Thoreau, Muir, and Jane Doe: Different Types of Private Forest Owners Need Different Kinds of Forest Management

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ABSTRACT: *We present a three-phase segmentation analysis designed to highlight the heterogeneity of forest ownership values and attitudes toward government control, privacy, and environmental protection held by a sample of Massachusetts private forest owners. This case study explores private forest owner characteristics that are associated with enrollment into Massachusetts' Chapter 61 current-use forest property tax program, which requires a professionally prepared 10-year forest management plan. We suggest the key to increasing landowner participation in forest management programs is to (1) recognize this heterogeneity of the target population, and (2) tailor the program to meet segment specific needs and desires. North. J. Appl. For. 23(1):27–34.*

Key Words: private forest owners, segmentation analysis, attitudes, forest management.

The northeastern United States, where private forest dominates the landscape, relies heavily on an intact, healthy, and resilient forest ecosystem. These private forests produce numerous social benefits including clean water and air, biodiversity, lumber/wood fiber, wildlife for consumptive and nonconsumptive uses, recreation, and a scenic backdrop for a rural tourism industry. Recognizing the value of private forests, several local, state, and federal agencies have designed programs to encourage private forest (PF) owners to practice forest stewardship. Forest stewardship can be defined as the judicious management of forest resources to ensure their sustainable health and productivity for future generations.

Despite the development of these programs, it is increasingly difficult to ensure stewardship practices across the private forest landscape. An increasing PF owner population challenges efforts to secure a sustainable and ecologically sound forest landscape because of parcelization, fragmentation, and land use change (Birch 1996; Sampson and DeCoster 2000). The effectiveness of forest management programs is challenged in this developing landscape, since they provide few economically compelling alternatives to landowners faced with the option to sell their property for subdivision and eventual land use change.

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We present findings of a recent PF owner study that uncovers patterns in values associated with forestland ownership. Based on unique value orientations identified in the PF owner sample, we propose that the state's current-use property tax program (Chapter 61) could enjoy greater success if it better reflected PF owners' values.

Case Study

Although it is generally perceived as a center of metropolitan development, Massachusetts is roughly 62 percent forested. Seventy-eight percent of this forest landscape is controlled by 235,000 PF owners (Alerich 2000). The forested landscape controlled by thousands of private individuals provides a myriad of market-based commodities and other invaluable benefits to the state's 6.3 million citizens. Considering the pressure from Massachusetts' rapidly expanding urban populations, the state has a recognized the need to protect forests for their social and ecological services. To this end, the state legislature passed Chapter 61 in 1989, which provides a 95 percent reduction in the assessed value of the property resulting in a corresponding savings in property taxes. The aim of Chapter 61 is to simultaneously encourage forest stewardship and keep the private forest in active timber management. Enrollment in the Chapter 61 program requires a professionally prepared 10-year forest management plan that identifies landowner forestland objectives (e.g., improving wildlife habitat, property esthetics,

or timber resource) and active management for those forestland objectives. An explicit requirement of Chapter 61 is that enrolled forestland be managed to produce timber. Local towns receive an 8% severance tax from the landowner when timber is sold. Also, once enrolled, the property cannot be withdrawn without paying a foregone back-tax penalty. Chapter 61 does not require the landowner to open their property to public access. Despite the liberal tax reduction benefit, it is estimated that only 17% of eligible acres and 19% of eligible owners participate (unpublished data).

Methods

The Survey

The data used in this case study were drawn from a survey distributed in the spring of 2000. The original study was designed to measure PF owners' attitudes toward ecosystem management activities implemented on their forestland (White 2001). In addition to questions concerning landownership, the survey elicited responses from landowners on attitudes toward a variety of themes or issues about the environment, government, and ownership decisions. The survey was mailed to 1,500 PF owners in 20 randomly selected towns in Massachusetts. The development and distribution of the survey followed Dillman's (2000) Total Design Method. In an attempt to exclude those PF owners in predominately urban centers, all Metropolitan Statistical Areas and Consolidated Metropolitan Statistical Areas as defined by the United States Census were excluded. Cape Cod and all towns east of Interstate 495 (which rings the greater Boston metropolitan area) were also excluded because PF owners in this area experience different environmental and developmental pressures related to the coastal environment. Approximately 75 PF owners in each of the sampled towns were randomly selected to receive the mail-back survey. The survey had a response rate of 47.2 percent (n = 708), and 139 observations were dropped from the analysis due to missing values.

Segmentation Approach

The three-phase analytical strategy defines and describes PF owner segments based on measured values and attitudes. Three distinct segments of respondents were defined, based on their responses to 13 Likert scale survey items. Using a 5-point Likert scale, each item measured reasons for owning forestland (with potential responses ranging from "not at all important" to "extremely important"). First, principal components analysis (PCA) was used to reduce the dimensionality of the survey item data set and render a parsimonious set of composite variables. Second, a cluster analysis (CA) extracted three distinct respondent segments based on the composite variables and retained original survey items. Third, a multiple discriminant analysis (MDA) identified those clustering variables that best exemplify segment differences. In addition to these three multivariate analyses, univariate tests on supplementary survey items were used to further profile the derived PF owner segments.

Analysis

Phase 1: Data Reduction Using Principal Components Analysis

In this case study, 13 items were used from the original survey (Table 1). These items measure respondents' reasons for forestland ownership. High simple correlations among several of these items warranted a data reduction procedure (Stevens 1986). PCA was performed on the 569 responses and 13 survey items. Table 1 displays the PC loadings and variance explained by the first four PCs. A PC loading represents the univariate correlation between the survey item and PC. These loadings are used to define and name each PC. Hair et al. (1998) suggest that in samples greater than 50, absolute PC loadings greater than 0.50 indicate strong variable to PC association. This criterion was used here for defining each PC. However, Item 12 (To have privacy) and Item 13 (To leave land unmanaged, letting nature take its course) were not incorporated into a PC and left to stand alone in the analysis. Emerging research suggests different PF owners hold unique definitions for the word privacy (Rickenbach et al. 1998); therefore, we were interested in observing the behavior of Item 12 as a unique variable. Item 13 did not adequately load on any of the four PCs, and was therefore also left as a unique variable.

Table 1. Rotated PC loadings, total variance explained by retained PCs, and Cronbach's Alpha for each PC.

		Rotated principal component loadings				
Items	Reasons for owning forestland	PC 1	PC 2	PC 3	PC 4	Cronbach's Alpha
1	Income from timber	0.05	−0.07	0.07	0.57	0.61
2	Income from agriculture	0.04	0.13	0.14	0.58	
3	To pass on to my children	0.12	0.09	0.72	0.14	0.80
4	To preserve family and tradition	0.23	0.22	0.73	0.17	
5	Personal recreation	0.27	0.64	0.13	0.03	0.79
6	As a place to live	0.18	0.65	0.13	0.05	
7	To enjoy the scenery	0.32	0.74	0.11	−0.01	
9	To protect land from development	0.66	0.27	0.26	0.08	0.82
10	To provide wildlife habitat	0.71	0.28	0.10	0.04	
11	To protect the environment	0.72	0.25	0.12	0.05	
12	To have privacy			Retained as unique variable		
13	To leave land unmanaged, letting nature take its course			Retained as unique variable		
Variance explained		1.83	1.74	1.21	0.84	

Based on associated item themes, we assign the following names to the different PCs: PC 1 *environmental protection*; PC 2 *contemplative enjoyment*; PC 3 *family legacy*; PC 4 *utilitarian consumptive uses*. As a measure of scale reliability, Cronbach's Alpha was calculated for each PC (Cronbach 1951). Because PC 4 does not meet Nunnally's (1978) suggested Cronbach Alpha minimum of 0.70, caution will be used when interpreting results related to the *utilitarian consumptive uses* PC.

Using PCA, the original 13 survey items were effectively reduced to four composite variables, and two original items (Item 12 and Item 13). PC scores serve as data observations for the new composite variables. To share a common scale with derived composite variables, Items 12 and 13 were standardized (mean = 0, variance = 1). In the second phase of the analysis, CA defines distinct respondent segments based on this reduced set of variables.

Phase 2: Segment Formation Using Cluster Analysis

Previous PF owner studies have effectively described commonly held reasons for landownership and attitudes concerning forest resource use (e.g., Birch 1996, Rickenbach et al. 1998). However, they have not described the heterogeneity of these values and attitudes among survey respondents. CA 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 survey items. The CA technique used in this analysis produces statistically significant and discrete segments of PF owners who exhibit common reasons for landownership.

The k-means clustering algorithm was used to assign respondents to exclusive segments based on their response to the six clustering variables derived from the PCA. To arrive at an appropriate number of respondent segments (i.e., clusters), two-, three-, and four-cluster solutions were explored. Results from the final phase of this analysis suggested that the three-cluster solution was most easily interpreted, and therefore, will serve as the basis for further analysis.

Phase 3: Describing Segment Differences Using Discriminat Analysis

CA defined three segments of respondents based on their scores on six clustering variables. The third phase of the analysis describes the unique signature or profile of these respondent segments. In this analysis, MDA was used to determine which of the six clustering variables were most influential in assigning respondents to segments. This information is important because it highlights those landownership values common and unique among segments.

Both discriminant functions are highly significant ($P < 0.01$) based on an approximate F-value (see Hair et al. 1998 for approximate F-value calculations). Table 2 lists each of the discriminating variables and associated standardized canonical coefficients.

To aid in interpretation, the MDA results are illustrated with a biplot (Figure 1), which depicts discriminating variables as vectors and segment centroids as point symbols. 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; stated differently, the more aligned a vector is with the canonical axis the more the discriminating power is associated with that axis. Furthermore, the direction of the vector mirrors the original low to high Likert scale; the variable or PC vector arrow points toward segments that scored high, and away from segments that scored low (Hair et al. 1987).

Examining the discriminant loadings (Table 2) and the biplot (Figure 1), we determined that the first function (i.e., the x axis) describes a gradient dominated by the value placed in privacy. This gradient generally separates segment three from segments one and two. The second function (i.e., the y axis) describes the difference between segment one and two. Specifically, this gradient is dominated by the recognition of ownership for contemplative enjoyment versus the value in ownership to preserve nature. We recognize that these value scales are not mutually exclusive (rather complimentary) and probably in most cases exist together in a landowner's set of ownership values. Our analysis suggests, however, that one set of values presides over the other

Table 2. Summary of discriminant analysis and variables' contribution to segment separation.

	Standardized coefficients		Discriminant loadings		Univariate F		Partial F	
Discriminant variables	DF 1	DF 2	DF 1	DF 2	Ratio	Prob.	Ratio	Prob.
PC 1 Environmental protection	0.269	−0.379	0.621	−0.272	101.99	<0.01	22.76	<0.01
PC 2 Contemplative enjoyment	0.173	0.677	0.628	0.4611	144.31	<0.01	43.26	<0.01
PC 3 Family legacy	−0.099	0.536	0.086	0.400	25.44	<0.01	38.51	<0.01
PC 4 Utilitarian uses	−0.007	0.296	−0.016	0.392	23.02	<0.01	11.05	<0.01
Item 12 Preserve privacy	1.187	0.227	0.953	0.212	361.72	<0.01	125.65	<0.01
Item 13 Preserve nature	0.334	−0.923	0.485	−0.646	147.96	<0.01	111.13	<0.01

DF, discriminant function.

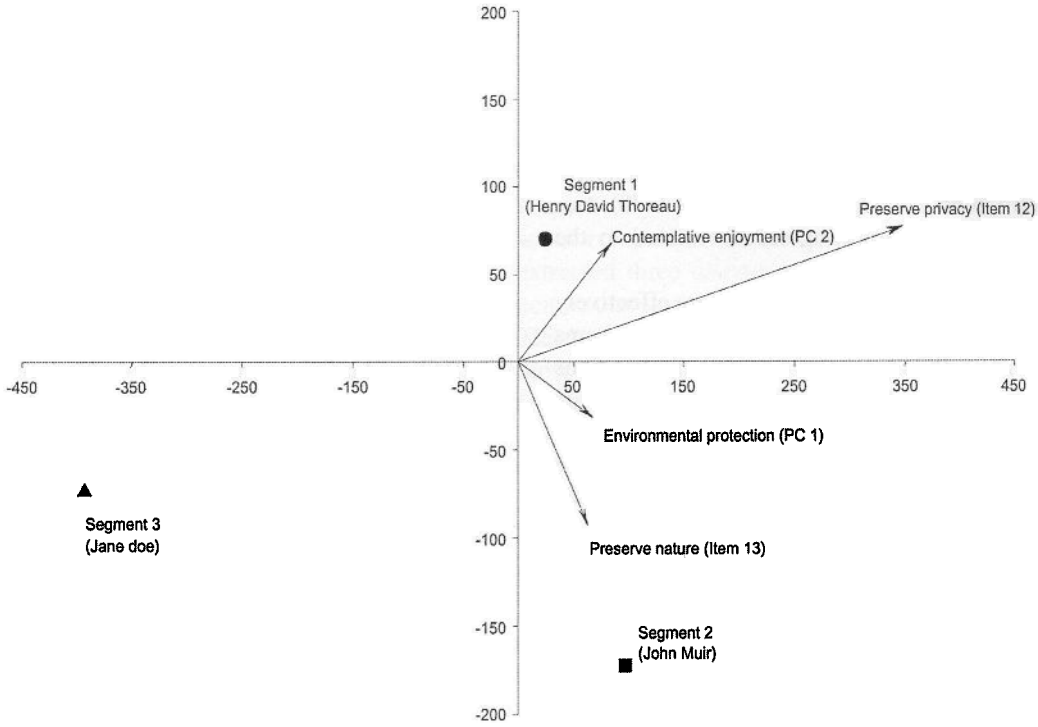

Figure 1. Biplot of important discriminant variables (vectors) and segment centroids (symbols). Axes measured in units of standard deviations.

between the segments. Specifically, landowners in segment 2 hold strong values of environmental protection, whereas landowners in segment 1 place higher priority on privacy and nonconsumptive uses such as recreation and scenery.

Although statistically significant, the composite variables of *family legacy* and *utilitarian uses* exhibit much less influence in distinguishing between landowner segments, as indicated by the univariate F scores (Table 2). Since these are not strongly distinguishing factors, the implication is that these concepts are held more or less commonly among segments and for this reason their vectors were not included in the biplot.

Segments

Our analysis has identified three statistically unique segments of the sampled landowner population in Massachusetts. These segments are basis on attitudes toward environmental protection, privacy, and appreciative values of forests.

- *Henry David Thoreau* is the figure we've chosen to exemplify landowners in this first segment. Like Thoreau, these landowners highly value privacy and the contemplative values or benefits of forest, such as scenery, personal recreation, and a pleasing residential setting. Although their land may not have a pond, these landowners view their property as providing important "Walden"-like qualities or benefits. Like Thoreau, however, these owners are not necessarily opposed to utilizing the forest for wood products (Foster 1999), but their highest priorities are more appreciative or nonconsumptive benefits. Approximately 67% of survey respondents are members of the Thoreau segment, and their average age is 58 years (Table 3). The average property size of Henry David Thoreau is 70 acres. Understandably, since they place a high priority on appreciative values such as scenery, 83% of Thoreau owners reside on their property, and only 17% live elsewhere (Table 4). In terms of future development, the vast majority of Thoreau owners (85%) have no such intentions for the next ten years (Table 5).
- *John Muir* is the historical figure we use to exemplify the second segment within the sampled landowners. Like Muir, these landowners place the highest priority

Table 3. Analysis of variance for survey items that measure segment specific ownership and demographic characteristics.

Item	PF owner segments			d.f. Prob.
	Henry David Thoreau (Segment 1)	John Muir (Segment 2)	Jane Doe (Segment 3)	
Forest area (acres)	69.55^{ab} (105.67)	54.11^{a} (60.73)	102.00^{b} (167.54)	2; 566 0.02
Respondent age (years)	58.12^{a} (12.64)	59.60^{ab} (13.12)	63.46^{b} (11.66)	2; 566 0.01
n	381	132	56	

GLM and Tukey's Studentized Range Test. Superscript letters attached to variable's mean denote mean separation $\alpha = 0.05$, variable's standard deviation shown in parentheses.

Table 4. Cross-tabulation by segment for the item that measures absentee ownership.

Frequency column percent	PF owner segments: Henry David Thoreau (Segment 1)	John Muir (Segment 2)	Jane Doe (Segment 3)	Total
Absentee	62 16.67	29 23.39	36 67.92	127
Non-absentee	310 83.33	95 76.61	17 32.08	422

Full table $\chi^2 = 68.55$; d.f. = 2; $P < 0.01$; missing values = 20.

Table 5. Cross-tabulation by segment for the item that measures plans to develop property or sell for development within the next 10 years.

Frequency column percent	PF owner segments: Henry David Thoreau (Segment 1)	John Muir (Segment 2)	Jane Doe (Segment 3)	Total
No plans to development or sale	292 84.64	112 87.50	28 57.14	432
Plans to develop or sell for development	53 15.36	16 12.50	21 42.86	90

Full table $\chi^2 = 25.40$; d.f. = 2; $P < 0.01$; missing values = 47.

on nature, environmental quality, and protection. Importantly, they are in strong agreement with the Likert scale statement that they should "leave land unmanaged, letting nature take its course." An estimated 23% of respondents are members of the Muir segment, and their average age is 60 years. The mean size of Muir properties is 54 acres. Like the Thoreau, a high proportion of Muir owners live on their property (77%; Table 4) and a slightly higher percentage (87.5%) have no plans to develop in the next 10 years (Table 5).

- *Jane Doe* is the third persona that we have identified in this segmentation analysis. We know the least about landowners in this segment (hence the anonymous name), as they appear to be indifferent to the factors that were otherwise found to be strong identifying characteristics. Unlike Thoreau and Muir, Jane Doe places little important emphasis on either environmental protection or privacy and other contemplative values of forest ownership. This relatively unknown, anonymous Jane Doe segment represents only 10% of respondents. Jane Doe's average age is 63 years (Table 3), which is significantly older than the Thoreauvians. Doe's average parcel size is 102 ac, which is also significantly larger than Muir's woods. Unlike Thoreau and Muir, most Jane Doe owners reside elsewhere, and not on their property (68%), which could in part explain their apparent indifference to environmental protection, privacy, and other contemplative values (Table 4). Also in contrast to Muir and Thoreau, 43% of Jane Doe owners do indeed have plans to sell or develop in the next 10 years (Table 5). This may be related in part to their older age and the fact that they identify neither with environmental protection sentiments, nor privacy and contemplative reasons for owning woodland.

Chapter 61 Enrollment

Based on the best existing estimates of the number of forest owners who own greater than 10 acres and are thus eligible to enroll land in Chapter 61 (Birch 1996), 17% of eligible acres and 19% of eligible owners participate (unpublished data). Overall, 54% of our respondents participate in Chapter 61 (Table 6). Participation breaks down differently among our segments, however. Henry David Thoreau and his members are most likely to enroll their land. Over 39% of Thoreau respondents cite Chapter 61 involvement. Recall Thoreau is not philosophically opposed to timber harvest, nor devoted to environmental protection, and places a greater emphasis on scenery, privacy, and other amenity qualities. A smaller percentage of Muir owners participate (28%), potentially due to the thought that timber harvesting (a necessary activity for all Chapter 61 lands) is detrimental to their highest ownership goal of nature protection. Jane Doe likewise is relatively disinterested in Chapter 61 (27% of Doe respondents), due perhaps more to general indifference, a possible detachment from their land since they are more likely to be absentee owners, or greater age and possible distrust of government programs in general.

Indeed, Jane Doe indifference to or disinterest in government influences on private forest ownerships is further illustrated in Table 7. Jane Doe respondents show significantly less agreement with statements about government regulatory roles in protecting water quality, rare species, or

Table 6. Cross-tabulation by segment for the item that measures enrollment in Chapter 61.

Frequency column percent	PF owner segments: Henry David Thoreau (Segment 1)	John Muir (Segment 2)	Jane Doe (Segment 3)	Total
Not enrolled	224 60.87	94 72.31	41 73.21	359
Enrolled	144 39.13	36 27.69	15 26.79	195

Full table $\chi^2 = 7.44$; d.f. = 2; $P = 0.02$; missing values = 15.

Table 7. Analysis of variance for survey items that measure segment specific agreement with statement about government control on PF.

Government should have the right to regulate how people use their land and forest to...	PF owner segments			
	Henry David Thoreau (Segment 1)	John Muir (Segment 2)	Jane Doe (Segment 3)	d.f. Prob.
Protect water quality	3.55[a]	3.89[a]	3.14[c]	2; 566 < 0.01
	(1.24)	(1.12)	(1.33)	
Protect threatened or endangered species	3.18[b]	3.65[a]	2.63[c]	2; 566 < 0.01
	(1.24)	(1.18)	(1.26)	
Preserve the beauty of the forest	2.81[b]	3.36[a]	2.32[c]	2; 566 < 0.01
	(1.20)	(1.30)	(1.13)	
Maintain healthy forests	3.03[b]	3.49[a]	2.57[c]	2; 566 < 0.01
	(1.21)	(1.23)	(1.22)	
n	381	132	56	

Scale items 1 = strongly disagree–5 = Strongly agree. GLM and Tukey's Studentized Range Test. Letters attached to variable's man denote mean separation $\alpha = 0.05$, variable's standard deviation shown in parentheses.

maintaining forest health or esthetics, compared with Muir and Thoreau. In fact, although Doe may express neutrality about government's role in protecting water quality, she is in moderate disagreement with statements about government's role in protecting these other attributes of forestland. Not surprisingly, Muir respondents show the most agreement with these statements, and Thoreau followers fall somewhere (and significantly) in between.

Discussion

We recognize that the aim of Chapter 61 is to simultaneously encourage forest stewardship and keep the private forest in active timber management. Given the current relatively low participation rate, we believe the program can be improved and made more attractive to owners if it is modified to be more in line with values that we have identified. Higher participation in Chapter 61 might result in a more effective way to secure an intact, ecologically healthy forest landscape, capable of meeting more domestic demand for timber (e.g., Berlik et al. 2002 identify that annual statewide harvest of wood represents only 3% of total annual consumption of wood products). We believe that realizing these benefits first entails recognizing the heterogeneity of values and beliefs within the state's PF owner population. Once the specific needs and wants of PF owners are understood, a program should address the barriers specific to each segment.

This case study highlighted some segment-specific barriers to achieving the objectives of Chapter 61. For example, John Muir members are devoted to letting nature take its course, and protecting the environment. We believe that a program that requires timber management is almost a guarantee for failure, since harvesting is most likely perceived by Muirs as in conflict with their central philosophy of landownership. Indeed, it is surprising that as many as 28% of Muir respondents are enrolled in Chapter 61. Perhaps this subset of Muirs represents people who have been convinced that environmental protection is not necessarily incompatible with forest management and the production of timber, through existing outreach efforts like the Forest Stewardship program, or Coverts Program (Snyder and Broderick 1992).

Thoreau members, although potentially receptive to the objectives of Chapter 61, hold contemplative and appreciate values most importantly, as well as their privacy. Although a greater percentage of survey respondents in the Thoreau "Family" are enrolled in Chapter 61 (and overall, Thoreaus represent 67% of our respondents), participation suffers. Perhaps Thoreaus are not convinced they need a 10-year forest management plan for their land to realize their desired benefits, and they question whether a management plan will enhance scenery, recreation, and privacy. Is the effort of finding a forester, having a 10-year plan prepared, and dealing with a government program justified by marginally greater appreciative benefits? Indeed, in Massachusetts since 1990, as much as 75% of the cost of management plan preparation has been underwritten by the Forest Stewardship Program (a national program of the USDA Forest Service, resulting from the 1990 Farm Bill; Wilkins 2000). Even this financial incentive has not resulted in meaningful numbers of Thoreaus (or Muirs or Does) seeing the marginal benefits and adopting forest management planning. Furthermore, Thoreaus place high importance on privacy, and possibly perceive that it is somehow compromised by participation in a public program. Would they need to permit public access?

Jane Doe and her kind represent a different type of challenge. They own the larger parcels making the prospect of forest management more attractive. Their attitudes toward government programs, absentee ownership, and likelihood of development in the future suggest that they are unlikely Chapter 61 participants in its current form, or in any modified version. Fortunately, Jane Doe represents only 10% of landowners in our sample. We believe land owned by people like Jane is potentially locked into an economically dictated trajectory of parcelization and land use change. Jane has neither a Muir environmental protection philosophy, nor places a strong importance on other appreciative values of the forest like her neighbor Thoreau. Lacking these, it is not surprising that she expresses a higher likelihood of selling or developing in the future.

Our segmentation analysis helps explain some confusing observed landowner behavior in Massachusetts. Previous landowner attitude surveys have identified that as a group,

most landowners place a very low priority on timber harvest and rate objectives such as wildlife, recreation, and scenery as much more important goals for their land (MacConnell and Archey 1982, Rickenbach et al. 1998, Alexander 1986). Indeed, Birch (1996) and others (e.g., Kingsley 1976) identify similar attitudes with owners throughout the northeast. Practicing foresters have long known, however, that in spite of these professed attitudes against harvesting, landowners still have timber cut from their land. Indeed, Kittredge et al. (2003) document that 64% of all harvesting (by area) in a 19-town region of central Massachusetts between 1984 and 2001 is on nonindustrial private forest land, and this ownership category represents 60% of the forest land base. Likewise, on a statewide basis between 1997 and 2001, 84% of harvested acres (as well as 78% of all harvested timber, and 83% of timber sales by number) occurred on nonindustrial private lands, which collectively represent 78% of all forestland in the state (unpublished data). If owners were so disinterested in harvest (as attitudinal survey results suggest), then we would expect a much smaller percentage of total harvest to come from these ownerships. This is a good example of the potential gap between professed attitudes and observed behaviors of forest owners (e.g., Egan and Jones 1993, Jones et al. 1995).

Our segmentation results suggest that the majority of owners (67%) are Thoreaus, who are not necessarily opposed to harvest and do not identify strongly with letting nature take its course or environmental protection. Jane Doe's segment represents another 10% of the sample who likewise do not identify strongly with environmental protection. Landowners like Thoreau may be more likely to have harvests on their land, as long as they can be convinced that their core values of esthetics and privacy are not compromised. Jane Doe landowners are probably not opposed to harvest as long as it does not interfere with their ability to sell or develop the land. Indeed, Jane may be interested in harvest as a precursor to subsequent sale, subdivision, or development. Jane and her type also own larger properties that would be more attractive to the buyers of standing timber. It really is only the Muirs with their professed nature ethic who would be disinclined to harvest, and a subset of them participate in Chapter 61 currently and apparently do not perceive harvesting as incompatible with their beliefs. Thus, a closer look at the landowner population, through segmentation, helps explain this perceived gap between the "average" attitudes of the whole, and the observed behavior.

How could Chapter 61 be modified to improve the rate of participation? We believe the program needs to be sufficiently flexible to accommodate the different perspectives of Jane, Henry, and John. Obviously, the requirement to harvest timber is a deterrent to the majority of Muirs. Relaxation of this requirement would improve the likelihood that members of this segment would enroll their land. We estimate that the Thoreau segment and their attitudes dominate the PF owner population in Massachusetts. This group remains unconvinced that their passive or appreciative enjoyment of the land and their privacy can be enhanced by a professionally prepared 10-year forest management plan. Did Thoreau need a plan to enjoy Walden? Relaxation of this standard would probably result in greater participation by Thoreaus. Skeptics might say that if a 10-year plan and commitment (defined by the threat of back taxes and interest as a penalty for withdrawal) are not required, then people would enroll and withdraw from the program too frequently. As long as greater public benefits (e.g., water, biodiversity, scenery) are provided for a given year, why should not the benefits of reduced property taxes be conveyed for their provision in that year? Or perhaps the benefits of Chapter 61 participation could be graduated, so that participation for one year was rewarded by a tax reduction of a certain percentage, but a greater level of commitment (longer time frame, management plan) would be rewarded by a greater tax benefit. Lastly, it may not be possible to modify Chapter 61 to have greater appeal for Jane Doe. Her disinterest in government programs may represent too great an obstacle. On the other hand, a more flexible program in terms of time commitment, penalty for withdrawal, and management plan requirements may be sufficient to overcome the barriers for at least some members of this segment.

We believe these segmentation results also provide guidance about outreach programming. Clearly the majority of landowners place priority on scenery, esthetics, and privacy. Educational programming for this segment needs to focus on these desires, instead of typical landowner workshops that dwell on management plan development and the promotion of other tree farming concepts. It is not a coincidence, for example, that a handbook on how to maintain forest esthetics while timber harvesting, developed by the Society for the Protection of New Hampshire Forests (Jones 1993), has sold more than 30,000 copies in 10 years, and represents the second most popular publication produced and distributed by the Natural Resource, Agriculture, and Engineering Service, out of over 150 publications (Geoff Jones, personal communication, spring, 1993). Similarly, programming designed for Muirs, to feature nature and environmental protection, would find a receptive audience. Indeed, the Coverts Program in Massachusetts and other northeastern states, with a focus on wildlife habitat, has been popularly received by many (Snyder and Broderick 1992).

We achieved a reasonably good response rate on the original survey (47%), and consequently did not feel the need to conduct a survey of nonrespondents to check for bias. It is possible, however, that such a bias does exist in our data. For example, a disproportionate amount of respondents could be Muirs or Thoreaus, thereby giving a misleading impression of the extent to which landowners are like Jane Doe. The fact that Doe represented only 10% of respondents makes one wonder whether or not this small proportion is representative, or if Jane Doe and others in this segment were simply less inclined to respond to the survey. As a result, caution should be used in extrapolating these relative proportions to the greater landowner population.

Our results show the significant power of taking a segmentation approach to better understanding PF owners. We

believe there are direct applications of this knowledge, in terms of improving existing management and educational programs. While the results we present are from a survey of Massachusetts owners, we believe the approach has wider and significant application in other northeast states with landscapes similarly dominated by this type of ownership. Results from other analyses may indicate that there are not Muirs in Minnesota, or Thoreaus in Pennsylvania, but we believe there is value to taking a closer look at this most important ownership category of our nation's forest resources, and using results to design more effective programs.

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