Interest in Cross-Boundary Cooperation: Identification of Distinct Types of Private Forest Owners

Andrew O. Finley, David B. Kittredge Jr., Thomas H. Stevens, Charles M. Schweik, and Donald C. Dennis

Abstract: This article presents quantitative results from a study that evaluated private forest (PF) owner interest in cross-boundary cooperation. The intent was to reveal subgroups, referred to here as segments, of PF owners that align with different forms and levels of cooperative activities. Segmentation analysis used 783 mail-back surveys from Franklin County, Massachusetts, PF owners in spring 2002. The analysis indicates that there are four segments of PF owners in Franklin County, each maintaining a distinct level of interest in proposed forms of cooperation. Two segments define positive interest in cooperation (General Cooperators, 27%; Conservation Cooperators, 21%), and the other two represent apathy (Neutralists, 27%), and disinterest (Non-Cooperators, 24%). Furthermore, each segment presents a unique profile of items and scales that measure personal values and attitudes about cross-boundary cooperation and socioeconomic and demographic characteristics. Segment profiles show a strong association between interest in cooperation and profiling variables such as age, affluence, personal values, and attitudes. By identifying the specific needs and wants among PF owners, these findings can help in the development of responsive initiatives to promote cross-boundary cooperation in Franklin County. Furthermore, the outlined segmentation analysis could aid PF owner studies identify and describe key segments and determine interest in cross-boundary cooperation. FOR. SCI. 52(1):10–22.

Key Words: Private forest owners, survey, cross-boundary cooperation, segmentation analysis, ecosystem-based approach to management.

PRIVATE INDIVIDUALS own the majority of the forestland in the United States, and anticipations are that the nation will have increasing dependence on these forests for wood and other benefits (Young et al. 1985, Birch 1996). Private forest (PF) owners are private individuals, partnerships, and families, traditionally referred to as nonindustrial private forestland (NIPF) owners. In New England, private forestland represents 85% of the landscape (Birch 1996). Although often viewed as contiguous forest, myriad small parcels compose New England's private forest landscape. Birch (1996) estimates the average PF ownership across the New England states at less than 8 hectares. However, in sum, these parcels are important for the benefits they provide. Unfortunately, most owners do not have a management plan for their own land (Butler and Leatherberry 2004). Herein lies the challenge facing resource professionals and PF owners. How can these small individual ownerships satisfy PF owners' objectives, society's need for wood products, and other benefits that come from healthy forest ecosystems? An improved understanding of PF owners and their attitudes toward management will provide a basis for developing education and incentive programs that will have greater appeal and might lead to improved forest management and cooperation among owners to achieve economies of scale or ecosystem level management.

We believe that techniques used in market analysis have merit for improving our ability to reach and engage PF owners. Too often, research studies directed to PF owners have sought to describe their objectives, perceived benefits of ownership, and their characteristics across the study sample. Although these studies provide information about landowners in general, they do not always illuminate specific approaches for reaching or communicating with those PF owners who are most likely to adopt new ideas. Segmentation analysis provides an approach for identifying groups (or segments) of landowners with shared interests and characteristics. These segment-specific profiles can help guide the development and administration of targeted educational programs, outreach materials, or direct or indirect incentives that might meet broader societal goals such as protecting biodiversity and maintaining a sustainable source of forest products.

Background

Although the investigation of general PF owner attitudes is not new (e.g., Kingsley 1976), recent studies have examined attitudes toward the broader concept of ecosystem-based management. Attaining increased cooperation to initiate ecosystem-based management in landscapes dominated by PF owners will necessarily involve cross-boundary

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cooperation, because ecosystem bounds are generally far greater than small, private ownerships.

Across the country, researchers have begun to explore PF owner receptivity to cross-boundary management and have found constrained levels of acceptance. For example, Rickenbach et al. (1998) assessed PF owner attitudes in rural Massachusetts toward principles of ecosystem-based management and found respondents were interested in applying these concepts. Belin (2002) found similar favorable attitudes among PF owner respondents in Vermont and New Hampshire. Private forest owners in a multiregional study in 11 states (Alabama, Florida, Georgia, Indiana, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee, Utah, and Virginia) indicated general interest; however, they wanted to know more and see examples before taking part in any on-the-ground effort (Brunson et al. 1996). A study of PF owner attitudes toward joint management planning (as a proxy for participation in an ecosystem-based management approach) in South Carolina also indicated interest in the concept, but identified sensitivity to timber and land values, and assurance that they be preserved as a condition of participation (Jacobson et al. 2000).

Defining interest in cross-boundary management is a first step in developing working relationships with and among PF owners. Developing schemes that might find support from PF owners is a second step. For example, Dedrick et al. (2000) studied Virginia PF owner attitudes toward The Nature Conservancy's (TNC) Forest Bank model, whereby landowners in an ecologically sensitive region deposit timber rights and in return receive an annuity. TNC would subsequently manage the timber on these lands in a sustainable manner. Respondents indicated tentative interest, but expressed the need to see examples before actually depositing their timber rights. Connecticut PF owners expressed similar interest in large-scale management of multiple properties, but indicated a need to have spatially explicit information to frame the context (Sinclair and Knuth 2000). Missouri PF owners needed to have a better understanding of their individual impacts at the greater ecosystem level to participate (Raedeke et al. 2001). Even significant levels of potential financial incentive in the form of cost-sharing or property tax rebates could not overcome the PF owners' need to know more about ecosystem management and its effects on property rights (Stevens et al. 1999, 2000, Klosowski et al. 2001, White 2001).

Overall, previous work suggests broad potential interest on the part of PF owners in cooperating at scales larger than their own properties. Also, some studies identified general barriers to PF owner participation in proposed programs or activities (e.g., need for more information before any commitment). All of these aforementioned efforts have sought to work with, or directed programs to, the "average" PF owner in the study or focus area. Constructing education and outreach efforts to meet the needs and wants of the average PF owner might not be the most effective strategy. The study described in this article identifies unique types of PF owners who are, and who are not, likely to engage in cross-boundary management or other cooperative efforts, and suggests some variables that potentially motivate or inhibit cooperative activities within the defined PF types.

Research Objectives

Numerous PF owner studies that use quantitative survey techniques, some of which are noted above, report results and conclusions based on sample-wide survey item averages. This is certainly useful and in many instances appropriate. However, our study objectives required a more detailed look at the heterogeneity of PF owner attitudes and interests.

The objectives of our study were to (1) identify feasible cooperative activities in which PF owners might participate, and potential barriers to cooperation; (2) quantitatively assess the level of interest in cooperative activities and recognition of barriers to these activities; and (3) look for subgroups (i.e., segments) within a sample of PF owners who align themselves differently with the cooperative activities and barriers, and then profile these segments.

Building on the results from the first objective (see Finley 2002), this article presents the quantitative methods and results of objectives two and three. We used a segmentation approach for discovering and profiling distinctly different subgroups within a PF owner sample. The methodology presented is very common in market research for identifying and targeting consumer groups. However, to the best of our knowledge, this powerful approach has not been used in a PF owner study.

Methodology

Mail-Back Survey Development

Our literature review found no previous studies or survey scales that specifically addressed our stated objectives. Therefore, we conducted a series of semi-structured interviews and focus groups with the intent to generate lists of current and potential forms of PF owner cooperative relationships and barriers to cooperation.

The study area for the interviews and focus groups was the 19-town North Quabbin Region of north-central Massachusetts. Parcel maps of the North Quabbin Region were used to select all PF neighborhoods of at least six spatially adjacent properties that compose at least 40 hectares in cumulative area. From these property groups, 11 (88 individual properties) were randomly selected to participate in the qualitative phase of our study. Within this pool of 88 individuals, we conducted 29 semi-structured interviews and four subsequent focus groups. Each focus group was composed of PF owners who belonged to the same property group of spatially adjacent properties.

Drawing on results from the semi-structured interviews and focus groups, we developed a mail-back survey instrument with items and scales to support and expand on the qualitative findings (Finley 2002). The survey was pretested on 10 landowners who participated in the focus group discussions. The pretest results helped us refine the mail-back survey questions and format. The final survey contained 45 items designed to measure

- interest in engaging in different types of cooperative activities with neighbors.
- agreement with reasons not to enter into cooperative arrangements.
- demographic and socioeconomic characteristics.
- reasons for forest ownership.
- agreement with world views or environmental statements.
- risk perception, specifically that of land development.
- stance on environmental regulation, land use, and development issues.
- sense of community within the surrounding forestland neighborhood.

The survey was distributed to PF owners in 10 randomly selected towns within Franklin County, Massachusetts. With a population density of 37.7 individuals per km^2 and 78% forest by area, Franklin County typifies rural western Massachusetts (MacConnell et al. 1991). Using the 2001 property tax log (ordered alphabetically by last name) from each town, names and mailing addresses of the first 120 property owners who owned 4.04 or more hectares of property were recorded (only one ownership was selected if there were multiple ownerships under the same last name).

In Feb. 2002, informational postcards were sent to the 1,200 selected PF owner recipients. The postcard notified recipients of their selection for the study, described the study objectives, and promised a US$2.00 incentive in the mail-survey packet that followed in 2 weeks. One week later, survey packets were sent including a cover letter, copy of the survey, a prepaid return envelope, and two US$1.00 bills. Two weeks after the survey packets were delivered, a reminder postcard was mailed to each recipient. In Mar. 2002, the second wave of surveys was mailed. Data from returned surveys were entered into spreadsheets and moved to SAS statistical software (SAS Institute 1989) for subsequent analysis.

Survey Response Rate

Of the 1,200 surveys mailed, 56 were returned undeliverable for various reasons. Eight hundred fourteen surveys were returned. However, 31 were discarded because the respondents did not own forestland ($n = 22$), or the respondents did not answer critical portions of the survey ($n = 9$). Therefore, 783 surveys were included in the analysis with an overall usable return rate of 68.4%. We did not conduct a formal follow-up survey to assess nonresponse bias. Based on information collected from the 2001 property tax log, we were able to establish that there was no significant difference between the property size of respondent and nonrespondent groups (at $\alpha = 0.05$). Furthermore, there was no statistically significant disparity (at $\alpha = 0.05$) of response rate among the selected towns in Franklin County. Based on these tests and the strong response rate of 68%, we feel confident that the results presented are representative of our initial sample.

Analysis

Data Reduction

Several high, simple correlations among many of the survey items warranted a data reduction procedure. Principal components analysis is an appropriate method to reduce the dimensionality of a multivariate data set, and in effect, the technique can reduce a large number of survey items to a smaller set of composite variables with a minimal loss of information. Principal component (PC) scores represented the data observations for the derived composite variables. PCs were retained based on the latent root criterion (Hair et al. 1998). Hair et al. (1987) suggest that, in samples greater than 50, absolute PC loadings greater than 0.50 are considered acceptable loading criteria. Those items that did not load significantly on derived PCs were left to stand alone in the analysis. Tables 1 and 2 present the independent variables used in this analysis, along with their summary statistics, orthogonally rotated factor loadings, and Cronbach's alpha. Cronbach's alpha is a measure of scale reliability that ranges between 0 and 1. Alpha values of 0.70 and greater are considered reliable (Hatcher 1994). The independent variables presented in Table 3 were also subjected to PC analysis and produced three poorly defined PCs (i.e., high cross loadings). Based on the unclear PC structure and to improve interpretability of the results, we allowed these individual items to continue in the analysis. Table 4 presents the 10 proposed cooperative activities set as dependent variables in the analysis.

Table 1. Definition and summary of survey items measuring reasons for owning forest land, along with principal components analysis summary statistics and descriptive names for derived components

Variable name (principal component)	Survey items	Mean (st dev)	PC loading	Cronbach's α
OWN ENVIRON	I own my land to protect the environment*	1.82 (0.86)	0.88	0.84
	I own my land to provide wildlife habitat*	1.75 (0.84)	0.84	
	I own my land to ensure it remains natural*	1.85 (0.93)	0.81	
OWN RURAL LIFE	I own my land for the feeling of privacy*	1.58 (0.94)	0.88	0.75
	I own my land for personal recreation*	1.90 (0.99)	0.80	
	I own my land because I value a rural life style*	1.62 (0.86)	0.69	
OWN DEVELOPMENT	I own my land as a real estate investment*	1.62 (0.86)		
OWN TRADITION	I own my land to preserve family and tradition*	2.24 (1.13)		
OWN TIMBER	I own my land for income from timber*	3.26 (1.15)		

* Item scale: 1 = very important, 5 = very unimportant.

Table 2. Definition and summary of survey items measuring attitudes and actions related to cross-boundary cooperation, along with derived principal components analysis summary statistics and descriptive names for derived components

Variable name (principal component)	Items	Mean (st dev)	PC loading	Cronbach's α
STEWARD	I feel an obligation to future generations to be a good steward of my land*	1.51 (0.67)	0.87	0.80
	We as society owe it to the environment to be good stewards of the land*	1.44 (0.64)	0.85	
	It is up to me, as a landowner, to protect wildlife habitat and biodiversity*	1.71 (0.79)	0.83	
SHARE	I wish my neighbors would enjoy my land more*	3.35 (0.97)	0.84	0.70
	I would allow my neighbors to build a trail across my land if I could control the type of recreation that occurs on it*	2.98 (1.34)	0.79	
	The fewer people on my land the better^{R,*}	3.84 (1.00)	0.75	
ENJOY	I find it therapeutic or enjoyable doing things to improve my forestland*	1.72 (0.84)	0.85	0.75
	I feel great satisfaction when I do things to improve my land*	1.62 (0.69)	0.85	
	I would like to spend more time enjoying my land*	1.79 (0.78)	0.76	
THREAT & COMMUNITY	I welcome more development in my town^{R,*}	2.21 (1.11)	0.88	0.73
	Housing development in my area will decrease the sense of community*	2.61 (1.11)	0.87	
	It will take an organized effort among community members to protect forestland from development*	2.23 (0.96)	0.99	
	I view development as a threat to things I value*	2.11 (1.09)	0.56	
MGNT COMMUNITY	I know my neighbors' forestland objectives*	3.28 (0.94)	0.85	0.75
	I feel that my neighbors' forestland objectives are compatible with my own*	2.85 (0.80)	0.82	
	I feel a sense of community with my forestland neighborhood*	2.69 (0.96)	0.78	
ECO HEALTH	Do you consider the ecological health of neighboring or nearby properties when making decisions concerning your forestland**	3.19 (0.90)		
MGNT COMMUNICATE	Have your neighbors or owners of nearby properties spoken to you about their management decisions**	1.77 (0.92)		

^{R} indicates scale reversal.
* Item scale: 1 = strongly agree, 5 = strongly disagree.
** Item scale: 1 = never, 4 = often.

Table 3. Definition and summary of survey items measuring barriers to cross-boundary cooperation, along with summary statistics and descriptive variable name for each item

Variable name	Items	Mean (st dev)
BARRIER DISAGREE WITH NEIGHBORS*	I do not agree with the way my neighbors use their forestland	3.16 (0.92)
BARRIER OVER COMMITTED*	I would not cooperate because I have too many other commitments in my life	2.82 (0.94)
BARRIER UNKNOWN NEIGHBORS*	I would not cooperate because I do not know many of my neighbors	3.16 (1.08)
BARRIER SATISFIED WITH SITUATION*	I would not cooperate because I am satisfied with the way things are	3.14 (0.83)
BARRIER NO BENEFIT*	I would not cooperate because I do not see any benefits from cooperation with my neighbors	3.28 (0.98)
BARRIER PRIVACY*	Cooperation with my neighbors could infringe on my privacy	2.83 (1.02)
BARRIER TIME*	Cooperation would be too time consuming	3.00 (0.87)
BARRIER AVOID NEIGHBORS^{R,*}	I would like to get to know my neighbors better	3.19 (0.83)

^{R} indicates scale reversal.
* Item scale: 1 = strongly agree, 5 = strongly disagree.

Table 4. Proposed cooperative activity (CA) items used to segment survey respondents, along with summary statistics, and descriptive variable name for each item

Variable name	Survey items	Mean (st dev)
CA MARKET TIMBER*	In the future, would you be interested in hiring a forester to market timber from your property jointly with one or more neighbors	3.21 (1.20)
CA TRAIL SYSTEM*	In the future, would you be interested in developing a shared trail system across multiple ownerships	3.05 (1.29)
CA MARKET PROPERTY*	In the future, would you be interested in working with a neighbor to jointly market your properties for development	4.37 (0.91)
CA MEETINGS FOREST MGNT*	In the future, would you be interested in attending a series of meetings on forest management with your neighbors	3.12 (1.09)
CA WALKING TOUR*	In the future, would you be interested in joining your neighbors for a walking tour of your collective properties	3.11 (1.14)
CA WILDLIFE*	In the future, would you be interested in talking with your neighbors about managing wildlife habitat together	2.83 (1.15)
CA MGNT PLAN*	In the future, would you be interested in sharing the fee for hiring a forester to write a management plan with your neighbors	3.41 (1.17)
CA SHARE EQUIPMENT*	In the future, would you be interested in sharing forest management equipment with neighbors to manage woodlands	3.34 (1.13)
CA LEASE HUNT REC*	In the future, would you be interested in asking your neighbors to join a group to lease hunting and recreation access to your shared properties	4.10 (0.99)
CA WRITE CONSERVATION RESTRICTION*	In the future, would you be interested in working with neighbors to write a conservation easement agreement to protect more than one ownership from development	2.96 (1.24)

* Item scale: 1 = very interested, 5 = very uninterested.

Segmentation

A two-phase segmentation strategy was used to identify and profile respondent segments based on their level of interest in proposed cooperative activities. The first phase used cluster analysis to define respondent segments based on the 10 cooperative activity variables defined in Table 4. Cluster analysis is a multivariate technique that can organize survey respondents into discrete segments, such that within-segment similarity is maximized and among-segment similarity is minimized according to respondents' scores on the variables considered. The SAS FASTCLUS *k*-means clustering algorithm was used to assign respondents to exclusive segments based on their response to the clustering variables. Multiple discriminant analysis (MDA) was then used to highlight those clustering variables that best exemplify segment differences.

The second phase again used MDA, but this time it was used to rank the strength of association between the predefined segments and measured reasons for forestland ownership (Table 1), attitudes and actions (Table 2), and recognized barriers to cooperative relationships (Table 3). Finally, analysis of variance (ANOVA) was used to test socioeconomic and demographic differences among segments.

Results

Phase 1, Segment Formation and Naming

To generate an appropriate number of respondent segments, two- through six-cluster solutions were explored. Results from the final phases of this analysis suggest that the four-cluster solution is most interpretable and therefore served as the basis for analysis. A general linear model (GLM) and Tukey's Studentized Range Test confirmed that the four-cluster solution produced statistically unique segments based on interest in proposed cooperative activities (Table 5). Within Table 5, alphabetic superscripts denote results of the Tukey's Studentized Range Test at an alpha level of 0.05. Because these simple univariate tests only identify differences in a variable's mean across segments, and cannot describe which variables are most important for discriminating among segments in a multivariate sense, MDA is the primary tool used in our analysis.

MDA was used to determine which of the 10 clustering variables are most important in assigning respondents to segments. This information is important because it highlights interest in cooperative activities that is common and unique among segments. The first two derived discriminant functions describe the strongest gradients of segment separation with canonical R_c^2 of 0.814 and 0.384, respectively. As a percentage, R_c^2 is a measure of the total canonical variation explained by segment differences and is used to judge discriminant performance. Although significant at an alpha level of 0.05 (based on an approximate F-value), the third function was not included because of its low contribution to segment separation. Table 6 presents the standardized canonical coefficients, discriminant loadings, and summary statistics for the 10 discriminant variables on the first two canonical axes. The Partial-F statistic confirms that each variable contributes uniquely to segment separation. A potency index is also provided for each variable. When presented for each discriminant function, the potency index

Table 5. GLM and Tukey's Studentized Range Test for cooperative activity (CA) variables by segment

Clustering variables	Segments (1) Non-Cooperators	(2) Conservation Cooperators	(3) General Cooperators	(4) Neutralists	Sig. Diff.
CA MARKET TIMBER*	4.27[a]	3.49[b]	2.08[d]	3.21[c]	<0.0001
	(0.84)	(1.05)	(0.80)	(0.91)	3; 760
CA TRAIL SYSTEM*	4.34[a]	3.08[b]	1.97[c]	2.95[b]	<0.0001
	(0.89)	(1.21)	(0.83)	(0.95)	3; 763
CA MARKET PROPERTY*	4.65[a]	4.80[a]	4.07[b]	4.08[b]	<0.0001
	(0.66)	(0.55)	(1.11)	(0.91)	3; 764
CA MEETINGS FOREST MGNT*	4.28[a]	2.61[c]	2.38[d]	3.21[b]	<0.0001
	(0.78)	(0.89)	(0.83)	(0.78)	3; 764
CA WALKING TOUR*	4.44[a]	2.49[c]	2.26[d]	3.26[b]	<0.0001
	(0.69)	(0.82)	(0.82)	(0.74)	3; 765
CA WILDLIFE*	4.11[a]	2.06[c]	2.00[c]	3.13[b]	<0.0001
	(0.90)	(0.71)	(0.71)	(0.72)	3; 760
CA MGNT PLAN*	4.65[a]	3.14[c]	2.26[d]	3.65[b]	<0.0001
	(0.56)	(1.01)	(0.68)	(0.80)	3; 764
CA SHARE EQUIPMENT*	4.52[a]	3.08[c]	2.24[d]	3.59[b]	<0.0001
	(0.59)	(0.94)	(0.74)	(0.79)	3; 763
CA LEASE HUNT REC*	4.74[a]	4.66[a]	3.32[c]	3.91[b]	<0.0001
	(0.534)	(0.559)	(1.115)	(0.830)	3; 762
CA WRITE CONSERVATION RESTRICTION*	4.10[a]	1.99[d]	2.26[c]	3.43[b]	<0.0001
	(1.05)	(0.75)	(0.90)	(0.93)	3; 761
Segment size	186	165	209	210	

Superscript letters denote mean separation $\alpha = 0.05$, standard deviation shown in parentheses.
* Item scale: 1 = strongly agree, 5 = strongly disagree.

Table 6. MDA standardized coefficients and loadings for cooperative activity (CA) variables on first two discriminant functions, along with associated descriptive statistics

	Standardized coefficients		Discriminant loadings		Univariate F		Partial F		
	Function 1	Function 2	Function 1	Function 2	Ratio[a]	Prob.	Ratio[b]	Prob.	Potency index
CA MARKET TIMBER	0.39	−0.47	0.69	−0.37	200.64	<0.0001	28.2	<0.0001	0.47
CA TRAIL SYSTEM	0.42	−0.45	0.72	−0.21	196.59	<0.0001	33.75	<0.0001	0.44
CA MARKET PROPERTY	0.02	−0.04	0.18	−0.47	36.46	<0.0001	3.15	0.03	0.19
CA MEETING FOREST MGNT	0.23	0.15	0.72	0.19	204.51	<0.0001	8.45	<0.0001	0.44
CA WALKING TOUR	0.36	0.25	0.80	0.25	308.66	<0.0001	12.03	<0.0001	0.55
CA WILDLIFE	0.40	0.28	0.79	0.38	323.65	<0.0001	13.53	<0.0001	0.60
CA MGNT PLAN	0.40	−0.02	0.83	−0.01	330.47	<0.0001	12.93	<0.0001	0.54
CA SHARE EQUIPMENT	0.33	0.01	0.81	0.01	301.08	<0.0001	10.51	<0.0001	0.51
CA LEASE HUNT REC	0.36	−0.68	0.49	−0.61	127.20	<0.0001	49.61	<0.0001	0.46
CA WRITE CONSERVATION RESTRICTION	0.33	0.72	0.66	0.52	214.16	<0.0001	40.36	<0.0001	0.55

[a] The degrees of freedom are 3 and 741.
[b] The degrees of freedom are 3 and 731.

is a relative measure of each variable's contribution to the function and the contribution of the function to the overall system. When presented as a single value for all discriminant functions, as it is here, the index is just the sum of individual potency indices across functions (Hair et al. 1998). Some investigators find this index useful for understanding the relative contribution of each variable to the analysis.

The discriminant loadings in Table 6 only describe the correlation between the variables and the two canonical axes. To understand how these variables are associated with the segments, each segment's centroid (i.e., the center of the segment data cloud) must be projected onto the canonical axes. Based on the calculated discriminant loadings and the segments' centroid coordinates, a biplot was constructed to aid in recognizing variable-to-segment relations and subsequent segment naming (Figure 1). The calculations for MDA summary statistics and biplot construction are described in Hair et al. (1987). Within the biplot, vectors and centroids are stretched so the length of the vector is proportional to its discriminating power; longer vectors have greater discriminating power. The angle of the vector relates this power to the canonical axis; the more aligned a vector is with a canonical axis, the more the discriminating power

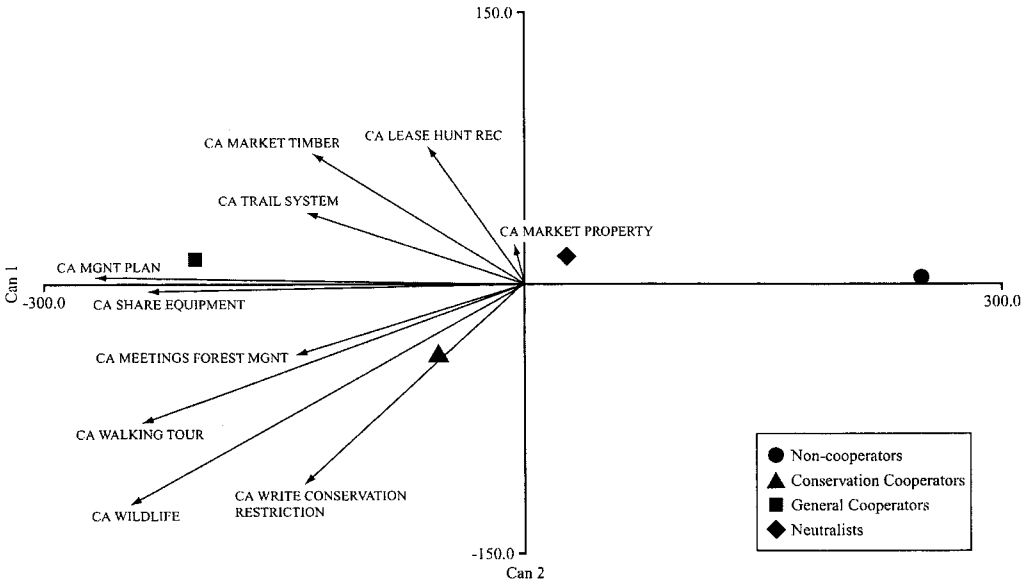

Figure 1. Biplot of cooperative activity (CA) variables. Points represent segment centroids. Axes measured on units of canonical separation.

is associated with that axis. The direction of the vectors were reversed so that the vectors point toward those segments interested in the cooperative activity, and away from segments that are not interested in the cooperative activity. This graphical representation enhances interpretation of the findings because it provides a dimensional and strength perspective not conveyed by the discriminant loadings alone.

The following paragraphs use Table 5 and Figure 1 to describe and name each segment based on its cooperative activity preferences.

Segment 1 (Non-Cooperator)—As seen in Figure 1, all cooperative activity vectors point away from Non-Cooperators. This indicates that this segment's members are not interested in any measured form of cooperation with their neighbors. Table 5 shows that the mean Likert score on all the cooperative activity variables is between Uninterested to Very Uninterested. This segment represents 24.1% of respondents.

Segment 2 (Conservation Cooperator)—The direction of vectors in Figure 1 indicates that this segment is highly aligned with forms of cooperation that protect the environment and promote wildlife habitat. Specifically, respondents who belong to this segment are primarily interested in the cooperative activities such as writing a group conservation restriction (CA WRITE CONSERVATION RESTRICTION), collectively managing for wildlife habitat (CA WILDLIFE), and other forms of cooperation that could promote conservation ideals (CA WALKING TOUR and CA MEETING FOREST MGNT). These respondents are generally Neutral or Uninterested in forms of cooperation that are utilitarian in nature. This segment represents 21.4% of respondents.

Segment 3 (General Cooperator)—As seen in Figure 1, this segment is the opposite of the Non-Cooperator segment. Respondents in this segment are interested in most forms of cooperation with the exception of cooperating to increase the real estate potential of their properties (CA MARKET PROPERTY) and collectively leasing hunting and recreational access (CA LEASE HUNT REC). General Cooperators tend to show greater interest in more utilitarian cooperative activities, like sharing trail systems (CA TRAIL SYSTEM), joint management plans (CA MGNT PLAN), sharing forest management equipment (CA SHARE EQUIPMENT), and the joint marketing of timber (CA MARKET TIMBER). This segment represents 27.2% of the sampled respondents.

Segment 4 (Neutralist)—In contrast to Non-Cooperators, respondents belonging to the Neutralist segment are less vehemently opposed to forms of cooperation and typically score between Neutral and Uninterested on the Likert scale for proposed activities. Landowners in this segment may be representative of the attitudes found in other studies, which show a need to know more specifics about cooperation before expressing an interest (e.g., Dedrick et al. 2000, Sinclair and Knuth 2000). This segment represents 27.3% of respondents.

Phase 2, Segment Profiles

Segments were profiled using the variables presented in Tables 1–3. Again, a GLM and an MDA were coupled to quantify independent variables in a univariate and multivariate fashion. Table 7 presents the GLM and Tukey's Studentized Range Test for the 20 independent variables considered in the profile.

An MDA was performed with the grouping variable set as the four segment centroids and those 14 independent variables displayed in Table 7 with a *P*-value less than 0.0001. Only those highly significant variables in the GLM

Table 7. GLM Tukey's Studentized Range Test for reason for forest ownership, attitudes, and actions related to cross-boundary cooperation, and barrier to cooperation variables by segment

Clustering variables	Segments (1) Non-Cooperators	(2) Conservation Cooperators	(3) General Cooperators	(4) Neutralists	d.f. Sig.
OWN ENVIRON*	0.20[a]	−0.46[c]	−0.19[b]	0.39[a]	3; 734
	(1.15)	(0.76)	(0.83)	(1.00)	<0.0001
OWN RURAL LIFE*	−0.04	−0.14	0.05	0.10	3; 734
	(1.07)	(0.82)	(0.92)	(1.13)	0.11
OWN DEVELOPMENT*††	2.83[b]	3.18[a]	2.75[b]	2.76[b]	3; 756
	(1.38)	(1.14)	(1.16)	(1.16)	<0.001
OWN TRADITION*††	2.11[a]	2.39[a]	2.14[a]	2.36[a]	3; 760
	(1.13)	(1.19)	(1.07)	(1.15)	0.03
OWN TIMBER*††	3.27[b]	3.74[a]	2.94[c]	3.17[b,c]	3; 756
	(1.32)	(1.11)	(1.04)	(0.99)	<0.0001
STEWARD*	0.37[a]	−0.51[b]	−0.33[b]	0.41[a]	3; 761
	(1.12)	(0.70)	(0.79)	(0.98)	<0.0001
SHARE*	0.73[a]	0.13[b]	−0.60[d]	−0.17[c]	3; 754
	(0.93)	(0.88)	(0.82)	(0.90)	<0.0001
ENJOY*	0.20[a]	−0.33[b]	−0.18[b]	0.26[a]	3; 748
	(1.11)	(0.86)	(0.96)	(0.92)	<0.0001
THREAT & COMMUNITY*	0.14[a b]	−0.52[c]	−0.02[b]	0.32[a]	3; 746
	(1.07)	(0.83)	(0.94)	(0.97)	<0.0001
MGNT COMMUNITY*	0.30[a]	0.07[a,b]	−0.19[b]	−0.10[b]	3; 737
	(1.17)	(1.02)	(0.88)	(0.89)	<0.0001
ECO HEALTH**	2.90[b]	3.49[a]	3.43[a]	2.97[b]	3; 739
	(1.06)	(0.72)	(0.71)	(0.92)	<0.0001
MGNT COMMUNICATE**	1.57[c]	1.84[a,b]	2.00[a]	1.67[b,c]	3; 753
	(0.85)	(0.91)	(0.97)	(0.90)	<0.0001
BARRIER DISAGREE WITH NEIGHBORS**†	3.00[b]	3.15[a,b]	3.25[a]	3.24[a]	3; 745
	(1.07)	(0.87)	(0.94)	(0.79)	0.03
BARRIER OVER COMMITTED**†	2.74[a,b]	2.87[a,b]	2.97[a]	2.69[b]	3; 744
	(0.99)	(0.96)	(0.95)	(0.84)	0.012
BARRIER UNKNOWN NEIGHBORS**†	3.06	3.15	3.32	3.08	3; 745
	(1.08)	(1.13)	(1.06)	(1.05)	0.08
BARRIER SATISFIED WITH SITUATION**†	2.09[c]	2.95[a]	2.95[a]	2.39[b]	3; 748
	(0.97)	(0.88)	(0.86)	(0.79)	<0.0001
BARRIER NO BENEFIT**†	2.60[c]	3.67[a]	3.71[a]	3.13[b]	3; 741
	(1.08)	(0.74)	(0.81)	(0.83)	<0.0001
BARRIER PRIVACY**†	2.23[c]	3.04[a,b]	3.16[a]	2.85[b]	3; 746
	(1.03)	(0.91)	(0.97)	(0.92)	<0.0001
BARRIER TIME**†	2.80[c]	3.20[a,b]	3.18[a]	2.83[b]	3; 747
	(0.94)	(0.83)	(0.85)	(0.80)	<0.0001
BARRIER AVOID NEIGHBORS**†	2.69[c]	3.40[a]	3.57[a]	3.09[b]	3; 743
	(0.90)	(0.78)	(0.70)	(0.68)	<0.0001
Segment size	186	165	209	210	

Superscript letters denote mean separation $\alpha = 0.05$, standard deviation shown in parentheses.
* Means calculated on derived principal component.
** (1 = never, 4 = often).
*†† (1 = very interested, 5 = very uninterested).
**† (1 = strongly agree, 5 = strongly disagree).

are likely to contribute substantially to among-segment differentiation in the MDA. Using these variables, three discriminant functions were found significant at an alpha level of 0.05. However, only the first two were retained based on their R_c^2 values of 0.397 and 0.206, respectively. The third canonical function was not considered in the analysis because of its minor contribution to explaining segment difference.

Table 8 presents the standardized canonical coefficients, discriminant loadings, and summary statistics for each variable on the first two canonical axes. As in the previous MDA, the discriminant loadings are interpreted, because they represent the univariate correlation between each discriminant variable and the derived canonical axes. Again, this relationship is illustrated with the aid of biplot (Figure 2). As in the previous MDA, the vectors and centroids are stretched, and the vectors are reversed so that arrows point toward those segments with which they are positively correlated. The variables STEWARD, SHARE, BARRIER AVOID NEIGHBORS, and BARRIER NO BENEFIT, are strong discriminators, and as a result, their vectors are quite long. In Figure 2, these vectors are broken to fit a common

Table 8. MDA standardized coefficients and loadings for forest ownership, attitudes, and actions related to cross-boundary cooperation, and barrier to cooperation variables on first two discriminant functions, along with associated descriptive statistics

	Standardized coefficients		Discriminant loadings		Univariate F		Partial F		
	Function 1	Function 2	Function 1	Function 2	Ratio[a]	Prob.	Ratio[b]	Prob.	Potency index
OWN ENVIRON	0.07	−0.26	0.37	−0.47	29.36	<0.0001	2.48	0.06	0.21
OWN TIMBER	0.14	0.38	0.06	0.49	15.92	<0.0001	9.32	<0.0001	0.12
STEWARD	0.40	−0.12	0.59	−0.44	49.20	<0.0001	8.90	<0.0001	0.35
SHARE	0.49	0.69	0.62	0.63	80.37	<0.0001	29.40	<0.0001	0.48
ENJOY	0.19	−0.22	0.37	−0.35	16.00	<0.0001	4.35	0.01	0.16
THREAT & COMMUNITY	0.10	−0.24	0.29	−0.55	25.1	<0.0001	2.86	0.04	0.22
MGNT COMMUNITY	0.01	0.18	0.22	0.25	7.81	<0.0001	1.18	0.32	0.07
ECO HEALTH	0.18	0.01	0.46	−0.23	23.01	<0.0001	2.11	0.10	0.18
MGNT COMMUNICATE	−0.06	−0.02	0.25	−0.01	8.87	<0.0001	1.54	0.20	0.05
BARRIER SATISFIED WITH SITUATION	−0.23	0.14	−0.54	0.18	44.15	<0.0001	3.72	0.01	0.22
BARRIER NO BENEFIT	−0.31	0.05	−0.68	0.05	64.64	<0.0001	5.34	0.01	0.33
BARRIER PRIVACY	−0.12	−0.05	−0.52	−0.13	34.33	<0.0001	1.91	0.13	0.20
BARRIER TIME	0.05	0.26	−0.36	0.16	11.98	<0.0001	2.37	0.07	0.11
BARRIER AVOID NEIGHBORS	−0.27	−0.01	−0.61	−0.09	49.20	<0.0001	4.52	0.01	0.27

[a] The degrees of freedom are 3 and 639.
[b] The degrees of freedom are 3 and 647.

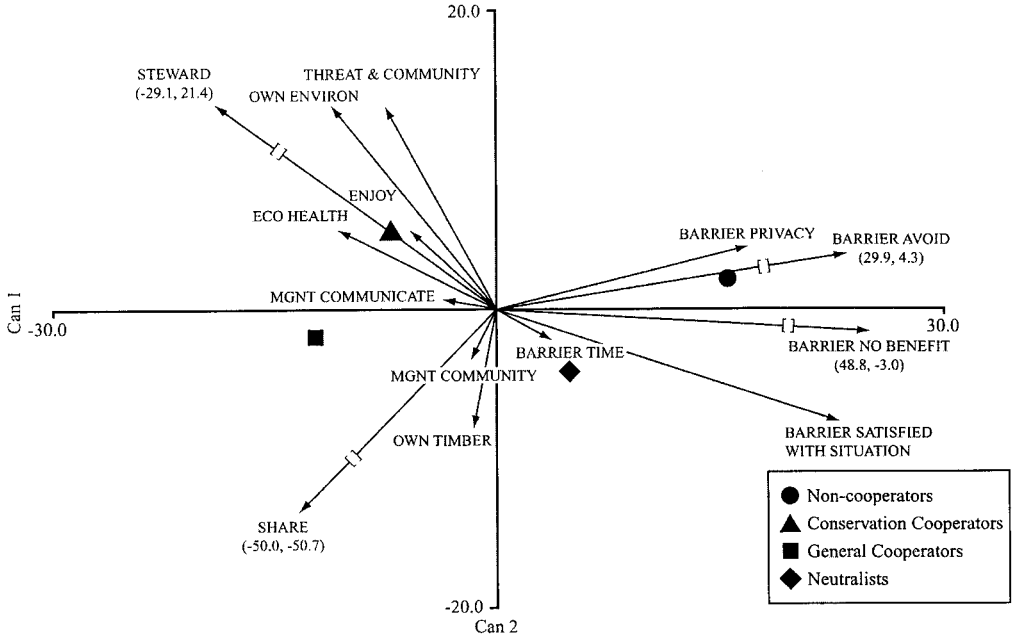

Figure 2. Biplot of reason for forest ownership, attitudes and actions, and barrier to cooperation variables. Points represent segment centroids. Axes measured on units of canonical separation.

scale with the other vectors, and end-point coordinates are provided below the vectors' label.

The following paragraphs use Table 7 and Figure 2 to profile each segment based on the landowner characteristic and barrier to cooperation variables.

Non-Cooperator (Segment 1)—As seen in Figure 2, the barrier to cooperation vectors all more or less point toward the Non-Cooperator's centroid. This indicates that Non-Cooperators recognize the most barriers to cooperation. Individuals in this segment see no benefit in cooperation (BARRIER NO BENEFIT), do not want to get to know their neighbors (BARRIER AVOID NEIGHBORS), believe cooperation would infringe on their privacy (BARRIER PRIVACY), and are satisfied with the status quo (BARRIER SATISFIED WITH SITUATION). This relationship is also reflected in Table 7. Here, Non-Cooperators are statistically unique from the other segments when barrier variables' means are compared. Consistently, Non-Cooperators score near the Important Likert level when asked to consider the different barriers to engaging in cooperative activities.

The fact that all non-barrier vectors point away from the Non-Cooperators indicates that these respondents scored high on these Likert scales and/or PC variables. For instance, a statistically unique mean on the SHARE variable

suggests that Non-Cooperators do not agree with the statements: "I wish my neighbors would enjoy my land more," and "I would allow my neighbors to build a trail across my property." Furthermore, these respondents do not agree with the reversed item: "The fewer people on my property the better" (refer to Table 2 for PC and item definitions). Although statistically indistinguishable from Neutralists, Non-Cooperators constantly hold the highest mean on the measured variables, with the exception of the utilitarian-oriented reasons for forestland ownership described by OWN DEVELOPMENT and OWN TIMBER.

Conservation Cooperator (Segment 2)—The direction of the vectors in Figure 2 indicates that these respondents are highly aligned with the environmental and community-oriented variables measured in the survey. These respondents hold environmental stewardship values (STEWARD), enjoy working and recreating on their property (ENJOY), own their forestland for its environmental values (OWN ENVIRON), believe that development will compromise the environment and community (THREAT & COMMUNITY), and consider the health of the broader ecosystem when making management decisions on their own property (ECO HEALTH).

For Conservation Cooperators, the measured barriers to cooperation are not an issue. For instance, the variables BARRIER TIME, BARRIER SATISFIED WITH SITUATION, and BARRIER NO BENEFIT point in the opposite direction of the Conservation Cooperator's centroid. This suggests that these respondents do not believe that cooperation would be too time-consuming, they are not satisfied with current environmental or social conditions in their neighborhood, and they recognize that cooperation with their neighbors could be beneficial.

General Cooperator (Segment 3)—The General Cooperators and Conservation Cooperators are statistically inseparable on most of the discriminating variables. Both segments are characterized by their alignment with the environmental and social variables. Neither segment recognizes any of the measured barriers as hurdles to cooperation, reflected by the near-neutral Likert levels on barrier variables. General Cooperators differ from Conservation Cooperators in their reason for forestland ownership. Specifically, General Cooperators rank ownership for timber value (OWN TIMBER) higher than ownership for conservation and wildlife habitat (OWN ENVIRON). In addition to differences in their reasons for ownership, the General Cooperators are more open to sharing their property with neighbors (SHARE). Furthermore, General Cooperators do not recognize development as a threat to their property or community (THREAT & COMMUNITY), and believe they know their neighbors' forestland objectives and feel these objectives are compatible with their own (MGNT COMMUNITY).

Neutralist (Segment 4)—The Neutralists are characterized by their ambivalence to most cooperation barriers. Referring to Table 7, the Neutralists score between Important and Neutral on the Likert scale for the barrier variables BARRIER SATISFIED WITH SITUATION, BARRIER OVER COMMITTED, and BARRIER TIME. The variable BARRIER OVER COMMITTED is a function of time (i.e., these two barrier variables had a high positive correlation), not one that stems from lack of interest or lack of value associated with the proposed activity. Generally, respondents in this segment do not recognize the other barriers as hurdles to cooperation.

The final step in the profile analysis examined segments on the basis of socioeconomic, demographic, and other descriptive variables related to forestland ownership. GLM results presented in Table 9 show that there is no significant difference in number of hectares owned by respondents across the segments (HECTARES OWNED). There is a highly significant difference between segments in the mean number of years that a respondent has owned the land (TENURE). Specifically, General Cooperators and Conservation Cooperators have shorter ownership tenures than

Table 9. GLM and Tukey's Studentized Range Test for socioeconomic and demographic variables by segment

	Segments				
Profile variable	(1) Non-Cooperators	(2) Conservation Cooperators	(3) General Cooperators	(4) Neutralists	Sig. d.f.
HECTARES OWNED	22.01	20.69	23.32	26.23	0.59
	(42.56)	(37.01)	(28.44)	(45.18)	3; 757
TENURE*	29.77[a]	18.50[c]	20.16[b,c]	25.29[a,b]	<0.0001
	(41.60)	(15.89)	(21.98)	(20.55)	3; 755
AGE*	59.91[a]	53.63[c]	53.87[c]	57.09[b]	<0.0001
	(13.91)	(12.80)	(11.82)	(13.85)	3; 736
EDUCATION**	5.39[b]	6.24[a]	6.10[a]	5.62[b]	<0.0001
	(1.50)	(1.27)	(1.21)	(1.42)	3; 746
INCOME**†	5.21[b]	5.74[a]	5.95[a]	5.61[a]	<0.001
	(1.57)	(1.67)	(1.48)	(1.63)	3; 647

Superscript letters attached to variable means denote mean separation $\alpha = 0.05$, standard deviation shown in parentheses.

* Years.

** (1 = Primary school, 2 = Some high school, 3 = High school diploma, 4 = Some college, 5 = Bachelor's degree or equivalent, 6 = Master's degree, 7 = PhD, MD, or JD).

**† Seven levels of annual income from 0 to 100,000 dollars.

Non-Cooperators. This same statistically significant relationship is reflected in the mean age of segment members (AGE). General Cooperators and Conservation Cooperators are slightly younger than respondents in the Non-Cooperator and Neutralist segments. Furthermore, Table 9 shows that General Cooperators and Conservation Cooperators are more educated than respondents in the other segments (EDUCATION). Typically, General Cooperators and Conservation Cooperators hold a Bachelor's degree or higher. The typical respondent in the Non-Cooperator and Neutralist segments has some college experience without receiving a diploma. As might be expected, income level (INCOME) is positively correlated with education level. General Cooperators, Conservation Cooperators, and Neutralists have a higher mean annual income than Non-Cooperators.

Discussion

We believe it would be premature to significantly alter public forest policy or suggest revised marketing strategies of private consulting foresters merely on the basis of our study in one rural county in one small northeastern state. In our opinion, however, there are a number of implications that warrant further study or consideration. Greater social benefits such as clean water, biodiversity, a scenic backdrop to a rural tourism industry, outdoor recreation opportunities, and a dependable supply of wood all emanate from an expansive and fully functioning forest landscape. When a forest landscape is dominated by hundreds of thousands of individual private ownerships and an average parcel size of fewer than 10 hectares, there are benefits to a management approach that considers ecosystem spatial scales. Because the natural patterns and processes that are indicative of a healthy and fully functioning landscape do not start or stop at individual property, town, or state boundaries, it makes sense to consider public policy that would reward management of private lands at broader scales. This is the underpinning rationale of an ecosystem-based approach to management. Although the concept of an ecosystem-based approach to management has been discussed for over 10 years (e.g., Society of American Foresters 1993), the means to apply it in heavily parcelized and private forest landscapes remain elusive. Paradoxically, it is landscapes like these, dominated by small private ownerships, and in densely populated parts of the country, where some approach to management at broader spatial ecosystem scales would be most important.

Recent studies of landowner attitudes toward an ecosystem-based approach to management have probed and reported on average landowner attitudes toward the concept (Brunson et al. 1996, Rickenbach et al. 1998, Jacobsen et al. 2000, Sinclair and Knuth 2000, Raedeke et al. 2001). Our results advance the understanding of this important audience by segmenting landowners into four distinct types, and getting beyond the "average." Importantly, however, self-reported attitudes of private forest owners do not necessarily translate into implemented behaviors or actions (Egan and Jones 1993). Our results suggest favorable attitudes toward the proposed activities and suggest that educational and incentive programs might be successful if they are carefully tailored to specific segments. Therefore, from a marketing perspective, we suggest defining and targeting clientele segments as a first step in motivating action such as ecosystem management.

In particular, our findings suggest that roughly half of responding PF owners are amenable to some form of cooperation (Conservation and General Cooperators). This result provides a "likelihood" of adoption given development of new public policies designed to promote cooperation. Conversely, our analysis could have revealed little segmentation between owners on this topic, and overall negative attitude, but it did not, implying at least the possibility that some actions might be taken. Over time, actual longitudinal studies of documented landowner behavior will help bridge this gap. This will represent a challenge. However, because of unlike individual landowner behaviors (e.g., tree-planting or management plan development), it may prove difficult to objectively define and measure cross-boundary or cooperative actions. We furthermore know that, of the two remaining segments not inclined to cooperate, roughly half of those can be considered neutral to the concept (Neutralists), and the other half were actively opposed to the proposed scenarios (Non-Cooperators) or related strongly to some of the potential barriers. Realistically, 100% acceptance or participation in any public policy is unlikely, but should policies change to promote segment-specific management interests, our results suggest that approximately 50% of the population could welcome this shift, and perhaps 25% could be considered neutral or undecided. These rough proportions of the landowner population are of course approximate, based solely on our findings from one study. Despite a 68% overall response rate, it is possible that nonresponse bias may exist in our data. Although we found no significant difference in ownership size between respondents and nonrespondents, if there is a bias, we believe it may manifest itself in the relative size of identified segments. For example, Non-Cooperators and perhaps Neutralists might be more inclined not to respond than Cooperators with an interest in the subject. The absolute size of the different segments is important and should be investigated in subsequent studies.

Our results also identify clear barriers to cooperation not previously documented. Importantly, for the Neutralists who are undecided about cooperation, principal barriers are a lack of time and satisfaction with the status quo. It is possible that the latter may potentially be addressed through educational programming designed to elucidate the benefits of cooperation at ecosystem scales. The former can be possibly overcome by incentives to make cooperation feasible (e.g., cost-sharing to provide support for consulting foresters to orchestrate cooperation, if owners themselves do see the benefits but have no time to implement). Only the true Non-Cooperator segment relates to the possibly insurmountable barriers of a desire for privacy and avoidance of neighbors. These barriers might be difficult to address by changing education or incentive programs. Thus, our results

suggest that perhaps as much as 25% of our sample might not react to attempts to promote cooperation due to insurmountable barriers. Overall, these kinds of "odds" (approximately 50% amenable, 25% neutral/undecided based on barriers of time and current satisfaction, and 25% uninterested based on barriers of privacy and lack of interest in neighbors) shed new light on the likelihood of adopting in the future. These findings provide policy makers and practicing foresters interested in promoting cooperation at ecosystem scales an improved understanding of the target audience.

We believe our results have the greatest application to state and federal forest policy-makers interested in promoting cooperation among owners to enhance or ensure greater societal ecosystem benefits. The USDA Forest Service promoted forest stewardship in the 1990 Farm Bill, and corresponding cost-sharing incentive programs were developed by state forest stewardship committees empowered with this federal funding. These practices focused on individual owners and their properties through activities like the development of management plans, walking trails, view and scenery enhancement, habitat improvement, and timber stand improvement. In some states, rather creative cost-sharing programs were developed to control invasive species or create early successional habitats in short supply on the greater landscape. Our results imply that Conservation Cooperators are interested in habitat practices on multiple properties, and the preparation of easements or conservation restrictions at a scale larger than their own land (Figure 1). They also show interest in local meetings and walking tours focused on forest issues. General Cooperators show interest in the joint preparation of management plans as well as the joint development of trails, sharing forest management equipment, and the marketing of timber. We believe that the public forest policy shift of individual property/owner-based incentives to incentives for joint action in these areas could find ready participants. These receptive owners could have newly acquired their land and not have been the target of more traditional individual property/owner-based incentives. Alternatively, they could be longtime landowners who have been uninterested in those traditional messages. Incentives for joint action and educational programming oriented in this way can be focused on new landowners, and by default on those who have not participated in previous, traditional approaches.

Campbell and Kittredge (1996) tested PF owner cooperatives in a pilot basis in one Massachusetts town with 20–30 owners, and found enthusiastic response among the participants. Their pilot study ultimately failed not because of owners, but because private consulting foresters in the area were more interested in marking and selling timber than orchestrating cooperation between owners or writing joint management plans. If private consulting foresters, who have traditionally been the customary providers of management information and activity on private family lands, are less interested in providing broader ecosystem-based management services, then an additional public policy shift for consideration is to empower public sector County and Extension Foresters to promote cooperation. This actually fits well with the recognition that education may be able to overcome the barrier of satisfaction with the status quo. Other temperate, forested countries with developed economies and dense populations (e.g., Japan, The Netherlands, Germany, France, and Belgium) have public forest policy that promotes cooperation among the plethora of small private owners (Kittredge, 2005).

In addition to re-tooling traditional cost-sharing incentive programs that currently promote individual and independent actions, public forest policy could shift emphasis in educational and outreach programming for PF owners. Rather than presenting educational programming and materials that promote development of management plans for individual properties (e.g., the current Forest Stewardship program), outreach efforts instead could place emphasis on joint action, communication among owners, and the reasons for and benefits of such activity. Indeed, landowners have long expressed an interest in recreation and wildlife habitat (Birch 1996), both of which are better provided or enhanced at spatial scales broader than small, individual properties. Our results suggest that possibly 25% of the PF owners sampled would benefit from this kind of outreach programming, whereby the benefits of cooperation are clarified, distinguishing this from the relative inaction of the status quo.

Our results suggest that ownership size is roughly the same among the four segments (mean ownership size of the four segments ranging from 20.7 to 26.2 hectares; see Table 9). Earlier PF owner attitude research suggested that owners of large properties are the ones more interested in timber management, and owners of small properties are more interested in other nonconsumptive results of ownership (Birch 1996). On the basis of this, one might conclude that policy and outreach focus should only be on the large properties, but our results suggest that size is a poor metric to use for focusing effort or investment to promote cooperation.

Importantly, there are some differences among owners in the different segments. Owners inclined to cooperate tend to be slightly younger, better educated and more affluent, and have owned their property for a shorter time period. PF owners are aging and forestland is transferring to the next generation, potentially reducing the average age of owners. As this change in ownership continues, there is a strong chance that the proportion of landowners inclined to cooperate (i.e., members of either the Conservation Cooperator or General Cooperator cohort) will increase over time. Public policies that promote cooperation may find a receptive audience in the future, as landownership changes hands, and owners become younger, more affluent, and better educated.

Conclusion

We believe our results shed new light on PF owner attitudes toward the important concept of cooperation at scales greater than individual properties. We believe further

study of PF owners, through the lens of segmentation by types of cooperation, is warranted, because the potential for public benefits of such cooperation in privately dominated landscapes are great, and will grow in the future. Although it may be premature to make alterations to existing forest policy on the basis of our study, we believe our results warrant a similar segmentation analysis of PF owners in other PF owner communities with the intention of better understanding the implications for existing forest policy.

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