



# Demographic Influences on Environmental Value Orientations and Normative Beliefs About National Forest Management

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*Using the cognitive hierarchy as the theoretical foundation, this article examines the predictive influence of individuals' demographic characteristics on environmental value orientations and normative beliefs about national forest management. Data for this investigation were obtained from a random sample of Colorado residents (n = 960). As predicted by theory, a structural equation analysis demonstrated that the biocentric/anthropocentric value orientation continuum predicted respondents' norms toward national forest management, and the value orientation mediated the relationship between the demographic predictors and the normative belief. Individuals who had lived longer in the state and those with more income tended to be more anthropocentric. Females and those with higher education levels, on the other hand, were closer to the biocentric end of the conceptual continuum. Overall, this article provides empirical support for expanding the cognitive hierarchy to include other predictor constructs when attempting to understand constituents' positions on natural resource issues.*

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Debate regarding how forests and other publicly owned natural resources should be managed can occur because different groups hold differing values and normative beliefs regarding appropriate actions. Individuals' values form the foundation for general environmental perceptions, while their normative beliefs are used to judge the acceptability of specific policies. Controversy over the spotted owl in the Pacific Northwest, for example, pits preservation-oriented environmentalists against the utilitarian values of loggers and local timber economies (Steel et al. 1994). Wilderness proponents are frequently at odds with those who value timber and other extractive uses of the resource (Rudzitis 1999). The values of natural resource agency personnel charged with planning and management often differ from the various constituencies they are charged to serve (Wiebe et al. 1999). To a large extent, all of these debates center on the conflicting value orientation of preservation versus use (Stern and Dietz 1994).

While values are typically learned early in childhood and remain stable throughout one's life, there is increasing evidence that we are in a period of relatively rapid and significant change with regard to environmental value orientations (Bengston 1994). A content analysis of 2000 "national forest" related news stories between 1982 and 1993, for example, shows that society's environmental orientations have shifted from utilitarian toward spiritual and ecological values (Bengston and Xu 1995). Researchers have attributed this shift to population growth (Cromartie and Wardwell 1999; Manfredo and Zinn 1996) and changing demographics (Steel et al. 1994). Younger, more educated, urban dwellers, for example, tend to de-emphasize traditional commodity uses of nature (e.g., logging, mining, and grazing) and place higher value on issues such as wildland preservation (Rudzitis 1999).

While research has demonstrated that value orientations affect normative beliefs regarding acceptable management practices (Wittmann and Vaske 1998; Zinn et al. 1998), less empirical attention has focused on the determinants of values and norms. This article explores the influence of demographic characteristics (length of residence, sex, education, income) on environmental value orientations and normative beliefs about national forest management.

## Study Context

Similar to other western states (Beyers 1999; Cromartie and Wardwell 1999), population growth has impacted Colorado. The state's population grew from 1.3 million in 1950 to 3.7 million in 1995 (Duerksen et al. 1995). By 2020, Colorado's population is projected to reach 5 million people (Manfredo and Zinn 1996). While much of this growth is concentrated in cities along the Front Range of the Rockies, mountain ski resort counties and retirement communities on the western slope have also experienced dramatic increases (Duerksen et al. 1995).

These population changes have increased development on forest, range, and agricultural lands. For example, between 1982 and 1992, approximately 400,000 acres of agricultural land were transformed to urban and suburban development (Duerksen et al. 1995). Ski resorts have expanded within national forests and housing developments adjacent to forest lands are now common (Eddy 1998). Combined with increasing demand for outdoor recreation opportunities, these

changes have necessitated a closer examination of residents' value orientations and normative beliefs relative to U.S. Department of Agriculture (USDA) Forest Service management.

## **Conceptual Framework**

Theory suggests that an individual's view of the environment can be organized into a cognitive hierarchy consisting of values, value orientations (i.e., patterns of basic beliefs), attitudes, normative beliefs, and behaviors (Homer and Kahle 1988; Rokeach 1973; 1979). Each of these elements build upon one another in what has been described as an inverted pyramid with relatively few values indirectly influencing numerous behaviors (Fulton et al. 1996; Vaske and Donnelly 1999). This article focuses on two of the constructs (value orientations and normative beliefs) that are typically associated with the cognitive hierarchy.

### ***Value Orientations***

Rokeach (1973, 5) defines a value as "an enduring belief that a specific mode of conduct is personally or socially preferable to an opposite or converse mode of conduct or end state of existence." Because values tend to be widely shared by all members of a culture, values are unlikely to account for much of the variability in other constructs. Rather, the influence of values on normative beliefs occurs indirectly via other components in the cognitive hierarchy. For example, basic beliefs serve to strengthen and give meaning to fundamental values. Patterns of these basic beliefs create value orientations (Fulton et al. 1996).

Value orientations toward natural resources can be arrayed along a continuum ranging from anthropocentric to biocentric (Shindler et al. 1993; Steel et al. 1994; Vaske and Donnelly 1999). An anthropocentric value orientation represents a human-centered view of the nonhuman world (Eckersley 1992). Traditional forest management policy in the United States has been based on this utilitarian philosophy (Pinchot 1910). The approach assumes that providing for human uses and benefits is the primary aim of natural resource allocation and management. The environment is seen as material to be used by humans as they see fit (Scherer and Attig 1983). There is no notion that the nonhuman parts of nature are important in their own right or for their own sake. In short, an anthropocentric value orientation emphasizes the instrumental importance of forests for human society, rather than their inherent worth (Vaske and Donnelly 1999).

In contrast, a biocentric value orientation is a nature-centered approach (Eckersley 1992). Ecosystems, species, and natural organisms are elevated to center stage. Human desires are still important, but are viewed from a larger perspective. This approach assumes that environmental objects have inherent as well as instrumental worth and that human economic uses and benefits are not necessarily the most important uses of natural resources. In matters of natural resource management, these inherent qualities are to be equally respected and preserved, even if they conflict with human-centered ideals (Thompson and Barton 1994).

Biocentric and anthropocentric value orientations, however, are not mutually exclusive. Rather, these value orientations can be arranged along a continuum with biocentric viewpoints on one end and anthropocentric orientations on the other. The midpoint of this scale represents a mixture of the two extremes. Research conducted in Oregon (Shindler et al. 1993; Steel et al. 1994) and Colorado (Vaske and Donnelly 1999) supports this conceptual continuum.

### **Normative Beliefs**

Normative beliefs are defined as judgments about what is appropriate in a specific situation (Zinn et al. 1998). They are the standards that individuals use for evaluating what behavior or conditions should exist (see Shelby et al. 1996 for a review). Because normative beliefs are more situation specific (e.g., more land should be set aside for wilderness in the Arapaho National Forest) than value orientations, they are also subject to change depending on the circumstance being evaluated. For example, normative beliefs for acceptable conditions (e.g., developed facilities) in a front-country national park are often different than what is judged appropriate for a backcountry wilderness area (Donnelly et al. 2000).

In the cognitive hierarchy, value orientations are predicted to influence a person's normative beliefs (Wittmann and Vaske 1998). Zinn et al. (1998), for example, demonstrated that across three different wildlife species (beavers, coyotes, mountain lions) and different situation contexts (e.g., seeing the animal in a residential area, human injury or death caused by wildlife), individuals with a protectionist wildlife value orientation were less willing to accept destroying the animal (a normative belief). Respondents with a wildlife use value orientation were more willing to accept this management action.

The determinants of these value orientations and their subsequent normative beliefs, however, have received less attention. Using the cognitive hierarchy as the theoretical foundation, this article examines the predictive influence of demographic characteristics on environmental value orientations and normative beliefs about national forest management.

### **Correlates of Value Orientations and Normative Beliefs**

Researchers have explored the correlates of environmental concern (for reviews see Inglehart 1990; Milbrath 1984; Van Liere and Dunlap 1980), however, the findings have not always been consistent. As noted by Van Liere and Dunlap (1981), this can probably be attributed to the variety of approaches used to operationalize the concepts. Milbrath (1984), however, suggests that while the choice of measure may affect the strength of the relationship, the direction of the relationship is seldom affected. This section examines four demographic characteristics (length of residence, sex, education, and income) relative to their influence on environmental value orientations and normative beliefs.

*Length of residence.* Length of residence in a community or state may influence a person's general environmental value orientation and specific normative beliefs about acceptable natural resource management practices (McCool and Martin 1994; Rudzitis 1999). Sheldon and Var (1984), for example, show that lifelong residents are more sensitive to human impacts than are short-term residents. In rural communities, "culture clashes" between newcomers and long-term residents is one of the main forms of growth-related conflict (Blahna 1990). Newcomers often believe that the rural landscape should be preserved whenever possible, while long-time residents prefer land management strategies that balance protection and use (McCool and Martin 1994). For long-time residents this means that traditional environmental value orientations linked to agriculture, forestry, or ranching are challenged by new residents (Rudzitis 1999). Given this reasoning and past research, we hypothesize:

H<sub>1</sub>: As length of residency decreases, individuals will be more biocentric (value orientation) and preservation-focused (normative beliefs).

*Sex.* Studies using sex as a predictor of environmental value orientations show a mixed pattern of findings. Van Liere and Dunlap's (1980) review of 21 studies from the 1960s and 1970s, for example, suggests that while some research has observed a correlation between sex and environmentalism, other investigations have not reported a significant relationship. In a study supporting sex differences, Steger and Witt (1989) found that women are more likely than men to support pro-environment value orientations and hold more pro-preservation normative beliefs. More recent reviews (e.g., Mohai 1992) come to a similar conclusion, but suggest that women are more concerned with local (as opposed to national) environmental issues than men.

Taken together, while the available empirical evidence is inconclusive, most authors conclude that females are more environmentally oriented than males, especially when the focus is on local natural resource issues (Mohai 1992). We therefore hypothesize:

H<sub>2</sub>: Females will be more biocentric (value orientation) and more preservation-focused (normative belief) than males.

*Education.* Research examining the relationship between education and environmental value orientations also shows a mixed pattern of findings. Steel et al. (1994), for example, found education to be a significant predictor of a biocentric–anthropocentric value orientation in their Oregon sample, but not in their national sample. Among the Oregon respondents, those with more education were more biocentric. In contrast, other research has reported an inverse relationship between education and biocentrism (Grendstad and Wollebaek 1998). These latter findings, however, contradict the bulk of the literature (Howell and Laska 1992; Inglehart 1990; Milbrath 1984; Nelson 1999) that shows higher education is associated with biocentric value orientations. We hypothesize:

H<sub>3</sub>: As education increases, individuals will be more biocentric (value orientation) and more preservation-focused (normative belief).

*Income.* “Income is correlated with education but, as a social influence, it acts quite differently from education” (Milbrath 1984, 77). In part, this stems from the curvilinear relationship between income and environmental orientation (Buttel and Flinn 1978). Very high income individuals have traditionally been employed in businesses that value economic rewards more than environmental preservation (Nelson 1999). Similarly, the very poor rate economic values higher than the environment because they need the income to survive. People in middle-income categories have sufficient resources to live and often have the formal education needed to be aware of the environmental consequences associated with human impacts on natural resources. When used as a predictor of environmental orientation in regression analyses, income can be nonsignificant due to this curvilinear relationship (Milbrath 1984). We, therefore, hypothesize:

H<sub>4</sub>: Income will not be associated with an individual's environmental value orientation or normative belief.

### **Multivariate Relationships**

To address the combined influence of the demographic predictors on value orientations and normative beliefs, a predictive model was developed. The model hypothesizes that three demographic indicators (length of residence, sex, education) will influence individuals' biocentric–anthropocentric value orientation and their normative beliefs regarding national forest management (hypotheses 1 through 3). Similar to the bivariate relationships, the model predicts that income will have no influence on the environmental value orientation and normative belief. In addition, based on the sequence of concepts suggested by the cognitive hierarchy (Fulton et al. 1996; Vaske and Donnelly 1999), it is hypothesized that:

H<sub>5</sub>: The biocentric–anthropocentric value orientation will mediate the relationships between the three demographic indicators (length of residence, sex, education) and the normative belief.

### **Methods**

Data were obtained from surveys of individuals living along the Front Range region of Colorado (a rapidly growing urban corridor at the eastern edge of the Rocky Mountains) and residents of the more rural mountain and western slope regions of the state. A random sample of names and addresses was purchased from a commercial sampling firm. Four mailings were used to administer the survey. Potential respondents were initially mailed a questionnaire, a postage-paid return envelope, and a cover letter explaining the study. Reminder postcards were sent 10 days later to individuals who had not yet returned completed questionnaires. Twenty days after the first mailing, new cover letters and replacement surveys were sent to those whose original questionnaires were still outstanding. A final mailing of the survey was sent to nonrespondents 1 month later. Of the 1800 surveys in the initial mailing, 960 usable surveys were returned for an overall response rate of 53%.

### **Model Variables**

The model examined biocentric–anthropocentric value orientation, normative beliefs regarding national forest management, and four sociodemographic characteristics.

*Value orientation (patterns of basic beliefs).* Following Vaske and Donnelly (1999), an individual's value orientation was constructed from four variables designed to measure biocentric basic beliefs and five variables measuring anthropocentric basic beliefs (see Table 1, later in article, for question wording). All 9 variables were coded on 7-point Likert scales ranging from “strongly agree” (1) through a “neutral” point (4) to “strongly disagree” (7). The two composite basic belief scales (biocentric and anthropocentric [reverse coded]) were combined to create the biocentric–anthropocentric value orientation continuum.

*Normative belief.* An individual's normative belief was constructed from six variables measuring beliefs toward the use or preservation of national forests (see Table 1, later in article, for question wording). Each of these variables was coded on the same scale used to measure the biocentric–anthropocentric continuum variables.

*Demographics.* Four sociodemographic variables were examined. The length of residence variable asked individuals to indicate how long they had lived in Colorado. Responses were coded as the number of years. Sex was coded as 0 equals males and 1 equals females. Education was reflected in a 9-point scale ranging from 1 (grade school) to 8 (graduate school). Income was recorded using 11 response categories (1 for < \$10,000 to 11 for > \$125,000).

### **Analysis**

The internal consistency of the biocentric and anthropocentric basic belief scales and the normative belief scale were examined using Cronbach's alpha reliability coefficients and confirmatory factor analysis. Bivariate analyses compared each of the predictor variables (length of residence, sex, education, and income) against the mediator (biocentric–anthropocentric value orientation) and the criterion (normative belief).

LISREL 8.14 (Jöreskog and Sörbom 1993) was used to test the predictive validity of the path model, as well as to assess the mediation role of the biocentric–anthropocentric value orientation continuum.<sup>1</sup> In structural equation analysis, three separate models are required to demonstrate mediation (Hayduk 1987, 163–167). In the full mediation model, the predictors (demographics) only influence the criterion (normative belief) indirectly through their effect on the mediator (biocentric–anthropocentric value orientation). In the partial mediation model, the predictors influence the criterion variable directly and indirectly through their effect on the mediator. In the third model, direct effects, the predictors directly affect both the criterion and the mediator, but the mediator is constrained to not affect the criterion.

Mediation occurs under the following conditions. First, the predictors must be significantly related to the mediator, and the predictors must significantly affect the criterion variable (direct effects model). Second, the paths between the predictors and the mediator, and between the mediator and the criterion must be significant in both the full and partial mediation models. Full mediation occurs when the direct paths from the predictors to the criterion are not significant in the partial mediation model. Third, a comparison of the nested models using the change in chi-square statistics indicates that the full mediation model fits better than the direct effects model, and the partial mediation model fits no better than the full mediation model (Baron and Kenny 1986; Hayduk 1987).<sup>2</sup>

### **Results**

The confirmatory factor analysis demonstrated that the data provided an acceptable fit to the constructs. Table 1 shows the standardized factor loadings, standard errors (SE), and *t* values associated with each multi-item concept. The standardized factor loadings for the anthropocentric basic beliefs ranged from .57 to .83, with relatively small standard errors ( $SE \leq .033$ ). Similar findings emerged for the biocentric basic beliefs (factor loadings ranged from .52 to .92;  $SE \leq .032$ ). For both sets of basic beliefs, the *t* values were  $\geq 16.22$ ,  $p < .001$ . The reliability coefficients for the items in these factors were .85 (anthropocentric basic beliefs scale) and .87 (biocentric basic beliefs scale). Deleting any of the items from their respective basic belief scales lowered the overall Cronbach alpha. The Cronbach alpha for the combined 9-item biocentric–anthropocentric value orientation index was .86.

**TABLE 1** Confirmatory Factor and Reliability Analyses for Latent Constructs

	Standardized factor loading	SE	<i>t</i> Value <sup>a</sup>	Cronbach alpha
Anthropocentric basic beliefs <sup>b</sup>				.85
The primary value of forests is to generate money and economic self-reliance for communities.	.70	.033	21.01	
The primary value of forests is to provide timber, grazing land, and minerals for people who depend on them for their way of life.	.70	.031	22.89	
Forests are valuable only if they produce jobs and income for people.	.66	.031	21.18	
Nature's primary value is to provide products useful to people.	.83	.029	28.83	
The value of forests exists only in the human mind. Without people forests have no value.	.57	.032	17.79	
Biocentric basic beliefs <sup>b</sup>				.87
Forests have as much right to exist as people.	.92	.028	32.62	
Nature has as much right to exist as people.	.90	.029	31.35	
Wildlife, plants, and people have equal rights to live and develop.	.80	.029	27.29	
Forests have value, whether people are present or not.	.52	.032	16.22	
Biocentric-anthropocentric value orientation continuum <sup>c</sup>				.86
Normative belief about national forest management <sup>b</sup>				.84
Heavily used areas in national forests should be restored to their natural state.	.61	.032	19.01	
More importance should be placed on keeping national forests healthy than on people using them in ways they want.	.53	.032	16.36	
The amount of human use of national forests should be reduced.	.68	.031	22.19	
National forests should be managed more for their natural health than for recreation.	.56	.032	17.14	
More national forest land should be set aside as designated wilderness.	.76	.029	25.93	
The Forest Service should decrease the amount of logging and grazing on national forests.	.75	.030	24.88	

<sup>a</sup> All *t* values significant at  $p < .001$ .

<sup>b</sup> Variables coded on a 7-point Likert scale ranging from 1, strongly agree, to 7, strongly disagree.

<sup>c</sup> For the combined 9-item biocentric-anthropocentric value orientation continuum, the values for the anthropocentric items were reverse coded. The scale values range from 1, biocentric, to 7, anthropocentric.

Support for combining the normative belief items into the latent construct is also evident in Table 1. The standardized factor loadings ranged from .53 to .76 ( $SE \leq .032$ ). All  $t$  values were significant at  $p < .001$  and the Cronbach alpha was .84.

### Bivariate Analyses

Having demonstrated the reliability of the constructs, analysis of variance was used to examine the relationships between each of the predictor variables and the mediator (biocentric–anthropocentric value orientation, Table 2) and the criterion (normative belief, Table 3). Individuals who had lived in Colorado longer ( $F = 4.54, p = .011$ ) were more anthropocentric than those with fewer years in the state. This finding is consistent with hypothesis 1.

Sex and education were also statistically related to the biocentric–anthropocentric value orientation construct and in the predicted direction (Table 2). Females ( $M = 1.95$ ), for example, were more biocentric than males ( $M = 2.34$ ) as suggested by hypothesis 2 ( $F = 26.29, p < .001$ ). College-educated respondents ( $M = 1.98$ ) were more biocentric than those who had no formal education beyond high school ( $M = 2.35$ ) as predicted by hypothesis 3 ( $F = 25.04, p < .001$ ). Consistent with hypothesis 4, no statistical difference was observed for the bivariate analysis of variance (ANOVA) between income and the value orientation ( $F = 1.03, p = .357$ ). Individuals in the lowest bracket ( $< \$25,000$ ) as well as respondents with more

**TABLE 2** Biocentric–Anthropocentric Continuum by Demographic Variables

Demographics	Sample		Dependent variable: biocentric–anthropocentric continuum <sup>a</sup>			
	<i>n</i>	%	Mean <sup>b</sup>	Standard deviation	<i>F</i> value	<i>p</i> value
Years of Colorado residence <sup>c</sup>					4.54	< .011
1–2 years	135	14	2.02	1.09		
3–10 years	149	16	2.01	1.17		
11 + years	661	70	2.56	1.12		
Sex					26.29	< .001
Male	584	61	2.34	1.18		
Female	367	39	1.95	1.01		
Education					25.04	< .001
≤High school diploma	545	57	2.35	1.18		
≥College degree	406	43	1.98	1.03		
Income <sup>c</sup>					1.03	.357
<\$25,000	299	32	2.12	1.05		
\$25,000–\$50,000	365	40	2.19	1.18		
>\$50,000	256	28	2.25	1.16		

<sup>a</sup> Scale for biocentric–anthropocentric continuum ranges from 1, biocentric, to 7, anthropocentric. For these bivariate analyses, the biocentric/anthropocentric continuum scale represented a 9-item composite index with the anthropocentric variables reverse coded.

<sup>b</sup> Means with different superscripts differ significantly at  $p < .05$  based on Scheffé multiple comparison tests.

<sup>c</sup> For the bivariate analyses, this predictor variable was recoded into discrete categories.

**TABLE 3** Normative Belief by Demographic Variables

Demographics	Sample		Dependent variable: normative belief about national forest management <sup>a</sup>			
	<i>n</i>	%	Mean	Standard deviation	<i>F</i> value	<i>p</i> value
Years of Colorado residence <sup>b</sup>					6.02	.003
1–2 years	135	14	3.15 <sup>c</sup>	1.33		
3–10 years	149	16	3.28 <sup>c,d</sup>	1.38		
11 + years	661	70	3.55 <sup>d</sup>	1.39		
Sex					71.97	< .001
Male	584	61	3.74	1.38		
Female	367	39	2.99	1.28		
Education <sup>b</sup>					18.20	< .001
≤High school diploma	545	57	3.62	1.42		
≥College degree	406	43	3.23	1.32		
Income <sup>b</sup>					6.22	.002
<\$25,000	299	32	3.22 <sup>c</sup>	1.36		
\$25,000–\$50,000	365	40	3.53 <sup>d</sup>	1.40		
>\$50,000	256	28	3.59 <sup>d</sup>	1.35		

<sup>a</sup> Scale for the normative belief ranges from 1, strongly agree, to 7, strongly disagree.

<sup>b</sup> For the bivariate analyses, this predictor variable was recoded into discrete categories.

<sup>c,d</sup> Means with different superscripts differ significantly at  $p < .05$  based on Scheffé multiple comparison tests.

income (\$25,000 to \$50,000, and > \$50,000) were all generally biocentric in their value orientation ( $M = 2.12, 2.19, \text{ and } 2.25$ , respectively).

Table 3 compares the demographic predictors against the normative belief scale. Similar to the bivariate analyses for the value orientation construct, length of residence in Colorado was significant and in the direction predicted by hypothesis 1. Those who had lived fewer years in Colorado were more preservation-minded than those who had lived in the state longer ( $F = 6.02, p = .003$ ).

The normative belief scale also varied significantly by sex (hypothesis 2) and education (hypothesis 3). Like the biocentric–anthropocentric findings for these comparisons, females ( $M = 2.99$ ) were more likely to hold propreservation normative beliefs than males ( $M = 3.74; F = 71.97, p < .001$ ). Respondents with a college degree ( $M = 3.23$ ) endorsed proenvironment norms more than those with a high school diploma ( $M = 3.62; F = 18.20, p < .001$ ). Unlike the value orientation results, however, the normative belief varied significantly by income ( $F = 6.22, p = .002$ ). After controlling for multiple comparisons, those in the lowest earnings category (< \$25,000) were shown to be statistically less preservation-oriented than respondents in the upper two income brackets ( $M = 3.22$  vs.  $M = 3.53$  and  $M = 3.59$ , respectively), findings that contradict hypothesis 4.

Taken together, these bivariate comparisons are consistent with hypotheses 1 through 4, with the exception of the relationship between income and the normative belief, where a significant difference was observed. Similar to past research summaries (Milbrath 1984), however, the magnitude of these statistical variations was in

some instances relatively small. Both sexes, for example, tended toward the biocentric end of the continuum ( $M_{\text{Female}} = 1.95$  vs.  $M_{\text{Male}} = 2.34$ ). Thus, while this difference was statistically significant, it would be inappropriate to conclude that females are biocentric and males are anthropocentric.

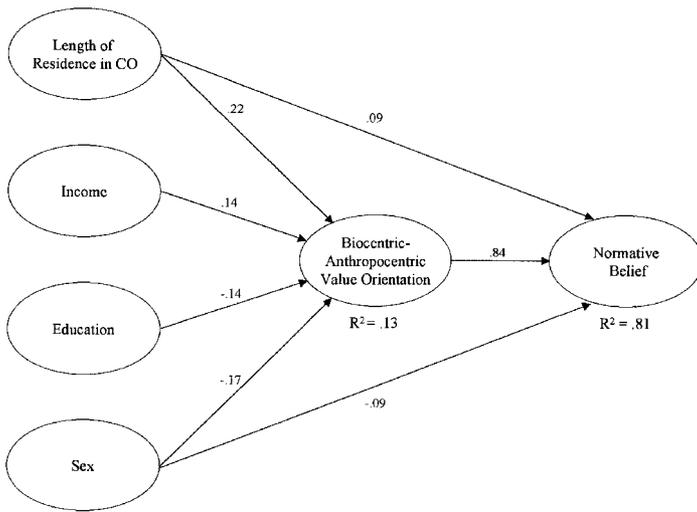
### Multivariate Analyses

To address the multivariate relationships among the latent constructs, three structural equation models were examined. The biocentric–anthropocentric value orientation was hypothesized to mediate between three demographic (length of residence, sex, education) latent predictors and the normative belief criterion. In the direct effects model, each of the predictors (including income) had a significant influence on the criterion ( $\beta \geq .11, t \geq 2.53, p < .05$ , for all relationships) and were statistically related to the mediator ( $\beta \geq .10, t \geq 2.48, p < .05$ , for all relationships)—the first condition necessary for establishing mediation. In the full mediation model, all of the predictors (including income) influenced the mediator ( $\beta \geq .14, t \geq 3.22, p < .05$ , for all relationships) and the mediator affected the criterion ( $\beta = .94, t = 4.23, p < .05$ ). When the partial mediation model was examined, however, only two of the predictors (length of residence and sex) and the mediator were significant. These findings (with the exception of the significant relationship for income) support hypothesis 5.

Support for the partial mediation model is evident from the change in chi-square statistics for the respective models. The partial mediation model ( $\chi^2 = 193.65$ ,  $df = 40$ ,  $p < .001$ ) had a significantly better fit than either the direct effects model ( $\chi^2 = 560.19$ ,  $df = 41$ ,  $p < .001$ ) or the full mediation model ( $\chi^2 = 206.03$ ,  $df = 44$ ,  $p < .001$ ). The change in chi-square for the partial versus full mediation models was 12.38,  $df = 4$ ,  $p < .025$ . For these reasons, the partial mediation model was used to describe the data.

The overall fit of the partial mediation model was assessed using six indicators ( $\chi^2$ ,  $\chi^2/df$ , GFI, NFI, CFI, RMR). Although the model produced a significant chi-square, large sample sizes tend to inflate this statistic. Consequently, Marsh and Hocevar (1985) suggest that the chi-square should be evaluated in relation to the model's degrees of freedom; a  $\chi^2/df$  ratio of 2:1 to 5:1 indicates an acceptable fit. The partial mediation model was in this range ( $\chi^2/df = 193.65/40 = 4.84$ ). Values for the goodness-of-fit index (GFI), the normed fit index (NFI), and the comparative fit index (CFI) for the partial mediation model were  $\geq .94$ , indicating an acceptable fit for the model (Bollen 1989). Finally, the root-mean-square residual (RMR), which measures the average discrepancies between the observed and the model-generated covariances, was .045 for the equation, suggesting a close fit of the data (Church and Burke 1994).

Figure 1 diagrams the path analysis for the partial mediation model. A significant relationship between the value orientation and the normative belief was observed ( $\beta = .84, t = 6.31, p < .001$ ). The positive coefficient implies that individuals with a biocentric value orientation were more likely to hold a pro-preservation normative belief. Length of residence in Colorado ( $\beta = .09, t = 2.01, p < .05$ ) and sex ( $\beta = -.09, t = 2.66, p < .05$ ) also influenced the normative belief in the predicted directions. Individuals who had lived longer in Colorado were more likely to disagree that national forests should be preserved. The negative coefficient for sex implies females were more supportive of preservation. Taken together, these three constructs explained 81% of the variance in the normative belief. Income and education did not directly affect the normative belief in the partial mediation model.



**FIGURE 1** Demographic influences on value orientation and normative belief about national forest management. Only significant paths ( $p < .05$ ) are shown.

Finally, each of the demographic latent concepts had a significant influence on the value orientation. Respondents who had lived longer in the state ( $\beta = .22$ ,  $t = 3.85$ ,  $p < .05$ ) and those with greater income ( $\beta = .14$ ,  $t = 2.77$ ,  $p < .05$ ) were more likely to hold an anthropocentric orientation. Note that the findings for income contradict hypothesis 4 (see Discussion section). Consistent with the predicted relationships, respondents with more education ( $\beta = -.14$ ,  $t = 2.68$ ,  $p < .05$ ) and females ( $\beta = -.17$ ,  $t = 3.74$ ,  $p < .05$ ) were more biocentric. These four variables, however, only explained 13% of the variance in the biocentric–anthropocentric value orientation.

## Discussion

The cognitive hierarchy hypothesizes that values influence higher order concepts such as norms. Consistent with previous research models (e.g., Fulton et al. 1996; Vaske and Donnelly 1999), this study supports the conceptual relationship between value orientations and normative beliefs. The biocentric/anthropocentric value orientation continuum predicted respondents' normative belief about national forest management, and the value orientation partially mediated the relationships between the demographic predictors and the normative belief. These findings have implications for application, theory, and future research.

From an applied perspective, by including the demographics in the model, the cognitive hierarchy provides a framework for understanding and predicting who holds certain value orientations and normative beliefs for acceptable management practices. Individuals who had lived more years in the state, for example, tended to be more anthropocentric and were more likely to be against national forest preservation management strategies (the norm). Females, on the other hand, were more biocentric and more likely to hold a propreservation norm. This expanded framework offers the potential for generalizing to a range of situations. The findings

presented by Rudzitis (1999), for example, suggest that the relationships observed in this paper may apply to many areas in the rural west and are not limited to national forest management. Similarly, given the path analyses reported by Fulton et al. (1996) and the observations of Ingram and Lewandroski (1999), the findings here are likely to generalize to a variety of wildlife issues.

There is a need, however, for management agencies to continue to monitor the relationship between rising population levels/changing demographics and values relative to natural resource decisions. Some data from Colorado, for example, suggest that although the population of the state has increased substantially, there does not appear to be an influx of “new” values (Manfredo and Zinn 1996). In other words, the wildlife value orientations of long-term residents and more recent immigrants were similar. The findings here suggest that while long-time residents and newcomers were both on the biocentric end of the value orientation continuum, there was a statistical difference between the groups; those with longer ties to the state were slightly more anthropocentric. The difference in results between the Manfredo and Zinn (1996) article and the present work might be attributed to the type of value orientation examined (i.e., a wildlife protection–use orientation versus a natural resource biocentric–anthropocentric orientation). Alternatively, the difference might be a function of when the data were collected. Some of the data used by Manfredo and Zinn (1996) to arrive at their conclusion were obtained early in the 1990s. The data reported here were collected later in the decade. Since changes in value orientations occur gradually over time (Inglehart 1990), the statistical differences between short- and long-time residents may point to the beginning of a shift. Only continued monitoring, however, can determine which of these two explanations is more appropriate.

From a theoretical perspective, this study does not incorporate all components in the cognitive hierarchy. First, the focus here was on value orientations, not values. Values represent the most basic cognitions that transcend specific situations and objects. Value orientations, on the other hand, are comprised of patterns of basic beliefs relative to a particular topic (e.g., environmental preservation–use, wildlife rights). While our findings are consistent with past research (Fulton et al. 1996; Homer and Kahle 1988; Vaske and Donnelly 1999; Wittmann and Vaske 1998), exploring the role of values as well as value orientations on respondents’ attitudes, norms, behavioral intentions, and actual behaviors would further our understanding of these relationships.

Second, this article examines only the biocentric–anthropocentric value orientation. Fulton et al. (1996), for example, identified two value orientations (benefits–existence and protection–use). Although Vaske and Donnelly (1999) have argued that the biocentric–anthropocentric value orientation is conceptually similar to the protection–use value orientation, a direct empirical comparison of the two constructs remains a topic of further investigation. Other authors have suggested a range of value orientations related to wildlands. Rolston (1988), for example, describes a taxonomy of wildland value orientations such as market, life support, recreational, scientific, aesthetic, and cultural symbolization. Inclusion and empirical verification of these additional basic belief patterns would further our understanding of the potential range of value orientations pertinent to wildland management, as well as potentially improve the predictive validity of the model. Similarly, expanding the range of value orientations to include broader environmental concerns (e.g., pollution, urbanization, recycling) may enhance managers’ understanding of behaviors related to specific issues.

Third, there is a need to further explore the determinants of value orientations and normative beliefs. While our findings are consistent with previous research (for reviews see Milbrath 1984; Van Liere and Dunlap 1980) showing only modest relationships between demographic indicators and environmentalism, there are ways to improve this predictive capability. For example, rather than focusing on length of residency (i.e., a demographic indicator), recent work by Williams and Patterson (1999) emphasizes the need to examine psychological indicators of attachment to an area. Similarly, rather than measuring sex (males vs. females), psychological indicators of gender (masculine vs. feminine) might improve the explanatory power of the model.

Relative to the relationships between income and value orientations/normative beliefs, the data reported here show a mixed pattern of findings similar to previous research (e.g., Milbrath 1984). In the bivariate analyses that collapsed the responses into three categories (< \$25,000, \$25,000 to \$50,000, > \$50,000), no statistical relationship was observed between income and the biocentric–anthropocentric value orientation. The association between the income categories and the normative belief construct, however, was significant. Individuals in higher income brackets tended to be more supportive of national forest preservation than those in the lowest earnings bracket. Findings from the path model revealed an opposite conclusion. Income had a significant influence on the value orientation and no affect in the normative belief equation.

Such differences might be attributed to how the income variable was treated in the analyses (categorical in the bivariate analyses, continuous in the path models). Alternatively, income may not be the most appropriate demographic indicator to use when attempting to explain variations in environmentalism. Given the mixed pattern of findings here as well as in past research, Milbrath (1984) suggests that classifying people according to their employment sector (e.g., service, manufacturing) is more useful than measuring income. People in service sectors have been shown to be more environmentally oriented than those in production-related industries. Support for this argument can be found in several recent articles (Beyers 1999; Nelson 1999; Rudzitis 1999). The empirical relationship between employment sector and environmental value orientations and normative beliefs, however, remains a topic of future study.

Finally, this study addressed only a limited set of the potential predictors of environmental value orientations and normative beliefs. Other studies (Manfredo and Zinn 1996; Mohai 1992; Steel et al. 1994) have suggested that values differ by respondents' age, ethnicity, location of residence (e.g., rural vs. urban), political orientation, and membership in environmental organizations. While some of this research has attempted to develop causal models predicting forest value orientations, most has been descriptive in focus. Future research examining these additional determinants of value orientations within the context of the cognitive hierarchy would help clarify the relationships.

Overall, this article has demonstrated that the cognitive hierarchy provides a useful theoretical framework for addressing who holds different value orientations and normative beliefs. Additional work within this model can help answer the issues raised here.

## Notes

1. When using LISREL, the error variance must be assumed for single item indicators of latent constructs. Following the recommendation of Hayduk (1987, 119–123), the error variance for the demographic constructs (length of residence, sex, education, income) was set

at .10 (reliability = .90). Use of other error variance values (.05, .15) provided similar solutions.

2. Models are nested if they contain the same variables and can be constructed from one another by adding or deleting paths. The difference between the  $\chi^2$  values of two nested models is distributed as a  $\chi^2$  with degrees of freedom equal to the difference between the degrees of freedom for the two models. This change in  $\chi^2$ , or  $\Delta\chi^2$ , is unaffected by sample size and can be used as a test to determine which model fits the data better. The model with the significantly smaller  $\chi^2$  value is the better fitting model (Hayduk 1987, 163–167).

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