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THE LONGLEAF PINE RESOURCE

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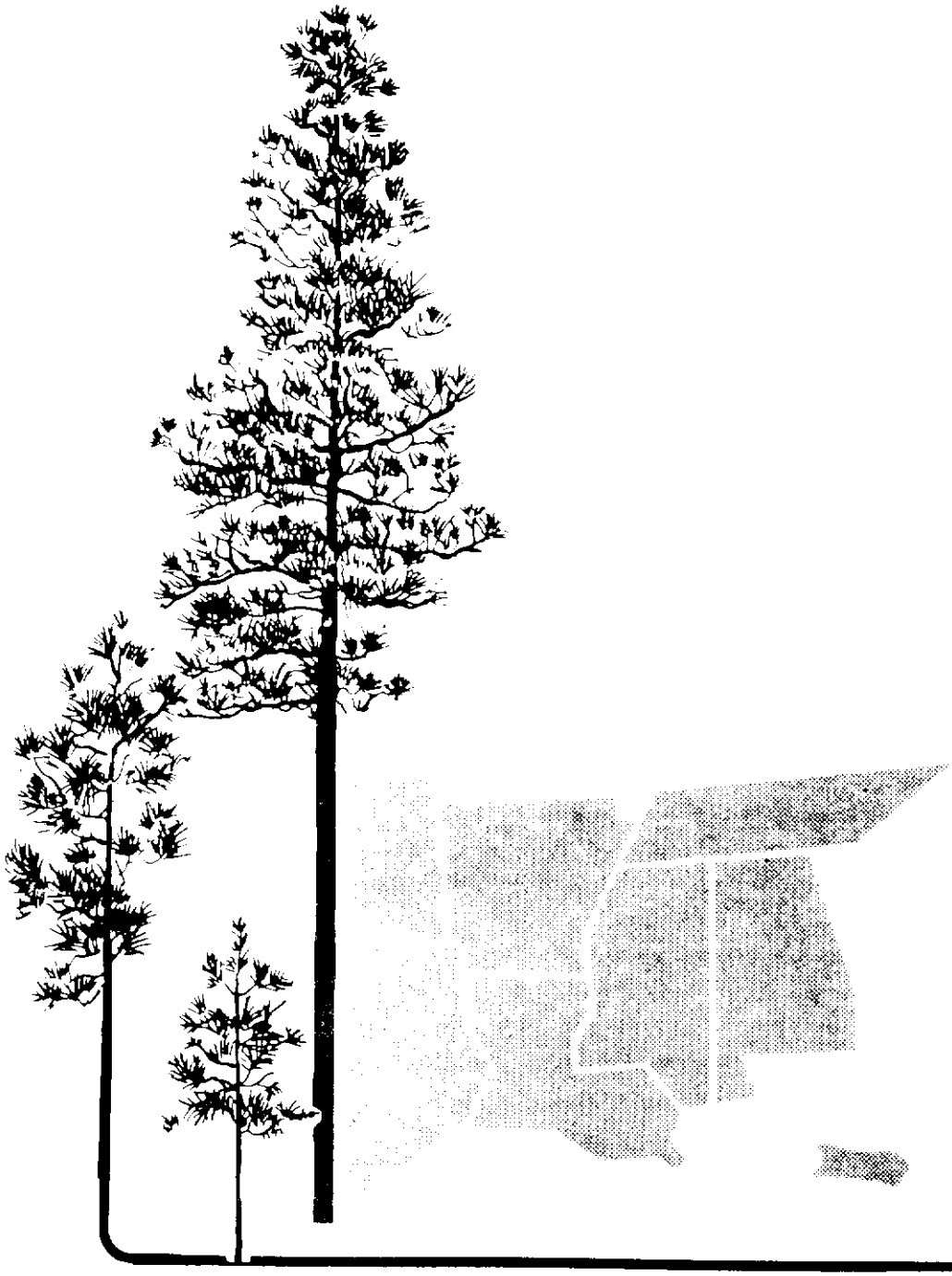

Southern Forest Experiment Station

The Longleaf Pine Resource

John F. Kelly and William A. Bechtold[1]

ABSTRACT. Area of longleaf pine (*Pinus palustrius* Mill.) in the Southern United States has declined from 12.2 to 3.8 million acres over the past 30 years. Longleaf pine, which once dominated vast portions of the region, now accounts for only 3 percent of the total timberland acreage in the 8 States where the species is found. Longleaf growing-stock volume has decreased by 12 percent in the past decade. Reduced numbers of saplings and seedlings indicate that a reversal of this trend is unlikely in the near future. Existing stands are maturing, but many are poorly stocked. Future prospects depend on effective management of existing stands and improvement of an unfavorable growth-to-removals ratio.

INTRODUCTION

The forests of the lower coastal plain of the American South were once dominated by longleaf pine (*pinus palustris* Mill.). This species has been a major factor in the development of the timber industry and forestry in the South (Croker 1987). Despite the past importance of longleaf pine, its prevalence has dwindled over the years to the point where it is now only a minor southern timber species. Dennington and Sirmon (1987) point out that although this species is admired, it has not been widely propagated. The purpose of this paper is to describe the current longleaf pine resource in the South, as well as past trends involving this species.

Most of the information reported here has been compiled from forest inventory and analysis (FIA) data collected during ongoing forest resource surveys. Additional information from the latest inventories of each State is available in published resource bulletins (Sheffield and Knight 1986; Tansey and Hutchins 1988; Sheffield and Knight 1984; Brown and Thompson 1988; Rudis, et. al. 1984; Donner and Hines 1987; Rosson, et. al. 1988; McWilliams and Lord 1988). Authorized in 1928 by the McSweeney-McNary Act, the first of these statewide inventories were conducted during the 1930s. At present, the sixth survey cycle of southern forest resources is now underway. Because inventory definitions, standards, and procedures have changed substantially since the initial surveys, this report will focus primarily on trends since the mid-1950s.

AREA

FIA forest type classification is based on the relative stocking of individual species. A designation of "pine type" requires at least 50 percent pine stocking; a specific type, such as longleaf pine, must have a plurality of pine stocking in the designated species. Oak-pine forest types are comprised of 25-49 percent pine stocking, with the balance in oaks and other hard-

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woods. Hardwood stands have less than 25 percent stocking in pine species. Even though longleaf pine occurs mainly in stands where it comprises a plurality of the stocking, it also occurs as a minor component of other pine forest types (mostly slash pine), as well as oak-pine and hardwood stands. The following descriptions of longleaf pine area refer to those acres dominated by longleaf stocking.

The natural range of longleaf pine extends from North Carolina to Florida and westward into Texas (Little 1971; Harlow and Harrar 1958). It is principally confined to the coastal plain portions of most States where it occurs, although the range does reach into the Appalachian foothills of Alabama and Georgia. Of the 4 major southern yellow pines, only slash pine (*Pinus elliottii* Engelm.) has a smaller natural range. Longleaf pine is most commonly found on sandy coastal plain soils. The best sites are well-drained, although it also occurs on sandy sites which are underlain by hardpan (Harlow and Harrar 1958).

Within its natural range, the area of longleaf pine has been declining throughout the 20th century. Actually, the demise of longleaf forests began in earnest with the advent of widespread logging in the South during the late 19th century (Barrett 1980; McWilliams and Lord 1988). Logging of these old-growth forests continued until the early 1930s in parts of the region. Early FIA data indicate that the area of longleaf pine continued to decline sharply between the mid-1930's and mid-1950s, the period when the second-growth forests of the South were established. Since 1955, area of longleaf pine has dropped from 12.2 to 3.8 million acres – a decrease of 69 percent in just 30 years (table 1). In the 8 states where longleaf presently occurs (North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, and Texas), only about 3 percent of the total timberland area supports a longleaf forest type (table 2). Figure 1 shows the relative distribution of this acreage by county.

Table 1. – Area of longleaf pine forest type by State and year, 1955-1985

State	1955	1965	1975	1985
Alabama	1,370.2	989.5	749.8	679.3
Florida	4,389.4	2,298.7	1,371.2	1,034.4
Georgia	2,486.0	1,362.5	778.3	632.7
Louisiana	1,264.2	682.1	386.6	305.0
Mississippi	1,011.4	639.3	354.6	293.9
North Carolina	665.3	524.1	453.8	381.8
South Carolina	818.7	571.1	481.6	405.7
Texas	199.8	132.3	58.5	36.9
All states	12,205.0	7,199.6	4,634.4	3,769.7

By ownership, the largest portion of longleaf pine acreage in the South is held by "other private" landowners (table 3). This category contains the largest share of longleaf pine acreage in all states except Florida, where public ownership is highest. Overall, other private owners account for 55 percent of the total longleaf area; public owners, 27 percent; and forest industry, including leased land, 18 percent.

About half of all longleaf pine stands occur on medium sites, which are capable of producing 50-84 cubic feet per acre per year when fully stocked (table 4). Another 31 percent are on sites with low productive potential (20-49 cubic feet per acre annually). The remainder, about one-fifth of the longleaf area, is located on superior sites able to produce at least 85

Table 2.—Timberland area by forest type and State where longleaf pine range occurs, latest survey cycle

State	All types	Longleaf pine	Other pine	Oak-pine	Hardwood
	Thousand acres				
Alabama	21,658.8	700.4	6,546.3	4,425.6	9,986.5
Florida	14,982.6	950.9	6,575.6	1,210.8	6,245.3
Georgia	23,733.7	676.4	10,762.5	2,959.6	9,335.2
Louisiana	13,872.6	313.2	4,653.2	1,913.3	6,992.9
Mississippi	16,981.6	270.2	4,493.1	3,477.6	8,740.7
North Carolina	18,450.3	389.0	5,955.9	2,276.7	9,828.7
South Carolina	12,178.8	396.5	5,040.6	1,543.7	5,198.0
Texas	11,565.3	34.7	4,181.8	2,401.8	4,947.0
All states	133,423.7	3,731.3	48,209.0	20,209.1	61,274.3

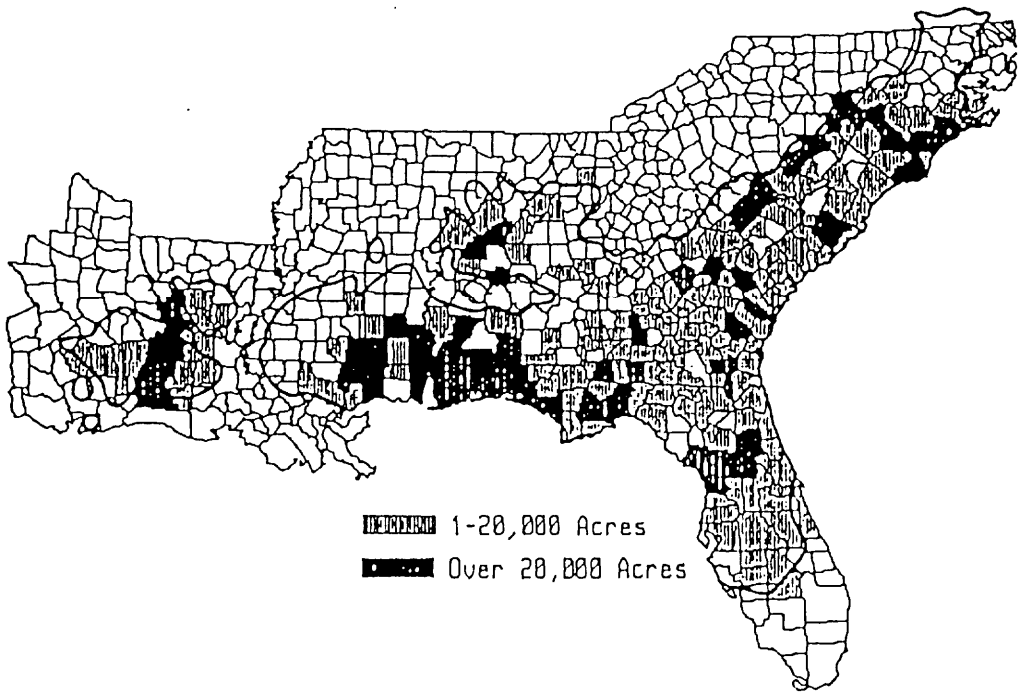

Fig. 1.—Counties with longleaf pine forest type. Natural range of longleaf pine indicated by dark line. (Light shading of counties indicates 1-20,000 acres; dark shading, over 20,000 acres.)

cubic feet per acre per year. The sandy sites where longleaf pine stands are commonly found are rarely highly productive sites. For example, in Alabama only 26 percent of the longleaf pine stands are in the high site classes. By contrast, 61 percent of all forest stands in Alabama are in these same high site classes.

Table 3. – Area of longleaf pine forest type by state and owner category, latest survey cycle

State	All owners	Public	Forest industry[1]	Other private
		Thousand acres		
Alabama	700.4	105.4	224.7	370.3
Florida	950.9	417.8	149.9	383.2
Georgia	676.4	46.7	83.2	546.5
Louisiana	313.2	73.7	109.7	129.8
Mississippi	270.2	101.5	37.3	131.4
North Carolina	389.0	141.4	44.8	202.8
South Carolina	396.5	120.1	22.7	253.7
Texas	34.7	6.1	11.4	17.2
All states	3,731.3	1,012.7	683.7	2,034.9

[1]Forest industry includes leased land.

Table 4. – Area of longleaf pine forest type by State and site class, latest survey cycle

State	All states	Site class, cubic feet/acre[1]				
		165 and greater	120-164	85-119	50-84	Less than 50
Alabama	700.4	12.0	6.2	164.8	386.7	130.7
Florida	950.9	---	---	34.1	473.1	443.7
Georgia	676.4	---	2.9	92.7	491.2	89.6
Louisiana	313.2	6.5	51.6	110.0	121.7	23.4
Mississippi	270.2	25.9	41.0	142.4	60.9	---
North Carolina	389.0	---	3.1	3.8	109.3	272.8
South Carolina	396.5	---	---	18.2	193.0	185.3
Texas	34.7	5.5	5.9	11.6	11.7	---
All states	3,731.3	49.9	110.7	577.6	1,847.6	1,145.5

[1]A classification of timberland based on potential yield in cubic foot per acre of mean annual growth at culmination of the increment in fully stocked natural stands.

The majority of longleaf pine stands are natural in origin, as only 9 percent of the area occupied by longleaf has been planted (fig. 2). The states leading in percentage of planted longleaf stands are Louisiana (18 percent), South Carolina (13 percent), and Mississippi (12 percent). Even in Louisiana, however, the percentage of planted longleaf pine stands is low compared to the percentage of all pine stands that are planted – 30 percent.

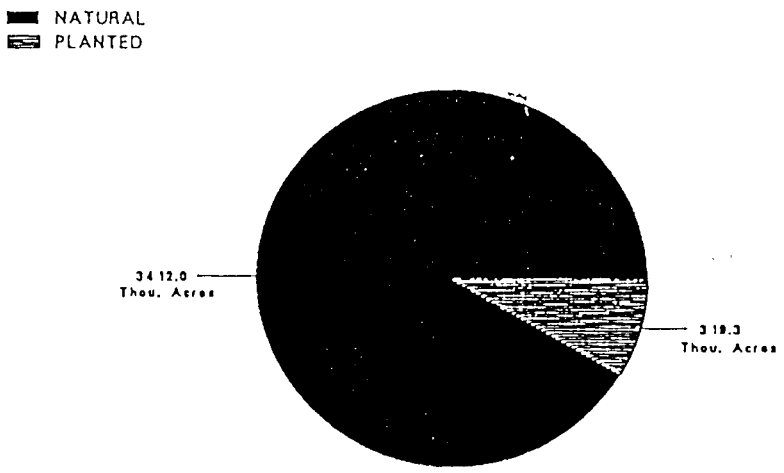

Fig. 2.—Area of longleaf pine stands by stand origin.

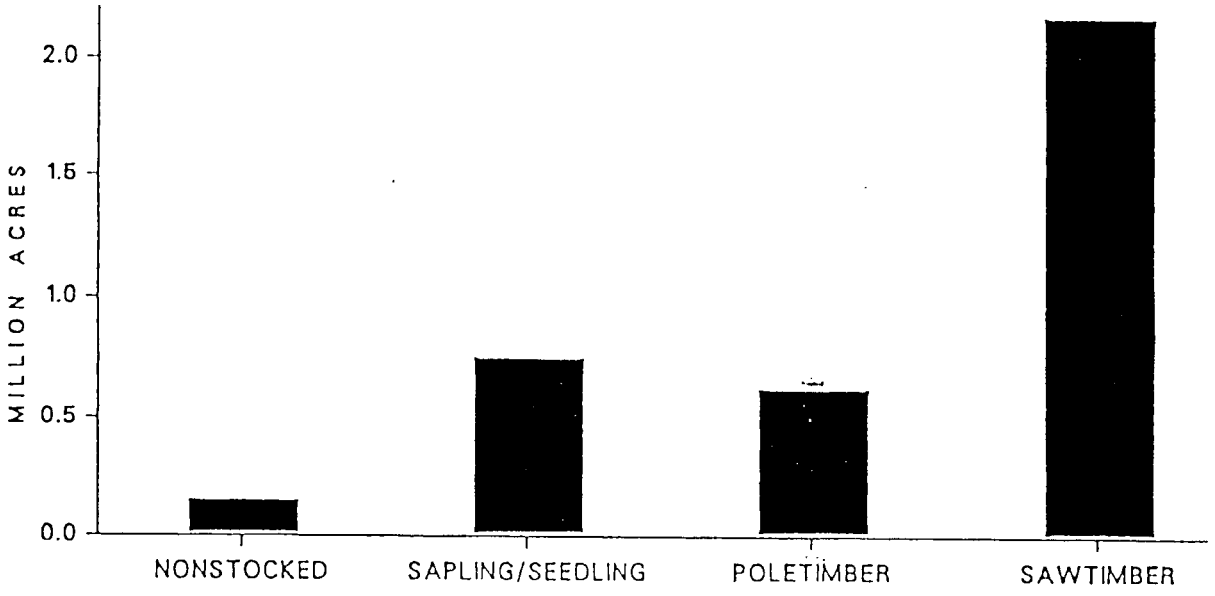

Fig. 3.—Area of longleaf pine stands by stand size.

About 58 percent of all longleaf pine stands are presently classified as sawtimber in size (fig. 3). Poletimber stands account for only 17 percent of the area, while sapling-seedling stands account for 20 percent. The remainder is nonstocked. The high ratio of sawtimber stands indicates that much of the resource is either mature or approaching maturity.

Even with the prevalence of sawtimber stands, only 24 percent of all longleaf pine stands are fully stocked (fig. 4). Although much of the area (40 percent) is medium stocked, a large amount - 36 percent - is poorly stocked. Fully stocked stands are at least 100 percent stocked, while the medium category ranges from 60-99 percent; poorly stocked stands are less than 60 percent stocked. Nonstocked stands, which are grouped with the poorly stocked stands in this comparison, are less than 16.7 percent stocked.

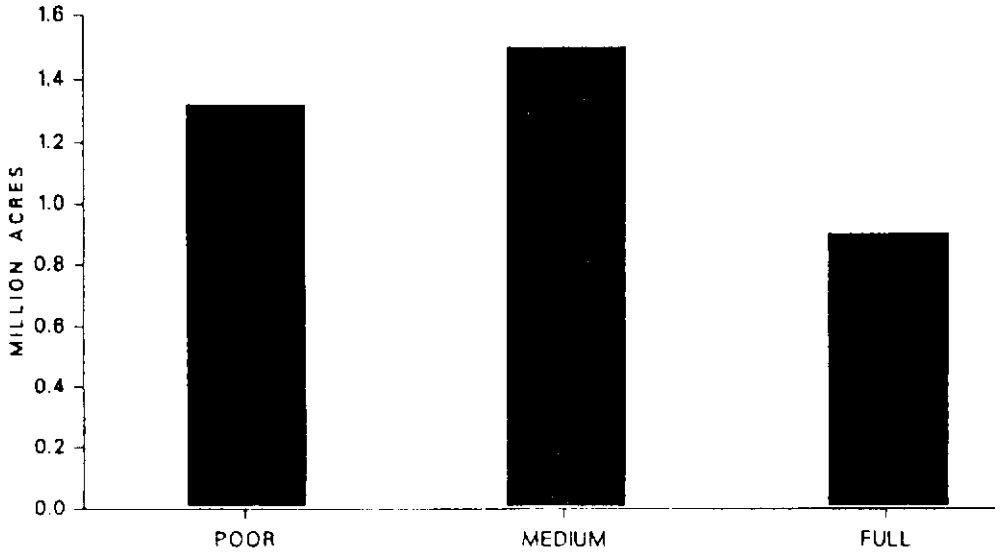

Fig. 4. – Area of longleaf pine stands by stocking class.

INVENTORY, GROWTH, AND REMOVALS VOLUME

Growing-stock volume in the 8-state area that bounds the natural range of longleaf presently totals 5.7 billion cubic feet (table 5, fig. 5). The States of Florida, Georgia, and Alabama are leaders in terms of total growing-stock volume. These 3 states account for 60 percent of all longleaf pine volume.

Table 5. – Growing-stock volume of longleaf pine by forest type and State, latest survey cycle

State	All types	Longleaf pine	Other pine	Oak-pine	Hardwood
	Million cubic feet				
Alabama	1,174.8	673.1	163.4	258.7	79.6
Florida	1,179.9	824.2	169.1	116.7	69.9
Georgia	1,050.1	678.3	246.0	81.6	44.2
Louisiana	438.2	261.8	145.4	27.3	3.7
Mississippi	604.5	296.7	132.8	147.1	27.9
North Carolina	442.6	322.2	73.7	32.7	14.0
South Carolina	659.0	463.3	112.8	57.5	25.4
Texas	108.0	54.3	40.9	8.7	4.1
All states	5,657.1	3,573.9	1,084.1	730.3	268.8

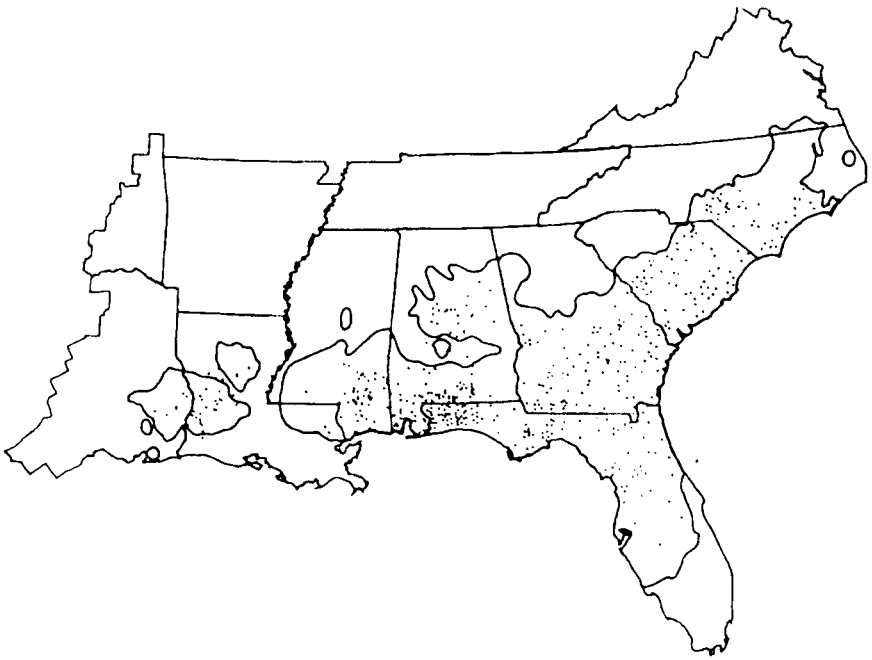

Fig. 5 – Volume of longleaf pine growing stock across the South. Each dot represents 10 million cubic feet. Natural range of longleaf pine indicated by dark line.

Most of the longleaf pine growing-stock volume - 63 percent - is found in stands specifically designated as a longleaf forest type. Other pine stands account for another 19 percent of the total longleaf volume. Oak-pine stands account for an additional 13 percent, while 5 percent is found in hardwood stands.

In the 10 years or so that mark the latest cycle of southern timber inventories, total longleaf pine volume has declined by about 12 percent. Notably, this decline has not been uniform across the range of diameter classes. Figure 6 indicates that for large trees - those 16.0 inches dbh and larger - volumes have actually increased. Volume in these large trees has increased 29 percent during the most recent cycle. They now contain more than one-fifth the total longleaf pine volume.

Sawtimber inventory of longleaf pine is 23.5 billion board feet (table 6). As with growing-stock volume, Florida, Alabama, and Georgia lead the other states in total sawtimber. Again, most of this volume - 63 percent - is located in longleaf pine stands.

Recent surveys across the region indicate the net annual growth of longleaf pine growing stock totals 228.7 million cubic feet, and sawtimber totals 1.1 billion board feet (tables 7 and 8). Annual removals of longleaf growing stock total 326.9 million cubic feet (table 9), exceeding growth by 43 percent. This disparity between growing-stock growth and removals is reflected in the declining volume measured during the latest round of inventories.

Similar to the situation with total growing stock, longleaf pine sawtimber removals exceed growth by 19 percent. Annual removals of sawtimber surpass 1.3 billion board feet, compared to the 1.1 billion board feet of growth.

SUMMARY OF RESOURCE TRENDS AND OUTLOOK

The longleaf pine resource has continued to decline as long as forest surveys have been tracking trends. The forest type that once covered much of the southern coastal plain now

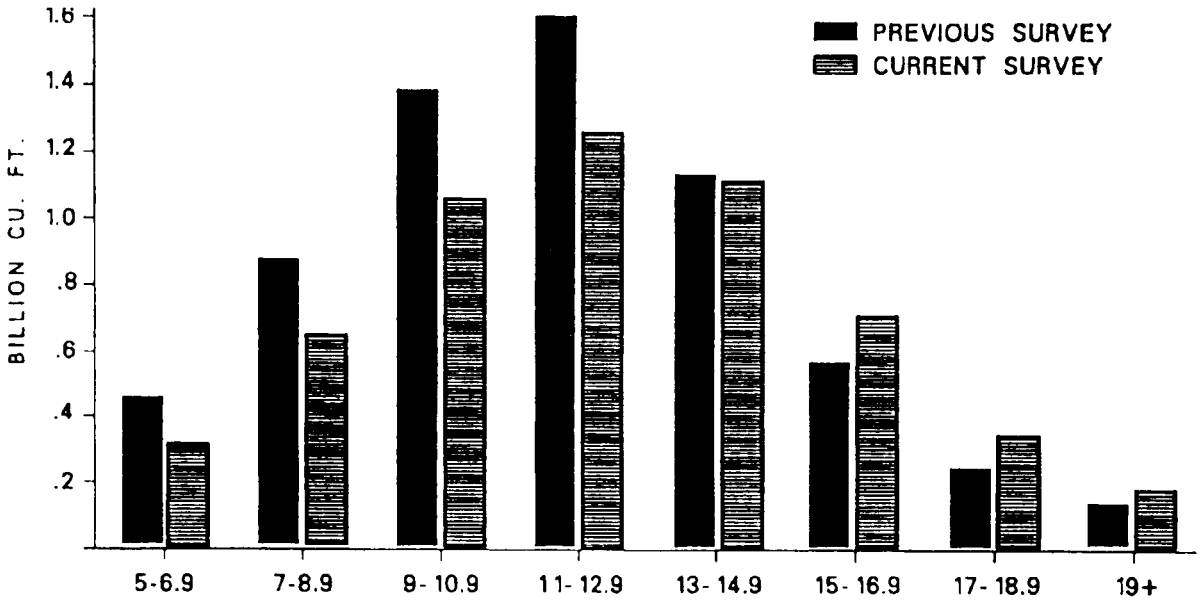

Fig. 6. — Growing-stock volume of longleaf pine by dbh class. Current and previous survey cycles.

Table 6. — Sawtimber volume of longleaf pine by forest type and State, latest survey cycle

State	All types	Longleaf pine	Other pine	Oak-pine	Hardwood
	Million board feet[1]				
Alabama	4,594.4	2,607.1	601.3	1,078.7	307.3
Florida	4,993.5	3,516.9	677.0	478.7	320.9
Georgia	4,445.3	2,889.0	999.8	359.4	197.1
Louisiana	1,666.8	970.5	567.1	116.8	12.4
Mississippi	2,716.1	1,326.1	598.5	661.8	129.7
North Carolina	1,776.0	1,254.9	326.6	136.7	57.8
South Carolina	2,833.8	1,950.7	503.6	261.2	118.3
Texas	508.4	252.9	193.8	43.4	18.3
All states	23,534.3	14,768.1	4,467.7	3,136.7	1,161.8

[1]International 1/4-inch rule.

Table 7. – Net annual growth of longleaf pine growing stock by forest type and State, latest survey cycle

State	All types	Longleaf pine	Other pine	Oak-pine	Hardwood
	Million cubic feet				
Alabama	45.4	22.2	8.1	9.5	5.6
Florida	35.8	23.7	5.4	4.1	2.6
Georgia	46.6	29.8	11.7	3.4	1.7
Louisiana	21.5	11.8	7.1	1.5	1.1
Mississippi	32.8	13.7	7.2	8.5	3.4
North Carolina	14.3	10.5	2.4	1.0	0.4
South Carolina	25.6	18.1	4.8	1.7	1.0
Texas	6.6	2.2	2.2	0.7	1.5
All states	228.7	132.0	48.9	30.4	17.4

Table 8. – Net annual growth of longleaf pine sawtimber by forest type and State, latest survey cycle

State	All types	Longleaf pine	Other pine	Oak-pine	Hardwood
	Million board feet[1]				
Alabama	221.4	103.5	37.7	51.2	29.0
Florida	204.0	132.2	32.2	23.6	16.0
Georgia	232.9	153.2	55.5	15.5	8.7
Louisiana	84.2	42.0	30.7	6.2	5.3
Mississippi	154.4	62.6	32.7	42.3	16.8
North Carolina	76.0	56.4	10.7	6.1	2.8
South Carolina	122.8	82.0	21.4	15.5	3.9
Texas	30.5	10.6	10.1	4.0	5.8
All states	1,126.2	642.5	231.0	164.4	88.3

[1]International 1/4-inch rule.

Table 9. – Annual removals of longleaf pine growing stock and sawtimber by State, latest survey cycle

State	Growing stock	Sawtimber
	million cu. ft.	million bd.ft[1]
Alabama	60.4	249.0
Florida	69.7	276.1
Georgia	72.7	295.4
Louisiana	26.1	106.0
Mississippi	35.0	153.1
North Carolina	21.6	87.7
South Carolina	30.7	121.8
Texas	10.7	48.1
All states	326.9	1,337.2

[1]International 1/4-inch rule.

occupies only 3.7 million acres. The longleaf acreage of today is only one-third of what it was just 30 years ago. The latest forest surveys show that longleaf growing-stock and sawtimber volume continues to diminish because of an imbalance between growth and removals.

Recent changes in numbers of trees imply that the protracted decline of longleaf pine is likely to continue. For the entire South, numbers of live longleaf pine trees are declining in all diameter classes except the largest - those 16 inches and larger in dbh (fig. 7). Generally,

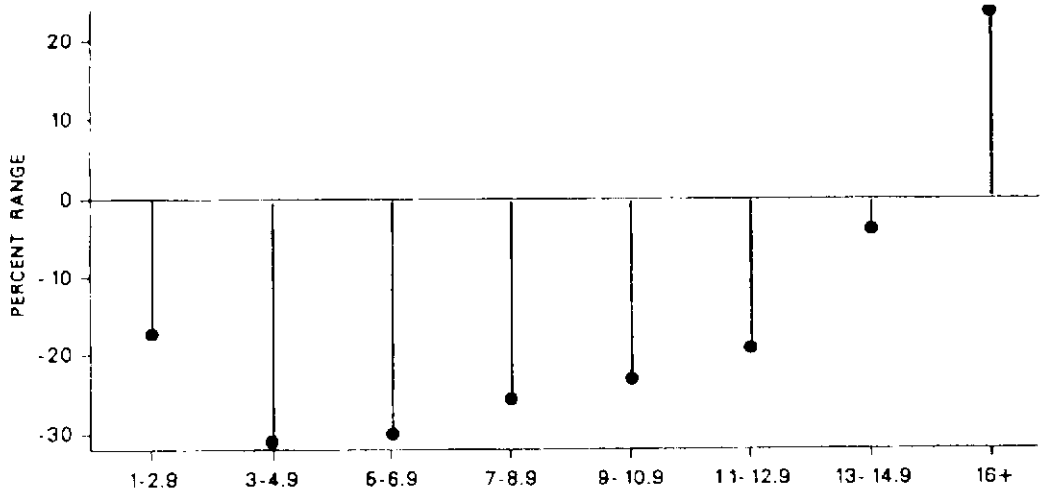

Fig. 7 – Percentage change in numbers of trees by dbh class from previous survey cycle.

this pattern holds true for individual states. In particular, a 23 percent decrease in trees below 5.0 inches dbh means that inventory volume can be expected to continue declining as a result of fewer trees available for ingrowth across the 5.0-inch volume threshold. Reductions in sawtimber volume can also be expected to steepen since numbers of poletimber trees (5.0-8.9

inches dbh) have also recently declined. These redistributions of trees by diameter class also imply that important stand structural changes are taking place. The buildup in large-diameter trees, combined with decreases in both volume and area of longleaf pine forest type, show that longleaf pine stands are generally advancing in maturity.

In addition to implicating a maturation of the resource, reductions in numbers of longleaf pine saplings support the acreage trends which indicate young stands are not replacing those now being harvested. For example, the area of longleaf pine in Mississippi declined by 31 percent between 1977 and 1987. This loss of acreage occurred principally because many harvested longleaf stands were not regenerated to longleaf. In many cases, forest managers replaced these harvested areas with slash pine plantations. Often, though, longleaf pine stands are partially cut with no effective regeneration; these areas then become mixed pine-hardwood or pure hardwood stands.

In addition to the problems associated with the shrinking longleaf land base, loss of longleaf inventory volume is intensified by the fact that such a high ratio of the remaining stands are producing far below potential due to inadequate stocking. Thirty-six percent of all longleaf stands are currently poorly stocked. This represents a sizeable treatment opportunity for existing stands.

Despite the unfavorable outlook for longleaf, there is some evidence of conscious longleaf pine management. Although accounting for a scant 9 percent of the total longleaf pine resource, the 319,300 acres of plantations undoubtedly represents a substantial investment for some landowners. There are some well-stocked natural stands as well. The future of the longleaf pine resource will depend on the conscientious management of existing and harvested stands to change the current unfavorable growth-to-removals ratio. The continuance of past trends does not bode well for a species many southerners profess to admire.

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