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A Forested Tract-Size Profile of Virginia's NIPF Landowners

Michael T. Thompson
Tony G. Johnson

The Authors:

Michael T. Thompson and **Tony G. Johnson** are Resource Analyst and Resource Forester, respectively, with the Forest Inventory and Analysis group, Southern Research Station, U.S. Department of Agriculture, Forest Service, Ashevillle, NC.

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Asheville, NC 28802

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Abstract

Information gathered from 3,221 permanent Forest Survey sample plots showed that nearly 1.3 million acres, or 11 percent of the nonindustrial private forest (NIPF) timberland in Virginia is in forested tracts 10 acres or less. Forested tracts ranging from 11 to 100 acres accounted for the largest proportion of NIPF timberland. Forested tract size varied significantly by NIPF-ownership group and broad management class. By NIPF-ownership group, the other corporate group recorded the highest average forested tract size of 684 acres. By management class, natural pine stands recorded the lowest average forested tract size of 128 acres. Volume and net annual growth of growing stock were stable across all forested tract-size categories. Softwood growing-stock removals were stable across all forested tract-size categories, whereas hardwood growing-stock removals increased successively up to the largest tract-size category.

Keywords: Timberland, forest ownership, forested tract size, timber volume, timber growth, timber removals.

Introduction

Future demand for timber products are expected to increase. As a group consisting of farmers, private individuals, and corporations that do not manufacture forest products, nonindustrial private forest (NIPF) landowners in Virginia have the potential to meet some of this increasing demand for three reasons. First, these owners control vast quantities of forest land and timber volume. Second, public forests will probably play a smaller role in timber production as constraints in budgets continue and environmental groups pressure to reduce levels of timber harvesting increases. And third, substantial amounts of forest industry land are shifting to corporate and individual ownership (Thompson and Johnson 1994).

In Virginia, NIPF landowners control more than three-fourths of the State's 15.4 million acres of timberland (Thompson and Johnson 1994). In landowner surveys, Hodge and Southard (1992) found trends suggesting a pattern of fragmentation of large forested parcels that will increase the numbers of NIPF owners in Virginia. If this fragmentation continues, managing timber on small privately owned tracts will become more significant and deserve greater attention.

Tract size affects timber management decisions. The high costs of managing tracts less than 50 to 100 acres in size must be considered by landowners when evaluating management alternatives (Society of American Forests 1979). Cost sharing and technical assistance programs, such as the Soil Bank Program of the 1950's and the Conservation Reserve Program of 1985, are more appealing to forest landowners who either own large acreages or already actively manage their lands for timber production (Kingsley and Birch 1977). The Forestry Incentives Program adopted in the 1970's established a 10-acre minimum as a guideline for assistance to NIPF owners.

Because increasing numbers of landowners control smaller tracts and because incentive and cost sharing programs continue to benefit owners of large tracts, the Forest Inventory and Analysis (FIA) work unit began collecting new information in Virginia's sixth inventory (1992). This information consists of tract size and the proportion of forested acreage in each tract. In this paper we summarize forested tract-size acreage distribution of NIPF-owned lands in Virginia by specific owner group, region, broad management class, and stand age. We also examine the differences among these variables. Finally, we review the relationship between forested tract size and volume, growth, and removals of growing stock.

The Procedure

The sampling scheme in this study follows the sampling design used by the FIA work unit at the Southern Research Station. Information was gathered from a subsample containing 3,221 permanent Forest Survey sample plots visited periodically by USDA Forest Service inventory crews in Virginia. Field crews used county courthouse records and tax maps to collect ownership information for each timberland sample. For each inventory plot sampled in the NIPF category, the acreage of the tract was recorded. The proportion of a tract covered by forest as determined by aerial photography

was applied to the total tract acreage to calculate the acreage of forest on the particular tract. This acreage, referred to as forested tract size or forested parcel, was used for analysis in this study. Forested tract-size differences among stand area variables, volume, growth, and removals were determined using the General Linear Model (GLM) test (SAS Institute 1988).

The collection of forested tract size is limited to the forested acreage contained in the tracts found in the subsample and does not include the total acreage the individual or corporation may own elsewhere in the county, State, or outside the State. Because trend information is unavailable until the next inventory of Virginia, the present examination of the timberland resource will be confined primarily to the current estimate of timberland area and volume. No tract-size data was collected from previous periods, therefore, comparisons of timber removals and harvest activities are confounded by timber harvesting on larger parcels that have been subsequently subdivided. Once trends have been established, forested tract size will provide a measure of resource fragmentation and may establish a connection between tract size and the NIPF landowner's attitude about timber management. Forested tract size, and many other stand variables may also serve as additional timber availability screening tools.

Results

Of the 11.9 million acres of NIPF timberland in Virginia, nearly 1.3 million acres, or 11 percent, were concentrated in forested tracts 10 acres or less (table 1). Forested tracts exceeding 500 acres totaled almost 1.0 million acres, or 8 percent, of all NIPF timberland in the State. Forested parcels ranging from 11 to 100 acres accounted for the largest proportion (51 percent) of privately owned timberland; tracts 101 to 500 acres the remaining 30 percent.

Ownership Group

Within the NIPF group, three owner categories are recognized: (1) farmer-owned land owned by farm operators, excluding incorporated farm ownerships; (2) other private-individual land owned by individuals other than farm operators; and (3) other corporate land owned by corporations that do not manufacture forest products, including incorporated farm ownerships. Across all owner categories, forested tract size averaged 221 acres. Mean forested tract size varied significantly among the three owner categories (table 1). Farmer-owned land recorded the smallest average parcel size (140 acres), and the other private-individual category indicated an average parcel size of 162 acres. Forested tract size averaged nearly 684 acres for the other corporate category. Mean tract size by owner category does not signify variations in acreage distribution among the three categories. Most other private-individual land is concentrated in forested parcels less than 101 acres, with 15 percent in forested parcels less than 11 acres. In contrast, the majority (65 percent) of timberland owned by other corporations is in forested tracts larger than 100 acres, with 25 percent in forested tracts larger than 500 acres. The bulk of farmer-owned timberland is in forested tracts 11 to 200 acres. These facts demonstrate that other private-individual owned timberland in Virginia is considerably more fragmented than the other two owner categories.

Table 1—Acreage by forested tract size and NIPF owner group, Virginia, 1992

Forested tract-size class	All classes	NIPF-owner group: Farmer-owned	Other corporate	Other private-individual
		Acres		
0 - 10	1,275,629	208,178	82,461	984,990
11 - 50	3,495,691	1,166,849	263,144	2,065,698
51 - 100	2,616,960	1,067,743	199,638	1,349,579
101 - 200	2,051,753	803,541	260,947	987,265
201 - 500	1,500,142	449,875	357,570	692,697
501 +	969,326	174,180	385,775	409,371
All classes	11,909,501	3,870,366	1,549,535	6,489,600
Mean*	220.9	139.9	683.7	162.4

*(F=102.14, P= 0.0001)

Region

When forested tract size was compared on a regional basis, results indicated the Northern Piedmont contained the highest proportion of tracts smaller than 11 acres (fig. 1). This finding is not surprising because this region of the State is characterized by extensive urbanization and a high ratio of other privately owned timberland. The mountain survey units contained the largest amount of timberland in tracts larger than 500 acres, primarily a result of other corporate holdings. Fifty-four percent of the total timberland acreage in these large forested tracts was located in the Northern and Southern Mountain Survey Units.

Broad Management Class and Stand Age

Comparisons of forested tract size were based on four broad management classes: (1) pine plantation, (2) natural pine, (3) oak–pine, and (4) hardwood. Examination of mean forested parcel size indicated significant differences between broad forest types ($F=3.69$, $P=0.0114$). Natural pine types were contained in forested parcels averaging 128 acres—the lowest recorded mean of the four types (fig. 2). Hardwood types were found in forested tracts averaging nearly 248 acres, the highest mean. Pine plantations on NIPF land occupied about 764,000 acres, with 6 percent of this acreage in forested tracts less than 11 acres (table 2). Eight percent of the NIPF land planted in pine was in tracts larger than 500 acres, with the remaining 86 percent evenly distributed in tracts 11 to 500 acres. When these planted stands are displayed in 10-year age classes, almost 64 percent are in stands less than 20 years old. Of those plantations under 10 years, 8 percent were forested parcels less than 11 acres and only 4 percent were in tracts greater than 500 acres.

These findings showed that few of the youngest pine plantations were in large tracts. By NIPF owner group, other corporations had a substantially higher proportion of their pine plantations in larger tracts than farmers and other individual owners. Fifty-eight percent of planted pine stands on corporate land were in tracts greater than 200 acres. Many of these plantations were recent acquisitions from the forest industry group (Thompson and Johnson 1994).

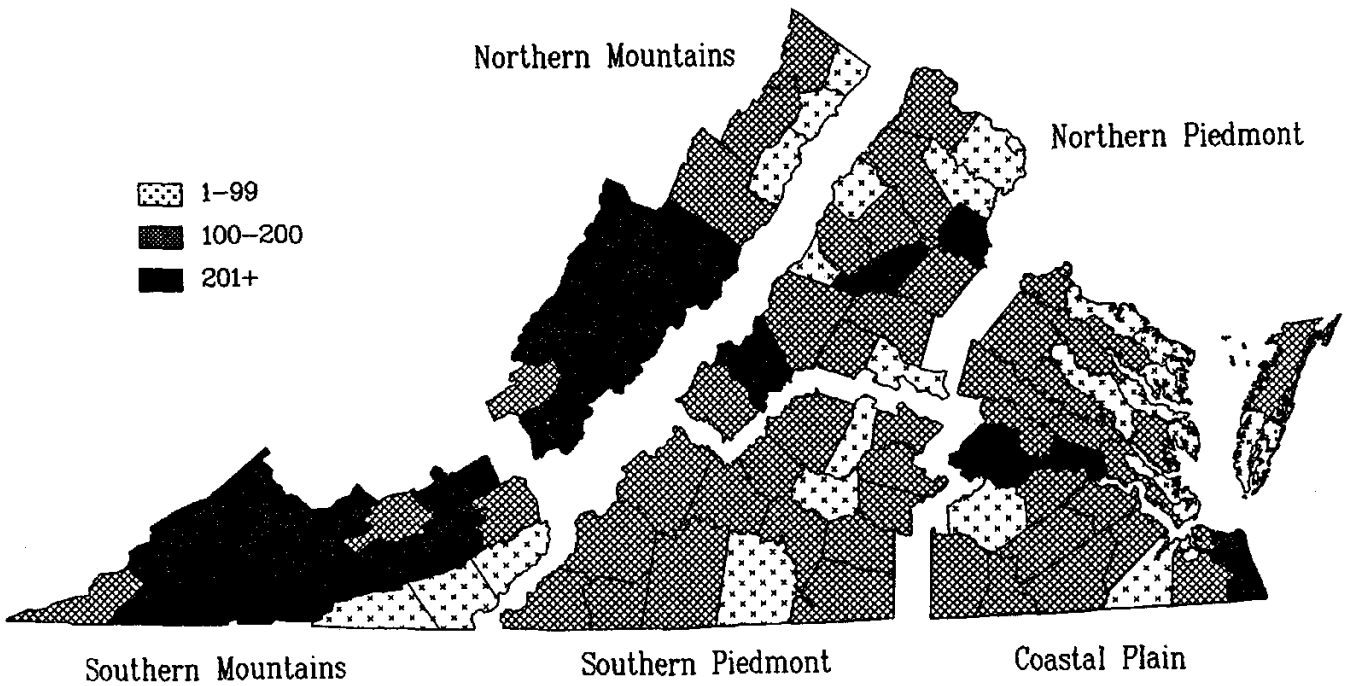

Figure 1—Average forested tract size for NIPF lands by county in Virginia, 1992.

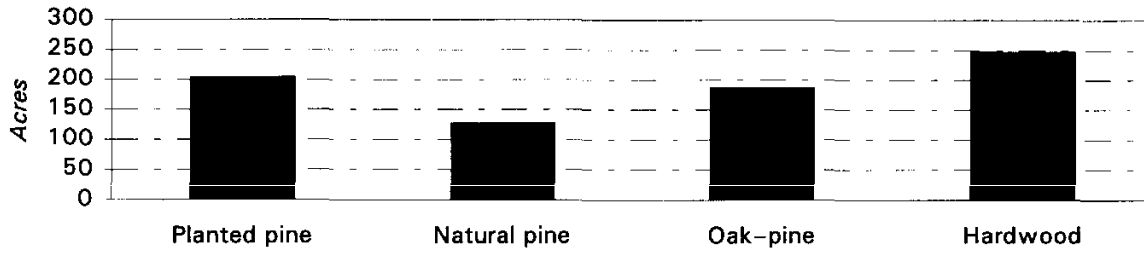

Figure 2—Average forested tract size by broad forest type, Virginia, 1992.

Table 2—Area of planted pine stands by forested tract size and stand-age class for NIPF lands in Virginia, 1992

Forest tract-size class	All classes	No manageable stand	Stand-age class (years)			
			0-9	10-19	20-29	30+
		Acres				
0 - 10	49,122	—	19,214	15,042	12,250	2,616
11 - 50	150,094	—	45,770	42,141	40,404	21,779
51 - 100	161,387	2,619	50,654	84,646	11,025	12,443
101 - 200	197,819	4,512	64,975	45,765	60,786	21,781
201 - 500	144,989	—	45,110	39,711	37,710	22,458
501+	60,838	—	9,061	25,601	16,417	9,759
All classes	764,249	7,131	234,784	252,906	178,592	90,836

Natural pine stands controlled by NIPF owners occupied over 1.5 million acres and more than 16 percent of this area resided in forested tracts of less than 10 acres (table 3). Under 5 percent of natural pine acreage was concentrated in forested tracts greater than 500 acres. A GLM test indicated that natural pine stands differed significantly from the other three types combined ($F = 8.12$, $P = 0.0044$), suggesting that natural pines stands are the most fragmented resource. The forested tract-size category containing the largest amount of natural pine acreage was the 11–50 acre class, accounting for 35 percent of the total area. Examination of natural pine stands on NIPF land in Virginia revealed some differences when compared to planted pine stands. A noteworthy difference is the distribution by stand-age class. More than 19 percent of natural pine stands less than 10 years were in forested parcels less than 11 acres. These differences in forested tract-size distribution and stand-age distribution suggest that either small tracts are being harvested or medium to large tracts are being harvested and subsequently subdivided.

Oak–pine is a transitory forest type in which hardwoods comprise a plurality of all live-tree stocking, but softwoods comprise 25 to 50 percent of the stocking. The distribution of acreage classified as an oak–pine forest type generally follows the same overall pattern for all types combined. On timberland controlled by NIPF owners, oak–pine stands covered about 1.5 million acres. Under 10 percent of oak–pine stands were concentrated in forested tracts less than 11 acres and in

Table 3—Area of natural pine stands by forested tract size and stand-age class for NIPF lands in Virginia, 1992

Forest tract-size class	All classes	No manageable stand	Stand-age class (years)						
			0-9	10-19	20-29	30-39	40-49	50-59	60+
				Acres					
0 - 10	248,624	8,461	18,417	43,528	30,879	37,080	54,847	34,101	21,311
11 - 50	524,111	35,758	26,917	67,579	86,535	70,309	85,782	92,022	59,209
51 - 100	312,913	8,470	19,067	27,241	68,744	45,281	51,207	39,660	53,243
101 - 200	217,278	13,328	15,201	19,300	19,138	39,709	31,074	43,959	35,569
201 - 500	130,928	2,619	11,372	10,003	10,067	15,085	32,650	27,046	22,086
501 +	69,080	7,673	5,370	7,795	7,788	3,798	5,081	9,813	21,762
All classes	1,502,934	76,309	96,344	175,446	223,151	211,262	260,641	246,601	213,180

forested parcels greater than 500 acres (table 4). About 51 percent of the oak–pine area is in tracts 11 to 100 acres; 32 percent in forested parcels 101 to 500 acres; and the remaining 8 percent in tracts greater than 500 acres.

Nonindustrial private forest owners held more than 8.1 million acres of timberland classified as hardwood forest type. The proportion of hardwood-type acreage varied by forested tract size from a low of 9 percent in the 501 acre and larger category to a high of 30 percent in the 11–50 acre category (table 5). Hardwood stands in Virginia are an aging resource compared to the other three broad forest types—almost 63 percent of NIPF hardwood stands are over 39 years (Thompson and Johnson 1994). Almost 10 percent of these NIPF-owned older, hardwood stands were located on forested parcels larger than 500 acres. In comparison, only 5 percent of hardwood acreage under 40 years resided in this largest forested tract-size category. This difference may be attributed to the higher ratio of large tracts in the mountain regions dominated by old, hardwood stands in areas characterized by steep slopes and other adverse site conditions that inhibit timber harvesting.

Volume, Growth, and Removals

Examination of growing-stock volume indicated some variation by forested tract size, however these differences were not determined significant (fig. 3). The highest growing-stock volume per acre was recorded in the smallest and largest forested tract-size categories. Growing-stock volume for softwoods and hardwoods combined averaged 1,840 cubic feet per acre in the 0–10 acre category. Softwood volume per acre was highest in this category, averaging over 486 cubic feet per acre. Forested parcels larger than 500 acres showed an average growing-stock volume of 1,831

Table 4—Area of oak-pine stands by forested tract size and stand-age class for NIPF lands in Virginia, 1992

Forest tract-size class	All classes	No manageable stand	Stand-age class (years)						
			0-9	10-19	20-29	30-39	40-49	50-59	60+
				Acres					
0 - 10	137,433	13,679	9,600	24,128	15,869	9,427	13,935	21,008	29,787
11 - 50	385,798	25,164	55,075	83,404	21,323	34,601	30,616	30,858	104,757
51 - 100	385,497	43,912	64,999	23,809	26,442	19,817	23,632	60,188	122,698
101 - 200	287,610	29,062	59,939	53,719	24,364	14,085	12,772	39,441	54,228
201 - 500	197,669	30,026	35,724	35,389	15,668	12,184	7,029	23,030	38,619
501 +	126,866	29,309	8,426	5,651	9,536	7,546	2,981	15,324	48,093
All classes	1,520,873	171,152	233,763	226,100	113,202	97,660	90,965	189,849	398,182

Table 5—Area of hardwood stands by forested tract size and stand-age class for NIPF lands in Virginia, 1992

Forest tract-size class	All classes	No manageable stand	Stand-age class (years)						
			0-9	10-19	20-29	30-39	40-49	50-59	60+
				Acres					
0 - 10	840,450	133,093	45,989	32,211	57,606	55,388	74,698	101,859	339,606
11 - 50	2,435,688	355,428	182,520	158,234	106,646	162,171	288,519	348,424	833,746
51 - 100	1,757,163	280,821	113,178	110,713	62,993	110,045	133,641	275,869	669,903
101 - 200	1,349,046	216,999	76,577	76,404	46,695	86,657	110,459	180,736	554,519
201 - 500	1,026,556	148,975	61,396	73,100	36,960	33,190	70,714	150,876	451,345
501 +	712,542	113,469	29,834	25,618	16,259	24,188	83,059	89,392	330,723
All classes	8,121,445	1,248,785	509,494	476,280	327,159	471,639	761,090	1,147,156	3,179,842

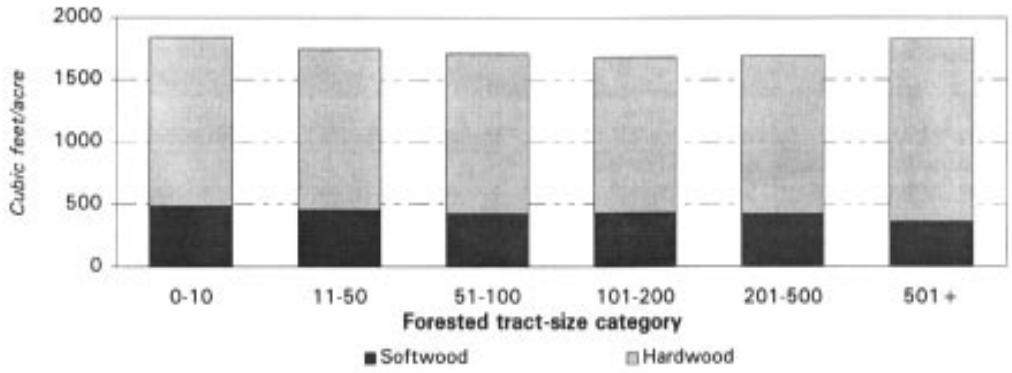

Figure 3—Average softwood and hardwood volume per acre by forested tract-size category, Virginia, 1992.

cubic feet per acre. This forested tract-size category contained the highest hardwood volume per acre at 1,469 cubic feet and the lowest softwood volume per acre at 362 cubic feet. The lowest average growing-stock volume per acre was recorded in the 101–200 acre category, averaging slightly over 1,682 cubic feet. Net annual growth of softwood growing stock was also relatively stable across all forested tract-size categories when examined on a per-acre basis. Average softwood growth ranged from over 18 cubic feet per acre in forested parcels greater than 500 acres to 21 cubic feet per acre in the 201–500 acre category (fig. 4). The level of softwood removals was also stable across all tract-size categories, ranging from just under 11 cubic feet per acre in the 201–500 acre category to 14 cubic feet per acre in the 0–10 acre category. Softwood growth exceeded removals in all forested tract-size categories. The largest margin of growth over removals was recorded in the 201–500 acre category, where softwood growth exceeded removals by a margin of 1.94 to 1.

Net annual growth of hardwood growing stock was relatively constant across all forested tract-size classes, ranging from 35 cubic feet per acre in the 201–500 acre category to 39 cubic feet in the 0–10 acre category (fig. 5). However, the level of hardwood removals indicated some differences by forested tract size. Hardwood removals in the 0–10 acre category averaged 15 cubic feet per acre and increased successively by forested tract-size class to 29 cubic feet per acre in the 201–500 acre category. The tendency for the larger tracts to display lower hardwood growth/removal ratios (e.g., higher removals) is important information about hard-wood availability. If this trend continues, smaller forested parcels will become an increasingly important source of hardwood volume.

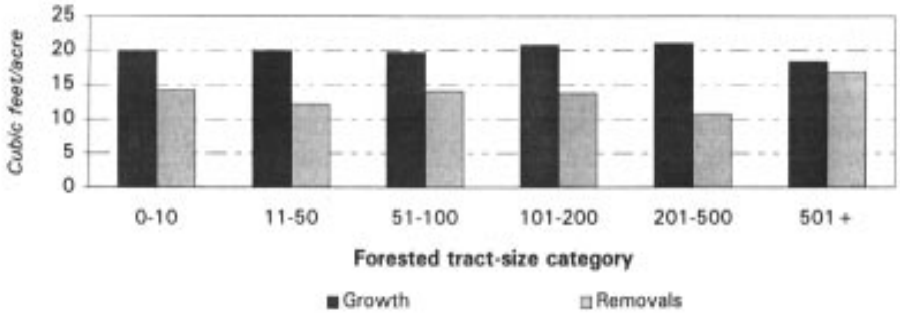

Figure 4—Average softwood growing-stock growth and removals per acre by forested track-size category, Virginia, 1992.

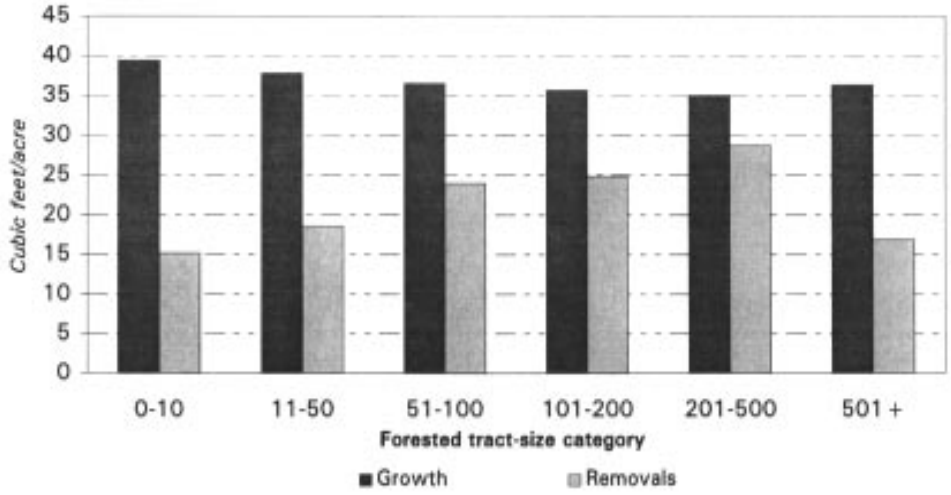

Figure 5—Average hardwood growing-stock growth and removals per acre by forested tract-size category, Virginia, 1992.

In the very largest tract-size category, however, annual removals of hardwoods dropped off sharply, averaging under 17 cubic feet per acre. Perhaps the low level of hardwood removal in the 500-acre and larger category reflect the unwillingness of some NIPF owners with large acreages to sell timber? Because decisions about timber harvesting are influenced by a multitude of social and economic reasons, identifying a single contributing factor to the hardwood growth surplus on large tracts is difficult. One possible explaination surmises that many of these large private corporations that have interests other than timber production own many of these large tracts.

Comparisons of growth and removals could be somewhat misleading, especially for smaller parcels. Many small tracts may be the result of subdividing the large tracts reported in previous inventories. Growth and removals statistics will be more meaningful when tracts that have remained the same size over an extended period can be isolated for comparison.

Summary and Conclusion

Examination of forested tract size in Virginia indicated that over half the timberland area controlled by NIPF owners was concentrated in 11- to 100-acre tracts. Most forested tracts under 11 acres were controlled by the other private-individual category. Natural pine stands appeared to be more fragmented than other broad management classes, and a substantial portion of these stands in small forested parcels were less than 10 years. Comparison of softwood growing-stock volume per acre indicated that many small forested tracts contained large amounts of softwood volume. Growth:removal relationships for hardwoods indicate successively smaller ratios up to the largest tract-size category.

Anticipated demands for increasing timber production in Virginia and elsewhere in the Southeast will shift more attention to the timber resource on NIPF land. By monitoring forested tract size over successive periods of time throughout the South, we will learn how the diverse NIPF-ownership group behaves in terms of land and timber management. Trend information by forested tract size will enable accurate monitoring and evaluation of resource fragmentation and the level of timber removals from small parcels. With this information, we will be able to identify factors affecting timber availability and production on NIPF lands in the Southern United States.

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Southern Research Station

Established 1921

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