

PUBLIC ACCEPTABILITY OF FOREST MANAGEMENT PRACTICES AT MORGAN-MONROE STATE FOREST

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Abstract.—Forest management practices on public forests are controversial with many organizational and individual stakeholders. Forest managers' understanding of the attitudes of stakeholders is necessary to honor statutory requirements and the social contract under which they operate. The human dimension component of the Hardwood Ecosystem Experiment (HEE) in Indiana included a study of recreationists' and neighboring landowners' forest management attitudes by examining the acceptability of alternative management practices on Morgan-Monroe State Forest (MMSF) before and after providing brief explanations of alternative management practices. An on-site survey of recreationists and a mail survey of landowners neighboring MMSF were used. Both surveys also included an investigation of the influence of information about timber management practices on respondents' attitudes.

As expected, as forest stand density increased, so did the acceptability of management practices, desirability of forest scenes, and likelihood of visiting managed forests for both recreationists and neighboring landowners. Results indicate that informational interventions had a statistically significant influence on the acceptability of forest management practices, but the practical change in attitudes was small. Ordinal regression models indicated that landowner attitudes about the benefits derived by harvesting timber had a small influence on the acceptability of some treatments. It is arguable whether the increase in the acceptability of forest practices resulting from informational intervention is large enough to change stakeholders' positions regarding how MMSF should be managed.

INTRODUCTION

To increase understanding of residents in the Midwest relative to forest management on public land, the present study used survey methodologies to examine stakeholder acceptability of alternative management practices on Morgan-Monroe State Forest (MMSF) by examining the influence of information, values, and

visual characteristics on acceptability of specific forest management practices (Rogers 2008).

This research is part of a larger long-range study, the Hardwood Ecosystem Experiment (HEE), being conducted at MMSF (Kalb and Mycroft, this publication). A variety of forest management techniques that involve timber harvesting are being studied. This study provided an opportunity to analyze the acceptability of these techniques. Furthermore, because the HEE was designed to provide detailed cause-and-effect information about forest management practices, interested parties will be able to make scientifically informed judgments about these practices.

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Managers of public forest land are charged with implementing forest management techniques that maintain healthy ecosystems and provide for the benefit of forest stakeholders. The mission statement of the Indiana Department of Natural Resources (IDNR)-Division of Forestry (DoF) charges its staff to “serve as stewards of natural, cultural, historic, and recreational resources for the benefit of present and future generations” (IDNR-DoF n.d.). Although Indiana does not statutorily require the DoF to use a formal public participation process, a broad communications program is conducted to make the general public and forest users aware of management plans and specific activities. DoF foresters recognize that they manage forest land as a public trust for current and future generations. Using stakeholder attitudes to inform forest management allows for a social and ecological balance in decisions. “Social acceptability ... can be used to define a target for managers to strive for, or a threshold of tolerance they dare not fall below” (Brunson 1993: 119).

Even-aged management, commonly referred to as clearcutting, remains especially controversial as a silvicultural treatment. Studies in several states confirm objections to clearcutting. Private forest landowners and the general public in Pennsylvania favored banning clearcutting altogether (Bourke and Luloff 1994). A study in the Tennessee Valley region found that only 14 percent of private forest owners and the general public felt that clearcutting on public forest land is appropriate (Bliss et al. 1994). Oregonians and stakeholders nationwide agreed that clearcutting should be banned on federal land (Shindler et al. 1993). However, professionally trained foresters generally agree that even-aged management is required to maintain the range of successional stages that would exist under natural conditions (Egan 2001, Egan et al. 1997).

Opposition to even-aged management by “casual viewers of forestry activities” is aesthetically driven (Bliss 2000). Members of a variety of organization

types in western Washington and Oregon were surveyed by Ribe and Matteson (2002) to find out their views of forest management practices. They categorized respondents into three interest groups: utilitarians desiring forest products from public lands, forest preservationists, and those who support a balance between these two extremes. They also found that even when clearcutting is presented as the safest and most economical harvesting method, most respondents supported minimizing environmental impacts by imposing regulations. Scenic beauty in relation to management acceptability on federal land was the primary determinant. Hikers in the White Mountain National Forest in New Hampshire viewed vistas with no clearcuts as having greater scenic value than those with clearcut areas (Palmer et al. 1995). The greater the cutting intensity in study areas, the less acceptable scenic hikers found it to be. A study of members of natural resource-related organizations indicated that “old forestry,” which includes clearcutting and plantations, is unpopular and that simply hiding such managed areas from view is not favored (Ribe and Matteson 2002).

The National Environmental Policy Act of 1969 and the National Forest Management Act of 1976 encourage federal planners to consider scenic beauty (Ribe 2002). Several studies found that managers assumed that if the public finds the scenery acceptable, then the plan and its environmental impacts may be considered acceptable (Greider and Garkovich 1994, Ribe 2002). However, a problem occurs if the social acceptability of a management practice cannot be inferred from scenic acceptability (Ribe 2002). For example, someone may think that a clearcut forest looks atrocious yet finds clearcutting an acceptable practice based on other rationales. Brunson (1993) suggested that forest management practices are judged cognitively based on personal values, not solely on aesthetics. For example, some who believe nature has intrinsic value may find a muddy area more acceptable if it is used as a mud wallow by elk as opposed to a landing for harvested trees (Brunson 1993).

Fire is used to a limited extent as a management tool on MMSF. Its use is likely to increase, however, making its acceptability relevant. The National Fire Management System requires consideration of impacts on recreation use. Englin et al. (2001) found that visitors to national forests in the Intermountain West desired trail access to burned areas for educational purposes. Kneeshaw et al. (2004) found that visitors to national forests in the West generally accepted letting naturally started fires burn out except when damage to private property was likely. However, Englin et al. (2001) noted that the acceptability of fire as a management tool may differ among regions (Bowker et al. 2008).

Those living near public forest land constitute critical stakeholders. They self-identify as stakeholders and use local ordinances to moderate harvesting activity. As the U.S. population continues to increase and spread more widely over landscapes, conflicts arising from the proximity of forest harvesting to forest neighbors will continue to grow (Shelby et al. 2004). Residents living near Oregon State University's research forest complained to forest managers, community leaders, and the State after harvesting was conducted near residents' property (Shelby et al. 2004). Neighbors were concerned that the aesthetic value of the landscape had declined and their property values and recreational opportunities were diminished. Because the potential for conflicts increases when stakeholders are not informed about forest harvesting activities, communications and improved relationships between forest managers and the public was recognized as an important need (Shelby et al. 2004).

A widely held assumption is that if management goals and public perceptions are competing factors, educating the public will draw the two together (Kearney 2001). The link between information and changes in attitudes, perceptions, knowledge, and behavior is complicated. People with formed opinions or strongly held attitudes might not be receptive to new information, making it difficult to change

their perceptions (Kearney 2001). Hill and Daniel (2008) had college students rate the acceptability and scenic beauty of landscape scenes from public parks and forests in Missouri. Before rating the scenes, participants were provided a message on the ecological benefits of forest openings and of maintaining tree density. The authors concluded that there was not enough evidence to suggest that the information had an effect on the acceptability or scenic beauty ratings.

However, studies by Anderson (1981), Brunson and Reiter (1996), Hodgson and Thayer (1980), Kearney (2001), and Ribe (1999) propose that a person's perception of a forest scene can be influenced by providing information about the scene. A study in California of county park visitors, college students, and residents sampled in a census tract showed that judgments of landscape beauty can be influenced by the meaning assigned to a landscape (Hodgson and Thayer 1980). Scenes with labels implying human influence, such as a "tree farm," were ranked lower than scenes displaying labels with natural meanings, such as forest growth. Anderson (1981) had introductory psychology students at the University of Arizona evaluate landscape scenes, mostly of pine forests, for scenic quality. The appearance of landscape scenes as well as assigned land-use labels affected judgments of scenic quality among the students. "Wilderness area," "national forest," and "national park" labels yielded higher scenic-quality ratings than "recreation area," "leased grazing area," and "commercial timber stand" labels. Ribe (1999) suggested that managers should focus on more than the appearance of a landscape to gain social acceptability because people use cognitive and visual information when perceiving harvests.

Vining and Tyler (1999) suggested that understanding who the interested public is and how to address its conflicting desires can be beneficial in the development of management plans. They noted that understanding the interested public's values, concerns, and desires is "a moral imperative in a democratic

society” (Vining and Tyler 1999: 21). Gobster (1999) suggested that landscape designers have portrayed 17th- and 18th-century paintings in their designs, giving Americans a “naturalistic” interpretation of the landscape. Wood (1988) implied that this portrayal of art furthers the idea that landscapes are static and neat in appearance. This unrealistic ideal may work in parks, but perceptions need to be broadened where ecological values are the primary concern (Tuan 1989).

In the past 40 years, forest management has broadened by supporting nonhuman benefits, such as providing wildlife habitat, and non-market values, as well as supporting human benefits and market values (Tarrant et al. 2003). Support for nonhuman and non-economic benefits can be seen in a study of Vermont residents regarding national forest management by Manning et al. (1999). Most residents viewed aesthetic and ecological values as most important while market values ranked least important. Tarrant et al. (2003) supported this finding by noting that people who have moved to urban areas or who were already residents of urban areas tend to support non-extractive values because they do not have a physical connection to the forest. They suggested that because public values have been shown to change, land managers need relevant and timely information regarding public views about forest management on public lands.

Managers of public land use public hearings to seek public opinions. However, Vining (2004) suggested that a representative public opinion is not always reflected by traditional public hearings. Some citizens are not comfortable voicing their comments in this type of setting. Vining (1992) contended that the strongly voiced opinions of interest groups may be overrepresented, while the views of the broader public may be unknown to land managers (Vining 2004).

Citizens want to be involved with land management decisions that might affect them. In a study of

Oregonians and people from across the United States, Shindler et al. (1993) found that most citizens in both groups support citizen participation in forest policy planning and believe government officials should be most responsive to local affected communities. This finding led the authors to suggest that professionals should not let the dominating views of interest groups overshadow professional assessment of public opinion.

Although there are methods besides surveys, survey research is one technique to obtain the views of the general public (Shindler et al. 1993, Vining 2004). Using surveys is a useful technique because it provides the opportunity to gain a representative public opinion (Shindler et al. 1993, Vining 2004). Because stakeholders of public forests can be affected by management decisions and want to be involved, public land managers should consider those who have a stake in the forest.

Some studies suggest that information may influence acceptability of a management practice (Kearney 2001, Ribe 1999). However, Hill and Daniel (2008) commented that the Kearney (2001) study was inconclusive. Kearney found that information affected forest scene preferences; however, forest treatments after the informational intervention were labeled when the scenes were being judged (Hill and Daniel 2008). The authors suggested that the question of whether information can affect a scenic beauty judgment or a more complex judgment is still an important one for research (Hill and Daniel 2008). Nonetheless, literature on contingent valuation or stated preference has resolved that additional information can have an effect; then the research question is to what extent and in what direction (Cummings and Taylor 1999). The present study attempts to substantiate and build on past findings and provide needed information about acceptability to stakeholders to reduce conflict between them and forest managers in the management of MMSF.

MATERIALS AND METHODS

Two categories of stakeholders were sampled. The proximity of MMSF to the Indianapolis metropolitan area and Indiana University's Bloomington campus provides a large pool of MMSF recreational users, referred to as "recreationists." The large number of private tracts, many touching only one boundary of a MMSF tract or none at all, provides a large pool of neighboring landowners, referred to as "landowners." Essentially the same survey was used for both categories and the same hypotheses tested; therefore, the same analytical procedures were used for both groups. Data were used to assess the impact of information on acceptability of forest treatments and how visual characteristics influence the acceptability, desirability, and likelihood of visiting MMSF. The study also examined whether knowledge of the economic and ecological benefits of timber harvests affected acceptability. Data were analyzed using SPSS 15.0 for Windows (SPSS Inc., Chicago, IL).

Survey Instrument

The survey instrument was a 24-page booklet with color pictures of representative stands post-treatment (see Appendix 1 for survey questions). It contained questions regarding: attitudes about forest harvesting when outputs are identified, acceptability of forest management conditions, desirability of forest scenes, likelihood of visiting a forest area, and demographics. Responses were in the form of a five-option Likert scale: strongly agree, agree, neutral, disagree, and strongly disagree. Participants were asked to respond while thinking of actively managed federal and state-owned forest land in Indiana. Timber management treatments included in the survey were no harvest, single-tree selection, shelterwood, and clearcut. Although not involving harvests, burned forest scenes were also included. The four harvesting treatments were assigned a relative stand density based on trees per hectare. Post-treatment stand densities from lowest to highest were level 1 - clearcut, level 2 - shelterwood, level 3 - group selection, and level 4 - no harvesting. The fire photographs were not ranked

because they do not represent a level of tree removal. The fire scenes were of burned fully stocked stands. Demographic information collected were gender, year of birth, place of residence, frequency of public forest use, and recreational activities pursued.

Informational Intervention

The informational intervention consisted of two to three paragraphs (approximately 180 words) and an adjacent photograph representing the corresponding forest management practice. The informational paragraphs were reviewed by foresters for accuracy and bias. The Flesch-Kincaid grade level for the descriptions ranged from 9.4 to 11.1. Respondents first answered the questions without having read the information paragraphs, "pre-information." They then responded to the same questions after reading the informational paragraphs, "post-information."

Pre- and Post-Intervention Questions

Questions in the pre- and post-information sections referred to color photographs of the five management practices. Participants were asked: "Imagine you were having an enjoyable hike in a forest on public forestland (federal and state owned forestland) in Indiana. At different places along the trail, you stop to look at the landscape on either side. A picture has been taken of each of these scenes you might experience while hiking on the trail. Please answer the following questions about each of these forest scenes as though they were something you saw during your hiking experience." Questions concerning acceptability of forest management conditions, desirability of a forest scene, and likelihood of visiting a forest area accompanied each photograph.

Sampling Methods

Recreational Users

It was impractical to identify MMSF recreationists by sampling the general population in the region. Recreationists self-identified by their presence at parking lots within MMSF. The attitudes of this category were assessed using an on-site survey with mail follow-up.

Surveys were conducted on-site from August to October 2007 by enumerators making personal contact with visitors in parking lots. Although MMSF is open year-round, the fall season was selected because the MMSF manager reported that this is the season of maximum use. Sampling was conducted on Tuesday, Thursday, Friday, and Saturday. Friday was included because many recreationists start their weekend activities on Friday. Weekdays were considered Monday through Thursday, and weekend days were considered Friday and Saturday. Surveys were conducted in variable 5-hour blocks randomly selected in the range of 9 a.m. to 9 p.m. Two hundred seventy-four people were approached at the forest to participate in the survey.

Recreationists could fill out the survey while at the forest or return it later by mail. In the latter case, names and addresses were collected and a reminder postcard sent about a week later. A replacement survey was mailed to non-respondents a week after the postcard was mailed. If the survey was not sent back within that week, a third and final survey was mailed a week after the second survey was sent. Of the 239 recreationists that accepted a survey, 165 respondents returned it (58 during the forest visit, 107 later by mail), yielding a 69-percent response rate.

Neighboring Landowners

The 2,515 owners of land in all Public Land Survey sections, 259 ha (640 acres), bordering all tracts of MMSF were sent a mail survey using the Tailored-Design Method (Dillman 2000). Contact information was obtained from records at the Morgan County and Monroe County assessors' and recorders' offices. Out of the 2,515 survey instruments mailed, 90 were undeliverable and 1,239 completed surveys were returned, a 51-percent response rate. Surveys that were at least 80 percent complete were included in the analysis. Eleven surveys did not meet this criterion. No duplicate cases were found using SPSS software.

Statistical Procedures

Paired-samples t-tests were used to analyze the hypothesis that information had an impact on acceptability of a forest management practice, defined by the level of stand density. Repeated measures one-way analysis of variance (ANOVA) tests with post-hoc Bonferroni adjustment for the number of comparisons were conducted for the four levels of stand density. The density levels were treated as discrete variables.

Logistic regression models were used to test the hypothesis that respondents' level of agreement with the importance of outputs and their demographic profiles were correlated with their acceptance of the specified forest management practices. The basic model was: $\text{Agree}(1-5) = \text{Logistic}(\text{output importance, demographics})$.

Recreational Activity Groupings

Logistic modeling of the acceptability of treatments was facilitated by categorizing recreational activities into two mutually exclusive groups: consumptive-motorized, and non-consumptive-non-motorized. Although the recreationist and adjacent landowner groups were analyzed separately, the recreational activity categorizations were the same. The consumptive-motorized category consisted of: fishing, boating, off-roading (snowmobile or all-terrain vehicle), hunting, and mushroom gathering. The non-consumptive-non-motorized category comprised camping, wildlife viewing, canoeing/kayaking, hiking, biking, picnicking, photography, and horseback riding. Two binary variables resulted, one for the type of recreational activities respondents engaged in, and one for the activities they were engaged in on the day they were invited on-site to participate in the survey. The second variable was not applicable for landowners because they were contacted by mail.

Harvesting Benefits

It was hypothesized that information about the benefits of harvesting timber influenced respondents’ attitudes about harvesting. Two factors were identified using the principal components analysis extraction method with Varimax rotation: acceptability of forest outputs for human benefits, and acceptability of forest outputs for ecological benefits. Cronbach’s alpha was equal to 0.877 for acceptability of forest outputs for human benefits and 0.854 for acceptability of outputs of forests for ecological benefits. These factors explained 56.9 percent of the total variance.

Ordinal logistic regression was used to test the influence of forest outputs on acceptability and desirability of each forest management practice. Strongly agree and agree were combined to form one variable, as were disagree and strongly disagree. Acceptability (or desirability) of each practice was the dependent variable with three ordinal levels: (1) strongly agree and agree, (2) neutral, and (3) strongly disagree and disagree. The independent variables were the acceptability of forest outputs for human and ecological benefits, and acceptability of managing for old-growth forests.

Visual Acceptability

We hypothesized that the visual characteristics of a forest scene were correlated with its acceptability

by both recreationists and landowners. The four scenes presented in the questionnaire (see Appendix 1) represented an associated management practice defined visually by its stand density. Before and after acceptability for the fire scene was not tested because stand density was not representative of this treatment. Respondents were asked to respond to the same questions both before and after the informational intervention included in the questionnaire. Repeated-measures one-way ANOVA with post-hoc Bonferroni adjustment and paired t-tests were used to analyze whether there were differences in acceptability between the before and after levels.

RESULTS
Response and Descriptive Statistics
Recreationists

One hundred sixty-five people returned the survey instrument. Surveys at least 80 percent complete were included in the analysis (N=163). Respondents reported whether they used public forests weekly, monthly, several times per year, or rarely. The typical respondent was a male born in 1962 who had come to MMSF to hike on the day invited to participate in the survey (Table 1).

Table 1.—Demographic profile of recreationists and landowners and participation in outdoor recreation activities.

Recreationists		Landowners	
Characteristic/activity	Percent of respondents	Characteristic/activity	Percent of respondents
Live in a suburb	48	Live in rural area	83
Gender		Gender	
Female	40	Female	38
Male	60	Male	62
Mean year of birth: 1962		Mean year of birth: 1951	
Activity		Activity	
Camping	82.2	Camping	52.8
Fishing	52.1	Mushroom gathering	54.3
Wildlife viewing	57.7	Wildlife viewing	64.5
Hiking	89.6	Hiking	74.6
Picnicking	60.7	Picnicking	50.2

Landowners

Surveys were returned by 1,239 landowners, of whom 1,228 had completed at least 80 percent of the survey. Landowners reported how often they use public forests for recreation: weekly, monthly, several times per year (occasional visitors), or rarely. The most frequent response was several times per year (39.7 percent, $n=1,202$). The typical respondent was a male born in 1951 who lived in a rural area and hiked (Table 1). A majority indicated that they did not feel informed about forest management activities occurring on MMSF (78.1 percent, $n=1,200$). Fifty-two percent reported that the property they owned does not share a border with any parcel of MMSF. This situation results from the high degree of fragmentation of tracts constituting MMSF (Jenkins, this publication).

Stand Density and Acceptability

Repeated measures one-way ANOVA tests for both categories, recreationists and neighboring landowners, revealed that there were significant differences in acceptability of forest management practices between the four levels of stand density, both pre- and post-information at the $p < 0.001$ level (Table 2). Bonferroni comparisons indicated that the means of all four stand density levels were significantly different from each other pre-information. This was also the case except for the recreation category, post-information. For level 2 the means of levels 1 and 3, 1 and 4, 2 and 3, and 3 and 4 were not significantly different. For level 3 the means of 1 and 2, 1 and 4, 2 and 3, and 2 and 4 were not significantly different (Table 2).

Harvesting Benefits and Acceptability

Separate ordinal logistic regression models for both categories were constructed for the acceptability of each treatment pre- and post-information based on the benefits of timber harvesting.

Pre-Information

The pre-information models for the recreationist category for group selection, clearcut, and no harvest were not significant (Table 3). The model for the acceptability of shelterwood treatment (pre-information) was significant ($p < 0.01$) with one significant effect in the model (Table 3). Respondents who disagreed or strongly disagreed with outputs of forests for ecological benefits were 13 times more likely to exhibit a one-unit reduction in acceptability score for shelterwood forest management compared to people who agreed or strongly agreed. The model for acceptability of fire (pre-information) also was significant ($p < 0.05$). There were two significant effects in this model (Table 4): gender and frequency of public forest use. Males were 4 times more likely than females to exhibit a one-level increase in acceptability score for fire management. People who reported using public forests weekly for recreation were 15 times more likely to increase by one level the acceptability for fire management compared to those who reported rarely using public forests for recreation. For the remainder of the logistic models only significant variables are reported for significant models (treatments). See Rogers (2008) for the complete models.

Table 2.—Repeated measures ANOVA for stand density effects on forest treatment acceptability. Treatment groups are recreationists pre-information (Rec-pre) and post-information (Rec-post) and neighboring landowners pre-information (Neighbors-pre) and post-information (Neighbors-post). Level 1 = clearcut, level 2 = shelterwood, level 3 = group selection, level 4 = no harvesting.

Treatment	Means by level				d.f.		MS	F	P
	1	2	3	4	Num.	Denom.			
Rec-pre	2.36 ^a	3.57 ^c	3.22 ^b	4.49 ^d	2.9	454	129.3	151.1	<0.0001
Rec-post	2.72 ^a	3.90 ^b	3.76 ^b	4.44 ^c	2.8	443	91.5	122.2	<0.0001
Neighbors-pre	2.36 ^a	3.51 ^c	3.06 ^b	4.36 ^d	2.9	3,462	882.6	991.0	<0.0001
Neighbors-post	2.75 ^a	3.77 ^c	3.65 ^b	4.27 ^d	2.4	2,893	593.4	517.8	<0.0001

Means with the same lettered superscript are not significantly different at $\alpha = 0.05$.

Table 3.—Significance of ordinal logistic regression model for effects of forest outputs on forest treatment acceptability to recreationists (pre-information). Asterisk (*) values indicate significance at alpha = 0.05.

Model	Group selection	Clearcut	Shelterwood	No harvest	Fire
Model fitting information					
Chi-square	29.177	25.912	38.311	20.799	34.856
d.f.	19.0	19.0	19.0	19.0	19.0
Significance	0.063	0.133	0.005*	0.348	0.015*
Goodness-of-fit					
Pearson					
Chi-square	271.381	252.877	242.22	80.364	269.725
d.f.	251	251	253	255	255
Significance	0.18	0.455	0.676	1	0.252
Deviance					
Chi-square	252.177	221.725	196.505	37.559	230.056
d.f.	251	251	253	255	255
Significance	0.467	0.908	0.997	1	0.867
Test of parallel lines					
Chi-square	10.176	13.312	14.935	18.865	28.462
d.f.	19	19	19	19	19
Significance	0.948	0.822	0.727	0.466	0.075

Table 4.—Parameter estimates for the effects of forest outputs on fire acceptability to recreationists (pre-information). Asterisk (*) values indicate significance at alpha = 0.05.

Independent variable	Estimate	SE	Sig.	OR ^a	Independent variable	Estimate	SE	Sig.	OR ^a
Outputs for ecological benefits					Gender				
Disagree	1.519	1.069	0.155	4.57	Male	1.337	0.394	0.001*	3.81
Neutral or undecided	0.525	0.561	0.349	1.69	Female	Reference			
Agree	Reference				Age				
Outputs for human benefits					Under 25	1.061	1.012	0.294	2.89
Disagree	-0.683	0.598	0.253	1.98	25 to 34	1.159	0.763	0.129	3.19
Neutral or undecided	-0.349	0.509	0.492	1.42	35 to 44	0.080	0.771	0.918	1.08
Agree	Reference				45 to 54	0.653	0.708	0.357	1.92
Old-growth					55 to 64	0.604	0.766	0.430	1.83
Disagree	-0.069	1.047	0.947	1.07	Place you live				
Neutral or undecided	-1.115	0.741	0.133	3.05	Rural	0.475	0.588	0.419	1.61
Agree	Reference				Suburban	-0.214	0.474	0.652	1.24
Consumptive/motorized					Urban	Reference			
No participation	0.531	0.419	0.205	1.70	Public forest use				
Participation	Reference				Weekly	2.677	0.955	0.005*	14.54
Nonconsumptive/motorized					Monthly	0.943	0.782	0.228	2.57
No participation	-0.585	1.550	0.706	1.79	Several times per year	1.228	0.763	0.108	3.41
Participation	Reference				Rarely	Reference			

^a OR is an odds ratio calculated as $e^{|\beta|}$, where β is the coefficient estimate.

For the landowner category, ordinal logistic regression showed significant model fits ($p < 0.01$) pre-information for all treatments (Table 5). However, the no-harvest acceptability model violated the test of parallel lines, negating interpretations. An assumption in ordinal regression is that the effect of the independent variables is the same across all levels of the dependent variable. If this assumption is violated, estimates may be biased (Garson 2006). The significant parameters for the other four treatments were outputs for ecological benefits, human benefits, and age (Table 6).

Post-Information

For the recreationists category, the post-information models for the acceptability of no harvest and fire were not significant ($p > 0.05$, Table 7). The models for group selection, clearcut, and shelterwood were significant. However, the group selection and clearcut acceptability models violated the test of parallel lines. Therefore, the coefficients were not interpreted. The model fit for shelterwood acceptability was significant ($p < 0.01$). People who disagreed or strongly disagreed with outputs of forests for ecological benefits were

71 times more likely to exhibit a one-unit reduction in acceptability score for shelterwood forest management compared with people who agreed or strongly agreed (Table 8).

The landowner models for all five treatments (post-information) were significant ($p < 0.01$, Table 9). However, the no-harvest and fire management acceptability models violated the test of parallel lines. Therefore, the coefficients were not interpreted. For the group selection, clearcut, and shelterwood treatments, people who reported disagreeing or strongly disagreeing with outputs for ecological benefits were 12, 16, and 26 times more likely, respectively, than people who reported agreeing or strongly agreeing to decrease one level of acceptability for these treatments (Table 10). People in the 25 to 34 years of age category were 2.2 and 2.0 times more likely to decrease one level of acceptability for group selection and clearcut treatments, respectively. People had the strongest feelings toward the clearcut treatment, indicated by seven significant variables. This was the case especially for people using public forests weekly.

Table 5.—Ordinal logistic regression model for effects of forest outputs on forest treatment acceptability to neighboring landowners (pre-information). Asterisk (*) values indicate significance at alpha = 0.05.

Model	Group selection	Clearcut	Shelterwood	No harvest	Fire
Model fitting information					
Chi-square	90.598	186.038	279.233	45.941	99.005
d.f.	19	19	19	19	19
Significance	0.000*	0.000*	0.000*	0.001*	0.000*
Goodness-of-fit					
Pearson					
Chi-square	1067.728	1064.728	1171.572	894.398	1077.645
d.f.	1075	1073	1073	1073	1071
Significance	0.557	0.565	0.019*	1	0.437
Deviance					
Chi-square	1115.907	903.565	1042.761	425.368	1069.857
d.f.	1075	1073	1073	1073	1071
Significance	0.188	1.000	0.740	1	0.504
Test of parallel lines					
Null hypothesis					
Chi-square	22.236	9.908	28.199	48.855	27.085
d.f.	19	19	19	19	19
Significance	0.273	0.955	0.080	0.000*	0.103

Table 6.—Estimates of only the significant parameters for the effects of forest outputs on group selection, clearcut, shelterwood, and fire acceptability by neighboring landowners (pre-information). Asterisk (*) values indicate significance at alpha = 0.05.

Independent variable	Estimate	SE	Sig.	OR ^a	Independent variable	Estimate	SE	Sig.	OR ^a
Group selection treatment					Shelterwood				
Outputs for ecological benefits					Outputs for ecological benefits				
Disagree	-1.101	0.242	0.000*	3.01	Disagree	-2.264	0.258	0.000*	9.62
Neutral or undecided	-0.375	0.166	0.024*	1.45	Neutral or undecided	-0.998	0.174	0.000*	2.71
Agree	Reference				Agree	Reference			
Outputs for human benefits					Outputs for human benefits				
Disagree	-0.662	0.180	0.000*	1.94	Disagree	-1.255	0.215	0.000*	3.51
Neutral or undecided	-0.450	0.153	0.003*	1.57	Neutral or undecided	-0.411	0.197	0.037*	1.51
Agree	Reference				Agree	Reference			
Age					Fire				
45 to 54	0.477	0.170	0.005*	1.61	Nonconsumptive/motorized				
55 to 64	0.357	0.165	0.030*	1.43	No participation	-0.606	0.269	0.024*	1.83
Public forest use					Participation	Reference			
Weekly	0.423	0.210	0.044*	1.53	Gender				
Clearcut					Male	0.427	0.132	0.001*	1.53
Outputs for ecological benefits					Female	Reference			
Disagree	-1.126	0.331	0.001*	3.08	Age				
Neutral or undecided	-0.620	0.208	0.003*	1.86	25 to 34	0.961	0.327	0.003*	2.61
Agree	Reference				35 to 44	1.182	0.228	0.000*	3.26
Outputs for human benefits					45 to 54	0.825	0.176	0.000*	2.28
Disagree	-1.536	0.203	0.000*	4.65	55 to 64	0.871	0.170	0.000*	2.39
Neutral or undecided	-1.009	0.158	0.000*	2.74	Public forest use				
Agree	Reference				Monthly	0.476	0.211	0.024*	1.61
Old-growth					Rarely	Reference			
Disagree	0.945	0.268	0.000*	2.57					
Neutral or undecided	0.638	0.194	0.001*	1.89					
Agree	Reference								
Age									
45 to 54	0.678	0.191	0.000*	1.97					
55 to 64	0.390	0.187	0.037*	1.48					

^a OR is an odds ratio calculated as e^{β_i} , where β_i is the coefficient estimate.

Table 7.—Model information for effects of forest outputs on forest treatment acceptability to recreationists (post-information). Asterisk (*) values indicate significance at alpha = 0.05.

Model	Group selection	Clearcut	Shelterwood	No harvest	Fire
Model fitting information					
Chi-square	47.545	36.164	64.857	24.306	28.222
d.f.	19	19	19	19	19
Significance	0.000*	0.01*	0.000*	0.185	0.079
Goodness-of-fit					
Pearson					
Chi-square	259.426	246.914	253.583	74.101	297.371
d.f.	253	255	255	255	249
Significance	0.377	0.63	0.513	1	0.019*
Deviance					
Chi-square	160.196	257.214	118.942	36.284	187.161
d.f.	253	255	255	255	249
Significance	1	0.449	1	1	0.999
Test of parallel lines					
Null hypothesis					
Chi-square	56.768	45.255	26.417	17.061	49.644
d.f.	19	19	19	19	19
Significance	0.000*	0.001*	0.119	0.586	0.000*

Table 8.—Parameter estimates for the effects of forest outputs on shelterwood acceptability to recreationists (post-information). Asterisk (*) values indicate significance at alpha = 0.05.

Independent variable	Estimate	SE	Sig.	OR ^a	Independent variable	Estimate	SE	Sig.	OR ^a
Outputs for ecological benefits					Gender				
Disagree	-4.266	1.092	0.000*	71.24	Male	-0.755	0.600	0.208	2.13
Neutral or undecided	-0.538	0.676	0.426	1.71	Female	Reference			
Agree	Reference				Age				
Outputs for human benefits					Under 25	0.196	1.514	0.897	1.22
Disagree	-1.626	1.010	0.107	5.08	25 to 34	-0.932	1.081	0.388	2.54
Neutral or undecided	-0.654	0.896	0.465	1.92	35 to 44	0.798	1.176	0.497	2.22
Agree	Reference				45 to 54	-0.037	1.089	0.973	1.04
Old-growth					55 to 64	0.053	1.197	0.965	1.05
Disagree	16.825	7410.535	0.998	>100	Place you live				
Neutral or undecided	0.423	1.094	0.699	1.53	Rural	-0.720	0.793	0.364	2.05
Agree	Reference				Suburban	0.015	0.688	0.982	1.02
Consumptive/motorized					Urban	Reference			
No participation	-0.701	0.553	0.205	2.02	Public forest use				
Participation	Reference				Weekly	2.006	1.111	0.071	7.43
Nonconsumptive/motorized					Monthly	1.869	0.993	0.060	6.48
No participation	-31.273	0.000	0.000	>100	Several times per year	2.810	1.042	0.007*	16.61
Participation	Reference				Rarely	Reference			

^a OR is an odds ratio calculated as e^{β} , where β is the coefficient estimate.

Table 9.—Model information for effects of forest outputs on forest treatment acceptability to neighboring landowners (post-information). Asterisk (*) values indicate significance at alpha = 0.05.

Model	Group selection	Clearcut	Shelterwood	No harvest	Fire
Model fitting information					
Chi-square	231.648	361.787	392.417	92.889	52.604
d.f.	19	19	19	19	19
Significance	0.000*	0.000*	0.000*	0.000*	0.000*
Goodness-of-fit					
Pearson					
Chi-square	1116.113	1090.123	1122.712	1150.958	1102.955
d.f.	1071	1077	1073	1073	1067
Significance	0.165	0.384	0.142	0.049*	0.216
Deviance					
Chi-square	970.843	987.737	753.959	553.528	1092.644
d.f.	1071	1077	1073	1073	1067
Significance	0.987	0.975	1	1	0.286
Test of parallel lines					
Null hypothesis					
Chi-square	16.179	18.230	16.899	62.263	38.753
d.f.	19	19	19	19	19
Significance	0.645	0.507	0.597	0.000*	0.005*

Table 10.—Parameter estimates for the effects of forest outputs on group selection, clearcut, and shelterwood acceptability to neighboring landowners (post-information). Asterisk (*) values indicate significance at alpha = 0.05.

Independent variable	Estimate	SE	Sig.	OR ^a	Independent variable	Estimate	SE	Sig.	OR ^a
Group selection					Shelterwood				
Outputs for ecological benefits					Outputs for ecological benefits				
Disagree	-2.445	0.254	0.000*	11.53	Disagree	-3.257	0.282	0.000*	25.97
Neutral or undecided	-1.069	0.182	0.000*	2.91	Neutral or undecided	-1.635	0.201	0.000*	5.13
Agree	Reference				Agree	Reference			
Outputs for human benefits					Outputs for human benefits				
Disagree	-0.630	0.221	0.004*	1.88	Disagree	-1.138	0.294	0.000*	3.12
Age					Agree	Reference			
25 to 34	-0.794	0.329	0.016*	2.21	Consumptive/motorized				
Clearcut					No participation	-0.414	0.209	0.048*	1.51
Outputs for ecological benefits					Participation	Reference			
Disagree	-2.762	0.447	0.000*	15.83	Age				
Neutral or undecided	-0.987	0.184	0.000*	2.68	45 to 54	-0.632	0.255	0.013*	1.88
Agree	Reference								
Outputs for human benefits									
Disagree	-1.706	0.193	0.000*	5.51					
Neutral or undecided	-0.610	0.157	0.000*	1.84					
Agree	Reference								
Age									
25 to 34	-0.715	0.325	0.028*	2.04					
Public forest use									
Weekly	-0.721	0.230	0.002*	2.06					
Monthly	-0.506	0.215	0.018*	1.66					
Rarely	Reference								

^a OR is an odds ratio calculated as e^{β} , where β is the coefficient estimate.

Stand Density and Visitation

Repeated measures one-way ANOVA tests indicated that there were significant differences in the likelihood of visiting a forest between the four levels of stand density pre- and post-information for both recreationists and neighbors (Table 11). Bonferroni comparisons for the recreationist category revealed that means were significantly different ($p < .05$) from each other between three levels of stand density pre- and post-information. The mean difference in stand density from level 2 to level 3 was not significant. Bonferroni comparisons for the neighboring landowner category revealed that all four means were significantly different from each other. Mean likelihood of visiting a forest significantly increased from stand density level 1 to stand density level 2 and again from stand density level 3 to stand density level 4. Pre- and post-information, mean likelihood of visiting a forest significantly increased as stand density increased (Table 11).

Stand Density and Desirability

Repeated measures one-way ANOVA tests indicated significant differences in desirability of forest management practices among the four levels of stand density pre- and post-information for both recreationists and neighboring landowners (Table 12). Bonferroni comparisons revealed that all four means were significantly different from each other pre- and post-information. For both pre- and post-information, mean desirability of a forest management practice significantly increased from stand density level 1 (lowest) to stand density level 2 and again from stand density level 3 to stand density level 4 (highest). The mean desirability of a forest management practice significantly decreased from stand density level 2 to stand density level 3 both pre- and post-information.

Information

Paired-sample t-tests were used to compare the mean pre- and post-information ranking of the acceptability of the five treatments. The rankings were the average Likert scale with 1 being the least acceptable and 5 being the most acceptable. Information increased the ranking of all treatments for both categories ($p < 0.01$) except no harvest (Table 13).

Table 11.—Repeated measures ANOVA for stand density effects on likelihood of visiting forests with different treatments. Treatment groups are recreationists pre-information (Rec-pre) and post-information (Rec-post) and neighboring landowners pre-information (Neighbors-pre) and post-information (Neighbors-post).

Treatment	Means by level				d.f.		MS	F	P
	1	2	3	4	Num.	Denom.			
Rec-pre	2.67 ^a	3.75 ^b	3.53 ^b	4.57 ^c	2.9	457	101.9	144.6	<0.0001
Rec-post	2.77 ^a	3.92 ^b	3.87 ^b	4.58 ^c	2.5	398	111.1	148.4	<0.0001
Neighbors-pre	2.63 ^a	3.58 ^c	3.26 ^b	4.36 ^d	2.8	3,354	675.1	823.2	<0.0001
Neighbors-post	2.76 ^a	3.80 ^c	3.69 ^b	4.37 ^d	2.4	2,818	679.2	702.1	<0.0001

Means with the same lettered superscript are not significantly different at $\alpha = 0.05$.

Table 12.—Repeated measures ANOVA for stand density effects on desirability of treatments. Treatment groups are recreationists pre-information (Rec-pre) and post-information (Rec-post) and neighboring landowners pre-information (Neighbors-pre) and post-information (Neighbors-post).

Treatment	Means by level				d.f.		MS	F	P
	1	2	3	4	Num.	Denom.			
Rec-pre	2.16 ^a	3.42 ^c	2.91 ^b	4.46 ^d	2.9	458	156.9	208	<0.0001
Rec-post	2.40 ^a	3.70 ^c	3.47 ^b	4.42 ^d	2.8	447	122.9	168	<0.0001
Neighbors-pre	2.25 ^a	3.37 ^c	2.81 ^b	4.30 ^d	2.8	3,404	984.6	1199	<0.0001
Neighbors-post	2.44 ^a	3.63 ^c	3.39 ^b	4.29 ^d	2.5	2,933	860.2	863	<0.0001

Means with the same lettered superscript are not significantly different at $\alpha = 0.05$.

Table 13.—Results of paired t tests for changes in ranking of acceptability of treatments pre- and post-information. Results are shown for both recreationists and neighboring landowners.

Treatment	Acceptability ranking		Significance
	Pre-information	Post-information	
Recreationists			
Group selection	3.23 (sd = 1.176)	3.76 (sd = 0.915)	t(160) = 3.787, p<0.001
Clearcut	2.35 (sd = 1.147)	2.71 (sd = 1.192)	t(160) = 3.787, p<0.001
Shelterwood	3.58 (sd = 1.004)	3.89 (sd = 0.870)	t(160) = 3.823, p<0.001
No harvest	4.48 (sd = 0.697)	4.44 (sd = 0.763)	t(160) = 0.489, p>0.05
Fire	3.49 (sd = 1.076)	3.71 (sd = 0.936)	t(159) = 2.855, p<0.01
Neighbors			
Group selection	3.05 (sd = 1.164)	3.65 (sd = 1.032)	t(1210) = 17.657, p<0.001
Clearcut	2.35 (sd = 1.164)	2.75 (sd = 1.311)	t(1213) = 11.260, p<0.001
Shelterwood	3.50 (sd = 1.118)	3.78 (sd = 1.031)	t(1215) = 8.948, p<0.001
No harvest	4.36 (sd = 0.812)	4.27 (sd = 0.879)	t(1207) = 2.964, p<0.01
Fire	3.47 (sd = 1.175)	3.58 (sd = 1.013)	t(1186) = 3.197, p<0.01

DISCUSSION

For recreationists and landowners alike, stand density influenced the acceptability and desirability of forest management practices and likelihood of visiting.

The pattern of acceptability was similar for pre- and post-information ratings. As the forest stand became denser, acceptability increased. Recreationists' acceptability of intermediate density levels was less clear, even reversed in some cases. The relationship for landowners was reversed for intermediate treatments. This idiosyncrasy might have resulted from respondents' difficulty in assessing stand density for intermediate levels. The group selection photographs depicted tree removal that created an opening in the forest. The shelterwood photographs showed dispersed tree removal. Respondents may have felt that the stand

density in the shelterwood was as dense as or more dense than that of the group selection opening because of the differing patterns of tree removal. Brunson and Shelby (1992) found similar results for scenic acceptability. Respondents in their study found old-growth most scenically acceptable and clearcut stands least acceptable, whereas stands with intermediate cutting were in the middle.

Pretesting the instrument with a subsample of recreationists and landowners might have detected misinterpretation of the shelterwood photograph. The instrument was pretested in a focus group of graduate students, and taken by undergraduate and graduate students to determine completion time.

Leaving some trees after a harvest may make the forest more desirable and people more likely to visit, even if stand density is less than that of another area. Tönnes et al. (2004) found that clearcut scenes were increasingly preferred as more trees were shown remaining in the area after harvest, and that respondents preferred retention trees in the form of single mature trees, such as the shelterwood condition in the present study, rather than in groups.

Overall, this study suggests that information about management practices can impact acceptability ratings by recreational users. However, mean ratings did not clearly increase to the next level of acceptability for any forest treatment. The results showed a small but significant increase in acceptability from scenes ranked before information about forest management practices was provided to scenes ranked after the information was provided. Information did not change the order of acceptability. In contrast, information did not change acceptability for the no-harvest scene. This result may reflect the acceptability of this treatment pre-information. The no-harvest treatment was in effect the control treatment. These results contrast with Hollenhorst et al. (1993). They reported that information had little effect on aesthetic preferences, suggesting that some informed participants were more critical of tree damage by gypsy moth (*Lymantria dispar*) while others were more tolerant. In contrast, however, the no-harvest treatment for MMSF was not associated with any forest health issues.

Attitudes about forest outputs influenced the acceptability of some forest treatments. Neighboring landowners who disagreed with harvesting and managing the forest for human benefits were more likely to find group selection, clearcut, and shelterwood management practices less acceptable compared to those who agreed with these uses. This finding was true both pre- and post-information. The information about management practices included benefits other than human benefits. However, neighbors who find these forest management practices

less acceptable may not believe that the other benefits are truly provided by harvesting, or that they outweigh their negative opinions about harvesting for human benefits.

Before forest information was provided, people who were neutral or undecided about harvesting and managing the forest for human benefits were more likely to find group selection, clearcut, and shelterwood management practices less acceptable compared to those who agreed with harvesting and managing for human benefits. However, after information was provided, this finding was true only for clearcutting. The information provided about forest management was apparently sufficient to dissuade those undecided respondents from considering group selection and shelterwood management practices less acceptable than do those who agree with managing the forest for human benefits.

Neighboring forest landowners who disagreed with harvesting or managing the forest for ecological benefits were more likely to find group selection, clearcut, and shelterwood management practices less acceptable compared to those who agreed with harvesting and managing for ecological benefits. This result was observed in both the pre- and post-information cases. This finding suggests that neighboring landowners who disagreed with harvesting for ecological benefits did not believe ecological benefits were provided by harvesting. Thus, they were less accepting of harvesting compared to those who agreed with harvesting for ecological benefits.

People who are neutral or undecided about harvesting or managing the forest for ecological benefits were more likely to find group selection, clearcut, and shelterwood management practices less acceptable compared to those who agree with harvesting or managing for ecological benefits. This was the case pre- and post-information.

As with recreationists, landowners considered no harvesting as the most acceptable forest management practice (Table 2). Group selection, shelterwood, and fire management practices ranged between neutral and acceptable but approached acceptability after information was provided. For both the recreationists and neighboring landowners, information seemed to elicit the greatest increase in acceptability of group selection (Table 2). Clearcutting was unacceptable but approached neutrality post-information. Information about forest management practices had a significant impact on landowner acceptability ratings. Reading information about the forest management practices included in this study led to increased acceptability scores for fire and harvesting practices and slightly lower scores for no harvesting (Table 2), all of which are consistent with a greater appreciation for the value of forest management. After reading the information about all of the forest treatments, respondents may have felt the benefits of harvesting outweighed the benefits of not harvesting.

Visual characteristics of a forest stand were examined in relation to forest treatment acceptability and desirability and recreational behavior. Stand density, the visual characteristic examined in each case, influenced recreationists' acceptability, desirability, and likelihood of visiting a forest. Moreover, the same patterns were evident for all three dependent variables. Acceptability, desirability, and likelihood increased in each case from lowest stand density to highest stand density, but the opposite trend occurred for intermediate stand densities. Respondents most likely were confused about the perceived residual stocking in forest stands with intermediate densities. Because this overall pattern was seen before and after the informational intervention, it is likely that information does not affect the stand density preferred by neighboring forest landowners. Stands with more trees are identified as more acceptable and desirable, and recreationists are more likely to visit them whether or not information is provided. Other studies found the same results: the denser a forest stand, from

clearcuts to old-growth forests, the more scenically acceptable a forest was rated (Brunson and Reiter 1996, Brunson and Shelby 1992). Respondents also viewed intermediate cuttings that have more residual stocking as more acceptable, as Brunson and Shelby (1992) found.

Landowners who disagreed with managing forests for human benefits or ecological benefits were more likely to find group selection, shelterwood, and clearcutting less acceptable than those who agreed with managing for human benefits or ecological benefits, respectively. Respondents were asked to answer questions only about public lands, and those who disagreed with managing for human benefits may have found harvesting less acceptable on public land than on private land. These findings are similar to Bliss et al. (1994) for forest landowners and non-owners in the Tennessee Valley Region. Only a small percentage of respondents agreed that clearcutting should be allowed on public land, compared to a significantly higher proportion who agreed with allowing clearcutting on land owned by paper and lumber companies or individuals. Thus, individuals may believe that clearcutting or other practices should occur elsewhere. In addition, respondents may prefer that the forest be managed for more ecological reasons. Even though information was provided highlighting ecological benefits, these respondents may not believe harvesting is truly necessary to accomplish certain ecological goals. This belief may explain why those who disagree with harvesting for ecological benefits are less accepting of harvesting.

CONCLUSIONS AND RECOMMENDATIONS

The analyses found many similarities between the recreationist and neighboring landowner groups for acceptability of forest management practices, desirability of forest scenes, and likelihood of visiting. The same forest management practices were found

acceptable and unacceptable by both categories. For both categories acceptability increased from lowest stand density to highest stand density. Of the two partial cutting methods, the shelterwood may have appeared to have more residual stocking, resulting in higher preferences. Similarly, respondents in the study by Tönnies et al. (2004) preferred forest scenes with higher tree density.

The present study supports findings by Brunson and Reiter (1996), Ribe (1999), and Kearney (2001), which found that providing information about a forest management practice can affect preferences for those practices. The study is dissimilar to studies by Hollenhorst et al. (1993) and Hill and Daniel (2008), which found that information had little or no effect on scenic beauty preferences or acceptability of forest management practices.

The results of this study support an increased emphasis on outreach activities to explain the purposes of the HEE. Even a nominal amount of unbiased information would be helpful. We assumed that respondents to our survey thought of the information as coming from the managers of MMSF. Increased acceptability may result from in-depth information. The information provided should help stakeholders better understand the practical and scientific bases of treatments, and tradeoffs among them. Dialog with the managing forester and staff would provide an opportunity for stakeholders to understand the benefits and negative consequences of a forest treatment and to answer general questions about the forest management practices applied in the specific forest. The correlation between quality, quantity, and form of education is not known. Additional research should focus on what would be required to switch mean acceptability of the lower-density treatments from unacceptable to acceptable.

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APPENDIX 1.—SURVEY QUESTIONS

Part A: Recreationist Survey Questions

Your Views on Indiana Public Forests

The purpose of this questionnaire is to obtain information about your forest values and attitudes towards management of public forests. This questionnaire is part of a research project being conducted by the Department of Forestry and Natural Resources at Purdue University.

To help us understand the various opinions of landowners, please take a moment to share your views.

This questionnaire is voluntary and anonymous and will take approximately 15 minutes to complete.

No personal information will be collected, so **please do not write your name on the questionnaire.**

If you have questions or want further information, please contact Shannon Rogers at srogers@purdue.edu or Bill Hoover, Ph.D., at whoover@purdue.edu, (765) 494-3580.

Participants must be 18 years of age or older.



For the purposes of this survey, **public forests will include** Federal and State owned forestland in **Indiana** such as National Forests and State Forests (**not** National and State Parks)

When thinking about public forestlands, how important are the following? (Please place an X in the appropriate box.)

The opportunity to enjoy the beauty of nature.

- ☐ Very unimportant
- ☐ Somewhat unimportant
- ☐ No opinion
- ☐ Somewhat important
- ☐ Very important

The opportunity to protect nature in order to ensure human well-being.

- ☐ Very unimportant
- ☐ Somewhat unimportant
- ☐ No opinion
- ☐ Somewhat important
- ☐ Very important

The opportunity to camp, hike, and participate in other recreational activities in nature.

- ☐ Very unimportant
- ☐ Somewhat unimportant
- ☐ No opinion
- ☐ Somewhat important
- ☐ Very important

The opportunity to learn more about nature.

- ☐ Very unimportant
- ☐ Somewhat unimportant
- ☐ No opinion
- ☐ Somewhat important
- ☐ Very important

The opportunity to respect and protect nature and other living things.

- ☐ Very unimportant
- ☐ Somewhat unimportant
- ☐ No opinion
- ☐ Somewhat important
- ☐ Very important

The opportunity to see and experience historical and cultural sites.

- ☐ Very unimportant
- ☐ Somewhat unimportant
- ☐ No opinion
- ☐ Somewhat important
- ☐ Very important

The opportunity to maintain or regain physical health or mental well-being through contact with nature.

- ☐ Very unimportant
- ☐ Somewhat unimportant
- ☐ No opinion
- ☐ Somewhat important
- ☐ Very important

The opportunity for scientists to study nature and ecology.

- ☐ Very unimportant
- ☐ Somewhat unimportant
- ☐ No opinion
- ☐ Somewhat important
- ☐ Very important

The opportunity to think creatively and be inspired by nature.

- ☐ Very unimportant
- ☐ Somewhat unimportant
- ☐ No opinion
- ☐ Somewhat important
- ☐ Very important

The opportunity to get closer to God or obtain other spiritual meaning through contact with nature.

- ☐ Very unimportant
- ☐ Somewhat unimportant
- ☐ No opinion
- ☐ Somewhat important
- ☐ Very important

The opportunity to get timber, minerals, and other natural resources from nature.

- ☐ Very unimportant
- ☐ Somewhat unimportant
- ☐ No opinion
- ☐ Somewhat important
- ☐ Very important

When thinking about public forestlands, how much do you agree or disagree with the following? (Please place an X in the appropriate box.)

It is acceptable to harvest trees from forests to lessen the severity or intensity of forest fires.

- ☐ Strongly disagree
- ☐ Disagree
- ☐ Neutral or undecided
- ☐ Agree
- ☐ Strongly agree

It is acceptable to use forests to produce products such as paper and lumber that humans can use.

- ☐ Strongly disagree
- ☐ Disagree
- ☐ Neutral or undecided
- ☐ Agree
- ☐ Strongly agree

It is acceptable to harvest trees from a forest to provide revenue for the state.

- ☐ Strongly disagree
- ☐ Disagree
- ☐ Neutral or undecided
- ☐ Agree
- ☐ Strongly agree

It is acceptable to manage forests for roads, accommodations, and services to help local tourism businesses.

- ☐ Strongly disagree
- ☐ Disagree
- ☐ Neutral or undecided
- ☐ Agree
- ☐ Strongly agree

It is acceptable for local industries and communities to have access to raw materials on forests.

- ☐ Strongly disagree
- ☐ Disagree
- ☐ Neutral or undecided
- ☐ Agree
- ☐ Strongly agree

It is acceptable for forests to be managed for non-timber forest products.

- ☐ Strongly disagree
- ☐ Disagree
- ☐ Neutral or undecided
- ☐ Agree
- ☐ Strongly agree

It is acceptable to manage forests to protect old-growth forests.

- ☐ Strongly disagree
- ☐ Disagree
- ☐ Neutral or undecided
- ☐ Agree
- ☐ Strongly agree

It is acceptable to harvest trees from a forest if it improves habitat for wildlife.

- ☐ Strongly disagree
- ☐ Disagree
- ☐ Neutral or undecided
- ☐ Agree
- ☐ Strongly agree

It is acceptable to harvest trees from a forest if it improves outdoor recreation opportunities.

- ☐ Strongly disagree
- ☐ Disagree
- ☐ Neutral or undecided
- ☐ Agree
- ☐ Strongly agree

It is acceptable to harvest trees from a forest if it provides jobs and income.

- ☐ Strongly disagree
- ☐ Disagree
- ☐ Neutral or undecided
- ☐ Agree
- ☐ Strongly agree

It is acceptable to harvest trees from a forest to provide income needed to manage forestland in Indiana.

- ☐ Strongly disagree
- ☐ Disagree
- ☐ Neutral or undecided
- ☐ Agree
- ☐ Strongly agree

It is acceptable to harvest trees from a forest to promote forest health and vigor.

- ☐ Strongly disagree
- ☐ Disagree
- ☐ Neutral or undecided
- ☐ Agree
- ☐ Strongly agree

It is acceptable to harvest trees from a forest to promote diversity of tree species in the forest.

- ☐ Strongly disagree
- ☐ Disagree
- ☐ Neutral or undecided
- ☐ Agree
- ☐ Strongly agree

Instructions:

For the next set of questions, **imagine you were having an enjoyable hike in a forest on public forestland** (Federal and State owned forestland) in **Indiana**. At different places along the trail, you stop to look at the landscape on either side. A picture has been taken of each of these scenes you might experience while hiking on the trail. **Please answer the following questions about each of these forest scenes as though they were something you saw during your hiking experience.**



Please place an X in the appropriate box.

How acceptable is the condition of the landscape represented in this scene as part of a publicly owned and managed National or State forest?

- ☐ Very unacceptable
- ☐ Unacceptable
- ☐ Neutral or undecided
- ☐ Acceptable
- ☐ Very acceptable

How desirable is this scene as a site to encounter along a hiking trail?

- ☐ Very undesirable
- ☐ Undesirable
- ☐ Neutral or undecided
- ☐ Desirable
- ☐ Very desirable

How likely are you to visit a forest again if you encountered this scene during your hike?

- ☐ Very unlikely
- ☐ Unlikely
- ☐ Neutral or undecided
- ☐ Likely
- ☐ Very likely



Please place an X in the appropriate box.

How acceptable is the condition of the landscape represented in this scene as part of a publicly owned and managed National or State forest?

- ☐ Very unacceptable
- ☐ Unacceptable
- ☐ Neutral or undecided
- ☐ Acceptable
- ☐ Very acceptable

How desirable is this scene as a site to encounter along a hiking trail?

- ☐ Very undesirable
- ☐ Undesirable
- ☐ Neutral or undecided
- ☐ Desirable
- ☐ Very desirable

How likely are you to visit a forest again if you encountered this scene during your hike?

- ☐ Very unlikely
- ☐ Unlikely
- ☐ Neutral or undecided
- ☐ Likely
- ☐ Very likely



Please place an X in the appropriate box.

How acceptable is the condition of the landscape represented in this scene as part of a publicly owned and managed National or State forest?

- ☐ Very unacceptable
- ☐ Unacceptable
- ☐ Neutral or undecided
- ☐ Acceptable
- ☐ Very acceptable

How desirable is this scene as a site to encounter along a hiking trail?

- ☐ Very undesirable
- ☐ Undesirable
- ☐ Neutral or undecided
- ☐ Desirable
- ☐ Very desirable

How likely are you to visit a forest again if you encountered this scene during your hike?

- ☐ Very unlikely
- ☐ Unlikely
- ☐ Neutral or undecided
- ☐ Likely
- ☐ Very likely



Please place an X in the appropriate box.

How acceptable is the condition of the landscape represented in this scene as part of a publicly owned and managed National or State forest?

- ☐ Very unacceptable
- ☐ Unacceptable
- ☐ Neutral or undecided
- ☐ Acceptable
- ☐ Very acceptable

How desirable is this scene as a site to encounter along a hiking trail?

- ☐ Very undesirable
- ☐ Undesirable
- ☐ Neutral or undecided
- ☐ Desirable
- ☐ Very desirable

How likely are you to visit a forest again if you encountered this scene during your hike?

- ☐ Very unlikely
- ☐ Unlikely
- ☐ Neutral or undecided
- ☐ Likely
- ☐ Very likely



Please place an X in the appropriate box.

How acceptable is the condition of the landscape represented in this scene as part of a publicly owned and managed National or State forest?

- ☐ Very unacceptable
- ☐ Unacceptable
- ☐ Neutral or undecided
- ☐ Acceptable
- ☐ Very acceptable

How desirable is this scene as a site to encounter along a hiking trail?

- ☐ Very undesirable
- ☐ Undesirable
- ☐ Neutral or undecided
- ☐ Desirable
- ☐ Very desirable

How likely are you to visit a forest again if you encountered this scene during your hike?

- ☐ Very unlikely
- ☐ Unlikely
- ☐ Neutral or undecided
- ☐ Likely
- ☐ Very likely

Instructions:

For the next set of questions, **please read the information describing how the forest in each picture is managed.**

Then, **imagine you were having an enjoyable hike in a forest on public forestland** (Federal and State owned forestland) in **Indiana**. At different places along the trail, you stop to look at the landscape on either side. A picture has been taken of each of these scenes you might experience while hiking on the trail. **Please answer the following questions about each of these forest scenes as though they were something you saw during your hiking experience.**

Group Selection Opening

Removal of a few trees to create openings that vary in size from $\frac{1}{2}$ to 5 acres is called group selection. This is an uneven-aged management practice since these group openings are created over time to create small stands of trees in the forest that vary by age as well as size.

The trees in these small openings often can be of several different species which compete for light and moisture with nearby trees. These openings in the forest are placed where trees are damaged, growing slower than normal, or where growth of desired trees is not possible without allowing for more sunlight to reach the forest floor. Treetops and branches from the cut trees provide shelter for wildlife and help prevent soil erosion.



Please place an X in the appropriate box.

How acceptable is the condition of the landscape represented in this scene as part of a publicly owned and managed National or State forest?

- ☐ Very unacceptable
- ☐ Unacceptable
- ☐ Neutral or undecided
- ☐ Acceptable
- ☐ Very acceptable

How desirable is this scene as a site to encounter along a hiking trail?

- ☐ Very undesirable
- ☐ Undesirable
- ☐ Neutral or undecided
- ☐ Desirable
- ☐ Very desirable

How likely are you to visit a forest again if you encountered this scene during your hike?

- ☐ Very unlikely
- ☐ Unlikely
- ☐ Neutral or undecided
- ☐ Likely
- ☐ Very likely

Clearcut

Sometimes, foresters remove all merchantable trees within a stand to create openings 10 to 25 acres in size. This even-aged management practice, called clearcutting, encourages the survival of trees that need full sunlight. An opening this size ensures that the trees surrounding the opening will not shade the sun-loving seedlings in the opening. Trees grow rapidly in these openings with some growing much faster than others creating a stand that varies in size after a few years.

Clearcuts are sometimes used in locations where an entire area of the forest has been damaged by wildfire or storms. They may also be used to correct past activities that left many undesirable trees and plants. The use of clearcut harvests favors the growth of forests dominated by oaks and hickories or ash, cherry, and yellow-poplar.



Please place an X in the appropriate box.

How acceptable is the condition of the landscape represented in this scene as part of a publicly owned and managed National or State forest?

- ☐ Very unacceptable
- ☐ Unacceptable
- ☐ Neutral or undecided
- ☐ Acceptable
- ☐ Very acceptable

How desirable is this scene as a site to encounter along a hiking trail?

- ☐ Very undesirable
- ☐ Undesirable
- ☐ Neutral or undecided
- ☐ Desirable
- ☐ Very desirable

How likely are you to visit a forest again if you encountered this scene during your hike?

- ☐ Very unlikely
- ☐ Unlikely
- ☐ Neutral or undecided
- ☐ Likely
- ☐ Very likely

Shelterwood

Another even-aged practice, called a shelterwood, is the removal of trees from 10 to 25 acres in 2 or 3 stages. The first cut leaves a few trees scattered across the site to provide for the establishment of new seedlings and sprouts. The remaining trees are removed in 3 to 10 years after the new stand is established. The shelterwood practice provides for the growth of tree species that require an intermediate amount of sunlight in the early years of growth.

Leaving a few large trees protects the site as new seedlings grow and helps to prevent erosion. The result is a natural return of a mixture of tree species. Increasing amounts of sunlight reaching the forest floor and the extended supply of seeds from the remaining trees will allow oaks and hickories to compete with other trees that need full sunlight and trees that grow well under the shade of other trees.



Please place an X in the appropriate box.

How acceptable is the condition of the landscape represented in this scene as part of a publicly owned and managed National or State forest?

- ☐ Very unacceptable
- ☐ Unacceptable
- ☐ Neutral or undecided
- ☐ Acceptable
- ☐ Very acceptable

How desirable is this scene as a site to encounter along a hiking trail?

- ☐ Very undesirable
- ☐ Undesirable
- ☐ Neutral or undecided
- ☐ Desirable
- ☐ Very desirable

How likely are you to visit a forest again if you encountered this scene during your hike?

- ☐ Very unlikely
- ☐ Unlikely
- ☐ Neutral or undecided
- ☐ Likely
- ☐ Very likely

Unmanaged

Unmanaged forests generally favor trees such as sugar maple that can reproduce and grow in the shade of other trees. Natural disturbances such as wind throw and fire create openings in the forest that allow trees to grow which require openings with full sunlight. The species of trees in an unmanaged forest will also vary with changes in growing conditions such as dry or wet soils.

Although no trees are cut or removed, unmanaged forests are full of continuous activity and change. Trees of different ages, sizes, and species occur in an unmanaged forest. Once old trees die, they donate their nutrients back to the soil and create small openings in the forest that other trees quickly fill.



Please place an X in the appropriate box.

How acceptable is the condition of the landscape represented in this scene as part of a publicly owned and managed National or State forest?

- ☐ Very unacceptable
- ☐ Unacceptable
- ☐ Neutral or undecided
- ☐ Acceptable
- ☐ Very acceptable

How desirable is this scene as a site to encounter along a hiking trail?

- ☐ Very undesirable
- ☐ Undesirable
- ☐ Neutral or undecided
- ☐ Desirable
- ☐ Very desirable

How likely are you to visit a forest again if you encountered this scene during your hike?

- ☐ Very unlikely
- ☐ Unlikely
- ☐ Neutral or undecided
- ☐ Likely
- ☐ Very likely

Fire

In the past, oaks were present in large numbers in Indiana's forests. They were able to reproduce and grow because of natural and man-made disturbances, such as fire. Fires were set by Native Americans and early European settlers. The fires released nutrients and opened forests to full sunlight needed by oaks and other sun loving species.

Under certain circumstances and in proper places, fire can help achieve certain management goals. For example, fire is used to get rid of fuel that could build up and cause future damaging wildfires. At times, low intensity forest fires can start naturally from dry conditions. Sometimes these isolated fires are allowed to burn unchecked to maintain the natural ecology of an area under certain conditions and in some forests.



Please place an X in the appropriate box.

How acceptable is the condition of the landscape represented in this scene as part of a publicly owned and managed National or State forest?

- ☐ Very unacceptable
- ☐ Unacceptable
- ☐ Neutral or undecided
- ☐ Acceptable
- ☐ Very acceptable

How desirable is this scene as a site to encounter along a hiking trail?

- ☐ Very undesirable
- ☐ Undesirable
- ☐ Neutral or undecided
- ☐ Desirable
- ☐ Very desirable

How likely are you to visit a forest again if you encountered this scene during your hike?

- ☐ Very unlikely
- ☐ Unlikely
- ☐ Neutral or undecided
- ☐ Likely
- ☐ Very likely

Please place an X in all boxes that apply.

What type of outdoor recreational activities do you participate in?

- ☐ Camping
- ☐ Hiking
- ☐ Fishing
- ☐ Hunting
- ☐ Wildlife watching
- ☐ Biking
- ☐ Boating
- ☐ Picnicking
- ☐ Canoeing/kayaking
- ☐ Photography
- ☐ Off-roading (snowmobile or ATV)
- ☐ Mushroom collecting
- ☐ Horseback riding
- ☐ Other _____

What brings you to the Morgan-Monroe State Forest today?

- ☐ Camping
- ☐ Hiking
- ☐ Fishing
- ☐ Hunting
- ☐ Wildlife watching
- ☐ Biking
- ☐ Boating
- ☐ Picnicking
- ☐ Canoeing/kayaking
- ☐ Photography
- ☐ Off-roading (snowmobile or ATV)
- ☐ Mushroom collecting
- ☐ Other _____

How often would you say that you use public forests for recreation?

- ☐ Weekly
- ☐ Monthly
- ☐ Several times per year
- ☐ Rarely

What is your gender?

- ☐ Male
- ☐ Female

How would you describe the place where you live?

- ☐ Rural
- ☐ Suburban
- ☐ Urban

In what year were you born?

Thank you for your time!

APPENDIX 1 (continued).

Part B: Landowner Survey Questions

All pages in the landowner survey are exactly the same as the recreationist survey instrument (Appendix 1, part A) except the last page of the survey, which is shown here.

Please place an X in all boxes that apply.

What type of outdoor recreational activities do you participate in?

- ☐ Camping
- ☐ Hiking
- ☐ Fishing
- ☐ Hunting
- ☐ Wildlife watching
- ☐ Biking
- ☐ Boating
- ☐ Picnicking
- ☐ Canoeing/kayaking
- ☐ Photography
- ☐ Off-roading (snowmobile or ATV)
- ☐ Mushroom collecting
- ☐ Horseback riding
- ☐ Other _____
- ☐ None

How often would you say that you use public forests for recreation?

- ☐ Weekly
- ☐ Monthly
- ☐ Several times per year
- ☐ Rarely

Do you feel informed about forest management activities occurring on the Morgan-Monroe State Forest?

- ☐ No
- ☐ Yes

How would you describe the place where you live?

- ☐ Rural
- ☐ Suburban
- ☐ Urban

Is the property where you live adjacent to the Morgan-Monroe State Forest?

- ☐ No
- ☐ Yes

What is your gender?

- ☐ Male
- ☐ Female

In what year were you born?

Thank you for your time!