.**

**Q-22** What community do you live in or what community is closest to your home? \_\_\_\_\_

**Q-23** What is your zip code? \_\_\_\_\_ Urban 46% Rural 55%

**Q-24** If you do not live within the above community, approximately how many miles is your residence from the community? \_\_\_\_\_ MILES

**Q-25** How long have you lived in or near this community? \_\_\_\_ YEARS

%	Total	Urban	Rural
0-10	44	40	49
11-25	29	30	24
26-50	20	23	17
50 or more	4	3	4

**Q-26** How long have you lived in Colorado/New Mexico? \_\_\_\_ YEARS

%	Total	Urban	Rural
0-10	20	21	24
11-25	25	27	20
26-50	37	36	35
50 or more	16	12	16

**Q-29** The cohesiveness of a community refers to the degree to which the residents of a community work together to accomplish common goals. It is the "sense of community" that is held by its residents. Overall, on a scale from Extremely Weak to Extremely Strong, how would you rate the cohesiveness of your community? (Please circle one number).

Extremely Weak  
Sense of Community    1                    2                    3                    4                    5                    6                    7                    Extremely Strong  
Sense of Community

**\* Rural Communities rated higher.**

**Q-30** What is your age? \_\_\_\_\_ YEARS (%)

	Total	Urban	Rural
18 - 30	7	11	3
31 - 45	33	36	24
46 - 60	36	31	41
61 - 90	20	17	23

Q-31 Are you? (Please circle one response): Male 70% Female 30%

Q-32 What is the highest level of education you have completed? (Please check one response).

1% Less than high school diploma 20% High school diploma or GED 17% Technical/vocational degree  
28% 4-year college degree 12% Some graduate work 22% One or more graduate degrees

**\*Urban Higher Education Level**

Q-33 What is your approximate annual household income before taxes? (Please circle one response).

4% Less than \$ 10,000 10% \$ 25,000 – 49,999 22% \$ 75,000 – 99,999 20% \$ 125,000 – 149,999  
17% \$ 10,000 – 24,999 15% \$ 50,000 – 74,999 4% \$ 100,000 – 124,999 10% \$ 150,000 or more

**\*Urban Higher Education Level**

Q-34 What is your occupation? 24% retired Total  
28% retired Rural  
20% retired Urban

Q-35 In what ethnic group (A) and race (B) would you put yourself?

A. Ethnicity (select one) 7% Hispanic or Latino

B. Race (select one or more) Asian American 2% Black/African American 1%  
Native American 3% White 94%

Q-36 Is there anything else you would like to tell us about the PSI and what you would like to see happen in the next 10-15 years? Is there any other topic of interest or concern that you would like the Forest Service to know about? We would appreciate any comments.

235 Comments (36%)

Respondents included Map information

55% included

## Appendix B: Results from Lake County Q-Study using PQMethod Software

Path and Project Name: C:\PQMETHOD\PROJECTS\psi  
 Correlation Matrix Between Sorts

Nov 18 05

SORTS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
1 L1	100	50	31	11	4	13	51	57	26	49	48	38	69	52	47	-1	32	0	54	40	9	43	53	56	-6	40	12	51	10	40	
2 L2	50	100	54	36	-21	3	46	40	58	24	32	40	52	51	36	-5	28	4	30	38	20	52	46	51	3	53	9	38	25	49	
3 L3	31	54	100	41	-53	-25	24	34	28	-2	8	66	43	50	13	-36	54	-45	48	46	-26	31	25	10	-55	69	7	64	58	80	
4 L4	11	36	41	100	-27	-30	21	16	10	-8	7	22	9	20	16	-30	30	-19	30	0	-9	19	8	9	-26	30	-25	26	10	30	
5 L5	4	-21	-53	-27	100	39	-16	-21	-16	10	-15	-56	-18	-17	9	33	-35	47	-27	-31	16	20	6	20	54	-55	16	-39	-45	-43	
6 L7	13	3	-25	-30	39	100	25	5	25	45	7	-31	5	10	29	58	-10	51	5	16	44	34	30	25	51	-13	20	6	-7	-1	
7 L8	51	46	24	21	-16	25	100	57	53	32	32	27	36	54	27	8	41	14	42	45	43	32	60	50	1	42	27	25	21	30	
8 L9	57	40	34	16	-21	5	57	100	45	33	55	67	71	47	-13	44	-3	58	54	27	39	52	48	-22	65	25	45	36	48		
9 L10	26	58	28	10	-16	25	53	45	100	35	31	32	42	45	17	23	1	24	40	49	35	45	45	53	25	53	32	25	32	32	
10 L11	49	24	-2	-8	10	45	32	33	35	100	44	8	38	36	42	26	26	20	35	51	34	39	56	44	23	20	12	42	-19	30	
11 L12	48	32	8	7	-15	7	32	55	31	44	100	34	54	31	24	3	19	29	29	36	20	23	42	45	10	29	8	30	-4	31	
12 L13	38	40	66	22	-56	-31	27	55	32	8	34	100	39	60	21	-25	61	-40	58	42	-17	30	36	29	-54	81	12	60	48	71	
13 L14	69	52	43	9	-18	5	36	67	42	38	54	39	100	42	42	-7	17	-11	54	55	11	37	36	30	-6	54	19	56	41	47	
14 L15	52	51	50	20	-17	10	54	71	45	36	31	60	42	100	46	-2	55	4	62	57	16	58	70	58	-24	65	8	58	33	69	
15 L16	47	36	13	16	9	29	27	47	17	42	24	21	42	46	100	20	26	18	45	34	21	65	46	40	5	39	11	49	10	41	
16 L17	-1	-5	-36	-30	33	58	8	-13	23	26	3	-25	-7	-2	20	100	-34	54	-16	-1	40	32	18	30	64	-14	24	-7	-15	-15	
17 L18	32	28	54	30	-35	-10	41	44	1	26	19	61	17	55	26	-34	100	-40	46	48	2	20	44	21	-52	49	-2	52	16	59	
18 L19	0	4	-45	-19	47	51	14	-3	24	20	29	-40	-11	4	18	54	-40	100	-15	-8	52	21	34	34	74	-26	14	-23	-39	-21	
19 L20	54	30	48	30	-27	5	42	58	40	35	29	58	54	62	45	-16	46	-15	100	59	-5	43	43	37	-31	67	13	71	50	58	
20 L21	40	38	46	0	-31	16	45	54	49	51	36	42	55	57	34	-1	48	-8	59	100	14	42	47	28	-19	55	26	62	40	50	
21 L22	9	20	-26	-9	16	44	43	27	35	34	20	-17	11	16	21	40	2	52	-5	14	100	13	38	35	48	2	26	-17	-15	1	
22 L 23	43	52	31	19	20	34	32	39	45	39	23	30	37	58	65	32	20	21	43	42	13	100	50	54	9	36	7	46	17	43	
23 L24	53	46	25	8	6	30	60	52	45	56	42	36	36	70	46	18	44	34	43	47	38	50	100	73	16	41	28	52	-4	50	
24 L25	56	51	10	9	20	25	50	48	53	44	45	29	30	58	40	30	21	34	37	28	35	54	73	100	22	40	33	27	6	29	
25 L6	-6	3	-55	-26	54	51	1	-22	25	23	10	-54	-6	-24	5	64	-52	74	-31	-19	48	9	16	22	100	-44	17	-32	-38	-38	
26 L26	40	53	69	30	-55	-13	42	65	53	20	29	81	54	65	39	-14	49	-26	67	55	2	36	41	40	-44	100	32	64	69	75	
27 L27	12	9	7	-25	16	20	27	25	32	12	8	12	19	8	11	24	-2	14	13	26	26	7	28	33	17	32	100	-3	37	13	
28 L28	51	38	64	26	-39	6	25	45	25	42	30	60	60	56	58	49	-7	52	-23	71	62	-17	46	52	27	-32	64	-3	100	35	67
29 L29	10	25	58	10	-45	-7	21	36	32	-19	-4	48	41	33	10	-15	16	-39	50	40	-15	17	-4	6	-38	69	37	35	100	48	
30 L30	40	49	80	30	-43	-1	30	48	32	30	31	71	47	69	41	-15	59	-21	58	50	1	43	50	29	-38	75	13	67	48	100	
31 L31	0	-4	-42	-11	35	36	18	16	39	47	18	-23	-2	4	15	32	-17	40	6	11	40	12	29	41	39	-3	18	-8	-30	-21	
32 L32	21	38	77	19	-57	-27	13	30	25	-11	9	67	41	34	18	-31	35	-42	47	40	-35	19	7	-7	-59	70	13	50	62	66	
33 L33	55	52	51	30	-32	13	49	66	40	51	60	42	57	63	33	-10	49	-3	51	54	14	32	62	54	-15	60	13	63	27	60	
34 L34	22	35	15	30	-13	8	36	50	51	42	53	41	27	49	18	25	24	17	31	27	22	32	51	62	5	49	17	31	5	31	
35 L35	-35	-28	18	2	-19	-55	-45	-33	-31	-44	-22	1	-10	-40	-57	-58	-7	-41	-19	-22	-36	-63	-52	-56	-32	-14	-15	-24	8	-4	
36 L36	50	22	-4	-18	36	56	48	40	33	48	49	-3	40	38	42	44	0	57	18	37	47	38	62	51	44	17	51	16	-2	24	
37 L37	37	51	61	28	-30	-3	59	60	47	13	33	56	35	68	37	-2	46	-1	44	36	13	52	54	50	-30	63	7	43	38	62	
38 L38	37	42	33	23	13	25	42	33	56	54	9	28	32	60	32	15	30	18	49	58	25	59	57	40	4	42	15	45	5	42	
39 L39	51	22	11	12	-11	32	37	56	28	64	62	30	56	54	42	29	26	21	52	56	22	43	51	40	6	39	1	49	9	47	

Path and Project Name: C:\POMETHOD\PROJECTS\psi

Correlation Matrix Between Sorts

SORTS	31	32	33	34	35	36	37	38	39
1 L1	0	21	55	22	-35	50	37	37	51
2 L2	-4	38	52	35	-28	22	51	42	22
3 L3	-42	77	51	15	18	-4	61	33	11
4 L4	-11	19	30	30	2	-18	28	23	12
5 L5	35	-57	-32	-13	-19	36	-30	13	-11
6 L7	36	-27	13	8	-55	56	-3	25	32
7 L8	18	13	49	36	-45	48	59	42	37
8 L9	16	30	66	50	-33	40	60	33	56
9 L10	39	25	40	51	-31	33	47	56	28
10 L11	47	-11	51	42	-44	48	13	54	64
11 L12	18	9	60	53	-22	49	33	9	62
12 L13	-23	67	42	41	1	-3	56	28	30
13 L14	-2	41	57	27	-10	40	35	32	56
14 L15	4	34	63	49	-40	38	68	60	54
15 L16	15	18	33	18	-57	42	37	32	42
16 L17	32	-31	-10	25	-58	44	-2	15	29
17 L18	-17	35	49	24	-7	0	46	30	26
18 L19	40	-42	-3	17	-41	57	-1	18	21
19 L20	6	47	51	31	-19	18	44	49	52
20 L21	11	40	54	27	-22	37	36	58	56
21 L22	40	-35	14	22	-36	47	13	25	22
22 L 23	12	19	32	32	-63	38	52	59	43
23 L24	29	7	62	51	-52	62	54	57	51
24 L25	41	-7	54	62	-56	51	50	40	40
25 L6	39	-59	-15	5	-32	44	-30	4	6
26 L26	-3	70	60	49	-14	17	63	42	39
27 L27	18	13	13	17	-15	51	7	15	1
28 L28	-8	50	63	31	-24	16	43	45	49
29 L29	-30	62	27	5	8	-2	38	5	9
30 L30	-21	66	60	31	-4	24	62	42	47
31 L31	100	-32	7	41	-28	26	-1	40	23
32 L32	-32	100	29	4	19	-12	47	21	16
33 L33	7	29	100	54	-32	42	55	29	60
34 L34	41	4	54	100	-34	29	50	39	49
35 L35	-28	19	-32	-34	100	-49	-27	-26	-44
36 L36	26	-12	42	29	-49	100	21	38	53
37 L37	-1	47	55	50	-27	21	100	32	28
38 L38	40	21	29	39	-26	38	32	100	42
39 L39	23	16	60	49	-44	53	28	42	100

Path and Project Name: C:\PQMETHOD\PROJECTS\psi  
 Unrotated Factor Matrix

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	Factors							
	1	2	3	4	5	6	7	8
SORTS								
1 L1	0.6782	0.1114	-0.2445	-0.2192	0.1139	-0.3384	0.0402	0.2954
2 L2	0.6581	-0.0248	0.1340	0.2113	-0.2112	-0.2984	-0.2467	0.2989
3 L3	0.6072	-0.6377	0.1516	-0.0285	-0.1779	-0.0639	-0.0465	0.1223
4 L4	0.2839	-0.3146	-0.2650	0.4132	-0.3289	-0.0817	-0.2470	0.1480
5 L5	-0.2862	0.6597	-0.0584	-0.1821	-0.2307	-0.1028	0.1364	0.3171
6 L7	0.1668	0.6849	0.1211	-0.3437	-0.1029	0.0987	0.0725	-0.1338
7 L8	0.6487	0.2026	0.1190	0.2509	0.0311	-0.0921	0.3292	0.1237
8 L9	0.7855	-0.0037	-0.0267	0.0872	0.2761	-0.1142	0.1460	-0.0146
9 L10	0.6160	0.2398	0.4608	0.2721	0.0005	0.1948	-0.2864	0.1545
10 L11	0.5392	0.4665	-0.3365	-0.1781	0.1502	0.3367	-0.0418	0.0805
11 L12	0.5425	0.2134	-0.2673	0.1521	0.5385	-0.2268	-0.2289	-0.1027
12 L13	0.6747	-0.5144	0.0452	0.0949	0.0340	0.0366	0.0359	-0.1876
13 L14	0.6868	-0.0511	0.0232	-0.2719	0.3580	-0.2168	-0.2852	0.2708
14 L15	0.8383	-0.0205	-0.0684	0.0611	-0.1839	0.0116	0.1882	-0.0528
15 L16	0.5720	0.2316	-0.1546	-0.3336	-0.2927	-0.1878	-0.0013	-0.1003
16 L17	0.0317	0.7053	0.2569	-0.1397	-0.1594	0.0413	-0.1725	-0.4245
17 L18	0.5638	-0.3679	-0.3290	0.0729	-0.0859	0.1388	0.4967	-0.0335
18 L19	0.0070	0.8048	0.0847	0.1121	-0.0391	-0.1397	-0.1177	-0.0455
19 L20	0.7436	-0.1980	-0.0547	-0.1961	-0.0103	0.1935	-0.0339	0.0516
20 L21	0.7214	-0.0429	0.0596	-0.2688	0.1647	0.3366	0.0395	0.1028
21 L22	0.2151	0.6112	0.1670	0.2432	0.1046	0.0144	0.2238	0.0447
22 L 23	0.6403	0.2636	0.0066	-0.1924	-0.5346	-0.1067	-0.1742	-0.0339
23 L24	0.7483	0.3655	-0.1189	0.1098	-0.0822	-0.0064	0.2517	0.0431
24 L25	0.6466	0.4462	0.0303	0.2809	-0.0722	-0.1454	0.0828	0.0067
25 L6	-0.1814	0.8286	0.1627	0.0152	0.0188	-0.1069	-0.2503	0.0918
26 L26	0.8120	-0.3659	0.2711	0.0696	0.0437	0.0855	-0.0325	-0.1158
27 L27	0.2548	0.2285	0.6500	-0.1123	0.2607	0.0171	0.3162	0.0695
28 L28	0.7415	-0.2552	-0.2288	-0.3041	-0.0901	0.1377	-0.1381	-0.0845
29 L29	0.4199	-0.4792	0.5890	-0.2008	0.0676	-0.0302	-0.0336	-0.1236
30 L30	0.7693	-0.3491	0.0227	-0.1049	-0.0924	0.0020	0.0141	-0.0793
31 L31	0.1213	0.6205	-0.0139	0.2482	0.0852	0.5147	-0.0735	0.1076
32 L32	0.4854	-0.6502	0.2862	-0.1781	-0.0279	0.0154	-0.1450	-0.0219
33 L33	0.7920	-0.0167	-0.2018	0.1059	0.2392	-0.1003	-0.0101	-0.0475
34 L34	0.5917	0.2210	-0.0641	0.5092	0.0991	0.1824	-0.1880	-0.2628
35 L35	-0.4322	-0.5964	0.0604	0.0793	0.2904	0.1435	-0.0700	0.3588
36 L36	0.4886	0.6367	0.1120	-0.2114	0.2030	-0.2146	0.1628	0.0711
37 L37	0.7261	-0.1503	0.1204	0.3036	-0.2050	-0.1890	0.1005	-0.1587
38 L38	0.6205	0.2249	0.0210	-0.0229	-0.3255	0.4591	-0.0515	0.3743
39 L39	0.6701	0.2718	-0.3083	-0.1952	0.2544	0.1048	-0.1967	-0.2264
Eigenvalues	13.3274	7.2574	2.0384	1.8553	1.7747	1.4381	1.3058	1.2005
% expl.Var.	34	19	5	5	5	4	3	3

Path and Project Name: C:\POMETHOD\PROJECTS\psi

Cumulative Communalities Matrix

Factors 1 Thru .....

	1	2	3	4	5	6	7	8
SORTS								
1 L1	0.4600	0.4724	0.5322	0.5802	0.5932	0.7077	0.7093	0.7966
2 L2	0.4330	0.4337	0.4516	0.4962	0.5408	0.6299	0.6907	0.7801
3 L3	0.3687	0.7754	0.7984	0.7992	0.8308	0.8349	0.8371	0.8520
4 L4	0.0806	0.1796	0.2498	0.4206	0.5288	0.5354	0.5965	0.6184
5 L5	0.0819	0.5171	0.5206	0.5537	0.6069	0.6175	0.6361	0.7366
6 L7	0.0278	0.4969	0.5115	0.6297	0.6403	0.6500	0.6553	0.6732
7 L8	0.4208	0.4618	0.4760	0.5390	0.5399	0.5484	0.6567	0.6720
8 L9	0.6171	0.6171	0.6178	0.6254	0.7016	0.7146	0.7360	0.7362
9 L10	0.3794	0.4369	0.6492	0.7233	0.7233	0.7612	0.8432	0.8671
10 L11	0.2907	0.5083	0.6216	0.6533	0.6758	0.7892	0.7910	0.7975
11 L12	0.2943	0.3399	0.4113	0.4345	0.7244	0.7758	0.8282	0.8388
12 L13	0.4552	0.7198	0.7218	0.7308	0.7320	0.7333	0.7346	0.7698
13 L14	0.4717	0.4743	0.4749	0.5488	0.6769	0.7239	0.8053	0.8786
14 L15	0.7028	0.7032	0.7079	0.7116	0.7455	0.7456	0.7810	0.7838
15 L16	0.3272	0.3809	0.4048	0.5160	0.6017	0.6370	0.6370	0.6470
16 L17	0.0010	0.4984	0.5644	0.5839	0.6094	0.6111	0.6408	0.8210
17 L18	0.3178	0.4532	0.5614	0.5667	0.5741	0.5934	0.8401	0.8412
18 L19	0.0000	0.6477	0.6549	0.6675	0.6690	0.6885	0.7024	0.7044
19 L20	0.5530	0.5922	0.5952	0.6336	0.6337	0.6712	0.6723	0.6750
20 L21	0.5203	0.5222	0.5257	0.5980	0.6251	0.7384	0.7399	0.7505
21 L22	0.0463	0.4199	0.4478	0.5069	0.5179	0.5181	0.5682	0.5702
22 L 23	0.4099	0.4794	0.4795	0.5165	0.8022	0.8136	0.8440	0.8451
23 L24	0.5599	0.6935	0.7077	0.7197	0.7265	0.7265	0.7898	0.7917
24 L25	0.4181	0.6172	0.6181	0.6970	0.7023	0.7234	0.7302	0.7303
25 L6	0.0329	0.7194	0.7459	0.7461	0.7465	0.7579	0.8206	0.8290
26 L26	0.6593	0.7931	0.8666	0.8715	0.8734	0.8807	0.8817	0.8951
27 L27	0.0649	0.1171	0.5396	0.5523	0.6203	0.6205	0.7205	0.7253
28 L28	0.5499	0.6150	0.6673	0.7598	0.7679	0.7869	0.8060	0.8131
29 L29	0.1763	0.4059	0.7529	0.7932	0.7978	0.7987	0.7998	0.8151
30 L30	0.5919	0.7138	0.7143	0.7253	0.7338	0.7339	0.7341	0.7403
31 L31	0.0147	0.3997	0.3999	0.4615	0.4687	0.7336	0.7390	0.7506
32 L32	0.2356	0.6584	0.7403	0.7720	0.7728	0.7730	0.7940	0.7945
33 L33	0.6272	0.6275	0.6682	0.6794	0.7366	0.7467	0.7468	0.7490
34 L34	0.3501	0.3989	0.4030	0.6624	0.6722	0.7054	0.7408	0.8098
35 L35	0.1868	0.5425	0.5461	0.5524	0.6367	0.6573	0.6622	0.7910
36 L36	0.2387	0.6441	0.6567	0.7014	0.7426	0.7886	0.8151	0.8202
37 L37	0.5272	0.5498	0.5643	0.6564	0.6985	0.7342	0.7443	0.7694
38 L38	0.3851	0.4357	0.4361	0.4366	0.5426	0.7534	0.7561	0.8962
39 L39	0.4490	0.5229	0.6179	0.6560	0.7207	0.7317	0.7704	0.8216

cum% expl.Var. 34 53 58 63 67 71 74 77

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Rotating Angles Used Between Factors

FTR#1	FTR#2	ANGLE	Generated By PQROT [12:17, 11/18/2005]
4	6	20.	
4	7	17.	
5	8	13.	

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 Factor Matrix with an X Indicating a Defining Sort

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QSORT	Loadings				
	1	2	3	4	5
1 L1	0.5900X	-0.1129	0.1787	0.2924	0.3241
2 L2	0.1928	0.3080	0.3850X	0.3876X	0.2153
3 L3	0.0303	-0.0764	0.8403X	0.0885	-0.0021
4 L4	0.0119	-0.0042	0.2381	0.0021	-0.0622
5 L5	-0.1665	0.0782	-0.6617X	0.1393	0.3730X
6 L7	0.0819	0.0900	-0.2482	0.2729	0.5897X
7 L8	0.1989	-0.0993	0.1795	0.7401X	0.1239
8 L9	0.5375X	-0.1320	0.3914X	0.5064X	0.0691
9 L10	0.1310	0.5133X	0.3311X	0.6128X	0.0712
10 L11	0.5552X	-0.1402	-0.1026	0.3293X	0.2945
11 L12	0.8490X	0.1125	0.0282	0.2272	-0.0129
12 L13	0.2249	-0.1992	0.7678X	0.1767	-0.0538
13 L14	0.6833X	0.2208	0.4252X	0.1670	0.1183
14 L15	0.2523	-0.2572	0.4664X	0.5014X	0.3325X
15 L16	0.2711	-0.1177	0.1913	0.1512	0.6938X
16 L17	-0.0155	0.3542X	-0.2526	0.1532	0.5805X
17 L18	0.1376	-0.7100X	0.4182X	0.2937	-0.0105
18 L19	0.1100	0.3698X	-0.5217X	0.3304X	0.3802X
19 L20	0.3444X	-0.1646	0.5822X	0.2251	0.1884
20 L21	0.3839X	-0.1265	0.4971X	0.3521X	0.1304
21 L22	0.0961	0.1167	-0.3074	0.6397X	0.1308
22 L 23	0.0916	0.1013	0.2748	0.2444	0.7623X
23 L24	0.3338X	-0.1964	0.0944	0.6707X	0.3763X
24 L25	0.2859	0.0824	0.0205	0.6732X	0.3354X
25 L6	0.0632	0.5356X	-0.6139X	0.2038	0.3067
26 L26	0.2304	0.0063	0.8289X	0.3651X	0.0257
27 L27	-0.0392	0.1886	0.1844	0.5712X	0.0230
28 L28	0.4180X	-0.2319	0.6072X	0.0101	0.3215
29 L29	-0.0467	0.1711	0.8309X	0.0927	-0.0121
30 L30	0.2579	-0.1756	0.7243X	0.2097	0.2048
31 L31	0.1130	0.1637	-0.3822X	0.4612X	-0.0035
32 L32	0.0462	0.0345	0.8769X	-0.0616	-0.0431
33 L33	0.6318X	-0.1283	0.3612X	0.3753X	0.0969
34 L34	0.3767X	0.1226	0.1497	0.4692X	0.0089
35 L35	-0.1714	0.0213	0.1081	-0.3412X	-0.7344X
36 L36	0.4344X	0.1041	-0.1373	0.5495X	0.4508X
37 L37	0.1102	-0.0601	0.5355X	0.4681X	0.2029
38 L38	0.0363	0.0104	0.2141	0.5064X	0.2869
39 L39	0.7393X	-0.0693	0.1591	0.1631	0.3362X
% expl.Var.	12	5	21	15	10

Factor 1 = Stewardship  
 Factor 2 = Extractive Economic  
 Factor 3 = Preservationist  
 Factor 4 = Leadville (place-based)  
 Factor 5 = Amenity Economic

Q-sort #4 not part of any discourse due to low factor loadings.

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Rank Statement Totals with Each Factor

No.	Statement	No.	Factors									
			1	2	3	4	5					
1	1. I consider these forests some of the most beautiful	1	0.07	19	0.37	15	0.22	18	-0.03	21	0.52	12
2	2. Dont compromise this beauty over commercial and sho	2	0.38	11	-1.68	34	1.31	6	0.33	13	-0.57	27
3	3. The PSI is a beautiful area which I hope will be ke	3	1.35	6	0.89	8	0.67	9	1.49	1	0.80	9
4	4. I want more wildlife: wolves, mountain lions, bears	4	-0.54	25	-1.11	31	0.65	10	-0.34	23	-1.30	34
5	5. I want wildlife habitat made the number 1 priority.	5	-0.72	26	-1.95	36	0.58	12	-1.06	30	-1.12	31
6	6. I am concerned about the barriers imposed on grazin	6	-0.77	27	0.37	14	-1.08	29	-1.18	32	-0.19	21
7	7. I am concerned about the barriers imposed on loggin	7	-1.05	32	0.99	7	-1.17	31	-1.06	31	-0.20	22
8	8. The Forests are important because the town I live i	8	0.09	18	1.04	6	-0.67	26	1.46	3	1.79	2
9	9. With the energy crisis - if gas or oil are discover	9	-1.04	31	1.48	2	-1.76	36	-1.71	34	-0.09	18
10	10. I strongly feel that larger and more reservoirs are	10	-0.77	28	-0.58	26	-1.44	32	-2.04	36	-1.50	35
11	11. No priority is more important than saving our natu	11	1.44	5	-1.42	33	1.44	4	0.93	9	0.22	16
12	12. People dont know the history (or don't care) - mo	12	-0.53	24	-0.19	24	-0.31	24	0.21	17	-0.21	23
13	13. These forests belong to all, including non-human l	13	1.48	4	-1.32	32	1.76	1	1.48	2	0.45	13
14	14. It is necessary that we adapt our lives to fit in	14	0.10	17	-1.05	30	1.53	2	0.05	19	-0.09	19
15	15. I believe the PSI is important to educational orga	15	0.79	9	0.23	17	0.28	15	0.78	11	1.31	4
16	16. Water quality and quantity should be preserved or	16	1.49	3	-0.19	23	-0.17	21	0.56	12	0.14	17
17	17. The roads are wonderful - they allow us access.	17	-0.23	22	0.53	11	-1.49	34	-0.18	22	-1.21	33
18	18. Remove all commercial profit from PSI!	18	-1.98	36	-0.99	29	-0.02	19	-1.96	35	-2.42	36
19	19. I appreciate what is being done to preserve these	19	1.88	1	0.42	12	0.29	14	1.03	8	0.43	14
20	20. The forests are my spiritual home, nothing man can	20	-0.47	23	1.20	5	1.37	5	0.31	14	-0.14	20
21	21. Having wild and free open spaces for exploring and	21	1.07	7	0.38	13	0.80	8	1.31	4	0.52	11
22	22. Preserve historical sites on the PSI.	22	0.31	13	-0.14	21	-0.29	23	1.17	5	0.93	6
23	23. An important priority for the Forest Service on th	23	0.26	14	-0.40	25	0.55	13	-0.35	24	-0.92	29
24	24. I feel protecting our national forests will help c	24	0.32	12	0.02	20	0.90	7	-0.91	29	-1.11	30
25	25. We must curb the destruction of forests because we	25	0.23	15	-0.75	27	1.52	3	-0.37	25	-0.36	24
26	26. Our footprint on the forest/wilderness should be m	26	1.64	2	0.16	18	0.62	11	1.07	7	1.42	3
27	27. Dont hire employees who favor non-motorized recrea	27	-1.60	34	0.26	16	-0.81	27	-0.69	26	-0.45	25
28	28. It is important to maintain our great forest areas	28	0.15	16	1.45	4	-1.09	30	0.87	10	0.32	15
29	29. This is a big world. There is no good reason why	29	-1.14	33	0.86	9	-1.47	33	-1.22	33	-0.86	28
30	30. It is important for the public to enjoy the forest	30	-0.98	30	1.83	1	-1.50	35	0.24	16	-0.53	26
31	31. We need to allow people the freedom of recreation	31	0.63	10	1.45	3	0.24	16	0.28	15	0.90	7
32	32. Water needs can be met and still allow for man to	32	-0.22	21	-0.16	22	-0.19	22	0.05	18	0.84	8
33	33. Proper management can allow for more water and ind	33	0.91	8	-0.88	28	-0.91	28	-0.03	20	1.15	5
34	34. Recreation helps man and economy.	34	-0.04	20	0.63	10	0.23	17	1.11	6	2.12	1
35	35. Recreation is an important value of the PSI so mor	35	-0.85	29	0.06	19	-0.51	25	-0.71	27	0.58	10
36	36. I feel that these areas should NOT be open to econ	36	-1.65	35	-1.79	35	-0.08	20	-0.88	28	-1.16	32

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Correlations Between Factor Scores

	1	2	3	4	5
1	1.0000	-0.0397	0.5035	0.7643	0.5711
2	-0.0397	1.0000	-0.4989	0.1508	0.3498
3	0.5035	-0.4989	1.0000	0.4218	0.0989
4	0.7643	0.1508	0.4218	1.0000	0.7334
5	0.5711	0.3498	0.0989	0.7334	1.0000

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Normalized Factor Scores -- For Factor 1

No.	Statement	No.	Z-SCORES
19	19. I appreciate what is being done to preserve these areas	19	1.878
26	26. Our footprint on the forest/wilderness should be minimiz	26	1.639
16	16. Water quality and quantity should be preserved or improv	16	1.487
13	13. These forests belong to all, including non-human life, a	13	1.485
11	11. No priority is more important than saving our natural la	11	1.444
3	3. The PSI is a beautiful area which I hope will be kept tha	3	1.354
21	21. Having wild and free open spaces for exploring and relax	21	1.071
33	33. Proper management can allow for more water and individua	33	0.907
15	15. I believe the PSI is important to educational organizati	15	0.786
31	31. We need to allow people the freedom of recreation to hel	31	0.626
2	2. Dont compromise this beauty over commercial and short ter	2	0.384
24	24. I feel protecting our national forests will help combat	24	0.318
22	22. Preserve historical sites on the PSI.	22	0.307
23	23. An important priority for the Forest Service on the PSI	23	0.255
25	25. We must curb the destruction of forests because we are e	25	0.226
28	28. It is important to maintain our great forest areas for a	28	0.150
14	14. It is necessary that we adapt our lives to fit in with t	14	0.100
8	8. The Forests are important because the town I live in coun	8	0.087
1	1. I consider these forests some of the most beautiful I hav	1	0.073
34	34. Recreation helps man and economy.	34	-0.038
32	32. Water needs can be met and still allow for man to use th	32	-0.221
17	17. The roads are wonderful - they allow us access.	17	-0.228
20	20. The forests are my spiritual home, nothing man can creat	20	-0.472
12	12. People dont know the history (or don't care) - more peo	12	-0.532
4	4. I want more wildlife: wolves, mountain lions, bears, ever	4	-0.538
5	5. I want wildlife habitat made the number 1 priority.	5	-0.716
6	6. I am concerned about the barriers imposed on grazing perm	6	-0.768
10	10. I strongly feel that larger and more reservoirs are neede	10	-0.769
35	35. Recreation is an important value of the PSI so more comm	35	-0.846
30	30. It is important for the public to enjoy the forests but	30	-0.982
9	9. With the energy crisis - if gas or oil are discovered, we	9	-1.041
7	7. I am concerned about the barriers imposed on logging oppo	7	-1.053
29	29. This is a big world. There is no good reason why more a	29	-1.141
27	27. Dont hire employees who favor non-motorized recreation o	27	-1.601
36	36. I feel that these areas should NOT be open to economic e	36	-1.649
18	18. Remove all commercial profit from PSI!	18	-1.981

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Normalized Factor Scores -- For Factor 2

No.	Statement	No.	Z-SCORES
30	30. It is important for the public to enjoy the forests but	30	1.826
9	9. With the energy crisis - if gas or oil are discovered, we	9	1.480
31	31. We need to allow people the freedom of recreation to hel	31	1.448
28	28. It is important to maintain our great forest areas for a	28	1.446
20	20. The forests are my spiritual home, nothing man can creat	20	1.200
8	8. The Forests are important because the town I live in coun	8	1.036
7	7. I am concerned about the barriers imposed on logging oppo	7	0.989
3	3. The PSI is a beautiful area which I hope will be kept tha	3	0.890
29	29. This is a big world. There is no good reason why more a	29	0.865
34	34. Recreation helps man and economy.	34	0.625
17	17. The roads are wonderful - they allow us access.	17	0.526
19	19. I appreciate what is being done to preserve these areas	19	0.415
21	21. Having wild and free open spaces for exploring and relax	21	0.384
6	6. I am concerned about the barriers imposed on grazing perm	6	0.372
1	1. I consider these forests some of the most beautiful I hav	1	0.368
27	27. Dont hire employees who favor non-motorized recreation o	27	0.257
15	15. I believe the PSI is important to educational organizati	15	0.229
26	26. Our footprint on the forest/wilderness should be minimiz	26	0.163
35	35. Recreation is an important value of the PSI so more comm	35	0.061
24	24. I feel protecting our national forests will help combat	24	0.020
22	22. Preserve historical sites on the PSI.	22	-0.143
32	32. Water needs can be met and still allow for man to use th	32	-0.156
16	16. Water quality and quantity should be preserved or improv	16	-0.187
12	12. People dont know the history (or don't care) - more peo	12	-0.191
23	23. An important priority for the Forest Service on the PSI	23	-0.402
10	10. I strongly feel that larger and more reservoirs are neede	10	-0.584
25	25. We must curb the destruction of forests because we are e	25	-0.749
33	33. Proper management can allow for more water and individua	33	-0.879
18	18. Remove all commercial profit from PSI!	18	-0.992
14	14. It is necessary that we adapt our lives to fit in with t	14	-1.051
4	4. I want more wildlife: wolves, mountain lions, bears, ever	4	-1.105
13	13. These forests belong to all, including non-human life, a	13	-1.319
11	11. No priority is more important than saving our natural la	11	-1.421
2	2. Dont compromise this beauty over commercial and short ter	2	-1.679
36	36. I feel that these areas should NOT be open to economic e	36	-1.790
5	5. I want wildlife habitat made the number 1 priority.	5	-1.950

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Normalized Factor Scores -- For Factor 3

No.	Statement	No.	Z-SCORES
13	13. These forests belong to all, including non-human life, a	13	1.761
14	14. It is necessary that we adapt our lives to fit in with t	14	1.526
25	25. We must curb the destruction of forests because we are e	25	1.517
11	11. No priority is more important than saving our natural la	11	1.444
20	20. The forests are my spiritual home, nothing man can creat	20	1.366
2	2. Dont compromise this beauty over commercial and short ter	2	1.313
24	24. I feel protecting our national forests will help combat	24	0.905
21	21. Having wild and free open spaces for exploring and relax	21	0.795
3	3. The PSI is a beautiful area which I hope will be kept tha	3	0.666
4	4. I want more wildlife: wolves, mountain lions, bears, ever	4	0.649
26	26. Our footprint on the forest/wilderness should be minimiz	26	0.623
5	5. I want wildlife habitat made the number 1 priority.	5	0.576
23	23. An important priority for the Forest Service on the PSI	23	0.547
19	19. I appreciate what is being done to preserve these areas	19	0.294
15	15. I believe the PSI is important to educational organizati	15	0.281
31	31. We need to allow people the freedom of recreation to hel	31	0.235
34	34. Recreation helps man and economy.	34	0.226
1	1. I consider these forests some of the most beautiful I hav	1	0.219
18	18. Remove all commercial profit from PSI!	18	-0.016
36	36. I feel that these areas should NOT be open to economic e	36	-0.083
16	16. Water quality and quantity should be preserved or improv	16	-0.167
32	32. Water needs can be met and still allow for man to use th	32	-0.191
22	22. Preserve historical sites on the PSI.	22	-0.290
12	12. People dont know the history (or don't care) - more peo	12	-0.305
35	35. Recreation is an important value of the PSI so more comm	35	-0.511
8	8. The Forests are important because the town I live in coun	8	-0.670
27	27. Dont hire employees who favor non-motorized recreation o	27	-0.809
33	33. Proper management can allow for more water and individua	33	-0.910
6	6. I am concerned about the barriers imposed on grazing perm	6	-1.078
28	28. It is important to maintain our great forest areas for a	28	-1.088
7	7. I am concerned about the barriers imposed on logging oppo	7	-1.165
10	10. I strongly feel that larger and more reservoirs are neede	10	-1.442
29	29. This is a big world. There is no good reason why more a	29	-1.473
17	17. The roads are wonderful - they allow us access.	17	-1.487
30	30. It is important for the public to enjoy the forests but	30	-1.498
9	9. With the energy crisis - if gas or oil are discovered, we	9	-1.760

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Normalized Factor Scores -- For Factor 4

No.	Statement	No.	Z-SCORES
3	3. The PSI is a beautiful area which I hope will be kept tha	3	1.486
13	13. These forests belong to all, including non-human life, a	13	1.475
8	8. The Forests are important because the town I live in coun	8	1.460
21	21. Having wild and free open spaces for exploring and relax	21	1.312
22	22. Preserve historical sites on the PSI.	22	1.169
34	34. Recreation helps man and economy.	34	1.114
26	26. Our footprint on the forest/wilderness should be minimiz	26	1.068
19	19. I appreciate what is being done to preserve these areas	19	1.027
11	11. No priority is more important than saving our natural la	11	0.933
28	28. It is important to maintain our great forest areas for a	28	0.867
15	15. I believe the PSI is important to educational organizati	15	0.776
16	16. Water quality and quantity should be preserved or improv	16	0.556
2	2. Dont compromise this beauty over commercial and short ter	2	0.326
20	20. The forests are my spiritual home, nothing man can creat	20	0.307
31	31. We need to allow people the freedom of recreation to hel	31	0.284
30	30. It is important for the public to enjoy the forests but	30	0.242
12	12. People dont know the history (or don't care) - more peo	12	0.210
32	32. Water needs can be met and still allow for man to use th	32	0.052
14	14. It is necessary that we adapt our lives to fit in with t	14	0.048
33	33. Proper management can allow for more water and individua	33	-0.027
1	1. I consider these forests some of the most beautiful I hav	1	-0.031
17	17. The roads are wonderful - they allow us access.	17	-0.179
4	4. I want more wildlife: wolves, mountain lions, bears, ever	4	-0.339
23	23. An important priority for the Forest Service on the PSI	23	-0.349
25	25. We must curb the destruction of forests because we are e	25	-0.372
27	27. Dont hire employees who favor non-motorized recreation o	27	-0.694
35	35. Recreation is an important value of the PSI so more comm	35	-0.710
36	36. I feel that these areas should NOT be open to economic e	36	-0.884
24	24. I feel protecting our national forests will help combat	24	-0.911
5	5. I want wildlife habitat made the number 1 priority.	5	-1.056
7	7. I am concerned about the barriers imposed on logging oppo	7	-1.057
6	6. I am concerned about the barriers imposed on grazing perm	6	-1.177
29	29. This is a big world. There is no good reason why more a	29	-1.223
9	9. With the energy crisis - if gas or oil are discovered, we	9	-1.706
18	18. Remove all commercial profit from PSI!	18	-1.958
10	10. I strongly feel that larger and more reservoirs are neede	10	-2.041

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Normalized Factor Scores -- For Factor 5

No.	Statement	No.	Z-SCORES
34	34. Recreation helps man and economy.	34	2.124
8	8. The Forests are important because the town I live in coun	8	1.787
26	26. Our footprint on the forest/wilderness should be minimiz	26	1.422
15	15. I believe the PSI is important to educational organizati	15	1.309
33	33. Proper management can allow for more water and individua	33	1.147
22	22. Preserve historical sites on the PSI.	22	0.930
31	31. We need to allow people the freedom of recreation to hel	31	0.903
32	32. Water needs can be met and still allow for man to use th	32	0.836
3	3. The PSI is a beautiful area which I hope will be kept tha	3	0.805
35	35. Recreation is an important value of the PSI so more comm	35	0.583
21	21. Having wild and free open spaces for exploring and relax	21	0.516
1	1. I consider these forests some of the most beautiful I hav	1	0.516
13	13. These forests belong to all, including non-human life, a	13	0.451
19	19. I appreciate what is being done to preserve these areas	19	0.432
28	28. It is important to maintain our great forest areas for a	28	0.323
11	11. No priority is more important than saving our natural la	11	0.220
16	16. Water quality and quantity should be preserved or improv	16	0.139
9	9. With the energy crisis - if gas or oil are discovered, we	9	-0.089
14	14. It is necessary that we adapt our lives to fit in with t	14	-0.093
20	20. The forests are my spiritual home, nothing man can creat	20	-0.142
6	6. I am concerned about the barriers imposed on grazing perm	6	-0.195
7	7. I am concerned about the barriers imposed on logging oppo	7	-0.202
12	12. People dont know the history (or don't care) - more peo	12	-0.214
25	25. We must curb the destruction of forests because we are e	25	-0.364
27	27. Dont hire employees who favor non-motorized recreation o	27	-0.455
30	30. It is important for the public to enjoy the forests but	30	-0.529
2	2. Dont compromise this beauty over commercial and short ter	2	-0.567
29	29. This is a big world. There is no good reason why more a	29	-0.856
23	23. An important priority for the Forest Service on the PSI	23	-0.916
24	24. I feel protecting our national forests will help combat	24	-1.110
5	5. I want wildlife habitat made the number 1 priority.	5	-1.119
36	36. I feel that these areas should NOT be open to economic e	36	-1.162
17	17. The roads are wonderful - they allow us access.	17	-1.213
4	4. I want more wildlife: wolves, mountain lions, bears, ever	4	-1.299
10	10. I strongly feel that larger and more reservoirs are neede	10	-1.498
18	18. Remove all commercial profit from PSI!	18	-2.422

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Factor Q-Sort Values for Each Statement

		Factor Arrays					
No.	Statement	No.	1	2	3	4	5
1	1. I consider these forests some of the most beautiful I hav	1	0	1	0	0	1
2	2. Dont compromise this beauty over commercial and short ter	2	1	-4	3	1	-2
3	3. The PSI is a beautiful area which I hope will be kept tha	3	3	2	2	5	2
4	4. I want more wildlife: wolves, mountain lions, bears, ever	4	-1	-3	2	-1	-4
5	5. I want wildlife habitat made the number 1 priority.	5	-1	-5	1	-2	-3
6	6. I am concerned about the barriers imposed on grazing perm	6	-2	1	-2	-3	0
7	7. I am concerned about the barriers imposed on logging oppo	7	-3	2	-3	-3	-1
8	8. The Forests are important because the town I live in coun	8	0	3	-1	4	4
9	9. With the energy crisis - if gas or oil are discovered, we	9	-3	4	-5	-4	0
10	10. I strongly feel that larger and more reservoirs are neede	10	-2	-1	-3	-5	-4
11	11. No priority is more important than saving our natural la	11	3	-3	3	2	0
12	12. People dont know the history (or don't care) - more peo	12	-1	-1	-1	0	-1
13	13. These forests belong to all, including non-human life, a	13	3	-3	5	4	1
14	14. It is necessary that we adapt our lives to fit in with t	14	0	-2	4	0	0
15	15. I believe the PSI is important to educational organizati	15	2	0	1	1	3
16	16. Water quality and quantity should be preserved or improv	16	4	-1	0	1	0
17	17. The roads are wonderful - they allow us access.	17	-1	1	-4	-1	-3
18	18. Remove all commercial profit from PSI!	18	-5	-2	0	-4	-5
19	19. I appreciate what is being done to preserve these areas	19	5	1	1	2	1
20	20. The forests are my spiritual home, nothing man can creat	20	-1	3	3	1	0
21	21. Having wild and free open spaces for exploring and relax	21	2	1	2	3	1
22	22. Preserve historical sites on the PSI.	22	1	0	-1	3	3
23	23. An important priority for the Forest Service on the PSI	23	1	-1	1	-1	-2
24	24. I feel protecting our national forests will help combat	24	1	0	2	-2	-2
25	25. We must curb the destruction of forests because we are e	25	1	-2	4	-1	-1
26	26. Our footprint on the forest/wilderness should be minimiz	26	4	0	1	2	4
27	27. Dont hire employees who favor non-motorized recreation o	27	-4	0	-2	-1	-1
28	28. It is important to maintain our great forest areas for a	28	0	3	-2	2	1
29	29. This is a big world. There is no good reason why more a	29	-3	2	-3	-3	-2
30	30. It is important for the public to enjoy the forests but	30	-2	5	-4	0	-1
31	31. We need to allow people the freedom of recreation to hel	31	2	4	0	1	2
32	32. Water needs can be met and still allow for man to use th	32	0	-1	-1	0	2
33	33. Proper management can allow for more water and individua	33	2	-2	-2	0	3
34	34. Recreation helps man and economy.	34	0	2	0	3	5
35	35. Recreation is an important value of the PSI so more comm	35	-2	0	-1	-2	2
36	36. I feel that these areas should NOT be open to economic e	36	-4	-4	0	-2	-3

Variance = 5.833 St. Dev. = 2.415

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Factor Q-Sort Values for Statements sorted by Consensus vs. Disagreement (Variance across normalized Factor Scores)

		Factor Arrays					
No.	Statement	No.	1	2	3	4	5
1	1. I consider these forests some of the most beautiful I hav	1	0	1	0	0	1
12	12. People dont know the history (or don't care) - more peo	12	-1	-1	-1	0	-1
3	3. The PSI is a beautiful area which I hope will be kept tha	3	3	2	2	5	2
21	21. Having wild and free open spaces for exploring and relax	21	2	1	2	3	1
15	15. I believe the PSI is important to educational organizati	15	2	0	1	1	3
32	32. Water needs can be met and still allow for man to use th	32	0	-1	-1	0	2
31	31. We need to allow people the freedom of recreation to hel	31	2	4	0	1	2
23	23. An important priority for the Forest Service on the PSI	23	1	-1	1	-1	-2
10	10. I strongly feel that larger and more reservoirs are neede	10	-2	-1	-3	-5	-4
35	35. Recreation is an important value of the PSI so more comm	35	-2	0	-1	-2	2
26	26. Our footprint on the forest/wilderness should be minimiz	26	4	0	1	2	4
22	22. Preserve historical sites on the PSI.	22	1	0	-1	3	3
6	6. I am concerned about the barriers imposed on grazing perm	6	-2	1	-2	-3	0
19	19. I appreciate what is being done to preserve these areas	19	5	1	1	2	1
27	27. Dont hire employees who favor non-motorized recreation o	27	-4	0	-2	-1	-1
36	36. I feel that these areas should NOT be open to economic e	36	-4	-4	0	-2	-3
16	16. Water quality and quantity should be preserved or improv	16	4	-1	0	1	0
4	4. I want more wildlife: wolves, mountain lions, bears, ever	4	-1	-3	2	-1	-4
20	20. The forests are my spiritual home, nothing man can creat	20	-1	3	3	1	0
17	17. The roads are wonderful - they allow us access.	17	-1	1	-4	-1	-3
24	24. I feel protecting our national forests will help combat	24	1	0	2	-2	-2
34	34. Recreation helps man and economy.	34	0	2	0	3	5
25	25. We must curb the destruction of forests because we are e	25	1	-2	4	-1	-1
7	7. I am concerned about the barriers imposed on logging oppo	7	-3	2	-3	-3	-1
5	5. I want wildlife habitat made the number 1 priority.	5	-1	-5	1	-2	-3
14	14. It is necessary that we adapt our lives to fit in with t	14	0	-2	4	0	0
29	29. This is a big world. There is no good reason why more a	29	-3	2	-3	-3	-2
28	28. It is important to maintain our great forest areas for a	28	0	3	-2	2	1
33	33. Proper management can allow for more water and individua	33	2	-2	-2	0	3
18	18. Remove all commercial profit from PSI!	18	-5	-2	0	-4	-5
8	8. The Forests are important because the town I live in coun	8	0	3	-1	4	4
2	2. Dont compromise this beauty over commercial and short ter	2	1	-4	3	1	-2
11	11. No priority is more important than saving our natural la	11	3	-3	3	2	0
13	13. These forests belong to all, including non-human life, a	13	3	-3	5	4	1
30	30. It is important for the public to enjoy the forests but	30	-2	5	-4	0	-1
9	9. With the energy crisis - if gas or oil are discovered, we	9	-3	4	-5	-4	0

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Factor Characteristics

	Factors				
	1	2	3	4	5
No. of Defining Variables	13	5	21	20	12
Average Rel. Coef.	0.800	0.800	0.800	0.800	0.800
Composite Reliability	0.981	0.952	0.988	0.988	0.980
S.E. of Factor Scores	0.137	0.218	0.108	0.111	0.143

Standard Errors for Differences in Normalized Factor Scores

(Diagonal Entries Are S.E. Within Factors)

Factors	1	2	3	4	5
1	0.194	0.258	0.175	0.177	0.198
2	0.258	0.309	0.244	0.245	0.261
3	0.175	0.244	0.153	0.155	0.179
4	0.177	0.245	0.155	0.157	0.181
5	0.198	0.261	0.179	0.181	0.202

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Distinguishing Statements for Factor 1

(P < .05 ; Asterisk (\*) Indicates Significance at P < .01)

Both the Factor Q-Sort Value and the Normalized Score are Shown.

		Factors									
		1		2		3		4		5	
No.	Statement	No.	RNK SCORE	RNK SCORE	RNK SCORE	RNK SCORE	RNK SCORE	RNK SCORE	RNK SCORE	RNK SCORE	RNK SCORE
19	19. I appreciate what ...	19	5 1.88*	1 0.42	1 0.29	2 1.03	1 0.43				
16	16. Water quality and ...	16	4 1.49*	-1 -0.19	0 -0.17	1 0.56	0 0.14				
25	25. We must curb the d ...	25	1 0.23*	-2 -0.75	4 1.52	-1 -0.37	-1 -0.36				
8	8. The Forests are imp ...	8	0 0.09*	3 1.04	-1 -0.67	4 1.46	4 1.79				
30	30. It is important fo ...	30	-2 -0.98	5 1.83	-4 -1.50	0 0.24	-1 -0.53				
9	9. With the energy cri ...	9	-3 -1.04*	4 1.48	-5 -1.76	-4 -1.71	0 -0.09				
27	27. Dont hire employee ...	27	-4 -1.60*	0 0.26	-2 -0.81	-1 -0.69	-1 -0.45				

Distinguishing Statements for Factor 2

(P < .05 ; Asterisk (\*) Indicates Significance at P < .01)

Both the Factor Q-Sort Value and the Normalized Score are Shown.

		Factors									
		1		2		3		4		5	
No.	Statement	No.	RNK SCORE	RNK SCORE	RNK SCORE	RNK SCORE	RNK SCORE	RNK SCORE	RNK SCORE	RNK SCORE	RNK SCORE
30	30. It is important fo ...	30	-2 -0.98	5 1.83*	-4 -1.50	0 0.24	-1 -0.53				
9	9. With the energy cri ...	9	-3 -1.04	4 1.48*	-5 -1.76	-4 -1.71	0 -0.09				
31	31. We need to allow p ...	31	2 0.63	4 1.45	0 0.24	1 0.28	2 0.90				
28	28. It is important to ...	28	0 0.15	3 1.45	-2 -1.09	2 0.87	1 0.32				
7	7. I am concerned abou ...	7	-3 -1.05	2 0.99*	-3 -1.17	-3 -1.06	-1 -0.20				
29	29. This is a big worl ...	29	-3 -1.14	2 0.86*	-3 -1.47	-3 -1.22	-2 -0.86				
17	17. The roads are wond ...	17	-1 -0.23	1 0.53*	-4 -1.49	-1 -0.18	-3 -1.21				
6	6. I am concerned abou ...	6	-2 -0.77	1 0.37	-2 -1.08	-3 -1.18	0 -0.19				
27	27. Dont hire employee ...	27	-4 -1.60	0 0.26*	-2 -0.81	-1 -0.69	-1 -0.45				
35	35. Recreation is an i ...	35	-2 -0.85	0 0.06	-1 -0.51	-2 -0.71	2 0.58				
18	18. Remove all commerc ...	18	-5 -1.98	-2 -0.99*	0 -0.02	-4 -1.96	-5 -2.42				
14	14. It is necessary th ...	14	0 0.10	-2 -1.05*	4 1.53	0 0.05	0 -0.09				
13	13. These forests belo ...	13	3 1.48	-3 -1.32*	5 1.76	4 1.48	1 0.45				

11	11. No priority is mor ...	11	3	1.44	-3	-1.42*	3	1.44	2	0.93	0	0.22
2	2. Dont compromise thi ...	2	1	0.38	-4	-1.68*	3	1.31	1	0.33	-2	-0.57
5	5. I want wildlife hab ...	5	-1	-0.72	-5	-1.95*	1	0.58	-2	-1.06	-3	-1.12

Distinguishing Statements for Factor 3

(P < .05 ; Asterisk (\*) Indicates Significance at P < .01)

Both the Factor Q-Sort Value and the Normalized Score are Shown.

		Factors															
No.	Statement	No.	1 RNK SCORE	2 RNK SCORE	3 RNK SCORE	4 RNK SCORE	5 RNK SCORE										
14	14. It is necessary th ...	14	0	0.10	-2	-1.05	4	1.53*	0	0.05	0	-0.09					
25	25. We must curb the d ...	25	1	0.23	-2	-0.75	4	1.52*	-1	-0.37	-1	-0.36					
2	2. Dont compromise thi ...	2	1	0.38	-4	-1.68	3	1.31*	1	0.33	-2	-0.57					
24	24. I feel protecting ...	24	1	0.32	0	0.02	2	0.90*	-2	-0.91	-2	-1.11					
4	4. I want more wildlif ...	4	-1	-0.54	-3	-1.11	2	0.65*	-1	-0.34	-4	-1.30					
5	5. I want wildlife hab ...	5	-1	-0.72	-5	-1.95	1	0.58*	-2	-1.06	-3	-1.12					
18	18. Remove all commerc ...	18	-5	-1.98	-2	-0.99	0	-0.02*	-4	-1.96	-5	-2.42					
36	36. I feel that these ...	36	-4	-1.65	-4	-1.79	0	-0.08*	-2	-0.88	-3	-1.16					
8	8. The Forests are imp ...	8	0	0.09	3	1.04	-1	-0.67*	4	1.46	4	1.79					
28	28. It is important to ...	28	0	0.15	3	1.45	-2	-1.09*	2	0.87	1	0.32					
30	30. It is important fo ...	30	-2	-0.98	5	1.83	-4	-1.50*	0	0.24	-1	-0.53					

Both the Factor Q-Sort Value and the Normalized Score are Shown.

		Factors															
No.	Statement	No.	1 RNK SCORE	2 RNK SCORE	3 RNK SCORE	4 RNK SCORE	5 RNK SCORE										
34	34. Recreation helps m ...	34	0	-0.04	2	0.63	0	0.23	3	1.11	5	2.12					
19	19. I appreciate what ...	19	5	1.88	1	0.42	1	0.29	2	1.03	1	0.43					
11	11. No priority is mor ...	11	3	1.44	-3	-1.42	3	1.44	2	0.93*	0	0.22					
28	28. It is important to ...	28	0	0.15	3	1.45	-2	-1.09	2	0.87	1	0.32					
16	16. Water quality and ...	16	4	1.49	-1	-0.19	0	-0.17	1	0.56	0	0.14					
20	20. The forests are my ...	20	-1	-0.47	3	1.20	3	1.37	1	0.31	0	-0.14					
30	30. It is important fo ...	30	-2	-0.98	5	1.83	-4	-1.50	0	0.24*	-1	-0.53					
33	33. Proper management ...	33	2	0.91	-2	-0.88	-2	-0.91	0	-0.03*	3	1.15					
10	10. I strongly feel tha ...	10	-2	-0.77	-1	-0.58	-3	-1.44	-5	-2.04*	-4	-1.50					

Distinguishing Statements for Factor 5

(P < .05 ; Asterisk (\*) Indicates Significance at P < .01)

Both the Factor Q-Sort Value and the Normalized Score are Shown.

		Factors									
		1		2		3		4		5	
No.	Statement	No.	RNK SCORE	RNK SCORE	RNK SCORE	RNK SCORE	RNK SCORE	RNK SCORE	RNK SCORE	RNK SCORE	
34	34. Recreation helps m ...	34	0 -0.04	2 0.63	0 0.23	3 1.11	5 2.12*				
15	15. I believe the PSI ...	15	2 0.79	0 0.23	1 0.28	1 0.78	3 1.31*				
32	32. Water needs can be ...	32	0 -0.22	-1 -0.16	-1 -0.19	0 0.05	2 0.84*				
35	35. Recreation is an i ...	35	-2 -0.85	0 0.06	-1 -0.51	-2 -0.71	2 0.58				
13	13. These forests belo ...	13	3 1.48	-3 -1.32	5 1.76	4 1.48	1 0.45*				
11	11. No priority is mor ...	11	3 1.44	-3 -1.42	3 1.44	2 0.93	0 0.22*				
9	9. With the energy cri ...	9	-3 -1.04	4 1.48	-5 -1.76	-4 -1.71	0 -0.09*				
6	6. I am concerned abou ...	6	-2 -0.77	1 0.37	-2 -1.08	-3 -1.18	0 -0.19				
7	7. I am concerned abou ...	7	-3 -1.05	2 0.99	-3 -1.17	-3 -1.06	-1 -0.20*				
30	30. It is important fo ...	30	-2 -0.98	5 1.83	-4 -1.50	0 0.24	-1 -0.53				
2	2. Dont compromise thi ...	2	1 0.38	-4 -1.68	3 1.31	1 0.33	-2 -0.57*				
23	23. An important prior ...	23	1 0.26	-1 -0.40	1 0.55	-1 -0.35	-2 -0.92				
18	18. Remove all commerc ...	18	-5 -1.98	-2 -0.99	0 -0.02	-4 -1.96	-5 -2.42				

Descending Array of Differences Between Factors 1 and 2

QANALYZE was completet at 12:22:55