

recreation

A National Assessment of Public Recreational Access on Family Forestlands in the United States

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Private forestlands in the United States are important for public recreation, but access to them may be threatened. Using the US Forest Service's National Woodland Owner Survey, we examined the following questions: (1) How prevalent is public recreational access on family forestland? (2) What influences whether a family forest owner allows public access? (3) Are there regional differences in the supply of public access? We found the provision of public access was modest, with 15% of respondents allowing it. Factors positively correlated with public access provision included owning more forestland, being a resident owner, owning an associated farm/ranch, participating in leasing or timber management activities, possessing a management plan, and allowing private recreational access. Negative factors included posting one's land, having privacy concerns, owning land for hunting, and being an older or more educated owner. Compared with landowners in the North, Southern landowners were less likely and Rocky Mountain landowners more likely to provide public access. Our results raise the question of whether family forest landowners are responsive to public access incentive programs.

Keywords: family forests, National Woodland Owner Survey, nonindustrial private forestland (NIPF), posting, public access

Participation in outdoor recreational activities is important to a large percentage of the US population. Cordell et al. (1997) reported that 94.5% of Americans who were at least 16 years old had participated in at least one type of outdoor recreation in the preceding year. Trends indicate increasing levels of participation in outdoor recreation resulting from both population increases and an increase in the proportion of people participating in outdoor recreation, while the amount of public land available for recreation remains largely static (Cordell et al. 2004, 2009). This suggests a decline in the national per capita availability

of public lands (Geisler 1993). Concern has been raised that the demand for US outdoor recreation will not be able to be met by public lands alone (USDA 2003, Cordell et al. 2004). Access to rural private lands has long been advocated as a means of alleviating recreational pressures on public lands (President's Commission on American Outdoors 1987). But concern is also growing about availability of private lands for recreational access because of urban expansion and land conversion of rural lands (Wright and Fesenmaier 1988) and an increase in the number of landowners restricting access (Teasley et al. 1999). Hunters, in particular,

rely heavily on private land for recreational opportunities, with three-fourths of all hunting effort in the United States occurring on private lands (US Department of the Interior [USDOI] 2001, 2006). Other recreational activities in high demand on private lands include fishing, wildlife observation, hiking, and collection of nontimber forest products (Teasley et al. 1999, Mozumder et al. 2007). Private forests are an important component of this supply of public recreational opportunities. Bratkovich and Floyd (1993) report that a large percentage of wildlife-related recreation takes place on private forests and farms. Given that family forest landowners account for 92% of all private forest owners and 35% of the total forested land base in the United States, or 264 million ac (Butler 2008), their willingness to provide public access can have a significant impact on recreational opportunities. [1]

One strategy that has been promoted for dealing with rising recreational demand and the pressures that places on public lands is to encourage private landowners to allow public recreational access through incentive mechanisms (President's Commission on American Outdoors 1987). Public agencies use a variety of means to promote public

Received November 16, 2011; accepted June 2, 2012; published online July 12, 2012.

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Acknowledgments: This research was supported by the US Forest Service, Northern Research Station.

recreational access on private lands. All states in the United States have enacted recreational use statutes that are meant to protect landowners when free recreational access is provided by restricting their liability (Simon 2004). Twenty-six states currently have programs that provide landowners with incentive payments or technical assistance if they allow the public to hunt, fish, or recreate on their land (Voluntary Public Access and Habitat Incentive Program 2011). Furthermore, some states offer reduced property tax rates to landowners if they provide public access (e.g., New Hampshire's Current Use program 2012). Another mechanism is government-sponsored walk-in hunter access programs, which compensate landowners for allowing public access for walk-in hunting on enrolled lands (Kilgore et al. 2008). Fee-based permits and lease arrangements are other ways to increase recreational access on private land, in which landowners provide access to a limited number of individuals or groups willing to pay them for permits or lease agreements (Zhang et al. 2006, Hussain et al. 2007, Mozumder et al. 2007, Kilgore et al. 2008).

In spite of these incentive programs, indications are that recreators are facing increasing challenges to gain access to private land and that the amount of private land accessible to the public is declining (Teasley et al. 1999, USDA 2003). Although almost one-half of private, rural landowners in the United States in a 1996 study reported that they permitted access for recreation by persons outside of their family, that number dropped to 12% if the persons seeking access were not known by the landowner (Teasley et al. 1999). Moreover, the number of landowners willing to allow recreational access to those they were not acquainted with dropped from 25% in 1987 to 12% in 1996 (Wright et al. 1988a, Teasley et al. 1999). Regional differences in public access on private lands in the United States have also been reported. The 1986 National Private Landowner Survey (NPLOS) found that the percentage of private land owners allowing public access varied across the country: from 29% in the Rocky Mountain region to 24% in the North, 14% in the Pacific Coast, and 13% in the South (Wright et al. 1998a). [2] By the 1996 NPLOS, the percentage of landowners allowing public access had dropped for all the regions: 16% in the North, 14% in the Rocky Mountains, 11% on the Pacific Coast, and 7% in the South (Teasley et al. 1999).

At the root of this public access issue may be the question of how to balance private property rights with the public good (Curry 2001, Acheson and Acheson 2010). The rights of private landowners are fiercely held in the United States (Bromley 2007). However, there is also a strong tradition that everyone, not just the landed, should have opportunities to undertake activities such as hunting and fishing (Mathews 1986, Simon 2004). Some states, such as Maine, have a long-standing tradition or ethic of public recreational access on private lands (Vail and Hultkrantz 2000), as do the Scandinavian countries (Kaltenborn et al. 2001). Thus, for a segment of private landowners in the country, public access is granted to their lands because they feel it is the right thing to do or because it has historically been done. For some recreators, this ethic is so entrenched that access on private lands has come to be viewed as an entitlement or right (Vail and Hultkrantz 2000). Conflict ensues, then, when traditions and norms about public access clash with rights and attitudes of private property owners who may want exclusive use of their land (Acheson and Acheson 2010). It is in this light that access incentive programs have been developed to help compensate private landowners for "takings" associated with public access. As Church and Ravenscroft (2008) suggest, however, landowner responsiveness to recreational access incentive programs will be influenced by more than just a financial incentive. Landowner interest in participation is also influenced by whether landowners agree

with the goals of incentive programs and whether public access is congruent with their ownership goals, attitudes, and practices.

Land managers and policymakers are interested in understanding opportunities and barriers to the provision of public recreational access on private lands for a variety of reasons. One important reason for this interest is that state fish and wildlife management agencies are largely funded through license sales and excise taxes on hunting and fishing equipment purchases (Wildlife Conservation Fund 1996). Lack of access to suitable places to recreate has been hypothesized to lead to declining license sales and revenues (Wright and Kaiser 1986) as well as declining interest in pursuing activities such as fishing and hunting (American Sportfishing Association 2010). Moreover, public lands will be subject to the potential for greater crowding, conflict, and degradation of resources if private lands can not meet some of the public's recreational demand (Wright and Kaiser 1986). In light of these concerns, we examined recent trends in the provision of public recreational access on family forestlands in the United States using data from the US Forest Service's National Woodland Owner Survey (NWOS; Butler 2008). Questions we sought to answer were (1) How prevalent is the provision of public recreational access on family forestland? (2) What influences whether a family forest owner allows public recreational access? (3) Are there regional differences in the provision of public access on family forestlands?

Management and Policy Implications

Our analysis has identified that a modest percentage of family forest landowners are willing to provide public recreational access, at least in terms of how access was defined by the NWOS. The related policy question here is why, when there are a variety of incentive programs that are designed to entice landowners to open up their land. Are family forest landowners largely unaware of access incentive programs available to them, aware of the programs but uninterested in participating, or, perhaps, unaware of the demand for public recreational access on private lands altogether? Conversely, are family forest landowners averse to providing public access because it conflicts with their own uses of the land? Without this information, policymakers do not know whether more marketing is needed of existing incentive programs, whether existing programs could be altered to better align with landowner goals, whether higher incentive amounts are needed, or whether landowners are simply not interested in providing public recreational access under any type of incentive or arrangement. If this latter condition is true, then policymakers may need to consider acquiring additional public lands or instituting different recreational policies on existing public lands to meet public recreational demands. Future research that evaluates landowner knowledge about access incentive programs, participation rates in these programs, and willingness to provide access for specific types of recreation, under different incentive amounts, or in certain seasons could be useful in evaluating whether current incentive programs are making measurable differences and/or whether modifications are needed.

Table 1. Definitions of explanatory variables used in the logistic regression models.

Variable name	Variable type	Variable description
Forestland characteristics		
ACRES	Continuous	Natural logarithm of forest acreage owned in a state
Landowner characteristics		
RESIDENT	Binary	One if the owner's primary residence is within 1 mi of their forestland; 0 otherwise
AGE	Binary	One if owner is 65 yr or older; 0 otherwise
COLLEGE	Binary	One if owner has completed an associate, technical, or higher college degree; 0 otherwise
Financial ownership objectives		
FARM	Binary	One if the owner has a farm or ranch located within 1 mi of their forestland; 0 otherwise
LEASE	Binary	One if owner has leased their forest or collected money for allowing others to hunt, recreate, graze, produce timber, and/or cultivate nontimber forest products; 0 otherwise
TIMBER	Binary	One if production of sawlogs, pulpwood, or other timber products is an important reason for forest ownership; 0 otherwise
MAN_PLAN	Binary	One if owner has a written management/stewardship plan; 0 otherwise
Access concerns		
MISUSE	Binary	One if owner is concerned about misuse (i.e., vandalism, dumping) associated with the use of their land; 0 otherwise
LAWSUIT	Binary	One if owner is concerned about lawsuits associated with the use of their land; 0 otherwise
POST	Binary	One if owner has posted land to restrict public access in the last 5 yr; 0 otherwise
Exclusive use		
PVT_REC	Binary	One if owner has allowed recreation or hunting for self, family, or friends in the last 5 yr; 0 otherwise
HUNT	Binary	One if having a place to hunt or fish is an important reason for forest ownership; 0 otherwise
PRIVACY	Binary	One if privacy is an important reason for forest ownership; 0 otherwise
Regional variables		
RPAReg1	Binary	One if owner's forest is in RPA Region 1 (North); 0 otherwise
RPAReg2	Binary	One if owner's forest is in RPA Region 2 (South); 0 otherwise
RPAReg3	Binary	One if owner's forest is in RPA Region 3 (Rocky Mountains); 0 otherwise
RPAReg4	Binary	One if owner's forest is in RPA Region 4 (Pacific Coast); 0 otherwise

Methods

Survey

The US Forest Service, Forest Inventory and Analysis program conducts the NWOS to understand who owns the forests of the United States, why they own them, how they use them, and how they plan to use them (Butler et al. 2005). The NWOS uses a stratified random sample design to identify forested parcels. A coverage of 6,000-ac hexagons are laid across the United States and within each hexagon, a sample point is randomly placed. Remote sensing is used to determine if the point is forested. If so, then property ownership records, which are available from tax assessors, are used to identify the owner. The private forest owners identified are contacted via a mail survey using the procedures outlined by Dillman (2007). Data presented are from the most recent survey cycle conducted between 2002 and 2006 (Butler et al. 2005).

The NWOS includes questions on owner objectives, woodland characteristics, management activities, forestland uses, landowner concerns and issues, and owner demographics. The cooperation rate for the NWOS for the 2002–2006 survey was 51.3%. Although the survey is sent to several types of private forest landowners, we focused only on the 15,799 responses from

family forest landowners. [3]. For details on survey questions and sample design, refer to the article by Butler et al. (2005). The NWOS data have been used for a number of research studies investigating different aspects of family forests and their owners (Indrajit et al. 2009, Bengston et al. 2011, Butler and Zhao 2011), although never a recreational access study.

Model

We examined the response to a question that asked landowners whether “in the last five years have you allowed recreation or hunting by the general public with your permission?” A logit model was developed to estimate the likelihood that a family forest owner would allow public access and to examine the contribution that a suite of explanatory variables has on this decision. The maximum likelihood estimation method and the full model selection method in SAS 9.1 (SAS Institute Inc., Cary, NC) were used to estimate the logit model. Peng et al. (2002) provide a good overview of the logit model.

Model Variables

Determinants of public recreational access on private lands have been found to include concerns about damage, liability, and visitor behavior; compatibility with owner-

ship goals and activities; and availability of economic incentives (Wright et al. 1988b, Snyder et al. 2009, Becker et al. 2010). Variables were selected for inclusion in our model guided by the literature on drivers of posting and recreational access. We hypothesized that the following categories of variables would influence forest landowner interest in providing public recreational access: forestland characteristics, landowner characteristics, financial ownership objectives, access concerns, exclusive use, and regional variables. Table 1 contains definitions of the explanatory variables.

In terms of forestland characteristics, Ruff and Isaac (1987) found that ownership of more acres resulted in a higher likelihood of the provision of hunter access. Hence, we hypothesized that those who owned more forestland (ACRES) would be more likely to provide public recreational access. [4]

We explored the influence of several landowner characteristics on the likelihood of providing public access. The literature is inconclusive on the role that absentee ownership has on access, although anecdotal evidence suggests that absentee owners might be less likely to permit access. In studies focused on hunter access, residency has been found to have no statistically significant effect on whether a landowner grants access

to their lands (Wright et al. 1988b, Hunt 2002, Snyder et al. 2009). We tested the influence of resident ownership (RESIDENT) on the likelihood of permitting public recreational access. Wright and Fesenmaier (1988) and Wright et al. (1988b) found that older owners were more likely to restrict access. Given this, we included age of landowner (AGE) and hypothesized that older owners would be less likely to allow public access. Landowners who have more years of formal education have been found to be both less likely to allow access (Wright et al. 1988b) and more likely to post (Dennis 1993). We included a variable in our model to indicate whether the respondent had a college degree (COLLEGE) and hypothesized that these landowners would be less likely to permit public access.

We hypothesized that owners who own or manage their forestlands for economic gain might be less likely to allow public recreational access because of interference with attainment of these financial goals. Kaiser and Wright (1985) suggested that ownership of rural lands for reasons of investment, tax relief, speculation, personal recreation, or second-home residency may be incompatible with public recreational use. Several variables were included to address this hypothesis. Gramann et al. (1985) found that “hobby farm” owners were less likely to permit public recreational use of their land. Conversely, Hunt (2002) found that forest landowners who were also farmers were more likely to allow hunting than nonfarmers. We explored whether the presence of an associated farm or ranch (FARM) influenced the likelihood of public access. A factor that has not been explored in the posting or public access literature is whether participation in leasing arrangements influences a landowner’s interest or ability to provide public access. We included a variable that indicated whether a landowner had leased or collected money (LEASE) for different activities on their land, including hunting, recreation, grazing, timber production, or nontimber forest product collection. We hypothesized that those with lease arrangements would be less likely, or unable because of contractual requirements, to allow general public access. We included three variables that represented different ownership objectives, one of which was production of timber products (TIMBER). [5] We hypothesized that respondents who owned their land for timber production goals

would be less likely to permit public access out of concern over interference or damage. Similarly, we included a variable to indicate whether landowners had a management plan (MAN_PLAN), which we interpreted as a proxy for being an active forest manager. We hypothesized that those who do would be less likely to allow access out of concern over interference with their forest management goals. Snyder et al. (2008) found that forest landowners with a management plan were more likely to post their land against trespass, suggesting that landowners may view timber management and public recreation as incompatible activities.

Two common deterrents to public access are concerns about misuse/damage to one’s property (MISUSE) and concern about lawsuits (LAWSUIT) if access is provided (Jagnow et al. 2006, Snyder et al. 2008). We hypothesized that NWOS respondents who reported high levels of concern about these factors would be less likely to permit public access. These variables were developed from responses to a 7-point Likert-scale question that asked respondents their level of concern with these issues, ranging from great concern (1) to no concern (7). Binary variables were created for each, with a value of 1 if the respondent answered 1 or 2 and a value of 0 with responses in the remainder of the 7-point scale.

We also included a variable indicating whether a landowner posted their land (POST) and hypothesized that posting, by definition, would increase the likelihood that access was prohibited. Posting is a legal means by which landowners notify the public that access to their property is prohibited, and it is signified by the placement of signs around one’s property boundaries. Posting practices are sometimes used as a proxy for public access provision. Several authors have shown that some landowners who post are willing to provide access for certain types of public recreation under specific circumstances (e.g., Brown et al. 1984, Lauber and Brown 2000, Snyder et al. 2009). It appears, then, that some landowners may be using posting as a means to selectively control access rather than to completely prohibit it. One of the questions we explored in this research, then, was whether posting serves as a reliable indicator of actual access practices.

We hypothesized that landowners who recreated on their land, or desired exclusive use of their land, would be less likely to allow the public to recreate because of concerns of conflict or diminishment of their own en-

joyment. Wright and Fesenmaier (1988) found that landowners who hunt on their land were more likely to limit hunting access to others, and Gramann et al. (1985) found that landowners who recreate on their land were more likely to post. We included a variable that indicated whether the landowner recreated on the land and/or allowed family or friends to recreate (PVT_REC). We also included a binary variable that indicated whether an important ownership reason for the landowner was having a place to hunt or fish (HUNT). We expected that both would be negatively correlated with the provision of public access. We also included a variable that represented an ownership goal for privacy (PRIVACY). (Both the HUNT and PRIVACY variables were created like the TIMBER variable described previously.) We hypothesized that providing public access would be at odds with those landowners who valued their privacy, which could be translated as a desire for exclusive use of one’s land. Exclusivity of land use has been associated with land closure (Gramann et al. 1985).

Finally, regional variables were included to assess whether owners in different parts of the country were more likely to permit public access (RPAReg1, RPAReg2, RPAReg3, and RPAReg4). Our hypothesis was that owners in the South would be less likely to provide public access than owners in other parts of the country based on findings in previous research (Wright and Fesenmaier 1990, Gentle et al. 1999, Vail and Hultkrantz 2000).

Results

Survey Results

Given the use of posting practices as a proxy for recreational access, we begin with an analysis of responses to an NWOS question on posting practices. Forty-one percent of respondents reported posting their land to restrict public access in the past five years (Table 2). Sixty percent of respondents reported either recreating on their lands themselves or allowing their family and friends access to recreate. The percentage changed dramatically, however, for public recreational access. Only 15% of respondents indicated that they had permitted public access on their land in the past 5 years (Table 2). Public access varied by region with 23% in the Rocky Mountains, 17% in the North, 13% on the Pacific Coast, and 9% in the South reporting access.

Table 2. Percentages of respondents posting their land, allowing private recreation, and allowing public recreational access.

Region	Respondents allowing public recreational access (%)	Respondents recreating on land and/or allowing recreational access to family or friends (%)	Respondents posting their land against trespass (%)
Entire United States	15	60	41
RPA Region 1 (North)	17	66	41
RPA Region 2 (South)	9	49	41
RPA Region 3 (Rocky Mountain)	23	54	46
RPA Region 4 (Pacific Coast)	13	51	48

Modeling Results

National Model. Table 3 contains the regression coefficients, and Table 4 shows the marginal effects of the explanatory variables for the logit models. Landowners who own more forested acres were more likely to permit public access. The marginal effect indicates that the probability of allowing access increases by 3% for each additional acre (transformed by its natural logarithm) owned. In terms of landowner characteristics, our analysis found that landowners who have their primary residence on their forestland were 4% more likely to permit public access than those who do not. However, being older or possessing a college degree both decreased the probability of allowing access.

Financial ownership objectives were positively correlated with the provision of public access. The probability of permitting public access increased by 5% for those landowners who owned a farm or ranch associated with their forestland. Landowners who participated in leasing activities were 3% more likely to permit public access. Landowners who reported that an important reason for owning forestland was because they wanted a place to grow timber products were 5% more likely to permit public recreational access. Possessing a management plan increased the probability of allowing access by 4% over landowners who did not have a plan.

As expected, posting had a negative effect, decreasing the probability of permitting access by approximately 6%. All three variables representing personal recreational use or exclusive land use were significant. A landowner who recreated or allowed friends and family to recreate on their land (e.g., private access) was 8% more likely to permit public access. However, landowners who reported that owning forestland as a place to hunt was an important ownership objective were 2% less likely to permit public access than those who hold other ownership objectives. Landowners who listed privacy as an

Table 3. Regression coefficients for the national and regional models (standard errors in parentheses).

Variable	All data	RPAReg1	RPAReg2	RPAReg3 and 4
Intercept	-2.79 ^a (0.15)	-2.65 ^a (0.19)	-0.35 ^a (3.93)	-3.38 ^a (0.55)
Forestland characteristics				
ACRES	0.23 ^a (0.03)	0.22 ^a (0.03)	0.25 ^a (0.06)	0.23 ^a (0.07)
Landowner characteristics				
RESIDENT	0.34 ^a (0.08)	0.33 ^a (0.09)	0.40 ^b (0.19)	0.12 (0.28)
AGE	-0.13 ^c (0.07)	-0.10 (0.09)	-0.34 ^b (0.17)	-0.02 (0.27)
COLLEGE	-0.14 ^a (0.07)	-0.08 (0.08)	-0.58 ^a (0.18)	-0.00 (0.27)
Financial ownership objectives				
FARM	0.38 ^a (0.07)	0.39 ^a (0.09)	0.15 (0.17)	1.07 ^a (0.31)
LEASE	0.24 ^a (0.09)	0.12 (0.12)	0.65 ^a (0.19)	-0.12 (0.29)
TIMBER	0.40 ^a (0.08)	0.41 ^a (0.09)	0.18 (0.19)	0.72 ^b (0.33)
MAN_PLAN	0.29 ^a (0.09)	0.31 ^a (0.10)	0.13 (0.19)	-0.01 (0.36)
Access concerns				
MISUSE	0.06 (0.07)	-0.00 (0.08)	0.17 (0.17)	0.31 (0.27)
LAWSUIT	0.08 (0.08)	0.06 (0.09)	0.03 (0.17)	0.20 (0.29)
POST	-0.50 ^a (0.07)	-0.62 ^a (0.08)	-0.01 (0.18)	-0.54 ^b (0.28)
Personal recreational use				
PVT_REC	0.65 ^a (0.10)	0.62 ^a (0.11)	0.69 ^a (0.21)	0.70 ^b (0.33)
HUNT	-0.14 ^b (0.08)	-0.16 ^c (0.09)	-0.13 (0.17)	0.27 (0.29)
PRIVACY	-0.39 ^a (0.07)	-0.39 ^a (0.09)	-0.37 ^b (0.18)	-0.40 (0.27)
Regional variables				
RPAReg2	-1.08 ^a (0.10)			
RPAReg3	0.27 ^c (0.16)			
RPAReg4	-0.40 (0.25)			
N	6261	4234	1644	383
-2 Log Likelihood	5580.82	4080.14	1087.44	374.93
Hosmer-Lemeshow statistic	0.5181 ^a	0.5590 ^a	0.7550 ^a	0.1195 ^a

Significance levels: ^a0.01, ^b0.05, and ^c0.1. RPA Region 1 (RPAReg1) was used as the reference level.

important reason for forest landownership were 5% less likely to permit public access.

Finally, regional differences regarding access provision were identified, with the South less likely than the North, and the Rocky Mountain region more likely than the North to permit access. Because of the significance of the regional variables, regional models were developed to identify factors that might be influencing differences across the country.

Regional Models. Models were developed for respondents in RPA Regions 1 (“North”) and 2 (“South”). Because of the small number of respondents in RPA Regions 3 and 4, these two regions were combined into a single “Western” group. The

smaller number of respondents in these regions is caused by fewer family forest owners and acres in these regions and a lower NWOS sampling rate. Regression coefficients from the models are contained in Table 3, with the marginal effects in Table 4.

Two variables were significant in all the models: ACRES and PVT_REC. The northern model was similar to the national model in terms of significant variables. All but three of the variables that were significant in the national model were also significant in this model. AGE, COLLEGE, and LEASE were insignificant. As with the national model, the probability of allowing access increases by 3% for each additional (logged) acre owned. Resident owners were

Table 4. Marginal effects from the logistic models.

Variable	All data	RPAReg1	RPAReg2	RPAReg3 and 4
Forestland characteristics				
ACRES	0.03 ^a	0.03 ^a	0.02 ^a	0.04 ^a
Landowner characteristics				
RESIDENT	0.04 ^a	0.05 ^a	0.03 ^b	0.02
AGE	-0.02 ^c	-0.01	-0.03 ^b	-0.00
COLLEGE	-0.02 ^b	-0.01	-0.04 ^a	-0.00
Financial ownership objectives				
FARM	0.05 ^a	0.06 ^a	0.01	0.18 ^a
LEASE	0.03 ^a	0.02	0.06 ^a	-0.02
TIMBER	0.05 ^a	0.07 ^a	0.01	0.14 ^b
MAN_Plan	0.04 ^a	0.05 ^a	0.01	-0.00
Access concerns				
MISUSE	0.01	-0.00	0.01	0.05
LAWSUIT	0.01	0.01	0.00	0.03
POST	-0.06 ^a	-0.09 ^a	-0.00	-0.09 ^b
Exclusive use				
PVT_REC	0.08 ^a	0.09 ^a	0.05 ^a	0.12 ^b
HUNT	-0.02 ^b	-0.02 ^c	-0.01	0.05
PRIVACY	-0.05 ^a	-0.06 ^a	-0.03 ^b	-0.07
Regional variables				
RPAReg2	-0.12 ^a			
RPAReg3	0.04 ^c			
RPAReg4	-0.04			

Denotes significance at the following levels: ^a0.01, ^b0.05, and ^c0.1.

The marginal effect, when multiplied by 100, is the percentage change in the probability of permitting access given a 1-unit change in a continuous variable or a change from 0 to 1 for a binary variable when all other variables are evaluated at their means.

5% more likely to permit access. Owning an associated farm, having timber management ownership goals, and having a management plan all were positively correlated with public access provision. A landowner in the North who posted was 9% less likely to permit access than one who does not. As with the national model, the provision of private recreational access had a significant positive influence on a landowner's decision to permit public access, while owning forestland as a place to hunt decreased the likelihood of access. A desire for owner privacy was negatively correlated with public access.

In the southern model, owning more forested acres, being a resident owner, engaging in leasing activities, and recreating or allowing family or friends to recreate on one's forestland increased the likelihood of public access. The factors that had a negative influence on the provision of public recreational access included being older, having a college degree, or owning forestland for privacy reasons. The southern model was the only regional model in which LEASE was a significant variable. The two demographic variables (AGE and COLLEGE) were significant in the southern model, but not in the other regional models. The POST variable was insignificant in the southern model but significant in all the other models.

The western model had the fewest significant variables and the worst overall

model fit but the highest marginal effects of all the models. Owning more forestland increased the likelihood of public access by approximately 4% for each additional (logged) acre. None of the variables associated with landowner characteristics were significant. Two of the economic ownership variables were significant, with fairly high marginal effects. Specifically, owning an associated farm or ranch increased the probability of allowing public access by 18%. Respondents who cited timber production as an important reason for forestland ownership were 14% more likely to permit access than those who did not. Posting in this model had a significant negative influence on the provision of public access, reducing the likelihood allowing access by 9%. As with all the models, those landowners who recreate or allow family members or acquaintances to recreate were more likely to permit public recreational access. This practice increased the likelihood of public access by 12%. Taken together, the four models illustrate that a number of factors influence a landowner's decision to permit public recreational access and that in some cases these factors vary by region of the country.

Discussion

The provision of public recreational access on family forests is not widespread, with 15% of NWOS respondents reporting that

they permitted access in the last 5 years with their permission. Respondents reported higher levels of access (60%) though to family and friends. Thus, opportunities for recreation on family forestlands may not be as limited as the 15% suggests if someone is related to or knows a forestland owner. Moreover, it is likely that a share of the NWOS respondents were never asked by the public to provide recreational access. Thus, the 15% may serve as a lower bound on the percentage of landowners willing to provide public access. The percentages of NWOS landowners willing to permit recreational access are similar to those reported in other studies of rural landowners (Wright et al. 1988a, Teasley et al. 1999, USDA 2003). Although not explicitly examined in our research, it could suggest that family forest landowner attitudes toward and provision of public access do not differ much from those of rural landowners with other types of land covers or land uses.

In all our models, landowners who permit public access own greater amounts of forestland. This may be because larger ownership makes it possible to provide public access without jeopardizing one's own use of the land. One concern about the future provision of public access, then, is whether it will be diminished in areas experiencing forestland parcelization. Does parcelization exacerbate the conflict between private property rights and the public right of access? Butler (2008) found that size of family forest landholding was significantly correlated with myriad landowner behavior and attitudes. In light of this, important questions to explore in the future will be whether or how well landowner attitudes toward public access and land-use exclusivity are correlated with parcel size or land tenure and whether access incentive programs align with ownership goals of landowners with smaller land holdings. It is encouraging that some NWOS landowners with smaller acreages reported the provision of public access. Although those owning 5–10 ac may not be providing opportunities for recreational pursuits that benefit from large expanses of land, the access may be meaningful for other forms of recreation, in offering right-of-way access to reach larger areas of open land, and/or in partnership with neighboring landowners. Although acreage was the only forestland characteristic evaluated for its influence on public access, we suggest variables that are reflective of recreation suitability or

quality would be useful to explore in future research as well.

Our results show that resident landowners are more likely to permit public recreational access than absentee owners. This may be because they can monitor their land more readily than absentee owners or because resident owners are easier for recreators to locate when inquiring about access. Additionally, it may be that resident landowners are more familiar with the tradition or ethic of providing recreational access. If this is true, public access might be able to be increased on family forestlands by providing absentee landowners information about the demand for public access on private lands as well as information about public access incentive programs. If, however, absentee owners choose not to provide public access because it conflicts with their ownership goals, then enhanced outreach and incentive programs may do little to open up more land (Church and Ravenscroft 2008).

Older owners were found to be less likely to permit public access. Several factors might explain this. Older owners might desire exclusive use of their property for recreation or privacy if they are retired and have more leisure time. Conversely, it could also be because they might be planning to sell or pass on their land to heirs in the near term and could be concerned about devaluing their assets. Thus, this may suggest that younger or perhaps newer landowners might be more receptive to allowing access. However, what is not known is whether landowner attitudes regarding access change with age. That is, as owners age, do they become more reluctant to provide access or do newer/younger/inheritor owners have different attitudes regarding access that may stay consistent through time? Are younger generations of landowners aware of or interested in continuing a tradition of public access on private lands? Is an intergenerational transfer of this ethic possible? These would be interesting trends to track as forestland is sold or passed down to family members. Owners with higher education level were also found to be less likely to permit access. The linkage between education and access may be related to monetary concerns associated with investments or liability; e.g., those with a higher education may also have more income, assets, or investments in their forestland and thus be more reluctant to allow access because of concerns around damage.

Ownership of forestland for economic pursuits was found to be positively corre-

lated with the provision of public access, which is counter to what we anticipated. Family forest landowners who own a farm or ranch associated with their forestland are more likely to permit public recreational access than those who do not, as are those who engage in leasing activities, have timber production goals, or have a management plan. One explanation for this may be that such owners have larger landholdings, making it more feasible for them to provide recreational access without compromising their use of the land. These owners may also view public recreation and farming/ranching or timber management as compatible activities, and as such, are willing to provide access. One possible explanation for the positive relationship between a management plan and public access is that such owners could have enhanced awareness about the role of private lands for public recreational access as a result of working with a professional forester in developing a management plan. Given the positive relationship we found between economic pursuits and public access on forestlands, policymakers might ensure access incentive programs provide a landowner flexibility in meeting multiple ownership goals, e.g., allow for a seasonality in access provision, allow landowners to specify access for certain types of recreational pursuits that will not interfere with their land-management activities, or allow for synergies with participation in other conservation incentive programs. This supports Church and Ravenscroft's (2008) contention that public access incentives and policies may be most effective when they allow for private benefits to the landowner such as enhanced stewardship, conservation, or sustainability goals in addition to the goal of enhancing public benefits through access.

Landowners involved in leasing arrangements are more likely to permit public recreational access than those who are not, at least in the national and southern models. The southern model was the only regional model in which LEASE was a significant variable. This finding could be caused by more leasing opportunities in the South, as well as leasing being a more accepted convention in the South than in other regions of the country (Zhang et al. 2006, Hussain et al. 2007, Mozumder et al. 2007). We hypothesized, however, that landowners with leasing arrangements would be less willing to provide public access out of concerns over diminishing their ability to earn this income. One possibility for this finding is con-

fusion regarding the NWOS wording pertaining to leasing and recreational access. The NWOS question asks whether a landowner has permitted "recreation or hunting by the general public with my permission." The question does not state that this access is provided free of charge. Thus, it is possible that some landowners who have recreational lease arrangements responded in the affirmative to this question about public access, even though the nature of access they are providing is very different than that of a landowner providing free recreational access to all. The 2011 version of the NWOS asks questions about free public access versus public access for a fee, which could be used to further investigate this issue.

Significance of the variables we classified as being indicative of public access concerns was mixed. Two factors often cited in the literature as major deterrents to recreational access are landowner concerns regarding lawsuit and damage/misuse associated with public access. Both variables were found to be insignificant in all the models. The insignificance of these variables in the models may be because respondents were not thinking specifically about public access in association with the legal liability and damage questions posed in the NWOS. Respondents were asked their degree of concern about these issues in general, not whether they were concerned about these issues *in relation to* public access. Attitudes toward behavior of recreators or past negative experiences with recreators have been found to exert a strong influence over a landowner's decision to allow public access (Ruff and Isaac 1987, Wright and Fesenmaier 1988). We used the LAWSUIT and MISUSE variables as indirect proxies of this, but they may not have captured these concerns, attitudes, or experiences well.

Posting was negatively associated with the provision of public access, although its influence was not large. The marginal effects indicate a 6–9% reduction in the probability of allowing public access for those who post. Table 2 illustrates that the posting percentages consistently underestimate the percentage of respondents who stated that they prevent public recreational access to their land. Although posting is used by some landowners as a deterrent to access, it is not a perfect indicator of access policies by landowners, at least how public access is defined in the NWOS. Thus, caution is urged in relying on posting practices as a reliable proxy for access practices. It is important to

note, however, that not all states require landowners to post to exclude the public. Some states, such as Oregon and Alabama, have no posting statute but rather require landowner permission for access. Private land in these states is closed to the public unless specific permission is granted, whereas the states with posting statutes are legally open unless posted closed against trespass. Landowners may be using means other than posting to prevent access such as the use of fencing or the requirement for explicit landowner permission. It is also notable that the POST variable was significant in all the models except the southern model. Although posting is certainly a prevalent practice in the southern states (41% of these NWOS respondents reported posting), it appears to have no statistically significant bearing on whether a landowner actually permits public recreational access, at least access with permission. This suggests that landowners are using posting as a means to control selective entry rather than exclude the general public altogether. Thus, recreators should be encouraged to inquire with landowners about access, even when lands are posted. Posting is on the rise even in states such as Maine in which public access to private lands has been commonly granted (Acheson and Acheson 2010). This suggests that support for traditional open access policies may be diminishing and that the tension between private property rights and the common pool recreational resource aspects of private forestlands may be increasing.

In all the models, landowners who enjoy personal recreation or permit family and friends to recreate on their land through private access were also more likely to permit public recreational access. This is counter to what we anticipated. This suggests that public recreational access need not always conflict with an owner's personal recreational activities, which is encouraging from a public access perspective. More research is needed, however, to determine if there are certain types of public and private recreation that are more or less compatible or if there is a seasonality involved in this willingness to provide both types of access. The significance of this variable could also be attributable to the fact that those who enjoy private recreation and also extend access privileges to the public do so because they have land that is highly suitable for recreational pursuits. Data are not collected in the NWOS on parcel characteristics to be able to include a variable on recreational suitability of

one's land. This linkage would be important to examine in future research. Again, such landowners might be more amenable to participation in access incentive programs if there is flexibility to allow them to stipulate seasonality of access or type of recreation allowed on their lands in order that they may enjoy their recreational pursuits, too.

Landowners who stated that either privacy or owning their forestland as a place to hunt were important reasons for forest landownership were less likely to permit access than those who did not view these ownership reasons as important. However, we also found that landowners who recreate or permit private recreation on their lands are more likely to allow public recreation. Hence, owners who use their land for hunting view the presence of the public as interfering with their use of the land more than landowners who use their land for other recreational purposes. Further research is needed to understand why those landowners who own land for hunting purposes are more likely to prohibit access or if there is seasonality to this restriction that might mean opportunities exist to entice such landowners to open up their lands when hunting season(s) is over.

Our results indicated regional differences in the provision of public recreational access. Landowners in the South were less likely to provide public recreational access than those in the North or West (Gentle et al. 1999). Some authors have suggested that the North has more of a tradition or ethic of public recreational access on private lands (Vail and Hultkrantz 2000, Sigmon 2004), whereas landowners in the South may harbor an exclusionary private land ethic and, as such, be less likely to allow public recreational access (Wright and Fesenmaier 1990). The findings of regional differences in the provision of recreational access suggest that a one-size-fits-all approach may not be effective when working to develop policies, incentives, and programs designed to enhance public recreational access on private lands throughout the country. Moreover, efforts to entice landowners in the South to open up their land for public access may be less successful, regardless of the incentive mechanism tried, than in other regions of the country.

In this research we only examined the supply side of the public access equation. The demand side is equally as important, but not one that can be addressed with our current data. Demand may be greater in ar-

reas of the country with higher population densities and fewer public lands such as the East coast. It is also important to gain an understanding of how well private rural lands are able to meet the demand for different types of recreational activities. Although private forestlands may well be able to provide quality opportunities for hunting and fishing activities, such ownerships are less likely to provide venues or amenities for outdoor recreational pursuits such as team sport activities. Understanding the dynamic between public access supply and demand on family forestlands will help in shaping educational and incentive programs designed to improve access, in targeting efforts where access pressures are most acute, and in understanding the types of recreational pursuits that might best be met on private lands.

Limitations and Next Steps

One limitation of our data is the manner in which the NWOS question was phrased relative to public recreational access. As noted earlier, the question was not explicit as to whether this access was provided free of charge. Thus, we could be overestimating the percent of landowners providing free access if respondents answered in the affirmative to the public access question but were actually charging recreators through a leasing or fee-based program. However, given that only around 3% of landowners have lease agreements, this is not likely to be a large error (Teasley et al. 1999). The new version of the NWOS will provide more clarity on this question. Two other caveats about the data should be mentioned. Some landowners might allow access, but do not require permission. Second, some landowners might allow access but were never asked about access. Thus, both types of respondents would have answered no to the question posed to them in the NWOS about public access. The 15% we report of respondents who were willing to provide public recreational access when asked, then, would serve as a lower bound on the number of landowners willing to provide public access.

A national longitudinal analysis of public recreational access practices would be valuable in gauging trends in public access and determining if efforts to increase access are succeeding over time. The NWOS will continue to include questions regarding posting and recreational access that will allow for a long-term, longitudinal analysis of recreational access practices by family forest landowners. In addition, planned modifica-

tions to the NWOS will allow greater clarity in understanding free versus fee-based access. Finally, gaining a greater understanding of the specific types of activities that landowners are willing to provide access for is needed. In the NWOS, access was not differentiated by the type of activity. In reality, a landowner's decision whether to provide access may vary greatly depending on the nature of the activity. This too would be an important area of future study.

Endnotes

- [1] Family forestland, as defined by the NWOS (Butler 2008), is forestland owned by families, individuals, trusts, estates, family partnerships, and other unincorporated groups of individuals.
- [2] The NPLOS and NWOS both use the following RPA Regions, allowing for direct comparisons: RPA Region 1 ("North"), Connecticut, Delaware, Illinois, Indiana, Iowa, Maine, Maryland, Massachusetts, Michigan, Minnesota, Missouri, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, Rhode Island, Vermont, West Virginia, and Wisconsin; RPA Region 2 ("South"), Alabama, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, and Virginia; RPA Region 3 ("Rocky Mountains"), Arizona, Colorado, Idaho, Kansas, Montana, Nebraska, Nevada, New Mexico, North Dakota, South Dakota, Utah, and Wyoming; RPA Region 4 ("Pacific Coast"), Alaska, California, Hawaii, Oregon, and Washington.
- [3] The remaining respondents were other types of private forest landowners: corporate; nongovernmental conservation or natural resources organizations; unincorporated partnerships, associations, or clubs; and Native Americans.
- [4] In the NWOS, respondents are asked to specify the number of woodland acres owned in a state, but not the size of parcels if a respondent owns more than one. Responses to the NWOS questions, then, are in relation to all the woodland a respondent owns. Thus, the ACRES variable represents total woodland acres owned and not individual parcel size.
- [5] Three ownership variables were developed from responses to a 7-point Likert-scale question that asked respondents how important a reason for forestland ownership was, ranging from very important (1) to not important (7). A binary variable was created for each of three ownership reasons, with a value of 1 if the respondent answered 1 or 2 and a value of 0 with responses in the remainder of the 7-point scale.

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