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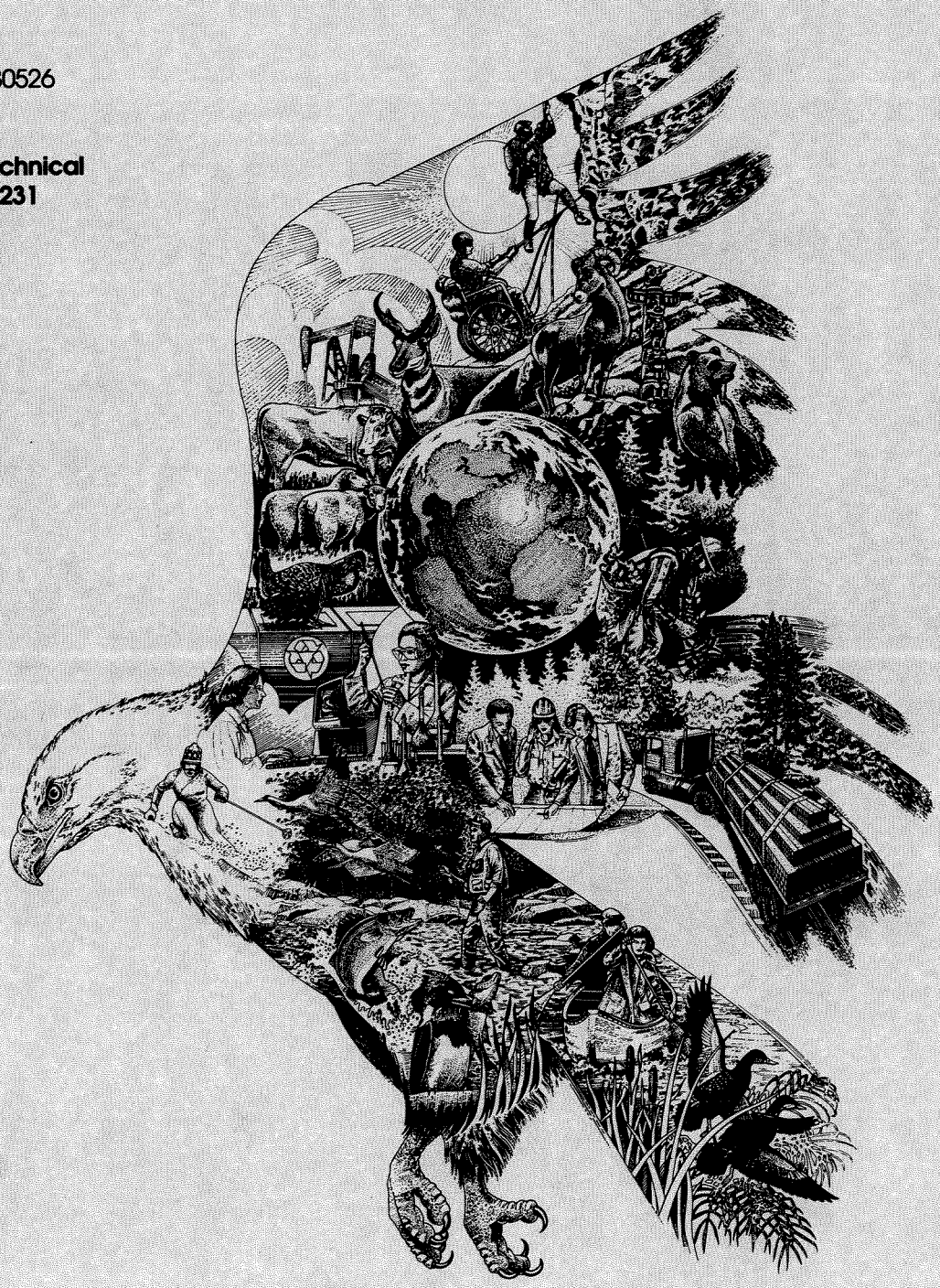
Effects of Subdivision and Access Restrictions on Private Land Recreation Opportunities

H. Ken Cordell, Donald B. K. English, and Sharon A. Randall



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Contents

Page

INTRODUCTION 1
LITERATURE REVIEW 1
METHODS 3
SECONDARY DATA TO DESCRIBE PRIVATE LAND TRENDS 3
PRIMARY DATA — THE 1992 LANDOWNER SURVEY 4
Sampling Private Land Tracts 4
The Survey Instrument 4
SPECIFICATION OF A THEORY-BASED CONSUMPTION MODEL 5
Total Use (Consumption) Model 6
Accessibility Model 7
RESULTS 8
SECONDARY DATA ANALYSIS 8
Trends 8
Homogeneity between Sampled and Unsampled Counties 9
DESCRIPTIVE RESULTS FROM THE LANDOWNER SURVEY 9
Land Uses and Reasons for Ownership 9
Tract Accessibility 10
Tract Size Changes 10
Comparisons between the 1985 and 1992 Survey Results 11
Land Use Comparisons 11
Trends in Reasons for Ownership 12
RECREATION CONSUMPTION MODELS 13
Noncorporate Landowners 13
The Total Use Model 13
Recreation Accessibility Model 13
Corporate Landowners 13
SUMMARY AND DISCUSSION 13
OVERALL RURAL LAND TRENDS 13
Homogeneity Between Sampled and Non-Sampled Counties 15
Significant Regional Findings 15
ACCESS ON CORPORATE LANDS 16
Estimated Models of Use and Accessibility 16
IMPLICATIONS 17
FUTURE RESEARCH 18
LITERATURE CITED 19

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INTRODUCTION

The total private, nonindustrial land base in the United States is approximately 1.3 billion acres, about two-thirds of the Nation's total land mass (Resources for the Future 1983; Hamilton 1989). More than 75% of these lands are east of the Mississippi River, compared to less than 5% of federal recreation lands and 80% of the Nation's population (Resources for the Future 1983; Harper, et al. 1990). Cordell and Hendee (1982) estimated that three-fourths of the U.S. population over the age of 11 years regularly participate in recreational activities on mostly undeveloped rural lands, and in natural environments. The demand for most outdoor recreational activities is predicted to continue to rise, especially among activities engaged in close to home (Cordell, et al. 1990) However, the publicly owned, undeveloped land base, which provides the primary resource for many of these activities probably will remain mostly stable. These trends, combined with the relative geographic distribution of public lands, private lands, and population, indicate that private lands may be increasingly important in meeting future recreation demand.

The apparent trend toward more restricted recreational access for the public to both nonindustrial and industrial private lands diminishes this potential (Cordell, et al. 1985). Some research that looked at trends in access restrictions has been interpreted to mean that the increasing frequency of such restrictions will result in fewer people having rights to use private lands, and less actual use (Cordell 1976; 1992). Virtually none of this research, however, has examined the effects that increased access restrictions actually has had on the level of opportunities for and use of private lands for recreation. The primary objective of this study is to examine the contemporary incidence of, reasons for, and effects on quantity of recreation accessibility and use that results from posting, leasing, and other forms of access restriction. A second objective is to determine if there are relationships between private land access and persistent, long-term private land trends, such as tract subdivision, consolidation, and land use changes.

This study proceeded in three principal phases. First, using data from the National Resources Inventory (NRI) and the Census of Agriculture (CENAG), apparent trends in private rural land subdivision (and consolidation) and land uses were examined and described. Second, this study used primary data from a landowner survey, in three eastern states, to update our knowledge of uses, reasons for ownership, access restrictions, and tract subdivision on private lands. Third, this landowner survey provided data to explore the relationship of recreational access to and use of private lands with factors hypothesized to determine access, including tract size (a measure of subdivision effects), type and degree of access restrictions, recreational suitability, owner characteristics, and selected recreation demand determinants.

LITERATURE REVIEW

Research indicates that a variety of factors seem to influence not only the availability of private land for recreation, but also the amount of recreational use that occurs on those lands. Leasing, posting, land use practices, and proximity to population centers are among the variables that have been used to predict the availability of private lands for public use. Other factors, including land use conversion, subdivision, and development have been linked to changes in the level of either availability or use. Considerable concern has been expressed in recent years that the supply of land on which to pursue outdoor recreation activities is decreasing at rapid rates (Brown, et al. 1984; Gyunn and Schmidt, 1984; Wright and Kaiser 1986; Cordell, et. al. 1990). Land is being permanently converted from an open space land base to housing and other highly developed uses.

It has been estimated that 1.5 million acres of agricultural land are converted to non-agricultural uses annually (Kaiser and Wright 1985; Doig 1990). Consequently, the recreational land base seems to be shrinking at a time when there are more Americans seeking outdoor opportunities (Kaiser and Wright 1985). Wetlands, often critical as wildlife habitat, were drained or converted to other uses at a rate of approximately 400,000 acres per year (Resources for the Future 1983). Additional amounts of remaining open land are being closed or posted by private landowners, thereby seeming to deny access to the public (Brown 1974; Brown, et al. 1984; Gyunn and Schmidt 1984; Resources for the Future 1983; Wright and Kaiser 1986). The current trend toward hobby farming and exclusive use has magnified this issue (Gramman, et al. 1985; Sampson 1986).

The impact of these trends on the number of people allowed to use private lands and on the amount of recreational use that occurs is unclear. Some research indicates that, in the future, there will be less access to private lands for a growing public (Hamilton 1989). Kaiser and Wright (1985) suggested that the effect of land closure on opportunities, although different in process than land conversion, is the same.

Literature shows that many different variables may be closely related to closure and posting of private lands. User misconduct and subsequent property damage are among the most frequently cited reasons for property closures and posting. However, other causes have also been cited as having significant effects (Jahn, et al. 1991; Brown, et al. 1984; Gyunn and Schmidt 1984; Birch and Dennis 1980; Cordell and Stevens 1984; Wright and Kaiser 1986). Motivations for owning rural land, fears of property damage, liability and loss of privacy are the most prominent reasons given for restricting public access (Kaiser 1985; Dennis 1990; Colyer, et al. 1989). Also, landowner characteristics, such as age, sex, and occupation, as well as the owner's use of the land for recreation, have been correlated with both use and availability of private lands for public recreation (Cordell et al. 1985; Gramman, et al. 1985; Birch 1982; Brown et al. 1984; Lee and Kreutzwiser 1982).

Gramman, et al. (1985) analyzed the public use policies of nonindustrial forestland owners in Wisconsin, and found that the probability of posting to control public access was positively associated with the degree to which owners themselves used their property for personal pursuits, the prevalence of having had negative experiences in the past with outside recreational users, owning a tract encompassing more than 50 acres of woodlands, being white-collar workers, and describing their land as something other than a farm (Gramman et al. 1985). Similarly, a 1977 study of Colorado landowners identified problems with vandalism and inappropriate behavior of hunters as the reasons most often precipitating their decisions to restrict access (Gyunn and Schmidt, 1984). In a recent survey of east Texas landowners, Wright and Fesenmaier (1988) found that attitudes toward hunting as a sport, incentives, and level of control over the actions of hunters were overwhelmingly the factors best predicting landowners' access policies. Generally, rural landowners who work in white-collar, urban-based occupations, who are female, older, or who use their land for their own recreational pursuits, have reported stricter public access policies (Wright and Fesenmaier, 1988; Wright, et al., 1988; Gramman et al., 1985; Birch, 1982; Brown et al. 1984; Lee and Kreutzwiser 1982).

A 1972 posting study of private landowners in New York State showed that almost four-fifths of those landowners who posted their property allowed some hunting (Brown 1974). Nearly three-quarters of those who allowed hunting permitted only friends and neighbors to hunt, while the remaining one-quarter granted access to anyone who asked permission. Using the same data, Brown, et al. (1984) attempted to identify which subgroups of landowners had higher propensities for posting. Results indicated that landowners who hunted posted more often (59%) than those who did not hunt (41%). Other subgroups whose members posted at higher rates included non-hunting landowners who did not photograph wildlife, who were in-state absentee owners, and who spent more than 60 days a year on their property. Another group who relied heavily on posting consisted of hunting landowners who were participated in at least one forest-related activity and who owned more than 20 ha (about 50 acres). While all these variables were found to be significant at a level p of ≤ 0.01, other socioeconomic variables, such as age, sex, education, occupation, and longevity of property ownership, were not significantly associated with posting.

A similar subgroup identification procedure was used by Brown, et al. (1984), based on whether or not landowners permitted hunting on their property upon request. Study results showed that more than 80% of the landowners who were hunters also allowed others to hunt. Also, more than one-half (56%) of the nonhunting landowners allowed access. Several variables describing landowners, including sex, education, participation in wildlife-related recreation, and interest in the land

management role of hunting, all were found to have a higher statistical probability (at the $p \leq 0.01$ level) of allowing others to hunt on their land.

In another study, Dennis (1990) identified characteristics that influenced the posting of private forest land in Vermont. A negative relationship found between size of tract and posting indicated that larger parcels were less likely to be posted. Also, shorter distances between the landowner's residence and the rural tract of land, the owner's age, and the owner's education level, all were positively and significantly correlated with an increased probability of posting. Significance also was shown between posting and an owner's employment in a white-collar, professional occupation. Variables shown to have no relationship to the probability that land would be posted included land characteristics, tenure of ownership, retirement status and place of childhood residence.

Stricter access policies do not necessarily imply less total recreational opportunities on private lands. Some research has suggested that seemingly restrictive land access policies, such as posting and leasing, under some circumstances, may have no effect on the overall supply of rural outdoor recreation opportunities. Past tendencies of researchers to interpret the posting of private lands as being synonymous with closure to recreational use may not be an entirely accurate (Brown, et al. 1984). There is increasing evidence to suggest that many private landowners post, at least in part, only to selectively control, rather than to totally prohibit access (Carpenter, et al 1986, Doig 1990; Brown, et al, 1984; Wright, et al. 1988; Wright 1990). What does seem to affect the supply of rural recreation opportunities, however, are the intentions of the posting landowners and how these practices are perceived by potential recreationists (Wright 1990). Also, some evidence exists to suggest that, although land may be leased to parties outside the owner's household, hunting privileges often are retained by the landowner, the landowner's family, and their guests. This suggests that leasing does not necessarily decrease the supply of recreational opportunities, or the number of people who use such land for recreation.

To date, very little definitive research has been done to examine the availability of private lands for outdoor recreation and to identify the factors and conditions which determine the actual amount and kind of access and use. The purpose of this research is to more closely examine the issue of private land availability and use, by looking at the factors which have been hypothesized to have an effect on availability.

METHODS

A combination of secondary and primary data were assembled and analyzed to examine relationships between subdivision, land and ownership characteristics, access policies, and recreation opportunity and use of private lands.

SECONDARY DATA TO DESCRIBE PRIVATE LAND TRENDS

Two principal national data bases were selected to examine subdivision or consolidation and land use trends and to test for homogeneity between sampled and unsampled counties. These data bases included the 1987 National Resources Inventory (NRI), compiled by the USDA Soil Conservation Service, and the 1987 Census of Agriculture (CENAG), developed by the Bureau of the Census. These data were selected for their comparability across states and regions, and across years. Both sources include data collected between 1982 and 1987, enabling a trend comparison over a 5-year period.

The NRI contains estimates of acreage of non-federal land by type of ownership, use and cover. Cover types include forest, crop, and pasture land. Estimates of acres of urban and other built-up land are especially important, because they highlight trends toward development of the private land base. Only farms that produced and sold at least $1,000 in agricultural products in the previous year were included in the CENAG. Therefore, the data in the NRI and CENAG are not totally compatible. CENAG contains county-level data which permitted tracking of trends in average farm size, and proportions of farms by size class and primary use (crop, pasture, forest, etc.) as indications of subdivision trends.

Data from these two sources also were used to test whether trends in the private land base, in the counties and states from which tract samples were drawn, were different from land base trends in unsampled counties in the same state and region. Percentage changes in acres of urban and built-up land; of privately-owned forest, crop, and pasture land; and in the number and acreage in farms, from 1982 to 1987, were the primary test variables. Separate t-tests were performed to compare mean percentage change between sampled and unsampled rural counties, within each of the three states, and within each of the three regions. These comparisons were developed to determine the degree to

which trends in the private lands and ownership circumstances in the sampled counties were homogeneous with the trends in lands and situations in non-sampled counties. These tests indicated the degree to which results based on the sampled counties could be extrapolated to state and regional levels.

PRIMARY DATA — THE 1992 LANDOWNER SURVEY

Sampling Private Land Tracts

The 1992 RPA Private Lands Special Issue Study was designed to survey samples of owners of both industrial and non-industrial private rural lands in three regions of the country — the North, the South, and the Midwest (fig. 1). One state was selected for study within each region, and included New York, Georgia, and Indiana. Using the USDA Forest Service's Forest Inventory and Analysis (FIA) physiographic regions within each of the sampled states, counties were stratified regionally to ensure representation across state-level geographical regions. This resulted in five physiographic regions per state. Because the focus of this study was rural private lands, counties with high population densities (≥ 200 people per square mile) were not sampled. After eliminating these high population counties, three counties from each FIA region were randomly drawn (fig. 2).

District Conservation agents with the USDA Soil Conservation Service visited the tax office in each of the sample counties to select a sample of private tracts, and to tally the total number of tracts within each stratum. From each county, an interval sample with a random

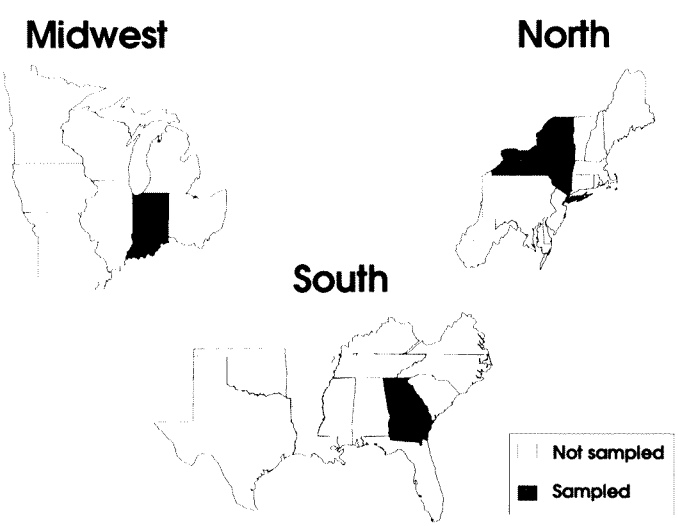

Figure 1.—States included in each of three analyses regions.

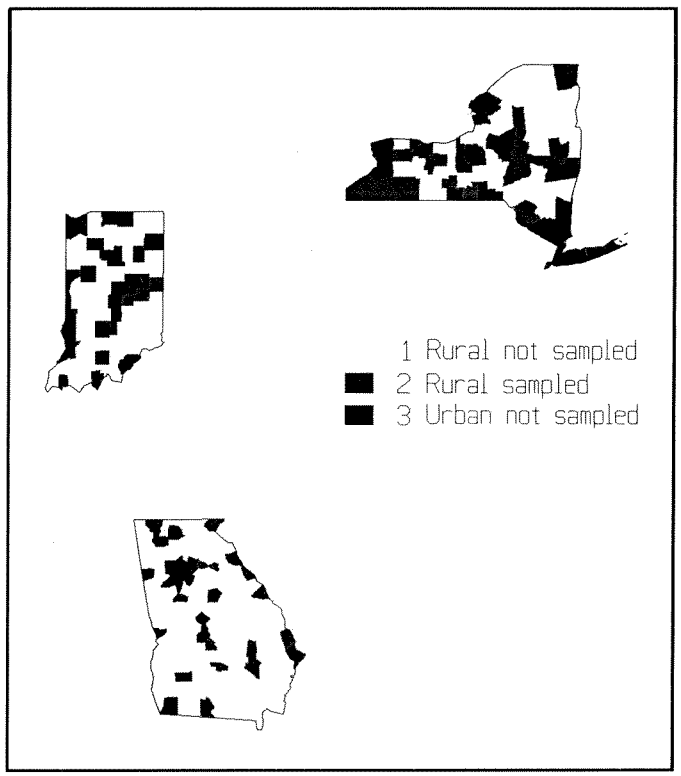

Figure 2.—Classification of counties within sampled states.

start, each including a sample of 40 eligible tracts, was chosen from master tax rolls to obtain names and addresses of the owners. Four size strata were defined, ranging from 10 to 24 acres, 25 to 99 acres, 100 to 499 acres, and 500 acres or more. For each tract, the following information was obtained: (1) owner's name and address; (2) tract, map, and parcel number; (3)legal description and any other identifying information about the tract; (4) number of acres in the tract; (5) assessed (taxable) value; (6) county millage rate; and (7) telephone number of the owner. A total sample of 1,371 tracts resulted.

The Survey Instrument

The survey was administered as a telephone interview lasting approximately 20 minutes. Of the 1,371 owners in the original sample, 220 had incorrect or no phone numbers, 16 had recently sold their property, and 12 had recently died. Another 242 owners could not be reached for reasons such as no answer, busy signal, and unsuccessful call back upon appointment. This resulted in 881 actual contacts. Of these, there were 506 completed interviews and 375 refusals. Standard telephone survey protocols were used to maximize interview

compliance. These included repeated trials on nonanswering owners, establishment of a call back appointment for contacts not completed during the initial contact, and a description of purpose, length, and use of the survey.

The telephone survey was designed to elicit information describing the tract, recreational access policies, the history of tract subdivision, and other information about the owner household. The sample, by design, also included a number of industrial owners. Completion of the survey was helped by dividing the interview into sections. Each section concentrated on a different aspect of private land management and use. Screening questions were established at strategic points within the survey to route respondents through or around questions and sections, depending on applicability to each tract in the sample. Interviews were conducted using data entry screens developed using a widely used data base management software for microcomputers. Instructions, prompts, and bypasses were built into the program to guide the interview and to avoid asking inapplicable questions.

The first two sections obtained descriptions of the tract, including type of vegetation cover, number of acres owned, current uses, length and type of ownership, residence on or distance from primary residence to the tract, and importance of various reasons for owning the land. The extent to which private lands were being used for recreation was the focus of Sections III through VI of the questionnaire. Section III examined specific land access policies, problems associated with recreational land access, activities permitted, and reasons for allowing access. Based on the answers to specific land access questions, the next three sections of the survey addressed the amounts of recreational use occurring on the tract. Section IV dealt specifically with land reserved exclusively for the personal recreational use of the owner, members of her/his household, and any others known personally, such as relatives, friends, neighbors, employees, and business associates. Section V examined leased land. In addition to questions on amount of use, this section looked at the characteristics and terms of any existing recreation lease, reasons for leasing, activities permitted through the lease, and whether or not the leased land was posted. The final section in this category, Section VI, dealt specifically with open lands, including land available to anyone, whether the landowner knew them or not, and closed land, lands on which no one may recreate.

Past and expected future land access and posting practices were examined in Section VII. Specific questions related to the amount of land that was open for recreation 5 years ago and that is expected to be open in 5 years, as well as the factors that may have influenced those decisions. Also, questions were asked addressing the amount of and reasons for posting. Land subdivision and parcel consolidation were the principal topics of Section VIII. Questions related to the acquisition of additional acres since 1985, the sale or transfer of title to any land that was originally a part of the specified tract, reasons for subdivision, and future plans for the property all were addressed in this section. The final section of the survey contained demographic questions, including landowner's age, sex, race, size of household, marital status, income, profession, and education.

SPECIFICATION OF A THEORY-BASED CONSUMPTION MODEL

The primary goal of this research was to examine the relationships between recreational use (consumption) of rural, private lands and both subdivision and access restrictions. Specifically, the goal was to test the hypothesis that greater access restriction (posting, leasing, and closure) results in reduced availability of private land opportunities for recreating households and, subsequently, in reduced total recreational use. Tract availability was operationally defined for this study as the number of different people who actually have access to and use a tract during a year. Recreational use was measured as the product of the average number of people per month who use a tract and the average number of days per month the tract was used. This measure provided an index to the volume of use on each studied tract.

To test the hypotheses that access policies influenced access and use, a consumption model was specified based on the household production model conceptualized by Bockstael and McConnell (1981), and estimated in a national application for the 1989 RPA Assessment of outdoor recreation by Cordell and Bergstrom (1991). Recreation consumption models are the reduced form of the demand and supply equations for recreation trips in a household production theoretical context.

Models specified for this study generally are analogous to the community-level recreation consumption models developed for the 1989 RPA Assessment (Cordell and Bergstrom 1991, Cordell et al., 1990). The principal

difference is that of perspective. For the 1989 models, the modeling perspective was of trips generated from and consumed by a community, at public recreation sites. The perspective of this study is generation of trips from households, in general, to a specific tract of rural, privately-owned land.

Household demand for recreation trips is easily derived from neoclassical demand theory (Bockstael and McConnell 1981). The demand for recreational trips to any tract of private land is determined, in part, by trip costs facing households (i.e., by distance and time costs to the tract plus any access fees). Demand for trips also is determined by the quality or suitability of the private tract for the recreation, by the price of substitute opportunities (public or private), and by household characteristics (typically including income, age, preferences) (Cordell et al., 1990, McCollum et al., 1991).

Private land recreational trip supply is a two-stage process (Cordell and Bergstrom 1991). In the first stage, landowners combine the set of costs they face with their respective objective functions, the physical attributes of the their land, skill in land management, and their access policies, to provide a set of recreational trip opportunities (availability). In the second stage, households combine their time, capital, recreation equipment, knowledge, skills and abilities with the available private land opportunities and their associated prices and qualities, to produce recreation trips to those private lands.

Private land opportunities are provided by both individual and corporate ownerships. Although both sets of owners may face the same costs, their access policies and the opportunities they provide may be quite different, because their objectives are typically quite different. Individual owners strive to maximize their personal utility functions, while corporate owners seek to maximize corporate profits. Such differences in objective functions between individual and corporate owners may result in quite different access policy decisions regarding otherwise identical tracts of rural lands. For this reason, data for recreational use of corporately owned rural lands were not pooled with data for tracts owned by private individuals.

Total Use (Consumption) Model

Following Cordell and Bergstrom (1991), the demand function for recreation trips by household "i" to participate in recreation on private land tract "j" is specified generally as:

$$T^{d}_{ij} = f(P, S, SO, H) \quad (1)$$

where T^{d}_{ij} = demand for trips by household i to tract j
P_j = average price per trip for households to recreate at tract j
S_j = recreational suitability of tract j
A_j = accessibility of tract j
SO = substitute recreational opportunities available to households
H = household characteristics.

Similarly, the generalized household trip supply model is:

$$T^{s}_{ij} = f(P, S, RO, H) \quad (2)$$

where T^{s}_{ij} = recreation trips supplied by household i to tract j; RO = recreational opportunities available to households; and P, S, A, and H are as defined previously.

The general reduced form of the total use or consumption model for recreational trips by households to private tract j (T^{c}_{j}) is:

$$T_{ij} = g(H, SO, RO, S) \quad (3)$$

Our interest was in total recreation consumption on a tract. That is, summing over households results in a model that uses aggregate measures of household characteristics. Population and per capita income for the county in which the tract is located were selected following Cordell and Bergstrom (1991). Suitability of the tract for recreation was measured by the size of the tract, the percentage of the tract in forest, and the percentage in water. A specific hypothesis examined in this model was the relationship of tract size to total tract use as an indication of tract subdivision effects. Land cover in water and forest were selected as suitability measures, because they represent the land characteristics most indicative of suitability for two of the primary activities that occur on private lands — hunting and fishing.

Tract accessibility for recreation (A) was measured by proportions of the tract in each of four mutually exclusive access categories. These included: (1) lands open to the general public for recreation; (2) lands reserved for the exclusive recreational use of the landowner's household, friends, and family; (3) land leased to groups for recreational use; and (4) land closed to recreation by anyone. The landowner survey asked respondents to list the number of acres in the sampled tract in each of

these accessibility categories. Percentage of the tract open, leased, or closed were the three access variables included in the model.

Because any or all of the lands in each of the access categories could be posted, percentage of acres posted also was included as a regressor. Also, a dummy variable indicating whether or not the landowner lived on the tract was included. This variable was included to represent both the accessibility of the tract for the landowner's own recreational use and accessibility to other users by immediate permission from the landowner. Because the model was specified to estimate total recreation use, not just outside public use, the size of the landowner's household also was included to represent the most immediate set of potential recreation users of the tract.

The final regressor selected for inclusion in the model was a measure of the availability of substitute recreation opportunities. The substitute variable used was an index of the amount of effective recreation opportunities within a distance recreationists are willing to drive for recreation. The concept of effectiveness accounts both for quantity and location of the relevant set of recreation resources that can be used as substitutes for private land opportunities and for the number and location of populations that potentially may compete for the use of these resources. More detailed explanations and theoretical background of the effectiveness concept can be found in English and Cordell (1993).

An index of the amount of recreational use on each tract was calculated as the product of the landowner's report of the average number of people per month using the sampled tract and the reported average number of days of use per month. Initial examination of the responses on total recreation use of the tracts showed that nearly one-fourth of the observations had a zero value for this use measure. As a result, we selected a Tobit regression to estimate model parameters. Tobit models use both cases at the limit value (zero, in this case) and cases above the limit in calculating coefficients. Consequently, coefficients resulting from Tobit analyses account for both the probability of being above the limit (>zero) as well as predicted changes in dependent variable values above the limit and associated with changes in independent variable values (McDonald and Moffitt 1980).

The final specified model contained 13 regressors, including a constant term (table 1). Four separate models were estimated, one for tracts with corporate landowners, and one each for tracts in private ownership in each of the three states representing regions. Regional models were estimated for the tracts with private individual landowners, to account for any regional differences that may affect either landowner access decisions or recreation use. Data from only 33 corporate landowners were available; therefore, the model was restricted to fewer regressors: tract size, percent of the tract posted, and percent open.

Table 1.—Regressors used in the tract use and accessibility explanatory models.

Regressor	Description
HH	Size of landowner's household.
EROS3	Index of the relative availability of comparable recreation lands for households in the same county as tract j. SOURCE: National Outdoor Recreation Supply Information System (NORSIS), USDA Forest Service.
POP	Population in the county of tract j. SOURCE: U.S. Census Bureau, City County Data Book (CCDB).
PERCAPY	Per capita income in county of tract j. SOURCE: CCDB.
LIVELAND	Dummy variable describing whether or not the landowner lives on the tract.
PCTOPEN	Percentage of the tract open to the general public for recreation.
PCTPOST	Percentage of the tract posted.
PCTLEAS	Percentage of the tract leased for recreation.
PCTCLOS	Percentage of the tract closed to all recreation.
NUMACRES	Number of acres in the tract.
PCTFORST	Percentage of the tract in forest cover.
PCTWATER	Percentage of the tract in lakes, streams, or rivers.

Accessibility Model

The dependent variable for this model was directly available from the landowner survey. The survey asked landowners to report the number of different people who use part or all of their tract for recreation. More than one-fifth of the cases reported a zero value, again indicating that a Tobit specification was appropriate for estimation of the model. An equal percentage indicated that only one person was allowed to use the tract. Again, four models were estimated, one for corporate landowners and one each for private landowners in each of the three regions. The set of regressors used for these models were identical to those used in the total recreation consumption models.

RESULTS

SECONDARY DATA ANALYSIS

Trends

Results from the 1987 CENAG show that both the total acreage in farms and number of farms in rural counties declined over the 1980s, in all three regions (table 2). The Southern region showed the greatest losses of acres (10.4 MM) and numbers (62,500) of farms from 1982 to 1987. Although the absolute loss in farm acres and farm numbers was smallest in the North, at 1.5 million and 9,000, respectively, the percentage loss in both acres and farms, down 6.8% and 8.4%, respectively, was greatest in the North. Both the North and South regions lost cropland, on farms in rural counties, between 1982 and 1987; yet, cropland increased in the Midwest region, during the same period, by about 3.8 million acres. All three regions saw declines in acres of woodlands on farms in rural counties. Declines measured as a percentage of the 1982 total (13.0%) and reduction of acres from 1982 to 1987 (4.9MM) were greatest in the South.

Average farm size in rural counties increased from 1982 to 1987 in all three regions (table 3). For all regions, the number of acres in farms between 1,000 and 2,000 acres rose during this period, despite an overall loss in farm acreage when summed over all size categories. Acreage in farms larger than 2,000 acres increased slightly in both the North and Midwest regions. In combination, these results indicate that more farm acreage, at least in rural counties, is becoming concentrated in larger holdings. All other farm size categories showed declining total acreage. In percentage terms, losses were greatest in the smallest size group (1-9 acres), where declines as large as 55% occurred across all three regions. Acres of farms of 260 to 499 acres declined more than 6% in the South, and almost 11% in the Midwest. Losses of acreage in the smaller tract size categories resulted from both conversions to other land uses and consolidation of smaller tracts into larger ones.

For the sampled counties, the number and proportion of farms in the two largest size categories either increased or stayed the same (table 4). For the Midwest and North regions, there also was an increase in the number of farms of the smallest size (less than 10 acres). For all regions, the greatest decline in the number of farms was in the 260- to 499-acre category.

Data from the 1987 NRI concurred with trends found in the CENAG (table 5). Privately owned cropland in rural counties increased in the Midwest by more than 3.5 million acres, almost a 2% growth. Both forest and pasture lands, however, declined in this region. Rural counties in the other two regions experienced declines in cropland and increases in forested land. In all three regions, acres of urban or built-up land increased. The increase was greatest in the South, more than 6%, and lowest in the Midwest, about 1.5%.

Table 2.—Change in acreage, number and percentage of acreage of farms, cropland and woodland on farms by region, 1982-1987.

Type of Acreage	Region		
	Midwest	North	South
Farm acres (MM acres)	-3.0	-1.5	-10.4
Percentage change	-0.9	-6.8	-3.9
Number of farms (1000s)	-61.0	-9.0	-62.5
Percentage change	-7.3	-8.4	-8.1
Cropland (MM acres)	3.8	-0.4	-5.9
Percentage change	1.7	-3.6	-5.2
Woodland (MM acres)	-1.6	-0.8	-4.9
Percentage change	-8.2	-12.5	-13.0

Source: 1987 Census of Agriculture, U.S. Department of Commerce, Bureau of the Census.

Table 3.—Average farm size and acres in farms in rural counties by farm size category and region, 1982 and 1987.

	Region					
	Midwest		North		South	
	1982	1987	1982	1987	1982	1987
Aver. farm size	403	431	204	207	349	365
Acres (MM) in farms in size class:						
1 - 9 acres	0.31	0.14	0.08	0.02	0.46	0.19
10 - 49 acres	2.97	2.66	0.48	0.45	4.92	4.44
50 - 69 acres	2.03	1.82	0.48	0.44	3.86	3.43
70 - 99 acres	5.74	5.15	0.91	0.82	6.62	5.94
100 - 139 acres	7.85	7.05	1.58	1.43	9.23	8.36
140 - 179 acres	12.12	10.87	1.56	1.41	9.19	8.42
180 - 219 acres	9.74	8.71	1.61	1.41	7.78	7.30
220 - 259 acres	11.32	9.92	1.53	1.34	6.90	6.47
260 - 499 acres	59.52	53.01	6.28	5.67	31.31	29.22
500 - 999 acres	74.40	74.37	4.69	4.50	39.79	38.23
1000 - 1999 acres	64.47	69.68	1.92	2.05	39.42	40.01
> = 2000 acres	85.87	89.01	0.63	0.65	110.52	104.99

Source: 1987 Census of Agriculture, U.S. Department of Commerce, Bureau of the Census.

Homogeneity between Sampled and Unsampled Counties

Based on data from the NRI, percentage trends from 1982 to 1987 in acres of cropland, forests, pasture, and urban or built-up land were computed for comparison between sampled and unsampled counties, at both state and regional levels (table 6). None of these comparisons were statistically significant, indicating that trends in land uses and cover types across the counties sampled for this study seemed to be reflective of the broader state and regional trends in private land use and access. From this, we concluded that findings from this study associated with use and access trends are likely to be indicative of statewide and regionwide trends.

DESCRIPTIVE RESULTS FROM THE LANDOWNER SURVEY

Land Uses and Reasons for Ownership

Corporately owned tracts, on average, have the greatest proportion of acreage in forests (57.4%) and water (3.9%), and the least in both cropland (21.2%) and pasture (5.2%) (table 7). Also, more than 45% of corporate tracts are used to grow commercial timber; and more than one-fourth of the corporate respondents indicated that growing timber is a very important reason for owning the tract. These land use results suggest that corporately owned tracts generally may be more suitable for outdoor recreation, especially for hunting and fishing, than are individually owned tracts. This assertion is further supported by the finding that for

Table 4.—Number of farms (in thousands) in farms in rural counties by farm size category and region, 1982 and 1987.

	Region					
	Midwest		North		South	
	1982	1987	1982	1987	1982	1987
Thousands of farms in size class:						
1 - 9 acres	44.0	44.9	5.7	5.8	55.0	50.3
10 - 49 acres	105.6	95.0	17.1	16.0	176.2	158.9
50 - 69 acres	34.8	31.1	8.3	7.5	66.4	59.0
70 - 99 acres	70.2	62.9	10.9	0.8	80.1	71.8
100 - 139 acres	67.1	60.2	13.5	12.3	79.6	72.1
140 - 179 acres	76.7	68.8	9.9	0.0	58.4	53.5
180 - 219 acres	49.3	44.1	8.1	7.1	39.3	36.9
220 - 259 acres	47.6	41.7	6.4	5.6	29.0	27.2
260 - 499 acres	164.5	145.9	17.8	16.1	88.0	82.0
500 - 999 acres	108.0	106.9	7.1	6.8	57.6	55.0
1000 - 1999 acres	47.1	50.7	1.4	1.5	28.8	29.2
> = 2000 acres	20.1	21.9	0.3	0.3	17.4	17.4

Source: 1987 Census of Agriculture, U.S. Department of Commerce, Bureau of the Census.

Table 5.—Change in millions of acres and percentage of privately owned land in cropland, forestland, pastureland, and in urban and built-up land in rural counties, by region, between 1982 and 1987.

Change	Region		
	Midwest	North	South
Farm acres (MM acres)	-3.0	-1.5	-10.4
Cropland	3.6	-0.1	-1.7
Percentage change	1.9	-1.1	-2.0
Forest land	-0.1	0.5	0.1
Percentage change	-0.2	1.1	0.1
Pasture land	-2.4	-0.4	0.0
Percentage change	-6.8	-6.3	0.0
Urban and built-up land	0.2	0.1	0.8
Percentage change	1.5	3.5	6.1

Source: 1987 National Resources Inventory (NRI), USDA- Soil Conservation Service.

Table 6.—Comparisons of land use change rates between sampled counties and nonsampled rural counties in the state and in the rest of the region, by region, 1992.

Percentage change in	Region					
	Midwest		North		South	
	Mean	t-ratio	Mean	t-ratio	Mean	t-ratio
Cropland acres:						
Sample counties	1.90		0.08		-3.70	
Rest of state	2.15	0.09	-4.52	0.95	-4.43	0.12
Rest of region	2.51	0.09	-1.18	0.27	-2.18	0.16
Pasture land acres:						
Sample counties	-1.62		0.04		10.01	
Rest of state	2.16	0.22	-3.93	0.46	2.36	0.57
Rest of region	0.81	0.07	-8.63	1.12	3.50	0.33
Forest land acres:						
Sample counties	7.89		-0.58		-0.30	
Rest of state	0.46	1.74	-1.60	1.03	0.33	0.49
Rest of region	2.12	0.42	1.41	1.25	-0.34	0.02
Urban and built-up land acres:						
Sample counties	2.91		4.49		8.23	
Rest of state	4.50	1.80	4.76	0.37	9.09	0.34
Rest of region	2.13	0.77	4.91	0.41	6.23	1.26

Table 7.—Comparisons of land uses, activities, and reasons for owning rural land, for corporate owners and noncorporate owners by region, 1992.

		Noncorporate		
	Corporate	Midwest	North	South
Average percent of tract in:				
Forests	57.4	21.7	41.3	52.5
Water	3.9	0.7	2.7	2.1
Crops	21.2	58.0	32.5	23.6
Pasture	5.2	9.8	11.9	16.4
Other	12.3	9.8	11.6	5.4
Percentage of tracts where landowners:				
Grow crops	33.3	75.9	55.3	52.2
Grow timber	45.4	22.3	31.9	33.6
Graze cattle	15.2	31.3	29.1	38.8
Rent a home	15.2	17.9	0.2	9.0
Run a nursery	3.0	1.8	10.6	1.5
Percentage of landowners listing as a very important reason for owning rural land:				
Grow timber	26.3	4.7	0.8	24.5
Grow crops	28.6	57.6	17.9	15.9
Raise livestock	11.4	20.9	13.1	19.1
Live in a rural environment	20.0	65.4	67.5	65.4
Provide recreation opportunities for others	33.3	6.5	16.1	18.5
Provide wildlife habitat	14.3	27.8	33.7	40.1
Make a profit from recreation	11.4	0.8	1.9	3.3
Sell land for profit	8.6	10.3	8.6	10.0
Personal recreation opportunities	25.7	32.3	46.6	34.2
Own greenspace	22.9	58.9	63.4	61.4

one-third of corporate landowners, providing recreation opportunities for others is an important reason for ownership, and further that 11% feel that making money from recreation is important.

On average, individual landowners in the South have almost as great a proportion of their tract in forest (52%) as do corporate landowners. Further, almost 25% of these owners stated that growing timber is an important reason for owning the tract. However, compared to the other two regions, noncorporate tracts in the South have the lowest proportion of land in crops, and the lowest percentage of tracts where any crop use occurs.

A much higher percentage of individually owned tracts in the Midwest have growing crops for sale as an important reason for ownership (table 8). Consistent with this difference, growing timber is a much less prevalent reason in the Midwest, compared to the South and North. Owning the land for personal recreational opportunities is greatest in the North (60%), next greatest in the South (43%) and lowest in the Midwest (33%). Few owners in the three regions indicated that collecting revenues by charging fees for access for public hunting and fishing is an important reason. The highest percentage for charging fees was in the South, at 2.6%.

Tract Accessibility

Individually owned tracts in the Midwest have the greatest proportion of acreage closed to all recreation (28.5%), compared to all other types, including corporate landowners (table 9). On average, corporately owned tracts differ from noncorporately owned tracts by having a greater percentage of acreage both open to the public (17.3%) and leased for recreation (9.7%). As might be expected, a smaller percentage of corporate owners reserve acreage exclusively for their personal recreation use (44.4%). Among the noncorporately owned tracts, those in the North have more of the acreage both open (10.9%) and leased (5.2%), and less is closed to all recreation (14.0%). In the North and the South, 10.9% and 4.0% of acreage, respectively, is open to the public, and 5.2% and 0.7%, respectively, is leased. Generally, among individual ownerships about two-thirds of the total tract acreage is reserved for the exclusive use of the owner across all three regions. The Midwest is slightly lower at 63%.

Tract Size Changes

Corporate owners more frequently purchased land to increase the size of their tract compared to individual owners. More than 15% of corporate respondents reported purchasing more land in the previous 5 years; about 9%, however, reported selling some of the land in the tract sampled (table 9). Individual owners in the South reported the lowest frequency (4.5%) of purchasing additional land to increase the size of their tract; and 11.2% sold some of the acreage from the sampled tract. Owners in the North purchased more frequently (almost 10%); but, this region also had the highest percentage to have sold off some of the acreage in the previous 5 years (13.5%). In general, more individual owners sold some of their land than did purchase additional acreage across all three regions. The inverse was true of corporate owners.

Table 8.—Comparisons of very important reasons for owning the specified tract of land: A comparison of 1985 NPLOS and 1992 RPA Special Issue Study, for corporate owners and noncorporate owners by region.

			Region					
	Corporate		Midwest		North		South	
Reason	1985	1992	1985	1992	1985	1992	1985	1992
Growing Timber for sale	30.8	26.3	4.2	4.7	18.7	0.8	26.3	24.5
Raising Live-stock for sale	19.4	11.4	23.6	20.9	17.1	13.1	27.1	19.1
Growing Crops for sale	31.5	28.6	51.5	57.6	21.1	17.9	24.8	15.9
Living in a rural environment	17.3	20.0	46.1	65.4	56.4	67.5	41.2	65.4
Making an estate for heirs	25.6	19.4	20.6	31.3	22.8	25.0	26.9	47.7
Making money from fee hunting or fishing	0.0	11.4	0.4	0.8	0.0	1.9	2.6	3.3
Selling all or part of the tract for a profit	59.1	8.6	9.6	10.3	13.7	8.6	14.4	10.0
Personal recreation	18.3	25.7	33.1	32.3	59.7	46.6	42.9	34.2

Comparisons between the 1985 and 1992 Survey Results

Comparisons of survey results estimating percentages by land use were made between the 1985 national study, NPLOS, which had been weighted using NRI data, and the 1992 survey of owners in three states. These comparisons were developed to help identify the degree to which the states selected for the 1992 survey seemed to represent their respective regions (table 10). Results of the two surveys were further compared to indicate trends in ownership objectives (table 8).

Land Use Comparisons

In general, New York seemed less representative of its respective region than did Georgia or Indiana. Percentage differences between the 1985 and 1992 surveys were evident for estimates of percentage forest, crops and pasture in New York. These differences indicated that the 1992 survey, conducted in New York, did not represent the rural land uses in the Northern region as well as Georgia and Indiana, represented the South and Midwest, respectively. Estimates for from the 1992 survey in Indiana and especially in Georgia, seemed to provide good percentage estimates of the dominant land uses in their respective regions, when compared with results from the 1985 survey.

Because these comparisons are somewhat confounded by the effects of real trends in land uses within the three regions, trends indicated by our surveys in 1985 and 1992 were compared with trends indicated by both the CENAG and the NRI. These comparisons indicated that trends in land use percentages from the private land surveys reported here agreed with CENAG and NRI-based trend estimates across approximately 60% of the cells representing land use by region strata. Also, three of the five most obvious differences in land use percentages between the 1985 and 1992 survey estimates were consistent with the temporal trends in those same land uses as estimated from CENAG and NRI data. This indicates that some portion of the discrepancies between estimates of land use percentages from the 1985 and 1992 surveys is likely a result of actual land use trends. While these comparisons do not offer totally

Table 9.—Comparisons of tract accessibility, and subdivision and consolidation trends, for corporate and noncorporate owners by region.

		Noncorporate		
	Corporate	Midwest	North	South
Average percentage of tract by access class:				
Open	17.3	6.9	10.9	4.0
Closed	28.6	28.5	14.0	22.9
Leased	9.7	1.2	5.2	0.7
Exclusive	44.4	63.4	69.9	70.4
Percentage of owners:				
Adding land	15.2	6.3	9.9	4.5
Selling land	9.1	8.9	13.5	11.2

conclusive results, it appears that the estimates of percentage land uses derived from the 1992 state-level surveys provide a reasonable representation of the uses of individually owned, private land, in their respective regions.

Trends in Reasons for Ownership

Because trends in land uses as estimated from the 1985 and 1992 surveys agreed, in general, with trends estimated from the CENAG and NRI data, it appeared that an examination of trends in reasons for ownership also would be reasonably appropriate. Percentages of owners indicating reasons for owning their land as estimated from the 1985 and 1992 surveys are shown in table 8.

In general, trends in reasons for ownership between 1985 and 1992 were consistent among the three states sampled. These trends are summarized below.

1. A smaller percentage of owners indicated that growing **timber** for sale was an important reason for owning land in 1992, except in the Midwest, where timber is a primary purpose for only about 4% of the owners and the upward trend was insignificantly small.

2. Smaller percentages of owners indicated that **raising livestock** is an important reason across all regions.

3. The percentage growing **crops** for sale declined, except in the Midwest where a moderate increase was noted.

4. The percentage indicating they owned their land to **live a rural lifestyle** increased across all three regions.

5. The percentages indicating they are **building an estate for heirs** increased across all regions.

6. The percentage who own land in order to **make money from recreation fees** increased in all regions.

7. The percentage indicating they own their land to **sell for a profit** decreased, except in the Midwest, where the increase was insignificant.

Table 10.—Comparisons of land cover and uses (in percentage of tract) between the 1985 national survey and the 1992 regional survey for noncorporate owners.

			Region					
	Corporate		Midwest		North		South	
Reason	1985	1992	1985	1992	1985	1992	1985	1992
Forests	53.6	57.4	26.9	21.7	67.7	42.3	50.8	52.5
Water	0.5	3.9	1.9	0.7	1.2	0.7	1.9	2.1
Crops	32.2	21.2	44.9	58.0	22.9	33.5	20.8	23.6
Pasture	9.4	5.2	11.2	9.8	0.8	11.9	18.7	16.4
Other	4.3	12.3	15.1	9.8	7.4	11.6	7.8	5.4
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

RECREATION CONSUMPTION MODELS

Noncorporate Landowners

The Total Use Model

The variables measuring accessibility of the tract performed with mixed results (table 11). Percentage of the tract closed to all recreation (PCTCLOS) had the expected negative sign across all regions; but, the coefficient was not significant in the North model. Percentage of the tract open to the public (PCTOPEN) had a positive sign for all regions, but was not significant in any regional model. Neither percentage of the tract leased (PCTLEAS) nor percentage posted (PCTPOST) had consistent signs across regions and, except for percentage leased in the North model, were not significant. Resident landownership (LIVELAND) was positively related to total recreation use, and significantly so in both the Midwest and South models.

Tract size (NUMACRES) did not have a consistent sign across the regional models, and was only significant in the South model. The other recreation suitability variables, PCTWATER and PCTFORST, generally were not significantly related to recreation consumption. The only exception was for the North model, where PCTWATER was positively and significantly related to consumption.

A goodness-of-fit measure (R^2) was calculated as the square of the simple correlation between the actual and fitted dependent variables. Results indicated relatively weak fits for all three regional models. In general, the results of this model do not provide strong evidence of the relation between recreation consumption on private lands and either tract subdivision or access restrictions, other than the negative effect of land closure.

Recreation Accessibility Model

For all regions, percentage of a tract open to the public is strongly and positively related to the number of people who have access to the tract (table 12). Consistent with this relationship, percentage of the tract closed to all recreation is negatively related to number who have access and significantly, or nearly so, in all regions. Percentage of a tract leased for recreation has a positive sign in all regions and is significant in two of the regions. However, having a resident landowner on the tract has a significant relation to number who have access only in the North model.

Suitability measures also are fairly consistent across regional models. Tract size is positively and significantly related to number who have access in two of three models. Percentage of the tract in water has a positive and significant coefficient in all three models. PCTFORST, however, is not significant in any of the models. In general, the relations between number having recreation access and both tract access and recreation suitability across the three regions are reasonably consistent and much stronger in the accessibility models than for the total consumption model.

Corporate Landowners

On average, the tracts owned by corporate landowners are available to a greater number of people and accommodate more use than do tracts owned by noncorporate landowners (table 13). Only 33 corporate landowners were included in this sample drawn from county tax roles. Also, the variables indicating owner residency and household size were not relevant to corporate owners. Therefore, a subset of the specified regressors in the models for noncorporate landowners were selected, including tract size, percentage of acres closed, and percentage leased for recreation. Results showed no significant relationships between these variables and either total use or the number of people having access to the tract. A more definitive analysis to model corporate land recreation use and accessibility may require a larger data set than was collected for this study. Nevertheless, these results add to the knowledge about the variables potentially important in determining the relationship between private land access and overall supply of public recreation opportunity.

SUMMARY AND DISCUSSION

OVERALL RURAL LAND TRENDS

An examination of data from the Census of Agriculture indicated that both total acreage in farms and number of farms in rural counties declined since 1982 (fig. 3). At the same time, average farm size increased, indicating that overall farm acreage is becoming more concentrated in larger holdings. Except for number of farms smaller than 10 acres, number of total acres and number of farms increased only in farm size categories of 1,000 acres or more. As farm tracts are becoming

Table 11.—Results of recreation use model estimation, for noncorporate landowners, by region.

	Midwest		North		South	
Variable	**Beta**	**t**	**Beta**	**t**	**Beta**	**t**
CONSTANT	-656.215000	1.51	-145.436000	0.17	-34.927900	0.09
LIVELAND	127.697000	2.27*	141.411000	1.52	209.119000	4.68***
HH	-35.440800	1.14	-23.723600	0.68	-60.858700	2.47**
PCTCLOS	-3.355980	4.21***	-1.732470	1.27	-2.445370	3.59***
PCTLEAS	-28.283700	0.05	7.528550	3.94***	-0.893057	0.57
PCTPOST	0.167782	0.28	1.161910	1.28	-0.018961	0.04
PCTOPEN	1.404390	1.49	2.316670	1.60	1.167130	1.14
NUMACRES	-0.267858	1.18	0.227475	1.18	0.126111	2.10*
EROS3	-15.064700	0.80	-9.991730	0.51	-10.081600	0.69
PERCAPY	0.087842	2.00*	0.007027	0.09	0.016024	0.41
POP85	0.443575	0.17	0.577495	0.33	-1.380680	0.39
PCTFORST	0.136328	0.13	-0.249391	0.20	0.557128	0.83
PCTWATER	1.268140	0.12	14.754500	2.44*	2.588180	0.54
N	112		141		134	
R^2	0.195		0.242		0.255	
Dep. Var. Mean	88.800		141.970		92.720	
σ	230.830		455.073		216.333	

* *= significant at p<= 0.05*
** *= significant at p<= 0.01*
*** *= significant at P<= 0.001*

Table 12.— Accessibility model results, for noncorporate landowners, by region.

	Midwest		North		South	
Variable	**Beta**	**t**	**Beta**	**t**	**Beta**	**t**
CONSTANT	6.33290	0.24	-27.50500	0.373	-3.33040	0.36
LIVELAND	1.75220	0.51	21.39200	2.612**	0.77227	0.72
HH	0.68216	0.36	2.95330	0.953	1.07970	1.83
PCTCLOS	-0.10528	2.53*	-0.20812	1.743	-0.07306	4.36***
PCTLEAS	0.08962	0.57	0.43492	2.511*	0.18828	5.08***
PCTPOST	0.10387	2.74**	0.02902	0.366	-0.00368	0.31
PCTOPEN	0.20993	3.46***	0.42777	3.281***	0.12544	4.87***
NUMACRES	-0.00225	0.17	0.03614	2.098*	0.00425	2.87**
EROS3	-1.81450	1.59	-0.50859	0.293	-0.03888	0.11
PERCAPY	0.00126	0.46	-0.00198	0.277	0.00011	0.11
POP85	-0.37444	2.36*	0.33658	2.192*	0.00821	0.09
PCTFORST	-0.00519	0.08	0.14357	1.291	0.02893	1.76
PCTWATER	2.29830	4.40***	1.06900	1.993*	0.40780	3.46***
N	112	141	134			
R^2	0.405	0.343	.514			
Dep. Var. Mean	5.540	16.580	3.310			
σ	14.900	41.121	5.460			

* *= significant at p<= 0.05*
** *= significant at p<= 0.01*
*** *= significant at P<= 0.001*

larger, there is proportionately less woodland on them across all three regions and, in the North and South, less cropland than in previous years. Land use data from the National Resources Inventory and comparisons between the 1985 NPLOS and the 1992 regional survey of private owners generally indicate that these conclusions hold for non-farm, rural lands as well. The continued increase of urban or built-up acres on private lands, across all three of the study regions, also is significant to recreation opportunities.

Homogeneity Between Sampled and Non-Sampled Counties

A further examination of the land use data from the 1985 and 1992 landowner surveys provided some insights into the apparent state and region-level representativeness of the counties in which the 1992 survey was conducted. Comparisons between those counties in New York, Georgia, and Indiana, that were randomly included in this recent survey, and those that were not, indicated that the surveyed and unsurveyed counties at the state level are largely homogeneous with regard to land characteristics. These same comparisons between counties surveyed in the three states, and all other rural counties in each of their respective regions, also indicated a high degree of homogeneity between sampled and unsampled counties at the regional level. The results of these comparisons indicate that findings from this research should be generalizable at both the state and region levels.

Table 13.—Results of corporate landowner recreation models.

	Total use		Availability	
Variable	Beta	T	Beta	T
CONSTANT	-1374.720	1.273	-9.484	0.676
PCTCLOS	-196.237	0.388	-41.495	0.735
PCTLEAS	-26.245	0.908	0.261	0.744
NUMACRES	0.010	0.095	0.002	1.514
N	33		33	
R^2	0.072		0.209	
Dep. Var. Mean	1136.580		18.730	
σ	4290.860		55.158	

* = *significant at p<= 0.05*
** = *significant at p<= 0.01*
*** = *significant at P<= 0.001*

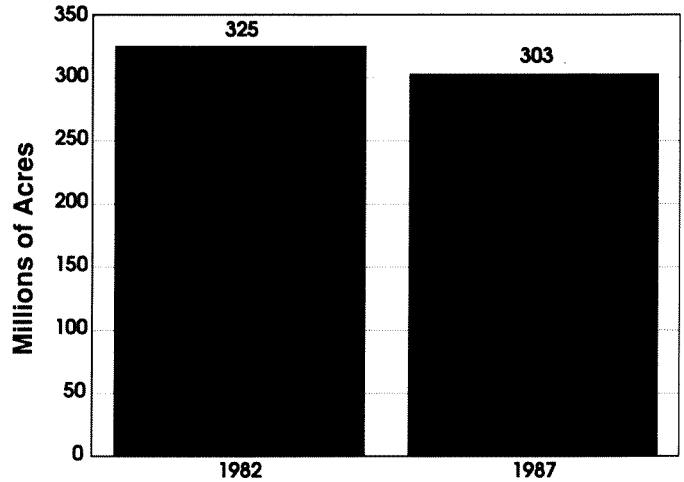

Figure 3.—Change in total acreage in farms of less than 1,000 acres in size in the eastern United States.

Significant Regional Findings

Individual owners in the Midwest are oriented more toward raising crops than individual landownes in other two regions (fig. 4). Higher proportions of tracts in use for growing crops in this region seem to have limited the suitability of these lands for outdoor recreation, as evidenced by lower use and accessibility rates. Higher percentages of acreage in crops also may explain the observed higher rates of total closure and lower rates of recreational leasing on Midwestern tracts. In addition to a greater emphasis on using their land for growing crops, private lands in the Midwest generally have less area in woodland and water than do tracts in the other two regions. This seems to make these lands even less less suitable for many forms of recreation, again contributing to the Midwest's lower recreation use and accessibility rates. Further research should explore in more detail the effects of having higher percentages of tracts in crops, forest, and water, and the relationship of these uses to landowners' access restrictions in the Midwest.

Northern landowners reported more frequently than did owners in the other two regions that a primary reason why they own their land is to provide recreational opportunities for themselves, as well as for the enjoyment of others. Tracts in this region had lower proportions of acreage completely closed, higher proportions with open access to the general public, and a higher incidence of leasing for more exclusive recreational access. This greater emphasis on using the land for recreation probably accounts for the greater actual amount of use on these tracts, compared to individually owned tracts in the other regions. The finding that a

higher percentage of Northern owners have established residency on their tract, combined with these owners' greater emphasis on recreation, seems to help explain why the existence of a resident owner is a significant determinant of the number of people having recreation access. Apparently, resident owners are more readily contacted for permission.

These findings are distinctly different from findings from the Midwest and South, and signify that ownership in the North is a much more significant indicator of degree of recreation accessibility. Also significant is the fact that there is a substantially smaller per capita land base in the Northern region, either private or public, relative to the other two regions. Higher future per capita demand in this region will make access ever more important in the North, and likely will position leasing in this region as a more profitable access management option, compared to the Midwestern and Southern regions.

For Southern owners, relatively high amounts of forest land, higher access closure rates, and lower lease rates combine to create the lowest accessibility and nearly the lowest use rates among the three regions. Although Southern owners are interested in providing recreation opportunities for themselves, they make their lands available to only a relatively small group of others. Because much of Georgia remains relatively rural, there is a relative abundance of alternative outdoor recreation opportunities, leading to comparatively low recreation use per private tract. In the South, timber growing and providing habitat for wildlife were cited more often as very important reasons for owning land (fig. 5). This concern for wildlife habitat and the commercial opportunities associated with timber growing also offers a likely explanation for the lower rates of accessibility for public recreation in this region.

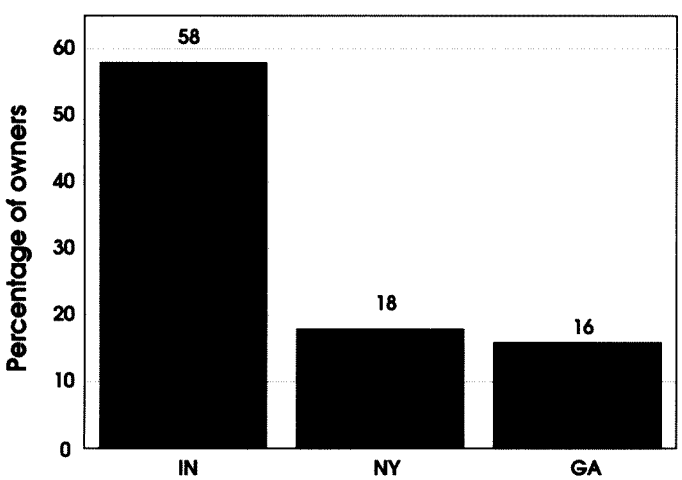

Figure 4.—Percentage of owners indicating growing crops for sale as an important reason for owning rural land in Indiana, New York, and Georgia, 1992.

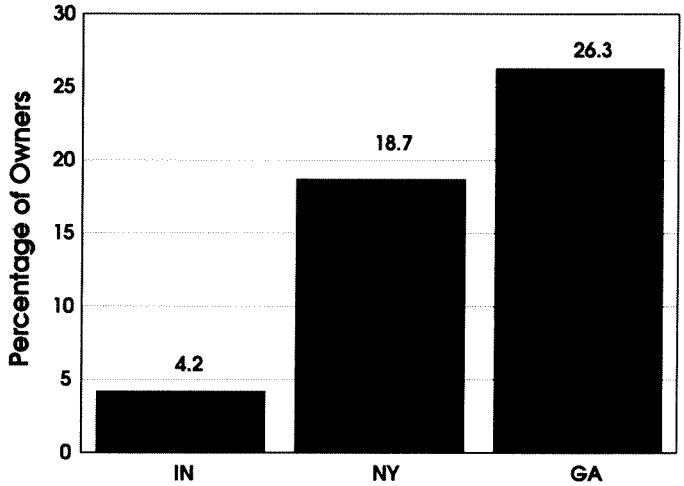

Figure 5.—Percentage of owners indicating that growing timber is an important reason for owning rural land in Indiana, New York, and Georgia, 1992.

ACCESS ON CORPORATE LANDS

Corporately owned rural lands historically have been an important source for outdoor recreation. Driven by continued population growth and people's quest for contact with the out-of-doors, this importance is likely to increase in the future, as demand for opportunities continues to rise. The 1992 interregional survey reported here has indicated that corporate owners seem more interested in providing public recreation opportunities than noncorporate owners, and that they tend to favor lease agreements more than individual owners do. Added to these conditions, corporate lands tend to have proportionally more acres in forest cover; and corporate owners are more likely than individual owners to purchase additional land, rather than to sell. Both recreation use and number of people having access are greater per average corporate tract, than is the case on noncorporate tracts.

Estimated Models of Use and Accessibility

As hypothesized, the estimated parameters for the noncorporate regional accessibility models indicated that the number of people having been granted access rights was positively related to the percentage of private acreage considered by owners to be open for public

recreation and, except in the North, negatively related to the percentage of the tract closed to all recreation. In the use models, percentage of the tract acreage closed, except in the North, negatively affected amount of use; but, percentage of the tract identified as open was unrelated to total use. Clearly, an owner's choice to completely close some or all of a tract has a negative effect on public recreation opportunities (accessibility and use). The effects of posting private land, however, is less clear, and seems to have very little effect on either accessibility or total recreation use.

Leasing noncorporate private land was significantly related to both use and accessibility only in the North; to accessibility in the South; but not related to either use or accessibility in the Midwest. Overall, it appears that leasing improves recreational access and use in some areas of the country, but otherwise is not related (table 14). This is an important finding, because much previous research has been interpreted to mean that more leasing means less opportunity to the public. Leasing seems to be a viable option for controlling who has access, especially when the alternative may be closing the land to all recreation.

Tract size was positively and significantly related to use in one region (South), and to accessibility in two regions (North and South). For corporate owners, tract size seemed to have no significant relation to either use or accessibility. Subdivision of private noncorporate land, then, could be expected to lead to some reduction in recreational access and use, if this were to be a trend in the future. The trend in the 1980s, however, has been toward consolidation of smaller tracts into larger ones. The emerging trend of the 1990s seems to be toward both more subdivision (more tracts of 10 or fewer acres) and more consolidation (more tracts larger than 1,000 acres).

Tract size may have indirect as well as direct links to recreation opportunities on private lands. Tract size may affect landowner decisions of whether to live on the land, and on the proportion of lands open, closed, leased, or reserved exclusively for the landowner's personal use. Further, tract size seems closely linked to uses of the tract, including existence of desirable features, such as woodland or water. Such relations are not explicitly examined in this analysis, but should be explored in future research.

Overall, other than complete closure to all recreation use, the modeling results from this study indicated that various forms of access restrictions do not appear to reduce either number of people having recreational access on private lands or the overall amount of use. Tract size has a moderate positive relationship to use and number of people having access, except for corporate owners.

Table 14.—Sign (+ or -) and significance (*=0.05, **=0.01, *=0.001) or selected variables in the recreation accessibility models for the Midwest, North, and South.**

	Region		
Variable	Midwest	North	South
Percentage leased	0	+*	+***
Percentage posted	+**	0	0
Tract Size	0	+*	+**

IMPLICATIONS

From 1982 to 1987, rural counties in the states from which the samples for this study were drawn experienced noticeable increases in conversion of woodland and cropland to urban and built-up uses. From 1983 to 1988, an equivalent time period, the population in New York and Indiana increased by about 1.5% and in Georgia by about 10.6%. In 50 years, population in these states is expected to rise by 8.7% in New York, 27.9% in Georgia, and 16.7% in Indiana. These population increases are likely to cause continued pressure to convert rural land from agricultural and open space uses to urban or other developed uses. Therefore, the suitability of the private rural land base in these and other states in the East can be expected to continue to diminish, while vigorous growth of a more recreationally active population is expected to continue. As a result, pressures for recreational uses of private rural lands are likely to increase faster than population growth.

Strong population growth also may create pressures for conversion of woodlands and similar open spaces on private land, that are generally viewed as more suitable for recreation to land uses that meet other needs, such as for additional food production. If this trend occurs, it apparently would have an undetermined effect on recreation use or accessibility, according to results from the estimated accessibility and use models presented in this study. However, increased cropland at the expense of woodland is likely to reduce the quality of the recreational opportunities that these tracts represent, as well as alter the seasonality of their availability.

If population increases also cause further subdivision of private rural lands, then the recreational availability of those lands can be expected to decline further. In general, tract size is negatively related to recreation accessibility, but less so to total use. It is likely that smaller tracts are mostly serving the recreational needs of the owners, their families, and their immediate friends. In this case, continued subdivision of rural land tracts may change not only the identity of the people who use private land, but also that of people who must depend on public lands for their recreation activities.

Although outright closure has an apparent negative effect on both recreation use and number of people having access, except in the North where it had no effect, the previously held notion that posting or leasing reduces recreational access or use was not supported by the findings of this research. In fact, in those regions where leasing significantly affected total recreational use, the North and South, the relationship was a positive one. Also, in the North, percentage of land leased was positively correlated with number of people having access. This suggests that leasing not only does not reduce use and accessibility, but that in some areas, leasing actually increases accessibility and use, and that these practices can provide a meaningful alternative to strict closure, where owners may wish only to exercise some degree of control over who may use their land. Based on the modeling results, neither does posting reduce accessibility or use of rural private lands. Increased posting and leasing of private lands can be expected to continue as a means for the public to gain access to private land and for the owners to both exert some control over who uses their land and to extract some economic rents from those who desire such use.

Results of the recreational accessibility models, for each of the three regions examined in this study, also showed a strong positive relationship between percentage of the tract open for public recreation (without a lease) and amount of use. Conversely, a negative relationship was found to exist between accessibility and use and the percentage of the tract closed to all recreation. Accessibility and use were found to be positively associated with size of tract and percentage of the tract that is water. This indicates that all tracts are not equal to recreationists seeking quality recreational opportunities.

It is possible that, in the future, recreational use of private rural land will be more limited to the wealthier segments of the population. More landowners are indicating that the reason they purchased their land was for personal recreation or to live on the land. That is, the purchase was to provide a place for themselves and their family to recreate. Those acquiring access through a recreational lease are doing essentially the same thing by purchasing only the right of access to the land. Census data point to a bipolarization of the distribution of income in this country, with a rapidly growing number and percentage of people who are in the lowest income categories. These people are not likely to have the resources to purchase their own land or to purchase a recreational lease for access to someone else's land. Therefore, one might expect that low income households will have public land and parks as their only recreation opportunity in an undeveloped outdoor setting.

Future population growth, according to Ricardian theory, is likely to put further economic pressure on farmers and other rural landowners, especially near metropolitan areas. This will be a problem especially for lower income owners, as land taxes continue to rise, given land value escalations in and around urban areas. Conversion to nonfarm and nonwoodland uses and subdivision can be expected to be relatively greater in the counties near growing urban areas. These changes are likely to lead to a diminishing private land base for public outdoor recreation. The net future effect of the demise of the rural private land base, of subdivision and consolidation of tracts, and of leasing, closure, and development is not clear, and should be a focus of continuing research.

The most critical implication of the findings of this research seems to be in its challenge to the conclusions typically drawn from the continuing trend toward posting, closure, and leasing. Certainly, complete closure of all or portions of private tracts reduces use and accessibility. Leasing and posting, however, not only do not reduce access and use, these practices often are associated with greater access and use. The implication for recreational access and use to public lands are that reductions in private land access will not necessarily add pressure for the use of public land. Therefore, aside from the continuing loss of private rural acreage in general, private lands could play a greater, not lesser, role in the future in meeting recreation demand pressures.

FUTURE RESEARCH

Few definitive conclusions could be reached in this study regarding the suitability, accessibility, or use of corporately owned rural land. However, there were some indications that these lands may become increasingly important for public recreation. Future studies of

privately owned rural lands should provide a more in-depth examination of the lands owned by corporations. These owners typically have different motivations than individual owners, and, therefore, are likely to respond differently to population, demand, and economic trends.

This study has contributed to a substantially better understanding of recreation use of noncorporate private land by providing a conceptual modeling framework by which recreational accessibility issues and trends may be examined. Additional research is needed to refine these models, including improving the measurement of recreation consumption. Replication on a broader geographic scale can further highlight regional differences.

No attempt was made in this study to examine or model landowners' access decisions in the context of household production theory. For example, the factors leading an owner to decide to lease or otherwise allow recreation access are not directly addressed in this analysis. This should be a focus of additional research, so that considerations important to access policy choices can be identified, their trends can be followed, and implications for future policies and supply trends can be described and analyzed. For example, variables such as percentage of the tract in crops seem to negatively affect a tract's accessibility and suitability for recreation.

The direct relationship between tract size and recreation consumption was moderate in the models reported here. However, there may be even more significant indirect relations. For example, tract size may affect a landowner's decision of whether to live on the land or the choice of an access policy. An examination of the extent to which tract size affects land use choices, such as timber management, water, agriculture, and grazing, and of how these uses interact with recreation use and access, may be very useful in establishing a better understanding of access and use trends.

Considering the factors that seem to affect recreation accessibility and use of private lands, much work remains to be done to develop an understanding of the net effects. With some factors, such as residency, leasing, and posting, use and accessibility generally increase with increasing acreages under these conditions. Subdivision and conversion to other land uses, especially development, in contrast, tend to lead to less use and accessibility. From regional and national perspectives, it is the net effects on number of people and amount of use that private lands accommodate that is important. Further study is needed to determine what these net effects are.

Finally, research to better understand the private land users is needed. Very little has been done to identify who these users are and the degree to which they use, lease, and access private land for recreation. Better understanding the users, what makes private land suitable to them for recreation, and how they use these lands, will help to develop forecasts of future demand for outdoor recreation and to inform land owners of potential revenue opportunities.

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Abstract

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Continuing conversion of woodlands, greater restrictions on recreational access, and subdivision are trends seeming to have important implications for future public recreation supply. The nature of these implications has not been adequately explored in previous research, a void that has led to questions about the actual effects these factors have on future recreational potential and use of private rural lands. In 1992 a survey of a sample of land owners in Indiana, Georgia and New York was conducted to help clarify the effects of subdivision and access restrictions on recreation potentials and use. In general, the findings of this study indicate that subdivision, leading to more tracts of smaller average size, has a negative impact on number of persons not having a direct relationship with the owner who have access, but a negligible effect on actual amount of use. Access restrictions, such as leasing or posting, however, seem to have an overall positive effect on availability and use. As a result, previous assumptions about the effects of subdivision and access restrictions will have to be reexamined.

Keywords: Private lands, leasing, subdivision, recreation supply, recreational access, access models.

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