United States
Department of
Agriculture

Forest Service

**Northeastern Forest
Experiment Station**

Research Note NE-341

Factors Influencing Recreational Use of Private Woodland

Donald F. Dennis

Abstract

Probit analysis was used to estimate relationships between the probability that forest land was used for recreation and characteristics of the forest, owner, and surrounding community. Land held by owners with more formal education or those reared in large cities was more likely to be used for recreation while the opposite was true for land held by older owners. Correlations are drawn with other studies and policy implications are discussed briefly.

The recent sale of nearly 1 million acres of forest land in northern Vermont and New Hampshire by Diamond International[1] focused attention on the public benefits (externalities) associated with large, undeveloped parcels. Suddenly, fears emerged that large blocks of forest land, traditionally available for recreational use, might be developed or closed to the public. Fears of a decreasing land base available for recreation are exacerbated by parceling and by the addition of residences in forested areas.

Recreational use is expected to become an increasingly important reason for owning forest land as regional demands for outdoor recreational opportunities grow and intensity of use increases on public lands (USDA Forest Service 1989). This is particularly true in the highly populated Northeast.

This study identifies landowner characteristics associated with recreational use of nonindustrial forest land. The study also examines the influence of forest characteristics, such as species composition and stand volume, and the population density of the surrounding community, on whether land is used for recreation. The results are useful in assessing the effect of trends in landowner characteristics on the recreational use of private woodland, and will aid in developing strategies for dealing with greater demands for outdoor recreation. Since landowners who use their land for recreation may manage differently, these results may provide insight into a variety of forestry concerns.

Data and Methods

Information on forest and owner characteristics was collected by the U.S. Forest Service during its periodic survey of Vermont in 1983. (See Frieswyk and Malley 1985 and Widmann and Birch 1988 for a detailed discussion of survey procedures.) Detailed forest characteristics were obtained for a sample of privately owned forest plots, and a questionnaire was sent to the owner of each plot. These data included species composition, elevation, proximity to a maintained road, parcel size, and many owner characteristics, such as, age, education level, occupation, tenure of ownership, and whether the land was used for any of a variety of recreational pursuits (hunting, hiking, camping, winter sports). Observations for 258 individually owned

[1] The use of trade or firm names in this publication is for reader information and does not imply endorsement by the U.S Department of Agriculture of any product or service.

nonindustrial private ownerships in Vermont were analyzed.

Probit analysis was used to estimate the relationship between a dichotomous dependent variable, coded "1" if the woodland was used for recreation and "0" otherwise, and selected explanatory variables. Probit procedures can be used to estimate the strength of correlations between recreational use of forest land and selected characteristics, as well as the probability that parcels with a given set of characteristics will be used for recreation. Judge and others (1982) and Aldrich and Nelson (1984) provide detailed discussions of probit models.

Results

Much privately owned woodland is used for recreation. Approximately 77 percent of the 258 sample plots were within ownerships that were used for recreation. The estimated probability that woodland was used for recreation was 0.57, evaluated at the mean values of the explanatory variables.

Table 1 provides a brief description of the variables, and Table 2 shows the probit results and the estimated elasticities.

Table 1. Definition of variables

Variable	Definition
REC	Dependent variable, coded "1" if woodland is used for recreational purposes and "0" otherwise
PINE	Proportion of eastern white pine in stand
ED	Years of formal education
AGE	Age of landowner (years)
PRO	Variable, coded "1" if owner is employed in a white collar or professional occupation and "0" otherwise
CITY	Variable, coded "1" if landowner spent the first 12 years of his or her life in a large city (population > 100,000) and "0" otherwise

The signs of the coefficients indicate the direction of change resulting from an increase in an explanatory variable, but since the model is nonlinear, the magnitude of the change is influenced by the values for all the variables and coefficients. Elasticities measure the percentage change in the probability that woodland is used for recreational purposes resulting from a 1 percent increase in an explanatory variable. The elasticities shown in Table 2 were calculated at the mean values of the explanatory variables.

The only forest characteristic statistically correlated (10-percent level) with recreational use was the proportion of eastern white pine occurring in the stand. There is no clear intuitive explanation for this correlation other than preference for the aesthetic appeal of white pine or that white pine is more likely to occur on better drained sites. Other parcel characteristics examined but not statistically discernible included: size of ownership, proximity to a maintained road, per-acre timber volume, and several variables that measured species composition other than white pine. Since forest measurements were taken on only one sample area for each parcel (see Frieswyk and Malley 1985) and may not portray average characteristics accurately, results with respect to forest characteristics should be used with caution.

Landowner characteristics had much greater significance in explaining differences in recreational use among wooded parcels. Woodlands owned by more highly educated persons had a greater likelihood of being used for recreation. A strong positive correlation (significant at the 1-percent level) was estimated between recreational use and the landowner's level of formal education.

Parcels held by owners reared in large cities also were more likely to be used for recreation. Recreation may be a more important reason for owning forest land for these owners than for those with a more rural background. Preliminary regressions provided weak evidence, significant only at the 20-percent level, that farmers were less likely to use their woodlots for recreation.

Table 2. Probit results and estimated elasticities

Explanatory variable	Coefficient	Standard error	Mean: Recreational use	Mean: No recreational use	Elasticity
Constant	0.511	0.613	1.00	1.00	—
PINE	0.828*	0.432	0.13	0.06	0.05
ED	0.083***	0.028	14.90	13.00	0.60
AGE	−0.017**	0.008	55.58	60.51	−0.47
PRO	−0.308	0.204	0.42	0.41	−0.06
CITY	0.506*	0.302	0.19	0.07	0.04

N = 258
−2 LOG (Likelihood Ratio) = 26.63

***Significant at 1-percent level
**Significant at 5-percent level
*Significant at 10-percent level

Parcels held by older or professionally employed landowners were less likely to be used for recreation (statistically significant at 2.7-percent and 12.9-percent levels, respectively). Physical restrictions may limit recreational use by older owners, while professionals may have less leisure time or may be more interested in developed recreational pursuits.

Many other variables were examined but the estimated correlations were not statistically discernible. Recreational use was not correlated with the population density of the surrounding community nor was it correlated with tenure of ownership, retirement status, or an owner's income.

Discussion

Several owner characteristics were correlated with recreational use of private woodland. Land held by more highly educated landowners or those reared in large cities was more likely to be used for recreation while the opposite was true for land held by older owners. Although trends show increases in the education level of landowners, the owners also are growing older as the baby-boom generation ages. The low estimated elasticities indicate that changes in the portion of forest land used for recreation, resulting from shifts in the characteristics of the landowning population, will come about slowly.

Increased demand for outdoor recreation may motivate certain types of individuals to purchase land. Understanding the characteristics of these individuals provides insight into a variety of forestry concerns. Studies have linked timber harvesting, forest management, posting, and participation in voluntary forestry programs with landowner characteristics (Binkley 1981; Widmann and Birch 1988; Dennis 1989; Dennis and Sendak, in press). For example, more highly educated landowners were less likely to harvest timber and more likely to post their land and participate in property tax relief programs for forest land. This suggests that alternate tax programs that encourage forest management and discourage posting might be effective in mitigating potential negative effects of changes in land ownership motivated by increased demand for recreation.

Literature Cited

Aldrich, J. H.; Nelson, F. D. 1984. **Linear probability, logit, and probit models.** [Quantitative applications in the social sciences series]. Beverly Hills, CA: Sage Publications. 95 p.

Binkley, C. S. 1981. **Timber supply from nonindustrial forests.** Bull. No. 92. New Haven, CT: Yale University of Forestry and Environmental Studies.

Dennis, D. F. 1989. **An economic analysis of harvest behavior: integrating forest and ownership characteristics.** Forest Science. 35(4):1088-1104.

Dennis, D. F.; Sendak, P. E. [In press] **Analyzing the effectiveness of Vermont's modified assessment program for forest land.** In: Schmithusen, Franz, ed. Forestry legislation; Proceedings, 1990 International Union of Forestry Research Organizations XIX World Congress; 1990 August 5-11; Montreal, Quebec. Zürich: Forstwissenschaftliche Beiträge.

Frieswyk, T. S.; Malley, A. M. 1985. **Forest statistics for Vermont, 1974 and 1983.** Resour. Bull. NE-87. Broomall, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 102 p.

Judge, G. G.; Hill, R. C.; Griffiths, W. E.; Lutkepohl, H.; Lee, T. 1982. **Introduction to the theory and practice of econometrics.** New York: Wiley. 839 p.

U.S. Department of Agriculture, Forest Service. 1989. **An analysis of the outdoor recreation and wilderness situation in the United States: 1989-2040.** Washington, DC: U.S. Department of Agriculture, Forest Service.

Widmann, R. H.; Birch, T. W. 1988. **Forest-land owners of Vermont—1983.** Resour. Bull. NE-102. Broomall, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 89 p.

DONALD F. DENNIS is an economist, Northeastern Forest Experiment Station, Burlington, Vermont 05402.

MANUSCRIPT RECEIVED FOR PUBLICATION 26 SEPTEMBER 1990

Northeastern Forest Experiment Station
5 Radnor Corporate Center
100 Matsonford Road, Suite 200
P.O. Box 6775
Radnor, Pennsylvania 19087

November 1990

☆U. S. GOVERNMENT PRINTING OFFICE: 1990/548-088/20006