



Exploring the dimensionality and social bases of the public's timber harvesting attitudes

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Received 16 November 2004; received in revised form 1 July 2005; accepted 7 July 2005
Available online 15 August 2005

Abstract

We measured timber harvesting attitudes (THA) of the American public and explored the social bases of these THA by conducting a national random digit dial telephone survey over 2 years (2003 and 2004). We developed three reliable subscales to measure timber harvesting attitudes. Results of this study indicate that, in general, the public is not opposed to timber harvesting, particularly for economic and utilitarian reasons and as a management tool. Analyses of the social bases of THA revealed that the effects of individual demographic characteristics on timber harvesting attitudes varied with motivations for the harvest. While support for harvesting for present benefits differed across categories of income, education, and between republicans and democrats, support for timber harvesting for economic reasons differed across income classes. Support for harvesting as a management tool differed between those who are religious and those who are not. Congruent with previous research, attitudes of the general public do not differ from those of forestland owners. This research provides key findings regarding the public's THA and offers a novel framework through which public attitudes toward timber harvesting may be assessed.

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Keywords: Timber harvesting attitudes; General public; Social bases; Random digit dial survey; Scale development

1. Introduction

With the increasing role and importance of public opinion in forest management planning, improving

our understanding of the public's attitudes towards timber harvesting and forest management in general may be essential to effectively incorporate public opinion into often controversial planning processes. Many questions about the nature and direction of relevant attitudes are raised as issues surrounding the management of both private and public forests gain prominence. In this research, we respond to the following five questions: How can we effectively measure public

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attitudes towards timber harvesting? Are there multiple dimensions that form people's timber harvesting attitudes? What levels of support does the American public hold for timber harvesting? How do these attitudes differ among Americans possessing different socioeconomic characteristics? Do these attitudes differ between those who own forestland and those who do not?

Past research has addressed many of these questions by exploring values (e.g., Manning et al., 1999), value orientations (e.g., McFarlane and Boxall, 2000; Vaske et al., 2001), and attitudes (e.g., Bliss et al., 1994, 1997; Bourke and Luloff, 1994; Broussard et al., 2001; Egan et al., 1997; Harmon et al., 1997) of various groups of individuals with respect to management of private and public forests. Following is a review of the extant literature on attitudes towards timber harvesting and forest management and our own proposal of a timber harvesting attitudes scale to capture the latent constructs therein.

Harmon et al. (1997) described two constructs related to attitudes toward timber harvesting and clearcutting in particular: (i) consequences of clearcutting or harvesting timber and (ii) clearcut acceptance. Despite the deep-seated opposition to clearcutting throughout much of society (Bliss, 2000), Harmon et al. (1997) found that after participation in an educational workshop, respondents became more knowledgeable and accepting of clearcutting as a silvicultural technique. Broussard et al. (2001) employed a revised version of Harmon et al.'s scale to investigate how a series of educational experiences affected forestry attitudes of inner-city youth in Philadelphia. They identified five constructs: (i) against timber harvesting, (ii) utilitarian view of forests, (iii) forest preservation not use, (iv) timber harvesting as a beneficial management tool, and (v) timber harvesting as permanently destroying forests. Students who participated in three cumulative educational experiences were more likely to have a utilitarian view of the forest and see timber harvesting as a beneficial management tool and were less likely to hold anti-harvest attitudes, feel that forests should be preserved not used, or believe that timber harvesting permanently destroys forests.

Other research has proposed additional constructs with regard to attitudes about forests and forestry, including (i) treatment of the forest, (ii) care of the forest, and (iii) responsibility for the forest (Bourke and

Luloff, 1994). Bourke and Luloff (1994) found no attitudinal differences between nonindustrial private forest owners and the general public, a finding congruent with research conducted in the mid-southern USA (Bliss et al., 1994, 1997). In a study of tree farmers and consulting foresters in West Virginia, Egan et al. (1997) grouped timber harvesting attitudes into two major categories: (i) general statements of harvesting and use and (ii) statements on specific harvesting practices and potential outcomes. Although these two surveyed populations appeared to express similar opinions on timber harvesting in general, there were significant differences in their perceptions of clearcutting and outcomes of harvesting, with tree farmers expressing much less support for clearcutting than consulting foresters.

The objectives of this study are to (i) develop an effective scale to measure public attitudes towards timber harvesting and (ii) determine the influence of individual characteristics including gender, race, age, education, income, political ideology and party affiliation, religiosity, region of residence, and forest ownership status on these attitudes.

2. Methods

With the assistance of the Social Research Institute of Purdue University (West Lafayette, IN, USA), we conducted a random digit dial (RDD) telephone survey of US residents in 2002, 2003, and 2004 administered via Computer Assisted Telephone Interview (CATI) facilities. In each year, a random sample of telephone numbers for US adults was purchased from Survey Sampling International (Fairfield, Connecticut, USA). The approximate cost to implement such a survey is US\$ 2000–3000. This cost, however, was largely alleviated in this research as services were provided in kind from the Social Research Institute. In 2003, we obtained 171 completed surveys with an adjusted response rate of 42.5%; in 2004, we obtained 173 completed surveys with an approximate response rate of 50.0%. This paper reports on results from 2003 and 2004 only, as the questions in year 2002 served as a pilot study and were revised for subsequent years. Given that there was no predicted temporal effect between years and that sampling techniques and questions were similar for years 2003 and 2004, these databases were pooled for analysis.

When comparing our sample to the US population, differences were noted in race, gender, age, and education (Table 1). Compared to the US population, our sample tended to include, by percentage, more whites and more females. The sample also attained higher education levels than the US population. The median age for the sample was 48.5 years, which is higher than the US median of 35.3 years. This difference may reflect the fact that the US Census age calculation is not restricted to individuals 18 years and older, whereas our sample was restricted to individuals over 18 years of age. The median income range encompassed the median value reported in the US Census for 2000 (US Census Bureau, 2001, 2002).

Analysis was conducted using SPSS/PC, Version 12.0. Individual characteristics examined in this research include: (i) gender, (ii) race, in which categories were condensed as white and non-white (the latter encompassing African American, Asian American, Native American, Latino, and multi-racial individuals), (iii) age, (iv) education, measured with categories of less than high school, high school graduate, vocational/technical training, some college, college graduate, or post-graduate degree, (v) income, comprised of the following ranges: less than US\$ 35,000 (lower income), US\$ 35,000–under US\$ 75,000 (middle income), and US\$ 75,000 and over (upper income), (vi) political party affiliation, represented by categories of democrats, republicans, and independents, (vii) political ideology, represented by categories of conservative and liberal, and (viii) religiosity, a dichotomous response of religious or non-religious. Case studies were conducted with the 2003 data, in which forestland ownership characteristics and the region of the US in which the respondent resided were also examined.

We used a multivariate analysis of covariance (MANCOVA) which allowed the examination of both categorical and continuous independent variables in predicting our continuous dependent variables—the factor scores for each THA subscale. Individual demographics, with the exception of age, were entered into the model as fixed factors, due to their categorical measurement level. Age was entered as a covariate, due to its interval measurement level. Differences in the means of main effects were compared using Bonferroni post hoc tests. Given the unbalanced nature of our design, we report the statistics for Type III sum of squares. The significance level was set at 0.05.

Table 1
Respondent demographics as compared to 2000 US census data

	Sample N = 340	2000 US Census Bureau ^c N = 281,421,906
Race ^a (%)		
White	78.5	69.1
Non-white	21.5	n/a
African-American	n/a	12.3
Asian	n/a	3.6
Native American	n/a	0.9
Hispanic	n/a	12.5
Multi-racial	n/a	2.4
Other	n/a	5.6
Age ^b (median in years)	48.5	35.3
Gender ^c (%)		
Female	62.2	51.7
Male	37.8	48.3
Education ^d (%)		
Less than high school	7.7	19.6
High school degree	19.8	28.6
Vocational/technical degree	13.9	n/a
Some college	26.6	21.0
College degree	21.6	21.8
Professional/graduate degree	10.4	8.9
Income (median)	US\$ 35,000– 75,000	US\$ 41,994
Political party ^f (%)		
Republican	38.6	n/a
Neither (independent)	27.3	n/a
Democrat	34.1	n/a
Political ideology ^f (%)		
Conservative	66.5	n/a
Liberal	33.5	n/a
Religious ^f (%)		
Yes	77.3	n/a
No	22.7	n/a

^a US Census percentages do not total 100 because individuals could have indicated more than one race.

^b Our sample was restricted to individuals aged 18 years of age or older; Census estimate includes all individuals.

^c US Census percentages reflect gender ratio for the population greater than 18 years of age.

^d US Census percentages reflect values for the population greater than 24 years of age.

^e Population value from: <http://www.census.gov/population/www/cen2000/briefs.html>.

^f Additional sample descriptive statistics, unavailable from US Census.

General linear modeling (MANCOVA as applied in this analysis) assumes equality of error variance, as assessed by Levene's test. The Levene's diagnostic test for the first factor score was significant, indicating that the null hypothesis of equal error variances should be rejected. The diagnostic, however, was not significant in the second and third factor scores. We proceeded with analyses as plots of predicted values versus residuals appeared acceptable for all three factors. Lack of fit tests in all three models were not significant, indicating that the models fit the data well.

In 2003, we conducted two case studies to (i) explore how owning forestland might affect attitudes toward timber harvesting and (ii) determine whether there were regional differences in these attitudes. Independent sample *t*-tests were used to examine differences in timber harvesting attitudes between those who own forestland and those who do not. Further, for those individuals owning forestland, we examined how dichotomous responses to questions related to possession of a forest management plan, residency in the same state as forestland, residency within one mile of forestland, owning a vacation home or cabin within one mile of forestland, and acreage class (less than 10 acres versus 10 or more acres) affected timber harvesting attitudes using multivariate analysis of variance (MANOVA). This same technique was also used to examine the relationships between timber harvesting attitudes and region of residence for all respondents in 2003.

2.1. Scale development

The scales used in this research were based on revisions to scales used previously by Broussard et al. (2001) and Harmon et al. (1997). Outside of these studies examining timber harvesting attitudes, no studies to our knowledge have put forth a valid and reliable framework for measuring such attitudes across a national sample over time. Given this paucity, we used exploratory factor analysis by means of principal component analysis (PCA) to determine the dimensionality of the proposed scale for the 2003–2004 combined data. Factors with eigenvalues greater than one were selected using a maximum of 25 iterations. Varimax rotation with Kaiser normalization was used to rotate the matrix orthogonally. The Kaiser–Meyer–Olkin measure of sampling adequacy was 0.775, indicating that the dis-

tribution of values was adequate for factor analysis. Bartlett's test of sphericity was significant ($p < 0.001$), signifying the data are multivariate normal, and thus, appropriate for factor analysis. The anti-image correlation matrix, which contains the negatives of the partial correlation coefficients and is a measure of sampling adequacy for each variable, yielded values between 0.544 and 0.847, demonstrating that adequate samples were drawn with respect to each variable.

Exploratory factor analyses of the attitude items produced three distinct sub-scales, named as follows: (i) harvesting for present benefits, (ii) harvesting for economic and utilitarian reasons, and (iii) harvesting as a management tool (Table 2). These three components accounted for 47.97% of the variance in the data matrix. The overall reliability of the scale was 0.750 (Cronbach's alpha). Items which correlated positively with the "harvesting for present benefits" subscale include the acceptability of harvesting on public and private forests, the freedom of property owners to use forestland as they wish, and the ability for harvesting to improve wildlife habitat; responsibility to future generations correlated negatively with this scale. "Harvesting for economic and utilitarian reasons" was defined by harvesting for economic benefits (both personal and societal) and the provision of forest products such as lumber and paper; the idea that forests should be left untouched by humans loaded negatively. "Harvesting as a management tool" was characterized by items regarding the necessity of forest management, planting trees after harvesting, the role of harvesting in fire prevention, and the benefits of harvesting for overall forest health.

Because the forestland and region of residence case studies questions were asked only in 2003, it was necessary to create factor scores for data collected in this year only. Similar to the combined years database, KMO's measure, Bartlett's test, and anti-image correlation matrix revealed that the data were well-suited to factor analysis. Exploratory factor analysis for the data from 2003 alone revealed a latent factor structure with two subscales, which we describe as: (i) harvesting for multiple benefits and (ii) harvesting as a management tool (Table 3). For the case studies, the first subscale is a combination of the "harvesting for present benefits" and "harvesting for utilitarian and economic reasons" subscales that emerged from exploratory factor analysis conducted on the entire sample (i.e., 2003 and 2004).

Table 2
Rotated component matrix for 13-item timber harvesting attitudes scale (2003–2004 data)^a

Items	Harvesting for present benefits	Harvesting for economic and utilitarian reasons	Harvesting as a management tool
1 It is okay to cut and remove trees from public forest land	0.709	0.227	0.028
2 It is okay to cut and remove trees from private forest land	0.694	0.083	0.228
3 People who own forestland have a right to use it as they see fit	0.526	0.129	−0.056
4 A responsibility of people who own forestland is to take care of it for future generations	− 0.625	−0.129	0.380
5 Forests should be left untouched by humans	−0.319	− 0.627	−0.056
6 Harvesting is good for the economy	0.130	0.737	0.064
7 Forests should be used to produce products such as paper or lumber that humans can use	0.188	0.689	0.145
8 Cutting and removing trees from a forest can improve habitat for wildlife	0.623	0.252	0.161
9 Some forest management by humans is necessary	−0.018	0.176	0.621
10 Cutting and removing trees is sometimes necessary to provide economic profits to the forest owner	0.092	0.623	0.122
11 Cutting and removing trees should be following by planting trees	−0.239	−0.014	0.621
12 When necessary, trees should be cut and removed from forests to prevent forest fires	0.137	0.118	0.670
13 Cutting trees can sometimes be good for a forest	0.277	0.134	0.612

^a Bold values indicate loadings over 0.4, contributing most to latent theme of the subscale.

Cronbach's alpha for the timber harvesting attitudes scale for the case study was 0.788.

Factor scores were calculated for each subscale using the regression method such that mean = 0 and the standard deviation = 1.0 (given that we used prin-

ciple components analysis to extract the factors). This refined approach, as opposed to a coarse approach of summation of items loading greater than 0.50, allowed us to incorporate the weighted influence of all items on each of three subscales (Grice, 2001). Factor scores

Table 3
Rotated component matrix for 13-item timber harvesting attitudes scale (2003 data only)^a

Items	Harvesting for multiple benefits	Harvesting as a management tool
1 It is okay to cut and remove trees from public forestland	0.609	− 0.429
2 It is okay to cut and remove trees from private forestland	0.692	0.018
3 People who own forestland have a right to use it as they see fit	0.454	−0.309
4 A responsibility of people who own forestland is to take care of it for future generations	− 0.427	0.663
5 Forests should be left untouched by humans	− 0.737	−0.027
6 Harvesting is good for the economy	0.616	0.127
7 Forests should be used to produce products such as paper or lumber that humans can use	0.757	0.128
8 Cutting and removing trees from a forest can improve habitat for wildlife	0.575	−0.176
9 Some forest management by humans is necessary	0.166	0.671
10 Cutting and removing trees is sometimes necessary to provide economic profits to the forest owner	0.641	0.187
11 Cutting and removing trees should be following by planting trees	0.106	0.763
12 When necessary, trees should be cut and removed from forests to prevent forest fires	0.388	0.455
13 Cutting trees can sometimes be good for a forest	0.490	0.213

^a Bold values indicate loadings over 0.4, contributing most to latent theme of the subscale.

were calculated for both the entire database and the case study data alone. Outliers were eliminated from the datasets, yielding a total sample size of $n = 340$ for the entire database and of $n = 167$ for the 2003 case studies.

To determine the range of neutrality for each subscale, factor scores were calculated for a series of hypothetical respondents based on the existing factor structure (thus not altering the original factor structure). We first calculated factor scores for each of the subscales for a hypothetical individual who expressed neutral attitudes (response = 3) for all items, which corresponds to overall neutrality. Similarly, we positioned the scores on each of the subscales of two hypothetical individuals who expressed neutral attitudes for every item that dominated (loading of 0.40 or greater) the given subscale, one individual strongly disagreed (response = 1) with every other item and the other individual strongly agreed (response = 5) with every other item. These hypothetical scores correspond to the bounds of the conceptual range of neutrality. We

then used these neutral boundaries to determine the percentage of respondents in our sample who disagreed (i.e., subscale scores fell below the lower bound of neutrality), fell within the range of neutrality, and agreed with each subscale (i.e., subscale scores were above the upper bound of neutrality). We used Z-tests to compare whether sample means differed from the neutral point on the subscales.

3. Results

3.1. Overall trends

Overall, the American public was not opposed to timber harvesting, particularly as a means to obtain economic benefits or when used as a forest management tool. However, most respondents fell within the range of neutrality when asked about timber harvesting in the absence of any specific application or outcome (Table 4). In sum, 38% of respondents disagreed

Table 4
Descriptive statistics for timber harvesting attitudes subscales (2003–2004 data)

Subscale	Neutral score ^a	Range of neutrality ^b	Individuals expressing disagreement (%)	Individuals within neutral range (%)	Individuals expressing agreement (%)
Harvesting for present benefits	0.6212	−0.3044 to 1.5468	38	57	5
Harvesting for economic and utilitarian reasons	−0.90316	−2.0164 to 0.21009	7	42	51
Harvesting as a management tool	−2.39502	−3.04901 to −1.74104	<1	3	97

^a Neutral score computed for a hypothetical respondent who selected “3” (neutral) for all 13 timber harvesting attitude items.

^b Range of neutrality computed for two hypothetical respondents. One respondent selected “3” (neutral) for items that dominated the subscale and 1 (strongly disagree) for the remaining items. The other respondent selected “3” (neutral) for items that dominated the subscale and 5 (strongly agree) for the remaining items.

Table 5
Descriptive statistics for timber harvesting attitudes subscales (2003 data only)

Subscale	Neutral score ^a	Range of neutrality ^b	Individuals expressing disagreement (%)	Individuals within neutral range (%)	Individuals expressing agreement (%)
Harvesting for multiple benefits	−0.92596	−1.45755 to −0.39436	9	19	72
Harvesting as a management tool	−2.15378	−2.53126 to −1.7763	1	3	96

^a Neutral score computed for a hypothetical respondent who selected “3” (neutral) for all 13 timber harvesting attitude items.

^b Range of neutrality computed for two hypothetical respondents. One respondent selected “3” (neutral) for items that dominated the subscale and 1 (strongly disagree) for the remaining items. The other respondent selected “3” (neutral) for items that dominated the subscale and 5 (strongly agree) for the remaining items.

with “harvesting for present benefits,” with 57% falling within the range of neutrality and an additional 5% expressing general agreement. With regard to “harvesting for economic and utilitarian reasons,” 7% of respondents expressed disagreement, with 42% falling with the range of neutrality, and 51% tending to agree. Almost all respondents (97%) agreed with the idea of “harvesting as a management tool,” with only 3% falling within the range of neutrality and less than 1% expressing disagreement. Z-tests indicate that the mean (0) did not differ significantly from neutrality (i.e., the subscale score when all responses = 3) for either “harvesting for present benefits” or “harvesting for economic and utilitarian reasons,” but did for “harvesting as a management tool” ($p=0.0084$). Due to the case studies conducted in 2003, the data collected during 2003 were also analyzed separately, which resulted in a factor structure composed of two subscales (see Section 2). Although the factor structure differed, the public still exhibited support for these subscales (Table 5). Respondents expressed general agreement (72%) for

“harvesting for multiple benefits” with only 9% of respondents disagreeing and 19% falling within the range of neutrality. “Harvesting as a management tool” was again a subscale that received almost unanimous agreement (96%), with only 3% falling within the range of neutrality and 1% expressing disagreement. The mean differed significantly from neutrality for the “harvesting as a management tool” subscale ($p=0.0158$).

In addition to examining the distribution of the composite factor scores, it is useful to examine the distribution of the categorical responses to the 13-items in this timber harvesting attitude scale in the combined years database (Table 6). While respondents generally expressed disagreement with the notion of leaving forests untouched by humans, they overwhelmingly supported the idea of leaving a forest legacy for the future and harvesting for multiple objectives. However, there was a clear distinction as to where this harvesting should occur in that 55.9% disagreed (in general and strongly) with cutting and removing trees from public land, leaving 35.4% in agreement, while

Table 6
Percentages of responses to Likert scale items on the timber harvesting attitudes item scale (2003–2004 data)

	Items	Strongly disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly agree (5)	Total number of responses
1	It is okay to cut and remove trees from public forest land	13.4	42.5	8.7	32.6	2.8	322
2	It is okay to cut and remove trees from private forest land	7.5	31.6	8.4	48.8	3.8	320
3	Cutting and removing trees from a forest can improve habitat for wildlife	5.8	32.0	11.7	47.4	3.1	325
4	People who own forestland have a right to use it as they see fit	2.4	23.9	10.0	53.8	10.0	331
5	A responsibility of people who own forestland is to take care of it for future generations	0.9	4.8	11.7	63.1	19.5	333
6	Harvesting is good for the economy	0.0	11.1	15.1	71.0	2.8	324
7	Cutting and removing trees is sometimes necessary to provide economic profits to the forest owner	2.1	13.5	10.1	69.4	4.9	327
8	Forests should be used to produce products such as paper or lumber that humans can use	0.6	10.4	12.5	72.9	3.7	328
9	Forests should be left untouched by humans	4.9	47.7	16.5	26.0	4.9	327
10	Cutting trees can sometimes be good for a forest	0.9	6.4	5.2	78.0	9.5	328
11	Some forest management by humans is necessary	0.6	3.3	6.9	77.0	12.1	331
12	Cutting and removing trees should be following by planting trees	0.3	0.9	4.5	62.2	32.1	333
13	When necessary, trees should be cut and removed from forests to prevent forest fires	0.3	7.2	9.0	70.0	13.5	333

39.1% disagreed with harvesting on private land, leaving 52.6% in agreement.

3.2. Social bases of timber harvesting attitudes

The overall model for “harvesting for present benefits” was significant ($F = 3.824$, $p < 0.001$), with an R^2 of 0.194 (adjusted R^2 of 0.143) (Table 7). These atti-

tudes differed across categories of income ($F = 6.507$, $p = 0.002$), education ($F = 2.538$, $p = 0.029$), and political party affiliation ($F = 3.568$, $p = 0.030$). The effects of gender, race, political ideology, religiosity, and age were not significant. Post hoc tests indicated that individuals who were in the middle income class tended to be more supportive of harvesting for present benefits relative to those who were in the lower or upper income

Table 7

Results of the multivariate analysis of covariance with age as a covariate: Main effects only (2003–2004 data)

	Present benefits		Economic and utilitarian reasons		Harvesting as management tool	
	Parameter estimates	Mean response scores	Parameter estimates	Mean response scores	Parameter estimates	Mean response scores
Gender						
Female	-0.126	-0.124	-0.180	-0.199	-0.020	-0.152
Male	Ref.	0.002	Ref.	-0.019	Ref.	-0.132
Race						
Non-white	-0.133	-0.127	-0.290	-0.254	-0.221	-0.252
White	Ref.	0.005	Ref.	0.036	Ref.	-0.031
Income						
Less than US\$ 35K	0.008	-0.209a	-0.130	-0.045	-0.299	-0.290
US\$ 35K < US\$ 75K	0.460*	0.243b	-0.453*	-0.368a	-0.153	-0.144
Greater than US\$ 75K	Ref.	-0.217a	Ref.	0.085b	Ref.	0.009
Education						
Less than high school	0.064	-0.167	-0.113	-0.126	0.005	-0.160
High school graduate	0.028	-0.203a	-0.012	-0.025	-0.160	-0.325
Vocational/technical	0.680*	0.450b	-0.238	-0.251	-0.033	-0.198
Some college	0.083	-0.147a	-0.132	-0.145	-0.059	-0.224
College graduate	0.162	-0.069	-0.082	-0.095	0.387	0.222
Post-graduate	Ref.	-0.230	Ref.	-0.013	Ref.	-0.165
Political party						
Republican	0.429*	0.118b	0.100	0.003	-0.049	-0.185
Independent	0.321	0.010	-0.137	-0.234	0.032	-0.104
Democrat	Ref.	-0.311a	Ref.	-0.097	Ref.	-0.136
Political ideology						
Conservative	-0.018	-0.070	0.230	0.006	-0.125	-0.204
Liberal	Ref.	-0.052	Ref.	-0.224	Ref.	-0.079
Religiosity						
Not religious	0.032	-0.045	-0.279	-0.249	-0.352*	-0.318a
Religious	Ref.	-0.077	Ref.	0.030	Ref.	0.034b
Age	0.008		-0.002		0.008	
Intercept	-0.882*		0.551		-0.004	
R^2 (adjusted R^2)	0.194 (0.143)		0.090 (0.032)		0.127 (0.072)	
F Statistic (sig.)	3.824 (<0.0001)		1.568 (0.090)		2.322 (0.005)	

Letters (a and b) indicate significant differences as detected by pairwise comparisons of estimated marginal means, with Bonferroni adjustment for multiple comparisons.

* Significance at $\alpha = 0.05$ with respect to the reference category (Ref.).

classes. In terms of education, post hoc tests indicated that individuals with vocational or technical training were more supportive than individuals with some college or a high school degree. Although the difference in mean scores for those without a high school education and those with post-graduate degrees would suggest significant differences, the 95% confidence intervals for these differences included 0, and thus, they were not significant in the post hoc tests. Republicans were also more supportive of the harvesting for present benefits relative to democrats.

The overall model for the “harvesting for economic and utilitarian reasons” subscale was not significant ($F = 1.568$, $p = 0.090$), with an R^2 of 0.090 (adjusted R^2 of 0.032). Only one individual characteristic was significant in this model: income ($F = 4.069$, $p = 0.018$). Contrary to the first subscale, individuals in the upper income class expressed more support than individuals in the middle income class. The effects of gender, race, education, religiosity, political party affiliation, political ideology, and age were not significant.

Religiosity ($F = 4.924$, $p = 0.027$) was the only significant predictor of attitudes towards “harvesting as a management tool.” Individuals who were religious were more supportive than individuals who were not religious. The effects of gender, race, income, education, political party affiliation, political ideology, and age were not significant. The overall model was significant ($F = 2.322$, $p = 0.005$), with an R^2 of 0.127 (adjusted R^2 of 0.072).

3.3. Case study in 2003

Timber harvesting attitudes of forest owners did not differ from those who do not own forest ($t = 0.240$, $p = 0.811$ for “harvesting for multiple benefits” and $t = -1.471$, $p = 0.143$ for “harvesting as a management tool”). Among those who do own forestland, the overall model for “harvesting for multiple benefits” was not significant ($F = 0.736$, $p = 0.602$); however, the model for “harvesting as a management tool” was significant ($F = 2.721$, $p = 0.038$) with an R^2 of 0.305 (adjusted R^2 of 0.193). Attitudes towards “harvesting as a management tool” differed between individuals who lived in the same state as their forest and those who did not ($F = 10.946$, $p = 0.002$), such that those who live in the same state as their forest were significantly more supportive of harvesting as a management tool than those

who do not. No other characteristics examined in the MANOVA (i.e., possession of a forest management plan, residency within one mile of forestland, owning a vacation home within one mile of forestland, or acreage of forestland ownership) affected support for “harvesting as a management tool.”

A MANOVA was also employed to explore the effect of region of residence on the two timber harvesting attitude subscales. The overall model was not significant for “harvesting for multiple benefits” ($F = 1.081$, $p = 0.368$), whereas the overall model for “harvesting as a management tool” was significant ($F = 4.232$, $p = 0.003$) with an R^2 of 0.106 (adjusted R^2 of 0.081). Individuals residing in the South Atlantic United States (DE, DC, FL, GA, MD, NC, SC, VA, and WV) were less supportive of “harvesting as a management tool” than individuals residing in the Western United States (AK, AZ, CA, CO, ID, HI, MT, NM, NV, OR, UT, WA, and WY).

4. Discussion and conclusions

We posed five questions in our introduction. How can we effectively measure public attitudes towards timber harvesting? Are there multiple dimensions that frame people’s timber harvesting attitudes? We examined three such dimensions in this research through exploratory factor analyses and reliability analyses. By employing exploratory factor analysis, we were better able to understand how the public conceptualizes timber harvesting. This research appears to indicate that one’s perception of and attitude toward timber harvesting depends on the particular motivation behind the harvest. For example, a majority of people expressed support for the two subscales that revealed particular reasons for timber harvesting—for economic reasons and as a means of forest management. These more tangible reasons garnered more support than the first factor, which was largely about the general acceptability of timber harvesting. The latent dimensions of timber harvesting in our proposed scale are more limited than the dimensions we would expect to see in a scale assessing forest management attitudes, or more broadly, attitudes towards forests. In Tarrant et al.’s exploration (2003) of the public value of forests, the authors describe a 12-point scale encompassing three latent factors: protection (e.g., provision of wildlife

habitat), amenity (typified by statements relating to legacy and lifestyle), and outputs (including provision of recreational opportunities and access to raw materials). The authors report that the public holds multiple values for forest ecosystems and tends to favor non-economic over economic values. Our research, however, illustrates that timber harvesting undertaken for economic reasons was acceptable to a majority of respondents. Further, this research demonstrates that there was virtually unanimous support for timber harvesting when employed as a forest management tool.

What levels of support does the American public hold for timber harvesting? In general, most respondents in our sample expressed neutral attitudes towards a scale that defined timber harvesting in generic terms, whereas most were supportive of harvesting undertaken for economic rationale or management motive. Interestingly, although many people supported various aspects of timber harvesting, they also agreed with the notion of a forest legacy for future generations, as related to private land. Although respondents expressed support for maintaining forests as a legacy for the future, a majority was opposed to forest preservation. Thus, the general public seemed to disagree that forests should be left untouched by humans and agreed that some forest management by humans is necessary, such that it provides for future generations.

How do these attitudes differ among people of different demographic characteristics of the United States? We explored literature centered on environmental concern as a means to make sense of the relationships uncovered between timber harvesting attitudes and income, education, political partisanship, and religiosity. Because timber harvesting attitudes are partly based on one's environmental beliefs, we contend that individuals with anthropocentric value orientations and utilitarian beliefs will be more supportive of timber harvesting for present benefits, for economic and utilitarian reasons, and as a management tool. While we did not examine such value orientations or beliefs in our study, in what follows we draw analogies between our results and those that have emerged from the environmental concern literature.

Individuals with vocational or technical training, those with middle incomes, and those affiliated with the republican party tended to agree most with the notion of "harvesting for present benefits;" however, those with middle incomes were least supportive of

"harvesting for economic and utilitarian reasons." When framed as a management tool, harvesting timber was favored more by those who practice or hold a religious belief relative to those who do not. Previous studies have examined the relationships between income, education, religiosity, political party affiliation and environmental attitudes, and value orientations, uncovering patterns generally consistent with those observed in this study. In Guber's (2003) analysis of 1994 National Opinion Research Center (NORC) data, she found that concern for environmental problems is influenced by sociopolitical variables in an expected manner, in that women, those who are better educated, those of a more liberal political ideology, or democrats express more concern for the environment. This follows previous analyses of NORC data by Jones and Dunlap (1992) and Van Liere and Dunlap (1980), who also found similar trends with regard to education, political ideology, and political party affiliation. "Harvesting for present benefits" has underlying anthropocentric and utilitarian philosophies, corresponding to our finding of more support for this concept from republicans and individuals with vocational training. In their study of the influence of demographic characteristics on environmental orientations and normative beliefs about the management of National Forests among Coloradans, Vaske et al. (2001) showed that individuals with higher incomes tend to be more anthropocentric relative to those with lower incomes. Our study found that those with middle incomes express the most support for "harvesting for present benefits," an anthropocentric proclivity. This incongruity may be related to discrepancies in income categories between Vaske et al. (2001) and our study. The highest income level in Vaske et al. (2001) was US\$ 50,000 or more, which overlapped with our middle income category of US\$ 35,000–75,000. Although there is very little research that has examined the relationship between religiosity and environmentalism, Kanagy and Nelsen (1995) found that religious individuals expressed less support for government spending on environmental protection, but they temper this finding by noting that there were no differences between religious and nonreligious individuals with regard to relaxing environmental controls for economic growth or identification as an environmentalist. In our study, religious individuals were more supportive of the "harvesting as a management tool" dimension,

which expresses conservation and anthropocentric ideals. In general, while most studies find some significance among the demographic factors, their influence is relatively modest, having little bearing on various measures of environmental concern. This encourages future research that considers other attributes that may shape such attitudes.

Do timber harvesting attitudes differ between those who own forest and those who do not? Similar to findings of Bourke and Luloff (1994), our case study in 2003 did not reveal any differences in timber harvesting attitudes between those who own forest and those who do not. Contributing to this attitudinal similarity across various types of forest owners are shifting demographics, which include an aging forest owner population (Birch, 1996), an increasing number of forest owners in general (Birch, 1996), and a growing number of previously urban residents (Egan and Luloff, 2000). Ownership is no longer unique to traditional rural residents. In our examination of the attributes of forest ownership for the sub-sample of private forestland owners, we saw that support for “harvesting as a management tool” did not vary according to attributes such as acreage owned or possession of a management plan. We temper the generalizability of this finding with the caveat that we had a small sub-sample size. Nonetheless, if we consider this timber harvesting attitude as a proxy for how private forestland policy might be accepted, then the lack of attitudinal difference raises interesting questions in terms of requirements for participation in current private forest policies which promote conservation and active use of forestland. Our results suggest that smaller landowners and larger landowners, the latter being the target of many of the current public policies (e.g., many programs have a minimum acreage requirement of 10 acres), hold similar attitudes towards harvesting as a management tool, and thus, private forest policies might be equally received by these typically separated classes of landowners. If the goal of policy is to promote the stewardship of as much forestland as possible, perhaps the targets of policy should be broadened to include these smaller landowners, especially as the number of individuals in this ownership category continues to increase. Another link to policy that can be made from this research is the role of forest management plans. Many private forestland policies promote and/or require the development of a formal, written management plan, under the assump-

tion that a written management plan is one means to encourage forest stewardship (e.g., through use of Best Management Practices, with consultation of experts, etc.). Our findings indicate that attitudes do not differ between forestland owners who have a plan and those who do not, which begs the question of the role of these plans: how, if at all, are the plans affecting the use of the forestland (e.g., are they changing timber harvesting attitudes, and thus, patterns of forest use across the landscape)? The question takes on increased importance when we consider that the overwhelming majority of forest landowners do not have forest management plans and fall into the often-neglected smaller-ownership category. This first glance at the similarities in timber harvesting attitudes not only between forestland owners and the general public, but also among forestland owners with regard to various ownership attributes seems to indicate that policies need to appeal to the attitudes of forest owners not solely the attributes of the land they own.

Ewert (1996) writes “. . . understanding the direction and status of various natural resources will increasingly necessitate an improved knowledge of the human activities and driving forces underlying those activities” (p. 6). These activities and forces are shaped by the attitudes and values held by the public for natural resources. This research reveals that people are not necessarily opposed to timber harvesting, but that support is contingent upon the rationale for the harvest. Additionally, the notion of leaving a forest legacy resonates with many individuals, and thus, should be a key consideration and discussion point in forest management planning efforts. However, the public does maintain different attitudes for public and private forests, as evidenced by the mirror-image levels of agreement and disagreement for each of these ownership classes. Given the general disagreement over removing trees from public forestland, effective planning and policies for public forestland management will necessitate dialogue with the public, agency personnel, and key stakeholders. Further, people were overwhelmingly supportive of harvests that are followed up with planting activities. The consideration and implementation of harvesting regimes that include planting or other regeneration improvement efforts will likely be met with increased acceptance from the public. Through this research, we provide key information on the timber harvesting attitudes of the public, which may facilitate

the creation of more effective and efficient institutions for natural resources management in the US.

The scale proposed in this research offers a novel and reliable framework through which to examine public attitudes towards timber harvesting. Although many items used in scale construction were validated in previous research, future research should be conducted to explore additional concepts related to timber harvesting and refine the proposed scale. Further, to examine forest management attitudes, we propose that the scale be expanded to capture additional dimensions such as regeneration, timber stand improvement, fire management, and pest control. It is also noteworthy that this scale examines the attitudes held by the public, not the underlying values. Previous work has demonstrated the role of value orientations, such as biocentrism and anthropocentrism, in shaping forest management preference (Steel et al., 1994; Vaske et al., 2001). Individuals of a more biocentric orientation were more likely to support forest management policies that pursue a protectionist and preservationist course, rather than a traditional management approach (Steel et al., 1994). This work examines attitudes, that is, the application of such underlying values to specific scenarios. Future research should incorporate statements of both values and attitudes to further assess forest management opinions of the public.

Acknowledgements

The authors gratefully acknowledge the many contributions of Purdue University graduate research assistants Karen Cox, Christine Mathenge, and Solange Muñoz Eifler, as well as Dr. John Stahura of the Social Research Institute at Purdue University. We thank Jessica Janota and two anonymous reviewers for thoughtful comments on an earlier draft of this manuscript.

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