

Estimating a Family Forest Landowner's Likelihood of Posting against Trespass

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ABSTRACT

Hunters and other recreators face challenges to gain access to private forestland in the United States because of an increasing number of landowners posting their land. A landowners' decision to post their land is influenced by a variety of factors, including landowner characteristics, hunter behavior, and parcel attributes. We used a logit model to help understand why family forest landowners in Minnesota post their land against public trespass. Factors that increased the likelihood of posting included younger owners, a perception that allowing access would interfere with one's own hunting, a perception that allowing access would result in damage to one's property, hunting as the primary reason for forestland ownership, larger parcel size, having a management plan, higher property values, and a high percentage of surrounding area open to public hunting. Implications of increased posting by family forest owners on hunting access and wildlife management are discussed.

Keywords: family forests, hunting, access, recreation, logit model

Family forest landowners control nearly half of the forested land base in the United States (Butler and Leatherberry 2004). The magnitude of this ownership has significant implications for a variety of uses and values provided by these lands. One such use of considerable importance to the public is recreation. Hunters, in particular, rely heavily on private forestland. Nearly three-fourths of all hunting effort in the United States occurs on private lands, much of which is forested (The National Survey of Fishing, Hunting, and Wildlife-Associated Recreation 2001). However, hunters and other recreators are increasingly challenged to gain access to private forestland as the number of private forest landowners posting their land against trespass is substantial and increasing (Brown 1974, Brown et al. 1984, Adkins and Irby 1994, Gentle et al. 1999, Benson 2001, Wright et al. 2001, Haggerty and Travis 2006).

Posting is the official means by which landowners notify the public that access to their property is prohibited and is done by placing signs around their property boundaries. Most states require that landowners post their forestland if they wish to exclude hunters from their property and define specific procedures for doing so (Sigmon 2004).

This increase in posting frequency has important implications for hunters seeking access, as well as wildlife managers trying to control population levels of certain species. Effective game management in the United States for some species (e.g., white-tailed deer) depends, in part, on hunter access to private lands to help control population levels (Brown et al. 1984, Adkins and Irby 1994, Waller and Alverson 1997, Brown et al. 2000). Adkins and Irby (1994) found that land with restricted hunter access is more likely to experience game depredation problems than land that is more accessible by the public for hunting. For example, increases in white-tailed deer populations have contributed to the following problems: re-

duced forest regeneration due to browsing, reduced flora and fauna diversity, deer-vehicle collisions, and crop damage (Brown et al. 2000, Waller and Alverson 1997). State wildlife administrators have also reported declining hunting license sales that could, in part, be attributable to diminished hunting access to private lands (Wright et al. 2001).

Given the potential for the hunter access issue to intensify in light of recent trends in forestland parcelization (Sampson and DeCoster 2000, Mehmood and Zhang 2001, Jin and Sader 2006), changing forestland ownership motivations (Butler and Leatherberry 2004, Kendra and Hull 2005) and the continued sale of tracts of industrial forestland to timberland investment management organizations, real estate investment trusts, and developers (Sampson and DeCoster 2000), there is a need to develop a more complete understanding of the issues and motivations that lead to a landowner's decision to post his/her forestland. In particular, policymakers and public land-management agencies need to better understand the motivations for posting if policies, financial incentive programs, or education campaigns designed to promote greater public access to private lands are to be effective.

The objective of our research was to explore current determinants of posting practices, with an empirical application in Minnesota. This is the first analysis of posting practices in Minnesota or the Great Lakes region. Although a few studies in other regions have been conducted over the past 20 years on posting practices, the influence of some of the variables in these studies have been found to be contradictory. In addition, some potentially important explanatory variables have not been investigated. Finally, given the evolution of forest landowner demographics, increasing numbers of absentee forest landowners and changing attitudes toward and motivations for forestland ownership and management, we were interested in determining whether the

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factors influencing posting practices today are the same as those found to influence such practices in the past.

Literature Review

Although a number of studies have focused on the access practices of private landowners (e.g., Ruff and Isaac 1987; Wright and Fesenmaier 1988, 1990; Wright et al. 1988; Hunt 2002), we limited our focus to those studies that explicitly addressed the determinants of posting practices. The major reasons for posting can be divided into the following three categories: landowner characteristics, hunter behavior, and resource or parcel attributes. In terms of landowner characteristics and demographics, age of the landowner or length of ownership has been found to influence posting decisions, although the direction of their influence has been mixed. In a study in Vermont, Dennis (1993) found that older owners were more likely to post, while Jagnow et al. (2006) found that length of ownership (a proxy for landowner age) in Pennsylvania had a negative influence on posting tendency. This discrepancy could be because of the length of ownership variable being a poor proxy for landowner age, regional differences in posting practices, or evolving attitudes toward posting given the 13-year time span between the two studies. Dennis (1993) also found that more educated owners were more likely to post as were those employed in professional or managerial jobs. The influence of absentee ownership on posting has also been mixed. Dennis (1993) found that owners living greater distances from their properties were less likely to post, while Brown et al. (1984) found that absentee owners in New York were slightly more likely to post their forestland.

Reasons for landownership and land-management activities the owner pursues have been found to influence posting decisions, although the direction of impact has been mixed. Gramann et al. (1985) found that recreational use of one's property makes a landowner more likely to post as does ownership for "hobby farming" purposes (Gramann et al. 1985). The authors hypothesized that hobby farm owners would be more interested in noneconomic management objectives for their forestland, such as recreation, resource protection and wildlife preservation, and, as such, were more likely to post. Results are mixed, however, when an owner is interested in managing their land for economic outputs. Jagnow et al. (2006) found that ownership for agricultural purposes negatively influenced posting practices. Wilkins and Erickson (1973) found that owners who pursue "economic activities" on their lands were less likely to post. However, Brown et al. (1984) found that owners who had implemented at least one forest management activity were more likely to post their land against public trespass. Thus, the literature is not clear on whether incompatibilities may exist between a landowner's interest in forest or agricultural management on their land and their likelihood of posting.

Concerns over liability and lawsuits are often a significant concern to landowners and have been found to be an important factor in posting decisions (Brown 1974, Jagnow et al. 2006). In an effort to encourage landowners to make lands available for public recreation, all 50 states have adopted recreation use statutes, which are meant to protect landowners by restricting their liability when free recreational access is provided (Sigmon 2004). It appears, however, that landowners typically are not fully informed about the protection these laws provide them from liability, and their perceptions of liability are not commensurate with the reality of legal risks associated with allowing public access (Wright et al. 2002, Mozumder et al. 2007). Thus, liability remains a concern among many landown-

ers and a barrier to public access despite state efforts to afford landowner liability protection.

Many studies have noted that landowners who have had negative past experience with hunters or other recreators are more likely to post their land. In fact, this is often the *primary* determinant of a landowner's decision to post (Brown 1974, Brown et al. 1984, Gramann et al. 1985, Jagnow et al. 2006).

In terms of parcel or land characteristics, parcel size has been found to have an influence on whether an owner posts against hunting, although the direction of this influence has been mixed. Gramann et al. (1985) found that larger parcels were more likely to be posted, and Dennis (1993) found a negative relationship between parcel size and likelihood of posting. Jagnow et al. (2006) found that the total number of acres owned positively influenced posting practices, although total acreage could be split among multiple ownership parcels. Owners of parcels near developing areas or with higher population densities have been found to be more likely to post their property (Brown et al. 1984, Jagnow et al. 2006).

Given the contradictory findings of how parcel size, age of owner, absentee ownership, and reasons for landownership impact posting practices, we wanted to test these variables for consistency with previous findings. In addition, we wanted to add to the posting literature by examining the influence of additional variables on a landowner's decision to post. In particular, our work explores the relationship between a landowner's interest in being an active forest manager (e.g., management plan) and posting practices. Given rapidly rising land values in the state (Kilgore and MacKay 2007), we also wanted to evaluate whether the land's market value influences posting decisions. Finally, given the high rate of forestland ownership for hunting in the state, we wanted to explore several variables related to hunting and posting. In particular, we examined the influence of landownership for hunting purposes, concerns about interference with one's own hunting, hunting quality on the land, and availability of neighboring lands for public hunting on the likelihood that an owner posts his/her land. None of these variables have been explored in the posting literature.

Methods

Survey

A mail-back questionnaire was administered to a sample of Minnesota family forest landowners. Eligible parcels were predominantly forested and at least 20 contiguous acres. Twenty acres was used as the minimum size because anything less was considered too small for either forest management or to support significant hunting opportunities. Assessors' offices in Minnesota's 15 counties with the largest acreage of family forestland were contacted in 2006 to obtain information on forestland that met the eligibility criteria.

A list of potential recipients was developed and subsequently screened to ensure only forested parcels owned by individuals (i.e., family forest owners) and whose owners had not received any surveys administered by the University of Minnesota's Department of Forest Resources within the past 5 years were selected. [1] A random sample of 160 private forest landowners was drawn to pretest the survey with the sample weighted by the amount of family forest acreage in each county relative to the total acreage of family forestland in the 15 counties.

The final questionnaire was mailed to 1,024 family forest owners (again, with the sample weighted by the amount of family forest

Table 1. Description and hypothesized influence of the explanatory variables on a landowner's decision to post their land against trespass.

Variable	Description	Hypothesized effect on posting behavior
Landowner characteristics		
OWNtoHUNT	A binary variable indicating that hunting is the most important reason for forestland ownership	Positive
INTERFERE	A binary variable indicating if the owner agrees that allowing hunters on their property will interfere with their own hunting	Positive
MANAGEMENT_PLAN	A binary variable indicating if the owner has a management plan for their property	Positive
ABSENTEE	A binary variable indicating if the owner lives away from the forestland	Positive
AGE	A continuous variable indicating the owner's age	Negative
Hunter behavior		
DAMAGE	A binary variable indicating if the owner agrees damage and/or littering is an important concern associated with allowing public access	Positive
Resource attributes		
ACRES	A continuous variable indicating the size (acres) of the forestland parcel	Positive
VALUE	A continuous variable indicating the 2005 assessor's estimated market value per acre of the land (\$/ac)	Positive
HUNT_QUALITY	A binary variable indicating if the owner considers the quality of hunting on the forestland to be good or excellent	Positive
HUNT_AVAILABILITY	A binary variable indicating if the proportion of land open to the public for hunting within 1 mi of the forestland is 60% or higher	Positive

Table 2. Descriptive statistics of explanatory variables.

Variable	Mean	Minimum	Maximum
Landowner characteristics			
OWNtoHUNT	0.47	0.00	1.00
INTERFERE	0.76	0.00	1.00
MANAGEMENT_PLAN	0.20	0.00	1.00
ABSENTEE	0.90	0.00	1.00
AGE	56.33	23.00	94.00
Hunter behavior			
DAMAGE	0.73	0.00	1.00
Resource attributes			
ACRES	61.73	20.00	720.00
VALUE	1,136.71	27.50	14,873.08
HUNTING_QUALITY	0.63	0.00	1.00
HUNTING_AVAILABILITY	0.25	0.00	1.00

acreage in each county relative to the total acreage of family forestland in the 15 counties) who were randomly selected using the criteria and screening process previously described. The survey was administered between October and December 2006 following the Dillman (2000) method.

We obtained an overall response rate of 67% and a usable response rate of 63%. An analysis of the survey respondents and non-respondents found no differences in key landowner metrics (e.g., acres of forestland owned) between the two groups, suggesting the data obtained and described in this report can be interpreted as being representative of Minnesota's family forest landowners meeting the study selection criteria.

Model

A logit model was used to estimate the likelihood that a landowner posts their land and examine the contribution that a suite of explanatory variables has on landowner posting behavior. The model was solved using the maximum likelihood estimation method and the full model selection method in SAS 9.1 (SAS Institute, Cary, NC). Peng et al. (2002) provide a through discussion of the logit model and logistic regression technique. Tables 1 and 2 contain definitions and descriptive statistics of the explanatory variables developed from the survey [2].

Results

Survey Results

Results from the survey indicate that the majority of respondents (67%) currently post their land. The average age of respondents was 56 years and length of ownership was substantial, with 32% having owned their land more than 20 years. Respondents were asked to indicate their most important reason for ownership. The highest response given was for a place to hunt (47%). Other responses to that question included a place to enjoy solitude (14%), a real estate investment (10%), a place to build a residence (7%), and a place to grow timber for income (3%). The vast majority of owners (90%) were absentee owners—those who lived apart from their forestland. Seventy-six percent of the respondents indicated they thought allowing hunters on their land would interfere with their own hunting activities, while 67% responded that public hunters would interfere with other forms of nonhunting recreation on their land. Sixty-seven percent of respondents were also concerned about liability and being sued if they allowed public hunters access to their land. Seventy-three percent were concerned about damage and litter, while 46% expressed concern about noise. Consistent with the findings from previous research, only 4% of respondents were personally opposed to hunting. Most respondents thought the hunting quality on their land was good to very good (63%). Twenty percent had obtained a management plan, which we view as an indicator of a landowner's interest to actively manage their forestland. The vast majority of owners (78%) planned to pass their land on as an inheritance rather than sell it in the future. Although almost one-half of all respondents had commercially harvested timber on their property, fewer owners planned to conduct a commercial timber harvest (other than for firewood) in the future. Similarly, the percent of owners who planned to perform forest management activities on their land in the future was lower than those who had done so in the past. A very small percent (4%) of the respondents planned to lease their land for hunting in the future.

Modeling Results

Eight of the 10 explanatory variables included in the model were significant at $P \leq 0.10$ (Table 3). The odds ratio for each of the explanatory variables in Table 3 provides information on how each

Table 3. Logistic regression results (dependent variable is whether the landowner posted their land against public trespass).

Variable	Coefficient	Standard error	Odds ratio	Marginal effect
Landowner characteristics				
OWNtoHUNT	0.4681 ^b	0.2122	1.597	0.0990
INTERFERE	1.1146 ^c	0.2304	3.048	0.2559
MANAGEMENT_PLAN	0.4515 ^a	0.2710	1.571	0.0907
ABSENTEE	-0.2051	0.3507	0.815	-0.0422
AGE	-0.0224 ^c	0.0088	0.978	-0.0048
Hunter behavior				
DAMAGE	0.4448 ^b	0.2143	1.560	0.0981
Resource attributes				
ACRES	0.0041 ^b	0.0021	1.004	-0.0009
VALUE	0.0002 ^a	0.0001	1.000	0.00005
HUNTING_QUALITY	-0.0937	0.2044	0.911	-0.0199
HUNTING_AVAILABILITY	0.4393 ^a	0.2371	1.552	0.0893
Constant	0.1767			
<i>N</i>	561			
-2 Log likelihood	636.194			
Log likelihood ratio	75.1705 ^c			
Prediction success				
% Concordant	71.2			
% Discordant	28.5			

^a*P* ≤ 0.1.^b*P* ≤ 0.05.^c*P* ≤ 0.01.

variable influences the odds of posting when the other variables are held constant. The marginal effects, when multiplied by 100, give the percentage change in the probability of posting given either a 1-unit change in a continuous variable or a change from 1 to 0 for a binary variable when all other variables are evaluated at their means (Table 3). For example, if an owner believed strongly that allowing the public access to hunt on their lands interfered with their own hunting, this increased their odds of posting three times over those owners who did not share this opinion and increased their estimated probability of posting by 26%. Older owners were less likely to post, with the estimated probability of posting decreasing by approximately 0.5% for each additional year in age.

The belief that allowing hunters on one's land is likely to cause damage and/or litter increased the odds of posting by approximately 1.6 times and increased the probability by 9.8% [3]. Also, those owners whose primary reason for purchase is a place to hunt are more likely to post, which may be indicative of the desire for exclusionary hunting rights that Gramann et al. (1985) and Wright et al. (1988) discussed. Finally, owners of larger parcels are more likely to post, which is expected because it becomes harder to monitor trespass as parcel size increases. Each additional acre increased the estimated probability of posting by approximately 0.09%.

Owners of more valuable parcels, on a per acre basis, are more likely to post against trespass, perhaps in an effort to protect their investment. The availability of land for hunting in the immediate area surrounding the owner's property also plays a role, with owners whose land is surrounded by land that is more than 60% open to hunting more likely to post. A value of 1 for this binary variable increases the odds of posting by 1.6 times and increased the probability of posting by 8.9%. Increased posting by these owners is probably done in an attempt to prevent other hunters from purposefully or accidentally straying onto their land while hunting in the adjacent properties. Finally, we found that those owners who have a management plan for their property are also more likely to post, with the estimated probability of posting increasing 9.1% for those with a plan. This may suggest that owners do not view forest management and public recreation as compatible uses of their land,

possibly because of concern to protect their financial investment in the land (e.g., reforestation).

Discussion

For variables which were found to have a contradictory influence on posting probability in previous research (e.g., parcel size, age of owner/length of ownership, absentee ownership, and economic ownership reasons/management actions on the land), our findings add to the discussion. For example, we found that smaller parcels are less likely to be posted, which is counter to the findings of Dennis (1993). An implication is that increasing forest parcelization might actually decrease posting activity, although at some point individual tract sizes may become too small to actually support viable hunting opportunities. In this event, the posting issue becomes less important than viable parcel size.

We found that absentee ownership was not a significant predictor of posting, which counters anecdotal evidence that absentee owners are the cause of increasingly fewer areas accessible by the public for recreation and the findings by Brown et al. (1984) that absentee owners were more likely to post their property. However, while absentee owners were no more likely to post their forestland than those living on their property, forestland owned by younger individuals was more likely to be posted. This could suggest increasing access problems in the coming decades as older landowners transfer their land to a younger generation through inheritance or sale. Our finding that older owners are less likely to post is also counter to previous research, which found that older forestland owners in Vermont were more likely to post (Dennis 1993) [4]. The discrepancies in our findings compared with previous posting research could be because of regional differences in posting practices, changing attitudes toward posting, and/or characteristics of the individual studies.

Our research also found that additional new variables are important predictors of landowner posting behavior. We found that the primary reason for forestland ownership for many individuals was

for a place to hunt, and that these owners are concerned that allowing access to others would interfere with their own hunting enjoyment. Both of these variables were found to increase the likelihood an owner posts his/her forestland. The implication of this finding is that programs that compensate landowners who provide public recreation access to their land may be ineffective. Such owners may not be willing to open their land in exchange for incentive payments or may require compensation in excess of what public agencies could reasonably fund (Kilgore et al. 2008). Given this, public land managers may have to look beyond traditional financial incentive, lease, and liability release programs if they hope to attract more family forest landowners to open their land for public recreation.

Our finding that having a forest management plan makes an owner more likely to post suggests a potential incompatibility between two important benefits provided by family forests: timber and public recreation. The policies and programs that promote timber production on family forestland may, in fact, be working against another important public policy objective of increasing public recreation opportunities. The other two new variables we found to be significant predictors of increased posting, higher land value and considerable land that is available for public hunting in the immediate area, give insight to both land managers and hunters as to where increased posting and access problems may occur on the landscape.

Our research also underscores the fact that some factors and conditions that were a concern to landowners in the past with regard to posting remain so today. Even though all states have taken significant steps to insulate landowners from liability when free recreational access is provided, results from our survey indicate that liability remains a concern among landowners and a barrier to public access. Given this, more effort is needed to educate landowners about their rights and responsibilities under these state recreation use statutes.

Hunter behavior is still a concern of today's family forest owners just as it was 20 years ago. This may suggest that hunters have not changed their behavior on private lands, owners' attitudes remain unchanged despite any changes in behavior, owners' perceptions of hunter behavior have not improved, or education efforts to increase owner recognition of the value of hunting and wildlife management have not been effective. Wildlife managers should consider how they can more effectively communicate the importance of private land and hunting in wildlife management. Forest owners, particularly those who do not hunt, may not be aware of the vital role their land plays in maintaining effective and healthy population levels of some game and nongame species, as well as maintaining vegetative diversity and productivity on their property. A greater awareness of these roles might entice some landowners to grant more access to their forestland.

It is important to note that posting does not necessarily result in the absolute exclusion of public access for hunting (Ruff and Isaac 1987, Jagnow et al. 2006). Brown et al. (1984) found that 79% of rural landowners in New York who posted their forestland did allow some degree of hunting, while 66% of those landowners who participated in a Texas study were willing to provide some level of access (Wright and Fesenmaier 1988). In our survey, 54% of respondents said they might be willing to allow some degree of hunter access to their land. Hunters, however, may be unaware of this potential to gain access and, consequently, may not try to seek permission from

the owner. Thus, greater efforts may be needed to educate hunters about the relationship between posting and access.

Endnotes

- [1] As one reviewer commented, this exclusion of landowners who had previously received surveys for other studies could potentially bias the sample.
- [2] Multicollinearity issues prevented us from using more than one variable from the questionnaire characterizing a landowner's interest in forest management. We used the variable indicating the existence of a forest management plan because we felt it embodies the widest range of activities characterizing an owner's interest in forest management.
- [3] Note, although we also included questions in the survey regarding noise disturbance and liability issues associated with allowing hunter access, correlation problems between these and the DAMAGE variable prevented us from including these as explanatory variables in the model as well.
- [4] As one of the reviewers noted, however, another explanation for this apparent discrepancy is that the "older" owners in our study would have been the "younger" owners in the Dennis (1993) study. Thus, the owners may have actually kept their same views and practices on posting as they aged, suggesting posting practices may have more to do with generational attributes of landowners rather than their age.

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