

Amenity Values of Public and Private Forests: Examining the Value–Attitude Relationship

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Abstract / Public values toward forests have changed since the late 1980s, from a commodity-oriented perspective toward a more inclusive (commodity and non-commodity) orientation. This study examines the influence of four indicators of population diversity (age, ethnic background, place of residence, and gender) on amenity values of forests, environmental attitudes, and forest value—attitude correspondence. Four values of public and private forests were assessed, wood pro-

duction (utilitarian value), clean air (a life support value), scenic beauty (an aesthetic value), and heritage (a spiritual value). Environmental attitudes were measured using a modified version of the New Environmental Paradigm scale. Five hundred and forty-eight randomly selected residents of households in 13 states of the Southern United States participated in a telephone interview. Age and ethnic background were found to moderate the value—attitude relationship, with the strength of the association being dependent upon the type of forest (i.e., public or private) and the forest value (i.e., utilitarian, life support, spiritual, and aesthetic). Females, younger persons (less than 43 years old), and whites reported lower utilitarian values of forests than their respective counterparts. Results are interpreted within the context of an emerging post-material society, in which a biocentric orientation to forests and the natural environment may be favored more by a younger (versus older) generation and increasingly racially diverse U.S. population. Implications for managing forests using a multiple-values (versus multiple-uses) approach are discussed.

As we begin the twenty-first century, pro-environmental values and attitudes in the United States remain high (e.g., Bengston and Fan 1999, Steel and others 1994, Steel and Lovrich 1997, Tarrant and Cordell 1997). Since the late 1960s, a “new environmental paradigm” emphasizing the sustainable development of, and harmony with, a finite supply of natural resources has begun to replace the “dominant social paradigm,” associated with economic development of, and human control over, natural resources (Bengston 1994, Brown and Harris 1992, Dunlap and Van Liere 1978). At the core of this paradigm shift has been changing public values and attitudes about how people should relate to forests and the natural environment (Steel and Lovrich 1997). For example, public opinion polls and social research studies since the 1980s indicate that Americans support multiple-values (versus uses) of forests and the natural environment (e.g., Xu and Bengston 1997). Multiple-uses have traditionally emphasized tim-

ber, water, wildlife, mining, and recreation commodities, while a multiple-values approach expands this list to include non-commodities such as life support, scientific, aesthetics, biodiversity, intrinsic, and spiritual values (Rolston and Caufal 1991). The purpose of this study is to examine the extent to which indicators of population diversity (specifically, age, ethnic background, place of residence, and gender) may moderate public values toward forests (both public and private), general environmental attitudes, and the correspondence between forest values and environmental attitudes.

Theoretical Framework

It has been well documented that individual characteristics are significant external factors influencing the relationships among forest values, environmental attitudes, and behavior (e.g., Ajzen 1989, Fazio 1986, Petty and others 1997). More specifically, these studies have identified several population diversity variables (e.g., age, gender, place of residence) that may act as significant mediators of those relationships. (A mediating effect occurs if an external factor (the “mediator”) explains the relationship between two variables.) In contrast, no published documentation could be found of a possible moderating effect that indicators of pop-

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ulation diversity may have on environmental value-attitude relationships. (A moderating effect exists when the relationship between two variables changes as a function of an external factor, the "moderator.")

Values, Attitudes, and Value-Attitude Correspondence

An attitude is "a learned predisposition toward some object as either favorable or unfavorable" (Fishbein and Ajzen 1975) and is typically comprised of several belief statements (Rokeach 1968). Environmental attitudes describe the extent to which people evaluate beliefs about natural resources as desirable (i.e., as good or bad, positive, or negative). Probably the most popular environmental attitude scale reported in the published literature over the past two decades has been the New Environmental Paradigm (NEP) proposed by Dunlap and Van Liere (1978). The NEP measures environmental concern and is comprised of multiple beliefs regarding limits to growth, balance of nature, and a biocentric philosophy. According to Dunlap and Van Liere, the beliefs form "an internally consistent and unidimensional scale" (p. 14), though there is some evidence that certain items are better discriminators than others when dealing with diverse groups of people (e.g., Noe and Snow 1990).

A value is "an enduring conception of the good" (Rokeach 1973) of which there are generally considered to be two types, held and assigned. Held values are modes of conduct (e.g., honesty), end-states (e.g., equality), or qualities (e.g., beauty); while assigned value refers to the relative worth or importance of an object relative to other objects (Brown 1984, Rokeach 1968). The two are not independent and it has been argued that assigned values reflect a person's held values (e.g., Brown 1984). There is precedence for using assigned value in studies of natural resource management because of the multiple values associated with forests and the natural environment (e.g., Bengston 1994, Purdy and Decker 1989, Steinhoff 1980). As such, assigned forest values describe the relative good (i.e., importance or worth) of forest resources.

From a commodity orientation, forests have an economic value represented by the monetary worth (gains or losses) of the resource. A broader (commodity and non-commodity) orientation addresses the economic and non-economic values of the goods and services of forests. One important component of this broader orientation is to better understand how the public values unpriced amenity goods and services of forests (Peterson and others 1988). Such values constitute some of the priorities that forest

managers may consider in benefit-cost analyses and provide important information in decisions about allocating resources. Xu and Bengston (1997), for example, have identified four general values of forests: utilitarian (i.e., the usefulness of forests), life support (i.e., ecological functions of forests), aesthetic (i.e., emotional value of forests), and spiritual (i.e., cultural and heritage value of forests).

Because of the changing nature of contemporary professional forest practices (Cramer and others 1993, Steel and others 1994), amenity values are likely to differ among private and public forests. Over the past decade, the USDA Forest Service, for example, has adopted several philosophies (e.g., new perspectives, ecosystems management, sustainable management) that reflect a less commodity-based, more environmentally friendly, and ecologically sensitive approach to forest management. While there appears to be both support among the general public and within the agency itself for the paradigm shift (e.g., Cramer and others 1993, Rolston and Coufal 1991, Xu and Bengston 1997), it is less clear if private forests (which represent over 60% of all forest coverage in the United States (Bourke and Luloff 1994)) are valued in the same way.

Since the 1960s, the cognitive hierarchy approach has been the most dominant social-psychological theory for understanding the relationship among values and attitudes and is widely used in the emerging field of social forestry (often termed, "the human dimensions of natural resources"). Under the cognitive hierarchy model, values predispose attitudes, and therefore provide an important basis for understanding, maintaining, and/or influencing people's attitudes toward relevant objects (Heberlein 1981, Rokeach 1973, Tesser and Shafer 1990). In the context of the natural environment, relevant objects concern the types of uses and non-uses of natural resources along an anthropocentric/biocentric continuum. An anthropocentric philosophy "emphasizes the instrumental value of forests for human society rather than their inherent worth. . . . a biocentric approach values the nonhuman world for its own sake rather than only for the sake of its utility to humans" (Steel and others 1994, p. 18-19). The four categories of forest values (Xu and Bengston 1997) and the NEP (Dunlap and Van Liere 1978) may be considered to reflect like-objects along the anthropocentric/biocentric continuum. For example, the NEP includes items related to human use and control of natural resources (similar to a utilitarian value), to ecological balance (similar to a life support value), and to human relationships with nature (representing emotional and/or spiritual values).

Moderating Effects

The present study examines the effect of four population diversity indicators in generating pro- (or anti-) environmental values and attitudes and in moderating environmental value-attitude consistency. Along with other external factors, such as normative behaviors, situational conditions (e.g., personal relevance), and direct experience, individual characteristics (including ethnic background, gender, age, etc) are thought to be important external factors in the organization of values, attitudes, and subsequent behaviors (Ajzen and Fishbein 1980, Fazio 1986, Zanna and others 1980). External factors are considered key components in that they identify the *specific conditions* under which values influence attitudes and behaviors. Past studies have supported the role of individual characteristics as possible mediating external factors, but have not examined them as potential moderating factors, in the value-attitude relationship. In part, this has occurred because of the confusion between mediating and moderating effects. Indeed, it has been common for researchers to use the terms mediation and moderation interchangeably (Baron and Kenny 1986). Fazio (1986), for example, reports the effect of several external factors (i.e., personal relevance, norms, and direct experience) as "moderators of the attitude-behavior relation" (p. 206), when, in fact, a mediation effect is implied.

A mediating effect occurs when the relationship between two variables is explained by a third external factor (James and Brett 1984). For example, in the case of environmental value-attitude consistency, a mediation effect occurs when values influence attitudes only indirectly through the presence of an external variable, such as gender; i.e., when introduced as an independent variable in the predictive equation, gender accounts for the variance in attitudes that was formerly explained by one's value toward the object. In contrast, "a moderator is a third variable that affects the zero-order correlation between two other variables" (Baron and Kenny 1986, p. 1174). A moderation effect occurs when either the direction of the sign is changed (e.g., from positive to negative) or the magnitude of the correlation is substantially changed. For example, gender may be considered a moderator if the relation between values and attitudes is significantly different (in magnitude and/or direction) for males versus females.

It has been fairly widely reported that females and younger persons have stronger biocentric values and attitudes than males and older persons (e.g., Howell and Laska 1992, Kellert and Berry 1987, Steel and others 1994, Stern and others 1993, Van Liere and

Dunlap 1980). Kellert and Berry (1987), for example, found gender to be the most important demographic influence on wildlife values, for which men demonstrated significantly stronger utilitarian and scientific beliefs, while women had higher moralistic and humanistic beliefs. Steel and others (1994) report higher biocentric values of forests by women ($r = 0.18$, $p < 0.001$) and younger (than older) persons ($r = -0.17$, $p < 0.001$). There is also some evidence that urban residents exhibit stronger pro-environmental values and attitudes than rural residents, on the basis that urbanites are more often exposed to higher levels of environmental degradation (e.g., pollution, traffic congestion, declining air, and water quality) while rural residents are directly dependent on resource-dependent extractive industries such as logging, mining, agriculture. Steel and others (1994), for example, found urban residents (in addition to females and young respondents) exhibited a stronger biocentric attitude than their respective counterparts.

Objectives

The present study addresses the influence of four indicators of population diversity (as external factors) on forest values and environmental attitudes and, specifically, as moderators of the value-attitude relationship. Three objectives were tested:

1. To determine the level of correspondence between general (private and public) values of forests and a general measure of environmental attitudes.
2. To identify differences in forest values and environmental attitudes by age, ethnic background, place of residence, and gender.
3. To examine the moderating effect of age, ethnic background, place of residence, and gender on the forest value-environmental attitude relationship.

Methods

Data Collection

Data were collected for the USDA Forest Service Southern Forest Resource Assessment (SFRA) (as part of the National Survey on Recreation and Environment (NSRE), 2000). The NSRE is a multi-year data collection exercise (which began in December, 1999) to measure recreation participation trends and environmental attitudes in the United States. The intent of the SFRA portion of the NSRE was to measure forest values and environmental attitudes of residents in 13 Southern states of the United States (Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Caro-

Table 1. Modified NEP scale

Item
*Human skill and resources will ensure that we do not make the earth unlivable
Humans are severely abusing the environment
Humans have the right to modify the natural environment to suit their needs
Humans were meant to rule over nature
*Humans will eventually learn enough about how nature works to be able to control it
*If things continue on their present course, we will soon experience a major ecological catastrophe
The balance of nature is delicate and easily upset
*The so-called "environmental crisis" has been greatly exaggerated
We are approaching the limit to the number of people this earth can support
When humans interfere with nature, it often produces disastrous consequences

*Modified item (reworded) from the original NEP.

lina, Oklahoma, South Carolina, Tennessee, Texas, and Virginia). Households in the 13 states were randomly sampled (by telephone number) and selected residents completed a telephone interview, conducted and administered by a human dimensions research lab at a large southern university. Telephone numbers were obtained from Survey Sampling, Inc. (SSI) which provided a random digit dial sample of valid telephone exchanges using a database of "working blocks." A block is a set of 100 contiguous numbers identified by the first two digits of the last four numbers dialed (e.g., in the phone number 542-3367, "33" is the block). A block is termed to be valid if one or more listed telephone numbers are found in that block. Numbers are generated from all eligible blocks in proportion to their density of listed telephone households. Respondents were selected by asking for the resident in the household, over the age of 16 years, with the most recent birthday.

Telephone interviews were conducted using the CATI (computer-aided telephone interviewing) system. The CATI system automatically generates random numbers, assists the interviewer in administering the survey (e.g., ensures skip patterns, responses are in legitimate ranges, etc), and aids in scheduling telephone callbacks.

Variables

Environmental attitude. General environmental attitude was measured using a modified (10-item) version of the New Environmental Paradigm (NEP) scale (Dunlap and Van Liere 1978) (Table 1). Two of the original NEP items (related to plants and animals and a space-

ship earth phenomenon) were dropped because of confusing terminology: in an empirical test of the scale, Noe and Snow (1990) report that, "these concepts are more difficult for the public to comprehend because they are predicated on a more technically based knowledge of ecology and economics. Such concepts are also perceived as ethereal" (p. 24). An additional two items (concerning a steady state economy and industrial growth) were reworded in an attempt to improve comprehension. Finally, gender-bias terminology was removed from the original NEP scale (for example, the term "mankind," was replaced by "humans"). The final 10-item scale (Table 1) represents a modified NEP, yet retains an overall measure of environmental concern. Indeed, some researchers (e.g., Pierce and others 1987) have argued that the number of items in the NEP scale could be reduced by as much as one-half and still not suffer loss of precision. The 10 items in the modified NEP scale were rated on a five-point response scale from "strongly agree" to "strongly disagree" with a midpoint of "neither." Possible scores ranged from 10 (representing a highly favorable attitude) to 50 (representing a highly unfavorable attitude).

Forest values. Assigned values toward public and private forests were measured using the four objects of forests proposed by Xu and Bengston (1997): wood products (a utilitarian object), clean air (a life support object); scenic beauty (an aesthetic object), and heritage (a spiritual object). Respondents were asked to rank these four object values in their relative order of importance from highest (i.e., most important) to lowest (i.e., least importance) for (a) private forests and (b) public forests. The highest ranked object was given a score of one and the least important object was given a score of four. The four items were randomly ordered before being read to each respondent so as to avoid any order bias.

External factors. Four indicators of population diversity were measured, age, ethnic background, place of residence, and gender. For the purpose of testing a moderation effect, the variables were categorized as followed: age (less than 43 years old and 43 years old and greater), ethnic background (white and non-white), place of residence (urban and non-urban), and gender (male and female). A cut-off of 43 years was selected for age as this represented the median value of the sample. (Although age was measured as an interval level variable, it was reduced to two categories in order to test for a moderating effect.) Non-urban included rural households and those living near, but not in, urban areas.

Analysis

All three objectives were tested using SPSS/PC+ Version 9.0, with a significance level of $p < 0.05$. Missing cases were deleted using the pairwise command in SPSS; i.e., cases were eliminated from the computation of a single coefficient if one or both of the variables had a missing value. For objective 1, the stepwise multiple regression procedure was used to examine the relation between scores on the NEP with rankings (from 1 to 4) on (a) each of the four private forest values (wood products, clean air, scenic beauty, and heritage) and (b) each of the four private forest values. Objective 2 was tested using two different ANOVA procedures. For the modified NEP scale, a one-way ANOVA was used to identify differences in environmental attitudes among each multicultural indicator (age, ethnic background, place of residence, and gender). For the forest objects, a MANOVA (Multivariate ANOVA) was used to examine differences in the four forest values for each of the four indicators of population diversity. A multivariate procedure was used because it was presumed that the forest values objects together measured a general forest values scale. The Multivariate F-test and Pillai's Trace were reported for examining overall group differences. For significant Multivariate F-tests, post-hoc comparisons were made using the Scheffe test. The Scheffe post-hoc comparison was selected because it is relatively insensitive to departures from normality and homogeneity of variance, and applicable to groups with unequal size (Hays 1988).

To test for a moderation effect (objective 3), a comparison of the value-attitude correlation coefficients for the various levels (categories) of each moderator (e.g., male versus female) was performed using Fisher's Z-transformation. The procedure (described in greater detail by Shavelson 1988) was as follows: (1) for each of the groups/categories of the moderator (e.g., males and females, whites and non-whites, etc), the correlation between forest values and environmental attitudes was determined, (2) the correlation coefficients were transferred to z-scores, and (3) a test of the difference between the two z-scores was conducted. Ideally, the moderator should be uncorrelated with either the predictor (i.e., values) and/or the criterion (i.e., attitude).

Survey Administration

Data for the 13 Southern states were collected from 548 respondents. Of all the eligible telephone numbers identified in the NSRE (i.e., excluding disconnected, business, and FAX numbers), 50.9% were refusals from "unknown" respondents (i.e., household residents who

could not be identified as having the most recent birthday). (For example, an individual who refused to participate in the survey but did not have the most recent birthday could not be included as a valid respondent regardless of whether they refused or answered the questions.) Furthermore, 17.9% of the eligible telephone numbers were never contacted (i.e., no one answered). By including refusals from known eligible respondents (i.e., household residents known to have the most recent birthday) and deleting the number of "never contacted" numbers, the response rate was 52.3% (this includes partial completes of 3.6%, hearing impaired respondents of 2.0%, callbacks that were never re-contacted of 3.0%, and known eligible refusals of 39.1%).

Results

Descriptive Findings

The sample was 58.3% female, 13.8% non-white, 55.8% urban, and 52.4% were less than 43 years old. A comparison of the sample data with the 1990 population in the 13 southern states shows that the sample does not differ considerably from the population of 51.4% female, 22.9% non-white, 55.0% inside urban area, and 47.0% 16-44 years old (U.S. Bureau of the Census 1990). The slightly higher proportion of (a) females in the sample can be accounted for by the higher number of single female head-of-households (thereby, increasing the chances of females being selected in the survey) and (b) whites in the sample can be explained by the higher percentage of non-white households without telephones.

The modified NEP scale achieved an acceptable level of internal reliability (standard alpha = 0.70) and an overall mean score of 23.75 (for the entire sample), indicating that respondents exhibited a moderately biocentric (versus anthropocentric) attitude. Table 2 shows that wood production and preservation of heritage were the least important values associated with forests, while clean air was the most important value of both private and public forests. Some differences existed between public and private forest values. Wood production was valued more highly for private forests (mean ranking = 2.77) than for public forests (mean ranking = 3.32), while clean air was rated as more important for public forests (mean ranking = 1.51) than for private forests (mean ranking = 1.62). These results suggest that respondents held stronger (i.e., more extreme) values about public than private forests; i.e., they strongly believe that public forests should provide clean air and should not harvest wood, but do not hold such extreme values for private forests.

Table 2. Values of public and private forests

Public Forest Values	<i>n</i>	Mean ¹	Rank	S.D.
To provide wood products	510	3.32	4	.93
To provide clean air	525	1.51	1	.75
To provide scenic quality	521	2.44	2	.97
To provide natural heritage	512	2.69	3	.98
Private Forest Values				
To provide wood products	498	2.77	3	1.20
To provide clean air	525	1.62	1	.78
To provide scenic quality	521	2.65	2	1.00
To provide natural heritage	512	2.91	4	.96

¹The four forest values (wood products, clean air, scenic beauty, and heritage) were ranked from most (¹) to least (⁴) importance.

Table 3. Test of the difference in forest values and environmental attitude by age

Public Forest Values	< 43 years (<i>n</i> = 115) ¹		> 42 years (<i>n</i> = 86) ¹		F	<i>p</i>
	Mean	S.D.	Mean	S.D.		
Wood products	3.30	0.85	3.34	0.93	0.12	0.73
Clean air	1.50	0.75	1.66	0.79	2.32	0.13
Scenic quality	2.47	1.08	2.31	0.92	1.16	0.28
Natural heritage	2.73	0.93	2.67	1.10	0.15	0.70
Private Forest Values						
Wood products	2.94	1.15	2.44	1.26	8.47	<0.01
Clean air	1.59	0.72	1.70	0.84	0.92	0.34
Scenic quality	2.57	1.05	2.73	0.93	1.24	0.27
Natural heritage	2.90	0.95	3.13	0.89	3.10	0.08
Environmental Attitude						
Modified NEP	23.57	6.68	23.90	6.85	0.32	0.57

¹*n* is lower than the original sample size because of missing values.

Objective 1

The general environmental attitude measure was significantly correlated with two of the four forest objects, wood production ($r = -0.20$ and -0.15 for private and public forests, respectively) and clean air ($r = 0.23$ and 0.22 , for private and public forests, respectively). Cultural heritage and scenic values were unrelated to the modified NEP scale. Results provide partial support for the cognitive hierarchy approach, in which values are related to attitudes.

Objective 2

The multivariate tests were significant for the four forest values (wood products, clean air, scenic quality, and natural heritage) by each of the four indicators of population diversity: Age (Pillais = 0.093, $F = 3.77$, $p < 0.01$), ethnic background (Pillais = 0.054, $F = 2.69$, $p = 0.014$), place of residence (Pillais = 0.028, F

= 2.20, $p = 0.042$), and gender (Pillais = 0.042, $F = 3.57$, $p < 0.01$). Tables 3–6 show results of the post-hoc comparisons along with descriptive statistics (mean and standard deviation) on environmental attitudes and forest values for each of the indicators of population diversity. Younger persons (less than 43 years old) valued private forests significantly less important for wood production, but there were no other significant differences in values and/or attitudes between the two age groups (Table 3). Non-whites rated public forests as more important for clean air and wood production, but less important for scenery than whites (Table 4). Since non-whites typically visit forests less than whites (National Survey on Recreation and the Environment 1995), one reason for the findings may be that they place a higher value on the indirect utility of forests for wood production and clean air than for direct use such as scenic enjoyment.

Table 4. Test of the difference in forest values and environmental attitude by ethnic background

	Non-white (<i>n</i> = 87) ¹		White (<i>n</i> = 370) ¹		F	<i>p</i>
	Mean	S.D.	Mean	S.D.		
Public Forest Values						
Wood products	3.14	1.00	3.36	0.89	4.03	0.04
Clean air	1.33	0.62	1.55	0.76	6.12	0.01
Scenic quality	2.77	0.92	2.39	0.97	11.14	<0.01
Natural heritage	2.76	0.94	2.71	1.01	0.20	0.65
Private Forest Values						
Wood products	2.89	1.14	2.77	1.21	0.65	0.42
Clean air	1.56	0.80	1.64	0.78	0.68	0.41
Scenic quality	2.63	1.04	2.67	0.99	0.12	0.73
Natural heritage	2.92	0.91	2.92	0.96	0.01	0.98
Environmental Attitude						
Modified NEP	23.42	7.63	23.71	6.57	0.31	0.76

¹*n* is lower than the original sample size because of missing values.

Table 5. Test of the difference in forest values and environmental attitude by place of residence

	Non-urban (<i>n</i> = 272) ¹		Urban (<i>n</i> = 202) ¹		F	<i>p</i>
	Mean	S.D.	Mean	S.D.		
Public Forest Values						
Wood products	3.38	0.86	3.27	0.98	2.95	0.09
Clean air	1.52	0.77	1.47	0.68	0.70	0.40
Scenic quality	2.39	0.97	2.60	0.97	5.90	0.02
Natural heritage	2.71	0.98	2.70	1.00	0.03	0.87
Private Forest Values						
Wood products	2.79	0.81	1.21	1.18	0.01	0.91
Clean air	1.58	0.72	1.68	0.86	1.97	0.16
Scenic quality	2.64	0.98	2.70	1.02	0.35	0.56
Natural heritage	2.98	0.94	2.81	0.97	3.69	0.05
Environmental Attitude						
Modified NEP	24.10	6.98	23.31	6.47	1.87	0.17

¹*n* is lower than the original sample size because of missing values.

With only one exception, there were no significant differences between urban and non-urban residents for all value objects across both private and public forests (Table 5). The single exception was that urban residents rated scenic beauty as a more important object of public forests than non-urbanites. Females demonstrated a significantly lower score on the modified NEP scale, suggesting a stronger pro-environmental attitude than males (Table 6). With the exception that females placed lower importance on private forest wood production than males, there were no other significant differences between males and females on forest values.

Objective 3

Table 7 shows (a) value-attitude correlations and (b) z-scores for tests of the difference in correlations for each of the four forest objects and two forest types (private and public). The indicators of population diversity were generally unrelated to either the forest values and/or the modified NEP (Table 8), supporting the use of the indicators in the test for a moderation effect. Age and ethnic background exhibited some moderation of the value-attitude relationship, while gender and place of residence had very little or no effect.

Value-attitude correspondence was significantly

Table 6. Test of the difference in forest values and environmental attitude by gender

Public Forest Values	Female (<i>n</i> = 273) ¹		Male (<i>n</i> = 201) ¹		F	<i>p</i>
	Mean	S.D.	Mean	S.D.		
Wood products	3.26	0.90	3.40	0.94	2.77	0.10
Clean air	1.45	0.73	1.57	0.73	3.15	0.08
Scenic quality	2.51	0.97	2.43	0.97	0.79	0.38
Natural heritage	2.78	0.99	2.60	0.98	3.96	0.05
Private Forest Values						
Wood products	2.95	1.12	2.60	1.27	10.22	<0.01
Clean air	1.58	0.772	1.68	0.81	1.85	0.17
Scenic quality	2.60	1.03	2.75	0.95	2.50	0.11
Natural heritage	2.86	0.96	2.97	0.94	1.42	0.23
Environmental Attitude						
Modified NEP	23.22	6.45	24.49	7.14	4.71	0.03

¹*n* is lower than the original sample size because of missing values.

Table 7. Correlations and Z-scores of the environmental value–attitude relationship for four indicators of population diversity (age, ethnic background, place of residence, and gender)

	<i>n</i>	Private Forests								Public Forests							
		Wood		Scenery		Clean Air		Heritage		Wood		Scenery		Clean Air		Heritage	
		<i>r</i>	<i>z</i>	<i>r</i>	<i>z</i>	<i>r</i>	<i>z</i>	<i>r</i>	<i>z</i>	<i>r</i>	<i>z</i>	<i>r</i>	<i>z</i>	<i>r</i>	<i>z</i>		
Age																	
16–43 years	122	-0.12	1.34	-0.03	0.28	0.09	2.94 ²	0.12	0.99	-0.26 ²	1.81 ¹	-0.11	0.64	0.14 ¹	1.43	0.25 ²	2.42 ²
43+ years	90	-0.30 ²		0.01	0.40 ²			-0.02	-0.01			-0.20 ¹		0.33 ²			-0.08
Ethnic background																	
Non-white	33	-0.21 ²	0.10	0.06	0.45	0.19 ¹	0.30	-0.01	0.40	-0.50 ²	2.54 ²	-0.09	-0.50	0.16 ¹	-0.40	0.47 ²	2.39 ²
White	177	-0.19 ¹		-0.03	0.25 ²			-0.07	-0.04			-0.19 ¹		0.24 ²			0.03
Place of residence																	
Non-urban	91	-0.18 ¹	0.10	0.01	0.05	0.22 ²	0.10	-0.03	0.54	-0.13	0.10	-0.17 ¹	0.34	0.18 ¹	0.20	0.17 ¹	0.61
Urban	123	-0.20 ²		0.02	0.24 ²			0.08	-0.15 ¹			-0.10		0.22 ²			0.05
Gender																	
Female	126	-0.07	1.92 ¹	-0.02	0.21	0.13	1.27	-0.01	0.99	-0.11	1.26	-0.10	0.49	0.18 ¹	0.70	0.06	1.02
Male	86	-0.33 ²		0.01	0.30 ²			0.13	-0.28 ²			-0.17		0.28 ²			0.20 ²

r = correlation coefficient for value–attitude relationship.

z = Fisher's Z-score for a test of the difference between value–attitude correlations for each multicultural indicator (e.g., females versus males).

n is lower than the original sample size because of missing values.

¹*p* < 0.05.

²*p* < 0.01.

higher and positive with (a) older persons (43 years old and greater) for clean air values of private forests and (b) younger persons (less than 43 years old) for heritage preservation of public forests. In other words, older persons who highly value forests for clean air were more likely to hold pro-environmental attitudes, and younger persons who highly value forests for heritage were more likely to hold pro-environmental attitudes. The value–attitude relationship was significantly higher and negative with younger persons for wood production in public forests; i.e., younger persons who

highly value public forests for wood production were more likely to hold anti-environmental attitudes. In a similar pattern to younger persons, the value–attitude association was (a) significantly higher and positive with non-whites for heritage and (b) significantly higher and negative with non-whites for wood production in public forests. In other words, non-whites who highly value public forests for heritage were more likely to hold pro-environmental attitudes, while non-whites who highly value public forests for wood production were more likely to hold anti-environmental attitudes.

Table 8. Correlations between forest values and environmental attitude for the four indicators of population diversity

	Age r	Ethnicity r	Residence r	Gender r
Public Forest Values				
Wood products	-0.01	0.10	-0.09	-0.06
Clean air	0.10	0.10	-0.04	-0.08
Scenic quality	-0.07	-0.16 ¹	0.09	0.02
Natural heritage	<0.01	-0.03	0.01	0.09
Private Forest Values				
Wood products	-0.20 ²	-0.05	-0.01	0.14
Clean air	0.07	0.04	0.07	-0.07
Scenic quality	0.07	0.02	0.02	-0.08
Natural heritage	0.12	-0.01	-0.09	-0.05
Environmental Attitude				
Modified NEP	0.02	0.02	-0.06	-0.09

Conclusions and Implications

Conclusions

Understanding the basis for a new environmental paradigm shift has been a relatively long-standing social research issue in natural resources management (e.g., Gigliotti 1992, Manfredo and others 1992, Samdahl and Robertson 1989, Van Liere and Dunlap 1980, 1981, Van Liere and Noe 1981, Wall 1995). Over the past several decades, a fundamental shift in forest values has been noted, a shift that has occurred away from a commodity-oriented, anthropocentric position to forest management and toward a more inclusive (i.e., commodity and non-commodity) and bi-centric position. Since its origins in the late nineteenth century, forest management has endorsed a resource conservation philosophy emphasizing wise human use and development of resources, economic dominance over non-economic values, and human control over nature (Bengston 1994, Steel and others 1994). The trend toward a biocentric philosophy of forest management recognizes a broader spectrum of values (which includes, but is not limited to, multiple uses) of forests, the production of human and non-human benefits, and the importance of public involvement in management decisions. Our study supports an emerging biocentric orientation toward the natural environment among the public, but also examines reasons why such a shift may have occurred.

Forest values and environmental attitudes explained.

Within the cognitive hierarchy model, the role of individual characteristics is fundamental in explaining why people hold certain attitudes toward the environment, as well as in improving the predictive validity of environmental values (i.e., the association between values and attitudes). Our study found age and ethnic back-

ground to moderate the relationship between forest values and environmental attitudes, with the strength of the association varying according to ownership of the forests (i.e., private and public) and value category (utilitarian, life support, spiritual, and aesthetic). Place of residence and gender had very little moderating effect on the value-attitude relationship. Consistent with previous studies, females exhibited lower utilitarian values and pro-environmental attitudes than males. Younger persons and whites also reported lower utilitarian values of forests than their respective counterparts.

One explanation for the findings is that lower forest use values and higher pro-environmental attitudes can be attributed to the advent of a post-industrial (or post-material) society that is characteristic of a more diverse population. Steel and Lovrich (1997), for example, suggest "value changes entailing greater attention to post-materialistic needs are thought to have brought about changes in many types of personal attitudes, including those related to natural resources and the environment" (p. 4). A post-industrial society emphasizes "higher-order" needs (such as self-actualization and life-style choices) over subsistence needs (e.g., basic needs and material acquisition) as the motivation for changes in social attitudes and behaviors. As the population of the United States has become increasingly diverse (U.S. Bureau of the Census 1990), post-industrial needs (at least as it concerns values and attitudes toward natural resources) have become reflected in these diverse groups, including gender, age, and ethnic background differences. Younger persons (of both genders) as well as females generally, have become more sympathetic to the non-use and biocentric values of the natural environment.

Value—attitude correspondence explained. Age and to some extent ethnic background potentially moderate the environmental value–attitude relationship, with the magnitude of the effect dependent upon the type of forest (private versus public) and the specific forest value. For non-whites and younger persons, higher utility values (i.e., wood production) of public forests were associated with a stronger anti-environmental attitude, while higher spiritual values (i.e., heritage preservation) of public forests were related to a stronger pro-environmental attitude. For older persons, higher life support values (i.e., clean air) of private forests were associated with a stronger pro-environmental attitude. It is not surprising that individuals who place high value on forests for their human benefit (i.e., wood production) exhibit more anti-environmental attitudes than those who do not place such high value on forest utility. Nor is it surprising that people who value non-use benefits of forests (i.e., for clean air and heritage) demonstrate more pro-environmental attitudes than those who do not place such high value on the non-use of forests. However, the effect of age and ethnic background as possible moderators of these relationships does provide new evidence to support the assertion that environmental values and attitudes are influenced greatly by life experiences (Newhouse 1989).

The racial make-up of America's youth is considerably more diverse than the racial composition of older populations in the United States (U.S. Bureau of the Census 1990). Since younger populations are more likely (than older persons) to be influenced by social trends (e.g., fashion, innovative technologies, and media), it is the ethnically diverse youth who are more likely to display new and emerging attitudes in a post-material society, including biocentrism. The support for biocentrism is manifested as empathy toward the non-use values of forests and against extracting resources from the natural environment. Older persons are probably less likely to favor non-use values of forests because they experienced and grew up with using forests for scenery (e.g., driving for pleasure), recreation and enjoyment, and resource extraction (e.g., timber harvesting). Furthermore, older persons with pro-environmental attitudes are more likely to value forests for clean air than heritage because they are part of the history and heritage of multiple-use (including, timber, mining, grazing, and recreation) management in the United States. In contrast, younger persons inherit the legacy of previous generations which, in the case of forests, means the bequest of a system where extractive uses have modified the forest landscape beyond, what might be considered by some to be, natural.

Limitations

Before considering implications of the study findings, the issue of response rate needs to be re-considered. A proportion of the "unknown" refusals would have included eligible non-respondents (i.e., residents with the most recent birthday). But, because eligibility could not be determined prior to a person's refusal to participate in the survey, the actual number of eligible non-respondents is not known. As a result, it is likely that the response rate is lower than the 52.3% reported here. Bowen (1994) reports that statewide telephone surveys in the U.S. achieve between 35% to 65% response rates, with national surveys obtaining probably much lower rates. The Council for Marketing and Opinion Research (reported by Montgomery 2000) suggests 60% of people hang up or immediately refuse telephone interviews, up from 41% in 1980. The survey response rate for the present study is a function of at least two factors: (1) relatively stringent selection criterion, requiring the person with the most recent birthday to be available at the time of calling and (2) telephone interviews are increasingly difficult to administer because of technological changes in communication (e.g., increasing use of answering machines, personal screening services, caller ID, and Internet connections tying up telephone lines).

Implications

In this study, we measured assigned values toward amenity forest resources. Such values represent resources that the general public value most or least with respect to forests, as opposed to their "held" (i.e., basic) values for happiness, quality of life, etc. The question of whether or not the assigned values that are rated as most important by the public should become the priorities for forest management is an interesting one. Today the dominant environmental paradigm swings in favor of noneconomic values; indeed, in our study public support for clean air, scenic quality, and heritage was much higher than for traditional uses, such as wood products. The implication for forestry is that a more complete understanding of stakeholders' values and attitudes is integral to achieving acceptable decisions about how resources are managed.

Many studies have argued that the key to effective management of natural resources is an understanding of people's relationship to the environment, including their attitudes, and the basis for their attitudes (Fulton and others 1996, Manfredo and others 1995). Along with fiscal constraints, scientific information, management philosophy, and biophysical characteristics of the resource, such values and attitudes, provide an impor-

tant component (representing public preference) in the decision-making process. As natural resource agencies seek to make better and more informed decisions, understanding stakeholder (including the general public's) concerns and preferences is critical to ensuring a more effective and "structured" decision process. The goal of such a structured decision approach is not necessarily to ensure consensus among all parties involved, rather it helps guide the consultation process and increases awareness of participants' values and opinions (Gregory 2000). The fact that these values are likely to differ (and, in some cases markedly, as illustrated in our study) serves to reinforce the need for policy-makers to clearly improve their understanding of the various publics involved. According to Gregory (2000), such differences provide a "source of valuable insights that can lead to a broadly acceptable agreement" (p. 44).

More generally, an understanding of the public's attitudes and values concerning forests, and trends/changes associated with these attitudes and values, equips forest managers to deal with potential conflict, establish policies and goals, and define broad strategies. For example, by managing forests for multiple values (including human and non-human attributes), managers can (a) "develop and implement ecosystem management approaches that are socially and politically acceptable, as well as biologically sound" (Bengston 1994, p. 529); (b) refine measurement techniques to recognize the total (i.e., economic and non-economic) values of forests to society; (c) include a broader spectrum of interested publics in the decision-making process (Tarrant and others 1997); and (d) reduce potential for conflict and resistance to management practices by responding to public views and opinions (Steel and others 1994).

Values are clearly associated with people's differing attitudes toward natural resources. As such, age and ethnic background may play a critical role in improving the prediction of environmental attitudes from underlying values, especially for forests held in the public domain. For managers, planners, and policy-makers in the natural resource arena, this means recognizing fundamental differences among diverse segments of the population. Specifically, acknowledging that younger and older persons as well as whites and non-whites, will likely respond very differently to communication campaigns (including, persuasive appeals, public education, and interpretation efforts) and the solicitation of public support for future agency directives and policy initiatives (including, use versus non-use forest activities). As American society gets older, it is especially important to examine whether age effects on the envi-

ronmental value-attitude relationship are generational (i.e., dependent upon a group or cohort of similar-aged people) or if the relationship changes as a function of age (i.e., as people age they become more conservative in their environmental orientation).

Literature Cited

- Ajzen, I. 1989. Attitude structure and behavior. In A. Pratkanis, S. J. Breckler, and A. G. Greenwald (eds.) *Attitude structure and function*. Lawrence Erlbaum Associates, Hillsdale, NJ.
- Ajzen, I., and M. Fishbein 1980. *Understanding attitudes and predicting social behavior*. Prentice-Hall, Englewood Cliffs, NJ, 278 pp.
- Baron, R. M., and D. A. Kenny. 1986. The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology* 51:1173-1182.
- Bengston, D. N. 1994. Changing forest values and ecosystem management. *Society and Natural Resources* 7:515-533.
- Bengston, D. N., and D. P. Fan. 1999. Roads on the U.S. National Forests. *Environment and Behavior* 31:514-539.
- Bourke, L., and A. E. Luloff. 1994. Attitudes toward the management of non-industrial private forest land. *Society and Natural Resources* 7:445-457.
- Bowen, G. L. 1994. Estimating the reduction in nonresponse bias from using a mail survey as a back-up for nonrespondents to a telephone interview survey. *Research on Social Work Practice* 4:115-128.
- Brown, T. C. 1984. The concept of value in resource allocation. *Land Economics* 60:231-246.
- Brown, G., and C. C. Harris. 1992. The U.S. Forest Service: Toward the new resource paradigm. *Society and Natural Resource* 5:231-245.
- Cramer, L. A., J. J. Kennedy, R. S. Krannich, and T. M. Quigley. 1993. Changing Forest Service values and their implications for land management decisions affecting resource-dependent communities. *Rural Sociology* 58:475-491.
- Dunlap, R. E., and K. D. Van Liere. 1978. The new environmental paradigm. *Journal of Environmental Education* 9:10-19.
- Fazio, R. H. 1986. How do attitudes guide behavior? Pages 204-243 in R. M. Sorrentino and E. T. Higgins (eds.) *The handbook of motivation and cognition: Foundations of social behavior*. Guilford Press, New York.
- Fishbein, M., and I. Ajzen. 1975. *Belief, attitude, intention and behavior: An introduction to theory and research*. Addison-Wesley, Reading, MA.
- Fulton, D. C., M. J. Manfreda, and J. Lipscomb. 1996. Wildlife value orientations. *Human Dimensions of Wildlife* 1(2):24-48.
- Gigliotti, L. M. 1992. Environmental attitudes. *Journal of Environmental Education* 24:15-26.
- Gregory, R. 2000. Using stakeholder values to make smarter environmental decisions. *Environment* 4(5):34-44.

- Hays, W. L. 1988. *Statistics*. Holt, Rinehart, and Winston, Inc., Fort Worth.
- Heberlein, T. A. 1981. Environmental attitudes. *Zeitschrift für Umweltpolitik* 2:241-270.
- Howell, S. E., and S. B. Laska. 1992. The changing face of the environmental coalition: A research note. *Environment and Behavior* 24:134-144.
- James, L. R., and J. M. Brett. 1984. Mediators, moderators, and tests for mediation. *Journal of Applied Psychology* 69:307-321.
- Kellert, S. R., and J. K. Berry. 1987. Attitudes, knowledge and behaviors toward wildlife as affected by gender. *Wildlife Society Bulletin* 15:363-371.
- Manfredo, M. J., S. M. Yuan, and F. A. McGuire. 1992. The influence of attitude accessibility on attitude-behavior relationships; Implications for recreation research. *Journal of Leisure Research* 24:157-170.
- Manfredo, M. J., J. J. Vaske, and D. J. Decker. 1995. Human dimensions of wildlife management: Basic concepts. In R. L. Knight and K. J. Gutzwiller (eds.) *Wildlife and recreationists*. Island Press, Covelo, CA, pp. 17-32.
- Montgomery, R. 2000. *Telephone polls' may be numbered*. <http://www.kcstar.com/com/item/pages/home.pat.local/3774c826.922.html> (November 30).
- USDA Forest Service. 1995. *National Survey on Recreation and the Environment*. Forest Service Southern Research Station, Athens, CA.
- Newhouse, N. 1989. Implications of attitude and behavior research for environmental conservation. *Journal of Environmental Education* 20:27-34.
- Noe, F. P., and R. Snow 1990. The new environmental paradigm and further scale analysis. *Journal of Environmental Education* 21(4):20-26.
- Peterson, G. L., B. L. Driver, and R. Gregory. 1988. *Amenity resource valuation: Integrating economics with other disciplines*. Venture Publishing, State College, PA.
- Petty, R. E., D. T. Wegener, and L. R. Fabrigar. 1997. Attitudes and attitude change. *Annual Review of Psychology* 48:609-647.
- Pierce, J., C. Lovrich, P. Nicholas, and T. Tsurutani. 1987. Culture, politics, and mass publics. *Journal of Politics* 49:54-79.
- Purdy, K. G., and D. J. Decker. 1989. Applying wildlife values information in management: The wildlife attitudes and values scale. *Wildlife Society Bulletin* 17:494-500.
- Rokeach, M. 1968. *Beliefs, attitudes and values: A theory of organization and change*. Jossey-Bass, San Francisco.
- Rokeach, M. 1973. *The nature of human values*. Free Press, New York.
- Rolston, H., and J. Coufal. 1991. A forest ethic and multivalue forest management. *Journal of Forestry* 89:35-40.
- Samdahl, D. M., and R. Robertson. (1989). Social determinants of environmental concern: Specification and test of the model. *Environment and Behavior* 21:57-81.
- Shavelson, R. J. 1988. *Statistical reasoning for the behavioral sciences*. Allyn and Bacon, Needham Heights, MA.
- Steel, B. S., P. List, and B. Schindler. 1994. Conflicting values about federal forests: A comparison of national and Oregon publics. *Society and Natural Resources* 7:137-153.
- Steel, B. S., and N. P. Lovrich. 1997. An introduction to natural resource policy and the environment: Changing paradigms and values. In B. S. Steel (ed.) *Public lands management in the west*. Greenwood Publishing, Westport, CT, pp. 3-15.
- Steinhoff, H. W. 1980. Analysis of major conceptual systems for understanding and measuring wildlife values. In W. W. Shaw and E. H. Zube (eds.) *Wildlife values*. Center for Assessment of Noncommodity Natural Resource Values, Tucson, pp. 11-22.
- Stern, P. C., T. Dietz, and L. Kaloff. 1993. Value orientations, gender, and environmental concern. *Environment and Behavior* 25:322-348.
- Tarrant, M. A., A. D. Bright, and H. K. Cordell. 1997. Attitudes toward wildlife species protection: Assessing moderating and mediating effects in the value-attitude relationship. *Human Dimensions of Wildlife* 2(2):1-20.
- Tarrant, M. A., and H. K. Cordell. 1997. The effect of respondent characteristics on general environmental attitude-behavior correspondence. *Environment and Behavior* 29:618-637.
- Tesser, A., and D. R. Shaffer. 1990. Attitudes and attitude change. *Annual Review of Psychology* 41:479-523.
- U.S. Bureau of the Census. 1990. Look-up web-site. <http://venus.census.gov/cdrom/lookup>.
- Van Liere, K. D., and R. E. Dunlap. 1980. The social bases of environmental concern: A review of hypotheses, explanations and empirical evidence. *Public Opinion Quarterly* 44: 181-199.
- Van Liere, K. D., and R. E. Dunlap. 1981. Environmental concern: Does it make a difference how it's measured? *Environment and Behavior* 13:651-676.
- Van Liere, K. D., and F. P. Noe. 1981. Outdoor recreation and environmental attitudes: Further examination of the Dunlap-Heffernan thesis. *Rural Sociology* 46:505-513.
- Wall, G. 1995. General versus specific environmental concern: A western Canadian case. *Environment and Behavior* 27:294-316.
- Xu, Z., and D. N. Bengston. 1997. Trends in National Forest values among forestry professionals, environmentalists, and the news media. *Society and Natural Resources* 10:43-59.
- Zanna, M. P., J. M. Olson, and R. H. Fazio. 1980. Attitude-behavior consistency: An individual difference perspective. *Journal of Personality and Social Psychology* 38:432-440.