

# Assessing Private Forest Owner Attitudes Toward Ecosystem-Based Management

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## ABSTRACT

Nonindustrial private forest owners in Vermont, New Hampshire, and western Massachusetts were surveyed to determine their attitudes toward an ecosystem-based approach to management. In all cases, respondents showed favorable attitudes toward: unique, small-scale ecological features like rare species and wetlands; management at spatial scales larger than the individual parcel; and ownership beyond a single generation. Even nonrespondents, when interviewed on the telephone, indicated attitudes sensitive to these issues. We believe future conservation of nonindustrial private forestland (NIPF) lands will be successful if professionals design management alternatives sensitive to these attitudes and policy makers craft appealing and effective programs that are perceived as relevant.

**Keywords:** ecosystem-based management; private forest owners

Nonindustrial private forest (NIPF) owners hold 58% of the forestland in the United States (423.8 million acres; Birch 1996). By 2050, timber harvests in the United States are expected to increase 24%, or 4.2 billion cubic feet, and much of this volume is expected to come from NIPF lands, because production from public lands has decreased (Adams 2002). The importance of private landowners and timber supply is discussed by Richard W. Haynes in a recent overview of the Resource Planning Act (RPA) Timber Assessment:

*“Over the past decade, policy decisions at state and federal levels have acted to sharply limit the role of public forestlands in the supply of timber. Thus, the future of the U.S. timber supply rests largely with. . . privately owned timberland. As a consequence, there is considerable need to better understand the determinants of timber supply behavior on these lands. . . . At the most basic level we must learn*

*more about private owners’ land-use decisions. To understand the long-term outlook, we must also have some knowledge of the motivations for and extent of private investments in forest management. . . .”*(Haynes 2002)

In a broader context, it is important to understand both NIPF timber supply behavior and owner attitudes toward management because many public benefits associated with forests, such as wildlife habitat and clean water, emanate from private land and occur on spatial scales that transcend individual properties. These benefits depend on a healthy ecosystem at broad spatial and temporal scales (e.g., Allen and Hoekstra 1992, Costanza et al. 1992, Woodley et al. 1993). As private lands become increasingly parcelized or fragmented (DeCoster 2000), an ecosystem-based approach to management on NIPF lands becomes more relevant.

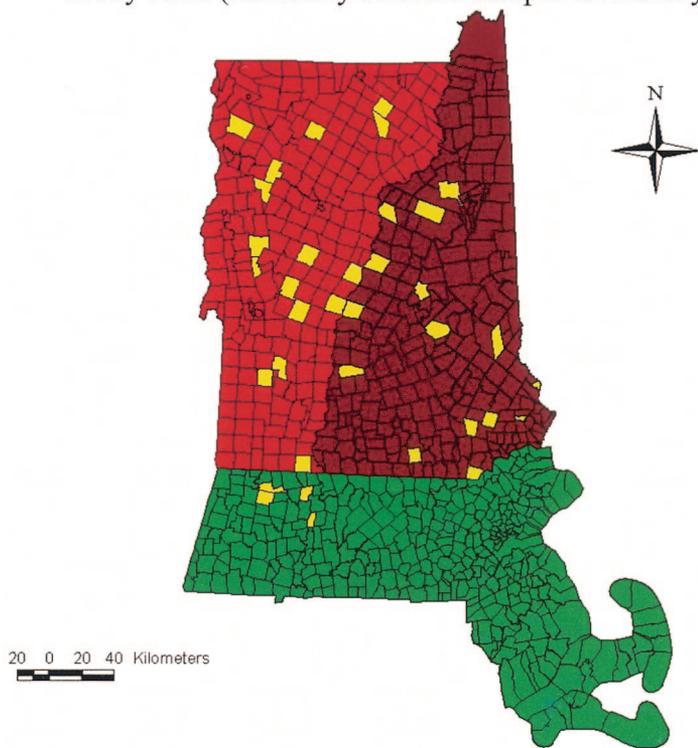
This study updates and expands an ear-

lier analysis by Rickenbach et al. (1998), which explored landowner attitudes toward an ecosystem-based approach to management in western Massachusetts. The purpose of this study is to assess private landowner attitudes in Vermont, New Hampshire, and Massachusetts toward an ecosystem-based approach. An improved understanding of these attitudes can assist managers in addressing landowner concerns and policymakers in reshaping programs to appeal to owners. Birch (1996) reported that 88% of private woodland owners (representing 67% of private forest area) do not have a written management plan in the 21-state north central/northeast region of the United States. On the other hand, Birch (1996) estimated that 49% of private owners have had timber harvested from their land. Apparently some owners see no need to have a management plan, yet management decisions such as harvesting are occurring. An improved understanding of owner attitudes may result in programs or messages that have greater appeal to the majority of owners who have yet to engage in more traditional forms of management. Improved programs can better protect private forestland, encourage responsible management, and ensure the provision of public benefits.

## Attitudes Toward an Ecosystem-Based Approach

Rickenbach et al. (1998) defined three key dimensions of an ecosystem-based ap-

Study Area (randomly selected sample towns in yellow).



**Figure 1. Study area (randomly selected sample towns in yellow).**

proach to management relevant to NIPF owners and their lands and developed attitudinal indices that gauge opinions toward these dimensions. These indices measured a respondent's attitudes toward "within-property sensitivity," "landscape-scale perspective," and "temporal vision." Within-property sensitivity refers to unique, small-scale ecological features like rare species and wetlands that one would likely find on an individual property. Landscape perspective pertains to an owner's attitudes toward management at spatial scales larger than the individual parcel. Temporal vision involves the condition of forest ownership beyond a single generation. At the most basic level, if an ecosystem-based approach to management is to succeed in the NIPF-dominated landscape, landowners must first show attitudes favoring these three components. If landowners do not favor such an approach, then management at spatial and temporal scales larger than individual ownerships has little chance of being accepted or adopted. While there may be gaps between professed attitudes of landowners and their subsequent behaviors (Egan and Jones 1993), it is quite likely that if landowners are not positively inclined toward these indices, then the chance of their actually behaving in ways

sensitive to some form of ecosystem management is quite small.

Rickenbach et al. (1998) studied NIPF owners in Franklin County, Massachusetts and found that, in general, respondents favored the three components of an ecosystem-based approach to management. We report on results derived from testing these indices with a broader set of landowners in Vermont, New Hampshire, and Franklin County, Massachusetts in 2001. Of particular interest is whether favorable attitudes identified for one Massachusetts county are found on a broader scale in New England. More specifically, how do landowners in the more rural northern states, commonly thought to be independent Yankees with more conservative attitudes, feel about progressive approaches to management?

## Methods

A mail-back survey was used to obtain demographic information, gauge respondents' attitudes toward the three indices of an ecosystem-based approach to management, and measure landowner preferences toward issues surrounding forest conservation. We followed the survey methods of Dillman (2000).

The study area for this survey includes Franklin County, Massachusetts (to com-

pare results between its residents in 1995) and the states of Vermont and New Hampshire (see Figure 1). The survey population was stratified on the basis of population density to determine if landowner attitudes varied on this basis. An equal number of towns was selected randomly above and below the median population density.

We intended to survey a total of 3,000 people who own at least 10 ac of forest. The number of owners to be surveyed in each state was determined by the proportion of total land area in the overall sample region (i.e., the sum of all Vermont, New Hampshire, and Franklin County acres). For example, Vermont represented 49.6% of total land area, and thus that percentage was applied to the overall population of 3,000 to determine the number of Vermonters receiving a survey. We then distributed the overall number of survey recipients between 14 Vermont towns, 12 New Hampshire towns, and 4 Franklin county towns. In our three sample states, all landownership is recorded at the town level for tax purposes. Thus, our sample scheme would not have missed any owners who might have not existed on town records. Property tax rolls from randomly selected towns were used to find individuals who own more than a total of 15 ac of land, and owners were randomly selected without replacement. Tax records do not indicate land use, so we used 15 ac as our minimum, assuming that at least 10 would be forested. Surveys reporting fewer than 10 ac of forest ownership were eliminated. Some towns did not have enough landowners with at least 15 ac. In these cases, another town was selected at random and the remaining landowners were randomly selected.

## Demographic Results

A total of 3,000 surveys were sent and 140 were returned as undeliverable. Of the 1,503 surveys returned, 172 were unusable because the respondent owned less than 10 ac of forestland or for other reasons. There were 1,331 usable surveys out of a possible 2,688, for a response rate of 49.5%. Thorough application of the Dillman (2000) survey method has achieved response rates of 70% or higher. We used a telephone survey of a sample of nonrespondents to look for bias.

Ninety percent of respondents are at least 40 years old, and 25% are older than 65. Ages range from 23 to 96, with a median of 56. Nearly one-quarter of the respondents

**Table 1. Most important reasons<sup>a</sup> for owning woodland.**

Reason for ownership	Percent of responses
Privacy	43
Part of residence	39
Conservation against development	31
Beauty	31
Recreation	29
Wildlife habitat	29
Personal use of forest products	25
Investment	21
Inheritance for children	19
Part of farm	18
Income from wood products	14
Other	5

<sup>a</sup> The survey asked landowners to list their three most important reasons for owning woodland. For example, 43% of respondents cited "privacy" as one of the three most important reasons for ownership.

live in a household with an income of \$100,000 or more. As in previous studies (Jones et al. 1995, Rickenbach et al. 1998, White 2001), landowners are highly educated. Over 92% of respondents have at least a high school diploma, and almost 57% have at least a bachelor's degree or equivalent.

Approximately half (55.8%) of the respondents reside on their property. Another 14.1% have a vacation or nonprimary residence on their property, and 27.2% of respondents own undeveloped land. The mean ownership size for respondents is 104 ac, with a median of 45 ac. The smallest parcel is 10 forested acres and the largest is 8,000 ac. Three-quarters of respondents (74.6%) own parcels less than 100 ac in size. The respondents' total acreage summed to 138,382 ac.

The average length of ownership is 21 years (standard deviation of 19 years). A large majority (80%) of respondents bought their land, rather than inherited it, and 59% acquired their parcel from a previous owner who either lost interest in the property, passed away, or moved. A smaller proportion (20%) acquired their land because financial constraints (e.g., taxes, health care, divorce settlement, or tuition payments) forced the previous owner to sell.

This survey asked landowners to list their three most important reasons for owning woodland (Table 1). These results agree with previous studies (Bliss et al. 1994, Jones et al. 1995, Rickenbach et al. 1998, White 2001) that demonstrate a similar diversity of reasons for ownership. Interestingly, respondents selected income from wood products

least often, while privacy was the most frequently selected reason. While perhaps not representative of the typical respondent, the multiple goals for ownership can be illustrated by one person's interesting comments:

*"I take good care of my land. I don't cut trees, I leave wildlife alone, no hunting is allowed, I have beaver ponds to backup the watershed and provide habitat. Fields are cut and seeded for feed, wild flowers abound. I like my land and no one is invited to trespass- STAY AWAY and leave me alone. I don't need or want your involvement. Semper fi, live free or die!"* (Anonymous 2001)

This respondent values wildlife habitat, water quality, esthetics, and—most emphatically—privacy.

### Ecosystem-Based Management Indices

In the Rickenbach et al. (1998) study of landowners in Franklin County, Massachusetts, respondents exhibited significantly positive attitudes toward the three Likert scale indices established to measure receptivity to an ecosystem-based approach to management. We used the same statements in this study (Tables 2–4) of owners from New Hampshire, Vermont, and Franklin County, Massachusetts.

Respondents indicated their agreement or disagreement with the Likert scale statements that represent the three dimensions of an ecosystem-based approach to management, ranging from 1 (strongly disagree) to 5 (strongly agree). Ten statements comprise each index. To balance each index, five positive and five negative statements were used. The distribution of composite scores for each index (i.e., the sum of the scores for each statement) was compared to a hypothetical neutral distribution (i.e., assuming a standard normal distribution of respondents indicating neutral attitudes of 3 on a 5-point scale). The Kolmogorov-Smirnov test was used to determine statistical significance between the actual composite distribution of scores and the hypothetical neutral distribution. This two-tailed, nonparametric test determines whether differences between two frequency distributions are statistically significant. This nonparametric test is appropriate for ordinal data such as Likert scale responses, where the intervals between numbers on the scale are of known and consistent size, and respondents have no opportunity to select a numeric response other than a

whole number (e.g., 1, 2, 3, 4, or 5). Thus, data from Likert scale questions are not continuous, but categorical (e.g., a respondent could not indicate 3.259 or 1.657 as a response to a statement, but only 1 or 3). This test shows each index (within-property sensitivity, landscape-scale perspective, and temporal vision) to be statistically different from the standard normal distribution (i.e., representing a hypothetical neutral response) with all *P*-values less than 0.002. The distribution of the composite scores was skewed to the right (in the direction of higher scores), indicating that respondents favor an ecosystem-based approach to management.

While the statistics indicate statistically significant and favorable attitudes toward the three indices of an ecosystem-based approach to management, obviously all respondents did not uniformly share these feelings. Tables 2–4 list all statements used in the indices and the relative distribution of responses. For example, 18% of respondents disagreed or strongly disagreed with the following statement that was part of the within-property sensitivity index (Table 2): "I would be pleased if a rare or threatened species was found on my land." Similarly, 11% of respondents disagreed or strongly disagreed with the following statement that was part of the temporal vision index (Table 4): "Current plant and animal populations are the result of previous landowner activity." In terms of the landscape-scale perspective index (Table 3), 10% of respondents disagreed or strongly disagreed with the following statement: "What I do on my land affects others." There was obviously not unanimous agreement with the statements comprising our indices, in spite of the fact that the overall results show significant, positive agreement with or sensitivity to them.

### Population Comparisons

To determine if differences in attitude exist between Franklin County respondents in 1995 and 2001, we compared the distribution of responses between these two groups using the Kolmogorov-Smirnov test. The distributions of 1995 and 2001 Franklin County responses were determined to be not significantly different (at the 0.05 level) for the within-property sensitivity and temporal vision indices. The distribution of responses for the landscape-scale perspective index was determined to be significantly different between 1995 and 2001 at the 0.05 level. The 1995 distribution of responses to

**Table 2. Responses (in percent) to Likert scale statements comprising the “within-property sensitivity” index.<sup>a</sup>**

Statement	Strongly disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly agree (5)	Total number of responses
The ecological health of the land is not as important as my economic needs <sup>b,c</sup>	33	41	17	7	2	1,288
Land must provide a return to cover the expenses associated with ownership <sup>b</sup>	16	39	19	18	8	1,290
The well-being of my land is not my responsibility <sup>b</sup>	60	34	2	2	2	1,296
I would be pleased if a rare or threatened species was found on my land	8	10	24	29	29	1,256
Individual plant and animal species are not important to me <sup>b</sup>	39	48	8	3	2	1,302
Wetlands are beneficial to me	3	7	14	50	26	1,281
Too much emphasis is placed on economics when decisions are made on how to use land	3	15	23	43	16	1,276
Human use should be minimized in swamps, bogs, and sensitive areas	2	9	16	47	26	1,280
Sensitive areas should not be protected from activities that could alter them <sup>b</sup>	31	45	13	8	3	1,293
Rare or threatened species should be protected	1	4	15	46	34	1,296

<sup>a</sup> Kolmogorov-Smirnov test of significance between a normal distribution of responses (implying hypothetical indifference or neutrality toward this attitudinal index of “within-property sensitivity”) and the observed responses: K-S Z statistic = 1.902; *P* = 0.0014; skewness = -0.455; kurtosis = 0.156.

<sup>b</sup> Statement is negative and responses were reversed for index calculation (i.e., a response of 1 is scored as a 5 for calculations).

<sup>c</sup> This statement was used in the telephone survey of nonrespondents.

this index were skewed farther to the right, indicating greater agreement with statements that comprised this index. Although both groups exhibited significantly different (at the 0.05 level) and favorable responses compared to the hypothetical, neutral response, the respondents to the earlier survey demonstrated more favorable attitudes toward an ecosystem-based approach to management than respondents to the 2001 survey.

We also tested for differences between respondents from Vermont, New Hampshire, and Franklin County, Massachusetts (2001) and found no significant differences between these populations (according to the Kolmogorov-Smirnov test statistic at the 0.05 level). Respondents share similar, positive attitudes toward an ecosystem-based approach to management according to our three indices, regardless of where they lived.

The landscape-scale perspective of respondents from towns with below-median population density differs from respondents in higher-density towns (according to the Kolmogorov-Smirnov test statistic at the 0.05 level). Respondents in less-densely populated towns had more favorable attitudes toward an ecosystem-based approach to management according to this index. Attitudes were similar for the other two indices.

We used a nonparametric version of the  $\chi^2$  test to test for differences in attitude by level of education, since there were seven possible levels. The  $\chi^2$  results indicate that there are significant differences in respondent attitudes toward our three indices, based on education. Subsequent analysis showed that these differences are statistically significant between the two ends of the educational spectrum. Respondents without a

high school diploma express less-favorable attitudes toward the three indices than respondents with a Master’s or professional degree. Respondents in the middle of this spectrum exhibit differing opinions, but they are not statistically significant from either end of the educational spectrum. In general, as education increases, so do attitudes favoring a holistic approach to management, according to all three indices. Importantly, however, respondents favored an ecosystem-based approach to management (as estimated by our three indices) across all categories of educational attainment—they only differed in their extent. We used the same kind of test to assess potential differences in attitude according to income level. There were no significant differences in attitude (at the 0.01 level) toward the three indices.

We also tested for potential attitudinal

**Table 3. Responses (in percent) to Likert scale statements comprising the “landscape-scale perspective” index.<sup>a</sup>**

Statement	Strongly disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly agree (5)	Total number of responses
My land is part of a much bigger natural system	3	4	8	39	46	1,257
My land is not important to others <sup>b</sup>	27	53	12	6	2	1,258
What I do on my land affects others	3	7	9	55	26	1,285
My land provides important habitat for wildlife	1	1	3	43	52	1,307
My land provides benefits for society	1	5	17	48	29	1,253
My property is insignificant in the big picture of all land in the region <sup>b</sup>	24	45	15	13	3	1,282
What my neighbors do on their land does not affect me or my land <sup>b,c</sup>	39	46	7	6	2	1,296
I would consider working with others, if it meant the forest would be better off	2	5	22	50	21	1,262
Wetlands are of no benefit to others <sup>b</sup>	46	43	7	2	2	1,299
Forest and woodlands do not benefit the whole town <sup>b</sup>	33	54	8	4	1	1,295

<sup>a</sup> Kolmogorov-Smirnov test of significance between a normal distribution of responses (implying hypothetical indifference or neutrality toward this attitudinal index of “landscape-scale perspective”) and the observed responses: K-S Z statistic = 2.126;  $P = 0.0002$ ; skewness =  $-0.547$ ; kurtosis = 0.520.

<sup>b</sup> Statement is negative and responses were reversed for index calculation (i.e., a response of 1 is scored as a 5 for calculations).

<sup>c</sup> This statement was used in the telephone survey of nonrespondents.

differences on the basis of participation in a current-use property tax program. Owners enrolled in such a program in each of the three states are required to have an approved forest management plan. There were no significant differences (at the 0.05 level) in the distribution of responses toward the within-property and landscape-scale indices on the basis of current-use property tax participation; however, there were significant differences on the basis of temporal vision. Those respondents enrolled in a current-use property tax program with a management plan responded significantly more favorably to the temporal vision index (at the 0.05 level) than their nonenrolled counterparts.

Finally, we tested for possible differences in attitude on the basis of whether or not respondents lived on their forestland. There were no significant differences (at the 0.01 level) in the distribution of responses to the questions comprising the three indices. Absentee or resident landowners share similar attitudes toward the ecosystem-based management indices.

## Nonresponse

Despite receiving a high response rate (49.5%), a telephone survey was conducted

to test for possible nonresponse bias. Three hundred individuals were chosen randomly (10% of the total original sample), and 60 responses were obtained for a response rate of 20%. Nonrespondents reached by telephone were asked a small subset of questions from the survey. Because time is limited during a telephone survey (especially of nonrespondents), people were asked to respond to one statement from each of our three indices. These statements are identified in Tables 2–4.

Respondents and nonrespondents are statistically similar at the  $\alpha = 0.05$  level in terms of their property size and tenure of ownership. Nonrespondents were older (significant at the  $\alpha = 0.05$  level) than those who responded to the survey. A higher proportion of nonrespondents live on their property (76.7% of nonrespondents live on their property compared to 55.8% of those who responded to the survey).

A Kolmogorov-Smirnov test was used to compare the attitudes of nonrespondents to respondents, as well as to hypothetical neutral values, normally distributed around a response of 3. In each index, nonrespondent attitudes were statistically different

from the normal hypothetical neutral distribution. Nonrespondents demonstrated attitudes favoring an ecosystem-based approach to management in all three scales (statistically different at the 0.01 level from the neutral, normal distribution, and skewed in the direction of favorable attitudes). Nonrespondents were then compared to survey respondents on the basis of the subset of questions asked of both populations. Respondents to the mail-back survey demonstrate more favorable attitudes toward an ecosystem-based approach to management (for 3 indices, based on individual statements) than nonrespondents at the significance level of  $\alpha = 0.01$ . While nonrespondents showed significantly less-favorable attitudes toward statements representing each perspective than the survey respondents, nonrespondent attitudes were nevertheless significantly different from a neutral distribution and skewed in the favorable direction.

## Discussion

Results from this study of Vermont, New Hampshire, and western Massachusetts landowners support trends revealed in other studies (Brunson et al. 1996, Jones et

**Table 4. Responses (in percent) to Likert scale statements comprising the “temporal vision” index.<sup>a</sup>**

Statement	Strongly disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly agree (5)	Total number of responses
The future of my land is up to my heirs	11	30	21	29	9	1,236
What I do on my land will not matter in the long run <sup>b</sup>	36	53	6	3	2	1,290
My land does not need to provide for future generations <sup>b</sup>	34	48	11	5	2	1,278
My land should provide for the needs of future plant and animal populations	1	3	9	55	32	1,284
I have a responsibility to leave my land in at least as good a condition as I found it	1	2	6	49	42	1,291
The health of the land today does not result from past activity <sup>b</sup>	29	54	7	9	1	1,284
Society has no responsibility to maintain healthy forests for future generations <sup>b</sup>	51	40	4	3	2	1,302
Land is a testament to the previous owners <sup>c</sup>	1	4	19	58	18	1,251
Actions of current land owners do not affect future owners <sup>b</sup>	39	55	3	2	1	1,302
Current plant and animal populations are the result of previous landowner activity	1	10	23	54	12	1,269

<sup>a</sup> Kolmogorov-Smirnov test of significance between a normal distribution of responses (implying hypothetical indifference or neutrality toward this attitudinal index of “temporal vision”) and the observed responses: K-S Z statistic = 2.173;  $P = 0.0002$ ; skewness = 0.408; kurtosis = 0.488.

<sup>b</sup> Statement is negative and responses were reversed for index calculation (i.e., a response of 1 is scored as a 5 for calculations).

<sup>c</sup> This statement was used in the telephone survey of nonrespondents.

al. 1995, Rickenbach et al. 1998, Dedrick 1999, Klosowski 2000, White 2001). Respondents were financially well-off (25% >\$100,000 annual income), well-educated (57% have at least a BA), older (90% >40 years of age), and own relatively small parcels (75% <100 ac). A large majority (80%) of respondents bought their land rather than inherited it, and over 50% acquired their parcel from a previous owner who either lost interest in the property, passed away, or moved. Few respondents (<18%) acquired their land because financial constraints forced the previous owner to sell, suggesting that monetary pressures are not a major factor in property turnover in this study.

Respondents own land for a number of reasons, the top three being privacy, residence, and conservation to prevent development. Income from timber, inheritance, and investment are the three least important reasons for ownership. All three of the most frequently chosen reasons involve nontimber and noneconomic issues, while all three of the least important reasons include timber

and economic concerns. This implies that the majority of private family forest owners do not own their land primarily for financial gain or timber production, but rather to conserve the forested landscape or for privacy. Paradoxically, however, we know that private owners are not averse to selling timber. Kittredge et al. (2003) studied 17 years of harvest permits for a 19-town sample landscape in western Massachusetts in which 60% of the forest was in family forest ownership. During that time, 65% of all timber sales, representing 64% of the total harvested area and 54% of total volume, occurred on family forestlands. Landowners are selling timber, but a small proportion have management plans (Birch 1996); an improved understanding of their attitudes and behaviors could be used to design programs that would have more appeal than traditional approaches to management.

Like landowners in the earlier Rickenbach et al. (1998) study, respondents from Vermont, New Hampshire, and western Massachusetts show attitudes favoring an

ecologically based approach to forest management for all three scales: within-property sensitivity, landscape-scale perspective, and temporal vision. Respondents are sympathetic to small-scale ecological issues on their property, such as wetlands and rare species. They favor management that addresses issues such as wildlife habitat that span property boundaries at broader ecosystem scales. Respondents also exhibit sensitivity to a management approach or concerns that extend beyond their specific tenure.

Respondents' attitudes varied based on certain demographic variables. Those with different levels of education demonstrated statistically different attitudes toward all three Likert scale indices. Those with higher levels of education responded more favorably to an ecosystem-based approach to management than those with lower levels of education. Respondents from towns with a lower population density articulated attitudes more favorable to the landscape-scale perspective index than those from more densely populated towns. These two popu-

lations did not differ for the other two indices. Similarly, when we compared 1995 Franklin County respondent attitudes with those of 2001, we discovered the same pattern: respondents did not differ significantly in attitudes toward the indices of within-property sensitivity and temporal vision, but held significantly different attitudes toward the landscape-scale perspective index. Respondents from 1995 held more favorable opinions than those of 2001, but in both cases respondent attitudes were significantly different from the hypothetical neutral distribution. Possibly respondents in 2001 perceive their communities becoming more “developed” and are reacting the same way as respondents from more densely populated communities in the total sample. If so, it is interesting that the landscape-scale perspective index is the one to which respondents seem sensitive, while respondent attitudes toward temporal vision and within-property sensitivity are apparently indifferent to population density. Respondents cite privacy as a very important ownership goal (Table 1), which is closely related to questions that comprise the landscape-scale index (Table 3). Lastly, those who did not respond to the survey demonstrated favorable attitudes toward an ecosystem-based approach to management on all three levels, but these attitudes were not as favorable as those from survey respondents.

These results imply that despite small differences among landowners, many are sympathetic to an ecosystem-based approach to management, as estimated by these indices. Respondents from rural, northern New England, a region known for traditional and independent values, held attitudes not significantly different from those of the more typically “liberal” Massachusetts. This suggests that many landowners are predisposed to accept broader, more inclusive forms of management. These tendencies and ecological orientation are important. While these results are not directly linked to behaviors of private owners, they nonetheless suggest that many owners hold favorable attitudes. Without those, any notion of forest owners thinking or behaving at a larger ecosystem scale would be highly unlikely. It might be argued that some of the statements used in our indices were too suggestive or leading and that few respondents would disagree with them. Landowners had the opportunity on the survey to register their disagreement with these statements, and several punctuated their opinions with

statements like: “I believe this questionnaire is slanted toward state (Big Brother) ownership. . . . Stop trying to tell me what to do on my land. Butt out!” (Anonymous 2001). We believe respondents would take advantage of the opportunity to disagree with statements about rare species or wetlands protection, if they so desired.

Research into landowner attitudes toward an ecosystem-based approach to management is admittedly fraught with potential problems, because ecosystems by nature are both large and ill-defined. Also, an ecosystem-based approach to management, and the implications in terms of responsibilities and opportunities, are unclear to both owners and managers. It is furthermore difficult to conceive of tightly controlled empirical means to test landowner attitudes and linked behaviors toward an ecosystem-based approach to management. Kilgore and Blinn (2003) used empirical methods to test for the effect of forest management guidelines on stumpage bids. They auctioned 27 public timber tracts with and without required guidelines and identified distinct differences in price that purchasers were willing to pay. An ecosystem-based approach to management for landowners is more than an individual timber sale transaction, though, and designing such an intriguing experiment would be difficult. Ultimately linking landowner attitudes and their behaviors would require lengthy longitudinal studies assessing opinions of individual owners and subsequent actions over years. Alternatively, a specific landowner behavior could be used as an indicator of an ecosystem-based approach to management, and the extent of this behavior could be assessed throughout an ecosystem. Given the breadth of the concept, it may be impossible to select a suitable behavioral surrogate that would indicate adoption or acceptance of this approach. Development of an estate plan that provides for the conveyance of land to heirs could be a behavioral indicator of the temporal vision dimension of an ecosystem-based approach to management. A “within-property sensitivity” behavior could be an inventory of rare species and special communities (e.g., late seral or old-growth forest). A minimal behavior indicative of the landscape-scale perspective could be development of a map indicating abutting properties and owners. Indeed, until a suite of surrogate behaviors is identified, and sufficient time passes to allow for a study of their adoption or rejection, it is possible that the only way to study the con-

cept of private owners and an ecosystem-based approach to management is through the lens of survey respondent attitudes. At the least, while favorable attitudes cannot guarantee how landowners will behave, they imply uncertainty. If landowner attitudes are clearly unfavorable to the concept, any form of adoption would be quite unlikely.

The importance of NIPF owners in shaping the future of forest landscapes has never been as significant as it is today. With increased fragmentation and an expected population growth of 126 million in the next 50 years (Alig et al. 2002), that importance will grow. Forest landscapes dominated by relatively small and shrinking ownerships, and a growing number of owners with a desire for privacy represent enormous impediments to any potential application of an ecosystem-based approach to management. These trends of parcelization have been well-documented (e.g., DeCoster 2000). Shelby et al. (2004) and Edwards and Bliss (2003) studied forest management in so-called urban-fringe areas and found that communication between stakeholders and managers is important, and bordering residents are concerned about aesthetic impacts and safety and seek acknowledgment of their management concerns. The complicated web of increasingly small forest parcels, owner attitudes, and resident opinion combine to make any kind of management, much less that on an ecosystem level, to be daunting. Communication alone between owners, managers, and stakeholders is an essential yet significant challenge. Because landowner families and individuals collectively control the fate of forest ecosystems in so many parts of the country, it is crucial to engage them in conservation efforts that match their interests. To do this, professionals need to understand landowner concerns, and policy makers need to design appealing and effective programs that are perceived as relevant. One respondent perceived a disconnect between current public programs designed to assist owners and the realities owners face:

*“Unfortunately, I feel the state of New Hampshire takes privately owned woodlands for granted. The state, I believe, collects a great deal of revenue from New Hampshire forest land (i.e., tourism, snowmobiling, hiking, hunting/fishing, timber tax etc.) However, the state gives very little back to the private landowner and, it seems to me, continually makes it more difficult, confusing, and costly to participate in the current use program (i.e., the Forest*

*Stewardship Program which appears to benefit foresters and not the forest or the landowner). If the state of New Hampshire values the woodlands (and the public use of private property) in this state it should do more to help the individual landowner preserve the forest instead of making it too expensive to preserve.” (Anonymous 2001)*

Comments like this show that landowners value their forest, but they feel the complexity and expense associated with its management are taken for granted. These sentiments need to be considered if conservation efforts are to succeed. Our attitudinal results suggest that behaviors such as inventories of rare species and communities, estate planning that includes the future of land, and information about the neighboring context could be welcomed by a large number of owners. The question is whether or not these attitudes can be translated into action in the face of encroaching sprawl and parcelization. Some form of an ecosystem-based approach to management may appeal to owners, especially those who have not adopted existing management methods. Such an approach may serve as a catalyst to inspire informed conservation behavior rather than inaction or uninformed reaction to a seemingly tempting offer to purchase standing timber.

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