



U.S. Department of Agriculture

November 1978

Forest Service Research Note SE-267

SIZES OF TIMBER STANDS IN THE PIEDMONT OF SOUTH CAROLINA

ABSTRACT.—Diseconomies of scale in the management of small tracts of woodland create interest in the average sizes of timber stands. The 1977 inventory of the Piedmont of South Carolina revealed that about 30 percent of the timberland there is broken up into stands smaller than 10 acres.

Keywords: Commercial forest land, forest type, stand age, ownership class, size of condition.

In the management and harvesting of timber, tract size is an important economic factor. Because of acreage and volume restraints, owners of small tracts pay more for services and receive less for timber harvested. Increased mechanization in timber harvesting, site preparation, and other forestry practices tend to aggravate this disadvantage. The Forestry Incentives Program (FIP) has established a 10-acre minimum as a guideline in its assistance to private, nonindustrial landowners. Prior to the establishment of this nationwide guideline, many of the States had already set minimum tract sizes on their own.

In response to concerns over small tracts, the Resource Evaluation Work Unit in the Southeast has attempted to measure and characterize stand size in its recent inventories. Here, a stand is defined as a contiguous forest condition in one forest type of similar origin or age and with similar stocking, without regard to ownership lines. At each sample location, field crews determine and record the size of each unique stand sampled based on their ground observations and interpretations of aerial photographs.

This Note summarizes the size classifications made in a 1977 inventory of the Piedmont of South Carolina, an 18-county area encompassing 4,528,000 acres of commercial forest land. First, I examined sizes by forest type and stand-age class. For analysis, all acreage was grouped into one of four forest types: (1) pine plantation, (2) natural pine, (3) oak-pine, or (4) hardwood. Poorly stocked areas with no manageable stand were grouped by forest type regardless of stand age.

Pine plantations occupy just over 400,000 acres and 20 percent of this area is in stands

smaller than 10 acres (table 1). When these plantations are arrayed into 10-year age classes, almost three-fourths of them are less than 20 years old. Of plantations under 10 years old, only 7 percent are smaller than 10 acres. In the 10- to 19-year age class, almost one-third are less than 10 acres. Forest ownership accounts for this size difference. Forest industries, with their larger tracts, own 71 percent of the plantation acreage in the younger age class, but less than 41 percent of plantation acreage in the 10- to 19-year-old class. The older age class includes most of the plantations established on other private lands under the Conservation Reserve Soil-Bank Program during the late fifties and early sixties.

Natural pine stands occupy 1,849,900 acres, and 35 percent of this area is in stands smaller than 10 acres (table 2). When these stands are arrayed into 10-year age classes, two significant findings stand out: (1) acreage occupied by natural pine stands drops off sharply in the younger age classes, and (2) size of the natural pine stands correlates closely with stand age—the younger the stand, the smaller the condition. At least three factors help explain the first finding. Hardwoods are replacing pines following harvesting on private, nonindustrial holdings; rotation of idle agricultural lands to pine forest is declining; and forest industries are converting their natural pine stands to plantations following harvesting. The second finding indicates a strong trend toward smaller stands or tracts within the natural pine forest types. Apparently, land use changes, ownership changes, and forest treatments and disturbances are breaking the natural pine stands up into smaller and smaller entities. Such a trend has some far-reaching

Table 1.—Area of commercial forest land occupied by pine plantations, by stand-age class and size of condition, Piedmont of South Carolina, 1977

Stand-age class (years)	All sizes	Size of condition (acres)					
		Less than 10	10-19	20-29	30-39	40-49	50 and larger
..... Thousand acres							
No manageable stand	1.3	—	—	—	—	—	1.3
Less than 10	151.7	10.6	1.4	—	4.6	33.6	101.5
10-19	148.6	48.6	28.3	16.1	14.0	—	41.6
20-29	77.3	15.6	17.4	18.3	4.2	—	21.8
30-39	16.7	6.0	7.3	—	—	—	3.4
40 and older	10.3	—	5.1	—	—	—	5.2
Total	405.9	80.8	59.5	34.4	22.8	33.6	174.8

Table 2.—Area of commercial forest land occupied by natural pine stands, by stand-age class and size of condition, Piedmont of South Carolina, 1977

Stand-age class (years)	All sizes	Size of condition (acres)					
		Less than 10	10-19	20-29	30-39	40-49	50 and larger
..... Thousand acres							
No manageable stand	58.0	34.9	4.6	6.9	—	2.9	8.7
Less than 10	105.9	65.1	12.6	2.9	8.7	—	16.6
10-19	211.6	100.9	48.5	11.8	7.6	—	42.8
20-29	421.9	150.0	71.7	49.8	13.4	28.3	108.7
30-39	443.9	133.3	79.3	45.2	33.7	19.2	133.2
40-49	365.3	103.6	51.8	44.7	30.1	16.1	119.0
50-59	169.2	46.3	11.8	18.4	4.0	12.7	76.0
60 and older	74.1	13.6	15.3	14.9	—	—	30.3
Total	1,849.9	647.7	295.6	194.6	97.5	79.2	535.3

implications with regard to the management and use of the pine resource.

Oak-pine stands occupy 673,600 acres, and 33 percent of this area is in stands smaller than 10 acres (table 3). Oak-pine is an unstable and transitory forest type in which hardwoods comprise a plurality of all live-tree stocking but pines comprise 25 to 50 percent of the stocking. This type frequently evolves from a gradual hardwood take-over following the harvesting of pine. Without some intervention to control or reduce the hardwood stocking, most of these stands rotate to an oak-hickory forest type through their successional development. Some of the acreage in the youngest age class in table 3 represents pine plantations where hardwoods dominate the stocking because of inadequate site preparation.

Oak-pine stands are more difficult to delineate on aerial photos or on the ground than are pine plantations and natural pine stands. These difficulties may have caused some error in the size distribution, but the values shown are based primarily on ground observations. And what may be the key finding—that younger stands are usually smaller—is certainly accurate.

Hardwood stands, primarily oak-hickory in the study area, occupy 1,598,600 acres, and 26 percent of this acreage is in stands smaller than 10 acres (table 4). While this proportion is high, it indicates that hardwood stands are not as fragmented as natural pine and oak-pine stands. Of all the forest types, hardwoods had the highest proportion of stands 50 acres or larger—46 percent. Except for the areas with inadequate stock-

Table 3.—Area of commercial forest land occupied by oak-pine stands, by stand-age class and size of condition, Piedmont of South Carolina, 1977

Stand-age class (years)	All sizes	Size of condition (acres)					
		Less than 10	10-19	20-29	30-39	40-49	50 and larger
..... <i>Thousand acres</i>							
No manageable stand	54.8	22.5	0.6	8.3	4.4	8.7	10.3
Less than 10	112.8	43.7	13.4	4.6	2.4	—	48.7
10-19	38.0	20.1	8.3	—	4.6	—	5.0
20-29	46.6	18.1	17.2	2.9	8.4	—	—
30-39	133.6	31.4	34.9	18.7	4.0	9.1	35.5
40-49	147.6	48.0	22.6	9.3	14.2	—	53.5
50-59	83.8	22.9	18.2	8.9	5.3	4.2	24.3
60 and older	56.4	13.3	17.8	—	—	8.1	17.2
Total	673.6	220.0	133.0	52.7	43.3	30.1	194.5

Table 4.—Area of commercial forest land occupied by hardwood stands, by stand-age class and size of condition, Piedmont of South Carolina, 1977

Stand-age class (years)	All sizes	Size of condition (acres)					
		Less than 10	10-19	20-29	30-39	40-49	50 and larger
..... <i>Thousand acres</i>							
No manageable stand	255.9	65.3	31.7	35.1	19.7	13.4	90.7
Less than 10	143.8	36.3	9.1	13.6	4.2	3.0	77.6
10-19	63.6	28.6	—	4.2	4.2	—	26.6
20-29	70.0	30.6	7.5	—	0.8	3.9	27.2
30-39	202.1	55.5	41.3	14.7	19.9	—	70.7
40-49	357.1	93.9	71.3	41.5	4.6	14.4	131.4
50-59	278.6	71.2	30.6	18.0	5.3	5.3	148.2
60 and older	227.5	36.3	8.0	15.9	4.5	—	162.8
Total	1,598.6	417.7	199.5	143.0	63.2	40.0	735.2

ing for management and the youngest age class, there was again some correlation between size of condition and stand age.

I examined size of condition by forest type and ownership class, without regard to stand age. As might be expected, timber stands on public lands and those owned by forest industries are significantly larger than stands on other private lands. Less than 15 percent of the pine plantations on public and forest industry lands are smaller

than 10 acres, in contrast to 27 percent on other private lands (table 5). For natural pine stands, the proportion smaller than 10 acres ranged from 14 percent on public lands to almost 40 percent on other private lands (table 6). The natural pine stands owned by private, nonindustrial owners were broken into smaller parcels than any other component of the resource.

Of all the forest types examined, oak-pine is the most heavily concentrated in one ownership

Table 5.—Area and percent distribution of commercial forest land occupied by pine plantations, by ownership class and size of condition, Piedmont of South Carolina, 1977

Ownership class	All sizes	Size of condition (acres)					
		Less than 10	10-19	20-29	30-39	40-49	50 and larger
..... <i>Thousand acres</i>							
Public	20.0	2.8	—	—	4.6	4.6	8.0
Forest industry	192.9	25.1	15.7	5.4	—	20.5	126.2
Other private	193.0	52.9	43.8	29.0	18.2	8.5	40.6
Total	405.9	80.8	59.5	34.4	22.8	33.6	174.8
..... <i>Percent of all sizes</i>							
Public	100.0	14.0	—	—	23.0	23.0	40.0
Forest industry	100.0	13.0	8.2	2.8	—	10.6	65.4
Other private	100.0	27.4	22.7	15.0	9.4	4.4	21.1
All owners	100.0	19.9	14.6	8.5	5.6	8.3	43.1

Table 6.—Area and percent distribution of commercial forest land occupied by natural pine stands, by ownership class and size of condition, Piedmont of South Carolina, 1977

Ownership class	All sizes	Size of condition (acres)					
		Less than 10	10-19	20-29	30-39	40-49	50 and larger
..... <i>Thousand acres</i>							
Public	235.8	33.5	23.3	39.1	7.0	7.0	125.9
Forest industry	195.1	49.0	10.9	18.0	9.9	20.7	86.6
Other private	1,419.0	565.2	261.4	137.5	80.6	51.5	322.8
Total	1,849.9	647.7	295.6	194.6	97.5	79.2	535.3
..... <i>Percent of all sizes</i>							
Public	100.0	14.2	9.9	16.6	3.0	2.9	53.4
Forest industry	100.0	25.1	5.6	9.2	5.1	10.6	44.4
Other private	100.0	39.8	18.4	9.7	5.7	3.6	22.8
All owners	100.0	35.0	16.0	10.5	5.3	4.3	28.9

class. Almost 84 percent of the oak-pine acreage is held by other private owners, and almost one-third is in stands smaller than 10 acres (table 7). Less than 15 percent of oak-pine acreage on public lands is in stands this small. While slightly over half of the oak-pine on forest-industry lands is in stands smaller than 10 acres, almost 45 percent is

in stands 50 acres or larger.

The proportion of hardwood acreage in stands smaller than 10 acres ranges from 11 percent on public lands to 28 percent on other private lands (table 8). About 20 percent of the hardwood stands on forest-industry holdings are in this size class.

This examination of the size classifications of timber stands in the Piedmont of South Carolina led to these basic conclusions:

1. About 30 percent of the Region's commercial timberland is broken up into distinct forest conditions less than 10 acres in size.
2. Small conditions are most prevalent within natural pine stands on private, nonindustrial ownerships.
3. Fragmentation is increasing.
4. The economic implications of these findings on management and harvesting of timber should be studied.

Table 7.—Area and percent distribution of commercial forest land occupied by oak-pine stands, by ownership class and size of condition, Piedmont of South Carolina, 1977

Ownership class	All sizes	Size of condition (acres)					
		Less than 10	10-19	20-29	30-39	40-49	50 and larger
..... <i>Thousand acres</i>							
Public	50.9	7.4	9.9	5.7	4.6	3.3	20.0
Forest industry	59.5	30.6	—	—	2.4	—	26.5
Other private	563.2	182.0	123.1	47.0	36.3	26.8	148.0
Total	673.6	220.0	133.0	52.7	43.3	30.1	194.5
..... <i>Percent of all sizes</i>							
Public	100.0	14.5	19.5	11.2	9.0	6.5	39.3
Forest industry	100.0	51.4	—	—	4.0	—	44.6
Other private	100.0	32.3	21.9	8.3	6.4	4.8	26.3
All owners	100.0	32.7	19.7	7.8	6.4	4.5	28.9

Table 8.—Area and percent distribution of commercial forest land occupied by hardwood stands, by ownership class and size of condition, Piedmont of South Carolina, 1977

Ownership class	All sizes	Size of condition (acres)					
		Less than 10	10-19	20-29	30-39	40-49	50 and larger
..... <i>Thousand acres</i>							
Public	122.1	13.7	19.8	6.6	8.7	—	73.3
Forest industry	180.7	36.7	6.6	3.6	5.8	5.3	122.7
Other private	1,295.8	367.3	173.1	132.8	48.7	34.7	539.2
Total	1,598.6	417.7	199.5	143.0	63.2	40.0	735.2
..... <i>Percent of all sizes</i>							
Public	100.0	11.2	16.2	5.4	7.1	—	60.1
Forest industry	100.0	20.3	3.7	2.0	3.2	2.9	67.9
Other private	100.0	28.3	13.4	10.2	3.8	2.7	41.6
All owners	100.0	26.1	12.5	8.9	4.0	2.5	46.0

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