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FOREST RESOURCES OF CENTRAL GEORGIA

by
A. R. Spillers
Associate Forest Economist

A Progress Report by

THE SOUTHERN FOREST SURVEY

I. F. Eldredge, Regional Survey Director

SOUTHERN FOREST EXPERIMENT STATION

E. L. Demmon, Director

New Orleans, La.

FOREWORD

The Forest Survey, which is a part of the United States Forest Service, was authorized by the McSweeney-McNary Forest Research Act of 1928 to make a nation-wide study of our forest resources. The five-fold object of this study is: (1) to make an inventory of the present supply of timber and other forest products, (2) to ascertain the rate at which this supply is being increased through growth, (3) to determine the rate at which this supply is being diminished through industrial and local use, windfall, fire, and disease, (4) to determine the present requirement and the probable future trend in the requirement for timber and other forest products, and (5) to correlate these findings with existing and anticipated economic conditions, in order that policies may be formulated for the effective use of lands suitable for forest production.

This release is based on a field survey made Oct. 26, 1935, to Mar. 7, 1936, and on two field canvasses of forest industrial plants to determine forest drain, the last of which was completed during June 1937. It should be regarded only as a progress report since it contains Forest Survey data that will be included in complete reports to be published later, and that, although considered reliable, are subject to correction or amplification as the work of computation proceeds. Item 4 above, which is being studied on a national basis, is not discussed in this report.

In the interpretation of these data, it must be noted that owing to the sampling method used in collecting them, the greater the number of samples in any given classification the more accurate are the data for that classification. Hence classes that are of infrequent occurence and relatively small in quantity generally cannot be determined with as high a degree of accuracy as classes that occur more frequently and in substantially greater quantities. Small tabular items are to be taken as showing, not the exact magnitude of the classes involved, but their relative magnitude in comparison with those of other classes.

In the South, the Forest Survey functions as an activity of the Southern Forest Experiment Station with headquarters at New Orleans, La.

Assisting Staff

E. B. Faulks, Associate Forest Economist } In Charge of Field Work
J. M. Tinker, Assistant Timber Expert } In Charge of Field Work
P. R. Wheeler, Associate Forest Economist, In Charge of Computations

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General Description

Central Georgia (Forest Survey unit No. 3) was one of the first widely-developed and prosperous agricultural areas of the Lower South; but erosion, the boll-weevil, and destructive methods of cultivation, together with the westward march of cotton farming, have caused such widespread abandonment of tilled land that many thousands of acres once white with cotton have reverted to the forests which originally covered them. Slowly a maladjustment has taken place in the pattern of human affairs, and today thinking people of this once prosperous section of the State are searching for ways and means of building up new sources of wealth. Consequently an account of the forest resources and wood-using industries of this unit, based upon the recent inventory made by the Forest Survey, is of particular interest,because it may shed some light on the extent to which the forests of the section may help in returning a measure of prosperity to the land.

Extending southwesterly across the State in a belt about 80 miles wide (fig. 1), this unit includes 49 counties, with an aggregate area of almost 11 million acres. Slightly more than half the land is classed as forest, with loblolly and shortleaf pines and gums predominating. Physiographically, there are two distinct parts of central Georgia, but they are combined in this report because no appreciable difference occurs in their forest resources. The northern half, in the lower Piedmont topographic province, with elevations seldom exceeding 900 feet above sea level, is distinguished by hills, with occasional steep slopes and ridges. The southern half, in the gently rolling upper Coastal Plain, with elevations seldom surpassing 500 feet, is separated from the Piedmont by the Fall Line (the shoreline of the ancient ocean), which may be traced near Augusta, Macon, and Columbus.

The principal rivers are the Savannah, forming the eastern boundary of the area; the Chattahoochee, forming the western boundary; and the Ogeechee, Ocmulgee, Oconee, and Flint Rivers flowing through or across it. The first two were great thoroughfares of transportation until about 1870, when the railroads became important, but in recent years river traffic has been light. Well-developed railroad facilities, including the Southern, Central of Georgia, Seaboard Air Line, and others, serve this unit. Also a well-correlated system of paved and gravel highways and graded country roads make all parts of the area accessible to motor vehicles.

An abundant supply of electric power is available at more than 20 plants, of which half are hydro-electric located chiefly on the Chattahoochee, Flint, Ocmulgee, and Savannah Rivers. In 1937, the hydro-electric plants had a total daily capacity of about 100,000 kilowatts and their total output for the year was almost 700 million kilowatt-hours. As to minerals, clays, bauxite, limestone, fuller's earth, and travertine are found locally in commercial quantities.

According to Census data, the total population of the area reached a peak in 1920 with 818,000 people, but by 1930 it had declined to 758,000, a loss of about 7 percent. It is significant, however, that while the total number of people declined, and there was an alarming shrinkage in rural population, the urban population increased 14 percent between 1920 and 1930. In 1930 Augusta had a population of 60,000; Macon, 54,000; Columbus, 43,000; and Albany, 15,000. For the area as a whole, however, the population is mostly rural, for only 29 percent of the people live in towns or cities having a population of 2,500 or more. Agricultural products, textiles (with Columbus, Macon, Augusta, and Thomaston, the principal centers), and wood-products form the bases for the most important industries. Agriculture, which gives employment to about 45 percent of the workers, is the principal means of livelihood, although many of the farmers find part-time work in logging and in the manufacture of forest products. Corn and cotton are the main agricultural crops, but orchard, forage, and truck crops also are grown. Yields of corn are light; in 1929 the average yield was about 11 bushels per acre harvested, and in 1934, 8 bushels. Yields per acre of cotton, the principal cash crop, are from 0.36 to 0.44 bales per acre, slightly higher than the average for the entire cotton belt.

Approximately 57 percent of the farm acreage is operated by tenants. This absentee-landlord and tenant-cropper system, which unfortunately has led to a deterioration of both human and soil resources, is largely the result of the old plantation economy, especially prevalent in the lower Piedmont.

In 1935, according to the Agricultural Census, in central Georgia there was a total farm area of 7,886,000 acres, or approximately 73 percent of the entire area. Of this, farm woodlands occupied 3,315,000 acres. There were 64,000 separate farms, a farm being defined as "all the land which is directly farmed by one person, either by his own labor alone or with the assistance of members of his household, or hired employees." There is a wide variation in the size of the farms, as shown by table 1, but the average size is 123 acres, of which approximately 52 acres is in woodland pasture or woodland not used for pasture. Approximately 63 percent of the total number of farms have less than 100 acres; but these small farms altogether include only 22 percent of the total farm acreage. The extent of the large holdings is further indicated by the fact that while less than 4 percent of the farms have over 500 acres, these large farms include more than 26 percent of the total farm area.

Table 1. - Number and acreage of farms classed according to size, 1935
(Data from Agricultural Census)

Size	Number of farms	Proportion of total number	Acreage in farms	Proportion of total acreage
Acres	Number	Percent	Acres	Percent
Less than 50	24,185	37.8	676,628	8.6
50 - 99	15,853	24.8	1,067,980	13.5
100 - 499	21,700	33.9	4,074,108	51.7
500 - 999	1,605	2.5	1,051,743	13.3
1000 and over	611	1.0	1,015,910	12.9
Total	63,954	100.0	7,886,369	100.0

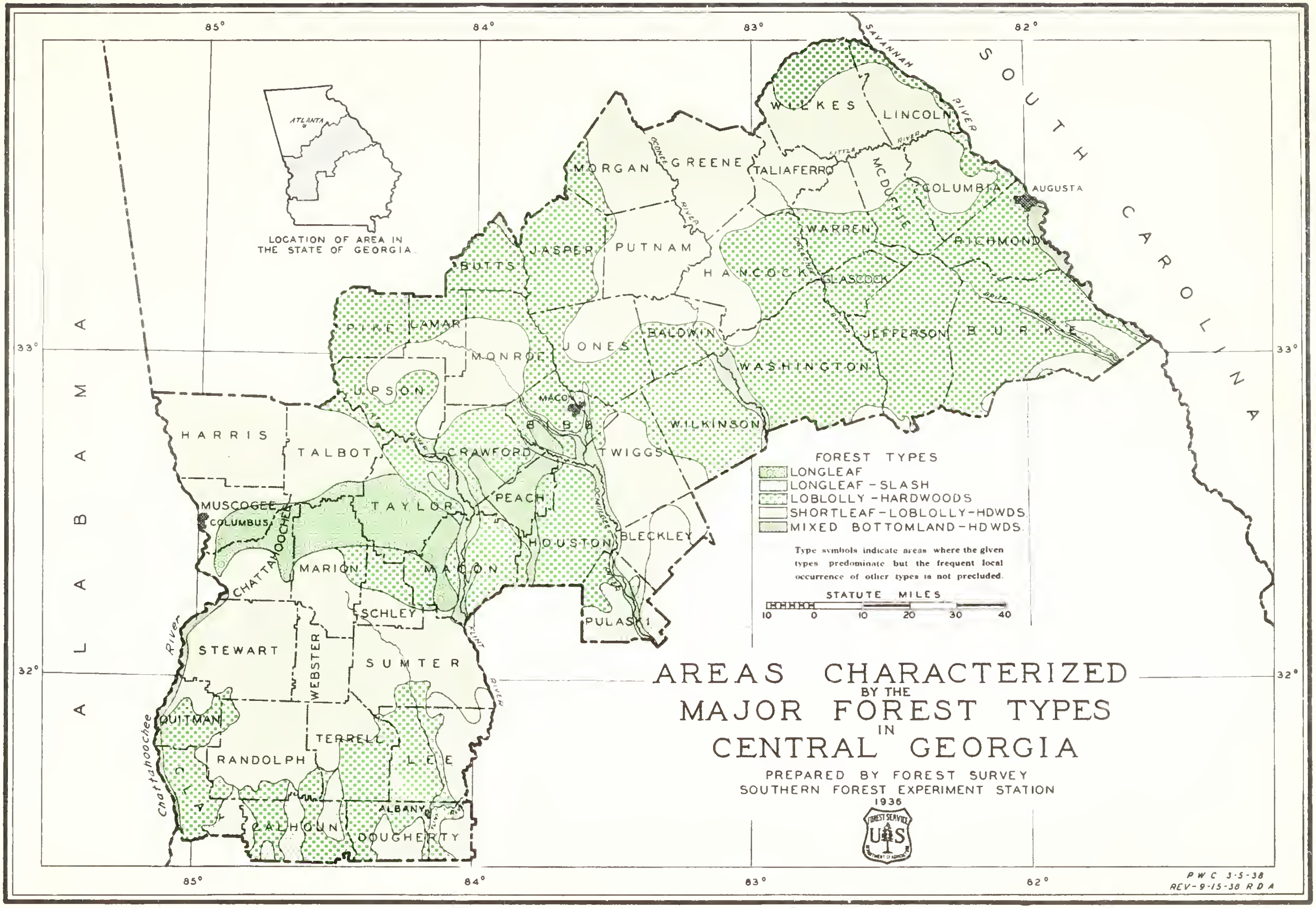

FIGURE 1 - FOREST TYPE MAP

What of the remaining 3 million acres not in farms? No figures on ownership for the non-farm holdings are available, but for the lower Piedmont part of the area, Hartman and Wooten 1/ list administrators, executors, banks, mortgage companies, merchants, and professional men as prominent landowners, in addition to farmers. In 1932, their survey of 8 counties in the lower Piedmont part of this unit revealed that for all owners (farm and nonfarm combined), over 45 percent of the land was in ownerships of 500 acres or more. 1/

Using Census data on the area in "farms less woodland" as an indication of the land in agricultural use, it is noteworthy that from 1909 to 1929 there was a steady shrinkage in land used for agriculture. The boll weevil (severe attacks occurred in 1920-1925) and other factors affecting cotton growing played an important part in this decline in agriculture, since the loss in cotton acreage alone from 1909 to 1929 was over 1 million acres. This reduced the total agricultural acreage 20 percent and the cotton land over 50 percent. There was, however, from 1929 to 1934 a slight recovery in agricultural land use; but cotton acreage has continued to decline. The shrinkage in cotton acreage caused a serious cash loss to the area, and since cotton requires three to four times as much labor as most other crops, this shrinkage also caused tremendous losses in labor opportunities. In 1936, under the Agricultural Adjustment Act, approximately 276,000 acres normally planted to cotton were removed from production, and payments made for cotton-crop control and soil conservation amounted to about 3 million dollars.

The decline in agriculture in many parts of this area, however, had started before the end of the nineteenth century. According to Hartman and Wooten, in the 50 years from 1880 to 1930, in 26 sample counties (mostly in the northern part of the unit), there was a total decrease of about 30 percent in acreage used for agriculture; in Lincoln and Hancock Counties, the decrease was over 50 percent. This breakdown of agriculture occurred in many parts of the unit but was more severe in the lower Piedmont section than in the Upper Coastal Plain.

The Forest Survey in the winter of 1935 and 1936 found slightly more than half the area in forest and most of the remainder in old cropland (table 2). Significant, too, was the negligible area of new cropland, as compared with the nearly 800,000 acres of idle and abandoned cropland, the poorer part of which probably will revert to forest, while the better fields may be cultivated again, depending upon the prices of cotton and corn.

Of the present forest area (5,581,900 acres), approximately 59 percent is in farm ownership, 37 percent is in the hands of other private owners, and only 4 percent is in public ownership.

1/ Hartman, W. A., and H. H. Wooten. Georgia land use problems. Georgia Exp. Sta. Bull. 191. 195 pages, illus., 1935.

Table 2. - Land area classified according to land use, 1936

Land	Area	Proportion of total area
	Acres	Percent
Forest	1/ 5,581,900	51.3
Nonforest:		
Agricultural:		
In cultivation:		
Old cropland	3,990,300	36.7
New cropland	40,100	.4
Out of cultivation:		
Idle	391,400	3.6
Abandoned	405,700	3.7
Pasture	214,900	2.0
Total agriculture	5,042,400	46.4
Other nonforest	253,200	2.3
Total nonforest	5,295,600	48.7
Total forest and nonforest	10,877,500	100.0

1/ Includes 900 acres of nonproductive forest land.

The average annual rainfall is between 40 and 50 inches, and the number of frost-free days per annum ranges between 210 and 240. North of the Fall Line the soils are generally clay or sandy-clay loams, and a large portion of the land is now unsuited to cultivated crops. South of this line the soils are sandy or fine sandy loams, often with red clay subsoils. Some of the soils are classed as highly productive, but most of them are so light that they are easily eroded when cultivated. In the Lower Piedmont part of the area, erosion has been very active for such a long time that, according to Hartman and Wooten, little of the original surface is left except in bottom lands or forested areas.

In some form and to some degree, erosion is occurring almost everywhere in the unit, but in this report only the well-marked and destructive stages are recognized (table 3). In the field classification, the following forms of erosion were recorded: (1) sheet erosion, where the soil is washing off from a generally smooth surface; (2) shoestring erosion, where the soil surface is cut into, and a system of small, branching gullies a few inches to 2 feet deep is formed; and (3) gully erosion, where the soil surface is severely cut into and is being destroyed by systems of deep gullies. Marked erosion, in one or more of the three forms, is found on 31 percent of the abandoned cropland, 22 percent of the idle cropland, 16 percent of the pasture, and 18 percent of the cropland in cultivation, but on only 11 percent of the forest, even though the forest is generally located on the steepest slopes. In many places where erosion is found in the forest, it is caused by run-off from cultivated fields situated higher up the slope. Also erosion is often found in forests that have been established recently on eroding abandoned fields, but when a grass- or tree-growth is well established, erosion is generally checked.

Table 3. - Correlation of land use with erosion

Land use	Type of erosion				Total
	None or arrested	Sheet	Shoestring	Gullies	
	Acres				
Forest	4,954,100	131,700	211,500	284,600	5,581,900
Cropland in cultivation	3,323,800	485,700	194,600	26,300	4,030,400
Idle cropland	306,000	52,700	26,800	5,900	391,400
Abandoned cropland	280,400	57,200	41,200	26,900	405,700
Pasture	181,400	17,600	10,100	5,800	214,900
Total	9,045,700	744,900	484,200	349,500	10,624,300
Percent of total	85.1	7.0	4.6	3.3	100.0

Description of the Forest

Loblolly pine, the principal species in the forest, occurs on all topographic situations in pure stands or with other pines (chiefly shortleaf) and with hardwoods. On the rolling uplands, which contain 83 percent of the forest area, loblolly pine generally occupies the better sites, while shortleaf pine and upland hardwoods predominate on the poorer ones. Loblolly pine is also found in the branch heads, river bottoms, and swamps; but here the bottom-land hardwoods predominate. Longleaf pine stands are found on the sand hills in the western part of the unit.

The prevalence of certain characteristic forest types over large areas is shown on the map (fig. 1), although within the broad ranges there delineated many small intermingled areas of other types occur as well as areas of cleared land. In table 4 will be found the area occupied by each of the four major forest type-groups. Pine and pine-hardwood types combined characterize over three-fourths of the forest land; upland hardwoods and bottom-land hardwoods each dominate about half of the remainder. The composition of the forest type-groups based on cubic volume is shown in table 5.

Table 4. - Forest area classified according to forest condition and type-group, 1936

Forest condition	Pine	Pine hardwood	Upland hardwood	Bottom-land hardwood	Total all types	Proportion of total
	- - - - - - - -	- - - - - -	Acres	- - - - - -	- - - - - -	Percent
Old growth:						
Uncut	54,400	23,400	56,800	91,200	225,800	4.1
Partly cut	65,200	47,700	26,800	95,300	235,000	4.2
Total	119,600	71,100	83,600	186,500	460,800	8.3
Second growth:						
Sawlog size:						
Uncut	1,099,900	199,800	135,500	186,500	1,621,700	29.0
Partly cut	775,300	271,800	71,900	123,800	1,242,800	22.3
Under sawlog size	991,100	457,500	317,800	151,400	1,917,800	34.3
Reproduction	107,800	88,700	36,800	5,900	239,200	4.3
Total	2,974,100	1,017,800	562,000	467,600	5,021,500	89.9
Clear-cut	91,200	2,500	1,700	3,300	98,700	1.8
Total all conditions	3,184,900	1,091,400	647,300	657,400	1/ 5,581,000	100.0
Percent of total forest area	57.0	19.6	11.6	11.8	100.0	

1/ Not included are 900 acres of non-productive forest land.

Much of the original forest of central Georgia was cleared to make way for cotton in the early nineteenth century, while the greater part of the remainder has been cut for lumber in the present century. Old-growth stands, closely resembling the original timber and containing large trees particularly desirable for high-quality lumber or veneer, now occupy only 8 percent of the forest area. There is a greater area of old growth in the bottom-land hardwoods than in any of the other type-groups. Although occurring in small scattered tracts, the old-growth forests are heavily timbered; uncut stands have an average volume per acre of 8,900 board feet (green lumber tally, based on the International $\frac{1}{4}$-inch rule), and partly cut stands, 5,600 board feet.

Table 5. - Species composition of the various type-groups

Species or species-group	Type-group: Pine	Pine hardwood	Upland hardwood	Bottom-land hardwood	Total
	- - - - - -	- - - - - -	Percent	- - - - - -	- - - - - -
Loblolly pine	62.5	33.8	5.9	1.9	43.1
Shortleaf pine	20.6	9.1	3.2	negl.	13.9
Longleaf pine	7.0	1.4	.4	.1	4.4
Other pines 1/	.4	2.0	.1	.2	.6
Black and tupelo gums	1.2	9.2	8.9	32.5	8.6
Red gum	2.9	12.9	21.8	17.1	8.3
Red and white oaks	1.7	9.9	22.5	11.2	6.1
Yellow poplar	.8	8.6	15.0	6.1	4.0
Hickory	.7	4.3	9.7	.7	1.9
Ash	.2	1.0	1.1	5.7	1.4
Other hardwoods 2/	2.0	7.8	11.4	24.5	7.7
Total all species	100.0	100.0	100.0	100.0	100.0

1/ Includes cedar
2/ Includes cypress

Much of the land once tilled has reverted to timber. Young second-growth stands (old-field and forest-grown stands combined) occupy 90 percent of the forest area (table 4), and are found in all sections of central Georgia. Approximately 51 percent of the entire forest area has second-growth sawlog-size stands—trees 9.0 inches d.b.h. and larger in pine and 13.0 inches d.b.h. and larger in hardwoods—with at least 600 board feet per acre if uncut and at least 400 if partly cut in trees of saw-timber size. Combining uncut and partly cut stands, the second-growth sawlog-size conditions contain an average volume per acre of about 4,100 board feet, or, for all growing-stock material, including the associated smaller trees 5.0 inches d.b.h. and larger, about 16 cords, including bark. Second-growth under-sawlog-size stands cover approximately 34 percent of the forest area and have an average volume per acre, in a few trees of saw-timber size, of only 200 board feet; since these stands contain many small trees, however, they have about 3 cords of cubic-foot material. Reproduction is the term applied to the youngest forest condition, in which seedlings and sprouts less than 1.0 inch d.b.h. standing 80 or more per acre, form the principal forest cover. Clear-cut areas have less than 80 seedlings per acre but may have an occasional seed tree and with fire protection may reforest naturally.

The site quality or productive capacity of the forest land, as indicated by the site index (i.e., by the height in feet of average dominant trees at 50 years), for pines compares favorably with that of other Survey units in the pine-hardwood region east of the Mississippi. Approximately 36 percent of the sites dominated by loblolly pine have an index of 80 or better; 55 percent, 70; and only 9 percent, 60 or less. Of the sites dominated by shortleaf pine, only 2 percent have an index of 80 or better; 20 percent, 70; 66 percent, 60; and 12 percent, 50 or less.

Figure 2 shows the prevailing age-class and volume distribution for the pine and pine-hardwood types (longleaf pine types excluded), which make up over two-thirds of the forest area, compared with the volume of well-stocked stands. The volume figures used are cubic feet i.b. (inside bark), and no deduction for woods cull has been made. The area and volume per acre of the forest is diagrammed from field estimates of the age-classes of the 3-3/4 million acres in the pine and pine-hardwood types. One measure of the productive capacity of the forest land is the volume on the most heavily stocked 10 percent of the present uncut forest stands, weighted by sites. That the average stocking of the forest is poor is clearly indicated by the fact that the volume per acre in the various age-classes is only one-third to one-half that found in the corresponding age-classes of the well-stocked stands.

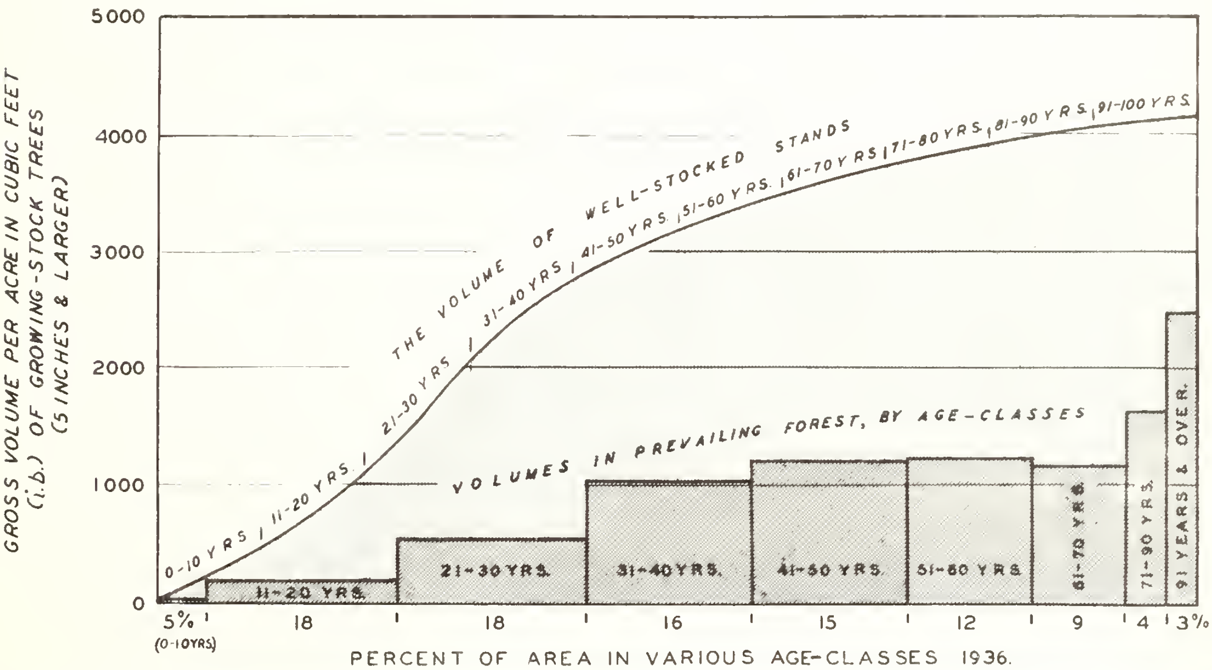

FIGURE 2 - PREVAILING AGE-CLASS AND VOLUME DISTRIBUTION COMPARED WITH THE VOLUME IN WELL-STOCKED STANDS BASED ON PINE AND PINE-HARDWOOD TYPE-AREA* OF 3,808,800 ACRES.

*EXCLUDING LONGLEAF AND SLASH PINE TYPES.

Figure 3 shows the number of sound trees by 2-inch diameter-classes (i.e., 1.0 to 2.9, 3.0 to 4.9, etc.). Two striking features are brought out: (1) the great preponderance of the trees in the 2-inch class, and (2) the relative scarcity of trees in the 10-inch and larger classes, from which the higher-priced commodities are generally produced. Of the pines, there are about 9 times as many 2-inch trees as 10-inch ones; and of the hardwoods, there are about 25 times as many. Of course, many of the trees in the 2-inch class will die before they reach maturity, as the result of fire, overcrowding, and other causes, but with fire protection a much larger number will live to increase eventually the stocking of the larger trees.

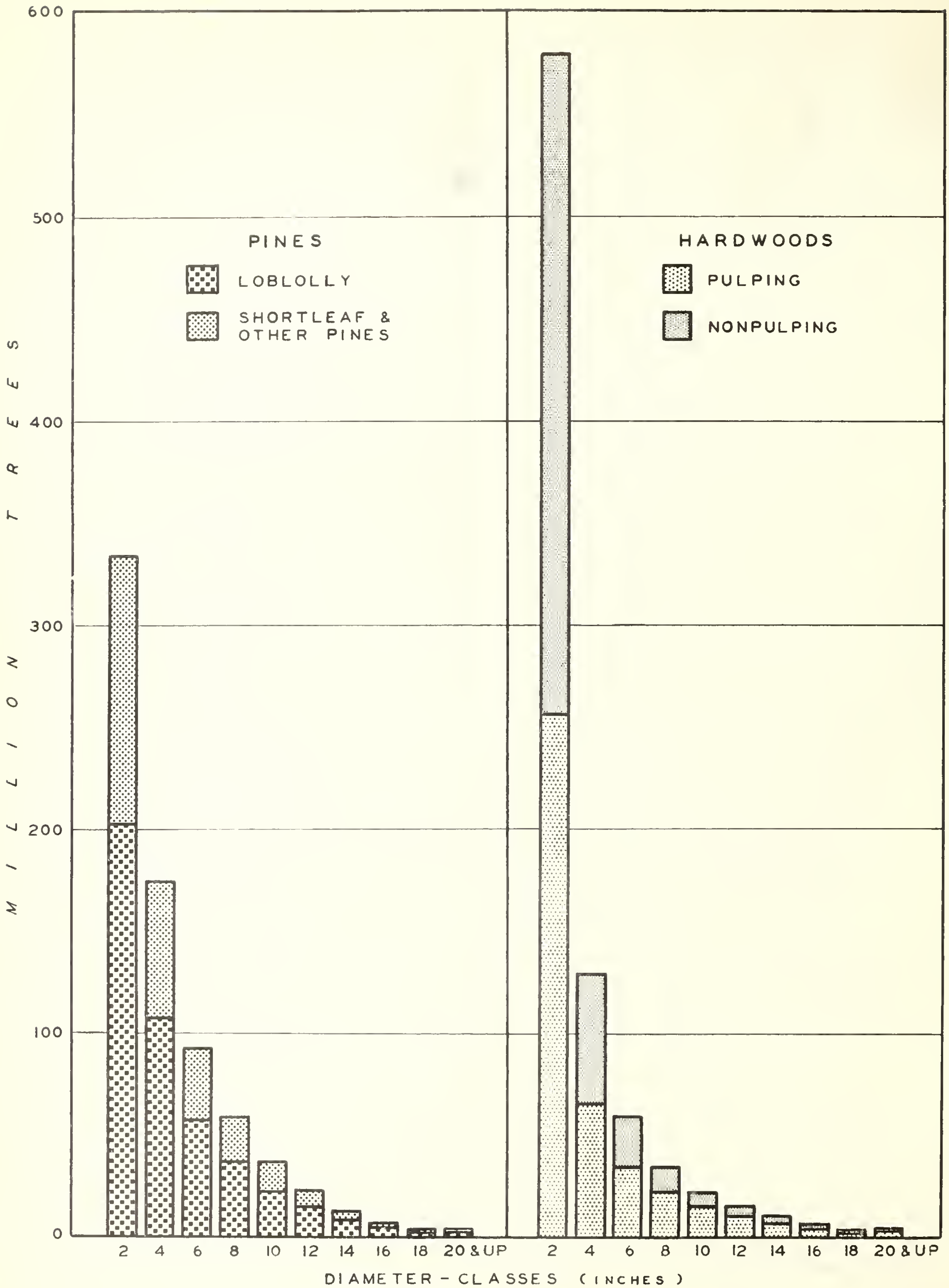

FIGURE 3 - STAND DIAGRAMS.

The stands of this area are somewhat uneven-aged, and probably will tend to become more so as the stock is built up by additional recruits following efficient fire protection. Therefore, good management policy for cutting should be based largely upon selective logging. Light cuttings should be the rule and should be as frequent as the rate of growth and economic conditions will permit. Cutting should not be restricted to certain diameter-classes, but should be made so as to give the best possible distribution of size-classes in all parts of the stands. Selective logging should aim to increase the proportion of volume in the larger trees, which yield quality material and high monetary returns.

Volume Estimates

Saw-timber volumes

The net volume of saw timber in the central Georgia unit is more than $9\frac{1}{2}$ billion board feet, according to the Doyle rule (the rule in general use in the South), or over $15\frac{1}{2}$ billion board feet, as measured by the International $\frac{1}{4}$-inch rule, which closely approximates green lumber tally (table 6). Pines and cypress included in this estimate are at least 9.0 inches d.b.h., and hardwoods are at least 13.0 inches; and all trees have at least 50 percent of their gross volume in sound material, or contain at least one 12-foot butt log. Top diameters vary with the prevailing usable limits, but no pine logs less than 5.5 inches in diameter, inside bark, and no hardwood logs less than 8.5 inches are included. All figures are net, deductions having been made for both woods and mill cull, that is, portions of the tree which cannot be manufactured into lumber on account of fire scars, rot, sweep, crooks, bad knots, or other defects. Loblolly pine makes up 51 percent of the volume, green lumber tally; shortleaf pine, 14 percent; longleaf and other pines, 6 percent; and all hardwoods combined, 29 percent.

Table 6. - Net board-foot volume of saw timber expressed in Doyle scale and in green lumber tally 1/ (1936)

Species	Doyle scale	Green lumber tally	Species	Doyle scale	Green lumber tally
	- - M board feet - -			- - M board feet - -	
Pines:			Hardwoods:		
Loblolly	4,762,100	7,954,400	Red gum	767,400	1,087,300
Shortleaf	1,139,500	2,153,400	Black & tupelo gums	658,900	929,700
Longleaf	467,700	808,500	Yellow poplar	475,100	666,300
Other	83,200	120,100	Red oaks	510,100	654,800
			White oaks	207,600	273,400
Total pine	6,452,500	11,036,400	Ash	72,400	107,200
Hardwoods	3,229,500	4,515,500	Other hardwoods 2/	538,000	796,800
Total all species	9,682,000	15,551,900	Total hardwoods	3,229,500	4,515,500

1/ Green lumber tally is based on the International $\frac{1}{4}$-inch rule, which it closely approximates.
2/ Includes a small quantity of cypress.

Table 7, which gives the volume by conditions, shows that almost four-fifths of the saw-timber volume is in the second-growth stands, while only one-fifth is in old growth. Owing to the good network of highways and country roads and the mobile logging equipment used, practically all the saw-timber stands are physically accessible for logging. The saw-timber stands, according to the Survey classification, averaged 4,500 board feet per acre, ranging from a minimum of 400 board feet per acre to as much as 10,000.

Table 7. - Net board-foot volume (green lumber tally, based on International $\frac{1}{4}$-inch rule) in the various forest conditions, 1936

Species-group	Old growth		Second growth			Total	Percent of total
	Uncut	Partly cut	Sawlog size		Under sawlog size 1/		
			Uncut	Partly cut			
	- - - - - - - - - -	Thousand board feet	- - - - - - - - - -				
Pines:							
Loblolly	651,400	338,400	4,771,300	1,931,700	261,600	7,954,400	51.2
Shortleaf	147,700	74,700	1,179,000	685,900	66,100	2,153,400	13.8
Longleaf & other 2/	122,100	135,900	440,300	179,600	50,700	928,600	6.0
Total pines	921,200	549,000	6,390,600	2,797,200	378,400	11,036,400	71.0
Hardwoods:							
Red gum	231,400	161,800	409,600	258,700	25,800	1,087,300	7.0
Black and tupelo gums	247,900	205,000	275,700	189,700	11,400	929,700	6.0
Yellow poplar	153,800	62,800	267,600	174,200	7,900	666,300	4.3
Oaks 3/	227,100	146,600	319,300	213,700	21,500	928,200	5.9
Other hdwds. 4/	232,000	191,500	300,500	159,400	20,600	904,000	5.8
Total hardwoods	1,092,200	767,700	1,572,700	995,700	87,200	4,515,500	29.0
Total all species	2,013,400	1,316,700	7,963,300	3,792,900	465,600	15,551,900	100.0
Percent of total	12.9	8.5	51.2	24.4	3.0	100.0	

1/ Mainly in residual sawlog-size trees. Includes 20,600 M board feet in the reproduction and clear-cut conditions.
2/ Includes slash pine, spruce pine, pond pine, and cedar.
3/ Includes 273,400 M board feet in white oaks, of which 54 percent is in high-grade species such as forked leaf and cow oak.
4/ Includes a small amount of cypress.

Figure 4 shows the proportional area and volume per acre of various saw-timber stands in the combined pine and pine-hardwood types (longleaf and slash pine types omitted), which occupy about $2\frac{1}{4}$ million acres. The proportions are based on gross volumes, no deductions having been made for woods cull. Stands that have less than 2,000 board feet per acre occupy 26 percent of the area but contain only 7 percent of the volume; and, conversely, stands that have 2,000 board feet or more per acre cover 74 percent of the area and contain 93 percent of the volume.

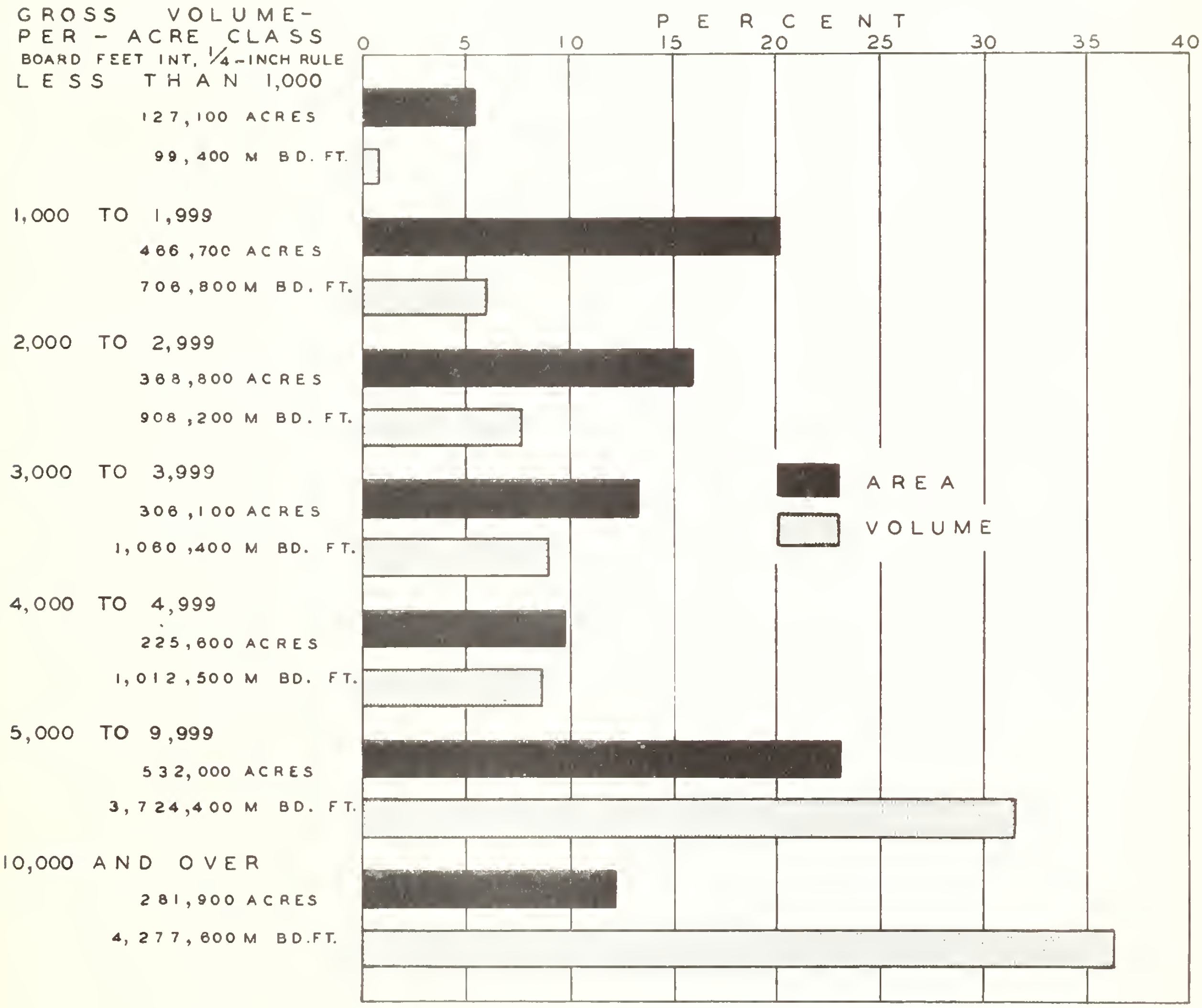

FIGURE 4 - PROPORTIONAL AREA AND VOLUME OF THE SAWLOG-SIZE CONDITIONS IN THE PINE AND PINE-HARDWOOD TYPES*, CLASSIFIED ACCORDING TO VOLUME OF SAW TIMBER PER ACRE.

* EXCLUDING LONGLEAF AND SLASH PINE TYPES.

An important point to be remembered about the forest resources is that 40 percent of the pine saw-timber volume (table 8) is made up of pines generally considered small by lumber manufacturers (i.e., trees 9.0 to 12.9 inches d.b.h.) and that 59 percent of the hardwood volume comes from "small" hardwoods (i.e., trees 13.0 to 18.9 inches d.b.h.).

Table 8. - Diameter distribution of net board-foot volume (green lumber tally, based on International ¼-inch rule) in the various forest conditions, 1936

Species-group and diameter-class in inches	Old growth		Second growth			Total	Percent of total
	Uncut	Partly cut	Sawlog size		Under sawlog size 1/		
			Uncut	Partly cut			
	- - - - - - - - -		Thousand board feet	- - - - - - - - - -			
Pines:							
10 - 12	102,700	79,200	2,560,300	1,379,200	319,800	4,441,200	40.2
14 - 16	191,900	139,400	2,246,600	874,100	50,800	3,502,800	31.7
18 - 20	237,200	132,200	1,111,700	396,100	5,600	1,882,800	17.1
22 and over	389,400	198,200	472,000	147,800	2,200	1,209,600	11.0
Total pines	921,200	549,000	6,390,600	2,797,200	378,400	11,036,400	100.0
Hardwoods:							
2/14 - 18	484,200	372,200	1,029,300	706,700	81,400	2,673,800	59.2
20 - 28	527,000	331,800	513,800	280,900	5,800	1,659,300	36.8
30 and over	81,000	63,700	29,600	8,100	-	182,400	4.0
Total hardwoods	1,092,200	767,700	1,572,700	995,700	87,200	4,515,500	100.0

1/ Includes 20,600 M board feet in the reproduction and clear-cut conditions..
2/ Includes cypress in the 10- and 12-inch classes.

In central Georgia much of the saw-timber volume is in old-field stands, with trees too widely spaced to grow good-quality sawlogs. The Forest Survey made a rough classification of the pine saw-timber trees into "smooth," "limby," and "rough." As shown by table 9, 48 percent of the pine saw-timber volume is in smooth trees, 45 percent is in limby trees, and 7 percent is in rough trees. As a general rule, pine trees in the old-growth stands are generally far superior in saw-timber quality to those in second-growth stands. Also, considerable difference can be noticed among the pine species; loblolly pine trees are generally the limbiest, while longleaf pines, which are seldom found in old-field stands, are the smoothest.

Table 9. - Classification of pine saw-timber quality

Species and stand condition	Tree grade[1]			Total
	Smooth	Limby	Rough	
	Percent of volume			
Loblolly pine:				
Old growth	76	23	1	100
Second growth	28	60	12	100
Weighted average	41	50	9	100
Shortleaf pine:				
Old growth	74	25	1	100
Second growth	39	53	8	100
Weighted average	54	41	5	100
Longleaf pine:				
Old growth	95	5	-	100
Second growth	45	49	6	100
Weighted average	67	30	3	100
All pines:				
Old growth	79	20	1	100
Second growth	32	58	10	100
Weighted average	48	45	7	100

1/ Smooth trees have 20 feet or more of clear length and also at least 50 percent of their total usable length practically free of limbs and indications of knots; limby trees have at least 12 feet of clear length and 30 to 49 percent of their total usable length practically free of limbs and indications of knots; rough trees have less than 12 feet of clear length, or less than 30 percent of their total usable length practically free of limbs and knots.

Cordwood volume

Because of the rapid expansion of the pulp and paper industry in the Southeast, it is of interest to consider the forest growing stock from the standpoint of supplies of pulping material. The total net volume of usable cordwood, including the saw-timber material previously described, in both sound and cull trees 5.0 inches d.b.h. and larger, is slightly more than 76 million standard cords (4 x 4 x 8 feet, bark included), almost equally divided between pine and hardwoods (table 10). Of the 38 million cords of hardwoods, 25 million are in "pulping hardwoods" such as the gums, yellow poplar, and maple. At the present time, however, the pulpwood industry in the Lower South uses primarily pine, which in central Georgia amounts to nearly 38 million cords.

Four sources of cordwood material are shown in table 10. The sawlog material includes only the sawlog portions of saw-timber trees (same material as that given previously in board feet in tables 6, 7, and 8), while the remaining usable portion of the trees (i.e., the upper stems of pines and the tops and limbs of hardwoods), taken to a variable minimum-diameter but not less than 4 inches, is shown under "upper stems of sawlog-size trees." In the volume of "sound trees under sawlog size," the full stems only (without limbs) are included up to a variable minimum-diameter but not less than 4 inches. Under "cull trees" only the usable sound portion in such trees is included. Scrub oaks are classed as nonpulping hardwood culls.

Table 10. - Net volume in various classes of sound material, 1936

Species-group	Sound trees sawlog size		Sound trees under sawlog size	Sound and rotten cull trees	Total all classes	Proportion of total
	Sawlog material	Upper stems				
	Cords					Percent
Pines	24,123,400	3,447,400	9,611,400	521,400	37,703,600	49.5
Hardwoods:						
Pulping 1/	7,812,000	4,254,800	9,352,800	3,816,000	25,235,600	33.2
Nonpulping 2/	3,659,700	2,139,900	4,325,000	3,064,200	13,188,800	17.3
Total hdwds.	11,471,700	6,394,700	13,677,800	6,880,200	38,424,400	50.5
Total all species	35,595,100	9,842,100	23,289,200	7,401,600	76,128,000	100.0
Percent of total	46.8	12.9	30.6	9.7	100.0	

1/ Basswood, bay, box elder, cottonwood, cypress, gum, magnolia, maple, willow, yellow poplar, etc.
2/ Ash, beech, birch, cherry, dogwood, elm, hackberry, hickory, locust, mulberry, oak, persimmon, sycamore, walnut, etc., are not considered as pulping material at present.

Figure 5 shows the cordwood volume of pulping and nonpulping species by size-classes, sound trees only. Approximately 26 percent of the pine volume is in trees less than 9 inches d.b.h., the minimum for sawlog-size pine trees; and 43 percent of the hardwood volume is in trees less than 13 inches d.b.h., the minimum for sawlog-size hardwoods.

In this report, cull trees and the tops and limbs of sawlog-size hardwoods are not considered as a part of the "growing-stock" resources on which growth and drain are computed. Of the total cordwood volume--76 million cords—approximately 62 million cords are growing-stock material: 39 million cords of this are in saw-timber trees and 23 million cords are in sound trees under sawlog size. It should be remembered, however, that this growing-stock volume should not be considered as available for cutting; only the equivalent of the net increment is the amount that can be cut without injuriously reducing the growing stock. Also, the competitive demand for saw timber and the present larger stumpage value for lumber, poles, and piles indicates the advantage of holding, wherever possible, a part of the increment of the smaller-tree growing stock for future uses. In addition to the increment of the sound-tree growing stock, there are almost 7½ million cords of usable wood in cull trees, which if removed would make available more room for the growth of desirable trees and the establishment of the seedlings necessary to secure a continuous succession of forest crops. Cull trees of pulping species alone (pine and hardwood) contain over 4 million cords of sound wood.

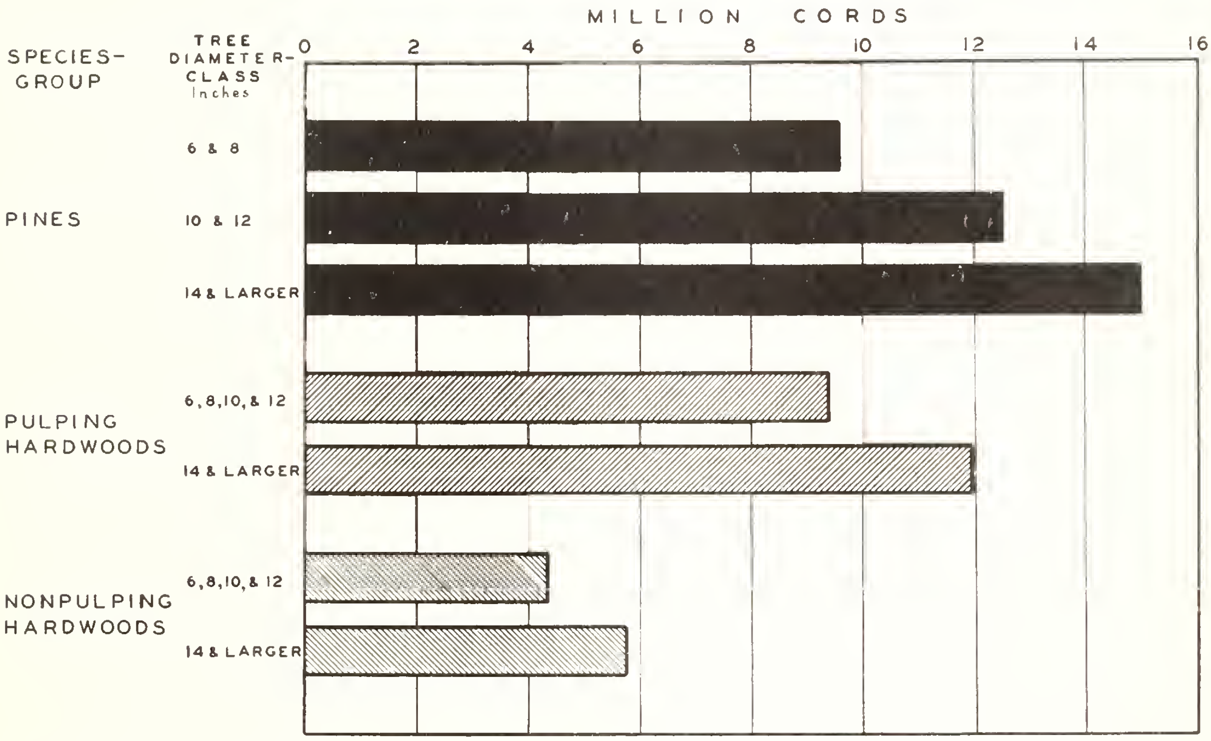

FIGURE 5 - CORDWOOD VOLUMES OF PULPING AND NONPULPING SPECIES BY SIZE-CLASSES, SOUND TREES ONLY.

The average per-acre volume of the growing stock for the entire forest (all species) is more than 11 cords; for the bottom-land hardwood type-group, more than 18 cords; and for the pine type-group, 11 cords (table 11). The heaviest volumes are in the old-growth uncut stands; but the second-growth sawlog-size stands, including those partly cut, have an average of more than 10 cords per acre for each of the forest type-groups.

Table 11. - Average per acre, cordwood volume of sound trees, including bark, 1936

Type-group	Old growth: Uncut	Old growth: Partly cut	Second growth: Sawlog size: Uncut	Second growth: Sawlog size: Partly cut	Second growth: Under saw-log size	All conditions 1/
	- - - - - - - - - - -	-	-	Cords per acre	-	- - - - - - - - - - - - -
Pine	37.3	17.0	18.4	10.9	3.7	11.2
Pine-hardwood	37.3	19.8	18.6	13.0	2.8	9.5
Upland hardwood	17.2	14.9	12.7	10.5	1.9	6.9
Bottom-land hardwood	30.1	20.9	22.4	16.1	7.2	18.3
All types (weighted averages)	29.3	18.9	18.4	11.9	3.5	11.2

1/ Includes areas of reproduction and clear-cut forest conditions.

Poles and piles

The forests of central Georgia contain over 11 million trees suitable for conversion into poles or piles. These trees have been included in the preceding volume inventories, but a special pole and pile inventory was made, based upon the specifications of the American Standards Association. Approximately 92 percent of the trees classed as potential poles or piles will yield pieces 20 to 35 feet long. Slightly more than 25 percent of the pieces are in trees 7.0 to 8.9 inches d.b.h. and probably would be useful chiefly in rural electric or telephone lines, while the majority (about 71 percent) are in trees 9.0 to 14.9 inches, the size of trees usually converted to poles and piles. As a general rule, the trees suitable for poles and piles occur singly or in groups, scattered throughout the forest, usually in the densest stands, where crowding has reduced limbs to a minimum. Owing to the difficulty of judging pole and pile material in standing trees, the estimate of the number of pieces of the various lengths, as shown in table 12, may not be entirely accurate; but the estimate of the relative proportions of the pieces of the various lengths should be fairly reliable.

Table 12. - Total number of pine poles or piles classified according to length and diameter

D.B.H. of trees (outside bark)	Pole or pile length (feet)						Total	Proportion of total
	20	25	30	35	40	45 and over		
Inches	Thousand pieces							Percent
7.0 - 8.9	1,639	860	335	33	-	-	2,867	25.4
9.0 - 10.9	1,659	1,225	813	288	147	-	4,132	36.5
11.0 - 12.9	743	689	595	331	185	127	2,670	23.6
13.0 - 14.9	194	274	238	227	127	151	1,211	10.7
15.0 and up	-	73	103	94	70	84	424	3.8
Total	4,235	3,121	2,084	973	529	362	11,304	100.0
Percent of total	37.5	27.6	18.4	8.6	4.7	3.2	100.0	

Forest Increment

The net annual forest increment is the volume added by growth to the individual trees, plus the merchantable volume newly created by small trees developing into merchantable sizes, and minus the losses due to mortality. This net increment of the forest volume represents, in a general way, the amount which could be cut for industrial and domestic consumption without reducing the total volume of the growing stock or forest capital.

In 1936, the net increment, before deducting the commodity drain for the year, amounted to slightly more than a billion board feet, green lumber tally, or more than 263 million cubic feet of wood, bark excluded (table 13). The increment given in board feet is for the saw-timber material only, while that given in cubic feet or cords includes the increment on the total usable lengths of all pines above 5.0 inches d.b.h., under-sawlog-size hardwoods above 5.0 inches d.b.h, and the saw-timber portion of hardwoods 13.0 inches d.b.h. and larger. No calculations of increment were made for cull trees, or for the upper stems of hardwoods.

Of the total net saw-timber increment, second-growth stands account for 93 percent; old growth, for only 7 percent. Since second-growth timber here ordinarily lacks the quality for lumber characteristic of old-growth trees, the fact that most of the net increment is in the second-growth stands should be considered whenever planning for new forest industries or for an expansion in this area of wood-products plants. Approximately four-fifths of the increment of saw-timber material is in pines; one-fifth, in hardwoods.

Table 13. - Net increment in board feet, green lumber tally, and cubic feet in the various forest conditions, 1936

Forest condition	Saw-timber material			All material		
	Pine	Hardwood	Total	Pine	Hardwood	Total
	Thousand board feet			Thousand cubic feet		
Old growth	13,700	61,400	75,100	2,300	15,680	17,980
Second growth:						
Sawlog size	558,200	137,600	695,800	99,680	47,050	146,730
Under sawlog size	274,500	25,400	299,900	81,030	17,090	98,120
Reproduction and clear-cut	1,000	100	1,100	280	190	470
Total all conditions	847,400	224,500	1,071,900	183,290	80,010	263,300

Table 14 shows the net increment expressed in standard cords (4 x 4 x 8 feet). This material is identical with that given in cubic feet in table 13, except that bark is included in the latter. The hardwood component of the increment in old-growth stands is greater than the pine, while in the second-growth stands the reverse is true. It is roughly estimated that two-thirds of the hardwood increment shown in cords is in pulping hardwoods.

Table 14. - Net increment in cords classified according to forest condition, 1936

Forest condition	Pines	Hardwoods	Total
	Cords		
Old growth	29,900	234,000	263,900
Second-growth, sawlog size	1,310,400	717,900	2,028,300
Second-growth, under sawlog size	1,114,800	269,000	1,383,800
Reproduction and clear-cut	3,800	2,900	6,700
Total	2,458,900	1,223,800	3,682,700

The average increment per acre in 1936, assuming that the stands were not influenced by cutting, was 195 board feet of saw timber; for all growing-stock material (saw-timber and other volume combined) in trees 5.0 inches d.b.h. and larger, it was two-thirds of a cord (table 15). These increment figures are unusually high and compare very favorably with those in other Forest Survey units. The greatest average annual increment occurs in the uncut, second-growth, sawlog-size stands.

Table 15. - Average increment per acre in 1936 in the various forest conditions (uninfluenced by cutting)

Forest condition	Pine component			Hardwood component			Total per acre		
	Bd.ft.	Cu.ft.	Cords	Bd.ft.	Cu.ft.	Cords	Bd.ft.	Cu.ft.	Cords
Old growth:									
Uncut	44	7.2	.09	177	39.8	.60	221	47.0	.69
Partly cut	19	3.6	.05	97	29.3	.43	116	32.9	.48
Second growth:									
Sawlog size:									
Uncut	261	46.9	.62	53	18.5	.28	314	65.4	.90
Partly cut	118	20.6	.27	43	14.3	.22	161	34.9	.49
Under sawlog size	144	42.6	.59	13	9.0	.14	157	51.6	.73
Reproduction and clear-cut	3	.8	.01	negl.	.6	.01	3	1.4	.02
Weighted averages	154	33.3	.45	41	14.5	.22	195	47.8	.67

Forest Industries

As previously pointed out, most of the original timber was cut in the early days to clear the land for agriculture at a time when practically no markets for forest products were accessible. About 1913, however, the rapidly developing stands of young timber on the old abandoned fields, together with the remaining original-growth timber, attracted a large number of small sawmills, chiefly from the Carolinas. Probably the peak of lumber production was reached about 1924, when there seemed to be a small sawmill in every patch of timber. During 1920-25, when the boll-weevil almost completely destroyed the cotton crops, many landowners were saved from financial ruin by selling their timber. Generally, however, the timber was converted into low-grade lumber, which sold at a low price, and consequently the net return to the landowners for stumpage was relatively small.

In 1936 when pine stumpage brought about $2.00 per thousand board feet, many small sawmills had moved elsewhere, but 533 remained, only 17 of which had a capacity of 20,000 board feet or more per 10-hour day (fig. 6 and table 16). While these mills in 1936 produced an average of only 840,000 board feet per mill, the total lumber manufactured by them from logs originating both within and without the unit, was 445 million board feet. Central Georgia produced 46 percent of the lumber cut in the entire State in 1936. Although its cut that year was 26 percent greater than for 1935 and was probably larger than for any of the previous 5 years, it could be considerably increased if market conditions warranted. Many of the sawmills are farmer owned and therefore are operated for only short periods between crop seasons. The majority of the small sawmills specialize in cutting pine "roofers" (i.e., ungraded 1-inch boards), many of which are shipped to markets in the northern and central States. As a general rule, the operations of the small sawmills are wasteful, both in the woods and at the mill, and they seldom leave standing any saw-timber trees. Approximately two-thirds of all the hardwood lumber is cut by mills that have a capacity of at least 20 thousand board feet per day.

All sawmills combined furnished 1,420,000 man-days (10 hours each) of employment in 1936. Because of the transient character of the little mills and their irregular part-time operation, it is difficult to estimate accurately the number of people actually employed full or part time, but it is believed that in 1936 about 15,000 workers were employed (mostly part time) by the lumber industry in central Georgia.

Table 16. - Number of sawmills, amount of lumber cut, and man-days of employment in mills of various sizes, 1936

Daily (10-hrs.) rated capacity	Number of sawmills	Lumber cut			Man-days of employment
		Pine	Hardwood	Total	
Thousand board feet		Thousand board feet			Thousand man-days
Under 20	516	303,400	24,400	327,800	1,017
20 - 39	11	39,500	30,000	69,500	229
40 - 79	6	18,500	29,300	47,800	174
80 and over	-	-	-	-	-
Total	533	361,400	83,700	445,100	1,420

In addition to the large number of sawmills in the unit, in 1936 there were 10 veneer mills, 2 treating plants, 5 dimension mills, and 3 small miscellaneous plants. Also there were about 8 gum naval stores plants producing turpentine and rosin from longleaf and slash pine trees. All forest industries combined furnished, in central Georgia, nearly 3 million man-days (table 17), which is equivalent to the regular employment of almost 15,000 men for 200 days a year. Since the harvesting, transportation, and manufacture of forest products is to a large degree a part-time occupation, it is difficult to translate man-days of labor required into number of people actually employed, but it is probable that about 30,000 people were employed in forests and mills full or part time during the year. Table 17 gives the production by the various industries from the raw material, which was taken mostly from this survey unit but partly from adjoining units. All the products are commercial except the fuel wood and fence posts, which are generally cut by farmers for their own use.

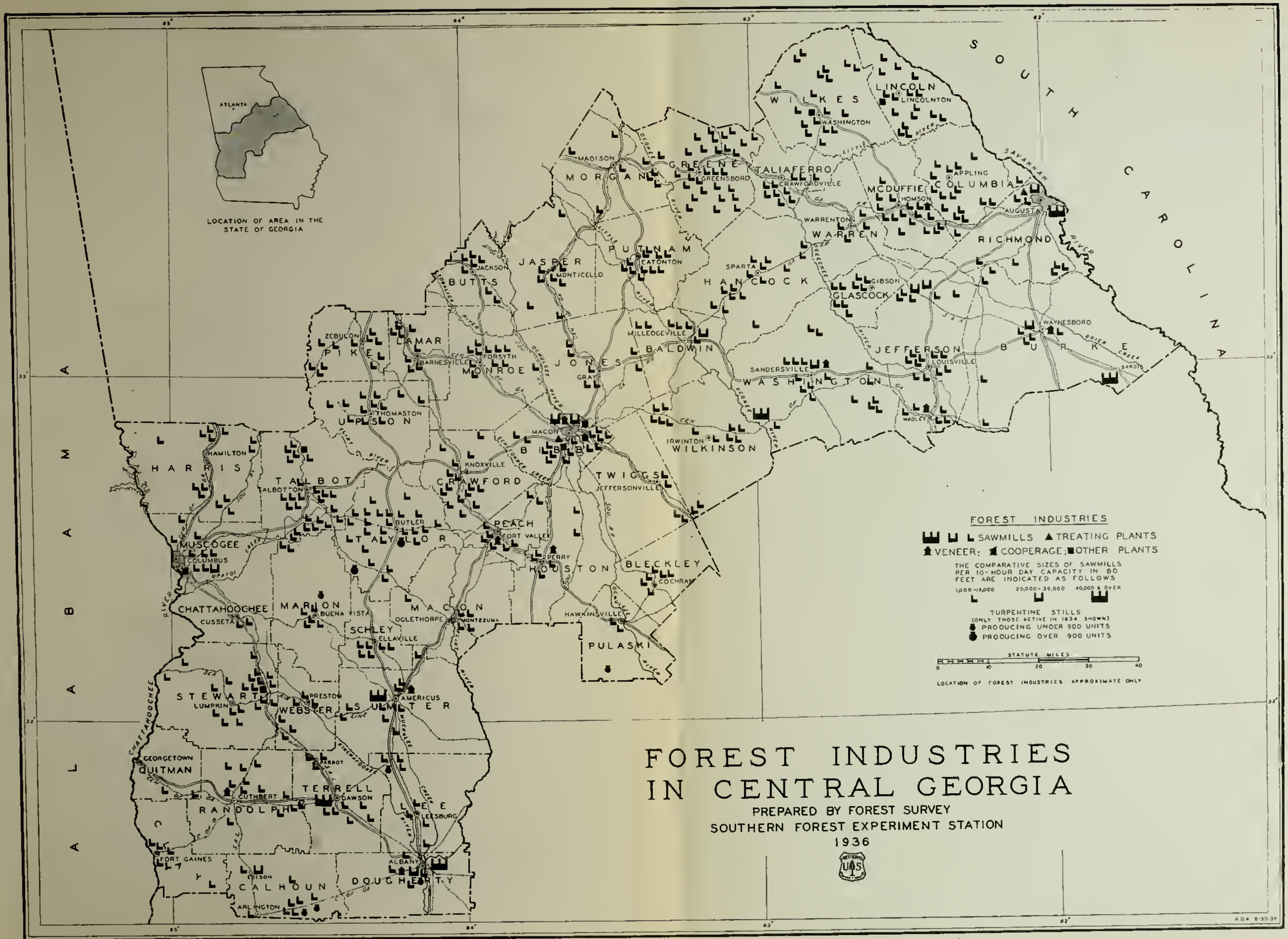

FIGURE 6 - FOREST INDUSTRIES MAP.

Table 17. Wood-products production and employment, 1936

Kind of plant or commodity	Units produced	Employment		
		In woods	At plants	Total
		- - Thousand man-days (10 hrs.) - -		
	M bd. ft.			
Lumber	445,100	479	941	1,420
Veneer	23,500	41	54	95
	M pieces			
Cross ties	113	15	-	15
Poles and piles	4	1	-	1
Fence posts	5,179	64	-	64
	Naval stores units			
Naval stores	2/ 4,980	71	4	75
	Cords			
Fuel wood	1,032,700	1,210	-	1,210
Miscellaneous (cooperage, treating plants1/, etc.).	7,100	28	36	64
Total		1,909	1,035	2,944

1/ For the treating plant only labor at the plant is included.
2/ A unit is made up of one 50-gallon barrel of turpentine and three and one-third 500-pound (gross) barrels of rosin.

Commodity Drain from the Growing Stock

The commodity drain in 1936 from saw-timber material amounted to 541 million board feet (table 18); while the net increment (as previously pointed out in table 13) was 1,072 million board feet of saw-timber material, after deducting mortality. This drain from the forest growing stock also includes logs cut for mills outside the unit, and the sound, usable material wasted in logging. The volumes removed from sound trees under sawlog size are not included in the saw-timber drain.

Lumber represented 84 percent of the commodity drain from saw-timber material; fuel wood, 6 percent; veneer, 5 percent; and all other commodities, 5 percent. More than three-fourths of all the saw-timber drain came from the pine component of the growing stock; less than one-fourth from the hardwood.

In 1936, the commodity drain from the total growing stock (i.e., trees 5-inches d.b.h. and larger, saw-timber and other material combined) amounted to about 131 million cubic feet, inside bark, or about 1-3/4 million cords of wood, bark included. These volumes include drain of saw-timber material, upper stems of sawlog-size pines, and small trees below sawlog size but at least 5.0 inches d.b.h. Dead trees, cull trees, and the upper stems and limbs of hardwoods are not included. Lumber accounts for approximately 63 percent of the drain from the total growing stock, fuel wood for 27 percent, and all other commodities for 10 percent. At this time pulp mills had not started to use wood from this area. The total commodity drain against the sound-tree growing stock is itemized in table 18 and allocated to the commodities for which the trees were cut.

Table 18. - Commodity drain from the sound-tree growing stock, 1936

Reason for drain	From saw-timber material			From all growing-stock material
	Species-group		Total	
	Pines	Hardwoods 1/		
	M board feet (green lumber tally)			M cu. ft. (i.b.)
Lumber	368,200	85,600	453,800	82,520
Cross ties	3,600	2,800	6,400	1,110
Poles and piles	400	negl.	400	70
Veneer	2,000	27,000	29,000	4,180
Fuel wood	30,300	negl.	30,300	34,920
Fence posts	600	1,200	1,800	1,860
Miscellaneous	1,200	3,100	4,300	900
Land clearing 2/	11,100	4,300	15,400	5,110
Total	417,400	124,000	541,400	130,670

1/ Includes cypress.
2/ Includes domestic farm use.

Comparison of Increment and Drain

In 1936 the growing stock of saw-timber material increased more than 3 percent as the result of the excess of growth over drain and mortality (table 19). The net increment of the saw-timber growing stock, after deductions had been made for mortality, was approximately twice the commodity drain, with the result that there was an excess increment of 430 million board feet of pine and 101 million board feet of hardwood, a total for all species of 531 million board feet (fig. 7).

Table 19. - Balance between increment and drain of saw-timber material, 1936

Item	Pine	Hardwood	Total
	Thousand board feet (Int. $\frac{1}{4}$-inch rule)		
Net growing stock, Jan. 1, 1936	11,036,400	4,515,500	15,551,900
Growth, 1936	948,800	265,700	1,214,500
Mortality, 1936	101,400	41,200	142,600
Net increment, 1936	847,400	224,500	1,071,900
Commodity drain, 1936	417,400	124,000	541,400
Net change in growing stock, 1936	430,000	100,500	530,500
Net growing stock, Jan. 1, 1937	11,466,400	4,616,000	16,082,400

In 1936, for all growing-stock material (i.e., all sound trees 5 inches d.b.h. and larger), there was a net increase of 133 million cubic feet of wood, inside bark, all species combined, after deducting a mortality of 53 million and a cut of 131 million cubic feet (table 20). The net increase in pines alone was almost 85 million cubic feet of wood, equivalent to 1,167,000 cords of wood including bark. The 48 million cubic feet of hardwood net increase in equivalent to about 773,000 cords, of which 500,000 cords are roughly estimated to be in pulping hardwoods.

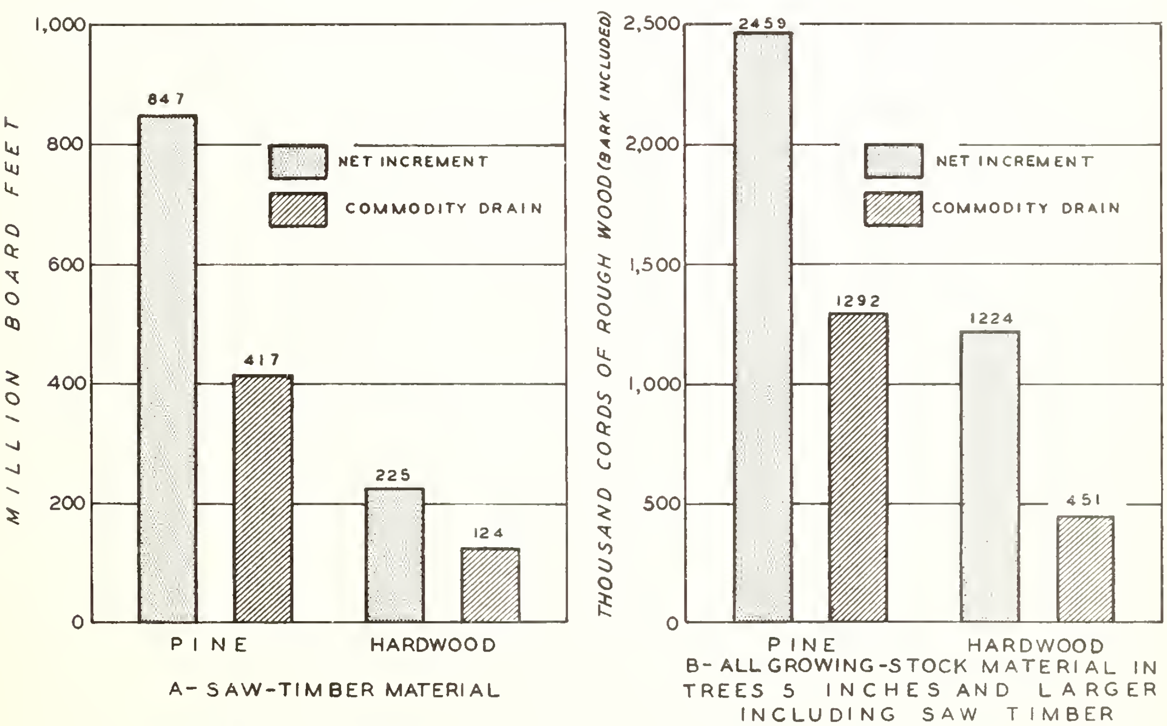

FIGURE 7 - COMPARISON OF NET INCREMENT WITH COMMODITY DRAIN, 1936.

Table 20. - Balance between net increment and drain in cubic feet, saw-timber and non-saw-timber material combined, 1936

Item	Pine	Hardwood	Total
	Thousand cubic feet (i.b.)		
Net growing stock, Jan. 1, 1936	2,818,900	1,656,140	4,475,040
Growth, 1936	213,290	102,530	315,820
Mortality, 1936	30,000	22,520	52,520
Net increment, 1936	183,290	80,010	263,300
Commodity drain, 1936	98,320	32,350	130,670
Net change in growing stock, 1936	84,970	47,660	132,630
Net growing stock, Jan. 1, 1937	2,903,870	1,703,800	4,607,670

Review of the Forest Situation

In many parts of the area covered by this report, agriculture has been declining for several decades. Thousands of farms have been abandoned, and thousands of families have had to give up their efforts to make a living from the soil, the fertility of which has been depleted through erosion. The decline in the production of cash crops, of which cotton is chief, has reduced both incomes and standards of living and has brought about a serious maladjustment in land use with a consequent instability in land ownership. More immediately, the situation has reduced greatly the opportunity of the people for gainful employment. The special unemployment census taken in November 1937 disclosed that in this Survey unit there were 43,000 people either unemployed and wanting work, or on relief, and 24,000 partially employed and wanting more work. It is imperative, therefore, that idle acres and idle hands be put back to work. In the final analysis, remedial action must come as a result of a fuller development and use of local natural resources. A shift in agriculture from those cash crops that are no longer profitable to new crops that promise better returns to the tiller of the soil, a change in use of some of the present agricultural land from row crops to forage crops that will hold the soil in place and build up its fertility, and an expansion of livestock production—all these are necessary to improve the situation. The problem cannot be solved completely in this manner alone, however; some large source of employment for land and people other than agriculture must be developed.

Chief among the natural resources of central Georgia is its timber resource which has not been developed and put to its fullest use. In 1936 the net forest increment was approximately twice the drain against it from all sources. This favorable balance offers an opportunity to expand considerably the industries and activities based upon the raw material from the forests.

This section of the State is located favorably for the production of hydro-electric power; it has an adequate supply of suitable resident labor; and it is well located in regard to transportation facilities and the consuming markets of the East.

Not only should the present forest resources of central Georgia be utilized to the fullest extent justified under the principle of sustained yield, but the basic growing stock should be given that care and protection and that degree of thrifty management that will, as time goes on, increase its sustained-yield possibilities far in excess of the present yields. The favorable natural conditions justify the belief that the usable annual output of raw material in the form of increment eventually could be doubled under good forest management, which includes increasing the quantity and quality of the growing stock through fire protection, thinnings, improvement cuttings, selective logging, and integrated utilization.

In 1936 central Georgia had 533 sawmills (mostly in the small transient class), 10 veneer mills, and a number of other wood-products plants (most of which were small), but these plants and mills furnished neither sufficient employment to meet the needs of the people nor an adequate and sufficiently integrated market for the total present yield of the forest.

The forest is predominantly second growth, and a considerable part of the timber volume is found in old-field stands, in which many of the trees of sawlog size are often so limby and rough that they produce mainly low-grade lumber or are unsuited entirely for lumber production; in fact the Forest Survey found 52 percent of the pine saw-timber volume in central Georgia to be in limby and rough trees. This tends to limit its suitability for lumber, and consequently an outlet is needed for low-grade forest materials, both hardwood and pine.

Approximately half the area of central Georgia is within practicable rail-haul (i.e., within 150 miles) from pulp and paper mills already established at Savannah and Brunswick, Georgia; Canton and Sylva, North Carolina; and Fernandina, Jacksonville, Port St. Joe, and Panama City, Florida; prospects, therefore, for an adequate pulpwood market for the low-grade material in this part of the area are considered good. For the remaining half of the area there is at present no such market. Based on the comparison of growth and drain in 1936, in pine species alone there is an indicated annual excess of pine increment of more than a half million cords within this unit, not tributary to any existing pulp mill. Other factors being favorable, this supply of raw material should be sufficient to justify the location of a pulp mill within the unit. A pulp mill, of average size, would involve an investment of perhaps six million dollars and would provide annually about the same number of man-days of employment as does the cultivation and harvesting of 40,000 acres of cotton. The wages paid for mill and woods work usually average about three times those derived from work in the cotton fields.

Deficiencies in the present forest

When adequate and profitable markets for all forest commodities are available, landowners will have a keen incentive for growing timber. The present forest which has developed in spite of man's indifference, contain stands so poorly stocked as to number and quality of trees that usable volume is less than half what it could be under management. After many years of harvesting the larger and more valuable trees in the growing stock, the remaining stands are composed chiefly of small trees 2 to 10 inches d.b.h., as shown in figure 3. Because of a high percentage of old-field pine stands, about half the pine saw-timber volume is at present in rough and limby trees that will yield mainly low-grade lumber.

Fire is the most important factor militating against the development of well-stocked stands. Uncontrolled forest fires have for years swept through the woods, killing the small trees that are needed to recruit the growing stock as well as injuring or killing many of the larger trees. While some of the fires originate from carelessness, many of them are purposely and systematically set.

There are almost 7½ million cords of wood in cull trees (mainly hardwoods) that should be removed in order to improve the quality and growing conditions of the stands. A large amount of wood in the tops, stems, and limbs of trees left in the forest when trees are cut could be utilized for pulp and fuel wood; this not only would add considerably to the volume of raw material available for manufacture but also would reduce the fire hazard in cut-over stands.

Measures for improvement

The forest resource is owned by thousands of individuals (almost 60% of the forest area is in the woodlands on the 64,000 farms in the unit) with varying financial limitations, and the problem of obtaining a widespread acceptance of good forestry practices, such as fire protection, stand improvement, and careful utilization, will require time and well-organized action. It will be necessary to educate landowners, wood consumers, and the general public to the value of these measures and to understand and accept their applications in practice.

In addition to sustaining a well-organized and well-directed educational program for many years, increased public aid, both State and Federal, is required for fire protection. Great encouragement has recently been given to forest landowners interested in fire protection by the adoption of an amendment to Georgia's Constitution, which creates a legal basis for county-wide forest-fire protection.

Close and profitable utilization of the wood supply will depend largely upon good markets for all the commodities the forest owner may produce. In the near future, the local industries will be forced to adapt themselves to a relatively large proportion of low-quality forest material. Landowners in their own interest, therefore, should recognize quality grades in their trees and sell or cut them for the commodities that yield the greatest stumpage returns; they should also manage their stands for the production of as much high-grade timber as possible.

Although central Georgia has none of the impressive mountains or beautiful seacoasts found elsewhere in the State, its forests and streams offer recreational opportunities that, with the exception of a small area around Augusta, have not yet been capitalized. The natural beauty of its forests, peach orchards, and ante-bellum plantation homes; and its mild, sunny, winter climate are not sufficiently known by the traveling public.

To lessen the losses from erosion and floods, to build up the forest growing stock, and to take submarginal cropland out of possible future cultivation, an effort should be made to convert abandoned fields into productive, tax-paying forests. Since in many cases to do this may be beyond the reach of private owners, it may require State or Federal participation. Of the nearly 800,000 acres of idle and abandoned cropland in the area, approximately 100,000 show advanced erosion and will require erosion-control work, including the building of check dams—usually of the inexpensive brush type 2/—terracing, sodding, etc. While nature can be depended upon eventually to reforest old fields in central Georgia, it will be necessary to reforest artificially the 100,000 acres of critically eroded land if a prompt establishment of forest cover is expected. It may be expedient to plant abandoned fields that are so large or so far removed from seed trees that natural seeding from adjoining forests will be slow if not impossible. It is estimated roughly that of the total area of idle or abandoned farm land (table 2) about 200,000 acres may justify artificial reforestation, while the remaining 600,000 acres can be expected to reforest naturally.

The forests of central Georgia can be made to play a more important part in providing the people a better living and greater security. The erosion that is dissipating the fertility of the soils can be checked, the fires that annually decimate many of the forest stands can be stopped, and with good forest management, including the abandonment of cutting methods that constantly deteriorate the growing stock, the net increment can be increased enough to supply raw materials for new and expanded industries on a permanent basis.

2/ Meginnis, H. G. The pole-frame brush dam—a low-cost mechanical aid in reforesting gullied land. Occasional Paper No. 76, Aug. 15, 1938. Southern Forest Exp. Sta., New Orleans, La.

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FOREST RESOURCES OF THE SOUTH LOUISIANA DELTA

by

R. K. Winters, Forester

A Progress Report by

THE SOUTHERN FOREST SURVEY

I. F. Eldredge, Regional Survey Director

SOUTHERN FOREST EXPERIMENT STATION

E. L. Demmon, Director

New Orleans, La.

FOREWORD

The Forest Survey, which is a part of the United States Forest Service, was authorized by the McSweeney-McNary Forest Research Act of 1928 to make a nation-wide study of our forest resources. The five-fold object of this study is: (1) to make an inventory of the present supply of timber and other forest products, (2) to ascertain the rate at which this supply is being increased through growth, (3) to determine the rate at which this supply is being diminished through industrial and local use, windfall, fire, and disease, (4) to determine the present requirement and the probable future trend in the requirement for timber and other forest products, and (5) to correlate these findings with existing and anticipated economic conditions, in order that policies may be formulated for the effective use of lands suitable for forest production.

This release is based on a field survey made October 1934 to March 1935 and on two field canvasses of forest industrial plants to determine forest drain, the last of which was completed during March 1938. It should be regarded only as a progress report since it contains Forest Survey data that will be included in complete reports to be published later, and that, although considered reliable, are subject to correction or amplification as the work of computation proceeds. Item 4 above, which is being studied on a national basis, is not discussed in this report.

In the interpretation of these data, it must be noted that owing to the sampling method used in collecting them, the greater the number of samples in any given classification the more accurate are the data for that classification. Hence classes that are of infrequent occurrence and relatively small in quantity generally cannot be determined with as high a degree of accuracy as classes that occur more frequently and in substantially greater quantities. Small tabular items are to be taken as showing, not the exact magnitude of the classes involved, but their relative magnitude in comparison with those of other classes.

In the South, the Forest Survey functions as an activity of the Southern Forest Experiment Station with headquarters at New Orleans, La.

Assisting Staff

J. A. Putnam, Associate Forest Economist, In Charge of Field Work
P. R. Wheeler, Associate Forest Economist, In Charge of Computations

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Note: Assistance in the preparation of these materials was furnished by the personnel of Works Progress Administration Official Projects 701-3-9 and 365-64-3-7.

FOREST RESOURCES OF THE SOUTH LOUISIANA DELTA

Location and General Description

The South Louisiana Delta Survey Unit includes the flood-plains of the Mississippi River in south Louisiana and the adjoining hardwood areas; it thus includes all or parts of 31 parishes 1/ lying south of the Red River below the city of Alexandria, as shown in figure 1. The outstanding physiographic subdivisions of the unit are: the better-drained flood plains of the Mississippi River; an extensive nonalluvial coastal marsh along the Gulf of Mexico; a natural prairie west of Opelousas and Lafayette almost entirely agricultural, with the forest confined to narrow belts of pine and hardwood along the streams; and timbered swamps in the Grand Lake area and to the west and south of Lakes Pontchartrain and Maurepas (fig. 1).

Much of the land area suited for agricultural use is being cropped. A strip of land along the west bank of the Mississippi between New Orleans and Baton Rouge is largely in sugarcane production, as is also the Bayou LaFourche country from Donaldsonville southward and the land near Bayou Teche. The prairie country is largely devoted to rice production and the beef-cattle industry associated with it. Elsewhere in the unit, cotton, along with some corn, is produced, while in a few areas specialized truck crops are raised.

During the past few years the rapidly developing oil industry has become a very important source of wealth, particularly in the south portion of the unit. Trapping and fishing, together with the sulphur and salt industries, all restricted largely to the coastal region, contribute materially to the economic life of the unit. New Orleans, Baton Rouge, Alexandria, and Lafayette are the principal cities and the only ones with a population of more than 10,000 in 1930.

Table 1 shows that the total land area of the unit, 11.5 million acres, is approximately one-third forest, one-third agricultural land, and one-third land in other uses. Of this latter, nearly all is in coastal marshes along the Gulf of Mexico.

With the exception of the natural prairies in the western part of the unit and the coastal marshes, practically all of this unit was originally covered with a dense stand of hardwood or cypress timber. Since earliest Colonial times, cypress and, to a less extent, hardwoods have been cut into lumber for local building and export. Until the beginning of the twentieth century, cypress logging was largely accomplished by floating accessible timber to sawmills near a local market. New Orleans and the cities of south-central Louisiana were chiefly built of cypress from nearby sloughs and the larger swamps in the vicinity of Grand Lake and Lakes Pontchartrain and Maurepas. Near the end of the past century, as southern cypress became an important item on the national lumber market, large efficient cypress mills were established at or near New Orleans, Franklin, Jeanerette, and Plaquemine; and during the second decade of the present century, as southern hardwood lumber came to fill an increasingly important place in the national market, hardwood lumber production in this unit accelerated sharply.

1/ Parishes in Louisiana are the equivalent of counties.

Table 1. - Land area classified according to major uses, 1935

Land use	Total land area	
	Acres	Percent
Forest	3,735,400	32.6
Agricultural:		
In cultivation:		
Old cropland	3,141,700	27.4
New cropland	44,500	.4
Out of cultivation:		
Idle	163,300	1.4
Abandoned	55,000	.5
Improved pasture	302,900	2.6
Total agricultural	3,707,400	32.3
Other:		
Marsh 1/	3,813,100	33.2
Nonmeandered waterways, towns, villages, roads, railroads, etc.	219,000	1.9
Total other	4,032,100	35.1
Total land area	11,474,900	100.0

1/ Includes a negligible area of prairie.

Owing to the relatively large area in marsh and in cypress-tupelo gum swamps, and to the fact that the area of cropland in this unit is practically stable, it is not anticipated that there will be any large-scale conversion of forest to cropland in the immediate future. The situation in regard to the forest area is shown in greater detail in table 2, where this area is classified into ten forest types on the basis of the species found there and into five forest conditions on the basis of the character of the timber stand. The areas in which certain forest types predominate are shown in figure 1. The red gum-water oak, hackberry-elm-ash, water oak, and cottonwood-willow types of table 2 have been combined in figure 1 into the red gum-mixed hardwood type. The coastal scrub hardwood and cypress types have been distributed in figure 1 between the red gum-mixed hardwood type and the cypress-tupelo gum type.

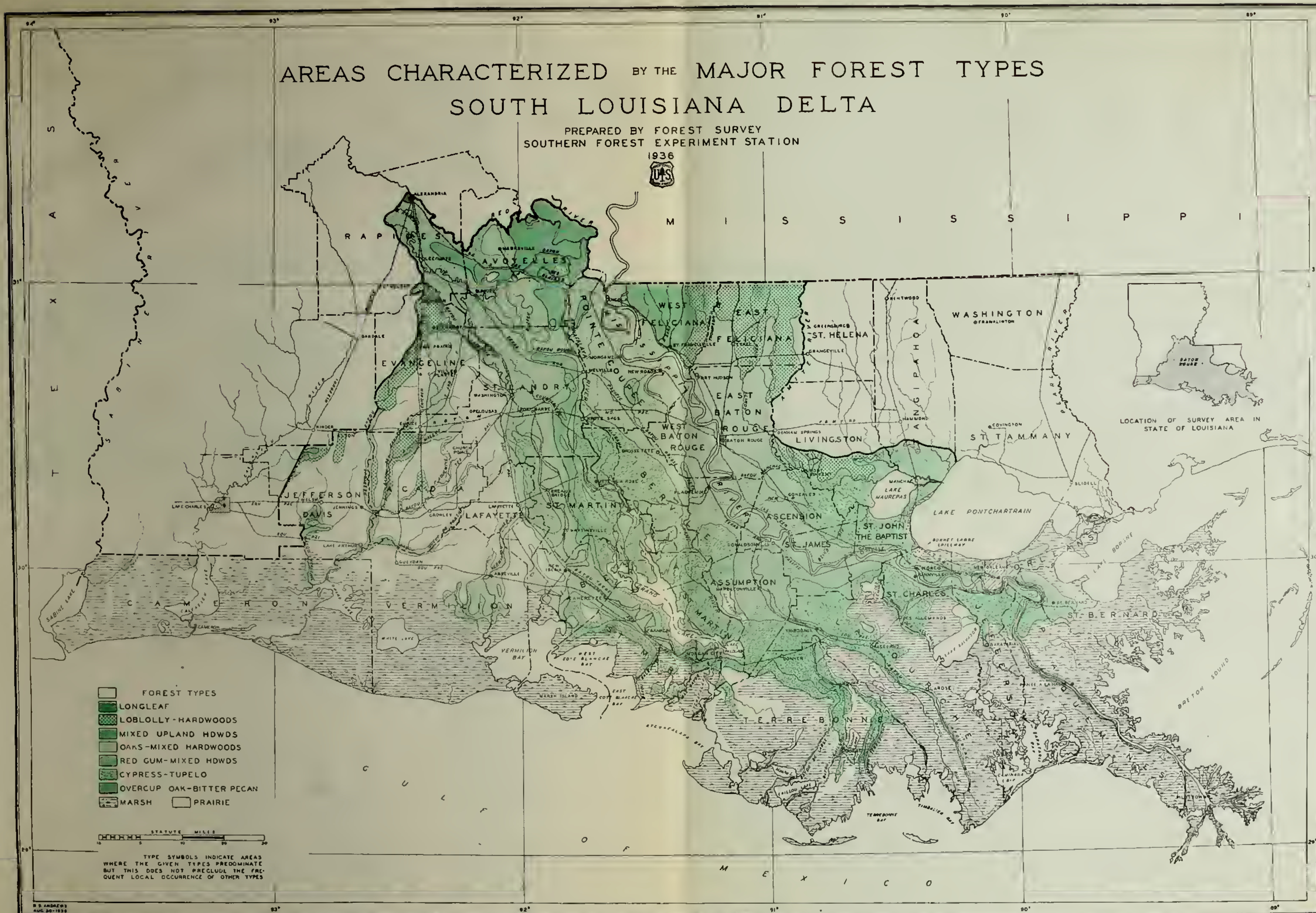

FIGURE 1.- FOREST TYPE MAP

Table 2. - Distribution of total forest area in the various forest types and forest conditions, 1935

Forest type	Old growth		Second-growth sawlog size		Second-growth under sawlog size, reproduction, and clear-cut	All conditions	
	Uncut	Partly cut	Uncut	Partly cut			
	Acres						Percent
Red gum-water oak	34,900	70,700	227,900	60,200	184,200	577,900	15.5
Hackberry-elm-ash	7,000	70,700	186,800	35,800	103,900	404,200	10.8
Overcup oak-bitter pecan	118,700	100,400	49,800	1/	80,300	350,900	9.4
Cottonwood-willow	-	-	125,700	16,600	335,200	477,500	12.8
Cypress-tupelo gum	48,900	179,000	381,500	38,400	444,300	1,092,100	29.2
Water oak	1/	19,200	56,700	16,600	15,700	109,100	2.9
Mixed oak-mixed hardwood	6,100	34,100	74,200	48,000	48,900	211,300	5.7
Pine-hardwood	14,800	6,100	155,400	54,100	84,700	315,100	8.4
Upland hardwood	1/	18,400	34,900	7,000	12,200	77,700	2.1
Scrub coastal hardwood and cypress	12,300	6,900	12,200	1/	82,900	119,600	3.2
Total	248,800	505,500	1,305,100	283,700	2/1,392,300	3,735,400	100.0
Percent of total	6.7	13.5	34.9	7.6	37.3	100.0	

1/ Although the Survey data show an area in this type and condition, it is too small to indicate accurately even the relative magnitude of the individual item. The area estimated, however, is carried in the total for the type and condition.

2/ Of the area in these conditions, only about 5 percent can be classed as "clear-cut."

The total forest area has been further subdivided on the basis of stand per acre and quality of timber into class-A areas and class-B areas. By a class-A forest area is meant one that supports a stand of adequate quality and volume per acre to warrant operation under present market conditions for such of the higher-grade products as industrial lumber, cooperage stock, or veneer. Since practically all the forest area in this unit is accessible for logging during some season of the year, throughout this report forest areas bearing 1,000 board feet or more per acre of higher-grade material are considered to be in class A. Class-B areas include all forest lands that do not meet these qualifications; some of these areas, which frequently bear stands suitable for cross ties, structural timbers, and lumber for domestic use, in time will develop through growth into class-A areas.

Material of the higher grades is contained specifically in (1) lumber-mill and veneer-mill logs and (2) other higher-quality logs suitable chiefly for the manufacture of cooperage and specialty stock. Lumber-mill logs are at least 13.6 inches (11.6 inches in ash and yellow poplar) in diameter, are at least 12 feet long, and can be expected to yield at least 30 percent of their lumber volume in grades No. 1 common and better. Logs in this class average about 60 percent of their volume in these grades of lumber. Cooperage logs and logs for specialty stock are at least 9.6 inches in diameter, at least 10 feet long, and of the same general quality as lumber-mill logs, but they cannot be so classified because of their small diameter or excessive sweep. These small logs of higher quality are suitable for industrial uses that require bolts or blocks rather than logs. In cypress and pine the higher-grade trees are those that will cut at least 80 to 90 percent of their lumber volume in grades No. 2 common and better, and that, in addition, will produce more than 5 percent in firsts and seconds or in B and better. Lower-grade material of all species is contained in logs at least 8 feet long which do not meet the above qualifications, but which are usable according to the definition on page 5. In all forest areas classified as partly cut sawlog size, the higher-grade volume is largely made up either of species that did not at the time of the last cutting have a well-established market, or of small logs suitable only for cooperage and specialty stock.

Nearly 20 percent of the total forest area, or 736,800 acres, supports sufficient higher-quality timber (1,000 board feet or more per acre) to be graded as class A. Of this class-A area, approximately 15 percent is in the old-growth uncut condition, 32 percent in the old-growth partly cut condition, 46 percent in the second-growth sawlog-size uncut condition, and 7 percent in the second-growth sawlog-size partly cut condition. Approximately 47 percent of the class-A forest area was in the cypress-tupelo gum type. Only a very small part of this, however, bears old-growth uncut timber; for the most part, it is timber land that was cut over for its merchantable cypress, leaving fair stands of tupelo gum and smaller cypress.

Forest Inventory

The volume estimate has been broken down into saw-timber volume (expressed in board feet, Doyle log scale) and into cordwood volume. The former includes the net volume of all usable logs in good trees of sawlog size, regardless of log grades. Such trees are at least 13.0 inches d.b.h. 2/ (9.0 inches in pine) and contain at least a 12-foot usable butt log (i.e., one 9.6 inches or more in diameter at the small end if hardwood and 5.6 inches or more if pine); or have at least 50 percent of their volume in material suitable for the manufacture of lumber of commercial grade, low-grade structural material, low-grade box material, or railroad cross ties. The saw-timber volume, however, includes neither the volume in cull trees nor the cull volume in good trees.

The cordwood volume of trees under sawlog size (5.0 - 12.9 inches d.b.h. in hardwood and cypress, and 5.0 - 8.9 inches in pine) includes the wood and bark of the main stem to a usable top, the minimum allowable top being never less than 4 inches and seldom more than 8. The cordwood volume is also net, that is, the volume of cull material that normally would be left in the woods as waste has not been included. In tables giving cubic-foot volumes, bark is not included in the volumes shown.

Board-foot volume

The total net board-foot volume, as shown in section I of table 3, is 6.0 billion board feet, according to the Doyle log rule. Of this total, approximately 19 percent is in old-growth uncut stands; 28 percent, in the old-growth partly cut; 43 percent, in the second-growth sawlog-size uncut; and 10 percent is in the remaining second-growth and clear-cut stands. Considering the total board-foot volume from another point of view, 55 percent (or 3.3 billion board feet), is on class-A areas; approximately 60 percent of this is of higher-grade material suitable for industrial lumber, veneers, and cooperage. On class-B forest areas, approximately 15 percent of the total board-foot volume is in the higher grades.

2/ "D.B.H." is the abbreviation for "diameter at breast height," which is the tree diameter outside bark at $4\frac{1}{2}$ feet above the ground. The Survey uses 2-inch diameter-classes; thus for example, the lower and upper limits of the 14-inch diameter-class are 13.0 and 14.9 inches, respectively.

Table 3. - Net volume of good trees on forest areas, classified (I) by forest conditions and (II) by species-groups, 1935

I. BY FOREST CONDITIONS

Forest condition and species-group	Volume on class-A areas			Volume on class-B areas			Total volume	
	Saw timber (Doyle)		Cordwood [1/]	Saw timber (Doyle)		Cordwood [1/]	Saw timber (Doyle)	Cordwood [1/]
	In higher-grade logs	In lower-grade logs		In higher-grade logs	In lower-grade logs			
	M bd.ft.	M bd.ft.	Cords	M bd.ft.	M bd.ft.	Cords	M bd.ft.	Cords
Old growth:								
Uncut	548,200	293,600	332,200	24,600	266,800	320,800	1,133,200	653,000
Partly cut	709,200	494,400	1,255,200	79,600	385,800	907,400	1,669,000	2,162,600
Second growth:								
Sawlog size:								
Uncut	640,100	455,400	2,322,500	231,900	1,261,300	5,454,200	2,588,700	7,776,700
Partly cut	78,000	58,600	235,700	56,600	254,500	819,100	447,700	1,054,800
Under sawlog size	-	-	-	21,300	118,600	5,229,000	139,900	5,229,000
Reproduction	-	-	-	100	2,300	6,700	2,400	6,700
Clear-cut	-	-	-	100	2,200	19,200	2,300	19,200
Nonproductive	-	-	-	-	1,200	12,500	1,200	12,500
Total	1,975,500	1,302,000	4,145,600	414,200	2,292,700	12,768,900	5,984,400	16,914,500

II. BY SPECIES-GROUPS

Red gum	208,700	192,100	224,200	29,400	296,600	1,052,600	726,800	1,276,800
Water oaks	97,800	155,000	156,400	26,900	317,800	761,000	597,500	917,400
Red oaks	19,300	17,100	32,100	3,700	40,600	133,400	80,700	165,500
White oaks	15,600	26,500	39,200	9,900	60,900	80,000	112,900	119,200
Overcup oak [2/]	25,500	52,600	44,700	23,300	179,100	258,300	280,500	303,000
Ash	49,800	32,400	417,600	18,900	70,100	1,449,100	171,200	1,866,700
Cottonwood	29,800	25,000	15,500	9,300	38,500	118,700	102,600	134,200
Willow	33,100	37,400	119,500	6,400	137,200	1,834,700	214,100	1,954,200
Elms [3/]	35,900	50,800	132,900	22,400	147,300	474,800	256,400	607,700
Tupelo gum [4/]	781,800	431,600	1,632,600	81,000	183,600	2,658,900	1,478,000	4,291,500
Cypress	219,000	68,100	594,100	71,300	83,700	1,499,600	442,100	2,093,700
Bitter pecan	38,700	54,100	79,800	17,800	248,800	550,800	359,400	630,600
Hickories [5/]	7,800	17,400	32,100	6,000	44,800	93,400	76,000	125,500
Hackberry	8,700	25,700	187,700	7,800	65,300	535,900	107,500	723,600
Pines	350,100	40,900	89,000	54,000	227,900	415,000	672,900	504,000
Miscellaneous [6/]	53,900	75,300	348,200	26,100	150,500	852,700	305,800	1,200,900
Total	1,975,500	1,302,000	4,145,600	414,200	2,292,700	12,768,900	5,984,400	16,914,500

1/ Cordwood volume of trees under sawlog size includes the wood and bark of the main stem to a usable top, the minimum allowable top never being less than 4 inches and seldom more than 8. Cordwood volume was calculated on a basis of 80 cubic feet per cord for hardwoods and 90 cubic feet for pines and cypress. Only woods cull was deducted from the cordwood volume.

2/ Approximately 16 percent of this volume is "hill" post oak and 1 percent is live oak.

3/ Approximately 95 percent of this volume is white elm; the remainder is cedar elm.

4/ Approximately 4 percent of this volume is black gum.

5/ Approximately 40 percent of this volume is sweet pecan.

6/ Chiefly maple, sycamore, and beech.

Although these are the total volumes, perhaps a clearer picture of the timber stands in the unit can be obtained from the following tabulation of the total average stand per acre in the various forest conditions, higher-grade and lower-grade material combined.

Forest condition	Average number of board feet per acre (Doyle log scale)
Old growth:	
Uncut	4,550
Partly cut	3,300
Second growth:	
Sawlog size:	
Uncut	1,980
Partly cut	1,580
Under sawlog size, reproduction, and clear-cut	100
Weighted average, all conditions	1,600

Since the Doyle log rule is the one most familiar to operators in Louisiana, timber-inventory volumes are shown in terms of this rule. Its application, however, to stands made up mainly of small trees results in a considerable understatement of the actual volume recoverable in lumber. The board-foot volume in this Survey unit, according to the International $\frac{1}{4}$-inch log rule, which closely approximates green lumber tally, is 8.5 billion board feet; and according to the Scribner log rule, it is 7.5 billion board feet. The average stand per acre, using the International $\frac{1}{4}$-inch rule, is 2,270 board feet instead of the 1,600 feet found with the Doyle rule. Hereafter in this report, therefore, because of the necessity of correlating drain expressed in lumber tally with volume and increment figures, the International $\frac{1}{4}$-inch rule is used to represent green lumber tally.

Cordwood volume

In addition to the cordwood volume in sound trees under sawlog size and the saw-timber volume already shown in table 3, there is, as determined by a very rough estimate, 19.6 million standard (4 x 4 x 8 feet) cords of sound wood, including bark, from the following sources:

Source	Cords
Tops and limbs of good trees of sawlog size	11,100,000
Sound wood in stems, tops, and limbs of cull trees	8,500,000
	19,600,000

In tops and limbs of sawlog-size trees, this cordwood volume includes that portion of the main stem above the usable sawlog limit and for hardwood and cypress includes in addition the limbwood over 4 inches in diameter. In cull trees, the sound volume of all stemwood in trees at least 5.0 inches d.b.h. is included, together with the limbwood in sawlog-size hardwood and cypress trees. This material is sound and usable for many uses, but only a small part is now being used. The total cordwood volume, including good trees under sawlog size, tops and limbs of sawlog-size trees, and cull trees, is 36,500,000 cords.

Cubic-foot volume

The total cubic-foot volume of sawlog material, together with the cubic-foot volume of the good trees under sawlog size and the upper stems of sawlog-size pine, constitutes the growing stock. This growing stock, which in 1935 amounted to 2.6 billion cubic feet, exclusive of bark, forms the base on which increment is calculated and from which the drain is deducted; 1.5 billion cubic feet of this was in sawlog material and 1.1 billion in trees under sawlog size. The volume in the upper stems of sawlog-size pines was negligible.

Forest Increment

The net annual forest increment is the volume added by growth to the individual trees, plus the merchantable volume newly created by small trees developing into merchantable sizes, and minus the losses due to mortality. This net increment represents, in a general way, the cut that can be made each year without reducing the volume of the original growing stock.

Board-foot increment, therefore, is made up of (1) the growth on trees already sawlog size and (2) the total board-foot volume of trees becoming sawlog size during the year. This increment is expressed in net log scale, and is based on good trees only, from which all cull material is excluded. Similarly, cubic-foot increment represents (1) the growth on sound stemwood in good trees at least 5.0 inches in diameter (including in sawlog-size trees only the saw-timber material), plus (2) the total volume of small trees reaching, or exceeding, a diameter of 5 inches during the year.

Table 4 shows the 1935 increment per acre in the various forest conditions in terms of board feet and cubic feet, excluding bark. In calculating these increments, deductions for natural mortality have been made; no deductions have been made, however, for material removed in cutting operations. Increment in board-foot material is expressed in green lumber tally, as measured by the International $\frac{1}{4}$-inch rule. Cubic-foot increment includes material in trees of both sawlog and under-sawlog sizes.

The average increment per acre for the entire forest approximates 100 board feet per year. On the 388,500 acres of second-growth sawlog-size class-A area, the 1935 increment averaged 209 board feet per acre.

Table 4.- Average increment[1] per acre of class-A and class-B forests by forest conditions, 1935

Forest condition	Annual increment: Board feet (green lumber tally 2/)	Annual increment: Cubic feet (i.b.)
Class-A area:		
Old growth, uncut	118	17
Old growth, partly cut	95	29
Second growth, sawlog size	209	45
Class-B area:		
Old growth, uncut	53	9
Old growth, partly cut	39	13
Second growth, sawlog size	143	36
Second growth, under sawlog size	53	34
Clear-cut and reproduction	negl.	3/-2
All conditions	98	31

1/ Figures in this table do not include increment resulting from the change of class-B areas to class-A areas (see footnote 3, table 5).
2/ Based on International $\frac{1}{4}$-inch rule.
3/ Negative increments occur when the volume lost to the stand through natural mortality of residual trees is greater than the increase in volume in good trees.

Table 5 shows the total net volume of wood added to the inventory of good trees on the whole forest area during 1935, expressed in board feet (lumber tally) for sawlog-size material and in standard cords (4 x 4 x 8 feet) for material under sawlog size. In arriving at these estimates, deductions were made for mortality but not for timber cutting. The total increment for all conditions is 366 million board feet. It is significant from the standpoint of timber utilization that of this total, 224 million board feet, or 61 percent, occurred on class-A forest areas, and that the increase in volume of trees 20 inches and larger d.b.h. was 127 million board feet. Furthermore, 42 percent of the total increment of more than a million cords on trees under sawlog size is on class-A areas. It is noteworthy that tupelo gum, which accounts for 30 to 40 percent of the increment in class-A stands, is not now widely used for lumber and also is so located that it offers small opportunity for profitable operation at this time. This volume of tupelo gum constitutes a reserve resource awaiting an effective market demand.

Table 5. - Forest increment,[1] classified according to forest condition, 1935

Forest condition	Increment[2] in trees under sawlog size			Increment in sawlog-size trees						
				Diameter-classes 14-18 inches		Diameter-classes 20 inches and over		All sawlog-size trees		
	Class-A area [3]	Class-B area	Total	Class-A area [3]	Class-B area	Class-A area [3]	Class-B area	Class-A area [3]	Class-B area	Total
	Cords			M board feet (green lumber tally)						
Old growth:										
Uncut	12,400	[4] -700	11,700	4,100	400	19,600	[3] -4,900	23,700	[3] -4,500	19,200
Partly cut	69,200	25,600	94,800	7,300	2,800	19,700	2,500	27,000	5,300	32,300
Second growth:										
Sawlog size	327,000	42,100	369,100	85,700	72,600	84,700	8,900	170,400	81,500	251,900
Under sawlog size	31,800	538,700	570,500	2,000	64,000	900	[3] -4,200	2,900	59,800	62,700
Reproduction and clear-cut	-	[4] -2,600	[4] -2,600	-	200	-	[3] -100	-	100	100
Total all conditions	440,400	603,100	1,043,500	99,100	140,000	124,900	2,200	224,000	142,200	366,200

1/ These increment figures are based on the assumption that no cutting takes place. A total increment of 356,100 M board feet is obtained when the 1935 timber cut enters into the calculation.

2/ This increment includes the annual growth on trees at least 5.0 inches d.b.h. that remain under sawlog size throughout the year, plus the volume in trees that during the year move into the 6-inch diameter-class.

3/ The annual increment on class-A forest areas includes not only the increment on areas that were class A at the beginning of the year, but also the total timber volume added through movement of areas from class B to class A as a result of 1 year's growth. A negative board-foot increment on class-B forest areas indicates (1) that the volumes on areas moving from class B to class A were greater than the increment on areas remaining in class B, and (2) that the mortality in residual stands is heavy.

4/ A negative annual increment of trees under sawlog size means that the volume of trees changing from under sawlog size to sawlog size is greater than the increment of the trees that were under sawlog size at the end of the year (see footnote 2).

Forest-Products Industries

In 1937, the South Louisiana Delta supported within its boundaries 172 forest-industry plants, of which 151 were sawmills. The location of these plants is shown in figure 2.

Lumber industry

The type of sawmill and nature of its product varies by locality within the unit. In East and West Feliciana, East Baton Rouge, and a portion of Livingston Parishes, most of the sawmills are small to medium size; they cut chiefly pine for both local and distant markets and hardwood cross ties. In the prairie portion of the unit the sawmills are almost exclusively small mills operated by farmers, cutting chiefly pine lumber for purely local farm use. Elsewhere the small farm-mills cutting scattered cypress are found in areas well developed agriculturally, while the medium-sized to large mills, cutting commercial grades of hardwood and cypress lumber for the national market, are found wherever the concentration of merchantable timber justifies operation. The chief centers for commercial forest industries in the unit are Alexandria, Plaquemine, and New Orleans.

The larger industrial lumber mills, none of which has a daily capacity of more than 80,000 board feet, generally use steam power and are of the single-band type; they are equipped to produce standard grades of well-manufactured lumber, which is usually air dried. The future of these mills depends upon their location with respect to supplies of suitable timber. Several of them unquestionably will be abandoned or moved within the next 5 to 8 years; others, especially on the Mississippi River above Donaldsonville, where water transportation of batture-grown timber is possible, can be expected to continue longer, perhaps indefinitely.

The small portable mills differ from one another chiefly with respect to kind of ownership. Some are owned by farmers and operated intermittently in connection with farming. Others are owned by commercial operators, who make a large part of their living by cutting lumber. The former use either a steam or gasoline engine for power, and their simple equipment seldom consists of more than a circular saw. These mills, most of which have a capacity of 3,000 to 6,000 board feet per day, generally operate only 10 to 25 days during the year. The commercial mills may differ very little from the farm mills, but most of them are somewhat larger and they operate a greater portion of the year.

There has recently appeared a new type of hardwood sawmill——a light, portable mill with a $4\frac{1}{2}$-foot band saw, operated by Diesel power and equipped to saw and yard standard grades of industrial lumber. At least two such mobile mills appear to be cutting successfully in the areas where the sparse residual stand of commercial-quality timber makes impracticable a large stationary plant. Owing to the cutting out of the larger mills, there is every reason to expect an increase in production from plants of this type, to fill the unsatisfied market demand for well-manufactured industrial lumber.

In table 6, which shows the production and employment data for sawmills of the unit in 1937, it is seen that these mills produced a total of 242 million board feet as compared with 199 million in 1936 and 172 million in 1935. In 1937 the timber cut from the forests of the unit for manufacturing into lumber amounted to 230 million board feet. Comparison of this figure with the 242 million board feet cut by the sawmills of the unit indicates that more logs were cut outside the unit and brought into it for sawmilling (chiefly at Alexandria, Plaquemine, and New Orleans) than were cut in the unit and shipped outside. Three plants in or near New Orleans use mahogany logs shipped from tropical countries. In addition to the sawmills in the unit, five medium-sized or large mills located outside the unit drew nearly 40 million board feet of timber in 1937 from the unit for manufacture. The 12 sawmills in the unit with a daily capacity of 40 to 79 M board feet accounted for half the lumber production. The 123 mills having a daily capacity of less than 20 M board feet cut only 14 percent of the total.

Table 6. - Production and employment data in the lumber industry, 1937 1/

Daily capacity	Mills	Produced by mills in the unit	Mill employment	Produced from forests of the unit	Woods employment
M bd.ft.	Number	M bd.ft.	Thousand man-days	M bd.ft.	Thousand man-days
Under 20	123	33,200	49	31,800	36
20 - 39	16	87,800	166	65,700	86
40 - 79	12	121,300	270	96,700	125
80 and over 2/	-	-	-	35,700	45
Total	151	242,300	485	229,900	292

1/ Based on a 10-hour operating day and green lumber tally.
2/ There were no mills of this class in the unit; the volume shown was cut in the unit for mills of this class outside, and the employment was that engaged in this cutting.

Nonlumber industries

Table 7 lists 21 nonlumber primary wood-using plants in the unit. Eight of these that manufacture tight and slack cooperage material and 5 that manufacture veneer, require a large proportion of higher-grade logs or bolts. In general, these plants are operating on selected residual trees cut from lands once cut-over for saw timber or from second-growth stands.

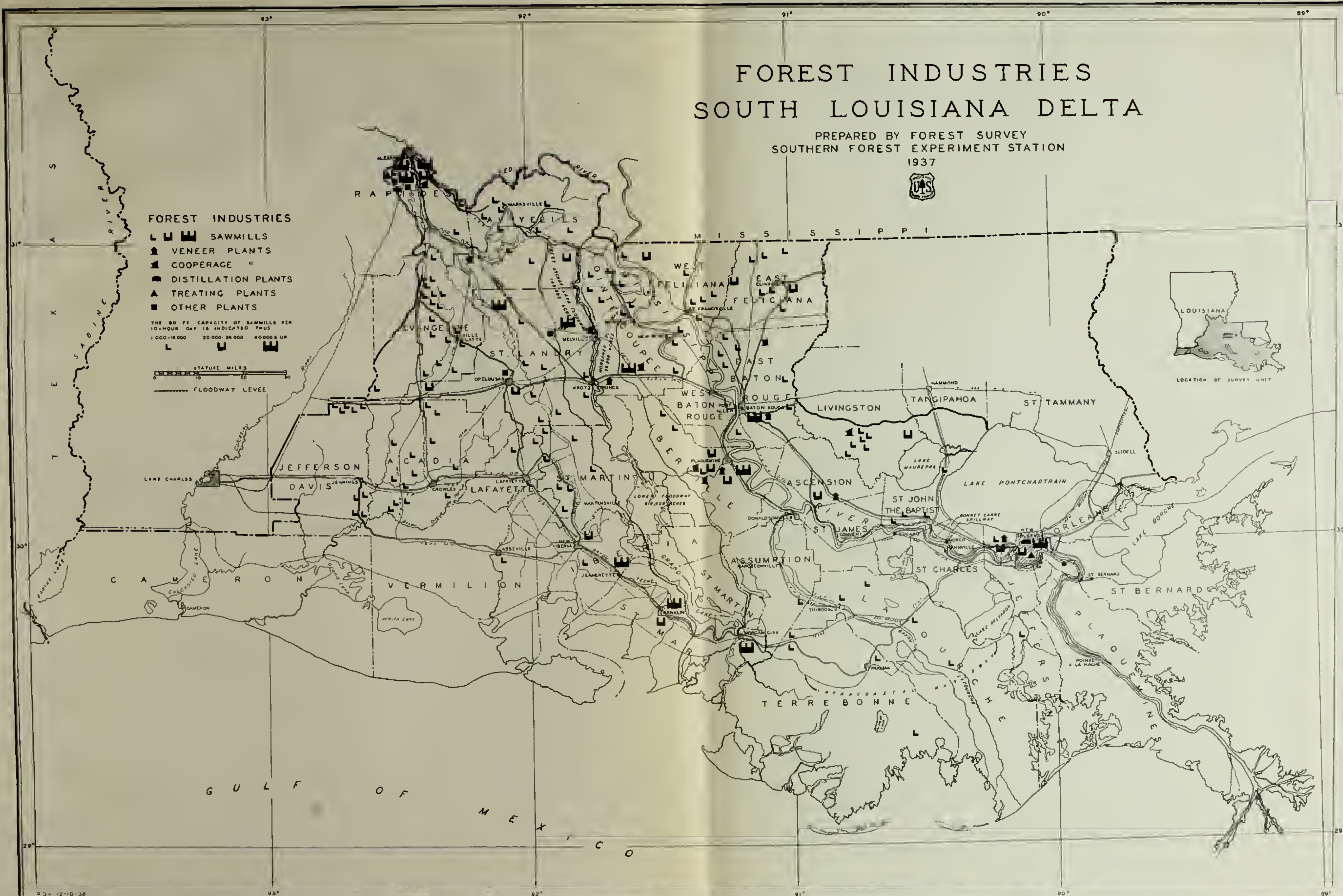

FIGURE 2 - FOREST INDUSTRIES MAP.

Table 7. - Production and employment data in the nonlumber forest industries, 1937 1/

Kind of plant or commodity	Plants in unit	Produced by plants in the unit	Plant employment	Produced from forests in the unit	Woods employment
	Number	Cords	Thousand man-days	Cords	Thousand man-days
Tight cooperage material	4	7,700	11	4,000	5
Slack cooperage material	4	17,400	34	12,800	13
		M bd.ft.		M bd.ft.	
Veneer	5	15,700	71	9,800	13
Miscellaneous 2/	8	1,600	58	800	2
		Pieces		Pieces	
Cross ties	-	-	-	182,000	21
Poles and piles	-	-	-	11,000	3
Total	21		174		57

1/ Cordwood volume is expressed in standard (4 x 4 x 8 feet) cords, including bark. Board-foot volumes are in terms of the International $\frac{1}{4}$-inch log rule. Man-days are based on a 10-hour day.

2/ Includes 2 treating plants, 2 pine destructive-distillation plants, 2 specialty plants, and 2 idle shingle mills. The production of the treating and destructive-distillation plants is not included, although the corresponding employment is.

Employment

The total forest-industry employment in the unit in 1937 was about 1,000,000 man-days (see tables 6 and 7), of which 777,000, or approximately 77 percent, were expended in the sawmill industry and the remainder in the non-lumber industries. Although it is impossible to translate these employment figures into the exact number of persons receiving either full or part-time employment in the forest industries, estimates based on the yearly production of sawmills of different sizes and of other primary forest-industry plants indicate that probably as many as 10,000 persons receive full or part-time employment in the forests and mills in this unit. Furthermore, the labor involved in cutting nearly a million cords of fuel wood and miscellaneous material used on farms, as well as the 5,400,000 fence posts used in the unit, probably amounted to approximately 1,300,000 additional man-days. Although only a small portion of this employment—possibly not more than 10 percent—was for cash wages, it represents an important employment item in the life of the people. The material thus produced, without cash outlay and usually without interference in normal gainful employment, is a substitute for material that would otherwise have to be purchased.

Forest Drain

In table 8 is shown the total volume of wood removed from the growing stock of the unit during 1937 for use in industry and for domestic purposes. This volume, termed forest drain, is the total volume of usable material removed from the growing stock by cutting; it does not include losses due to mortality, which are taken into account in calculating the increment. Neither does it include material cut from cull and dead trees or from limbs, none of which is part of the growing stock. Thus, drain in board feet in table 8 includes the volume actually used (from tables 6 and 7), plus the volume left in the woods as waste because, although it met the Survey specifications for usable material, it did not meet the requirements of the particular user or of the current market. Drain in the last column of table 8 includes the cubic-foot contents (inside bark) of the sawlog portion of sawlog-size trees, plus the cubic-foot contents of the main stem of good trees at least 5.0 inches d.b.h. but under sawlog size.

Table 8. - Net volume of timber drain from the growing stock, 1937

Commodity	From sawlog-size trees				From all trees 5 inches d.b.h. and larger
	Pines	Hardwoods	Cypress	Total	
	Thousand board feet (green lumber tally)				Thousand cubic feet (i.b.)
Lumber	32,000	155,300	54,800	242,100	39,660
Veneer	negl.	10,900	-	10,900	1,670
Tight cooperage material	-	2,700	-	2,700	410
Slack cooperage material	-	8,600	-	8,600	1,350
Poles and piles	-	100	1,400	1,500	260
Cross ties	3,400	1,600	2,800	7,800	1,490
Material used by miscellaneous industries 1/	-	800	-	800	190
Material cut in clearing land	2,000	13,400	-	15,400	3,700
Material cut for fuel wood, farm fence posts, and other domestic uses	1,400	116,800	-	118,200	33,580
Total	38,800	310,200	59,000	408,000	82,310

1/ Includes material used by two specialty plants and export logs.

The total 1937 drain from sawlog-size trees of the growing stock was 408 million board feet, of which 59 million was cypress, nearly 39 million was pine, and the remainder was hardwoods; in 1936 the drain from sawlog-size trees was about 369 million board feet, and in 1935 it was 326 million board feet. It is estimated that about 50 to 60 percent of this drain is taken from class-A areas, which furnish a high proportion of the volume cut for lumber, veneer, and cooperage material. Class-B areas, on the other hand, furnish the greater part of the board-foot drain occasioned by land clearing, for fuel wood, and for other domestic use, since the sawlog material cut for these purposes is usually unsuited to higher-grade industrial uses.

Comparison of Increment and Drain

Timber-inventory data are based on field work done in the winter of 1934-35 and represent conditions as of Jan. 1, 1935. Subsequent changes in this growing stock caused by additions due to growth and by subtractions due to timber cutting and natural mortality were calculated as shown in table 9.

Table 9. - Changes in the growing stock

Date	Saw-timber material				All trees 5-inches d.b.h. and larger
	Hardwood	Cypress	Pine	Total	
	- - Million board feet (green lumber tally) - -				Million cubic feet (i.b.)
Jan. 1, 1935	6,854	638	996	8,488	2,608
Jan. 1, 1936	6,856	631	1,031	8,518	2,653
Jan. 1, 1937	6,830	613	1,059	8,502	2,698
Jan. 1, 1938	6,771	578	1,099	8,448	2,739

From this table we see that the total board-foot volume present Jan. 1, 1938 was practically the same as that present Jan. 1, 1935; this indicates an approximate balance of increment and drain for the 3-year period. The first year, however, when the drain was less than during the other two years, the board-foot growing stock was actually built up. All three years show a slow building up of the pine board-foot growing stock. Also the total cubic volume of the stand has been steadily increasing since 1935. A more detailed picture of the balance of growth and increment is shown for 1937 in table 10.

Since 61 percent of the total net board-foot increment is on class-A forest areas, and approximately the same percent of the drain comes from them, they do not seem to be cut more severely than the forest as a whole. This situation is true even though some of the larger sawmills are facing a shortage of accessible timber of suitable species and quality. This seeming contradiction is chiefly explained by the fact that a relatively large part of the increment, especially that on class-A areas, is in tupelo gum on the less accessible lands in the swamps adjacent to Grand Lake and Lakes Pontchartrain and Maurepas. The volume on these particular areas is being built up until it reaches a quantity and value that will make it attractive to operators.

Table 10. - Comparison of increment with drain, 1937

Item	Saw-timber material				All trees 5 inches d.b.h. and larger
	Species-group			Total	
	Hardwood	Cypress	Pine		
	- - Thousand board feet (lumber tally) - -				Thousand cubic feet (i.b.)
Growing stock Jan. 1, 1937	6,829,800	612,600	1,059,100	8,501,500	2,697,620
Growth	377,900	31,800	89,000	498,700	165,850
Mortality	125,600	7,600	10,600	143,800	42,460
Net increment	252,300	24,200	78,400	354,900	123,390
Commodity drain	310,200	59,000	38,800	408,000	82,310
Net change in growing stock	-57,900	-34,800	39,600	-53,100	41,080
Growing stock Jan. 1, 1938	6,771,900	577,800	1,098,700	8,448,400	2,738,700

Outlook for the Future

The outlook for the future of the forest and forest industries is, in a very real sense, conditioned by the present situation, which may be summed up as follows: Based on the record of the past 3 years (table 9), the total timber stand, as measured in cubic feet, is increasing even after deductions are made for timber cut and mortality losses, while the saw-timber component, measured in board feet, is remaining approximately constant. Of the total board-foot increment, approximately 60 percent occurs on class-A areas. Several of the larger sawmills cutting choice old-growth timber are facing a shortage of adequate timber supplies and may either have to reduce their cut or cease operation in the near future. The volume of tupelo gum, a species not now prized by industrial lumber operators, is large and forms a considerable reserve of industrial raw material, the use of which must await the development of a better market demand. The increment on this volume, which probably amounts to more than one-fourth of the total increment, contributes substantially to the approximate balance of increment and drain over the 3-year period 1935-1937.

Although this Survey unit has long been an agricultural region, perhaps never more than one-third of its area was cultivated at any one time; some areas are now being abandoned for crops, but probably a larger proportion is becoming pasture land than in other parts of the Mississippi River bottom lands. Extensive areas now in forest are entirely unsuited for agriculture and cannot be expected to be so used. Also the growth rate of the timber is rapid, and a relatively high timber yield can be sustained. Altogether, this unit will inevitably continue to be an important timber producer; even the present cut-over forest has a good average volume per acre, although parts are in species not now being used commercially. Tupelo gum, the most abundant of these little-used species is suitable for the manufacture of lumber, boxes, crates, and flooring as well as certain kinds of paper pulp. With water transportation available to such manufacturing centers as Plaquemine and New Orleans, the extensive use of this and other species suitable for pulp manufacture depends chiefly upon the establishment in or near this unit of manufacturing plants using them.

The balance between board-foot increment and drain, where the margin is as small as that here, is likely to fluctuate annually from plus to minus and vice versa, depending upon the market demand. In the event of a return within the near future to what has been considered a normal demand for lumber, an over-cut can be expected. Considering, however, the possibility that several large mills may cease operation, it is not unlikely that an approximate balance between increment and drain will continue. The general application of a few simple timber-cropping practices (to be discussed later) will do much to increase this increment and thereby make possible larger future cuts. These measures are most practicable in the accessible regions where logging is already established.

In estimating the future possibilities of timber production in this unit, it must be considered in four more or less distinct subareas: (1) the pine forest, largely concentrated in East and West Feliciana, East Baton Rouge, and a portion of Livingston Parishes; (2) the prairie parishes in the southwest portion of the unit; (3) the cypress-tupelo gum swamp area adjacent to Grand Lake and Lakes Pontchartrain and Maurepas, and (4) the hardwood forest on the remainder of the area in the unit.

The pine timber stand of the parishes in the northeastern portion of the unit is growing faster than it is being used, in both cubic feet and board feet. Obviously the present cut can be maintained without over-cutting and even may be increased, especially when reduction in fire losses and improvements in management practices augment the increment still further. The pine cut, which in this territory is made largely by small to medium-sized mills, probably will continue to be made by mills of this size.

The timber stands in the prairie parishes, occurring largely in mixed pine and hardwood types along the streams but including some nearby pure pine stands, are being used to supply a number of small mills that cut lumber mainly for local farm improvements. It seems likely that the supply will continue to meet these local requirements.

The future timber possibilities of the Grand Lake swamp area—a part of subarea (3) above—and the hardwood area lying north of Krotz Springs in the floodway of the Atchafalaya River—a part of subarea (4) above—are so closely associated with the plans of the U. S. Engineer Office that a word concerning the flood-control plans of this organization is necessary in order to understand the situation.

The Atchafalaya River floodway, a levee-confined band some 15 miles wide extending southward from the Red River to the Gulf of Mexico, comprises about 760,000 acres (see fig. 2). During recent decades the amount and duration of the annual flood waters in the cut-over cypress and tupelo gum timberland of the swamp area south of Krotz Springs gradually have increased. The Engineers do not, at this time, foresee for the immediate future any sudden or marked change in the timber-growing conditions that have prevailed during the last decade. The floodway area of about 150,000 acres north of Krotz Springs is, in the main, partially cut-over hardwood timberland. Bounded by levees, it is expected to be used as a floodway only about once a century. Here the influence of flood waters on timber growth will be practically negligible.

In the Morganza Floodway—mostly part of subarea (4) above—comprising some 57,000 acres between the Mississippi River at Morganza and the Atchafalaya River near Melville, conditions of timber management doubtless will be considerably modified from what they have been in the past. This area probably will be used to carry flood waters about once every 10 to 15 years. The U. S. Government will hold such broad easements on land and timber in this area that it virtually will control the land and timber use and the Engineers probably will not permit commercial timber cutting. If they do, it will be on a very selective basis only, as clear-cutting in a spillway stimulates the growth of cottonwood and willow, both of which, at least in the juvenile stage, retard the water flow and are consequently undesirable. On a considerable part of the spillway area, therefore, the Engineers will also wish to clear out the reproduction under 5 inches d.b.h. and the underbrush.

The U. S. Government also holds fee title to the land in the Bonnet Carre Spillway, an area of about 8,000 acres connecting the Mississippi River near Norco, La. with Lake Pontchartrain. This area of young hardwood forest has received the same treatment as is planned for the Morganza Floodway.

No easements at all are held on timber lands in the Atchafalaya floodway south of Krotz Springs, nor are any contemplated. The easements held on lands in the floodway north of this point are so drawn that the Engineers have practically no control of the timber use. As far as present law is concerned, timberland management in these two areas will be little affected by the operations of the Engineers. There is, however, no way of predicting when a change in the Federal Law may occur.

According to the present outlook, the Atchafalaya floodway area will continue to be forested, at least to the extent that it now is. Although there is agricultural land in the floodway and even some new land is being cleared north of Krotz Springs, the danger of flooding makes this land less desirable for agriculture than lands of comparable quality elsewhere.

The swamp area bordering Lakes Pontchartrain and Maurepas has been largely cut over for cypress, but it still bears substantial volumes of tupelo gum and other swamp hardwoods. Present indications are that this area will remain in timber. The hardwood forest area referred to under subarea (4), page 17, exclusive of the several floodways, can be expected to continue undiminished and probably will increase somewhat. It is from this area that will come most of the future growth of mixed oak and red gum timber in this unit.

A considerable proportion of the forest area in the unit is held by large landowners and sawmill operators. Even though these lands may not offer opportunity for income from the timber for several years, most of their owners are holding them in expectation of oil development. A number of developed oil fields occur in the unit, and many forest owners pay their taxes with returns from oil-right options or in the expectation of such returns. The forests of this unit, therefore, can be expected to remain in private ownership as long as oil prospects are good.

The timber stands of this unit are growing on highly productive forest soils, which unlike those in other units in the Mississippi Delta, do not seem destined for future agricultural use. The opportunity for developing excellent stands of fast-growing, high-quality hardwood trees, along with the favorable location for future markets, indicates that the management of privately owned forest land for continuous crops of timber has excellent chances for success. This is particularly true in areas where income from oil leases and royalties is sufficient to help carry the cost during the period necessary to build up the forest growing stock. In view of the favorable prospects for continuous timber crops, the field for effective forest extension work ought to be better in this unit than in almost any other portion of the Mississippi Delta.

The forest land-tax situation in this unit is probably somewhat more favorable for forest production than that in other portions of the Mississippi bottom lands. In the well-settled agricultural communities, the usual state, parish, school, and road taxes average about 25 to 35 mills on the assessed valuation, which compares favorably with similar rates in other parts of the Delta. In organized drainage districts, comprising a relatively small percentage of the total forest area, drainage taxes usually amount to 20 to 35 cents per acre but may be much higher. There is, however, a large forest area in swamps and batture lands where road and school taxes are considerably less than in the agricultural communities and where there are no drainage taxes.

Among the improvements in forest practice needed in this unit are the following:

1. Increased effort in the prevention and suppression of forest fires. Even on the wettest situations, fires in the dry season (a) damage severely the standing timber, causing a loss in actual volume and reducing the grade or quality of the timber that is not destroyed, and (b) effectively prevent a stocking of the younger age-classes.

2. Improvement in the quality and composition of forest stands. Defective trees and those of low quality should be removed from all stands to make way for thrifty, young ones. This can be accomplished, in part, by taking more of the farm fuel wood, fence posts, and similar material from low-quality residual trees, from cull timber, and from thinnings rather than from sound high-quality trees.

3. The full and most economic use of the trees cut. All logs should be converted into the product for which they are best suited. This involves diversified logging, i.e., the trees to be removed from a stand are felled in one operation in which each is cut to the best advantage for sawlogs, cooperage and veneer stock, bolts, ties, etc.

These steps, if generally carried out, will do much to improve the forest for timber production and ultimately will increase the possibilities for employment and industrial income. The high growth rate and the present approximate balance between increment and drain place this unit in a very favorable position for a continuous high production of timber. The most needful forestry practices are simple and easily applied. Furthermore, the oil industry helps to carry timber land until the timber-stand improvement produces additional income through increased increment. Thus, in this unit, the prospects, on the whole, are very favorable for the development of an adequate, permanent, and dependable forest industry.

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FOREST RESOURCES OF SOUTHWEST LOUISIANA

by

James W. Cruikshank
Associate Forest Economist

A Progress Report by

THE SOUTHERN FOREST SURVEY

I. F. Eldredge, Regional Survey Director

SOUTHERN FOREST EXPERIMENT STATION

E. L. Demmon, Director

New Orleans, La.

FOREWORD

The Forest Survey, which is a part of the United States Forest Service, was authorized by the McSweeney-McNary Forest Research Act of 1928 to make a nation-wide study of our forest resources. The five-fold object of this study is: (1) to make an inventory of the present supply of timber and other forest products, (2) to ascertain the rate at which this supply is being increased through growth, (3) to determine the rate at which this supply is being diminished through industrial and local use, windfall, fire, and disease, (4) to determine the present requirement and the probable future trend in the requirement for timber and other forest products, and (5) to correlate these findings with existing and anticipated economic conditions, in order that policies may be formulated for the effective use of lands suitable for forest production.

This release is based on a field survey made Dec. 1, 1934, to March 30,1935 and on two field canvasses of forest industrial plants to determine forest drain, the last of which was completed during March 1938. It should be regarded only as a progress report since it contains Forest Survey data that will be included in complete reports to be published later, and that, although considered reliable, are subject to correction or amplification as the work of computation proceeds. Item 4 above, which is being studied on a national basis, is not discussed in this report.

In the interpretation of these data, it must be noted that owing to the sampling method used in collecting them, the greater the number of samples in any given classification the more accurate are the data for that classification. Hence classes that are of infrequent occurrence and relatively small in quantity generally cannot be determined with as high a degree of accuracy as classes that occur more frequently and in substantially greater quantities. Small tabular items are to be taken as showing, not the exact magnitude of the classes involved, but their relative magnitude in comparison with those of other classes.

In the South, the Forest Survey functions as an activity of the Southern Forest Experiment Station with headquarters at New Orleans, La.

Assisting Staff

P. R. Wheeler, Associate Forest Economist,
In Charge of Computations

Note: Assistance in the preparation of these materials was furnished by the personnel of Works Progress Administration Official Projects 701-3-9 and 365-64-3-7.

FOREST RESOURCES OF SOUTHWEST LOUISIANA

General Description of the Unit

Southwest Louisiana was once famed for its magnificent stand of virgin longleaf pine. Between 1890 and 1930 much of this timber was cut, and at present this unit contains the largest area of clear-cut longleaf land west of the Mississippi River, or more than a million acres. The unit (Forest Survey Louisiana Unit No. 3) consists of six complete and seven partial parishes, containing 5,774,200 acres. Roughly triangular in shape, it extends northward from Calcasieu Parish to include as the northern boundary Sabine, Grant, Natchitoches south of the Red River, and the hill portions of La Salle and Catahoula Parishes. The Sabine River forms the western boundary, while the eastern limit is an irregular line between the pine land of this unit and the hardwood bottoms and prairie lying to the east (map, fig. 1).

Lake Charles in the southern part of the unit is the largest town, but Alexandria is just outside the unit on the Red River. Agriculture and lumbering are the chief industries. Although 79 percent of the area is still forest land, the clear-cutting policy followed by the large pine mills has practically exhausted the timber supply over large areas, so that several former sawmill communities have been almost entirely abandoned.

The south half of Calcasieu Parish is a low, flat prairie with timber growth confined to the better-drained land along the streams. North of this prairie is a flatwoods belt that averages about 20 miles in width and that, although poorly drained, is productive forest land. The flatwoods merge into a series of low benches, which are progressively higher northward and eastward from the Sabine River, becoming quite rugged in such places as the Kisatchie Hills in Natchitoches Parish. The Red River bottoms, which average 5 to 10 miles in width, separate the hill land of Grant and La Salle Parishes from the rest of the unit. Elevations range from 20 feet above sea level at Lake Charles, to 300 feet in Sabine, Natchitoches, and La Salle Parishes. Alexandria, on the Red River, has an elevation of 75 feet.

The soils most intensively used for agriculture are those found in Calcasieu Parish and the Red River bottoms. The Lake Charles and Crowley soils of Calcasieu Parish are black to gray coastal-prairie soils with yellow to mottled gray subsoils, and are used chiefly for rice production and grazing. The Red River alluvial soils, which belong mainly to the Miller series, are dark reddish-brown clay, very fertile, and well adapted to cotton production. The flatwoods and upland soils are less desirable for agriculture, but their ability to produce timber has been demonstrated by the occurrence of old-growth longleaf pine stands that contained up to 30,000 board feet per acre. The Caddo, Beauregard, and Norfolk soils of the flatwoods have a light gray topsoil with a gray mottled or yellow, impermeable subsoil. In the rolling uplands the surface soils are gray or light brown with red to gray or yellow, poorly drained subsoil. Susquehanna and Ruston soils are most common.

The Sabine and Calcasieu Rivers, with their tributaries, flow southward into the Gulf of Mexico, and drain all but the northeast part of the unit; this is drained chiefly by the Red and Little Rivers, which join outside the unit and flow southeastward into the Mississippi. Only a small proportion of the land surface has been used for agricultural crops, and since gentle slopes are common, erosion is less serious here than in north Louisiana. There is little or no erosion in Calcasieu, Beauregard, and Allen Parishes, or in the stream bottoms, but the rest of the unit has slight sheet erosion with occasional gullies.

Long warm summers with short mild winters are the rule. Temperatures during the summer season range from about 50 to 110° F., while winter temperatures range from slightly above zero to about 90° F. Winter temperatures are very changeable. The average date of the first killing frost is Nov. 15, while the average date of the last killing frost in the spring is March 10, giving an average frost-free season of 250 days. The average annual rainfall is 50 to 55 inches per year.

In this area there are six main railroad systems. The Kansas City Southern and Missouri Pacific go to northern points from Lake Charles by way of Shreveport and Alexandria, respectively. Mainline east and west transportation is provided through Lake Charles by the Southern Pacific; through DeRidder into Texas by the Atchison, Topeka, and Santa Fe; and through Alexandria by the Texas and Pacific. The Louisiana and Arkansas from New Orleans enters the unit at Alexandria and continues northward to Arkansas. Rail service is adequate for the area, but the decline in tonnage of forest products has seriously affected freight revenues. It is important to the future welfare of these railroads that they cooperate fully in any program that will return the forest lands of this area to full productivity. Paved Federal highways radiate from Lake Charles and Alexandria providing ample through routes. Inter-connecting gravelled roads link practically all of the settlements, but there are extensive areas that are 5 to 10 miles from a road. As most of the topography is gentle, these areas are accessible to logging trucks in dry weather.

The first permanent settlement in this unit was at Natchitoches, which the French established as a trading post in 1714. Extensive settlement throughout the region did not begin, however, until after 1800, when settlers from Mississippi, Alabama, Georgia, and the Carolinas gradually moved westward into Louisiana. Population increased slowly until about 1890, when the construction of railroads opened up vast tracts of virgin longleaf timber to the lumber industry. A few large sawmills were established between 1890 and 1900, but the majority came between 1900 and 1915. This expansion of industry resulted in a rapid increase in population. Sawmills and their communities began to be abandoned early in the century, with a consequent shifting of the population between parishes. In the decade between 1920 and 1930, there was a total decrease of nearly 10,000 in the population of Allen, Beauregard, and Vernon Parishes, while Calcasieu Parish, with its rice farming and gas and oil discoveries, gained over 9,000. According to the Bureau of the Census, the total population of the unit was about 202,000 in 1930, when 46 percent of the people lived on farms; 34 percent in small towns, sawmill villages, and lumber camps; and 20 percent in incorporated towns of more than 2,500 inhabitants. In 1935 the farm population was about 106,000, an increase of 13,000 since 1930. The Unemployment Census of 1937 showed that there were about 12,000 individuals totally unemployed, 4,000 employed on emergency work, and about 7,000 partly unemployed. With the lumber industry declining, and the acreage of certain agricultural crops being restricted, the maintenance of the present

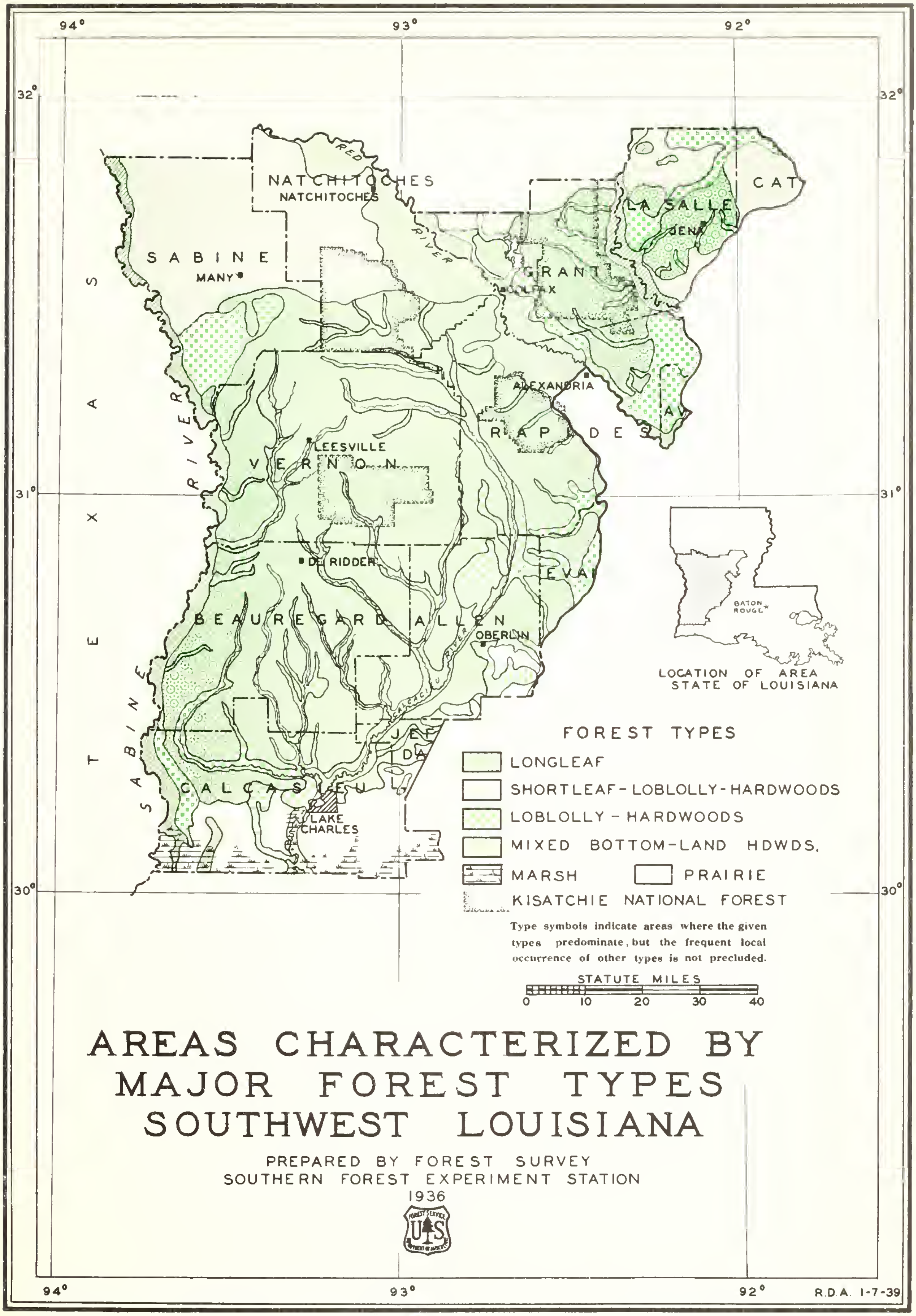


FIGURE 1 - FOREST TYPE MAP.

population within this unit may not be possible unless new forms of land use and new industries are developed.

Less than one-fourth of the unit area is in farms, but land used for agriculture is the chief support of nearly half of the people and indirectly contributes to the livelihood of many more. While in the Red River Valley and Coastal Prairies, agriculture has a definite place, it is questionable whether further unguided expansion should occur on the upland soils, although even here there are undoubtedly local areas that will justify intensive farming, particularly for truck crops.

In 1935, according to the Bureau of the Census, there were 22,000 farms containing 1,310,000 acres. Crops were harvested from 30 percent of the total farm acreage, open land used for grazing amounted to 15 percent, woodland (including wooded pasture) occupied 42 percent, and land used for all other purposes amounted to 13 percent of the total. In the upland parishes the farms are generally small, averaging about 50 to 60 acres. Larger ownerships are common among the cotton plantations in the Red River bottoms and the rice and cattle farms in Calcasieu Parish; these two areas contain over 50 farms exceeding 1,000 acres each. Cotton, which is the chief cash crop, is grown to some extent in every parish, but it is estimated that the cotton acreage was reduced about 20 percent between 1924 and 1934. The 109,000 acres planted to cotton in 1934 produced 52,000 bales. Rice is an important cash crop in Calcasieu Parish, where 35,000 acres were grown in 1934. Other crops in the unit, grown chiefly for home consumption, include corn, hay, sugar cane, sweet and Irish potatoes, and various vegetables. Large numbers of cattle, sheep, and hogs are raised, since most of the cut-over land is used as open range. About half a million pounds of wool were produced in 1934, with Beauregard Parish the largest producer. The large amount of woodland included with the farm acreage contributes materially to the farm income; farms reporting sales of forest products in 1934 received an average of $60.00 each. That farming does not fully occupy the time of rural people, however, is indicated by Census data, which show that the farmers worked a total of 665,000 days away from their farms in 1934, equivalent to 30 days per farm family.

The ownership of the 4,543,500 acres of forest land is indicated in figure 2. This information has been compiled from Federal and State Forest Service records of private-land holdings, reports of the Louisiana Tax Commission, and Census records, and reflects fairly accurately the proportion of public and private ownership. The subdivision of private ownerships is less accurate and is based upon rough estimates rather than detailed compilation of records. Public lands consist of a part (354,800 acres) of the Kisatchie National Forest, the State Forest at Woodworth (7,600 acres), the Beechwood Fish Hatchery (200 acres), Camp Beauregard (1,800 acres), and the accumulated acreage of tax-delinquent land adjudicated to the State and unredeemed as of Nov. 15, 1937 (440,000 acres). Large industrial operators hold the most privately owned forest land. These are chiefly lumber and pulp companies, who are actively operating on their land or holding it for timber growth. The large investment owners include private individuals, land companies, and inactive lumber companies, who are often holding the land for oil, stumpwood, or speculation. Farm woodlands make up a part of practically every farm in the unit, and therefore are in thousands of individual ownerships. One and a quarter million acres of private forest land is of unclassified ownership, but a large majority is believed to be held by investment owners and small industrial operators in tracts ranging from a few acres to several thousand acres each.

FIGURE 2 -APPROXIMATE OWNERSHIP OF FOREST LAND IN SOUTHWEST LOUISIANA

For tax-assessment purposes forest land is classified by State and parish officials into several categories: woodland—brush woods that can not be classed as open land or timber land, including partially reforested cut-over lands; hardwood, pine, or cypress land—forest land supporting hardwood, pine, or cypress stumpage, respectively; reforestation land—lands set aside for reforestation purposes as provided by Act. No. 90 of 1922, Act No. 71 of 1924, and Act No. 121 of 1926; and cut-over land—all cut-over forest land not classified as woodland or reforestation land. According to the 1937 report of the Louisiana Tax Commission, the assessed value of woodland ranged from $3.68 in La Salle Parish to $12.18 in Calcasieu. On the areas classified as hardwood or pine land, the land is assessed at $2.00 to $3.00 per acre, and the standing timber at $3.12 to $6.00 per thousand board feet, resulting in assessed values per average acre ranging from $3.87 for pine land in Calcasieu Parish to $45.27 in Vernon. Hardwood land varied from $5.22 in Allen Parish to $44.29 in Calcasieu. Reforestation lands were assessed at $1.00 per acre in La Salle Parish and $3.00 per acre in Allen Parish. Forest land classified as cut over, either hardwood or pine, bears an assessment of $2.10 to $4.63 per acre. The average total State and parish tax rate was approximately 38 mills per dollar of assessed valuation. Taxes per acre on land with timber varied from 13¢ in Calcasieu Parish to $2.51 on the old-growth stands in Vernon. The tax on cut-over land with little or no timber is 8 to 20¢ per acre. Approximately 460,000 acres of unredeemed land, both forest and agricultural, have been adjudicated to the State as of Nov. 15, 1937, for nonpayment of taxes; most of this is recently cut-over forest land in Natchitoches, Rapides, Calcasieu, and Vernon Parishes. In addition to the tax on land and standing timber, there is a severance tax that must be paid when the timber is cut. This varies with the species, being about 7 to 24¢ per M board feet, log scale, for hardwoods, 12¢ for pine, and 26¢ for cypress. The legal log rule is the Scribner-Doyle.

The most striking feature of table 1, which shows the land area of the unit classified according to land use, is the high proportion of the area in forest land. Small areas of new cropland occur chiefly in Sabine Parish, but this increase in new land is outweighed by land abandonment in Natchitoches, Sabine, Rapides, and Calcasieu Parishes. The excess of abandonment over new cropland is partially due to the large reduction in the acreage of cotton in these parishes between 1924 and 1934. About 20,000 acres of land were classified as abandoned in Calcasieu Parish, perhaps erroneously, as much of it is open prairie land that is used occasionally for grazing cattle. It is estimated that about half the idle and abandoned land shown in table 1 is in the uplands and suitable for timber production; the remainder is largely flat coastal prairie that may be less adapted for trees. Planting of forest-tree seedlings and intensive fire protection will be necessary for early and complete stocking in either case, and if present crop-control programs continue in effect, it is probable that many of these idle and abandoned acres will be available for timber production.

Table 1. - Land area classified according to land use, 1935

Land use	Area	Proportion of total area
	Acres	Percent
Forest:		
Productive	4,541,900	78.7
Nonproductive	1,600	negl.
Total forest	4,543,500	78.7
Nonforest:		
Agricultural:		
In cultivation:		
Old cropland	583,100	10.1
New cropland	34,300	.6
Out of cultivation:		
Idle	141,100	2.4
Abandoned	68,600	1.2
Pasture	96,700	1.7
Total agricultural	923,800	16.0
Other nonforest	306,900	5.3
Total nonforest areas	1,230,700	21.3
Total forest and nonforest	5,774,200	100.0

Description of the Forest

One of the finest longleaf pine forests in the South originally covered the uplands of this unit, while old-growth hardwoods of excellent quality occurred in the bottoms of the Sabine, Calcasieu, Red, and Little Rivers. At the turn of the century, however, large pine sawmills were established, and the process of clear-cutting the pine lands began. At present only a few large tracts of virgin pine and hardwood remain, and these are rapidly being cut. Vernon, Natchitoches, and Rapides Parishes contain most of the old-growth pine, while a greater part of the old-growth hardwood is in Vernon Parish in the Sabine River bottom lands. In the northern part of the unit, particularly in Sabine, Natchitoches, and La Salle Parishes, loblolly and shortleaf pine restocked large areas after the removal of the original stands (fig. 1). Extensive acreages of clear-cut longleaf land are in Grant and La Salle Parishes, but nearly a million acres of it lies in the central and southern parts of the unit. In the southwest portion of the unit there are some well-stocked stands of second-growth longleaf. Bottom lands along the larger streams contain a mixture of bottom-land hardwood species, chiefly red and black gums and water and white oaks. Scattered patches of hardwoods also occur on the uplands throughout the unit, with upland red oaks, scrub and post oaks, and hickories the more common species. The upland hardwoods, however, are much lower in quality than those of the bottom lands.

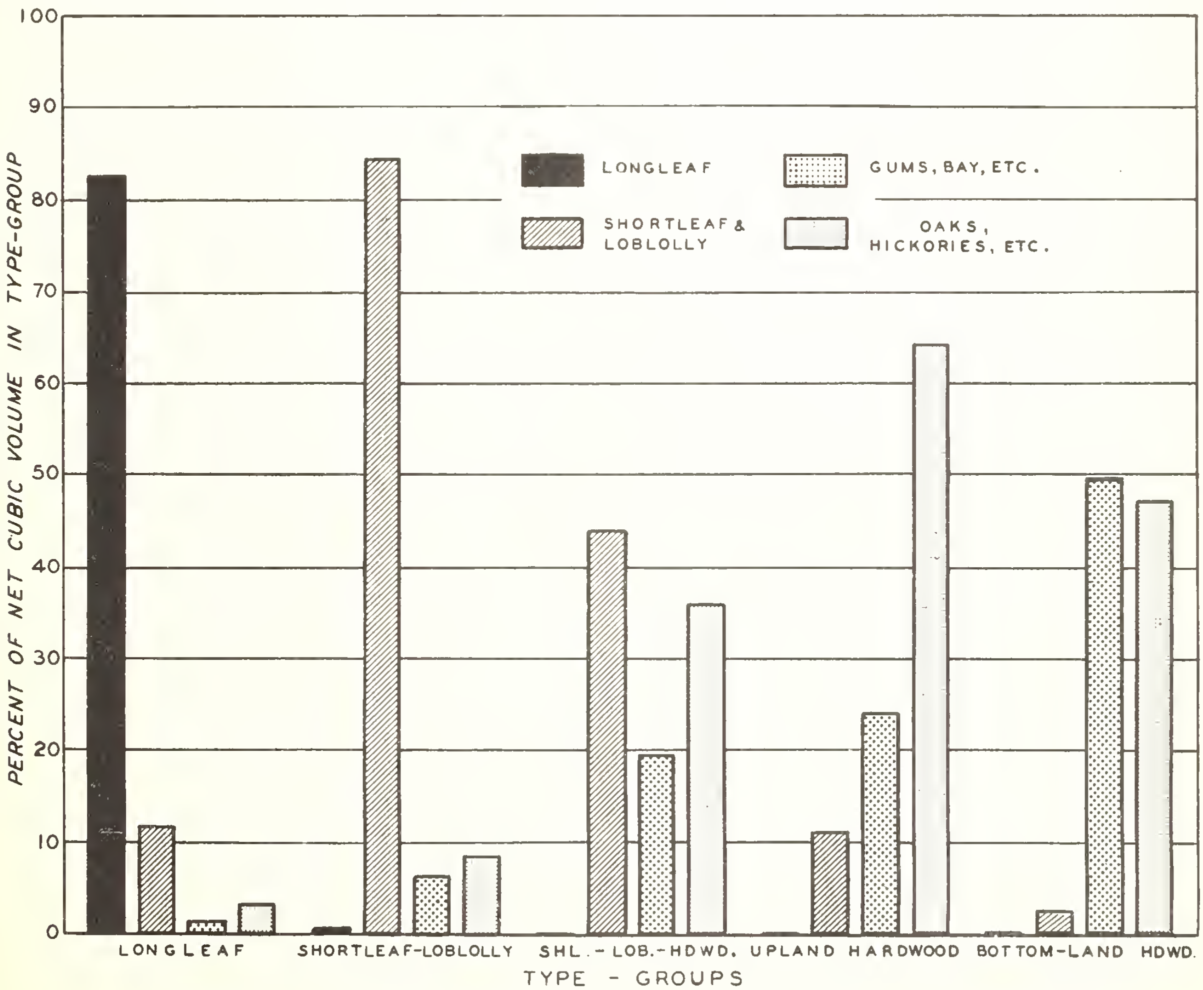
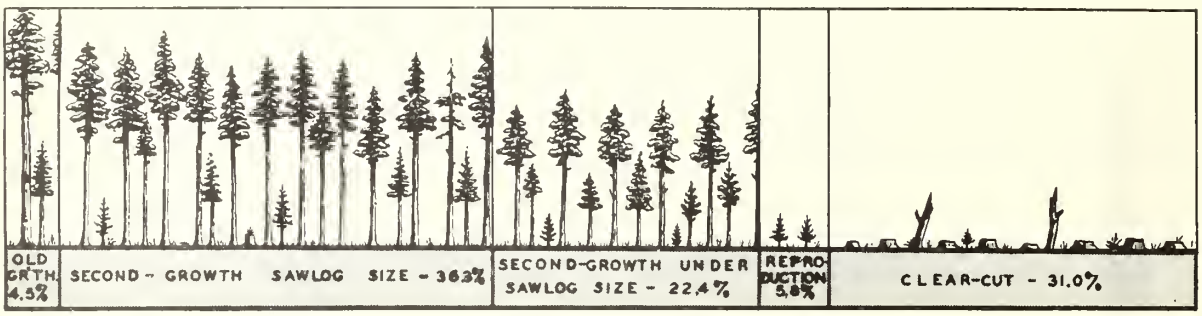


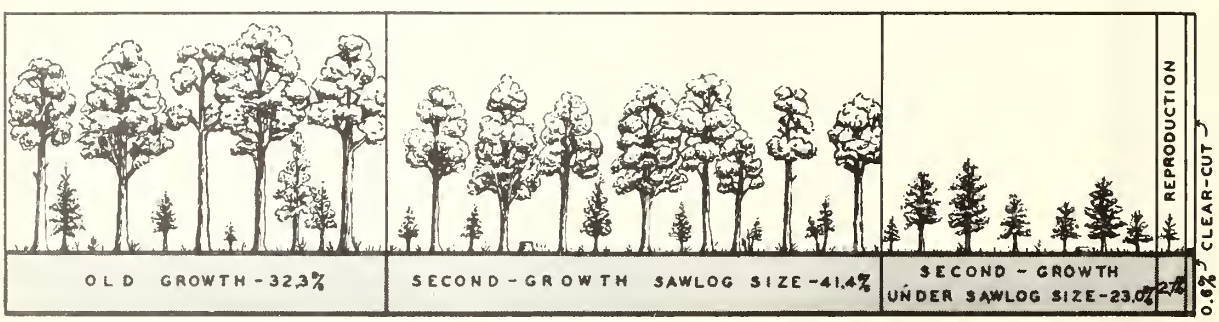
FIGURE 3.- SPECIES COMPOSITION OF FOREST TYPE-GROUPS.

Certain tree species are commonly associated, and this characteristic is the basis for classifying the forest stand into five major type-groups (see appendix): longleaf pine, shortleaf-loblolly pine, shortleaf-loblolly-hardwood, upland hardwood, and bottom-land hardwood. The species composition of each of the type-groups is shown in figure 3, in which the net cubic volume (bark included) in each species-group is expressed as a percentage of the total net cubic volume in the type-group. The species-groups as combined are: (1) longleaf pine; (2) shortleaf and loblolly pines; (3) red, black, and tupelo gums, with smaller quantities of cypress, bay, magnolia, maple, and cottonwood (the pulping hardwoods); and (4) oaks, beech, hickories, and elm (the hardwoods at present considered nonpulping).

Past cutting practices have influenced materially the character of the present forest cover. Logging has been in progress for over half a century, varying in intensity from absolute clear-cutting to the removal of selected trees only. The denuded areas have remained so, but second growth has become established over much of the forest land left in better condition. Age- and size-classes vary with the length of time since cutting, so that at present the forest land supports all stages of forest growth: clear-cut land, reproduction, young second-growth under sawlog size, merchantable second growth, and a remnant of the original old-growth stands. Figure 4 shows the proportionate area of the pine and hardwood type-groups in these various conditions. Very striking is the large area of clear-cut land in the pine types. Most of this area will require planting to restore the forest, since only 15 percent of it has even as many as three seed trees per acre.



A-PINE TYPES



B-HARDWOOD TYPES

FIGURE 4 - PROPORTIONATE AREA OF FOREST CONDITIONS IN THE PINE AND HARDWOOD TYPES.

In table 2 the area in the various forest conditions is presented by type-groups. More than half the longleaf area is clear-cut. About three-fourths of a million acres have restocked to second growth, but only recently, as reproduction and sapling sizes predominate. The small remaining area of old growth is being harvested rapidly, with part of the land left in good growing condition and part left denuded. Most of the shortleaf-loblolly and shortleaf-loblolly-hardwood stands are in the northern part of the unit on former longleaf land that was cut over when lumbering first started. Although this was only a little over 50 years ago, sufficient time has elapsed to produce timber stands of sawlog size on more than two-thirds of the area in these types.

Table 2. - Forest area classified according to forest condition and forest type-group, 1935

Forest condition	Longleaf	Short-leaf-lob-lolly	Short-leaf-loblolly-hardwoods	Upland hard-woods	Bottom-land hard-woods	Total all types	Propor-tion of total
	Acres						Percent
Old growth:							
Uncut	58,500	5,500	7,000	22,600	122,400	216,000	4.8
Partly cut	64,700	9,300	11,700	25,700	173,900	285,300	6.2
Total	123,200	14,800	18,700	48,300	296,300	501,300	11.0
Second growth:							
Sawlog size:							
Uncut	187,100	416,400	231,500	51,400	194,900	1,081,300	23.8
Partly cut	59,300	198,000	167,600	60,800	134,900	620,600	13.7
Under sawlog size	383,500	194,100	199,600	111,500	134,100	1,022,800	22.5
Reproduction	153,500	34,300	15,600	18,800	10,100	232,300	5.1
Total	783,400	842,800	614,300	242,500	474,000	2,957,000	65.1
Clear-cut	1,055,600	21,000	800	800	5,400	1,083,600	23.9
Total all conditions	1,962,200	878,600	633,800	291,600	775,700	4,541,900	100.0
Percent of total forest area	43.2	19.3	14.0	6.4	17.1	100.0	

Nearly 30 percent of the area in the upland hardwood type-group consists of scrub hardwoods, which are found in scattered patches throughout the cut-over longleaf land. Since these species seldom attain merchantable size, they make up a large part of the area of under-sawlog-size upland hardwoods shown in table 2. More than half the total area of upland hardwoods is stocked with sawlog-size stands, but most of these have been cut over for the more valuable species. The bottom-land hardwood type-group contains the largest acreage of old-growth timber and also the highest proportion of sawlog-size stands. Although about half the merchantable bottom-land hardwood stands have been culled by removal of the most valuable trees, a considerable volume of high-quality hardwood is still available.

The distribution of the total number of trees by size-classes is shown in figure 5. Noteworthy facts brought out by this diagram are: (1) hardwoods greatly exceed the pines in number; (2) longleaf pines make up a minor part of the total stand; (3) in the hardwoods there is an enormous number of 2-inch trees; and (4) in both pines and hardwoods the number of large trees is relatively small. Although there is an apparent surplus of smaller trees, a large part of these will die before reaching usable size. Fire protection is essential to reduce this mortality.

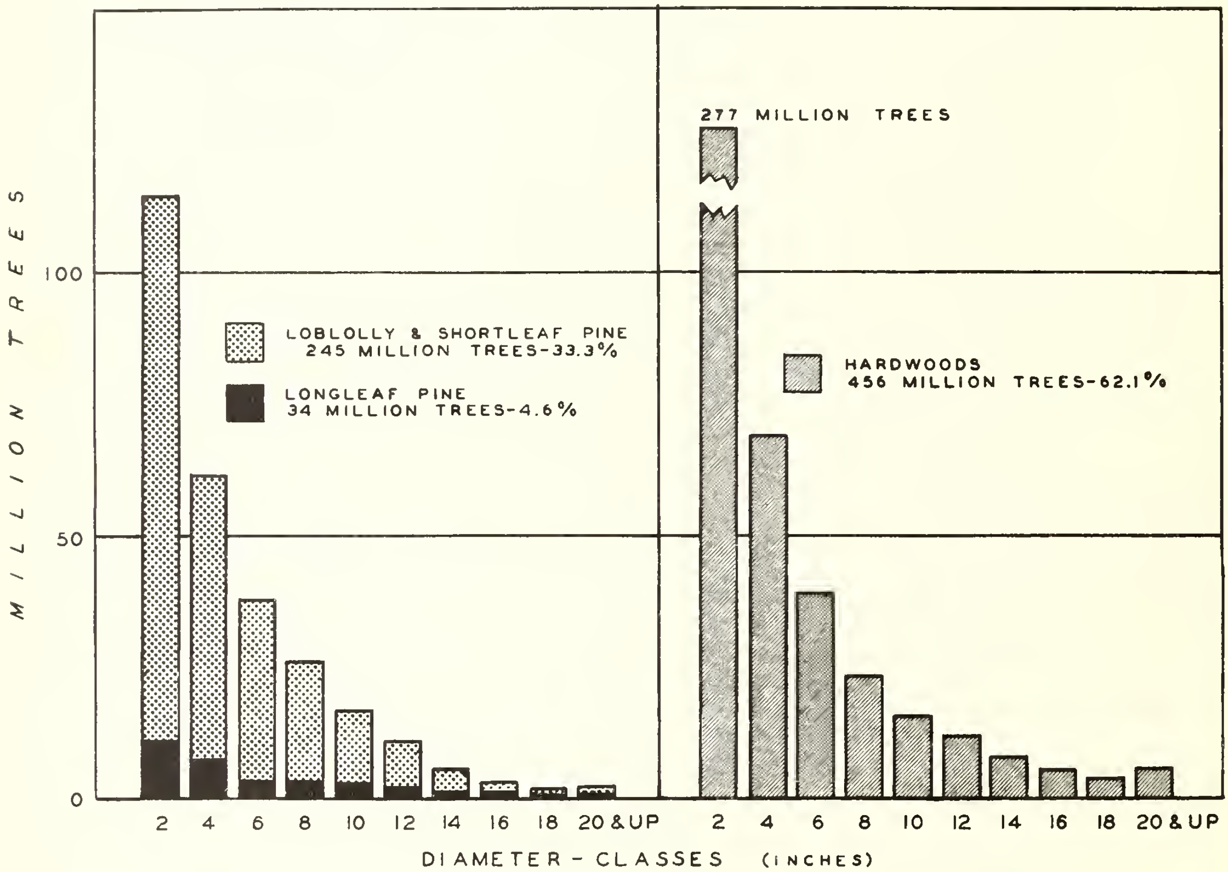


FIGURE 5 - STAND DIAGRAMS.

The portion of figure 6 designated as (A) represents the longleaf type area of 1,962,200 acres; while that designated as (B) represents the shortleaf-loblolly and shortleaf-loblolly-hardwood type areas combined, amounting to 1,512,400 acres. The total pine forest thus diagrammed occupies three-fourths of the forest land in the unit. The figure shows the age-class and volume distribution of the prevailing pine forest and contrasts the present volumes at various ages with the volumes that can be expected at comparable ages from well-stocked stands. The area and volume per acre of the existing age-classes was determined by a field survey of the $3\frac{1}{2}$ million acres in the

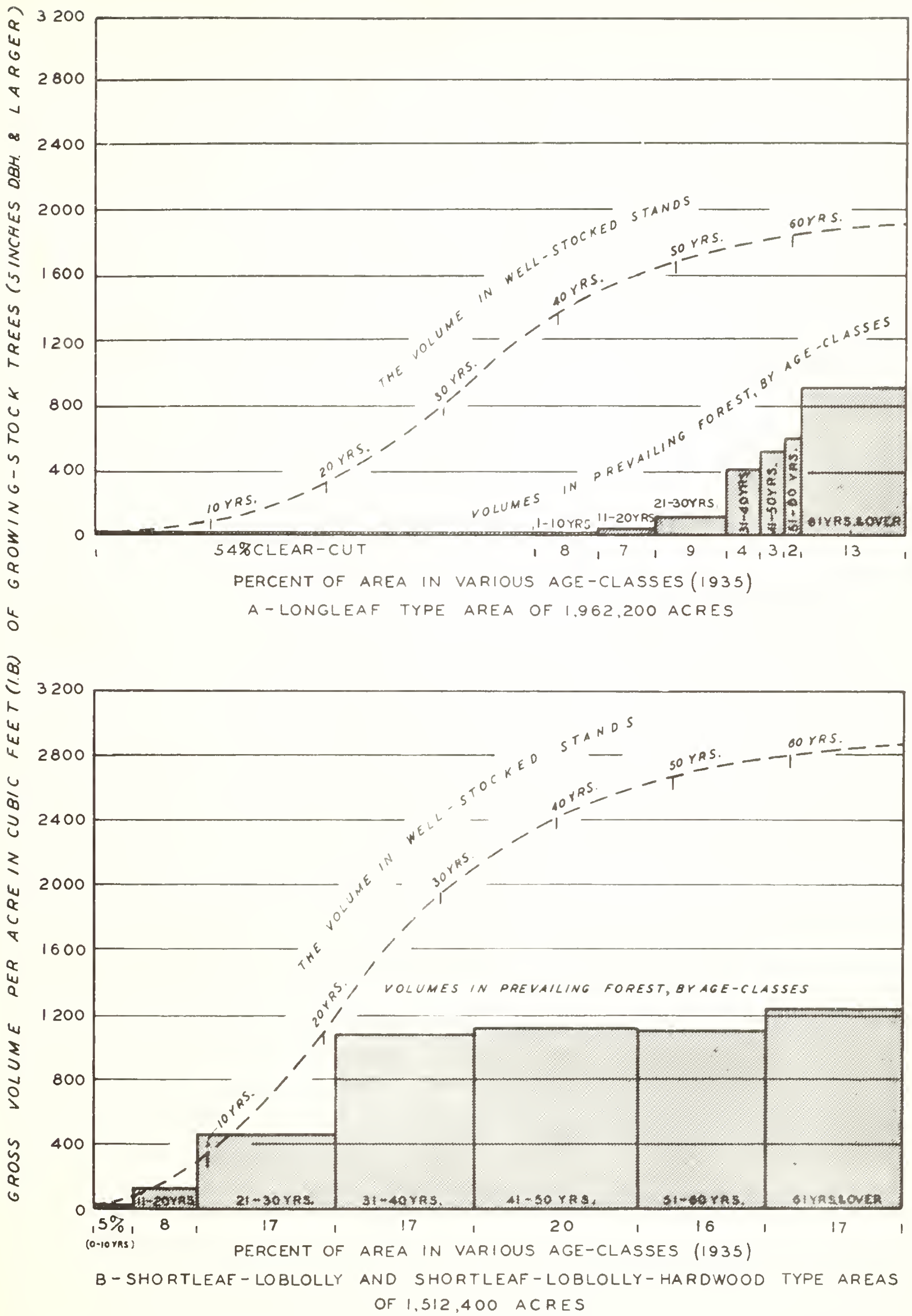


FIGURE 6 - DISTRIBUTION BY AREA OF PREVAILING AGE-CLASSES AND VOLUME, AND THE VOLUME IN WELL-STOCKED STANDS.

pine forest. The volume of well-stocked stands (shown by the broken line) is based upon the most heavily stocked 10 percent of the present uncut stands of weighted-average sites in these types. The deficiency in stocking of the prevailing forest is most obvious in the longleaf type area, but an opportunity for increasing the stocking on the remaining pine area is indicated for each age-class by the wide disparity between present volume and the volume attainable in well-stocked stands.

Planting will be necessary on about half of the longleaf area if the forest land is to be returned soon to productivity. Even though facilities were available to plant this large acreage immediately, it probably would require 4 to 5 million dollars for nursery stock and planting, and a wait of 20 to 30 years for the planted trees to reach pulpwood size (and even longer for them to reach saw-timber size). In addition, the elimination of fires would be necessary. Private industry is not likely to finance such an endeavor. Public acquisition, followed by planting, seems the probable answer.

The volume deficiency in the shortleaf-loblolly-hardwood forest can be improved greatly through intensive fire protection, since there is unutilized growing space in the present stand that will support a new crop of young trees if fire is eliminated. Present age-class distribution is favorable for sustained-yield operations, but it should be realized that the age-classes of the actual forest are much intermingled and not at all in even-aged blocks as shown in the figure.

It is apparent from figure 6 that there is an opportunity for greatly increased yields of wood products on a sustained-yield basis, if adequate forest-management practices are applied to the timber stands. In the early part of 1938, the Regional Office of the U. S. Forest Service at Atlanta, Ga., conducted a study of management practices throughout the Southern Region, visiting most of the larger industrial and investment owners. In southwest Louisiana, which is one of the worst cut-over areas in the South, the 36 owners visited were found to control nearly 2 million acres, or about 43 percent of the forest land. Figure 7 shows that 54 percent of the 2 million acres studied was being left in poor growing condition. Most of this land (over 1 million acres) has been cut so clean that planting will be necessary for the early establishment of forest cover, but indicative of the brighter side of the picture and of the growing trend in southern forestry was the discovery that 46 percent of the forest land visited was left in a productive condition, and that more than a half million acres were being managed for sustained yield.

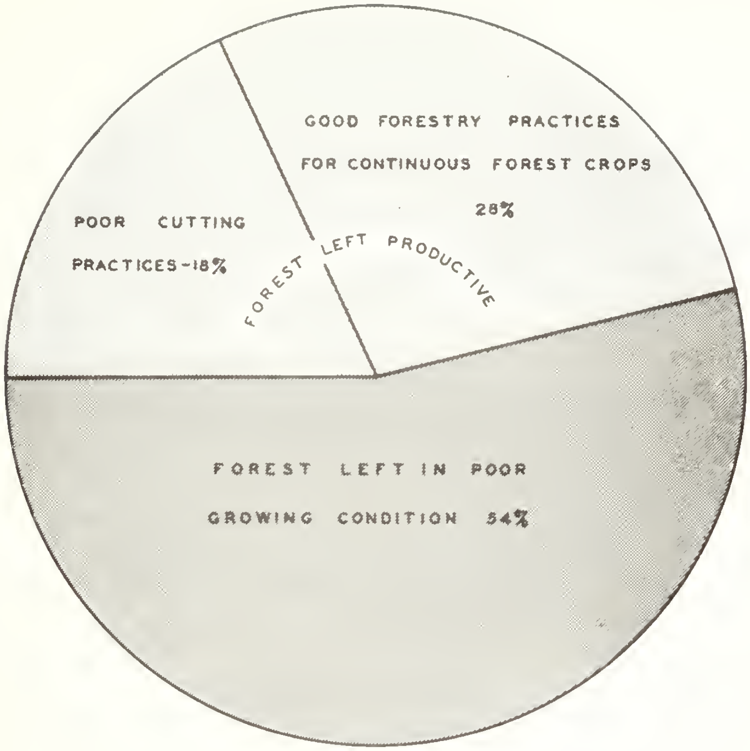


FIGURE 7 - MANAGEMENT PRACTICES ON PRIVATE FOREST LAND IN LARGE OWNER-SHIPS (BASED ON 1,975,100 ACRES.)

Volume Estimates

Board-foot volume

The estimate of the board-foot volume (definition in appendix) as of 1935 is given in table 3, expressed in terms of board feet as measured by the Doyle log rule. According to this table, the total volume is $6\frac{1}{2}$ billion board feet, almost equally divided between pines and hardwoods. About two-thirds of the pine volume is in second-growth stands. There is slightly over a billion board feet of old-growth pine, 82 percent of which is longleaf. Three-fourths of the total pine volume is in trees at least 13.0 inches d.b.h. In the hardwoods, the volumes in old-growth and second-growth stands are about equal. Although there are many trees of low quality, particularly in the upland hardwoods, about two-thirds of the hardwood volume is in trees that are 19.0 inches d.b.h. or larger and that contain a large proportion of high-quality material.

Additional information on the quality of both pines and hardwoods was gathered by supplemental studies. Trees in both the old-growth and second-growth conditions were graded. In the pines each tree was classified as "smooth," "limby," or "rough," while in the hardwoods the individual logs were classified as grade 1, 2, or 3. Descriptions of the classifications will be found in the appendix. The percentages given on page 15 are based upon the gross volume, lumber tally. The data show that the old-growth pine volume is practically all in "smooth" trees, whereas a considerable part of the volume in old-growth red gum and red oaks is in grade 3 logs. Shortleaf is the best of the second-growth pine species, while red gum has the highest proportion of volume in grade 1 among the second-growth hardwoods.

Table 3. - Net volume (Doyle) classified according to species-group and forest condition, 1935

Species-group	Old growth		Second growth		Total	Proportion of total
	Uncut	Partly cut	Sawlog size	Under sawlog size1/		
	Thousand board feet					Percent
Pines:						
Longleaf	730,900	151,300	227,700	43,200	1,153,100	17.7
Shortleaf	23,700	38,200	506,600	12,500	581,000	9.0
Loblolly	91,500	46,500	1,243,500	26,700	1,408,200	21.6
Total pines	846,100	236,000	1,977,800	82,400	3,142,300	48.3
Pulping hardwoods:						
Red gum	226,000	186,600	342,100	7,900	762,600	11.7
Black gum	162,200	137,100	149,500	7,300	456,100	7.0
Others, incl. cypress	86,500	57,400	79,800	6,700	230,400	3.5
Nonpulping hardwoods:2/						
Red oaks	142,200	132,900	331,100	12,800	619,000	9.5
White oaks3/	104,300	133,000	331,700	9,300	578,300	8.9
Ash	19,200	9,300	25,100	1,700	55,300	.8
Others4/	172,000	169,800	313,000	11,700	666,500	10.3
Total hardwoods	912,400	826,100	1,572,300	57,400	3,368,200	51.7
Total all species	1,758,500	1,062,100	3,550,100	139,800	6,510,500	100.0
Percent of total	27.0	16.3	54.6	2.1	100.0	

1/ Includes reproduction and clear-cut.
2/ Includes species not commercially pulped at present, although some have been used experimentally.
3/ Approximately 26 percent of this volume is post oak.
4/ Approximately 28 percent of this volume is hickory.

	Old-growth trees			Second-growth trees		
	Smooth	Limby	Rough	Smooth	Limby	Rough
Longleaf pine	100	negl.	-	89	11	negl.
Shortleaf pine	100	negl.	-	98	2	-
Loblolly pine	No data			67	26	7

	Old-growth logs			Second-growth logs		
	Grade 1	Grade 2	Grade 3	Grade 1	Grade 2	Grade 3
Red gum	79	2	19	69	8	23
Red oaks	62	14	24	53	10	37
White oaks	No data			63	7	30

The volumes given in table 4 are obtained by using the International ¼-inch rule, which is used throughout this report as the equivalent of green lumber tally. It therefore gives a more accurate expression of the recoverable volume in the forest stand than the Doyle rule, which under-scales small logs and over-scales large ones. A comparison of tables 3 and 4 shows that the lumber tally volume exceeds the Doyle volume by 47 percent.

Table 4. - Net volume, lumber tally, classified according to species-group and forest condition, 1935

Species-group	Old growth		Second growth		Total
	Uncut	Partly cut	Sawlog size	Under sawlog size[1/]	
	- - - - Thousand board feet (green lumber tally) - - -				
Pines:					
Longleaf	931,100	212,700	422,500	94,000	1,660,300
Loblolly and shortleaf	157,300	123,600	3,118,800	87,200	3,486,900
Total pines	1,088,400	336,300	3,541,300	181,200	5,147,200
Hardwoods:					
Gums, etc.	608,900	491,700	814,400	37,800	1,952,800
Oaks, etc.	531,300	555,800	1,347,400	53,700	2,488,200
Total hardwoods	1,140,200	1,047,500	2,161,800	91,500	4,441,000
Total all species	2,228,600	1,383,800	5,703,100	272,700	9,588,200

1/ Includes reproduction and clear-cut conditions.

The old-growth condition occupies only 11 percent of the forest area (table 2), but it contains 38 percent of the total board-foot volume (table 4). Volumes per acre are high, averaging 10,300 board feet lumber tally, for all types in old-growth uncut stands. In the various type-groups of the old-growth uncut condition, the average stands per acre are as follows: longleaf, 16,600 board feet; shortleaf-loblolly, 12,000; shortleaf-loblolly-hardwoods, 10,500; upland hardwoods, 3,800; and bottom-land hardwoods, 8,500 board feet.

The second-growth condition, including reproduction, occupies 65 percent of the forest area and contains almost 62 percent of the board-foot volume. Second-growth stands have less volume per acre than those in the old-growth condition, averaging 3,800 board feet for all types in the second-growth uncut sawlog-size condition. There is considerable variation between type-groups in this condition, as the average stand per acre in the longleaf is 2,300 board feet; in the shortleaf-loblolly, 4,700; in the shortleaf-loblolly-hardwoods, 3,700; in the upland hardwoods, 2,800; and in the bottom-land hardwoods, 3,800 board feet.

About 24 percent of the forest area is in the clear-cut condition, but this large area of more than a million acres contains only a negligible part of the total board-foot volume. The average stand per acre is 40 board feet.

Figure 8 is included to show the distribution of the volume in the sawlog-size conditions of the pine and hardwood type-groups. The total volume shown in the two portions of the figure is gross and exceeds the volume given in table 4 because cull has not been deducted. In the pine types, 90 percent of the volume is in stands of 2,000 or more board feet per acre, such stands occurring on 65 percent of the area. Stands of at least 10,000 board feet per acre contain 30 percent of the total pine volume, which is concentrated on 108,000 acres. These figures, which are based upon the 1935 inventory, however, do not portray exactly the 1938 situation, inasmuch as cutting has been continuous in these old-growth stands. In the hardwood types, 93 percent of the volume is in stands of 2,000 or more board feet per acre, with 75 percent of the area supporting these more-heavily stocked stands. Volumes of at least 10,000 board feet per acre occur on 11 percent of the hardwood area and account for 33 percent of the total hardwood volume.

The bottom-land hardwood types exceed those of the uplands in concentration of volume, and 95 percent of the bottom-land hardwood volume is in stands of 2,000 feet or more per acre, compared with 86 percent of the upland hardwood volume. Furthermore, 37 percent of the bottom-land hardwood volume is in stands of at least 10,000 board feet per acre, whereas only 5 percent of the upland hardwood volume is in such heavy stands.

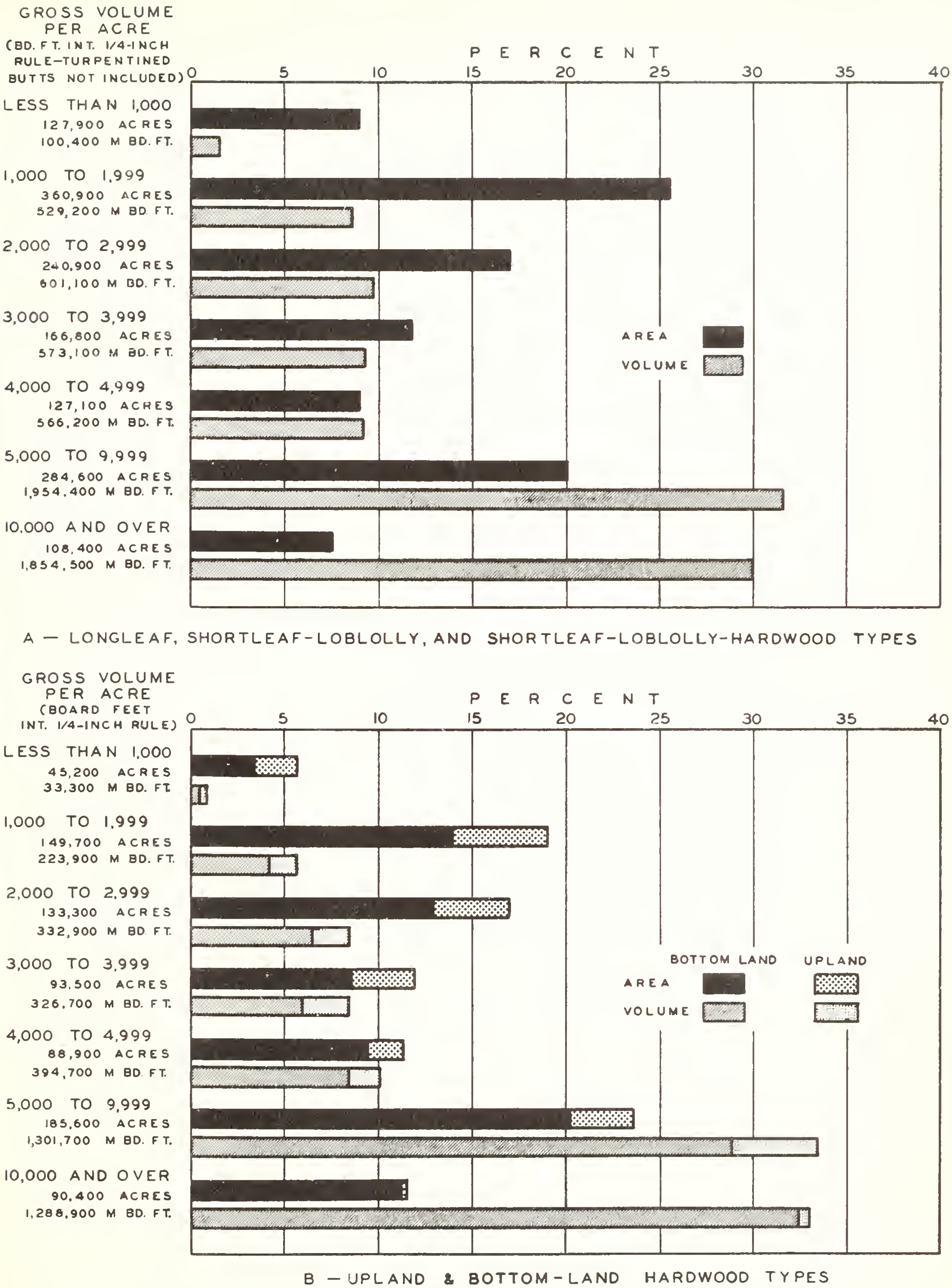


FIGURE 8 — PROPORTIONAL AREA AND VOLUME OF THE SAWLOG-SIZE CONDITIONS, CLASSIFIED ACCORDING TO VOLUME OF SAW TIMBER PER ACRE.

Cordwood volume

The estimate of cordwood volume (see detailed description in appendix) as of 1935, shown in table 5, includes the entire stand of sound trees at least 5.0 inches d.b.h. outside bark, and in addition the net sound volume in cull trees 5.0 inches d.b.h. or larger. These volumes are expressed in terms of standard cords (4 x 4 x 8 feet), estimated to contain 90 cubic feet of pine or cypress, or 80 cubic feet of hardwood, all including bark.

Shortleaf and loblolly make up three-fourths of the pine volume; and longleaf, the remainder. Almost 77 percent of the total pine volume is in trees 9.0 inches and larger. About 9-3/4 million cords are in trees 5.0 to 12.9 inches d.b.h.; 85 percent of the volume in these smaller trees is in shortleaf and loblolly pine. Stands of these species are most widespread in Sabine and Natchitoches Parishes. The pulping hardwoods are chiefly red, black, and tupelo gums, which are most abundant in the larger river bottoms. Twenty-eight percent of the total volume in the pulping hardwood species is in sound trees below sawlog size. There is also a large volume of hardwoods that are considered nonpulping at present but that eventually may be useful for pulp; post and scrub oaks already are being used in small amounts for experimental purposes.

Table 5. - Net volume of all sound material, expressed in cords of wood with bark, 1935

Species-group	Source of material				Total all classes	Proportion of total
	Sound trees sawlog size	Upper stems of sawlog-size trees	Sound trees under sawlog size	Cull trees		
	Cords					Percent
Pines	11,253,200	2,081,400	4,050,800	131,400	17,516,800	36.4
Hardwoods:						
Pulping	4,837,900	2,491,800	3,653,900	1,936,500	12,920,100	26.9
Nonpulping	5,688,800	3,395,300	5,039,400	1/3,556,100	17,679,600	36.7
Total hardwoods	10,526,700	5,887,100	8,693,300	5,492,600	30,599,700	63.6
Total all species	21,779,900	7,968,500	12,744,100	5,624,000	48,116,500	100.0
Percent of total	45.2	16.6	26.5	11.7	100.0	

1/ Includes sound scrub oak.

The cordwood volume of sound-tree growing stock is shown in figure 9, classified according to species-group and diameter-class. Sound-tree volume as used here includes the full stems of pines and hardwoods under sawlog size but at least 5.0 inches d.b.h., the full stems of merchantable pines to a variable (minimum 4-inch) top, and the saw-timber portion of sawlog-size hardwoods. The volume in cull trees, scrub oaks, and tops and limbs of sawlog-size hardwoods is not included.

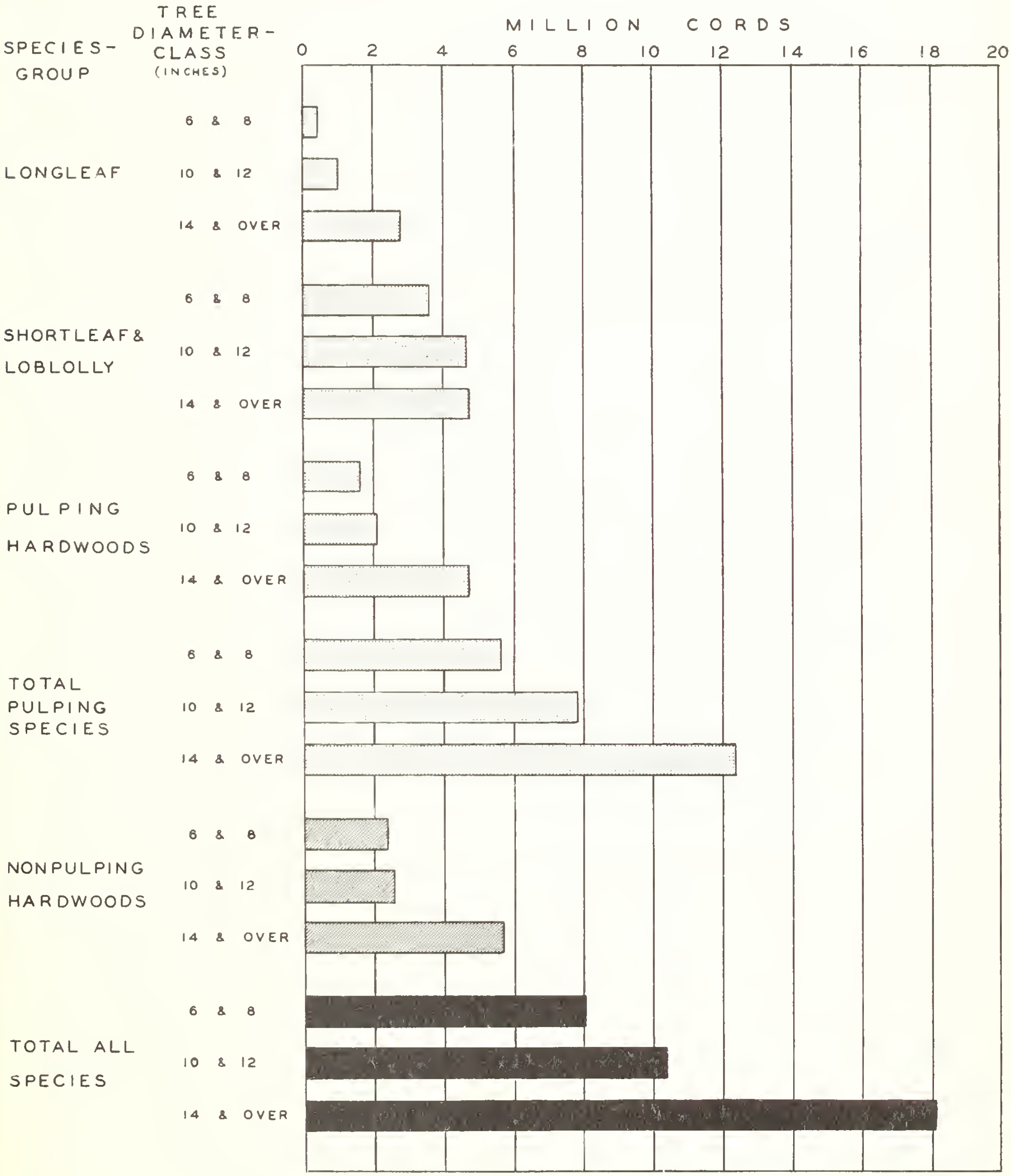


FIGURE 9 - CORDWOOD VOLUMES OF PULPING AND NONPULPING SPECIES.

Pine poles and piles 1/

Many of the pine trees included in the tables of volume shown earlier in this report are suitable for use as poles or piles. Their number, classified by size and length, is given in table 6, where the preponderance of shorter and smaller trees is apparent. Technicians drawing up pole or pile specifications should note that there are four times as many 30-foot pieces as 35-foot ones. Liberalizing the specifications where possible will greatly increase the supply of pole and pile timber, and will provide one way of meeting the competition of the growing pulp industry.

Table 6. - Total number of pine poles or piles, classified according to length and diameter, 1935

D.B.H. of trees (outside bark)	Pole or pile length (feet)							Total	Proportion of total
	20	25	30	35	40	45	50 or over		
Inches	Thousand pieces								Percent
7.0 - 8.9	1,884	542	361	20	-	-	-	2,807	30.4
9.0 - 10.9	1,368	616	614	150	146	-	-	2,894	31.3
11.0 - 12.9	728	458	508	164	97	69	28	2,052	22.2
13.0 - 14.9	263	228	282	86	45	39	45	988	10.7
15.0 - 16.9	83	91	117	43	18	11	24	387	4.2
17.0 - 18.9	22	27	34	16	4	3	6	112	1.2
Total	4,348	1,962	1,916	479	310	122	103	9,240	100.0
Percent of total	47.1	21.2	20.7	5.2	3.4	1.3	1.1	100.0	

Wood naval stores

The clear-cutting of longleaf stands that has been in progress since 1890 has left a vast reservoir of stumpwood that can be utilized by the wood naval stores industry. One steam and solvent plant has been operating in this area for about 20 years, but its reduction of the total supply is not very apparent. It is estimated that there are 1,412,400 acres on which stumps are commercially available at present. In addition, there are 630,000 acres (containing about 2 million tons of stumps), upon which stumps are at present unavailable because they are (a) in thick stands of second-growth timber or (b) freshly cut and consequently unseasoned. Nearly 87 percent of the stumpwood area now operable contains 6 or more stumps per acre, and 34 percent contains 26 or more per acre.

The tonnage of merchantable stumps on a blasting basis (5 stumps per ton) is presented in table 7. These stumps occur in all the forest conditions,

1/ For additional information, see "Pole and Pile Timber in the Pine-Hardwood Region-West," Forest Survey Release #28, Southern Forest Exp. Station, New Orleans La., Sept. 25, 1937.

and all are available according to present methods of operation. Theoretically this total volume of about 6 million tons is sufficient to support 4 steam and solvent plants, each using 75,000 tons of wood annually, for the next 20 years. Calculated on the basis of yields obtained from other steam and solvent operations, these four plants could produce annually 39,000 barrels (50 gallons each) of turpentine, 250,000 barrels (500 pounds gross each) of rosin, and 1.9 million gallons of pine oil, as well as other chemical products. At present several factors make immediate and full utilization of these wood supplies impractical, for the output of sulphate wood turpentine is steadily increasing, substitute materials are narrowing the market, and the gum naval stores industry is in a chaotic financial condition because of overproduction. It would be good economy, however, to use these stumps before they are wasted through fire and decay. A program of research that will develop new uses for all naval stores, coupled with more conservative practices in the gum naval stores industry, e.g., chipping only sawlog-size trees, might allow a more balanced and profitable production of both wood and gum naval stores.

Table 7. - Weight of merchantable longleaf pine stumps removable by blasting, classified according to forest condition and number of stumps per acre, 1935

Stumps per acre	Old growth	Second growth			Clear-cut	Total	Proportion of total
		Sawlog size	Under sawlog size	Reproduction			
	Thousand tons						Percent
5 or less	6	11	15	6	37	75	1.2
6 to 13	12	72	168	48	281	581	9.6
14 to 25	75	119	321	166	1,160	1,841	30.4
26 or more	100	145	374	253	2,690	3,562	58.8
Total	193	347	878	473	4,168	1/ 6,059	100.0
Percent of total	3.2	5.7	14.5	7.8	68.8	100.0	

1/ If mechanical stump pullers were used, the total recoverable volume would be about 10 million tons.

Gum naval stores

The gum naval stores industry in this area has been based almost entirely upon old-growth longleaf pine. This class of timber is now almost gone, and the naval stores industry is vanishing with it. During the 1937 season, there was only one active turpentine operation. Old-growth timber, located in Vernon and Rapides Parishes, was being worked in advance of logging.

It is difficult to estimate the part that second-growth longleaf may play in future naval stores production in this unit. Field observations indicate that south and west of DeQuincy there is an extensive body of second-growth longleaf that soon may be suitable for turpentining, but Survey data are not localized enough to warrant estimates of the number of stems per acre and the total round-timber acreage in this locality. Data gathered for the entire unit show that in 1935 there were about $4\frac{1}{2}$ million round second-growth longleaf pine trees (9.0 inches d.b.h. and larger) in the longleaf pine type, estimated to have about 5 million future faces, but probably a large majority of these trees are so scattered that naval stores operations would be impractical.

Forest Increment

Throughout this report the term "forest increment" is used to denote the net volume of wood created by growth of the forest growing stock. In all the tables dealing with forest increment, except table 11, the calculations for each year are based upon (1) the growth of the sound trees that remained in the stand, (2) the growth produced by trees previous to their being harvested, (3) the volume of those trees that came into measurable size, and (4) the volume lost because of mortality, rot, and other natural causes. Increment on cull trees and limbs of all species, however, is omitted. The board-foot increment includes the growth on the saw-timber portion of sawlog-size trees. The cordwood increment, which includes bark in all cases, is the growth on the sound stemwood of pines 5.0 inches d.b.h. and over, on under-sawlog-size hardwoods, and on the sawlog portion of sawlog-size hardwoods. Cubic-foot volumes are for wood without bark; otherwise, the material is identical with that included in the cordwood tables.

The increment of the forest stand for 1935 is shown in table 8. This is the latest year for which increment can be presented accurately by forest conditions, as the changes in the area of these conditions, due to cutting and growth, have not been determined since the inventory was made.

Owing to the fact that all the pine species are grouped together in the old-growth condition, table 8 fails to emphasize properly the retrogression of the old-growth longleaf stands. Long since mature, the loss in these stands from mortality and decay exceeded the gain through growth by over 5 million board feet, whereas the less mature stands of old-growth shortleaf and loblolly increased 3 million board feet through growth. Obviously rapid utilization of the mature and over-mature trees in the old-growth longleaf stands is desirable to keep the volume lost through mortality at a minimum, but it is likewise desirable that the cutting methods used should insure the continued productivity of the forest land.

The total increment of 487,500 board feet represents a volume increase of more than 5 percent during the year. About two-thirds of the total board-foot increment is in the pine species, owing to a greater growth rate and a larger growing stock in this species-group. Eighty-three percent of the pine increment is in sawlog-size stands and is available for sustained-yield utilization at the present time. It would be good practice, however, to reserve a portion of this increment for building up the growing stock, as the pine stands are both understocked and overcut. In the hardwoods, 89 percent of the increment is in sawlog-size stands, but some of this is in low-quality species that are commonly not logged in commercial operations.

Table 8. - Forest increment in board feet and cubic feet in the various forest conditions, 1935

Forest condition	Saw-timber material			All material		
	Pine	Hardwood	Total	Pine	Hardwood	Total
	Thousand board feet			Thousand cubic feet (i.b.)		
Old growth	-2,300	55,600	53,300	740	10,530	11,270
Second growth:						
Sawlog size	264,300	98,900	363,200	55,430	27,780	83,210
Under sawlog size	48,200	18,500	66,700	15,780	8,380	24,160
Reproduction and clear-cut	4,200	100	4,300	1,040	530	1,570
Total all conditions	314,400	173,100	487,500	72,990	47,220	120,210

The cubic-foot increment above is expressed in standard cords (4 x 4 x 8 feet) in table 9. The volumes given include both wood and bark, since this is the usual commercial practice in the pulpwood industry in the South.

Table 9. - Forest increment in cords of wood with bark in the various forest conditions, 1935

Forest condition	Pine	Hardwood	Total
	Cords		
Old growth	9,800	154,400	164,200
Second growth:			
Sawlog size	728,200	421,200	1,149,400
Under sawlog size	215,100	131,400	346,500
Reproduction and clear-cut	13,700	8,200	21,900
Total all conditions	966,800	715,200	1,682,000

The increment in board feet and cubic feet is shown in table 10 for each of the 3 years since the inventory of 1935. The values for 1937 are used in the comparison of increment and drain in tables 14 and 15 in order to portray the growing-stock situation on Jan. 1, 1938.

Table 10. - Forest increment in board feet and cubic feet in 1935, 1936, and 1937

Year	Saw-timber material			All material		
	Pine	Hardwood	Total	Pine	Hardwood	Total
	- - Thousand board feet - -			- Thousand cubic feet (i.b.) -		
1935	314,400	173,100	487,500	72,990	47,220	120,210
1936	323,600	168,600	492,200	76,360	47,660	124,020
1937	329,000	170,300	499,300	78,000	48,240	126,240

Increment per acre of uncut stands

The growing power of the various forest conditions in 1935 is illustrated in table 11. The values revealed here are based upon the 1935 inventory, and since they are given in order to show the relative growth rates of various forest conditions and species-groups, the estimated full year's growth on harvested trees has been included.

Table 11. - Average increment per acre in the various forest conditions undisturbed by cutting in 1935

Forest condition	Pine component			Hardwood component			Total per acre		
	Bd.ft.	Cu.ft. 1/	Cords	Bd.ft.	Cu.ft. 1/	Cords	Bd.ft.	Cu.ft. 1/	Cords
Old growth:									
Uncut	-34	-4.1	-.05	126	19.0	.27	92	14.9	.22
Partly cut	21	6.4	.08	107	23.6	.35	128	30.0	.43
Second growth:									
Sawlog size:									
Uncut	194	40.4	.53	62	17.3	.26	256	57.7	.79
Partly cut	103	21.6	.28	53	15.1	.23	156	36.7	.51
Under sawlog size	47	15.6	.21	18	8.2	.13	65	23.8	.34
Reproduction and clear-cut	3	0.8	.01	negl.	0.4	.01	3	1.2	.02
Weighted averages	71	16.5	.22	39	10.5	.16	110	27.0	.38

1/ Inside bark.

Forest Industries

Sawmills

The lumber industry became important in this area soon after 1890. Since that time many large sawmills, with their accompanying effects upon community development, have come and gone. For instance, in Vernon and Beauregard Parishes, 16 large sawmills that began operation between 1898 and 1920 had cut out and were completely abandoned by 1933. Most of these mills employed about 400 men each and maintained towns of at least 1,000 people.

Although the lumber industry has passed its heyday, in 1937 there were in the area 95 active sawmills (table 12), producing 449 million board feet of lumber, which included at least 270,000 sawn cross ties. About 72 percent of this was pine and the remainder, mixed hardwoods. About 40 percent of the pine cut was from old-growth timber and 60 percent from second growth, but about 90 percent of the hardwood lumber was cut from old-growth stands. Only 63 million board feet of the total lumber production was cut from saw timber brought into the unit from the outside, and this was nearly balanced by the 51 million board feet of saw timber shipped to sawmills outside the unit.

Table 12. - Number of sawmills, lumber production, and extent of employment, classified according to size of mill, 1937

Rated capacity 1/ (10-hour day)	Number of sawmills	Lumber production			Employment provided		
		Pine	Hardwood	Total	In woods	In mill	Total
Thousand board feet		- Thousand board feet -			- Thousand man-days -		
Under 20	69	31,800	1,000	32,800	28	52	80
20 to 39	3	21,100	4,700	25,800	61	42	103
40 to 79	11	44,800	66,700	111,500	176	243	419
80 and over	12	223,800	54,900	278,700	250	617	867
Total	95	321,500	127,300	448,800	515	954	1,469

1/ Rated capacity indicates size of mill rather than actual average daily production.

Sawmills with a rated capacity of less than 40,000 board feet per 10-hour day are most numerous (fig. 11), but they produced only 13 percent of the lumber cut. The mills of a daily capacity of 40,000 to 79,000 board feet produced 25 percent of the lumber, while 62 percent was cut by the 12 large mills having a capacity of 80,000 or more board feet per day. The cutting capacity of the 95 mills listed in table 12 is 2.45 million board feet per 10-hour day, or a yearly cut of 612.5 million board feet, on the basis of 250 days per year. The 1937 lumber production was about three-fourths of this computed capacity.

The total production of the sawmills for 1937 in each complete or partial parish is shown graphically in figure 10. Most of the logs contributing to the production of a parish were cut within it, but a few of the larger sawmills drew material from a much wider area.

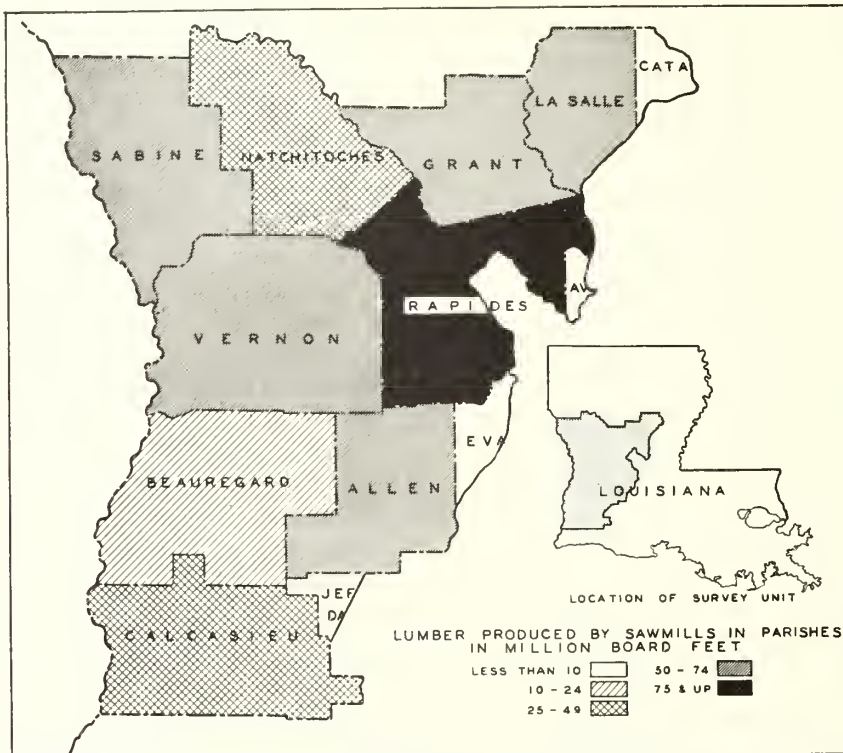


FIGURE 10 - LUMBER PRODUCTION BY PARISHES DURING 1937.

Other forest industries

The lumber industry greatly exceeds the other forest industries in number of plants, wood requirements, and employment provided. There is, however, some activity in practically all kinds of forest utilization common to the South. The largest of the other forest industrial establishments, as measured in terms of labor required to operate it, is the wood distillation plant at De Quincy, which uses the steam and solvent process in the conversion of old-growth longleaf pine stumps and "light wood." A sulphate pulp mill at Elizabeth also secures all its timber from this unit.

Two treating plants, one at De Ridder and one at Colfax, were in operation in 1937. A third plant, constructed at De Ridder in 1937, began operation early in 1938. Among the smaller manufacturing establishments are 4 shingle mills, 3 cooperage plants, 1 handle plant, 1 hardwood dimension plant, and 1 gum turpentine still (fig. 11). These 14 plants operating in 1937 required 142,000 man-days of labor for the manufacture of the raw material after it was delivered to them.

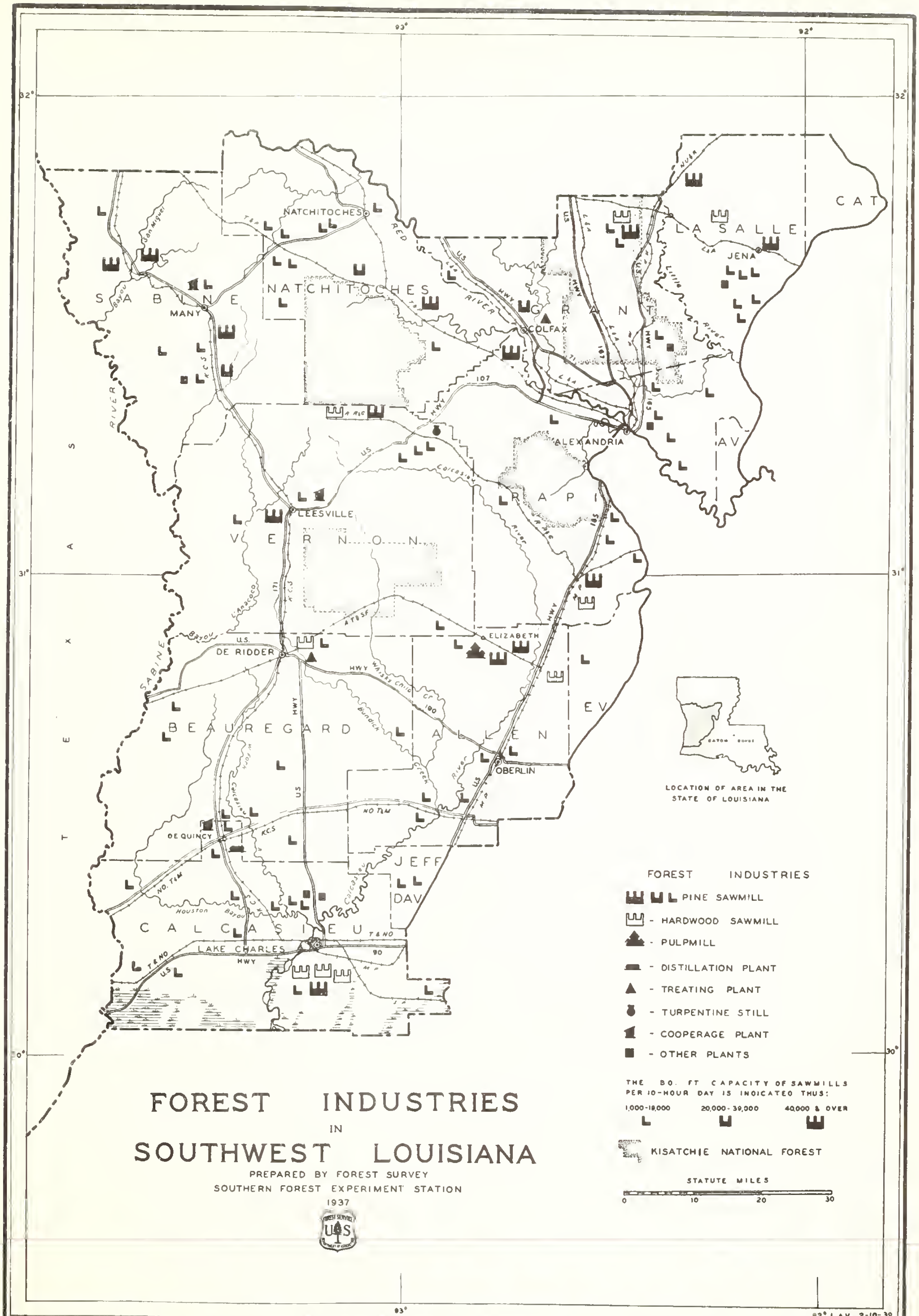


FIGURE 11 · FOREST INDUSTRIES MAP.

Contributions to the wood requirements of plants both inside and outside the unit and the local production of poles, piles, cross ties, fuel wood, and fence posts form an important part of the forest-utilization activity. In 1937, nearly 2 million board feet of veneer blocks were shipped to Texas and north Louisiana, while 2-1/3 million board feet of cooperage stock went to plants in Louisiana outside the unit. Pulp mills in north Louisiana obtained 8,500 cords of pulpwood from this area. Hardwood dimension stock sold to plants outside the unit amounted to 2,500 cords. In addition to this material, 229,000 poles and piles were produced, 1,019,000 hewn cross ties, 1,017,000 fence posts, and approximately 378,000 cords of fuel wood. It is estimated that the production of the above items, plus the raw material for the 14 plants in the unit, required 823,000 man-days of labor in the woods.

Summarizing the employment situation, we find that the primary forest-industrial plants (sawmills, pulp mills, distillation plants, etc.) required 1.1 million man-days for their operation in 1937. This includes labor spent in processing wood shipped into the unit from outside. Woods labor, which includes all the labor involved in cutting material to be sent out of the unit as well as that used locally, amounted to 1.3 million man-days. About 87 percent of the mill labor and 38 percent of the woods labor was in the lumber industry. It is estimated that at least 12,000 individuals were employed full or part time by the forest industries in 1937.

Commodity Drain

The amount of wood cut from the saw-timber component of the sound-tree growing stock to satisfy the needs of the various forest-industrial plants, and for use as cross ties, poles, fuel wood, fence posts, and miscellaneous items, amounted to 580 million board feet in 1937. The total drain of saw timber plus the smaller sizes was 112 million cubic feet of wood without bark, or 1.5 million cords of wood with bark. Table 13, which shows these volumes distributed according to use, substantiates the fact that 80 percent of the saw-timber drain was caused by the lumber industry. It is estimated that about 94 percent of the total drain from the saw-timber material in merchantable trees was utilized; the remainder was wasted because of incomplete utilization of the felled trees. The drain on the saw-timber portion of the trees, including both the utilized and wasted portions, is expressed in board feet, while the volumes given in cubic feet and cords include drain on saw-timber material, upper stems of sawlog-size pines, and small trees ranging from 5.0 inches d.b.h. to sawlog size.

Table 13. - Commodity drain from sound trees, 1937

Commodity	Saw-timber material			All material			
				With bark		Without bark	
	Pine	Hardwood	Total	Pine	Hardwood	Pine	Hardwood
	- Thousand board feet - (lumber tally)			Thousand cords		Thousand cubic feet	
Lumber	327,400	133,900	461,300	769.3	251.6	58,870	19,370
Cross ties	37,800	8,300	46,100	96.4	19.5	7,370	1,490
Poles and piles	15,800	1,200	17,000	43.1	2.7	3,300	210
Veneer	600	1,400	2,000	1.4	2.7	110	210
Cooperage	100	3,200	3,300	.6	6.9	50	530
Pulpwood	8,600	-	8,600	35.0	.1	2,650	10
Misc. manufactures	negl.	2,100	2,100	negl.	5.2	negl.	380
Fuel wood	27,700	6,900	34,600	179.3	38.5	12,580	2,570
Fence posts	800	100	900	8.4	.4	630	20
Misc. farm use and land clearing	2,600	1,200	3,800	15.4	11.6	1,090	770
Total	421,400	158,300	579,700	1,148.9	339.2	86,650	25,560

Comparison of Increment and Drain

It has not been possible to keep the inventory figures of 1935 up-to-date by forest conditions, but by computing growth and mortality and determining commodity drain each year, the total volume of growing stock on Jan. 1 of each succeeding year has been determined. Tables 14 and 15, which are for 1937, exemplify the method used for 1935 and 1936 and lead to an estimate of the volume of growing stock as of Jan. 1, 1938.

Table 14 shows that the volume of saw-timber material, when expressed as a total, decreased by 80 million board feet during the year. The longleaf pine growing stock was reduced about 9 percent in this year, but such heavy cutting is in some respects justified, as 69 percent of the longleaf volume in 1935 was in old-growth stands that were losing more volume through mortality than they were gaining by increment. The cut of shortleaf and loblolly was greater than that of longleaf, but the volume in these species is largely in fast-growing young timber where growth greatly exceeds mortality, so that the resulting increment in these species was more than ample to meet cutting needs. In the old-growth hardwoods, mortality is less than the growth, but the increment does not equal the drain. The 12 million board feet of surplus increment shown in table 14 is due to the abundance of increment in the younger hardwood stands. In both the pines and hardwoods, the cut is concentrated in the larger sound trees and, in the hardwoods particularly, in the more valuable species. The result is to reduce gradually the average size of the saw-timber trees and to increase the proportion of cull trees and inferior species.

Table 14. - Balance between increment and drain of saw-timber material, 1937

Item	Longleaf	Shortleaf and loblolly	Hardwood	Total
	- - - Thousand board feet (lumber tally) - - -			
Growing stock, Jan. 1, 1937	1,455,600	3,599,300	4,431,100	9,486,000
Growth	57,200	315,600	205,500	578,300
Mortality	20,200	23,600	35,200	79,000
Net increment	37,000	292,000	170,300	499,300
Commodity drain	165,500	255,900	158,300	579,700
Net change in growing stock	-128,500	36,100	12,000	-80,400
Growing stock, Jan. 1, 1938	1,327,100	3,635,400	4,443,100	9,405,600

In addition to the drain upon saw timber there is a considerable drain upon smaller material, such as pulpwood, fuel wood, fence posts, and small poles, that is expressed most conveniently in cubic feet. Table 15 summarizes the effect of increment and drain upon saw timber plus this supplemental material, expressed in cubic feet inside bark. It is noteworthy that the inclusion of the younger, smaller, and fast-growing timber influences the increment so favorably that the stand as a whole increased 14 million cubic feet during the year.

Table 15. - Balance between increment and drain of saw-timber and cordwood material, 1937

Item	Longleaf	Shortleaf and loblolly	Hardwood	Total
	- - - Thousand cubic feet (inside bark) - - -			
Growing stock, Jan. 1, 1937	300,290	1,021,130	1,319,920	2,641,340
Growth	13,170	76,230	60,880	150,280
Mortality	3,650	7,750	12,640	24,040
Net increment	9,520	68,480	48,240	126,240
Commodity drain	29,300	57,350	25,560	112,210
Net change in growing stock	-19,780	11,130	22,680	14,030
Growing stock, Jan. 1, 1938	280,510	1,032,260	1,342,600	2,655,370

A comparison between increment and drain of sawlog-size pines and hardwoods is presented in figure 12 for 1935, 1936, and 1937. The figure shows that the cut of pine saw timber has gradually increased each year and in each of these years has exceeded the increment by at least 40 million board feet. Oddly enough, however, the increment of pine saw timber has likewise increased each succeeding year. This is because a large part of the saw-timber cut is taken from the old-growth stands that have little net increment, thus leaving the second-growth stands with an excess of increment over drain. These second-growth stands, therefore, gradually increase in volume, and as growth is rapid and young trees are constantly attaining sawlog size, the resulting increment is progressively greater. In the hardwoods, the relation of increment to drain in the various forest conditions is similar to that in the pine species, but the overcut of 1935 was so heavy that it is reflected in a reduced increment in both 1936 and 1937, even though drain in these 2 years had also decreased.

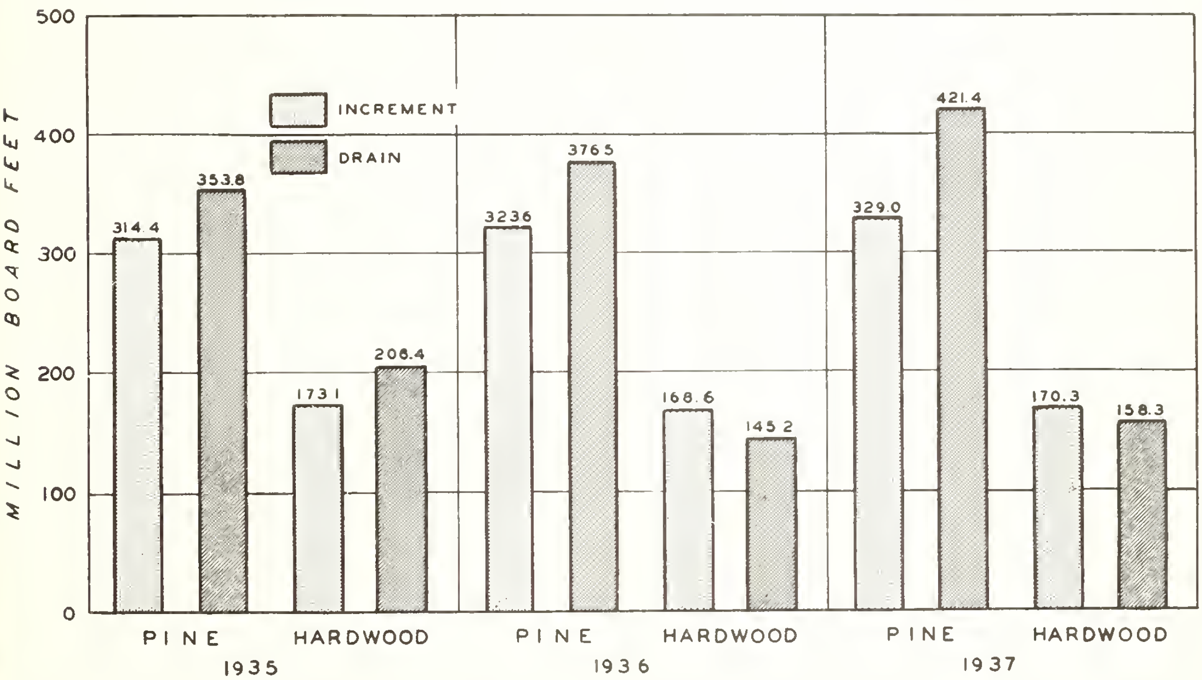


FIGURE 12 - COMPARISON OF NET INCREMENT OF SAWLOG-SIZE MATERIAL WITH SAW-TIMBER DRAIN IN 1935, 1936, 1937.

The change that occurred in the old-growth and second-growth growing stock over a 3-year period is shown by species-groups in figure 13, which bears out the assertion that the old-growth stands of both pine and hardwood are being reduced in volume, gradually but constantly, while the second-growth stands are increasing steadily. It is highly desirable that this trend in second growth be continued and accelerated in order that the growing stock of second-growth timber may satisfy, as completely as possible, the demand for saw-timber material that will continue after the exhaustion of the virgin stands. Inasmuch as the main body of old-growth pine will be cut-out in a few years, at the prevailing rate of use, no time should be wasted before taking steps to increase the productivity of the second-growth stands through increased fire protection, thinnings, improvement cuttings, and building up the growing stock by restricting the cut to less than the annual growth.

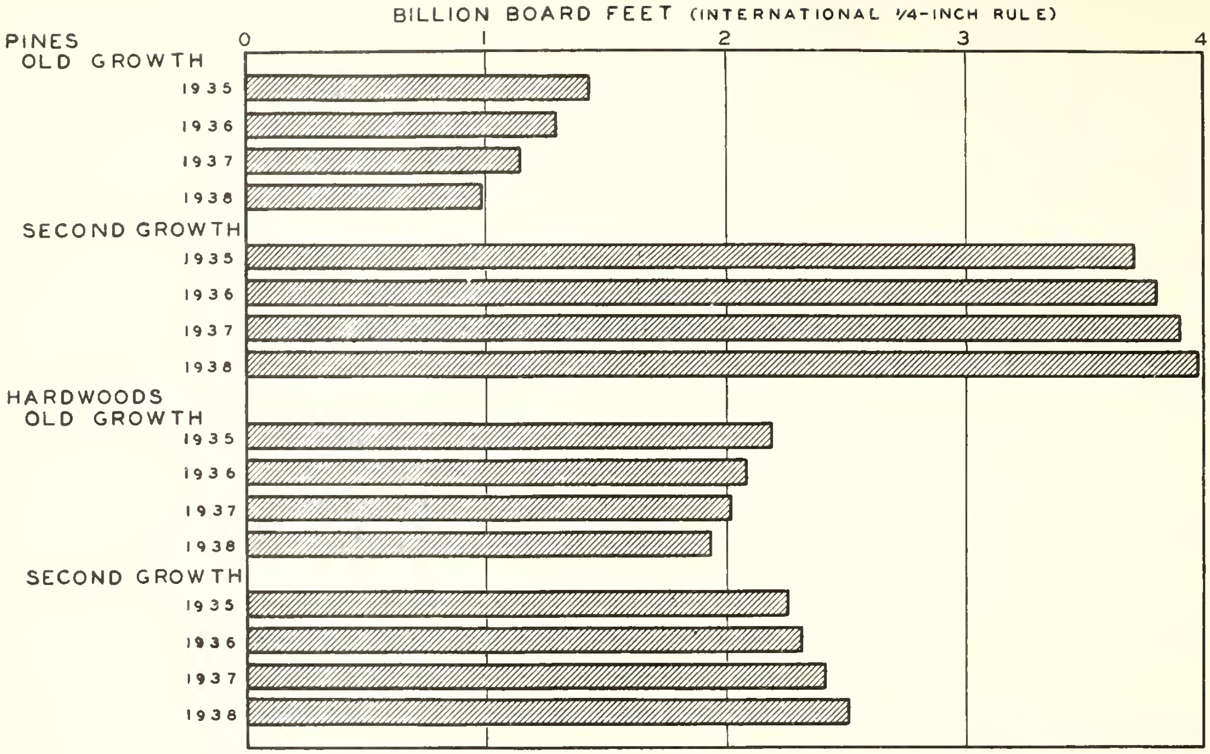


FIGURE 13 - GROWING STOCK BY SPECIES-GROUPS AND FOREST CONDITIONS ON JAN. 1 OF 1935, 1936, 1937, AND 1938.

Summary of the Present Situation

The forest in the economic picture

The exploitation of the formerly vast timber resource was the leading factor in the original development of the towns, railroads, and economic structure of this area. Most of the old-growth longleaf pine, upon which the lumber industry was based, has been removed; and many of the sawmill communities such as Pickering, Neame, and Cravens have disappeared, leaving the forest industries diminished in importance but still highly essential to the region. Forest land occupies 79 percent of the area, but over wide areas it is nonproductive of timber for industry or local use, as about 1 million acres, or 24 percent of the forest area, have been practically denuded of trees. The timbered portion contains a growing stock of 5 billion board feet of pine and $4\frac{1}{2}$ billion feet of hardwood, which together produced half a billion board feet of increment in 1937. Ninety-five sawmills and 14 other wood-using plants distributed at least 4 million dollars in wages to 12,000 or more woods and mill workers in 1937. The value of lumber produced at the sawmills in 1935 was approximately 40 percent of the value of all products manufactured in the unit that year. Since forest lands, along with their timber, bear about one-fifth of the total assessed tax valuation of the unit, as allocated by the Louisiana Tax Commission in 1937, they contribute a large part of the State and parish taxes. Forest products make up an important part of the railroad tonnage in the area and also contribute appreciably to the export trade of Lake Charles, the only seaport, about 20 percent of whose exports in 1936, both in tons and in dollar value, were forest products, mostly lumber.

Deficiencies in the present forest

1. The most striking and serious defect in the forests of southwest Louisiana is the appalling acreage of denuded land. Over 1 million acres are so denuded of trees that natural restocking to desirable species, within a reasonable time, is impossible. Reference to figure 6A shows that 54 percent of the longleaf land is in this unproductive condition.

2. Another major shortcoming is that the present average forest yield is far below the optimum offered by the soil, climate, and species. There are two important contributing factors: First, the large area of clear-cut land produces almost no annual increment; secondly, the stands in the timbered areas are too sparsely stocked. Frequent fires have prevented the survival of young seedlings, killed small trees, and seriously damaged many of the larger trees, so that the stands, on the average, contain far below the number of stems and usable volume the site will sustain. This understocked condition is further aggravated by present over-cutting on much of the forest area.

3. The small proportion of larger trees is unfavorable for the continued production of the better grades of saw timber. Most of the timber is second growth, and the decline in the supply of old-growth timber has resulted in the practice of "high-grading" the young stands, leaving stands made up predominantly of the smaller trees. More than 97 percent of the trees, both pines and hardwoods, are under 15 inches d.b.h.

4. In the hardwoods there is a growing scarcity of the more valuable species, such as forked-leaf white oak, ash, and the better species of red oak, owing to the common practice of concentrating the cut in the species that provide the most opportunity for profit. Immediate economic conditions usually dictate the cutting practices followed, but for continued long-time production it is poor silviculture to leave only the inferior species, as they occupy the growing space that could be used more profitably by better ones and foster the retrogression of the forest by reseeding the ground to the less desirable species.

Measures for improving the forest

Any plan that attempts to set up ways and means of improving the forest in this unit must recognize that about three-fourths of the forest land is largely under-stocked with timber, while one-fourth is clear-cut. For each of these situations the first step toward improvement is intensification of the present system of fire control throughout the several million acres of privately-owned forest land. Prevention of fire is essential for the survival of planted tree seedlings. Its elimination in the partly stocked forest will allow many more young trees to mature and augment the volume of growing stock, and at the same time will reduce the volume lost through decay and death of the older trees.

The clear-cut forest land best suited for continued timber production should be restored to productivity as rapidly as protection from fire can be assured. This can be accomplished within a reasonable length of time only through a planting program participated in by both public agencies and private owners. The amount of clear-cut land that should be planted is problematical, but the need for timber in the area, the proven suitability of the soil and climate, and the opportunity for profit in timber growing, lend weight to the claim that a large part of the million acres of denuded land has its highest use in timber production.

A million acres of denuded land presents a grave problem, it is true, but its seriousness must not hide the fact that there are also $3\frac{1}{2}$ million acres of forest land in the unit insufficiently stocked with timber. The whole burden of providing timber for the present and future wood-using industries must fall upon these partly stocked stands until the denuded land is again productive, and even then they should contribute their share. At present the net annual growth of these stands does not equal the volume of wood removed for industrial and domestic use. Fortunately, however, there is opportunity to increase both the quantity and quality of the yield from the forest growing stock through application of tested forest-management practices. In addition to intensive fire protection, these call for improvement cuttings to remove trees that are defective and of poor form, thinnings in young growth, planting in areas that will not restock naturally to the proper density, spreading the cut to include inferior species, and conservative cutting to leave a volume equivalent to part of the annual increment in the stand until the growing stock is built up to its optimum volume per acre. The responsibility for initiating these forestry practices rests with the private owner, but public agencies should cooperate fully, as the benefits of a stabilized industry, based upon a permanent and ample resource, extend not only to southwest Louisiana but also to the State and the Nation.

A P P E N D I X

Forest Type-Groups

Longleaf pine. - Includes the following forest types: longleaf pine, longleaf and loblolly pine, longleaf and shortleaf pine, longleaf pine and mixed hardwoods. Almost 85 percent of the net cubic volume is longleaf pine.

Shortleaf-loblolly pine. - Includes the following forest types: shortleaf pine, loblolly pine, shortleaf and loblolly pine. About 85 percent of the net cubic volume is shortleaf and loblolly pine.

Shortleaf-loblolly-hardwood. - Includes the following forest types: shortleaf pine and mixed hardwoods, loblolly pine and mixed hardwoods. About 45 percent of the net cubic volume is pine; the remainder is mixed hardwoods.

Upland hardwood. - Includes the following forest types: upland hardwoods, scrub hardwoods. About 90 percent of the net cubic volume is mixed hardwoods; scattered pines account for the remainder.

Bottom-land hardwood. - Includes the following forest types: cypress-tupelo, bottom-land hardwoods. About 50 percent of the net cubic volume is red, black, and tupelo gums, bay, cypress, red maple, and other pulping hardwoods; the remainder is in species such as oaks, hickories, ash, beech, elm, and hackberry, with a small amount of loblolly pine.

Forest Conditions

Old-growth uncut. - Old-growth stands from which less than 10 percent of the volume has been cut.

Old-growth partly cut. - Old-growth stands from which 10 percent or more of the volume has been cut, but in which the remaining old-growth saw timber contains at least 1,000 board feet per acre of hardwood, or 600 board feet of pine or pine and hardwood mixed.

Second-growth sawlog-size uncut. - Second-growth stands from which less than 10 percent of the sawlog-size trees have been cut and in which the remaining saw timber contains at least 600 board feet per acre.

Second-growth sawlog-size partly cut. - Second-growth stands from which 10 percent or more of the sawlog-size trees have been cut, and in which the remaining saw timber contains at least 400 board feet per acre.

Second-growth under sawlog size. - Second-growth stands composed largely of under-sawlog-size trees, and containing less than 600 board feet per acre.

Reproduction. - Areas insufficiently stocked to classify as second growth, but bearing per acre more than 80 seedlings less than 1 inch d.b.h.

Clear-cut. - Cut-over areas in which an insufficient quantity of young growth has come in to classify them either as second growth or as reproduction.

Diameters

D.B.H. (diameter breast height). - Diameter, outside of bark, $4\frac{1}{2}$ feet above the ground.

A 2-inch diameter-class includes diameters 1 inch below and 0.9 inch above the stated midpoint, e.g., the 6-inch class includes trees 5.0 to 6.9 inches d.b.h. Corresponding limits apply to the other diameter-classes.

Tree Classification

Sawlog-size tree. - A pine or cypress tree at least 9.0 inches d.b.h., or a hardwood tree at least 13.0 inches d.b.h., which will produce 1 sound butt log at least 12 feet long, or which contains at least 50 percent of its gross saw-timber volume in sound material in case the butt log is a cull.

Under-sawlog-size tree. - Any tree between 1.0 inch and the minimum merchantable diameter at breast height, at least 75 percent sound and with a reasonably straight stem.

Cull tree. - A sound tree which, because of form, crook, extreme limbiness, or other sound defect, is not, and never will become, suitable for saw timber. Also a sawlog-size tree that is more than 50 percent defective, or an under-sawlog-size tree that is more than 25 percent defective.

Volume Estimates

Board-foot volume. - Only sawlog-size trees are included in this estimate. Top diameters vary with the limits of usable material, but no hardwood logs less than 8.5 inches in diameter at the small end, nor any pine logs less than 5.5 inches, are included. Deductions are made for woods cull, such as rot, fire scar, crook, limbiness, and similar defects, as well as for loss in sawing at the mill due to sweep and hidden defects.

Cordwood volume. - This includes the entire stand of sound trees at least 5.0 inches d.b.h., outside bark, and contains material from:

1. Sound trees sawlog size—the merchantable sawlog portion of saw-timber trees.

2. Upper stems of sawlog-size pine trees—the portion of saw-timber trees not used as sawlogs but usable as cordwood. This includes only the upper stems to a variable top-diameter limit (but not less than 4 inches).

3. Sound trees under sawlog size—the full stems of both pines and hardwoods at least 5.0 inches d.b.h. to a variable usable top-diameter (but not less than 4 inches).

Deduction is made for woods cull, such as rot, fire scar, excessive crook, bad knots, or other defects.

Additional material included in table 5 is the estimated sound usable portion of cull trees at least 5 inches d.b.h. and the upper stems and limbs of sawlog-size hardwoods and cypress.

Cubic-foot volume contains the material described under "Cordwood volume." It includes no bark except in figure 3.

Pine Tree Grades

Smooth tree. - A tree with at least 20 feet of clear length and at least 50 percent of the total usable length practically free of limbs and knots.

Limby tree. - A tree with at least 12 feet of clear length and with 30 to 49 percent of the total usable length practically free of limbs and knots.

Rough tree. - A merchantable tree not clear enough to be put in either of the previous classes.

Hardwood Log Grades

Grade 1. - Logs suitable for industrial lumber. They must be at least 12 feet long and 14 inches (ash, 12 inches) in top diameter, with at least 50 percent sound volume. Defects must leave 60 percent of the surface clear, and the log should produce at least 30 percent No. 1 common lumber.

Grade 2. - Logs suitable for cooperage and small dimension use. They must be at least 10 feet long and 10 inches (ash, 9 inches) in top diameter, with at least 50 percent sound volume. Defects must leave 60 percent of the surface clear, and the logs should produce at least 30 percent of No. 1 common lumber, but they may have sweep that would disqualify them for Grade 1 logs.

Grade 3. - Logs suitable only for ties, headings, crates, boxes, and rough structural material. They must be at least 8 feet long and 10 inches in top diameter, with at least 50 percent sound volume.

FOREST SURVEY RELEASE NO. 44 JUNE 15, 1939

FOREST RESOURCES OF NORTH CENTRAL GEORGIA

by
A. R. Spillers
Associate Forest Economist

A Progress Report by

THE SOUTHERN FOREST SURVEY

I. F. Eldredge, Regional Survey Director

SOUTHERN FOREST EXPERIMENT STATION

E. L. Demmon, Director

New Orleans, La.

FOREWORD

The nation-wide Forest Survey, being conducted by the United States Forest Service, was authorized by the McSweeney-McNary Forest Research Act of 1928. Its five-fold object is: (1) to determine the extent and condition of forest lands and to make an inventory of the present supply of timber and other forest products thereon, (2) to ascertain the rate at which this supply is being increased through growth, (3) to determine the rate at which this supply is being diminished through industrial and local use, windfall, fire, and disease, (4) to determine the present requirement and the probable future trend in the requirement for timber and other forest products, and (5) to correlate these findings with existing and anticipated economic conditions, in order that policies may be formulated for the effective use of land suitable for forest production.

This release is based on a field survey made Sept. 21, 1935, to Dec. 21, 1935, and two field canvasses of forest industrial plants to determine forest drain, the last of which was made during July 1937. It should be regarded only as a progress report since it contains Forest Survey data that will be included in complete reports to be published later, and that, although considered reliable, are subject to correction or amplification as the work of computation proceeds. Item 4 above, which is being studied on a national basis, is not discussed in this report.

In the interpretation of these survey data, it must be noted that owing to the sampling method used in collecting them, the greater the number of samples in any given classification the more accurate are the data for that classification. Hence classes that are of infrequent occurrence and relatively small in quantity generally cannot be determined with as high a degree of accuracy as classes that occur more frequently and in substantially greater quantities. Small tabular items are to be taken as showing, not the exact magnitude of the classes involved, but their relative magnitude in comparison with those of other classes.

In the South, the Forest Survey functions as an activity of the Southern Forest Experiment Station with headquarters at New Orleans, La.

Assisting Staff

E. B. Faulks, Associate Forest Economist }
W. E. Houser, Associate Timber Expert } In Charge of Field Work
J. M. Tinker, Assistant Timber Expert }
P. R. Wheeler, Associate Forest Economist, In Charge of Computations

Note: Assistance in the preparation of these materials was furnished by the personnel of Works Progress Administration Official Projects 701-3-9 and 365-64-3-7.

FOREST RESOURCES OF NORTH CENTRAL GEORGIA

General Description

North central Georgia (Forest Survey Unit Georgia No. 4) is an agricultural area of almost $6\frac{1}{2}$ million acres embracing 32 counties and extending southwesterly in a broad band across the State from its eastern to its western boundary (see map, fig. 1). The chief cash crop is cotton, which is grown on over 600,000 acres and is made into textiles at about 120 factories having a total of approximately 2 million spindles. Atlanta, the largest city, with over one-fourth of all the people in this entire area, is one of the biggest manufacturing and distributing communities in the South.

How important are the forests that cover $2\frac{1}{2}$ million acres, or over four times as much area as the cotton fields? And how can these forests be made more valuable to the people of this unit? The Forest Survey made an inventory of the forest resources and studied the wood-using industries for the purpose of finding answers to these questions. Although agriculture broadly defined includes both farming and forestry, in this report agriculture is used to mean farming, and forestry to mean timber growing and utilization.

With the exception of some of the northernmost counties, which extend over into the Blue Ridge foothills, the northern three-fifths of the area is in the upper Piedmont province, where elevations range from less than 700 to more than 1,300 feet above sea level and the land surface is rolling to hilly with steep slopes only along the stream borders. The southernmost tier of counties, or about two-fifths of the area, is in the lower Piedmont, with elevations ranging from less than 600 to more than 900 feet. Here the topography is more dissected, with narrower ridges and steeper slopes, than in the upper Piedmont.

The entire area is well drained by the Chattahoochee, Savannah, and other rivers flowing generally southward. The rainfall is about 50 inches per annum; the growing season is about 220 days per annum. As determined in 1936 by the Survey (table 1), 40 percent of the area was in some stage of forest growth, 57 percent was used for agriculture, and 3 percent was included in cities, towns, and villages, and in railways, highways, and other rights-of-way.

Included among the principal cities and towns are Atlanta, LaGrange, Athens, Decatur, and Griffin. Slightly less than half the total population of 956,000 (1930 Census) lives in incorporated towns and cities of 2,500 population or larger, while most of the remainder live on farms or in small communities. Although the total population has shown a steady increase since 1900 and the urban population has more than tripled, the rural population has remained practically stationary.

By 1860 there were several important railroad lines, and now north central Georgia has a maze of railroads, most of which connect at Atlanta. The principal railways are the Southern, the Louisville and Nashville, the Seaboard Air Line, the Central of Georgia, and the Atlanta and West Point. There is an excellent road system composed of paved and gravelled highways supplemented by many dirt roads. At least eight paved roads radiate from Atlanta to the major divisions of this area.

Table 1. - Total area classified according to land use, 1936

Land use	Area		Proportion of total area	
	Acres		Percent	
Forest:				
Productive	2,549,000		40.2	
Nonproductive	2,400		negl.	
Total forest		2,551,400		40.2
Nonforest:				
Agriculture:				
In cultivation:				
Old cropland	2,744,500		43.3	
New cropland	27,600		.4	
Out of cultivation:				
Idle	314,100		4.9	
Abandoned	264,600		4.2	
Pasture	247,500		3.9	
Total agriculture	3,598,300		56.7	
Other nonforest	195,900		3.1	
Total nonforest		3,794,200		59.8
Total area		6,345,600		100.0

Agriculture, which gives employment to approximately 128,000 of the 393,000 gainfully employed (in 1930), is the principal industry. Second in importance is the large and rather recently developed textile industry, which has located here because of the nearness to raw materials, abundant labor, and plentiful power. In 1937, the 12 electric power plants located here (7 hydroelectric and 5 steam) had a total capacity of 95,000 kilowatts and a total output for the year of about 340 million kilowatt-hours.

Approximately four-fifths of all the land is in farms, according to the special Census of Agriculture of 1935. The total farm area of 5 million acres, however, is made up of 2 million acres of farm woodlands and 3 million acres of cropland, pasture, and other farm land. The corn acreage in 1934 was more than 836,000 acres with an average yield of about 10 bushels per acre; while the 618,000 acres of cotton averaged slightly less than half a bale to the acre. The corn yields per acre are poor compared with the average for the United States, but the cotton yields are somewhat better than the average for the entire cotton belt.

The proportion of land available for crops (cropland and plowable pasture) in the different counties is shown in figure 2, based on data from the 1935 Census. Most of the land not available for crops is forested.

From 1920 to 1935 the total land in farms showed little change, although the area in farm woodlands increased about 20 percent. More significant, however, is the fact that the acreage in cotton—the area's chief cash crop—declined from 1,461,000 acres in 1919 to 618,000 acres in 1934, a loss of more than one-half; and, unfortunately, there has not been a compensatory gain in

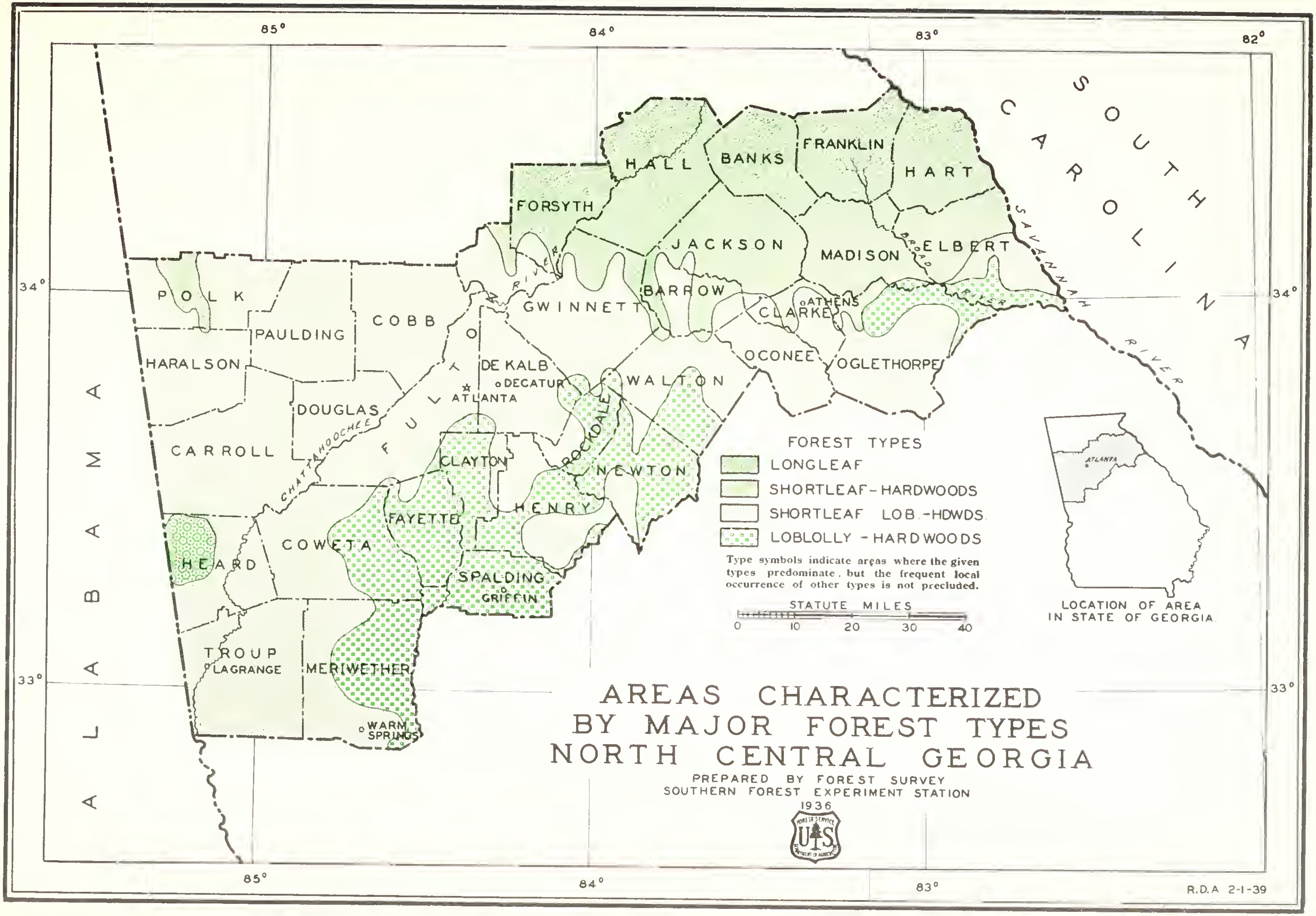


FIGURE I.- FOREST TYPE MAP.

the acreage of corn, oats, hay, peaches, or other agricultural crops. From an employment standpoint, the decline in cotton production is serious, for cotton requires several times as much labor per acre as corn, the other principal crop in the area.

In 1935, the Census of Agriculture listed in the counties making up north central Georgia 70,700 separate farms, a farm being defined as "all the land which is directly farmed by one person, either by his labor alone or with the assistance of members of his household, or hired employees." In the aggregate, these farms make up 5,121,000 acres, or 81 percent of the entire area. The average size of the farms was 72 acres, of which approximately 28 acres was in woodland. A wide variation in the size of the farms is apparent; although 77 percent of the total number of farms had less than 100 acres each, these small farms included only 46 percent of the total farm acreage (table 2). The extent of the relatively large holdings is clearly indicated by the fact that while only 23 percent of the farms had 100 acres or more each, they included 54 percent of the total farm area.

Table 2. - Number and acreage of farms classified according to size, 1935

Size	Number of farms	Proportion of total number	Total area	Proportion of total acreage
Acres		Percent	Acres	Percent
Less than 50	31,631	44.8	828,418	16.2
50 - 99	22,860	32.3	1,526,525	29.8
100 - 499	15,834	22.4	2,453,801	47.9
500 - 999	313	.4	199,685	3.9
1,000 and over	75	.1	112,516	2.2
Total	70,713	100.0	5,120,945	100.0

As for the remaining $1\frac{1}{4}$ million acres not in farms, no ownership data are available; but for the lower Piedmont part of the area, Hartman and Wooten1/ list as important land-owning groups (in addition to farmers) administrators and executors, banks and mortgage companies, merchants, and professional men.

The following description of the soils is given by the authorities mentioned above: "The most extensive soils in this region [upper Piedmont] are the sandy loam and clay loam of the Cecil series. Both have red clay subsoils. The sandy loam commonly occupies smoother lands where erosion has not removed the surface material, while the clay loam occupies more sloping sites and represents areas from which the sandy loam surface has been removed by erosion. Both these soils, except where the slopes are too steep, are fairly productive. Important causes of farm-land abandonment in this section are erosion and depletion of the soil by continuous cropping, with a consequent

1/ Hartman, W. A., and Wooten, H. H. Georgia land use problems. Georgia Expt. Sta. Bull. 191. 195 pages, illus., 1935.

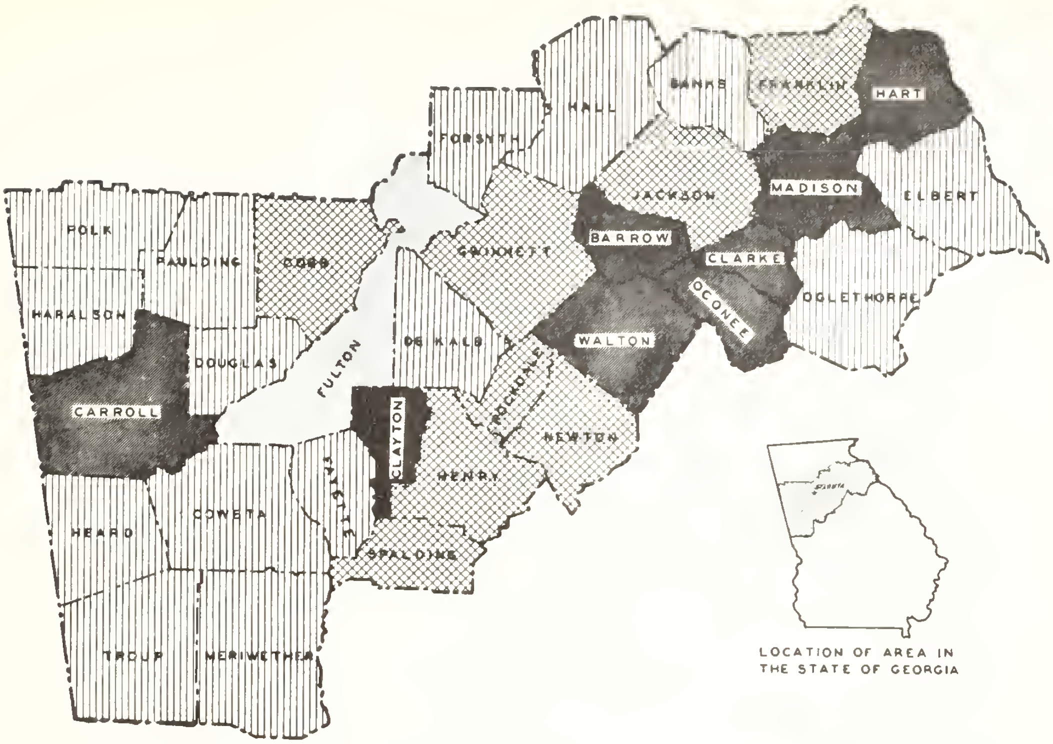


FIGURE 2.— PROPORTION OF COUNTY IN LAND AVAILABLE FOR CROPS.

0 - 29.9%　　30.0 - 39.9%　　40.0 - 49.9%　　50.0% & OVER

reduction in yields." In regard to the lower Piedmont these authorities say: "An exploitative system of farming by reason of which erosion took heavy toll is a principal cause of the serious decline [in agriculture]. The clay loam soils require later planting of cotton than the lighter soils, and on this account the cotton crop is very susceptible to boll weevil injury."

In some form and to some degree, erosion is occurring almost everywhere in the area, but the field men of the Forest Survey recorded only the following well-marked and destructive stages: (1) sheet erosion, where the soil is washing off from a generally smooth surface; (2) shoestring erosion, where the soil surface is cut into and a system of small, branching gullies a few inches to 2 feet deep is formed; (3) gully erosion, where the soil surface is being destroyed by deep gully systems. Marked erosion, in one or more of these three forms (table 3) is found on 58 percent of the abandoned cropland, 50 percent of the idle cropland, 30 percent of the cropland in cultivation, and 27 percent of the pasture, but on only 18 percent of the forest, even though the forest is generally located on the steepest slopes. Furthermore, in many places accelerated erosion on forest land is caused by run-off from cultivated fields higher up the slope. Also erosion often is found continuing in a forest newly established on an eroded, abandoned field. The common farming practice is to allow the land to pass through a cycle of use-stages: Starting with the natural forest, areas are cleared and cultivated or pastured until erosion becomes serious, when they are abandoned; these areas again reforest in time by natural means, but until grasses or trees are established, marked erosion continues unless check dams or other artificial measures to control run-off are constructed.

Table 3. - Correlation of land use with erosion

Land use	Form of erosion				Total
	None or arrested	Sheet	Shoestring	Gullies	
	- - - - - - -	- - - -	Acres	- - - -	- - - -
Forest	2,096,700	152,900	153,700	148,100	2,551,400
Cropland in cultivation	1,932,100	621,300	191,800	26,900	2,772,100
Idle cropland	157,900	89,500	52,900	13,800	314,100
Abandoned cropland	112,000	58,400	53,600	40,600	264,600
Pasture	180,100	34,100	20,300	13,000	247,500
Total	4,478,800	956,200	472,300	242,400	6,149,700
Percent of total	72.9	15.5	7.7	3.9	100.0

Forest Description

The forest as a whole is made up of thousands of relatively small and scattered tracts, which in the aggregate cover $2\frac{1}{2}$ million acres. Over 99 percent of the forest is privately owned; less than 1 percent is in public ownership.

The species-groups that compose the various type-groups are shown in figure 3, in which the cubic volume (including bark) of the species-groups is expressed as a proportion of the total volume in the type-group. The species-groups consist of the following: (1) pines- about half loblolly pine and half shortleaf pine, including a small volume of other pines—and cedar; (2) red, black, and tupelo gums, yellow poplar, and other pulping hardwoods; (3) oaks, including scrub oak; and (4) hickories, elms, sycamore, ash, etc. The pine and pine-hardwood type-groups, which cover 80 percent of the forest area, are found principally on the rolling uplands. Upland hardwood types cover 14 percent of the forest area; while the bottom-land hardwood types (located in the branch heads, river bottoms, and swamps) are found on 6 percent of the forest area. Almost 92 percent of all the forest land is in the rolling uplands; the remaining 8 percent is in branch heads, river bottoms, and swamps. The map (fig. 1) shows in a general way the range of certain forest types over large areas, although within the broad range limits are intermingled many small areas of other types as well as non-forest land.

Only 127,400 acres of old growth are left, mainly in small scattered tracts; three-fifths of this area—since 10 percent or more of the sawlog-size trees have been removed—is classed as partly cut (table 4). The smallest trees considered as saw timber by the Survey are: pines, 9.0 inches d.b.h. (diameter at breast height, $4\frac{1}{2}$ feet above the ground); and hardwoods,

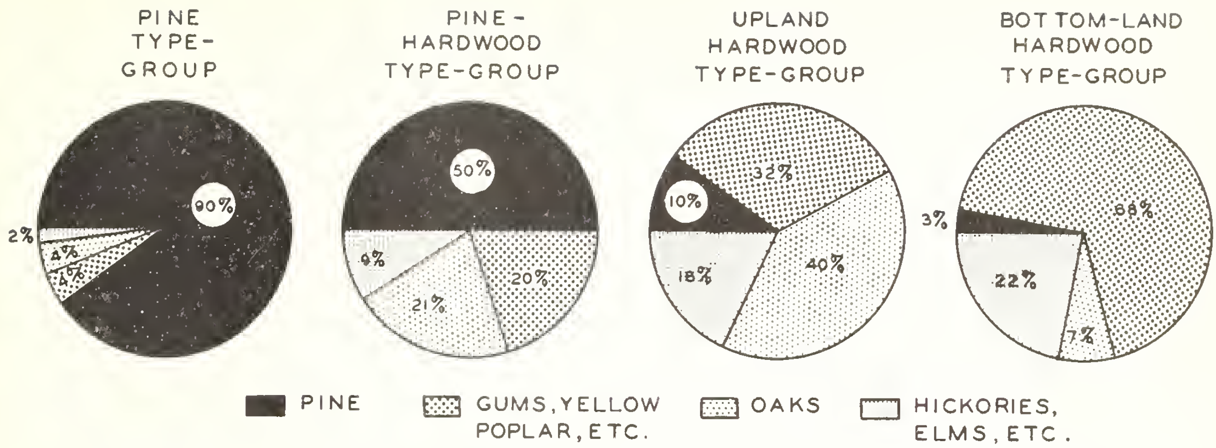


FIGURE 3.- SPECIES COMPOSITION OF FOREST TYPE-GROUPS.

13.0 inches d.b.h. The uncut old-growth stands average 7,200 board feet (green lumber tally) per acre, and the partly cut stands, 4,300 board feet. Approximately 41 percent of the old growth is in the pine and pine-hardwood types, 42 percent in upland hardwoods, and 17 percent in the bottom-land hardwoods.

Table 4. - Forest area classified according to forest condition and forest type-group

Forest condition	Pines	Pine-hardwoods	Upland hardwoods	Bottom-land hardwoods	Total all types	Proportion of total
	-----------	-----------	Acres	-----------	-----------	Percent
Old growth:						
Uncut	13,000	7,300	16,200	13,800	50,300	2.0
Partly cut	22,700	8,900	37,400	8,100	77,100	3.0
Total	35,700	16,200	53,600	21,900	127,400	5.0
Second growth:						
Sawlog size:						
Uncut	546,100	120,900	76,300	54,400	797,700	31.3
Partly cut	280,800	86,800	63,300	6,500	437,400	17.2
Under sawlog size	577,800	282,500	148,400	75,500	1,084,200	42.5
Reproduction 1/	54,400	34,100	11,400	2,400	102,300	4.0
Total	1,459,100	524,300	299,400	138,800	2,421,600	95.0
Total all conditions	1,494,800	540,500	353,000	160,700	2,549,000	100.0
Percent of total forest area	58.7	21.2	13.8	6.3	100.0	

1/ Includes 4,100 acres of clear-cut condition in the pine type.

The second-growth stands, covering almost $2\frac{1}{2}$ million acres, or 95 percent of the forest area, occur in both large and small tracts throughout the area and in all forest type-groups, although mainly in the pine and pine-hardwood types. Well advanced in size are the second-growth sawlog-size stands, which have, if uncut, an average volume of 4,900 board feet per acre, or if partly cut, an average of 3,100 board feet per acre. The most important of all conditions, from the standpoint of area, is the under-sawlog-size second growth, in which the characteristic pines are less than 9 inches d.b.h. and the characteristic hardwoods are less than 13 inches d.b.h.

"Reproduction" is the term applied to the youngest forest condition; seedlings and sprouts less than 1.0 inch d.b.h. and occurring at the rate of 80 or more per acre form the principal forest cover. Over four-fifths of the reproduction area is in the combined pine and pine-hardwood type-groups. All the important native species are prolific seeders, and the new forest usually has the same species pattern as the old. The clear-cut forest area is so small that it is included in the table with the figures for the reproduction area.

The site quality or productivity of the forest as indicated by the site index, i.e., the height in feet of average dominant trees at 50 years, compares favorably with that of other Forest Survey units in the South. About 31 percent of the sites dominated by loblolly pine have an index of 80 feet or better; 52 percent, 70; and 17 percent, 60 or less. Of the sites dominated by shortleaf pine, 2 percent have a site index of 80 or over; 18 percent, 70; 52 percent, 60; and 28 percent, 50 or less.

In the field work on each of the forest sample plots, the age of the predominating stand was determined, and, for cases in which more than one age-class was found on the same area, the age-class recorded was that of the trees that in the judgement of the cruiser would provide the next cut. As shown in figure 4, 48 percent of the pine and pine-hardwood type-areas is in the 0- to 30-year age-classes; 39 percent in the 31-60, and only 13 percent is in stands at least 61 years old. This deficiency in area of the older stands (i.e., stands 61 years old and over) is an obvious weakness of the north central Georgia forests. Prevailing forest volumes, or the average gross volume per acre in cubic feet, inside bark, of growing-stock trees (5.0 inches d.b.h. and larger), increases from practically nothing for the 0- to 10-year age-class to slightly over 1,000 cu. ft. per acre for the 31- to 40-year age-class and to about 1,700 cu. ft. for the oldest stands (i.e., stands 71 years old and over). These yields, however, are only a fraction of the productive capacity of the sites, as shown by the volumes of well-stocked stands actually growing on the area. The heaviest stocked 10 percent of the plots adjusted to a weighted-average site, is shown by the dotted, curved line. For example, well-stocked stands 31 to 40 years old have about 2,000 to 2,600 cubic feet per acre and at 70 years about 3,200 cubic feet. This comparison indicates a striking need and opportunity for building up the growing stock, without which full use of the soil and optimum harvests cannot be attained.

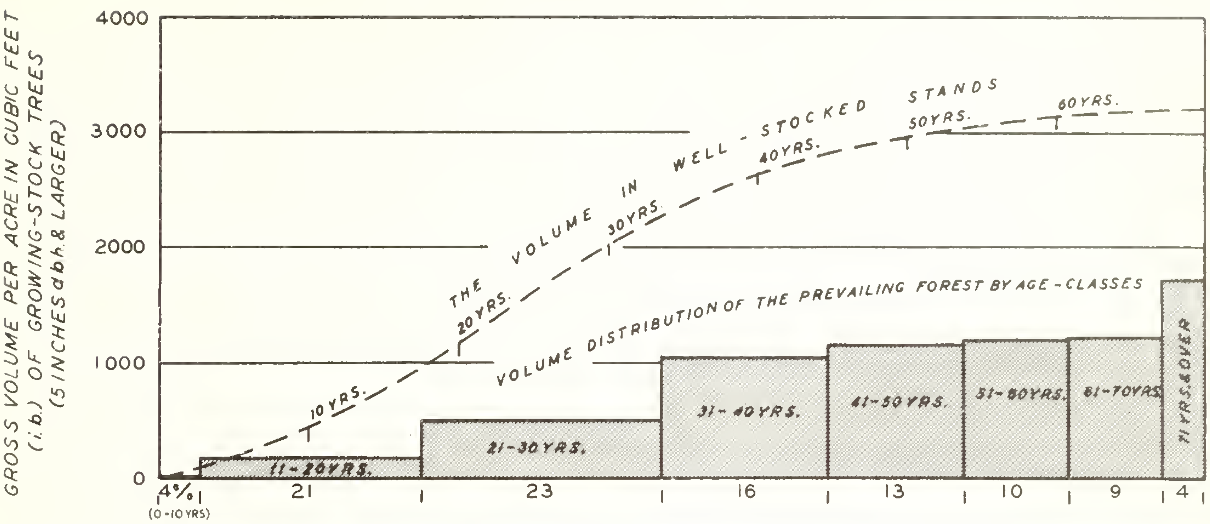


FIGURE 4.- **DISTRIBUTION OF PREVAILING AGE-CLASSES AND VOLUME, AND THE VOLUME IN WELL-STOCKED STANDS** (BASED ON THE PINE AND PINE-HARDWOOD TYPE AREAS* OF 1,962,300 ACRES).

*EXCLUDING THE LONGLEAF AND SLASH PINE TYPES.

Figure 5 shows the total number of pines and hardwoods by 2-inch diameter-classes (the 2-inch class ranges from 1.0 to 2.9 inches; the 4-inch, from 3.0 to 4.9 inches, etc.). The "pulping hardwoods" include yellow poplar, the gums, maples, willows, bay, and basswood; while the "non-pulping hardwoods" (species not commonly pulped at present but which, in the future, may be found suitable) include the oaks, hickories, ashes, and other hardwoods. This chart indicates that more than three-fourths of all the trees are in the 2- and 4-inch classes. These small trees would greatly augment the volume in the large-tree portion of the growing stock within the next 2 or 3 decades if any large proportion of them survived. This emphasizes the urgent need for protection from fire, without which this well-established basis for future forest yields easily may be lost.

The number of growing-stock trees 13.0 inches d.b.h. and larger is relatively small, owing to the common practice of taking out the largest and most valuable trees at each logging operation. Since high-quality lumber and veneer stumpage is found chiefly in larger trees, forest landowners should endeavor to increase the number of these trees. In place of the old "cut-any-tree-that-has-a-value" method, selective logging practices, designed to bring about a good distribution of the growing stock and to leave the stand as a whole in a healthy and rapidly growing condition, should be adopted. Cuttings adjusted to the sustained-yield productivity of the forest should be made in all suitable size-classes and as frequently as economic conditions and the rate of growth will permit.

Estimates of Timber Volume

Saw-timber volume

To be classed as saw timber by the Forest Survey, a tree must be living. Also, if pine, it must be at least 9.0 inches d.b.h. outside bark, or if hardwood, 13.0 inches; and it either must have at least 50 percent of its gross volume in sound material or contain at least one sound 12-foot butt log. This area contains more than 6 billion board feet, as measured by the International $\frac{1}{4}$-inch rule, which closely approximates green lumber tally, or less than 4 billion board feet according to the Doyle rule, the measure used locally (table 5). The volume figures given are net, in that allowance has been made for woods cull caused by rot, fire-scar, crook, limbiness, etc., as well as for loss in manufacture due to sweep and hidden defects. A flexible top-diameter limit, depending upon merchantability, is used; no pine logs less than $5\frac{1}{2}$ inches in diameter inside bark at the small end are included, and likewise no hardwood logs less than $8\frac{1}{2}$ inches. The average top diameters actually used, however, considerably exceed these minima.

Table 5. - Net board-foot volume expressed in green lumber tally (based on the International $\frac{1}{4}$-inch rule) and in Doyle scale, 1936

Species	Green lumber tally	Doyle scale
	- - - - - - - - - M board feet - - - - - - - - - -	
Loblolly pine	2,522,200	1,567,800
Shortleaf pine	2,108,600	1,130,000
Longleaf and other pines	190,900	115,000
Yellow poplar	357,300	260,300
White oaks	221,000	159,900
Red oaks	207,200	147,700
Red gum	185,700	130,000
Black and tupelo gums	98,900	67,900
Ash	30,200	20,000
Other hardwoods	253,900	173,900
Total all species	6,175,900	3,772,500

Pines, principally loblolly and shortleaf, make up over three-fourths of the green-lumber volume; hardwoods, with yellow poplar, oaks, gums, ashes, and other species, include less than one-fourth. Grouped together as "other hardwoods" are the hickories, maples, birches, elms, sycamore, basswood, and other hardwoods of minor volume. For all species combined, old-growth stands—uncut and partly cut together—make up 11 percent of the total volume; sawlog-size second growth, 85 percent; and under-sawlog-size second growth, 4 percent. The volume in the old-growth conditions is fairly evenly divided between pines and hardwoods, whereas the volume in the second growth is mostly pine (table 6).

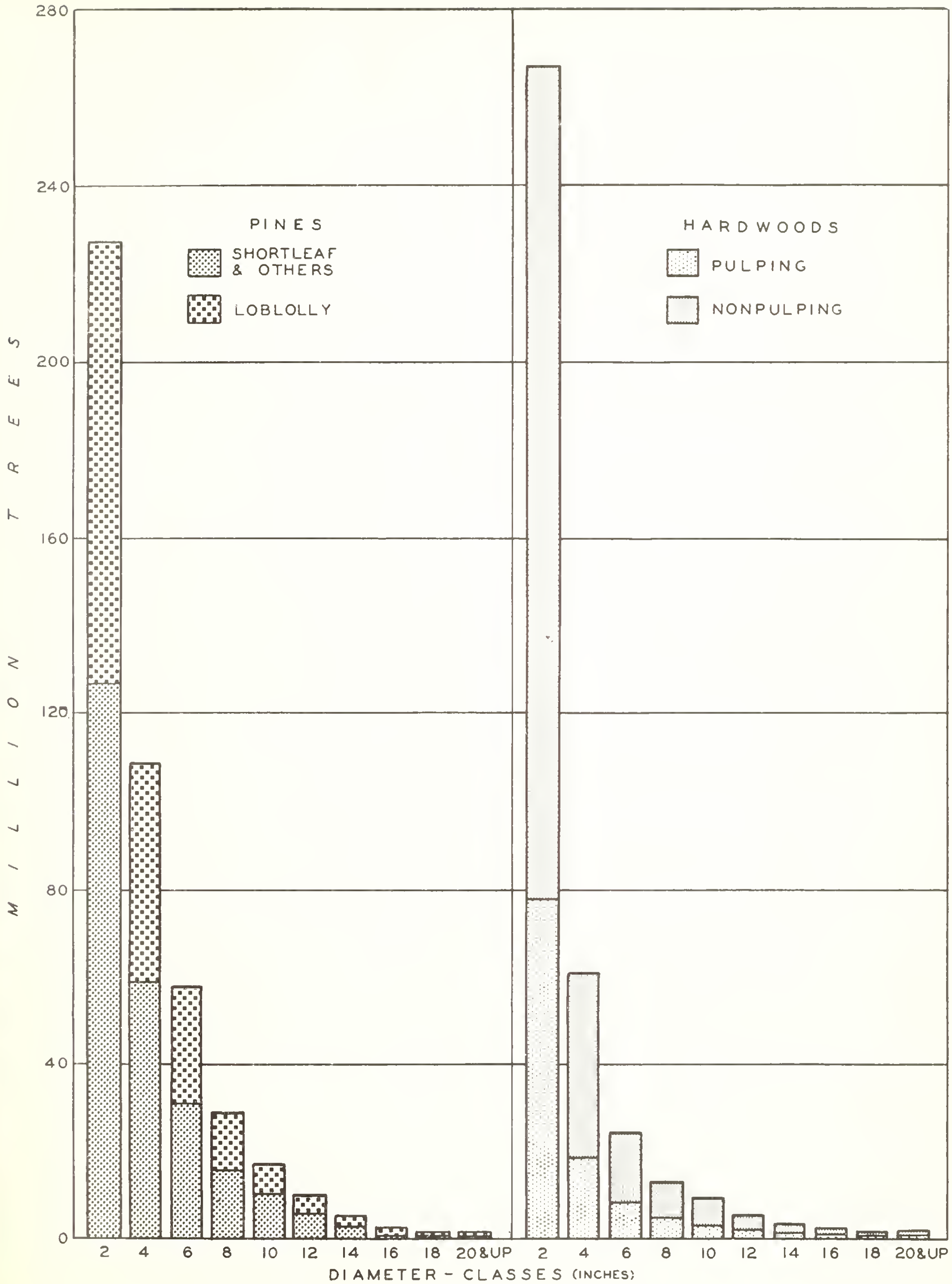


FIGURE 5 - STAND DIAGRAMS.

Table 6. - Net board-foot volume (green lumber tally based on International ¼-inch rule) in the various forest conditions, 1936

Tree species-groups	Old growth		Second growth			Total	Percent of total
	Uncut	Partly cut	Sawlog size: Uncut	Sawlog size: Partly cut	Under sawlog size 1/		
	Thousand board feet						
Pines:							
Loblolly	113,900	63,300	1,718,700	524,500	101,800	2,522,200	40.9
Shortleaf	75,000	68,700	1,343,900	539,100	81,900	2,108,600	34.1
Longleaf and other	6,700	39,500	101,400	29,100	14,200	190,900	3.1
Total pines	195,600	171,500	3,164,000	1,092,700	197,900	4,821,700	78.1
Hardwoods:							
Yellow poplar	35,800	37,400	208,600	62,500	13,000	357,300	5.8
Red gum	22,800	12,800	112,200	34,000	3,900	185,700	3.0
Black and tupelo gums	12,500	13,800	59,200	10,000	3,400	98,900	1.6
Red oaks	18,800	29,700	98,600	50,700	9,400	207,200	3.3
White oaks	35,200	31,900	94,800	51,000	8,100	221,000	3.6
Other hardwoods	43,600	32,700	151,500	41,400	14,900	284,100	4.6
Total hardwoods	168,700	158,300	724,900	249,600	52,700	1,354,200	21.9
Total all species	364,300	329,800	3,888,900	1,342,300	250,600	6,175,900	100.0
Percent of total	5.9	5.3	63.0	21.7	4.1	100.0	

1/ Includes the reproduction and clear-cut conditions.

It is noteworthy that much of the saw timber is in trees considered rather small for the manufacture of lumber and veneer. Small pine saw-timber trees (i.e., trees in the 10- and 12-inch d.b.h.-classes) make up 42 percent of the pine volume; while small hardwood trees (i.e., trees in the 14-, 16-, and 18-inch d.b.h.-classes) make up 63 percent of the hardwood volume (table 7).

The volume density per acre greatly influences the economic value of the stands, owing to the fact that logging costs per thousand board feet generally decrease as the volume per acre increases. Proportional area and volume of the sawlog-size conditions are classified in figure 6, Charts A and B, according to gross saw-timber volume per acre (no deductions being made for cull). Considering all the saw-timber stands of pine and pine-hardwood type-groups combined, approximately 73 percent of the area and 93 percent of the saw-timber volume are in stands having at least 2,000 board feet per acre; it follows that 27 percent of the area and only 7 percent of the volume are in stands having less than 2,000 board feet. As shown by the charts, there is a

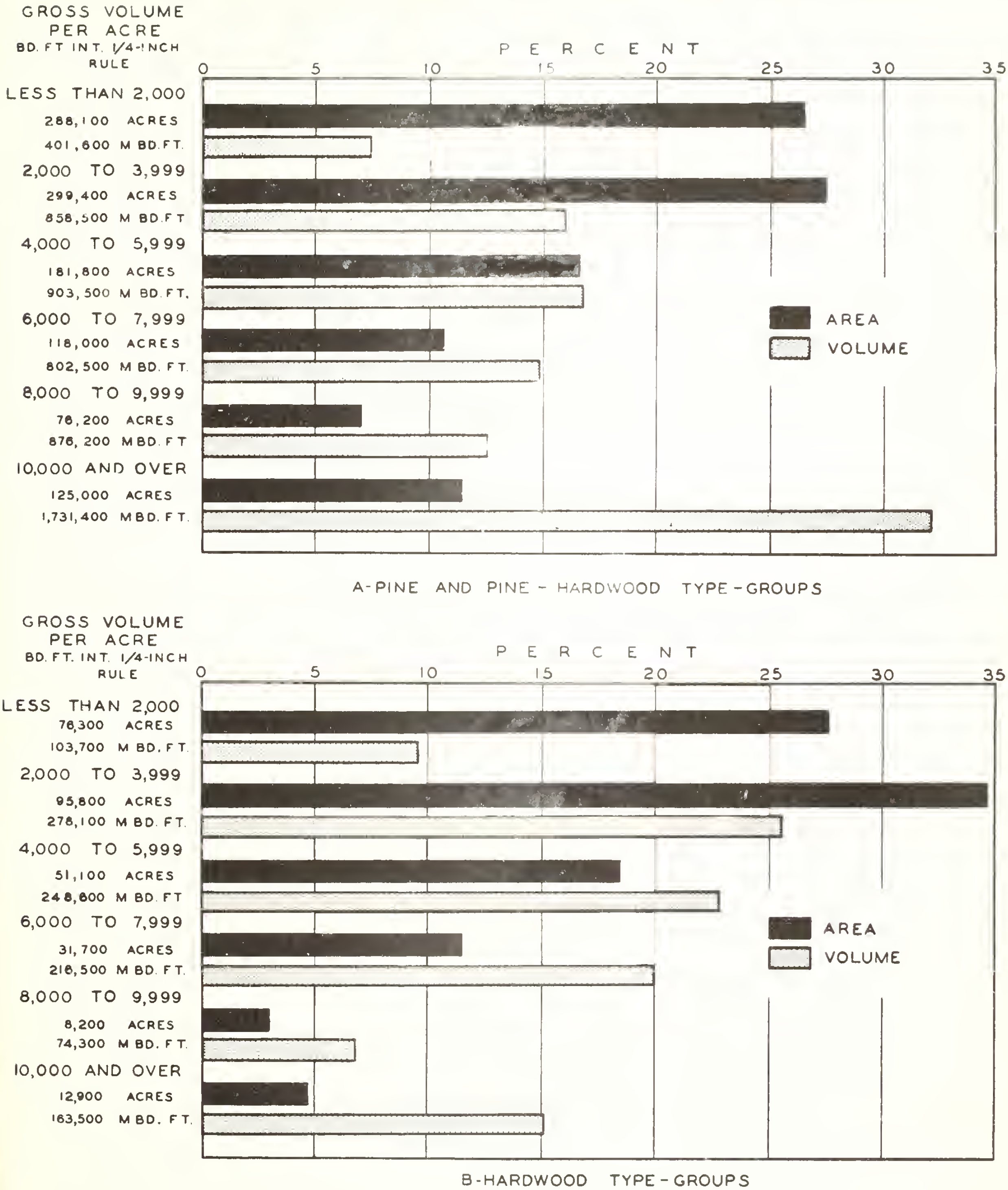


FIGURE 6. - PROPORTIONAL AREA AND VOLUME OF THE SAWLOG-SIZE CONDITIONS, CLASSIFIED ACCORDING TO VOLUME PER ACRE.

slightly greater representation of stands of 2,000 board feet and over per acre in the pine and pine-hardwood type-groups than in the hardwoods. Although the topography of much of the forest land in the northernmost tier of counties is rough, about 98 percent of the entire forest area of north central Georgia has been cut over at least once, and only a small part of the remaining uncut area can be classed as so inaccessible that commercial logging operations are impracticable.

Table 7. - Diameter distribution of net board-foot volume (green lumber tally, based on International $\frac{1}{4}$-inch rule) in the various forest conditions

Species-groups and diameter-classes (in inches)	Old growth		Second growth			Total	Percent of total
	Uncut	Partly cut	Sawlog size		Under sawlog size 1/		
			Uncut	Partly cut			
	Thousand board feet						
Pines:							
10 - 12	26,500	29,400	1,330,500	476,600	168,200	2,031,200	42.1
14 - 16	49,500	45,800	1,088,700	380,100	20,400	1,584,500	32.9
18 - 20	40,800	46,100	512,300	171,000	5,700	775,900	16.1
22 - 28	67,500	45,700	216,500	62,000	3,600	395,300	8.2
30 and over	11,300	4,500	16,000	3,000	-	34,800	.7
Total pines	195,600	171,500	3,164,000	1,092,700	197,900	4,821,700	100.0
Hardwoods:							
14 - 18	88,300	69,200	460,500	183,400	47,700	849,100	62.7
20 - 28	70,000	74,000	248,800	66,200	5,000	464,000	34.3
30 and over	10,400	15,100	15,600	-	-	41,100	3.0
Total hdwds	168,700	158,300	724,900	249,600	52,700	1,354,200	100.0

1/ Includes the reproduction and clear-cut conditions.

In north central Georgia so much of the saw-timber volume is in trees too widely spaced to grow high-quality sawlogs that the Forest Survey made a supplemental study and classified the pine saw-timber trees as "smooth," "limby," and "rough." Table 8 shows that 47 percent of the pine saw-timber volume is in smooth trees, 47 percent is in limby trees, and 6 percent is in rough trees. As a general rule, pine trees in the old-growth stands are far superior in saw-timber quality to those in open-grown second-growth stands, many of which are "old field."

Table 8. - Classification of pines according to saw-timber quality [1] (based on supplemental data)

Species and stand condition	Tree grade			
	Smooth	Limby	Rough	Total
	- - - - - Percent of volume - - - - - -			
Loblolly pine:				
Old growth	92	8	-	100
Second growth	33	60	7	100
Weighted average	37	57	6	100
Shortleaf pine:				
Old growth	91	9	-	100
Second growth	54	41	5	100
Weighted average	56	39	5	100
All pines (including longleaf and others):				
Old growth	92	8	-	100
Second growth	44	50	6	100
Weighted average	47	47	6	100

1/ Smooth trees have 20 feet or more of clear length and also at least 50 percent of their total usable length practically free of limbs and indications of knots; limby trees have at least 12 feet of clear length and 30 to 49 percent of total usable length practically free of limbs and indications of knots; rough trees have less than 12 feet of clear length, or less than 30 percent of total usable length practically free of limbs and knots.

Cordwood volume

The entire net usable volume of all live trees 5.0 inches d.b.h. and larger, including the saw-timber volume shown previously, amounts to over 31 million standard cords (4 x 4 x 8 feet) with bark included (table 9). Deductions for non-usable volume include only defects that cause the material to be unsuited for use as cordwood; therefore, deductions for sweep and slight crook are not made. "Upper stems of saw-timber trees" include the cordwood above the sawlog portion up to a flexible top-diameter limit, varying with the quality, but not less than 4 inches. For hardwoods, the usable limbs are included, while for pine the upper stems (but no limbs) are included. "Sound trees under sawlog size" include the full stem (without limbs) of pine trees 5.0 to 8.9 inches d.b.h. and of hardwoods 5.0 to 12.9 inches d.b.h. up to a variable top-diameter limit but never less than 4 inches. In the fourth column, under "sound and rotten cull trees," is given the usable volume that may be salvaged if undesirable cull trees 5.0 inches d.b.h. and larger are utilized.

Table 9. - Net volume in various classes of sound material, 1936

Species-group	Sound trees saw-log size	Upper stems of sawlog-size trees	Sound trees under saw-log size	Sound and rotten cull trees 1/	Total all classes	Proportion of total
	- - - - - - - - -	Cords (bark included)	- - - - - - - - -			Percent
Pines	10,402,500	1,513,200	5,139,500	638,400	17,693,600	56.4
Hardwoods:						
Pulping	1,892,900	1,067,400	2,171,800	1,310,800	6,442,900	20.5
Nonpulping	1,589,900	888,200	2,980,700	1,776,300	7,235,100	23.1
Total hardwoods	3,482,800	1,955,600	5,152,500	3,087,100	13,678,000	43.6
Total all species	13,885,300	3,468,800	10,292,000	3,725,500	31,371,600	100.0
Percent of total	44.2	11.1	32.8	11.9	100.0	

1/ Includes all scrub oaks.

About 56 percent of all the cordwood is in pines; 21 percent is in pulping hardwoods (gums, yellow poplar, basswood, etc.); and 23 percent is in "nonpulping" hardwoods (oaks, hickories, ash, etc.). It should be recognized, however, that future development in pulp- and paper-making technique may facilitate the pulping of species now considered unsuitable for this purpose.

Figure 7 gives the cordwood volume in sound trees only, including the upper stems of pine and upper stems and usable limbs of hardwoods. From the standpoint of the future of the forest, it is significant that over half the cordwood volume in sound trees is in the 6-, 8-, 10-, and 12-inch diameter-classes. If large trees suitable for high-quality lumber and veneer are to be grown, some of the highest-quality small trees must be reserved for this purpose, in spite of the fact that trees less than 13 inches d.b.h. are usable for pulpwood. At prevailing stumpage rates for pulpwood, poles, and saw timber, it can be demonstrated that it will pay the average timber owner to hold a portion of his younger trees to grow into sizes that will produce poles or saw-logs. This practice should allow the cutting of pine for pulpwood, fuel wood, and other low-priced commodities as intermediate yields.

Although the total usable cordwood volume is over 31 million cords, the growing stock is less than 26 million cords, because this growing-stock material, for which increment is computed, does not include either the cull trees or the tops and limbs of hardwoods. Cull trees have a usable volume of 3-3/4 million cords, of which slightly more than half is in pulping species. The cordwood in cull pines alone—the main species now used in the South for pulpwood—amounts to almost two-thirds of a million cords. Although the removal of these cull trees would leave the forest in a healthier and faster-growing condition and give additional space for the establishment of seedlings, additional markets for cordwood material are essential before the forest land-owners can dispose of these trees without taking a loss.

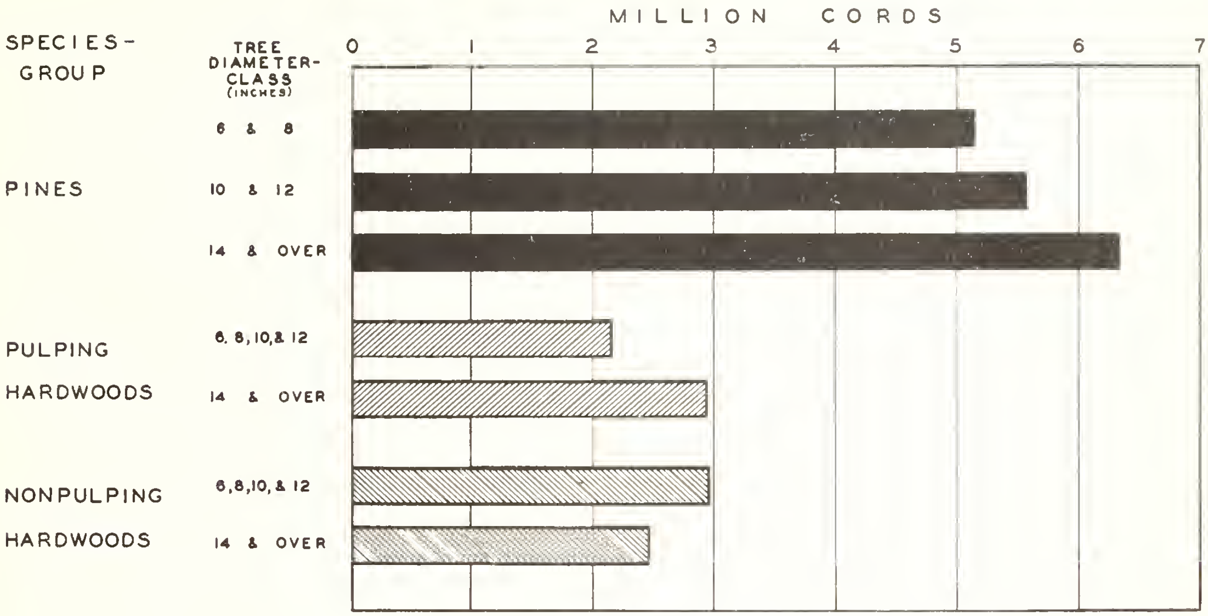


FIGURE 7.- CORDWOOD VOLUMES OF PULPING AND NONPULPING SPECIES BY SIZE-CLASSES, SOUND TREES ONLY.

Average volumes per acre in cords of growing-stock material (computed by dividing volumes by corresponding forest area) are shown in table 10. The weighted average per acre for all forest conditions and type-groups is approximately 10 cords, which is about the average for the entire State.

Table 10. - Average cordwood volume per acre in sound trees, including bark, 1936

Type-group	Old growth		Second growth			All conditions 1/
	Uncut	Partly cut	Sawlog size: Uncut	Sawlog size: Partly cut	Under sawlog size	
	Cords per acre					
Pine	29.7	16.2	19.0	11.5	3.7	11.0
Pine-hardwood	32.1	16.4	16.0	11.4	3.2	7.8
Upland hardwood	16.8	12.9	14.4	10.7	3.2	8.5
Bottom-land hardwood	25.0	13.5	20.3	16.3	4.9	12.6
All types (weighted average)	24.6	14.3	18.2	11.4	3.5	10.1

1/ Includes areas of reproduction and clear-cut conditions.

Poles and piles

Poles and piles are considered in a separate inventory of trees that could be used for these generally high-priced products. It should be noted, however, that these trees also were included in the saw-timber and cordwood inventories, because it is obvious that some of them will be used for lumber, posts, or other products. According to a conservative estimate, based upon the specifications of the American Standards Association, there were in 1936 over 7 million pine trees suitable for poles and piles (table 11). More than half of these trees were less than 11 inches d.b.h. and under 30 feet long.

Table 11. - Total number of pine poles or piles, classified according to length and diameter, 1936

D.B.H. of trees (outside bark)	Pole or pile length (feet)						Total	Proportion of total
	20	25	30	35	40	45 and over		
Inches	- - - - - - - Thousand pieces - - - - - - - -							Percent
7.0 - 8.9	1,610	588	137	68	-	-	2,403	33.1
9.0 - 10.9	1,042	639	383	124	58	-	2,246	31.0
11.0 - 12.9	445	315	483	130	107	68	1,548	21.4
13.0 - 14.9	110	101	243	110	107	98	769	10.6
15.0 - 18.9	-	42	88	45	46	61	282	3.9
Total	3,207	1,685	1,334	477	318	227	7,248	100.0
Percent of total	44.2	23.3	18.4	6.6	4.4	3.1	100.0	

Forest Increment

The net annual forest increment is the volume added by growth to the individual trees, plus the merchantable volume newly created by small trees developing into merchantable sizes during the year and minus the losses due to mortality. This net increment of the forest represents, in a general way, the amount that could be removed annually without depleting the volume of the growing stock.

In 1936, the gross growth amounted to almost 502 million board feet, green lumber tally, and the mortality was 49 million board feet, leaving a net increment of 453 million board feet before making deductions for commodity drain. Less than 4 percent of the net increment of saw-timber material occurred in old-growth stands; 69 percent in sawlog-size second-growth stands; and 27 percent in under-sawlog-size second-growth stands (table 12). Considering all forest conditions combined, pines make up over four-fifths of the net saw-timber increment and hardwoods less than one-fifth. In 1936, the net increment for all growing-stock material of trees 5 inches d.b.h. and larger, not including upper stems and limbs of sawlog-size hardwoods or culls, amounted to over 119 million cubic feet, bark excluded. The net increment of all growing-stock material amounted to more than 1½ million cords of rough wood, bark included, of which 1,183,000 cords were pine and 468,900 cords were hardwoods (table 13). It is estimated that of the hardwood increment approximately half was in pulping species.

Table 12. - Net increment in board feet and cubic feet in the various forest conditions, 1936

Forest condition	Saw-timber material			All material		
	Pine	Hardwood	Total	Pine	Hardwood	Total
	- Thousand board feet (green lumber tally) -			- Thousand cubic feet (inside bark) -		
Old growth	3,800	13,700	17,500	830	3,490	4,320
Second growth:						
Sawlog size	249,500	61,700	311,200	49,540	18,360	67,900
Under sawlog size 1/	112,100	11,800	123,900	38,550	8,620	47,170
Total all conditions	365,400	87,200	452,600	88,920	30,470	119,390

1/ Includes a small amount in the reproduction and clear-cut conditions.

In 1936 the average net increment per acre in the area, assuming that the stands were not influenced by cutting, was higher than that in many parts of the South, although much less than it could have been under good forest management, which includes long-continued fire protection. For the entire

Table 13. - Net increment in cords in the various forest conditions, 1936

Forest condition	Pines	Hardwoods	Total	Percent of total
	- - - - - - Cords (bark included) - - - - - -			
Old growth	10,700	52,500	63,200	3.8
Second-growth, sawlog size	645,600	280,600	926,200	56.1
Second-growth, under sawlog size 1/	526,700	135,800	662,500	40.1
Total	1,183,000	468,900	1,651,900	100.0

1/ Includes a small amount in the reproduction and clear-cut conditions.

forest, including reproduction and clear-cut areas, the average net increment per acre was 181 board feet of saw timber; or, for all growing-stock trees 5 inches d.b.h. and larger, two-thirds of a cord of rough wood, including bark (table 14). The greatest average growth occurred in the uncut, sawlog-size, second-growth condition with 321 board feet per acre of saw timber; or almost a full cord of all growing-stock material in trees 5 inches d.b.h. and larger.

Table 14. - Average increment per acre in 1936 in the various forest conditions (Uninfluenced by cutting)

Forest condition	Pine component			Hardwood component			Total per acre		
	Bd.ft.	Cu.ft.	Cords	Bd.ft.	Cu.ft.	Cords	Bd.ft.	Cu.ft.	Cords
Old growth	31	6.8	.09	110	27.7	.41	141	34.5	.50
Second growth:									
Sawlog size:									
Uncut	258	51.5	.67	63	17.0	.26	321	68.5	.93
Partly cut	114	22.5	.29	29	11.9	.18	143	34.4	.47
Under sawlog size	104	36.4	.50	11	8.2	.13	115	44.6	.63
Weighted averages all conditions 1/	146	35.9	.47	35	12.2	.19	181	48.1	.66

1/ Includes a small amount in the reproduction and clear-cut conditions.

Forest Industries

Lumber industry

During the period of greatest agricultural development (1800-1860), in the absence of suitable markets, most of the original timber was cut and burned to clear the land for fields; and until the World War, the wood-using industries in north central Georgia were relatively unimportant. A few small sawmills cut lumber almost entirely for the meager local demand. About 1914, however, the "roofer" industry moved southward from the Carolinas, and a swarm of little sawmills was attracted to the rapidly developing second-growth stands and to the remaining tracts of old-growth timber. Concentration yards with planing mills, generally located along the railroad lines, were set up, each yard having tributary to it a number of small or "peckerwood" sawmills cutting rough lumber. The high prices of the World War period and of the subsequent building era of the 1920's gave a great stimulus to lumber production, which probably was at a peak in this area between 1924 and 1929. The quality of the saw timber was relatively poor; but even poorer was the method of manufacture. All logs regardless of grade were sawed into 1-inch boards, commonly called "roofers," which, after being dried more or less, were planed and shipped ungraded to the northern markets.

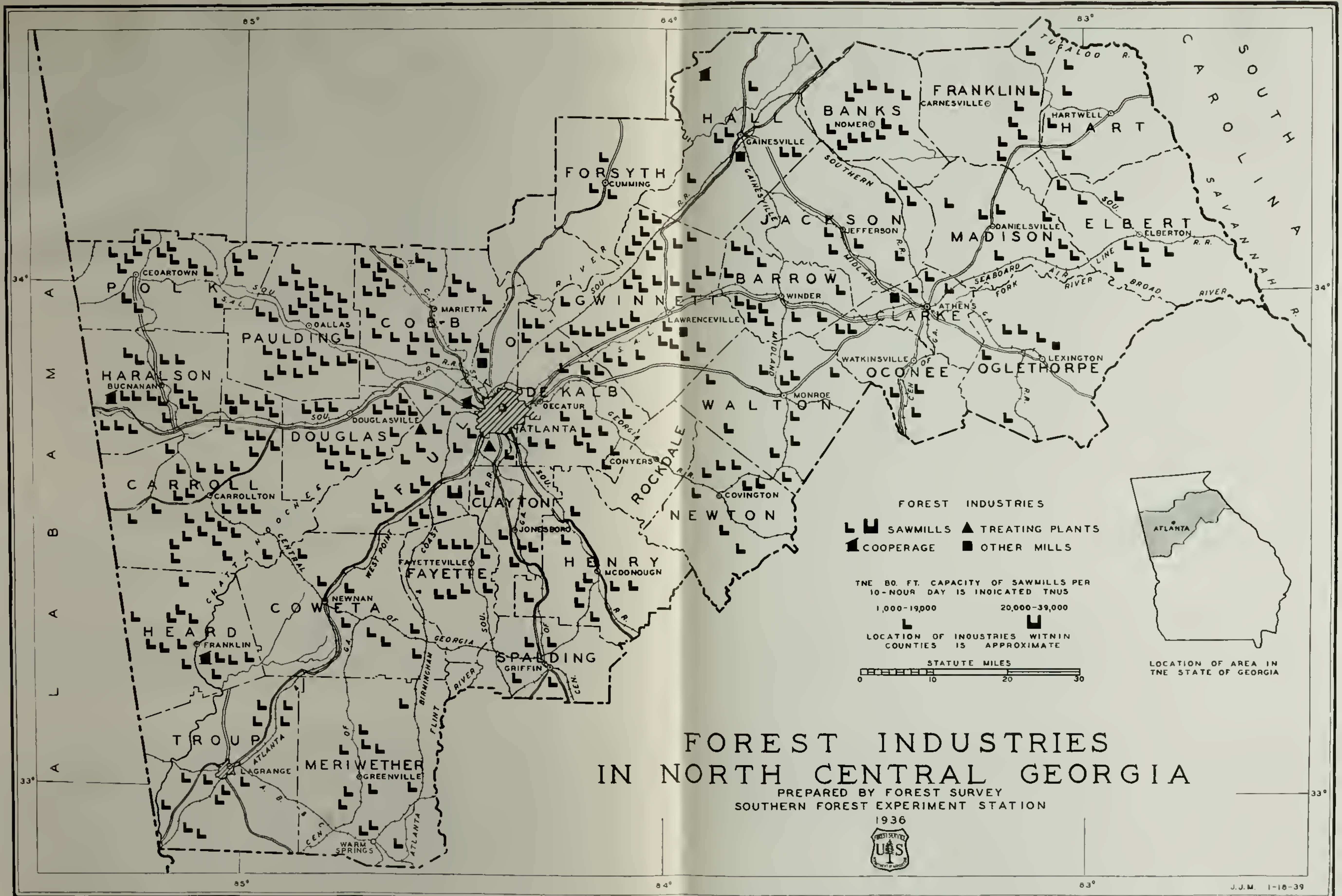


FIGURE 8.- FOREST INDUSTRIES MAP

In 1936, in north central Georgia there were 369 sawmills, only one of which had a 10-hour cutting capacity of more than 20,000 board feet (fig. 8). Many of the mills still cut nothing but "roofers," although there is a growing tendency to diversify the lumber product (especially for the local demand) and to improve the manufacturing methods; these improved methods include dipping to prevent sap stain, more thorough drying, more careful remanufacturing, and grading. In 1936, regardless of whether the trees cut were within or without this area, the 369 sawmills produced 112 million board feet, or about 300,000 board feet per mill. This average production seems very small, but many of the mills are farmer-owned and are operated only a few days per year. Carroll, Gwinnett, and Fulton Counties each produced more than 8 million board feet of lumber in 1936. In 1936 all the sawmills combined provided, at both the plant and in the woods, a total of 338,000 man-days (10 hours each) of employment (table 15). It is estimated that at least 7,000 workers, with an average of almost 50 working days per year, were employed by the sawmills.

Table 15. - Wood-products production and employment, 1936

Product	Units produced or used	Employment		
		In woods	At plants	Total
		- Thousand man-days - (10 hours each)		
Lumber	112,000,000 board feet	118	220	338
Fence posts	4,039,000 pieces	50	-	50
Cross ties, poles, and piles	76,000 pieces	11	-	11
Fuel wood	1,191,700 cords	1,422	-	1,422
Cooperage and veneer 1/	10,300 cords	13	14	27
Miscellaneous (dimension stock, excelsior, treated products,2/ etc.)	40,200 cords	12	40	52
Total		1,626	274	1,900

1/ For veneer, only woods labor for 11,500 cords of veneer bolts shipped to plants outside the unit is included.
2/ For the treated products only the labor at the plants is included.

Other forest industries

Four mills making cooperage stock and nine miscellaneous plants were in north central Georgie in 1936. Three of the four cooperage mills cut oak staves for "tight" cooperage, while the fourth cut pine heading for "slack" cooperage. The nine miscellaneous plants include two treating plants, both located at East Point (near Atlanta), where they creosoted pine poles, piles, cross ties, and lumber; three mills making dogwood shuttle blocks; one producing hickory handle blanks; one making baseball-bat stock; one manufacturing excelsior from peeled pine and yellow poplar cordwood; and one excelsior plant not operating in 1936. (In addition, there are a few shingle mills, mostly small and cutting principally for local use; these are not shown in figure 8.) All nonlumber forest-products industries (not including fuel wood) furnished a total of 140,000 man-days, or employment for about 1,400 men, assuming an average of 100 working days per man.

From the standpoint of cubic-foot volume cut and man-days of labor involved, however, fuel wood is the most important forest product. Over 1 million cords of wood were cut for fuel, practically all of which came from farm woodlands and were used directly upon the farms; almost $1\frac{1}{2}$ million man-days (10 hours each) were used in cutting and hauling it.

The harvesting, transportation, and manufacture of forest products is generally a part-time occupation for the inhabitants of the area, and it is impossible to convert accurately the man-days of labor required into number of people actually employed. According to the 1935 Census of Agriculture, however, farmers worked for pay away from their own farms about 1 3/4 million man-days, and it is believed that much of this time was spent in the forest and in forest-products industries.

Commodity Drain from the Growing Stock

The total volume of wood removed in 1936 from the saw-timber part of the growing stock of this area for all industrial uses and for domestic purposes was the equivalent of 243 million board feet; while from all sound trees at least 5 inches d.b.h. were removed about 83 million cubic feet, inside bark (table 16), or over 1 million cords of wood including the bark. The commodity drain of saw timber, which is the total cut from saw-timber trees, includes (a) the logs, poles, ties, billets, and cords of wood cut from this class of timber for conversion within and without the area, and (b) the waste incidental to the various logging operations. Material cut and utilized from the cull trees and from dead trees is not included.

Of the drain from saw-timber material alone, approximately four fifths comes from pines, and one-fifth from hardwoods. The saw-timber drain occasioned by lumber is closely approximated by that utilized for fuel wood. To cut such a large volume of saw-timber stumpage for fuel wood, a low-priced commodity that could be cut from the great number of cull and dead trees, is a wasteful practice indeed.

A part of the total commodity drain against the sound-tree growing stock (i.e., the non-sawtimber material in trees under sawlog size and in upper stems of sawlog-size pine trees) is not measured in board feet. In 1936, this drain amounted to 44 million cubic feet, inside bark, or 618,000 cords of rough wood, outside bark. The total commodity drain from both the saw-timber and the non-sawtimber components of the growing stock was, as stated above, 83 million cubic feet, or over 1 million cords. In table 16 the total commodity drain is allocated to the commodities for which the trees were cut.

Table 16. - Commodity drain from the sound-tree growing stock, 1936

Reason for drain	From saw-timber material			From all growing-stock material
	Species-group		Total	
	Pines	Hardwoods		
	Thousand board feet (green lumber tally)			Thousand Cubic feet (i.b.)
Lumber	104,000	11,700	115,700	19,610
Cross ties, poles, and piles	600	4,300	4,900	760
Cooperage and veneer	negl.	8,700	8,700	1,280
Fuel wood	80,700	19,800	100,500	53,880
Fence posts	negl.	900	900	2,140
Miscellaneous (including land clearing and domestic farm use)	10,300	2,200	12,500	5,120
Total	195,600	47,600	243,200	82,790

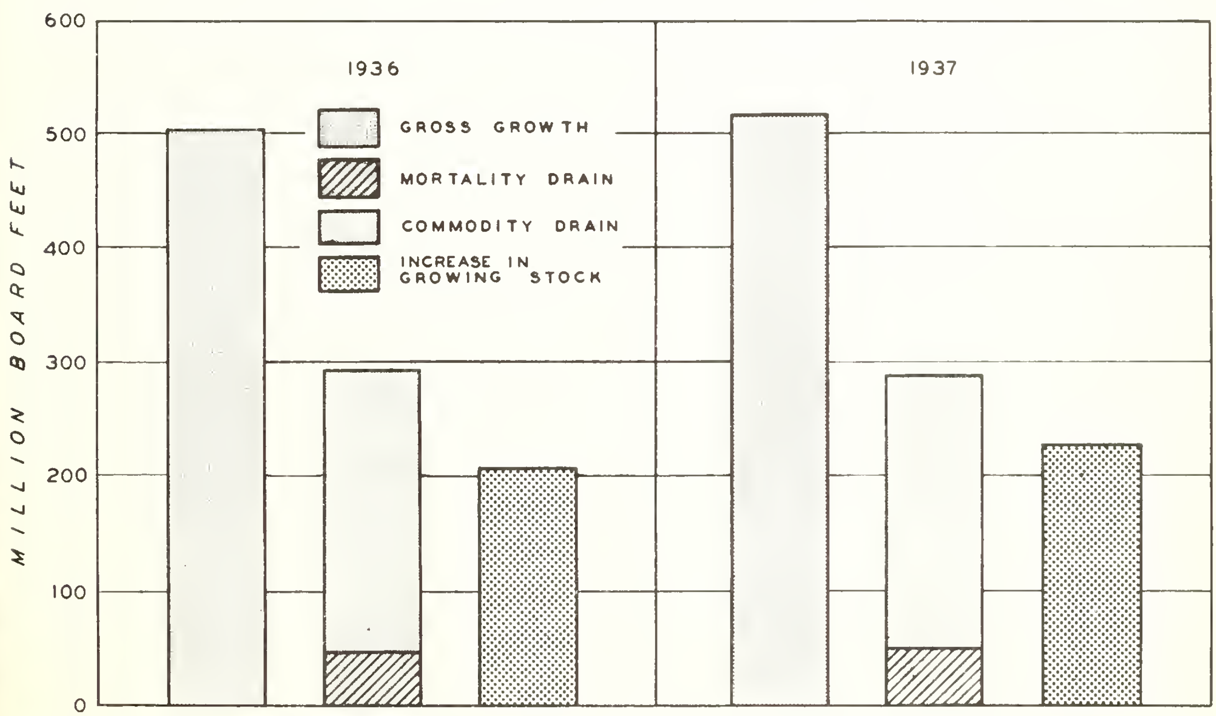


FIGURE 9.- COMPARISON OF GROWTH AND DRAIN FOR THE SAW-TIMBER COMPONENT OF THE GROWING STOCK.

Table 17. - Comparison of increment with commodity drain, 1936 and 1937

Item	Saw-timber material: Species-group: Pines	Saw-timber material: Species-group: Hardwoods	Saw-timber material: Total	All growing stock
	Thousand board feet (green lumber tally)			Thousand cubic feet (i.b.)
Net growing stock, Jan. 1, 1936	4,821,700	1,354,200	6,175,900	1,865,690
Growth	404,600	96,700	501,300	137,930
Mortality	39,200	9,500	48,700	18,540
Net increment	365,400	87,200	452,600	119,390
Commodity drain	195,600	47,600	243,200	82,790
Net increase in growing stock	169,800	39,600	209,400	36,600
Net growing stock, Jan. 1, 1937	4,991,500	1,393,800	6,385,300	1,902,290
Growth	418,300	99,000	517,300	144,960
Mortality	41,700	9,900	51,600	18,960
Net increment	376,600	89,100	465,700	126,000
Commodity drain	195,300	41,900	237,200	84,460
Net increase in growing stock	181,300	47,200	228,500	41,540
Net growing stock, Jan. 1, 1938	5,172,800	1,441,000	6,613,800	1,943,830

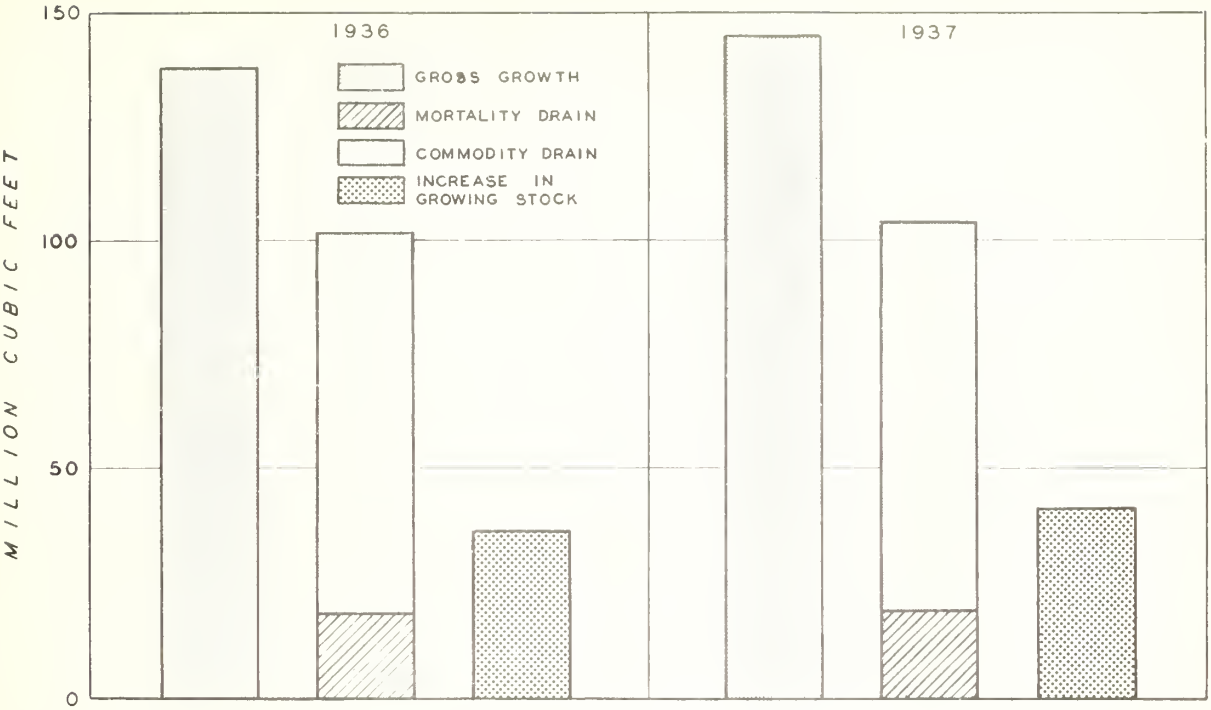


FIGURE 10.- COMPARISON OF GROWTH AND DRAIN FOR THE ENTIRE GROWING STOCK.

Comparison of Increment and Drain

In 1937, the net increment of saw-timber material, after deducting 52 million board feet of mortality from the gross growth, was more than 228 million board feet in excess of the commodity drain from this same class of material (table 17 and fig. 9). Thus the increase in the capital growing stock for one year (1937) amounted to almost 4 percent. For pines as well as for hardwoods the net saw-timber increment was about twice the commodity drain.

For all growing-stock material in trees 5 inches d.b.h. and larger (including those of sawlog size) the net increment, after deducting over one-quarter million cords for mortality, amounted to over $1\frac{1}{2}$ million cords, bark included. It thus exceeded the commodity drain from all sources by slightly more than one-half million cords. In terms of solid wood (bark not included) the increase in the growing stock amounted to almost 42 million cubic feet (fig. 10). While it must be realized that these ratios of increment to drain for 1937 are subject to change from year to year and that immediate fluctuations are largely due to changes in the demand for forest products, it is believed that the lumber industry in 1936 and 1937 was considerably more active than in any of the 5 preceding years.

Summary and Future Outlook

From 1920 to 1930 north central Georgia witnessed a great expansion in its manufacturing enterprises (chiefly cotton textiles), an important increase in the production of hydro-electric power, and a remarkable growth in Atlanta, its largest city. The development of its land resources, however, has failed to keep step. Even the growing of cotton, its principal cash crop, has declined; and no other agricultural crop has taken its place. Although the forests have often been ignored, people are now beginning to appreciate that the forest resources may be developed to contribute much more to the wealth of the region, and thus to the welfare of the people, than they have in the past. During the settlement period and rapid expansion of agriculture, forests were considered only as an obstacle that had to be destroyed in order to provide space for crops, but farm woodlands now have come to be such a valuable asset that during times of agricultural stress, such as the period of the boll weevil epidemic, many farmers were saved from bankruptcy by the sale of forest products. In addition to being a source of cash income, however, the farm woodland furnishes a constant supply of fuel wood, fence posts, tobacco sticks, and other useful farm products. The forest and forest-products industries are an important source of employment, either on a full-time or part-time basis, for both farm and non-farm people.

In recent years the area in forests has shown a marked increase. From 1920 to 1935, according to the Census, the total land in farms increased less than 2 percent, while at the same time the farm woodland area increased about 20 percent. According to the forest survey made in 1935, approximately $2\frac{1}{2}$ million acres were classed as forest out of a total of almost $6\frac{1}{2}$ million acres. With 4 out of 10 acres in forest land, and with 3/4 of all the forest land in farm woodlands, the management of the forests of north central Georgia is part and parcel of the agricultural land-use problem. Also as shown by the Forest Survey, there are over one-half million acres of idle and abandoned agricultural land, much of which eventually will revert to forest cover unless the declining trend in cotton growing is reversed or a new cash crop is found.

Many people are leaving their rural homes and moving to the towns and cities. Between 1900 and 1930 the urban population more than tripled, while the rural population remained relatively stable. Increased opportunities for work are urgently needed. The special Census of Unemployment taken in 1937 classed 67,000 people as either unemployed and wanting work, or as emergency workers, and 33,000 as partially employed and wanting more work. The possibility of increasing the number of workers in forests and wood-using industries, therefore, certainly warrants careful consideration.

The present "happen-so" forests are in the main either old-field stands or patches of timber left on land undesirable for cultivation. Practically all the forest stands are second growth, which have been cut into several times and burned over frequently, but in spite of indifferent treatment they are still a valuable resource. As shown by the 1936 inventory, they contain over 6 billion board feet of saw-timber material, largely in second-growth loblolly pine, shortleaf pine, yellow poplar, oaks, and gums. Considering all sound material in trees 5 inches and larger, there are about 26 million cords of wood in the sound-tree growing stock.

Furthermore, the forest growing stock is increasing; a comparison of increment and drain reveals that in 1937 the volume in the saw-timber component of the stands increased over 228 million board feet, even though 237 million board feet had been removed for use and 52 million board feet had been lost through mortality. In the entire growing stock (i.e., all good trees 5 inches d.b.h. and larger), the net increase was over one-half million cords.

As shown by figures 4 and 5, the forest stands of north central Georgia are deficient in two respects: (1) considering the entire growing-stock material, the various age-classes have only one-third to one-half the volume the forest sites are capable of producing; and (2) large trees that are desirable for the manufacture of lumber, poles, veneer, and other high-quality products are relatively scarce. Forest fires and short-sighted cutting practices are the principal factors responsible for the poor stocking. Of less importance are the scarcity of seed trees and the prevalence of erosion—two factors that often prevent complete restocking of old abandoned fields.

Every year many growing-stock trees die from the effects of fire, wind, insects, lightning, drought, and the competition for space in overcrowded groups. It is estimated that this mortality drain in 1937 amounted to 52 million board feet of saw-timber material, or over one-quarter million cords of all classes of growing-stock material. This annual mortality, it is interesting to note, is far greater than the volume annually required by a pulp mill of average size, which consumes only about 150,000 cords a year. The mortality of saw-timber material is equivalent in amount to almost one-half the total lumber cut in the unit in 1937.

Fire probably causes not only much of the loss in growing-stock volume, but also tremendous losses in trees less than 5 inches d.b.h., which are essential to the recruitment of the growing stock. In addition, the periodic burning of the woods damages even more trees than it kills; the accumulated effects of this is partially reflected in the number of cull trees found in all stands and the large amount of low-grade or defective material present.

While fire protection is a prerequisite, other phases of good forest management are required in this area. Stand-improvement work, involving the removal of cull trees, slow-growing trees, and trees of inferior species, as well as close and thrifty utilization, are necessary for building up both the quality and quantity of the growing stock. Listed in the inventory (but not in the growing stock) is approximately 4 million cords of sound wood in cull trees that should be cut and utilized wherever possible. Their removal will provide additional space for the growth and development of sound growing-stock trees, and also for the establishment of additional seedlings. If utilized, this volume in cull trees will tend to supply a part of the annual requirement now cut from the sound growing-stock trees and thus accelerate the building up of a larger capital without an immediate reduction in the cut. For example, the three-fourths million cords of wood cut annually from the growing stock for fuel wood should be taken instead from the cull trees, which contain a volume sufficient to meet all the fuel-wood requirements of the entire area (almost $1\frac{1}{4}$ million cords annually) for 3 years; this would leave the growing-stock material to accumulate or to be used for higher-priced products. An expansion and greater diversification of the market for forest products, especially for those products sold as cordwood, is needed to give forest landowners the opportunity to practice more intensive timber management.

An enlargement and intensification of forestry educational work is greatly needed in this area in order to educate landowners and the general public to an appreciation of the profits that may be realized through the protection and proper management of forest properties. The losses caused by forest fires, both to the individual landowners, to workers dependent upon the forest, and to the general public, and the methods of preventing and combating forest fires, must be impressed upon the minds of all concerned. The Legislature of Georgia has recently passed an amendment that permits the establishment of county-wide forest-fire protection, and the people of the State should take advantage of this act. Also, landowners should be shown the advantages of selective logging, stand-improvement work, and artificial reforestation, and should be taught how to accomplish these forestry measures.

An expanded market for forest material is needed to provide employment and to furnish added incentive to landowners to grow timber. The comparison of increment with commodity drain in 1937 shows that there was a surplus of over one-half million cords of net increment suitable to build up the growing stock or to support a larger forest-products industry. The present markets for forest products are inadequate to furnish a steady and profitable outlet for the low-grade material that should be removed in thinnings, improvement cuttings, and in the utilization of tops of trees cut for lumber. Any expansion of forest industries in this area, therefore, should be made with the full knowledge that much of the forest resource is suitable only for pulpwood and other relatively low-priced commodities.

No pulp mill has located in this area or in the two adjacent Survey units of Georgia. Furthermore, in 1937 no pulpwood was reported as shipped from north central Georgia to more distant areas. It appears, therefore, that on the basis of the balance between increment and drain in 1937, there is room for a pulp mill, which would greatly improve both employment and timber-marketing conditions. As more markets develop, it will be both necessary and desirable to integrate the utilization of the forest stumpage by the various forest industries, in order that the most valuable material may be converted into the products which will return the highest prices.

These industries, however, should be assured of a permanent future supply of timber by the adoption of good management practices, which will enable the forest resource to contribute permanently, and in a much greater degree than at present, to the welfare of the people.

FOREST SURVEY RELEASE NO. 45 · JUNE 30, 1939

FOREST RESOURCES OF NORTH GEORGIA

by
A. R. Spillers
Associate Forest Economist

A Progress Report by

THE SOUTHERN FOREST SURVEY

I. F. Eldredge, Regional Survey Director

SOUTHERN FOREST EXPERIMENT STATION

E. L. Demmon, Director

New Orleans, La.

FOREWORD

The nation-wide Forest Survey, being conducted by the United States Forest Service, was authorized by the McSweeney-McNary Forest Research Act of 1928. Its five-fold object is: (1) to make an inventory of the extent, location, and condition of forest land and the present supply of timber and other forest products, (2) to ascertain the rate at which this supply is being increased through growth, (3) to determine the rate at which this supply is being diminished through industrial and local use, windfall, fire, and disease, (4) to determine the present requirement and the probable future trend in the requirement for timber and other forest products, and (5) to correlate these findings with existing and anticipated economic conditions, in order that policies may be formulated for the effective use of land suitable for forest production.

This release is based on a field survey made Oct. 12, 1935, to Dec. 21, 1935, and three field canvasses of forest industrial plants to determine forest drain, the last of which was made during June 1937. It should be regarded only as a progress report, since it contains Forest Survey data that will be included in complete reports to be published later and that, although considered reliable, are subject to correction or amplification as the work of computation proceeds. Item 4 above, which is being studied on a national basis, is not discussed in this report.

In the presentation of these survey data, it is to be noted that owing to the sampling method used in collecting them, the greater the number of samples in any given classification the more accurate are the data for that classification. Hence classes that are of infrequent occurrence and relatively small in quantity generally cannot be determined with as high a degree of accuracy as classes that occur more frequently and in substantially greater quantities. Small tabular items are to be taken as showing, not the exact magnitude of the classes involved, but their relative magnitude in comparison with those of other classes.

In the South, the Forest Survey functions as an activity of the Southern Forest Experiment Station with headquarters at New Orleans, La.

Assisting Staff

E. B. Faulks, Associate Forest Economist }
W. E. Houser, Associate Timber Expert } In Charge of Field Work

P. R. Wheeler, Associate Forest Economist, In Charge of Computations

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Note: Assistance in the preparation of these materials was furnished by the personnel of Works Progress Administration Official Projects 701-3-9 and 365-64-3-7.

FOREST RESOURCES OF NORTH GEORGIA

General Description

North Georgia (Forest Survey Unit Georgia No. 5) is an area of over 4 million acres lying in 21 counties, 9 of which are along the northern boundary of the State (fig. 1). An area of broken and diversified topography, its main divisions are the southern extremities of the Blue Ridge Mountains of the Appalachian Mountain Range in the eastern part, and the Valley and Ridge Belt in the western part. Small areas of the upper Piedmont province are found chiefly in the southern tier of counties, and some of the Cumberland Plateau occurs in the northwest part (chiefly in Dade County). The highest point, Brasstown Bald, on the boundary between Union and Towns Counties, is over 4,700 feet above sea level, and the lowest points in the valleys have an elevation of about 600 feet. Approximately two-thirds of this area (table 1) is forested with various hardwoods, and with pines, hemlock, and cedar. Nearly 6 percent of the unit is made up of idle and abandoned cropland. Although agriculture broadly defined includes both farming and forestry, in this report agriculture is used to mean farming, and forestry to mean timber growing and utilization.

Table 1. - Land area classified according to land use, 1936

Land use	Area	Proportion of total area
	Acres	Percent
Forest	2,835,300	66.4
Nonforest:		
Agricultural:		
In cultivation:		
Old cropland	932,100	21.8
New cropland	22,700	.5
Out of cultivation:		
Idle	156,400	3.7
Abandoned	84,400	2.0
Pasture	152,500	3.6
Total agriculture	1,348,100	31.6
Other nonforest	84,100	2.0
Total nonforest	1,432,200	33.6
Total forest and nonforest	4,267,500	100.0

Rome is the largest city (population 22,000 in 1930), but other cities and towns in the area having 2,500 or more are Dalton, Cartersville, Toccoa, Trion, Rossville, Canton, and LaFayette. Also two large cities—Chattanooga, Tenn. and Atlanta, Ga.—are near the area. More then four-fifths of the area's total population of 282,000 (1930 Census) live in the country or in towns of less than 2,500 people.

Agriculture, which provides work for approximately half of those gainfully employed, is the principal source of income, although textiles, forest products, and mining are important. About 35 textile companies with more than 650,000 spindles are located in this unit, chiefly in Floyd, Whitfield, and Walker Counties. The principal marble industry of the State is in Pickens County.1/ Bartow and Walker Counties have important cement industries. Coal and limestone occur in north Georgia as well as many valuable minerals, such as asbestos, barytes, bauxite, feldspar, gold, graphite, iron ore, manganese, ocher, pyrite, sericite, slate, talc, and clays.

According to the Census of Agriculture, in 1935 there were almost 33,000 farms with an aggregate area of 2-3/4 million acres (table 2). Most of the farms are small, i.e., they contain less than 100 acres each. Only 29 percent of the farms have 100 acres or more, but these large farms together make up almost two-thirds of the total farm area. The average size of the farms is about 84 acres, of which 46 acres (55 percent) are farm woodlands. These farm woodlands, which occupy about 1½ million acres, contribute important quantities of forest products both for farm use and for cash income. The area in cropland remained practically unchanged between 1924 and 1934.

Table 2. - Number and acreage of farms according to size, 1935

Size	Number of farms	Proportion of total number	Acreage in farms	Proportion of total acreage
Acres		Percent	Acres	Percent
Less than 50	14,582	44.7	353,591	12.9
50 - 99	8,661	26.5	609,025	22.1
100 - 499	9,077	27.8	1,523,422	55.4
500 - 999	249	.8	156,202	5.7
1000 and over	56	.2	106,111	3.9
Total	32,625	100.0	2,748,351	100.0

In 1934, the most widely planted crop, corn, occupied about 327,000 acres, practically the same area as in 1909; but the principal cash crop, cotton, was planted on only 163,000 acres, a decrease in acreage of over 23 percent since 1909. For the entire area, the average yield per acre of corn in 1934 was about 13 bushels; and of cotton, one-half bale. Both these yields were greater than corresponding averages for the State of Georgia as a whole.

The frost-free season ranges from about 5½ months in the mountains to about 6½ in the valleys. Rainfall is plentiful, ranging from about 50 inches at low elevations to more than 60 in the highlands. Adequate drainage is provided mainly by the Coosa, Chattahoochee, Tennessee, and Savannah river systems.

1/ Industrial Georgia. Year Book 1930. Georgia Power Co. 102 pp., illus.

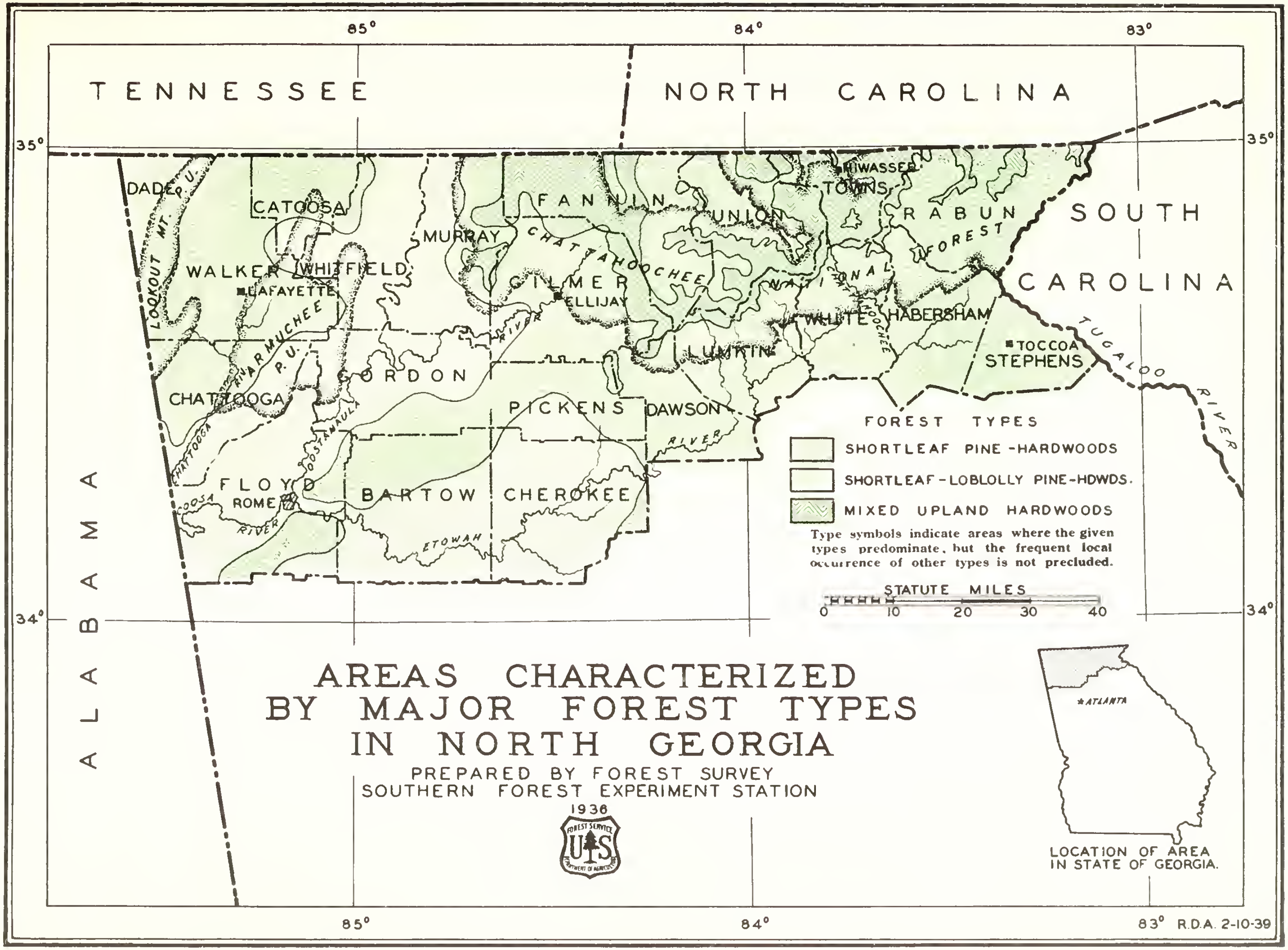

FIGURE - 1. FOREST TYPE MAP.

Generally unsuited for transportation, the turbulent mountain streams are rich in hydroelectric power. On the Tallulah, Tugalo, and other rivers in this area, in 1937 there were 10 hydroelectric plants with an aggregate capacity of over 186,000 kilowatts and an annual output for 1937 of approximately 500 million kilowatt-hours.

This section is served by several railroads including the Louisville and Nashville; the Southern; the Nashville, Chattanooga, and St. Louis; the Central of Georgia; the Tennessee, Alabama, and Georgia; the Tallulah Falls; and the Seaboard Air Line. Approximately 500 miles of paved or surface-treated highways are in the unit, as well as a much greater mileage of secondary roads.

In the eastern and central parts of the area, where the steep mountains are located, the principal soils are (1) the sandy and clay loams derived from the gray-red granitic lands of the Cecil series, and (2) the "slate lands" derived from greasy, micaceous subsoils of the Talladega series. The topsoil has in many places been removed by erosion, leaving the subsoil largely reddish clay, on the surface. In the western part, where long, narrow, northeast-southwest ridges are separated by wide valleys, the principal soils are of the Clarksville series, largely silt-loams and gravelly-loams, developed from highly cherty limestone.

From an agricultural dominant-use standpoint, the farms in the northeast part of this area are labeled by Hartman and Wooten2/ as "self-sufficing," "part-time," or "forest products"; in the southeast part as "cotton"; and in the western part as "cotton," "dairy," or "some truck and fruit." Probably not more than one-tenth of the western part of the area is in prosperous valley farms, while the remainder may be used best for forest crops or pasture and hay. The northeast part of the area is generally so rough and mountainous that profitable agriculture is confined chiefly to the relatively small area of alluvial soils in the major stream bottoms.

As shown by figure 2, a small proportion of the total area of the counties in the northeast part is classed as "land available for crops," including cropland and plowable pasture (Census of Agriculture, 1935). Most of the area not considered as available for crops is forest land.

Only 14 percent of the total area is in public ownership, 65 percent is in farms, and 21 percent is in other private ownerships (fig. 3). For the forest area alone (fig. 4) the ownership status is estimated as follows:

National forest	599,000 acres	
Other publicly owned forest . . .	8,000 acres	
Farm woodlands	1,514,500 acres	(Census)
Other privately owned forest . .	713,800 acres	
Total forest	2,835,300 acres	(Forest Survey)

Although much of the land within the National forest boundaries is privately owned, the gross area within the National forest includes over 75 percent of the total area of Rabun, Towns, Union, and Fannin Counties.

2/ Hartman, W. A. and Wooten, H. H. Georgia land use problems. Georgia Expt. Sta. Bull. 191. 195 pages, illus., 1935.

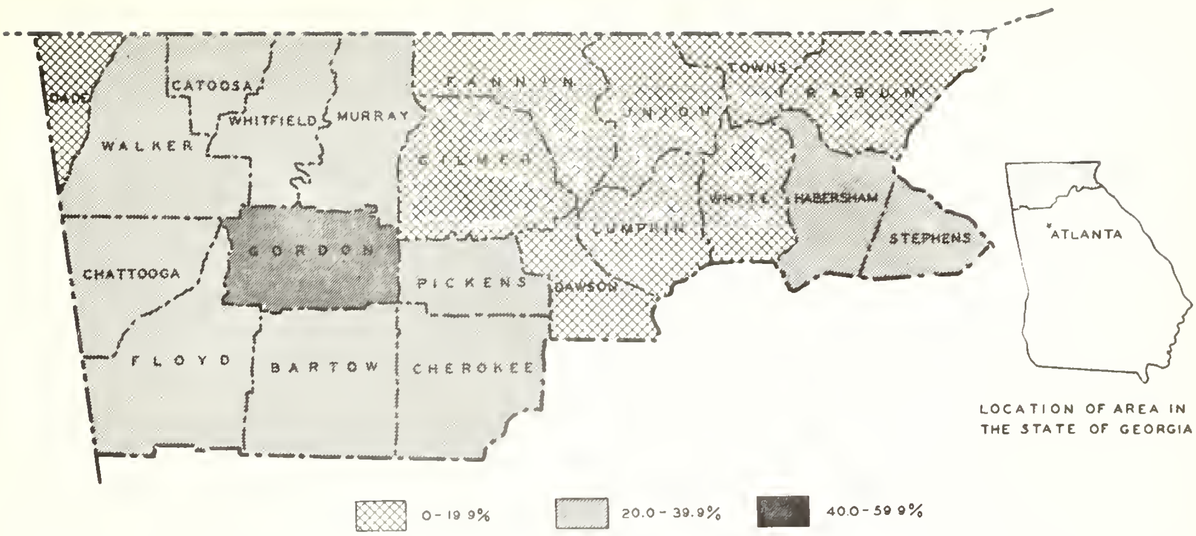

FIGURE 2.- PROPORTION OF COUNTY IN LAND AVAILABLE FOR CROPS
(CENSUS OF AGRICULTURE, 1935).

According to the forest survey made during the last 3 months of 1935, approximately two-thirds of the area of north Georgia was forest (table 1). Of the remaining one-third, that is, the nonforest land, old cropland occupied by far the largest area. Not to be overlooked, however, is the 240,800 acres of idle and abandoned cropland; some of this will revert to forest, while some will be cultivated again if the prices of corn and cotton rise sufficiently. In north Georgia, the common farming practice is to allow the land to pass through a cycle of use-stages: starting with the natural forest, areas are cleared and cultivated until erosion becomes serious, then used as pasture, and finally allowed to reforest naturally. Until a grass, weed, or tree growth is established, however, erosion continues after cultivation is abandoned, unless terraces, check dams, or other artificial deterrants to run-off are constructed.

Table 3. - Correlation of land use with erosion, 1936

Land use	Type of erosion				Total
	None or arrested	Sheet	Shoe-string	Gullies	
	Acres				
Forest	2,706,300	53,200	30,500	45,300	2,835,300
Cropland in cultivation	750,700	151,700	46,900	5,500	954,800
Idle and abandoned cropland	152,500	41,400	28,100	18,800	240,800
Pasture	129,000	6,300	10,200	7,000	152,500
Total	3,738,500	252,600	115,700	76,600	4,183,400
Percent of total	89.4	6.0	2.8	1.8	100.0

Soil erosion in some form and to some degree is occurring almost everywhere in this area, but in this report only the well-marked and destructive stages are recognized. In making the field survey, the following forms of erosion were recorded: (1) sheet erosion, in which the soil is washing off from a generally smooth surface; (2) shoestring erosion, in which the soil surface is cut into, and a system of small, branching gullies from a few inches to not over 2 feet deep is formed; and (3) gully erosion, in which the soil surface is being destroyed by deep gully systems. Table 3 presents existing interrelationships between erosion and land use as indicated by the sample plots. Marked erosion, in one or more of these three forms, is found on 21 percent of the cropland, 37 percent of the idle and abandoned land, 15 percent of the pasture, but on only 5 percent of the forest land, which includes many old gullied fields with only a partial stocking of trees.

The small percent of erosion on the forest land is especially noteworthy when one considers that steep slopes (i.e., slopes of more than 30 percent), which are more characteristic of north Georgia than of any other part of the State, occur on approximately 40 percent of the forest area but on only 1 percent of the cropland in cultivation (table 4).

Table 4. - Forest and agricultural area classified according to land use and slope, 1936

Land use	Slope			Total
	Gentle (0-10%)	Moderate (11-30%)	Steep (31% and over)	
	Acres			
Forest	510,600	1,197,900	1,126,800	2,835,300
Cropland in cultivation	695,200	249,400	10,200	954,800
Idle and abandoned cropland	130,600	99,300	10,900	240,800
Pasture	101,600	45,400	5,500	152,500
Total	1,438,000	1,592,000	1,153,400	4,183,400

Description of the Forest

Shortleaf pine, by far the most important forest species in the unit, is often associated with hardwoods and with loblolly and Virginia pines. A few hemlocks, cedars, and pitch, northern white, and mountain pines also are found. Of the hardwoods, oaks, hickories, yellow poplar, gums, and maples are the most prevalent, but black locust, dogwood, basswood, beech, elms, ash, and birch also occur. Chestnut, an important hardwood, which in the mountainous areas probably made up one-third of the original timber, has been wiped out by the blight, but many dead, usable trees remain. Chestnut and the dead trees of other species are not included in the timber inventory, however, unless specifically stated.

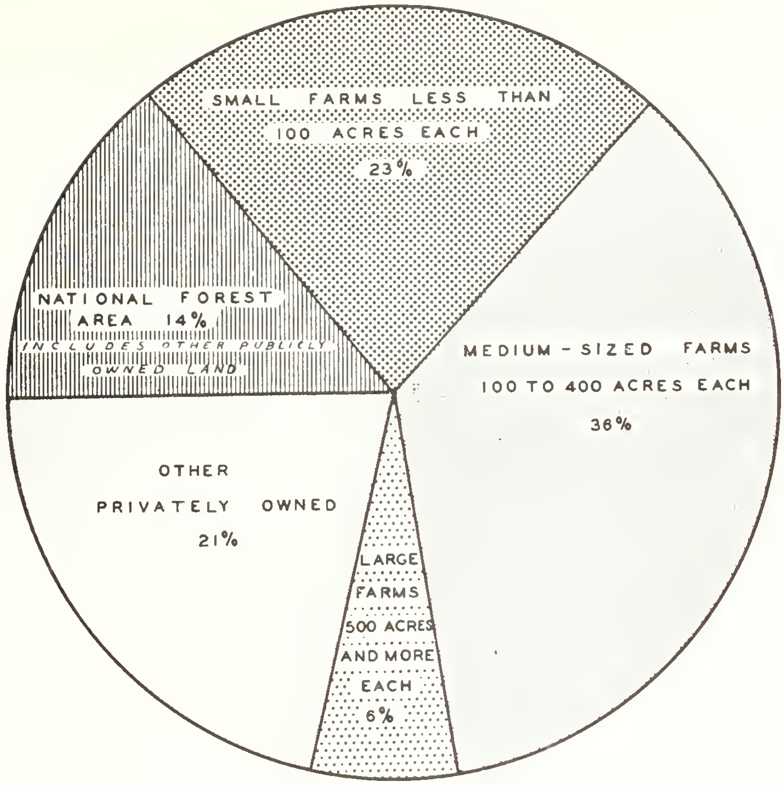

FIGURE 3. - TOTAL LAND AREA IN VARIOUS OWNERSHIPS.

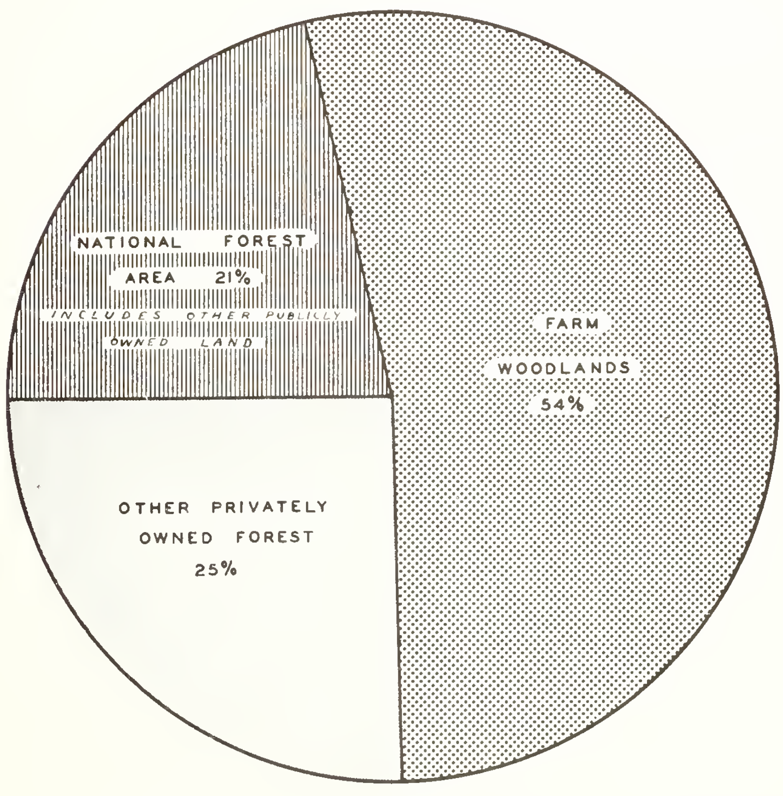

FIGURE 4.- FOREST LAND IN VARIOUS OWNERSHIPS.

The various species of forest trees may be combined into three main type-groups (table 5). The <u>pine type-group</u> (mostly in the southern and western parts and on the south slopes) covers 39 percent of the forest area (table 6), and includes, in addition to the widespread shortleaf pine type, smaller areas in the loblolly pine, Virginia pine, white pine, and hemlock types. The <u>pine-hardwood type-group</u>, found on 23 percent of the forest area, is generally the shortleaf pine-hardwood type, but less often it is made up of the loblolly pine- or Virginia pine-hardwood and occasionally the white pine-hardwood types. The <u>hardwood type-group</u> (mostly in the northeastern part, in stream bottoms and on north slopes) occupies 38 percent of the total forest area; it includes large areas of oak and oak-chestnut type and a small representation of the cove hardwood, yellow poplar, scrub hardwood, and other hardwood types. The prevalence of certain major forest types over large areas is shown on the map (fig. 1), although within the broad ranges there delineated, occur many small intermingled areas of other types, as well as areas of cleared land.

Table 5. - Species composition[1] of the various type-groups

Species or species-group	Type-group: Pine	Pine-hardwood	Hardwood	Total
	Percent			
Shortleaf, pitch, and mountain pines	55.1	33.9	2.5	34.8
Loblolly pine	17.9	7.1	.5	10.4
Virginia pine and other conifers	14.4	11.2	3.2	10.3
Red oaks	4.5	17.6	34.2	16.3
White oaks	2.5	11.0	26.4	11.6
Hickory	1.6	5.7	9.8	4.9
Yellow poplar	.6	3.8	7.8	3.4
Other hardwoods	3.4	9.7	15.6	8.3
Total	100.0	100.0	100.0	100.0

1/ Based on cubic-foot volume, outside bark of trees 5.0 inches d.b.h. and larger.

Only 12 percent of the forest area is in the old-growth condition, which resembles the original-growth timber in that it has a high proportion of large trees suitable for lumber (table 6). The old growth, most of which is in the hardwood types, is either in a few large blocks, chiefly on the mountains and in the river bottoms of the National forest, or in small isolated patches. The uncut old-growth stands, for all type-groups combined, average 4,100 board feet per acre, green lumber tally, based on the International $\frac{1}{4}$-inch rule, in sawlog-size trees[3], while the partly cut stands, in which 10 percent or more of the sawlog-size trees have been removed, average about 3,200 board feet per acre.

Second-growth stands, found in all parts of the unit, in both small and large tracts, occupy 85 percent of the total forest area. Having developed

3/ Sawlog-size pines are at least 9.0 inches d.b.h. and hardwoods at least 13.0 inches.

above the stumps of the original timber or upon abandoned fields, these young stands constitute the main part of the present forest resource as well as the foundation of the forest of the future. The uncut second-growth sawlog-size stands, all types combined, have an average volume of 3,100 board feet (green lumber tally); the partly cut stands have an average volume of 2,500 board feet per acre, and a minimum of 400 board feet. Under-sawlog-size stands, made up chiefly of saplings less than 9 inches d.b.h. for the pines and less than 13 inches for the hardwoods, occupy a large part of the area but have very light volumes; for all types combined, these stands have an average of less than 300 board feet of saw timber per acre in a few sawlog-size trees, or about 5 standard cords in all growing-stock trees 5 inches d.b.h. and larger.

Table 6. - Forest area classified according to forest condition and forest type-group, 1936

Forest condition	Forest type group			Total all types	Proportion of total
	Pines	Pine-hardwoods	Hardwoods		
	Acres				Percent
Old growth:					
Uncut	36,800	23,400	138,400	198,600	7.0
Partly cut	36,700	20,400	94,600	151,700	5.4
Total	73,500	43,800	233,000	350,300	12.4
Second growth:					
Sawlog size:					
Uncut	510,600	192,400	331,500	1,034,500	36.5
Partly cut	165,800	71,100	82,900	319,800	11.3
Under sawlog size	295,500	331,600	412,100	1,039,200	36.6
Reproduction 1/	51,700	27,300	12,500	91,500	3.2
Total	1,023,600	622,400	839,000	2,485,000	87.6
Total all conditions	1,097,100	666,200	1,072,000	2,835,300	100.0
Percent of total forest area	38.7	23.5	37.8	100.0	

1/ Includes 7,800 acres of clear-cut condition.

The reproduction condition, which is composed predominantly of seedlings and sprouts less than 1.0 inch d.b.h. without an overstory of larger timber, occupies only 3 percent of the total forest area; this includes a small area of clear-cut condition that has less than 80 seedlings per acre but may have an occasional seed tree. In general, the trees are such prolific seeders, or sprout so readily, that reproduction quickly becomes established after cutting the forest or abandoning the cultivated land. The species pattern of the new forest closely follows that of the old one, or of the adjacent seed trees.

The productivity or site index of the forest is indicated by the height in feet attained by average dominant trees at 50 years of age. For the areas dominated by pines, the proportion of the poorer sites is greater than in other Survey units in Georgia. In north Georgia the percentage of the various sites is as follows:

	Areas dominated by:		
Site index in feet	Shortleaf pine Percent	Loblolly pine Percent	Other pines Percent
80 or better	2	25	6
70	11	43	7
60	45	28	33
50 or less	42	4	54
Total	100	100	100

Figure 5 includes 2 charts which show the volume per acre of the various 20-year age-classes and their distribution in the present forest; chart A is based on pine and pine-hardwood types, and chart B on hardwood types. For the purpose of comparison, the volumes of the most heavily-stocked 10 percent of the uncut stands for the same age-classes on weighted-average sites are indicated by the broken line. The age-class of the stands was determined in the field for each forest plot, and where there was more than one age-class on the same plot, the one which would provide the most of the next cut was recorded. The volumes are expressed in cubic feet, inside bark, with no deductions for woods cull.

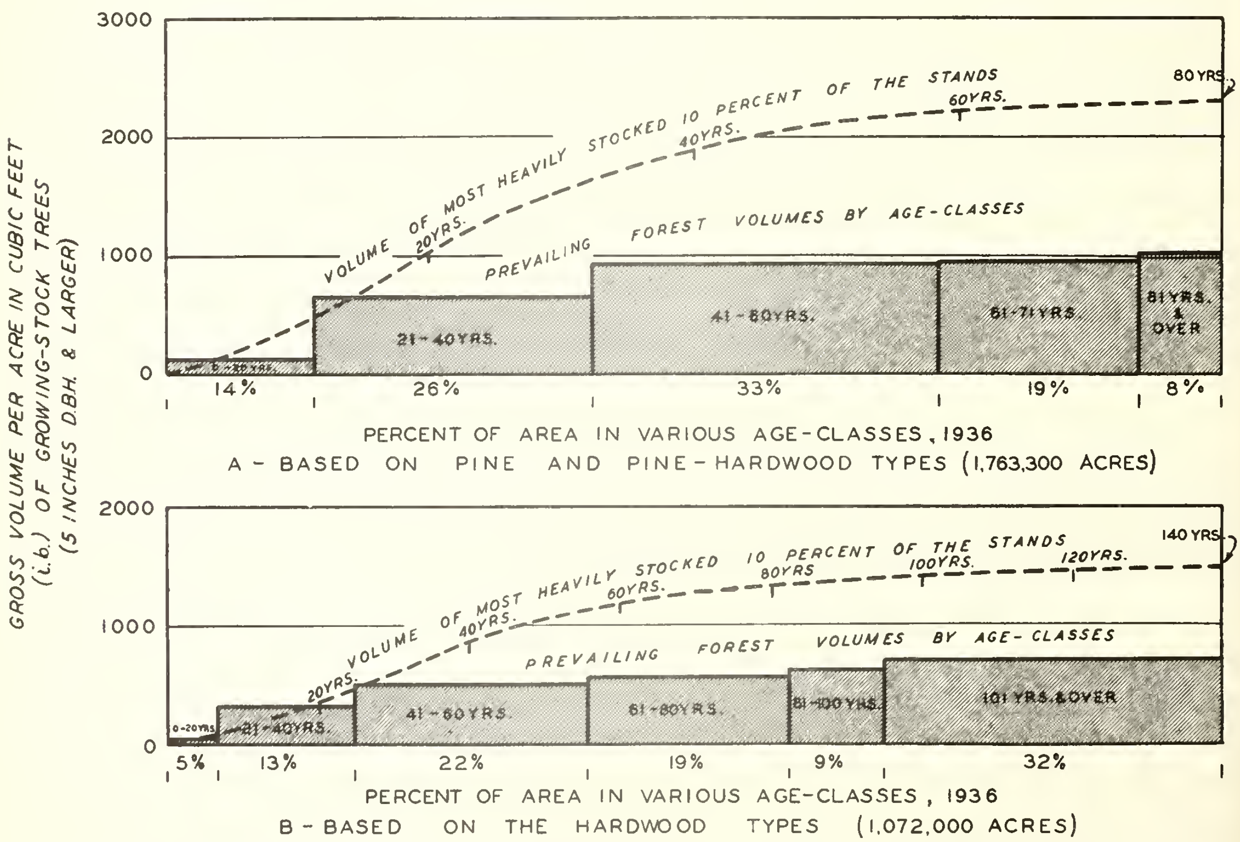

FIGURE 5.- DISTRIBUTION BY AREA OF PREVAILING AGE-CLASSES AND VOLUME, AND THE VOLUME IN WELL-STOCKED STANDS.

For the pine and pine-hardwood types, 40 percent of the area has stands up to 40 years old, 52 percent has stands 41-80 years old, and only 8 percent has stands at least 81 years old. Volumes per acre for the average stands range from 100 cubic feet per acre for the youngest 20-year age-class to slightly over 1,000 cubic feet for the oldest (81 years old and over). In striking contrast, the volume per acre of the well-stocked stands, shown by the dotted line, amounts to over 1,000 cubic feet per acre at 20 years, 2,200 at 60 years, and 2,300 at 80 years. These volumes of well-stocked stands, however, are generally lower than those of corresponding stands and sites in other Forest Survey units in Georgia.

For the hardwood types, only 18 percent of the area has stands up to 40 years old, 41 percent has stands 41-80 years old, and 41 percent has stands at least 81 years old. The oldest age-class (trees 101 years old and over) includes many stands of over-mature hardwood trees that should be cut as soon as this is economically possible. Volumes per acre for the average stands range from 50 cubic feet for the youngest 20-year age-class to 700 cubic feet for the oldest. In contrast, the much higher volumes per acre of the well-stocked stands (shown by the broken line) amount to 400 cubic feet at 20 years, 1,200 at 60 years, and 1,400 at 100 years. That the growing stock of the prevailing forest stands can be doubled, is indicated by the volumes of the most heavily stocked 10 percent of the stands. Fire protection and other good management practices, however, will be required to increase the growing stock throughout the forest.

Figure 6 shows the relative prevalence of sound trees by diameter classes[4]. In the 2- and 4-inch classes there are more hardwoods than pines, but in the larger classes there are about as many pines as hardwoods. While there is a preponderance of 2-inch trees, it should be recognized that these small trees are so perishable that many will die from fire and the natural causes of mortality, e.g., overcrowding. With adequate fire protection a sufficient number of these small trees will live to increase the stocking in the presently understocked large-diameter classes.

Large trees, viz., those over 15 inches d.b.h., are relatively scarce. Since most of the high-grade lumber and veneer stumpage is usually taken from these large trees, particular attention should be given to the building up of the large-tree component of the growing stock. When the stands are logged, selective cutting should be practiced, i.e., the over-mature, poorly formed, defective, and slow-growing trees, irrespective of size, should be removed where economically possible, along with some of the better trees, leaving many of the larger and faster-growing trees to develop high-quality saw timber. As a general rule, the cuttings should be made as frequently as economic conditions and the growth of the stands will permit, but the volume removed at any one time from the growing stock should, in general, not exceed the net increment expected before the next cutting.

4/ The 2-inch class ranges from 1.0 to 2.9 inches d.b.h., the 4-inch class from 3.0 to 4.9 inches, and so on.

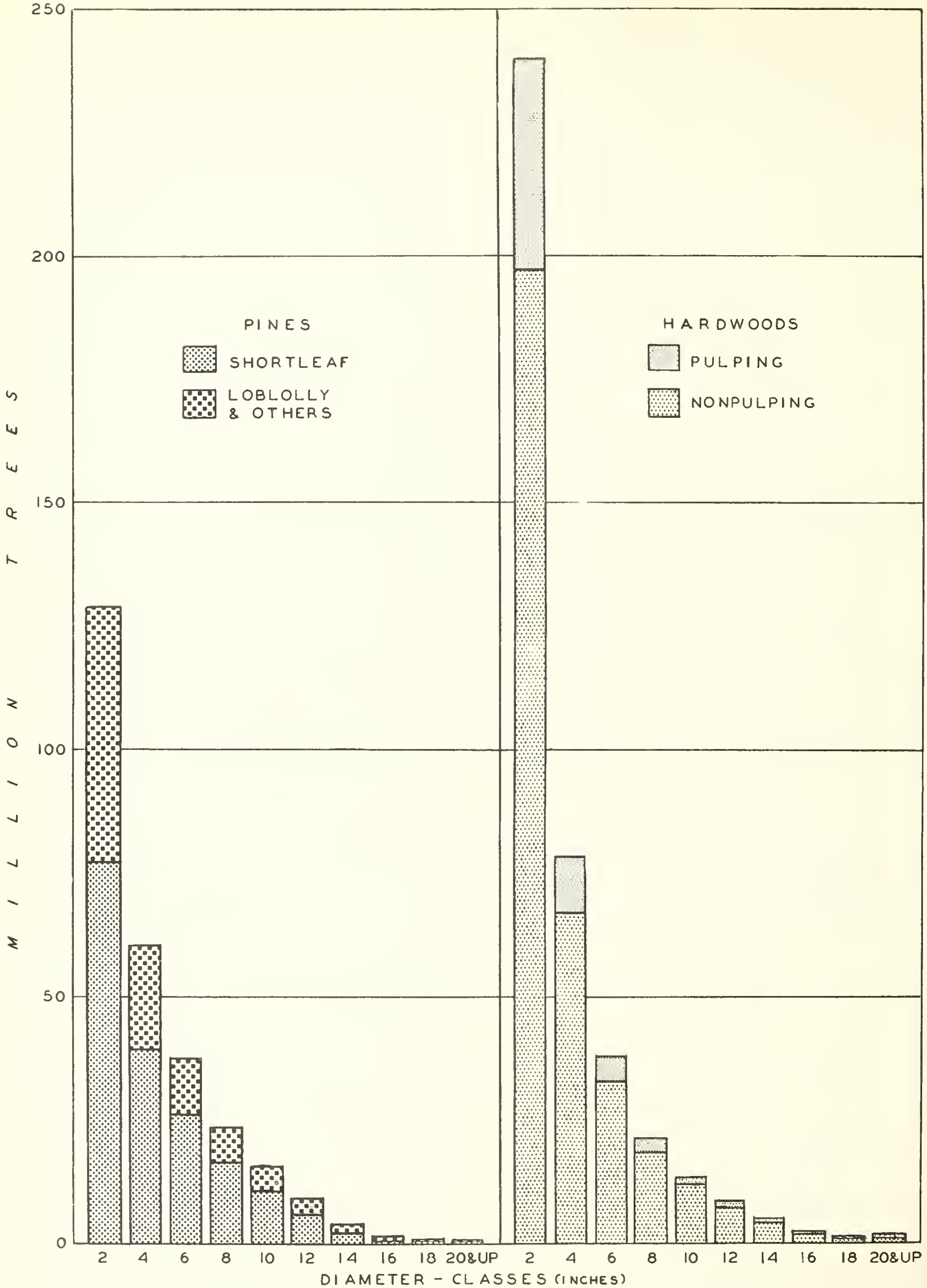

FIGURE 6.- STAND DIAGRAMS OF SOUND TREES.

Estimates of Timber Volume

Saw-timber volume

The Survey classified as saw-timber trees all living pines at least 9.0 inches d.b.h., and all living hardwoods at least 13.0 inches d.b.h., if they contained one sound butt log at least 12 feet long, or if 50 percent of their gross volume was in sound material. The total net saw-timber volume in this unit is more than $5\frac{1}{2}$ billion board feet, according to the International $\frac{1}{4}$-inch rule, which closely approximates green lumber tally (table 7), or over $3\frac{1}{4}$ billion board feet, according to the Doyle scale, which is in general use in the South. All figures are net, deductions having been made for both woods and mill cull, that is, for portions of the tree which cannot be manufactured into lumber because of fire scars, rot, sweep, crook, bad knots, or other defects.

Table 7. - Net board-foot volume of live trees1/ (green lumber tally, based on International $\frac{1}{4}$-inch rule) in the various forest conditions, 1936

Tree species-group	Old growth		Second growth			Total	Proportion of total
	Uncut	Partly cut	Sawlog size		Under sawlog size2/		
			Uncut	Partly cut			
	Thousand board feet						Percent
Pines and other softwoods:							
Shortleaf pine3/	188,100	145,900	1,453,300	376,900	124,900	2,289,100	41.2
Loblolly pine	35,100	34,200	552,100	168,800	34,700	824,900	14.9
Virginia pine	29,000	20,800	304,300	44,200	25,600	423,900	7.6
White pine, hemlock, and cedar4/	104,300	19,200	143,900	25,100	6,300	298,800	5.4
Total conifers	356,500	220,100	2,453,600	615,000	191,500	3,836,700	69.1
Hardwoods:							
Yellow poplar	78,300	19,100	90,700	14,700	5,800	208,600	3.8
Red oaks5/	155,800	78,700	335,500	81,600	48,700	700,300	12.6
Forked leaf white oaks	58,900	45,200	75,200	19,700	11,300	210,300	3.8
Chestnut oaks	100,500	28,200	93,100	8,600	10,200	240,600	4.3
Hickory	35,500	49,400	55,900	16,900	14,400	172,100	3.1
Other hardwoods	33,000	38,500	67,700	27,800	15,700	182,700	3.3
Total hardwoods	462,000	259,100	718,100	169,300	106,100	1,714,600	30.9
Total all species	818,500	479,200	3,171,700	784,300	297,600	5,551,300	100.0
Percent of total	14.8	8.6	57.1	14.1	5.4	100.0	

1/ Chestnut not included.
2/ Includes 3,400 M board feet in residual trees in the reproduction and clear-cut conditions.
3/ Includes pitch and mountain pines.
4/ Includes 192,200 M board feet of white pine.
5/ Includes 158,600 M board feet of northern red oak.

Of the total lumber-tally volume, coniferous species, with shortleaf pine by far the most important, make up over two-thirds; hardwoods, with red and white oaks predominating, less than one-third. This is shown in table 7, in which the small volumes of ash, beech, elm, gums, maples, etc. are combined as "other hardwoods." Much of the hardwood volume is in the Appalachian Mountain Range and is similar to hardwood cut in North Carolina and Tennessee and advertised as "Appalachian hardwood."

Old-growth stands, all types combined, contain 23 percent of the saw-timber volume; second-growth stands, 77 percent. In the old-growth conditions, uncut and partly cut combined, hardwood has a greater volume than pine, but in the second-growth conditions pine has over three times as much volume as hardwood.

The diameter distribution of the net saw-timber volume is given in table 8, which shows that 53 percent of the pine is in trees of the 10- and 12-inch classes and that 62 percent of the hardwood is in the 14-, 16-, and 18-inch classes. As a general rule, small saw-timber trees contain little material suitable for high-grade lumber or veneer.

Table 8. - Diameter distribution of net board-foot volume (green lumber tally, based on International $\frac{1}{4}$-inch rule) in the various forest conditions, 1936

Species-groups and diameter-classes (in inches)	Old growth		Second growth			Total	Proportion of total
	Uncut	Partly cut	Sawlog size		Under sawlog size[1]		
			Uncut	Partly cut			
	Thousand board feet						Percent
Pines:							
10 - 12	47,300	65,700	1,381,100	357,800	165,800	2,017,700	52.6
14 - 16	88,200	50,400	740,900	193,500	23,700	1,096,700	28.6
18 - 20	83,900	66,700	234,100	52,200	2,000	438,900	11.4
22 and over	137,100	37,300	97,500	11,500	-	283,400	7.4
Total pines	356,500	220,100	2,453,600	615,000	191,500	3,836,700	100.0
Hardwoods:							
14 - 18	173,600	119,900	539,600	137,700	93,200	1,064,000	62.0
20 - 28	228,300	128,000	166,100	31,600	12,900	566,900	33.1
30 and over	60,100	11,200	12,400	-	-	83,700	4.9
Total hardwoods	462,000	259,100	718,100	169,300	106,100	1,714,600	100.0

1/ Includes 3,400 M board feet in the reproduction and clear-cut conditions.

As shown in table 9, more than half the saw-timber volume in coniferous species is in limby and rough trees. Shortleaf pine has the highest percentage of volume in smooth trees; white pine, Virginia pine, and hemlock combined have the lowest. For all coniferous species combined, trees in the old-growth conditions generally are much higher in lumber quality than those in the second growth.

Table 9. — Classification of the coniferous species according to grade of trees of saw-timber quality (based on supplemental data)

Species and stand condition	Tree grade 1/			Total
	Smooth	Limby	Rough	
	- - - - - - - -	Percent of volume	- - - - - - - -	
Shortleaf pine:				
Old growth	93	7	-	100
Second growth	57	41	2	100
Weighted average	62	36	2	100
Loblolly pine:				
Old growth	84	16	-	100
Second growth	50	45	5	100
Weighted average	53	42	5	100
White pine, Virginia pine, hemlock, and cedar:				
Weighted average	7	68	25	100
All conifers combined:				
Old growth	66	26	8	100
Second growth	47	47	6	100
Weighted average	49	44	7	100

1/ Smooth trees have 20 feet or more of clear length and also at least 50 percent of their total usable length practically free of limbs and indications of knots; limby trees have at least 12 feet of clear length and 30 to 49 percent of their total usable length practically free of limbs and indications of knots; rough trees have less than 12 feet of clear length, or less than 30 percent of their total usable length, practically free of limbs and knots.

Due to the fact that logging costs per thousand board feet usually decrease as the volume per acre increases, the volume density or stand per acre greatly influences the economic value of the forests. The area and volume-per-acre distribution of the sawlog-size conditions are given in figure 7. The volumes are gross, since no deductions have been made for cull. In the pine and pine-hardwood type-groups (A), 28 percent of the area and 10 percent of the volume are in stands with less than 2,000 board feet (green lumber tally) per acre; and it follows that 72 percent of the area and 90 percent of the volume are in stands of 2,000 board feet or more. In the hardwood type-groups (B), the proportion of light stands is much greater.

The fact that 93 percent of the forest area of north Georgia has been logged at least once, in spite of the mountainous nature of the terrain in the east and northwest parts of the unit, indicates the accessibility of the forests. Most of the relatively small area of inaccessible land is in the National forest, where active road building is rapidly opening up new areas for utilization.

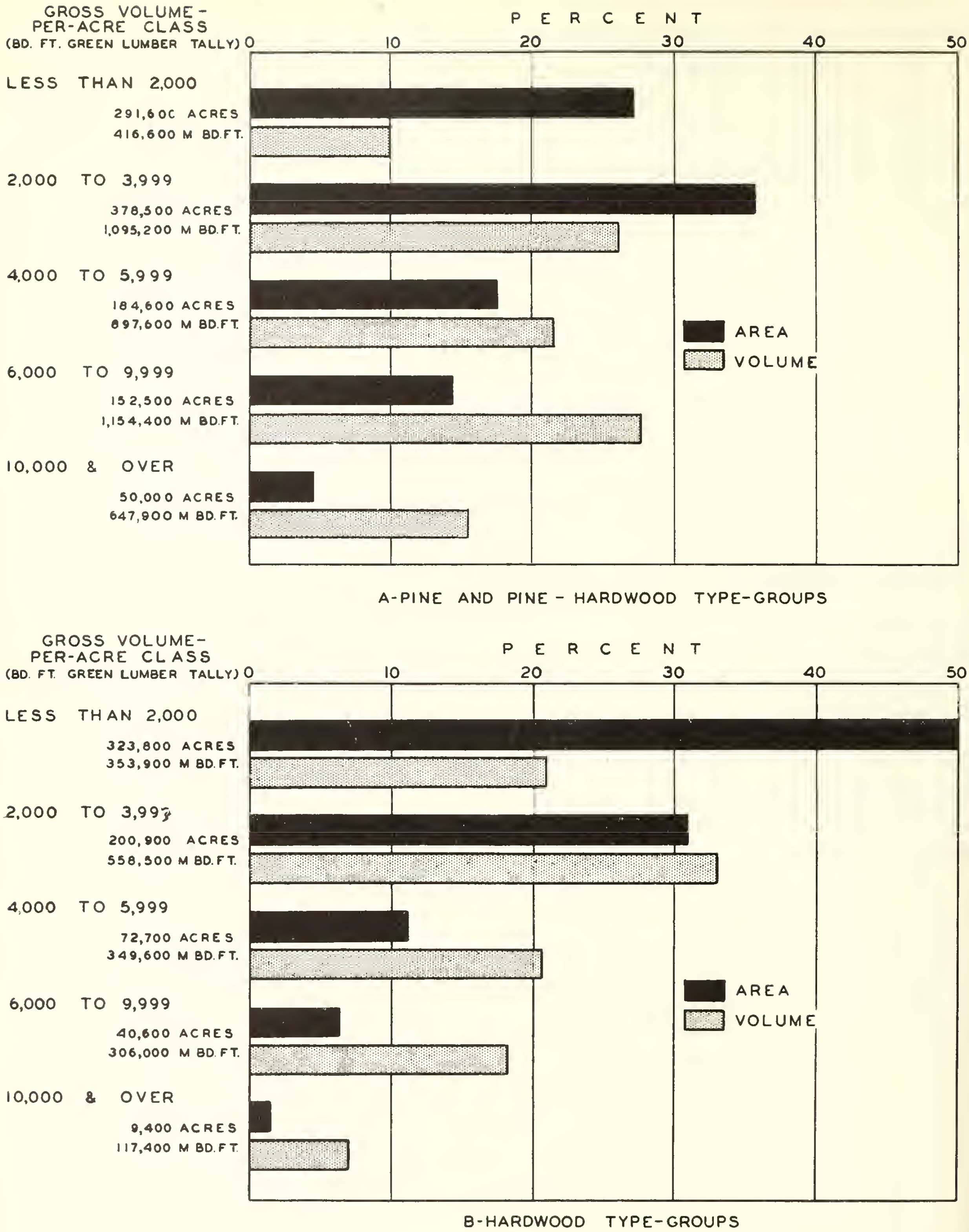

FIGURE 7.-AREA AND VOLUME-PER-ACRE DISTRIBUTION OF THE SAWLOG-SIZE CONDITIONS, CLASSIFIED ACCORDING TO VOLUME OF SAW TIMBER PER ACRE.

Cordwood volume 5/

In living trees 5.0 inches d.b.h. and larger, the total net volume of usable cordwood material, bark included, is more than 35 million standard cords (4 x 4 x 8 feet). It should be understood, however, that this includes volume shown in the saw-timber estimate given in the preceding section. As previously stated, all volume figures are net, deductions having been made for woods cull — the material unsuitable for use because of fire scar, crook, excessive limbiness, rot, or other defects.

In table 10, cordwood volumes are given by species-groups and according to the following sources:

1. From the merchantable stems of sawlog-size trees.

2. From that portion of saw-timber trees not used as sawlogs but usable as cordwood; this includes the upper stems of all species to a variable top-diameter (but not less than 4 inches), and the limbs of hardwoods to a 4-inch minimum.

3. From sound trees under sawlog size but at least 5.0 inches d.b.h.; here the entire stem of all species is included to a variable top-diameter (but not less than 4 inches).

4. From the estimated sound material in sound and rotten cull trees, including scrub oaks, which are classed as sound culls.

Fuel wood and pulpwood are the principal uses for cordwood material that is unsuited for saw timber. While most species are useful for fuel wood, the pines and the soft-textured hardwoods, such as yellow poplar, cucumber magnolia, red gum, and maple are preferred for pulpwood in this locality. More than four-fifths of the total pulpwood inventory of about 18 million cords is in pine. "Nonpulping" species are not commonly pulped at present but in the future may be found suitable. Not included in the data given above is a volume of chestnut roughly estimated to be about 2 million cords, mostly in dead trees. Some of this dead material is cut into lumber, and small quantities are being converted into fuel wood and fence posts.

Figure 8 shows graphically the cordwood volumes in live, sound trees only, by size-classes. Trees from 5.0 to 13.0 inches d.b.h., rarely suitable for high-grade lumber and veneer, include 70 percent of the pine volume and 51 percent of the hardwood. As this report will indicate in the following pages, much of the growth is occurring on these small, low quality trees.

5/ For more detailed information, see "Sawtimber and cordwood volumes in North Georgia," Forest Survey Release No. 30, Feb. 10, 1938. Southern Forest Expt. Sta., New Orleans, La.

Table 10. - Net volume in various classes of sound material[1], 1936

Species-group	Sawlog portion of saw-timber trees	Upper stems of saw-timber trees	Sound trees under saw-log size	Sound and rotten cull trees [2]	Total all classes	Proportion of total
	- - - - - - - - -	Cords (bark included)	- - - - - - - - -			Percent
Pines, hemlock, and cedar	8,478,200	1,182,100	4,284,600	914,600	14,859,500	42.1
Hardwoods:						
Pulping[3]	842,700	483,900	960,200	828,100	3,114,900	8.8
Nonpulping	3,613,300	2,091,100	6,291,400	5,330,700	17,326,500	49.1
Total hardwoods	4,456,000	2,575,000	7,251,600	6,158,800	20,441,400	57.9
Total all species	12,934,200	3,757,100	11,536,200	7,073,400	35,300,900	100.0
Percent of total	36.7	10.6	32.7	20.0	100.0	

1/ Does not include about 2 million cords of sound chestnut material, mostly in dead trees.
2/ Includes all scrub oaks as nonpulping hardwoods.
3/ 1,416,000 cords of yellow poplar; 1,698,900 cords of cucumber magnolia, gums, maple, basswood, etc.

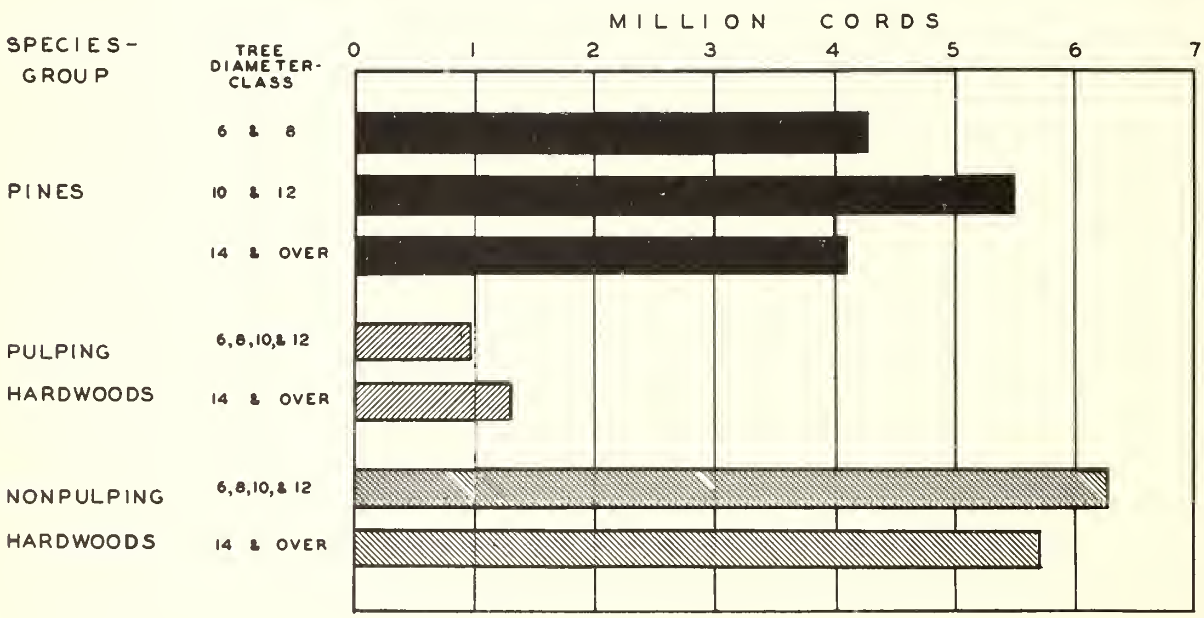

FIGURE 8.- CORDWOOD VOLUMES OF PULPING AND NONPULPING SPECIES BY SIZE-CLASSES, SOUND TREES ONLY.

The growing stock of all species made up of live, sound trees (chestnut, cull trees, and the upper stems and limbs of sawlog-size hardwoods excluded) amounts to 12 million cords in sound trees under sawlog size and 14 million cords in sawlog-size trees, or a total of about 26 million cords. The volume per acre of growing-stock trees, measured in cords, for the various forest conditions and type-groups, computed by dividing total volume by the corresponding area, is given in table 11. The competitive demand for saw timber, and the present larger stumpage prices paid for lumber, cross ties, veneer, poles, and piles encourage the holding of a considerable part of the under-sawlog-size trees of the growing stock for such future uses. Since many trees of the growing stock, however, are so rough and limby that they may never be suitable for high-grade material, selection of the trees to be held should depend upon smoothness and other indications of quality, as well as upon rapidity of growth. Of importance in a consideration of better forests and forest utilization is the fact that there are over 7 million cords of usable wood in cull trees and 2 million cords of usable chestnut wood in dead trees, all of which, if used as fully as possible, should reduce the consumption of growing-stock trees for fuel wood and other low requirement uses.

Table 11. - Average volumes of cordwood per acre in growing-stock trees, 1936

Forest type-group	Old growth		Second growth			All conditions 1/
	Uncut	Partly cut	Sawlog size: Uncut	Sawlog size: Partly cut	Under sawlog size	
	Cords (bark included)					
Pine	15.7	12.7	15.9	12.2	4.2	11.3
Pine-hardwood	13.8	11.8	11.3	10.4	4.1	7.3
Hardwood	11.8	10.5	8.9	7.6	5.3	7.8
Weighted averages all types	12.8	11.2	12.8	10.6	4.6	9.0

1/ Includes areas of reproduction and clear-cut forest conditions.

Poles and piles

A special inventory was made of pine trees suitable for poles and piles, based upon the specifications of the American Standards Association; the resulting estimate of $10\frac{1}{2}$ million trees suitable for these uses is believed to be conservative (table 12). These trees, which have been included in the volume inventories previously given, are scattered throughout the area, singly or in groups. Most of the pole and pile pieces are 20 and 25 feet long and in trees less than 11.0 inches d.b.h. outside bark.

Table 12. - Total number of pine poles or piles, classified according to length and diameter, 1936

D.B.H. of trees (outside bark)	Pole or pile length (feet)			Total	Proportion of total
	20 and 25	30 and 35	40 and over		
Inches	- - - - - - -	Thousand pieces	- - - - - - -		Percent
7.0 - 8.9	3,385	168	-	3,553	33.3
9.0 - 10.9	2,586	972	39	3,597	33.7
11.0 - 12.9	1,408	823	96	2,327	21.8
13.0 - 14.9	462	374	74	910	8.5
15.0 and up	59	183	46	288	2.7
Total	7,900	2,520	255	10,675	100.0
Percent of total	74.0	23.6	2.4	100.0	

Forest Increment

Forest increment, as used in this report, means the difference between the net volume of growing-stock trees standing on the area at the beginning and at the end of a year, before deducting the total commodity drain for the year. Board-foot increment is made up of the growth on sawlog-size trees and the total board-foot volume of trees becoming sawlog size during the year, with appropriate deductions for mortality. Cordwood increment represents (a) the growth on the sound stem wood of pines 5.0 inches d.b.h. and over, on under-sawlog-size hardwoods, and on the sawlog portion of hardwoods 13.0 inches d.b.h. and larger; (b) the total volume in pines and hardwoods that become 5.0 inches d.b.h. or larger during the year; and (c) deductions for mortality. In calculating both the board-foot and cordwood increments, cull material and the upper stems of hardwoods are excluded.

Table 13. - Net increment in the various forest conditions, 1936

Forest condition	Saw-timber material			All material		
	Pine component	Hardwood component	Total	Pine component	Hardwood component	Total
	- - Thousand board feet (green lumber tally) - -			- - Thousand cubic feet (inside bark) - -		
Old growth	1,100	8,100	9,200	580	2,720	3,300
Second growth:						
Sawlog size	161,500	31,600	193,100	29,560	10,720	40,280
Under sawlog size[1]	62,300	14,000	76,300	20,580	8,710	29,290
Total	224,900	53,700	278,600	50,720	22,150	72,870

1/ Includes 300 M board feet, or 120 M cubic feet, in the reproduction and clear-cut conditions.

In 1936, the gross growth amounted to 343 million board feet (green lumber tally), and the loss due to mortality was 64 million board feet, leaving a net increment of 279 million board feet, before deducting the commodity drain for the year. Second-growth stands contributed about 97 percent of the total saw-timber increment; old-growth stands, about 3 percent. Approximately four-fifths was pine and one-fifth was hardwoods (table 13). The net increment for all growing-stock trees 5.0 inches d.b.h. and larger, including those of sawlog size, was one million cords with bark, or 73 million cubic feet without bark. It is noteworthy, however, that much of the growth occurs on trees of relatively low quality.

In order to arrive at an estimate of average increments per acre for various forest conditions uninfluenced by cutting, the figures in table 14 were computed. These figures represent, therefore, the average increment that occurred on live trees that were on the area at the beginning of the year, deduction having been made only for mortality which occurred during the year. The board-foot figures are green lumber tally, based on the International $\frac{1}{4}$-inch rule, and the cordwood figures include the bark. The average net increment per acre, in 1936, of 99 board feet for saw timber, or one-third cord for all growing-stock material, is fairly close to the average for the South, although it is less than the average for the adjoining Georgia Forest Survey unit (No. 4). Present growth of the north Georgia forest stands is believed to be only one-third to one-half what it could be with good forest management. With fire protection and wise cutting practices, the growing stock could be greatly increased, and, simultaneously, the mortality could be decreased.

Table 14 - Average increment per acre in the various forest conditions, uninfluenced by cutting, 1936

Forest condition	Pine component			Hardwood component			Total		
	Bd.ft.	Cu.ft.	Cords	Bd.ft.	Cu.ft.	Cords	Bd.ft.	Cu.ft.	Cords
Old growth	4	1.8	.02	24	7.9	.12	28	9.7	.14
Second growth:									
Sawlog size:									
Uncut	126	22.8	.30	24	8.0	.12	150	30.8	.42
Partly cut	103	19.6	.25	22	8.2	.13	125	27.8	.38
Under sawlog size	59	19.9	.27	14	8.4	.13	73	28.3	.40
Weighted averages 1/	80	18.1	.24	19	7.9	.12	99	26.0	.36

1/ Including reproduction and clear-cut conditions.

Wood Products Industries

During the nineteenth century, in north Georgia there were only a few small sawmills, which cut lumber mainly for local consumption. In these early years of settlement, since suitable markets were lacking, many of the original forest stands were cut and burned to clear the land for agriculture. During the collapse of agriculture in the period following the War between the States, much of the cropland was abandoned. As the years passed, erosion robbed many fields of their fertile top soil, causing further abandonment and the clearing of new areas for cultivation. Fortunately, the abandoned fields quickly reverted to forests, and by 1905-1915 many of the old fields were supporting merchantable stands of timber. About this time, a strong demand arose for southern pine lumber in northern markets, and there began to come into the western and southern sections of north Georgia many small sawmills which concentrated upon the cutting of one product, "roofers"; these were pine boards 1 inch thick, which as a general rule comprised the log run and were sold ungraded. Concentration yards, with facilities for air-drying, planing, and shipping, were located along the railroads, each yard taking the output of several small mills. It is believed that the activity of the lumber industry reached a peak here between 1925 and 1929.

Today, although operating at a greatly reduced rate, the lumber industry is much the same as it was a decade ago, except that now there is some diversification and grading of products. In 1936, there were 346 sawmills, mostly in the western and southern parts of the area (fig. 9). These had a aggregate lumber production of about 82 million board feet (only 8 percent of the total production for the State), of which 75 million is pine and 7 million is hardwood, including sawed oak cross ties. All of the mills were small, i.e., each had a daily (10-hour) capacity of less than 20,000 board feet, and the average cut per mill for the entire year was only 236,000 board feet. As a whole, the sawmills, which are mostly farmer-owned and are operated only a few weeks between crops each year, cut only a small fraction of their yearly capacity.

It should be noted that the Appalachian Mountains, with their typical hardwoods, extend into north Georgia. In 1936, approximately 7 million board feet of hardwood sawlogs were shipped out of this unit to large hardwood sawmills in Tennessee and North Carolina. This material has the quality of, and is sold as, "Appalachian hardwood."

According to estimates the lumber industry in the unit gave 264,000 man-days of employment or, in other words, part-time employment to about 5,000 men, assuming an average of about 50 days a year in the mills or woods. Habersham, Cherokee, Gilmer, and Whitfield Counties were important lumber-producing areas.

In addition to the sawmills, in 1936 there were, in descending order of importance in wood use, 3 cooperage plants, 1 veneer plant, and 3 dimension plants. (In addition, there are a few shingle mills, mostly small and cutting for local use; these are not shown in the forest industries map.) The veneer, of package type, is made from pines, yellow poplar, and gum. One of the cooperage plants makes slack cooperage from pine, while the other two make tight cooperage from white oak. All of the dimension plants cut shuttle blocks from dogwood; the shingle mills used pine. These non-lumber industries, together with the production of cross ties, poles, piles, and pulpwood, provided 86,000 man-days of employment, or part-time employment for over 1,000 men.

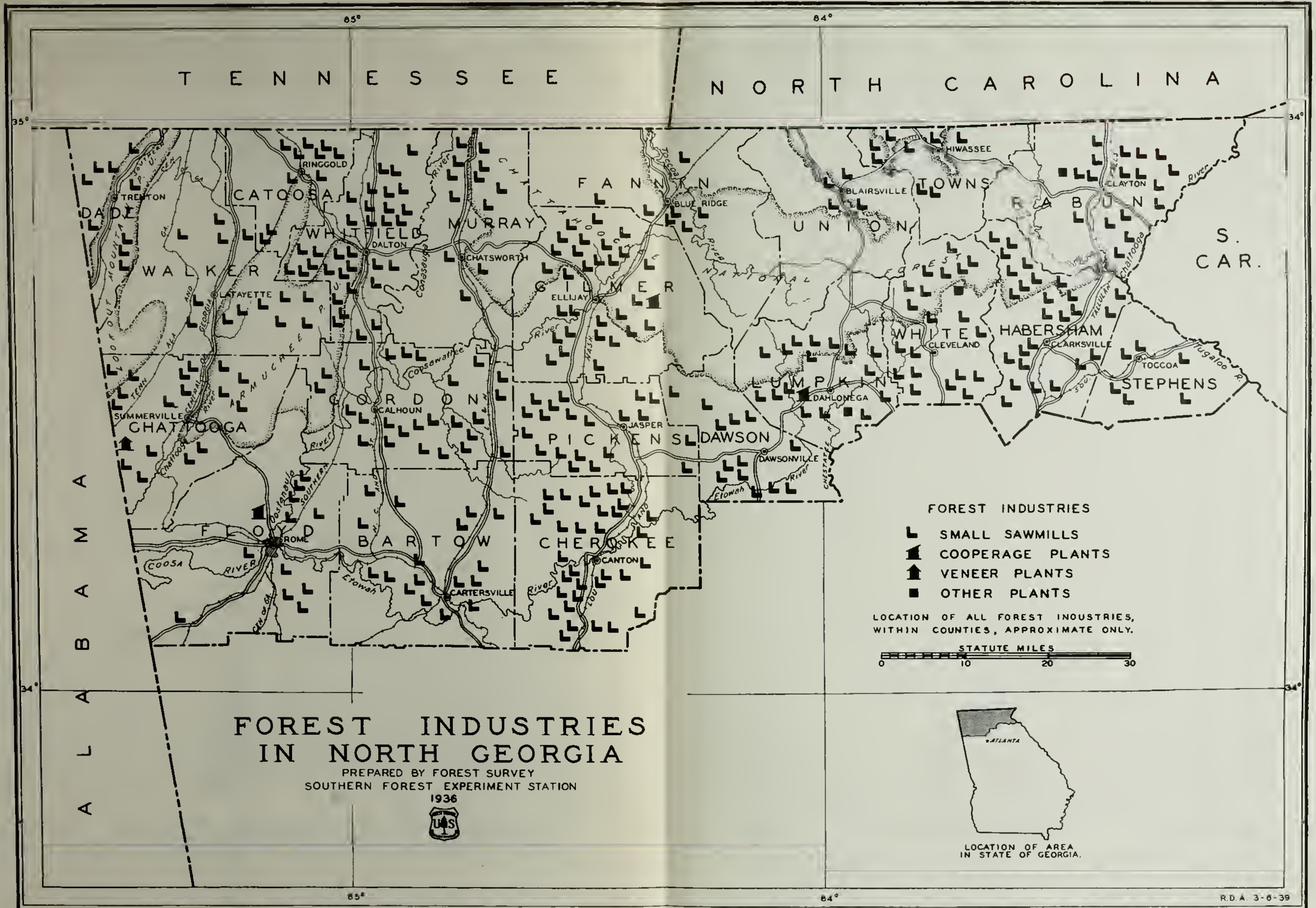

FIGURE 9.- FOREST INDUSTRIES MAP.

All forest industries combined furnished 745,000 man-days (10 hours each) of employment, but approximately half of this total was involved in the cutting of fuel wood and fence posts, chiefly for use on the farms (table 15). According to the Census of Agriculture for 1935, the farmers of this area worked one million man days off their farms for pay; some of this labor was in the forest industries, chiefly the small sawmills.

Table 15. - Wood products and employment, 1936

Product	Units produced	Thousand man-days (10 hours) of employment		
		In woods	At plants	Total
Lumber	81,700 M board feet	102	162	264
Cross ties (hewn)	144 M pieces	22	-	22
Poles and piles	56 M pieces	13	-	13
Fence posts	1,260 M pieces	18	-	18
Pulpwood 1/	14,800 cords	15	-	15
Cooperage	6,400 cords	8	9	17
Fuel wood	761,100 cords	2/ 377	-	377
Miscellaneous (veneer, shuttle blocks, shingles, etc.)	2,400 cords	16	3	19
Total		571	174	745

1/ Entirely for pulp mills outside this area, since no pulp mill is within this unit.

2/ Not including a substantial amount of labor involved in salvaging 474,200 cords of fuel wood from waste, land clearing, and other sources.

Commodity Drain from the Growing Stock

The total volume of wood removed from the sawlog-size trees of the growing stock of this area for use in industry and for domestic purposes in 1936 was the equivalent of 143 million board feet. The commodity drain from all sound trees at least 5 inches d.b.h. was about 34 million cubic feet, inside bark (table 16), or 464,400 cords, including bark. This commodity drain, which does not include the losses due to mortality, is the growing-stock material removed for utilization, including the logs cut for shipment to mills outside the area and the waste incidental to the various logging operations. Material cut and utilized from the cull and dead trees, or from the upper stems and limbs of sawlog-size hardwoods, is not included.

Approximately 70 percent of the drain from saw-timber material comes from the pines; 30 percent comes from the hardwoods. Lumber, the largest single item, accounts for about two-thirds of the total, while fuel wood is second in importance.

Table 16. - Commodity drain from the sound-tree growing stock, 1936

Reason for drain	From saw-timber material			From all growing-stock material
	Species-group		Total	
	Pines	Hardwoods		
	Thousand board feet (green lumber tally)			Thousand cubic feet (inside bark)
Lumber	79,700	15,400	95,100	15,870
Cross ties	1,200	8,000	9,200	1,410
Poles and piles	6,100	-	6,100	1,140
Cooperage	1,500	3,100	4,600	690
Fuel wood	6,100	7,000	13,100	9,580
Fence posts	-	100	100	470
Pulpwood	1,100	100	1,200	990
Miscellaneous (including veneer, land clearing, and domestic farm use)	5,200	8,700	13,900	4,110
Total	100,900	42,400	143,300	34,260

The total commodity drain in cubic feet, inside bark, for 1936, is itemized in table 16 and allocated to the commodities for which the trees were cut. More growing-stock material, in trees 5 inches d.b.h. and larger, was cut for fuel wood (a commodity that should be cut from cull, scrub, and dead trees) than for all other non-lumber forest products combined.

Comparison of Increment and Drain

In 1937, the trees of the saw-timber part of the growing stock had a growth of 350 million board feet, which was reduced 66 million board feet by mortality, leaving a net increment of 284 million board feet. As the commodity drain for that year amounted to only 138 million board feet, there was a net increase in the growing stock of 146 million board feet (table 17). For the pines alone, the net increment was 2.4 times the commodity drain (fig. 10); for the hardwoods, 1.3 times; and for all species combined, the net increment was over twice the commodity drain.

For all growing-stock material in trees 5.0 inches and larger, including those of saw-timber size, the comparison of increment and drain shows a comparable surplus. In 1937 there was a net-increment balance of over 40 million cubic feet available for additional industrial or domestic usage and for building up the growing stock (fig. 11). This situation does not remain static but changes from year to year, varying largely with the demand for (and the prices of) lumber. It is estimated, however, that the lumber industry was more active in 1936 and 1937 than in any of the 5 preceding years. An idea of the magnitude of the surplus of growth over drain is given by the fact that in 1937 the

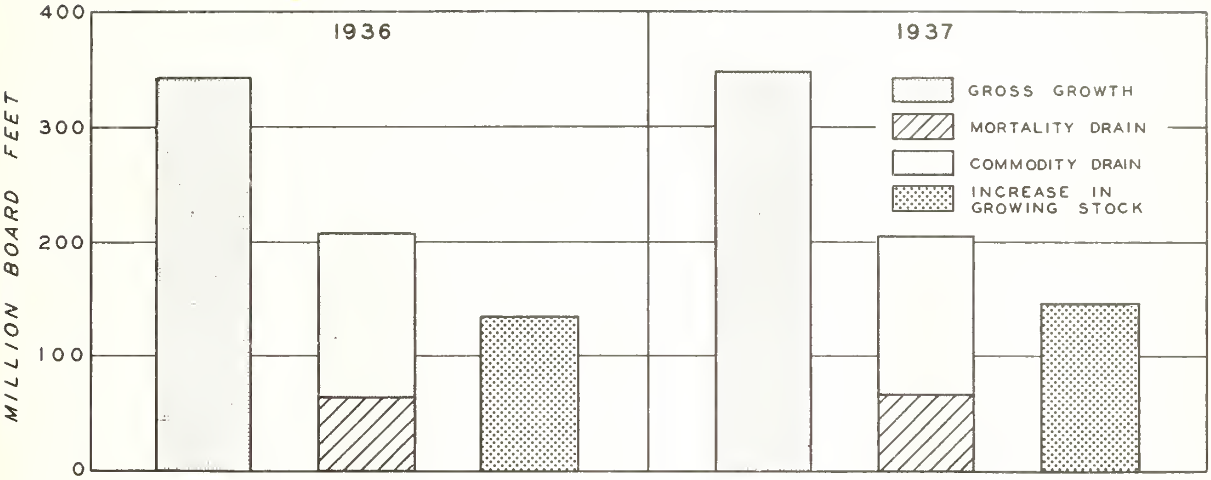

FIGURE 10 – COMPARISON OF GROWTH AND DRAIN FOR THE SAW-TIMBER COMPONENT OF THE GROWING STOCK.

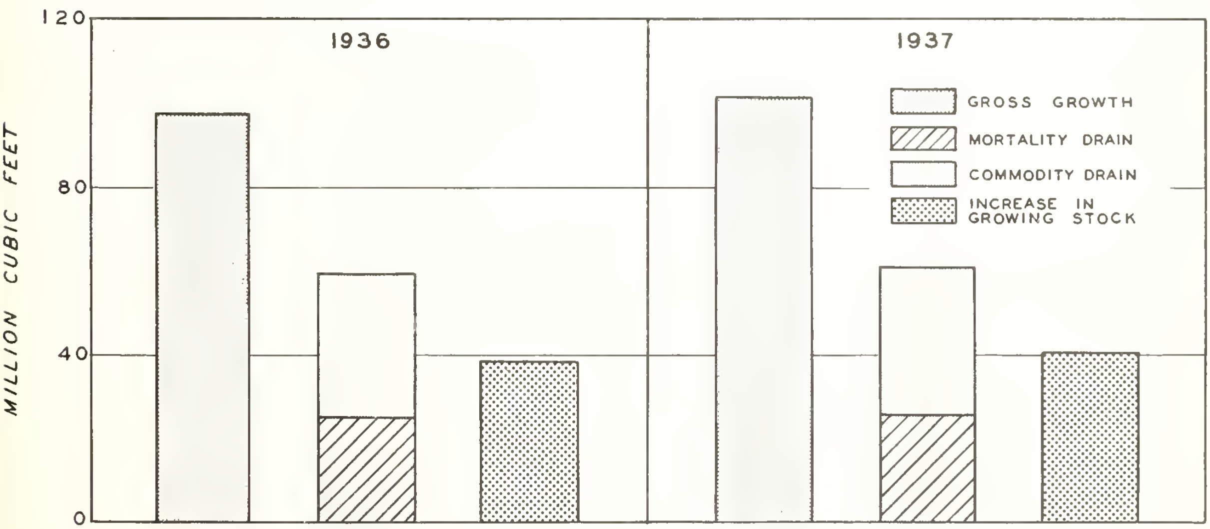

FIGURE 11. – COMPARISON OF GROWTH AND DRAIN FOR THE ENTIRE GROWING STOCK.

unused growth was sufficient to build almost 10,000 new 5-room houses; or, based on pine alone, more than enough to meet the requirements of 2 pulp mills.

Table 17. - Balance between net increment and commodity drain, 1936 and 1937

Item	Saw-timber material			All growing stock	
	Species-group		Total		
	Pines	Hardwoods		Outside bark	Inside bark
	Thousand board feet (green lumber tally)			Cords	Thousand cubic feet
Growing stock, Jan. 1, 1936	3,836,700	1,714,600	5,551,300	25,640,200	1,839,260
Growth	258,900	83,600	342,500	1,359,900	97,850
Mortality	34,000	29,900	63,900	354,800	24,980
Net increment	224,900	53,700	278,600	1,005,100	72,870
Commodity drain	100,900	42,400	143,300	464,400	34,260
Net increase in growing stock	+124,000	+11,300	+135,300	+540,700	+38,610
Growing stock, Jan. 1, 1937	3,960,700	1,725,900	5,686,600	26,180,900	1,877,870
Growth	265,600	84,300	349,900	1,392,200	101,770
Mortality	35,300	30,300	65,600	361,900	25,480
Net increment	230,300	54,000	284,300	1,030,300	76,290
Commodity drain	97,900	40,700	138,600	481,000	35,470
Net increase in growing stock	+132,400	+13,300	+145,700	+549,300	+40,820
Growing stock, Jan. 1, 1938	4,093,100	1,739,200	5,832,300	26,730,200	1,918,690

Notwithstanding the large amount of material that might be used to expand industrial activity in the near future, it would be to the lasting advantage of the region to leave a considerable part of the surplus growth in the stands to build up the quantity and quality of the growing stock in order to provide for even greater expansion as time goes on.

Summary of the Forest Situation

North Georgia, a mountainous area with many steep slopes and much soil erosion, especially on cleared land, has a total area of $4\frac{1}{4}$ mill on acres, of which 2-3/4 million acres are forest land. Of the total forest area, 54 percent is in farm woodlands, 25 percent is in other privately owned forests, and 21 percent is in publicly owned forest (mostly in the Chattahoochee National Forest).

Shortleaf, loblolly, and other pines, along with red and white oaks, are the principal species. About 88 percent of the forest is second growth. Most of the trees are small; the 2-inch and 4-inch diameter-classes include more trees than all others combined. Most of the pine stands are less than 60 years old; most of the hardwood stands are somewhat older. The timber-producing capacity of the unit, as shown by the large proportion of poor sites, is generally less than in the two comparable Survey units to the south of it. Owing largely to the common occurrence of fire, the forest stands are generally so poorly stocked that their volumes are only a fraction of those found in the most-heavily stocked stands.

The forest inventory of more than $5\frac{1}{2}$ billion board feet of saw timber shows that most of it is in trees near the minimum size and lowest quality accepted by lumber and veneer manufacturers, but more than four-fifths of it is in stands having 2,000 board feet or more per acre. Considering all sound usable material in live trees 5 inches d.b.h. and over, the volume is 35 million standard cords of rough wood, including over 7 million cords in cull trees. About 42 percent of the cordwood volume is pine, 9 percent is pulping hardwood, and 49 percent is nonpulping hardwood. Over two-thirds of the pine cordwood and about half the hardwood is in trees less than 13 inches d.b.h., not including the tops and limbs of sawlog-size hardwoods and the culls. Included in the inventory are $10\frac{1}{2}$ million trees from which poles and piles may be manufactured.

In 1937, the growth amounted to 350 million board feet, but mortality approximated 66 million board feet, leaving a net increment of 284 million board feet. For the entire growing stock (all sound trees 5 inches d.b.h. and larger, including those of sawlog size), the net increment was 1 million cords, bark included.

The relatively poorly developed forest-products industries include 346 sawmills, all with capacities of less than 20,000 board feet per day, and a few other small forest-products plants. In 1936, the commodity drain for industrial and domestic use, from saw-timber material in trees of sawlog size, was 143 million board feet; from both saw-timber and non-sawtimber material in growing-stock trees 5 inches d.b.h. and larger, it was 464,400 cords.

The net increment exceeded the commodity drain by 135 million board feet, or more than $\frac{1}{2}$ million cords. This margin of forest income over withdrawals is sufficient to justify the expansion of forest industries in this area. Good forest management will be necessary to develop the poorly stocked forest stands if that higher degree of productivity of which the soils are capable is attained.

Measures necessary to improve the situation

The people of north Georgia always have been directly dependent for their livelihood upon the products of their fields and forests. In the northeast part of this area, there has developed a self-sufficing farm economy, in which corn, hogs, fruit, and truck crops are grown, largely for home consumption, while lumber, railroad cross ties, and other forest products are depended upon for the cash income. In most of the remaining parts of this unit, the cash income is supplied by cotton, supplemented by work in the forest. In the entire area during 1934, over one million man-days of employment furnished farmers by forest activity outside their individual farms supplemented the meager returns from cotton and corn. In addition, the woodlands furnished farmers fuel wood, fence posts, and building material.

North Georgia needs additional opportunities for employment. Between 1909 and 1934 the cotton acreage declined over 23 percent, and preliminary figures indicate that from 1934 to 1938 the value of the crop has declined almost 2 million dollars, or about one-third. Since cotton has been the principal cash crop of the area, other income-producing possibilities must be developed. The special Unemployment Census taken in November 1937 disclosed that in this Survey unit there were about 12,000 people either unemployed and wanting work or on relief, and 8,000 partially employed and wanting more work.

Almost 2 out of every 3 acres is forest land, and this ratio is increasing; according to the Census of Agriculture, the acreage of farm woodland increased 23 percent from 1924 to 1934. Another indication that forest acreage is increasing is the fact that in 1936 the Survey found 240,800 acres of idle or abandoned cropland, much of which will revert to forest unless cotton prices go up. Before the expanding forest area can contribute fully to the welfare of the people, however, good forest management practices must be adopted and better and more diversified markets must be developed. A widespread and intensive campaign of forestry education is a prerequisite to the adoption of good forest management on privately owned forest lands throughout north Georgia.

Organized fire protection has long been practiced on the National forest, and more recently five counties—Chattooga, Floyd, Bartow, Cherokee, and Gilmer—have adopted county-wide forest-fire protection, under the supervision of the State Forest Service, according to the provisions of the Clark-McNary Act. If the benefits of good forest management are to be realized, fire protection, possibly on a county-wide basis, as encouraged by a recent act of the Georgia Legislature, must be extended to all unprotected parts of the unit.

Stand-improvement cuttings, wherever economically possible, are recommended to raise the quality and increase the growth of the present deficient forest stands. Cull and undesirable trees should be removed from the stands and, whenever practical, utilized for pulpwood, for extract wood, and for fuel wood, fence posts, and other domestic farm uses. Approximately 2 million cords of usable wood in blight-killed chestnut trees should be salvaged at an early date in order to save much of its cash value, to make room for an increased growing stock, and to lessen the fire hazard caused by its presence.

Selective-logging practices, designed to remove the over-mature slow-growing and surplus trees in all merchantable diameter-classes would greatly improve both the growth rate and the quality of the growing stock. As a general rule, cuttings should be light and as frequent as economic conditions will permit. The volume removed at one cutting ordinarily should not be greater than the net increment expected before the next cutting, and every effort should be made to build up the growing stock. Also thrifty utilization of the trees cut should be followed in order to recover all the usable material and to obviate the present wasteful practices of cutting high-quality saw timber into low-priced commodities, e.g., fuel wood and pulpwood.

A greater and more diversified demand for forest stumpage, either by existing forest industries or by new ones, such as are developing in south Georgia, would greatly stimulate and encourage landowners to protect and develop their forests. At the present rate of growth, the annual increment can and should support a greater forest-products industry, the ultimate size and character of which should be determined largely by the improved capacity of the increment to support it and by the kind and quality of the stumpage produced. Additional forest-products plants capable of using low-grade material are needed. Hardwood dimension-stock mills and chemical plants that could provide a market for some of the tremendous volume of low-grade hardwood would be helpful. No pulp mill is located in this unit, although such a mill could find here adequate wood supplies without undue competition with other industries, provided it took a large part of its wood from low-grade hardwoods and pines. A typical pulp mill would involve an investment of about 6 million dollars, would create a market for about 150,000 cords of wood annually, and would provide year-round employment for about 1,700 people in the mill and woods.

Much of the forest land has such a low productivity or is in such a depleted condition that private owners can hardly be expected to develop fully its forestry possibilities. At the same time, the proper management of the forest resources is essential (1) to increase the productivity of forest land and thereby meet the future wood requirements of expanded forest-products industries, (2) to preserve the scenic values of this important recreational area, and (3) to maintain a forest cover on the steep slopes for watershed protection. For these and other reasons, the public must play an important part in improving the forest situation in north Georgia. This it may do in part by encouraging and assisting private forest landowners to practice good forest management and in part by increasing the area of publicly owned and managed forest lands.

FORFST SURVEY RELEASE NO. 46 SEPT. 20, 1939

FOREST RESOURCES OF THE SOUTH ARKANSAS DELTA

by

R. K. Winters, Forester

A Progress Report by

THE SOUTHERN FOREST SURVEY

I. F. Eldredge, Regional Survey Director

SOUTHERN FOREST EXPERIMENT STATION

E. L. Demmon, Director

New Orleans, La.

FOREWORD

The Forest Survey, which is a function of the United States Forest Service, was authorized by the McSweeney-McNary Forest Research Act of 1928 to make a nation-wide study of our forest resources. Its five-fold object is: (1) to make an inventory of the present supply of timber and other forest products, (2) to ascertain the rate at which this supply is being increased through growth, (3) to determine the rate at which this supply is being diminished through industrial and local use, windfall, fire, and disease, (4) to determine the present requirement and the probable future trend in the requirement for timber and other forest products, and (5) to correlate these findings with existing and anticipated economic conditions, in order that policies may be formulated for the effective use of lands suitable for forest production.

This release is based on a field survey made chiefly between August 1934 and April 1935 and on two field canvasses of forest industrial plants to determine forest drain, the last of which was completed during July 1937. It should be regarded only as a progress report, since it contains Forest Survey data that will be included in complete reports to be published later and that, although considered reliable, are subject to correction or amplification as the work of computation proceeds. Item 4 above, which is being studied on a national basis, is not discussed in this report.

In the interpretation of these data, it must be noted that, owing to the sampling method used in collecting them, the greater the number of samples in any given classification the more accurate are the data for that classification. Hence classes that are of infrequent occurrence and relatively small in quantity generally cannot be determined with as high a degree of accuracy as classes that occur more frequently and in substantially greater quantities. Small tabular items are to be taken as showing, not the exact magnitude of the classes involved, but their relative magnitude in comparison with those of other classes.

In the South, the Forest Survey is an activity of the Southern Forest Experiment Station with headquarters at New Orleans, La.

Assisting Staff

J. A. Putnam, Associate Forest Economist, In Charge of Field Work
P. R. Wheeler, Forest Economist, In Charge of Mensurational Analyses

Note: Assistance in the preparation of this release was furnished by the personnel of Works Progress Administration Official Project 365-64-3-7.

FOREST RESOURCES OF THE SOUTH ARKANSAS DELTA

Location and General Description

The portion of Arkansas treated in this report is a former flood plain of the Mississippi River, through which the Arkansas, the White, the Mississippi, and other rivers have cut new channels and developed a later flood plain at a lower level. The soils and topography differ accordingly on the two sites. The present flood plains, or bottoms, are generally flat; whereas the earlier flood plains, or terraces, are slightly undulating, and because they are about 10 to 20 feet higher they are usually better drained than the bottoms. Altogether, this area (Forest Survey Unit Arkansas #1) covers some 5 3/4 million acres, including all or parts of 19 counties, as shown in figure 1.

The large areas of natural prairie in the central portion of the unit, chiefly in Arkansas, Lonoke, and Prairie Counties, along with the adjacent cleared lands, are extensively used for the cultivation of rice. Elsewhere in the unit, cotton and corn are the chief agricultural crops. Farm tenancy prevails; more than half of all land in farms is operated by tenants, but tenancy is least in the rice section and greatest in the cotton areas. The plantation system of farming prevails in the southeastern counties along the Mississippi River; elsewhere individual farm operators are more common. According to the 1930 Census, between 20 and 30 percent of the area in farms was woodland.

Agriculture and forest industries are the principal means of support of the present population, which is largely rural. Villages and small towns are common, and only one city, North Little Rock with 20,000 people, had a population of more than 5,000 persons in 1930. On the land adjacent to the Mississippi, Arkansas, White, and Cache Rivers, negroes make up 50 to 65 percent of the population, but in the prairie portion of the unit they make up only 20 to 35 percent.

In the main, this unit is adequately covered by transportation lines. Hard-surfaced and gravel all-weather roads are well distributed; and the Mississippi, Arkansas, and White Rivers afford water transportation. Also the Missouri-Pacific Railroad; the Chicago, Rock Island and Pacific; the Saint Louis Southwestern; the Missouri and Arkansas; and two or three local railroad lines operate in the unit.

The nature of the land use is shown in table 1. More than 47 percent of the total land area supports a forest stand, and 51 percent is agricultural. Less than 2 percent is in waterways, towns and villages, roads, railroads, etc. Of the agricultural land, 69,000 acres is new cropland that had been cleared not more than 5 years at the date of survey. There is reason to believe that since that time new cropland has been cleared at an accelerated rate. The natural fertility of the alluvial soils found extensively in this unit make it inevitable that still greater agricultural development will take place. The relatively large area of idle and abandoned land found by the Survey in 1934 and 1935 was probably due in part to the depressed market for agricultural crops existing at that time; there is reason to believe that some of this idle and abandoned land has already been returned to cultivation and that more of it will be returned to cultivation as economic conditions improve.

Table 1. - Land area classified according to major land uses, 1935

Land use	Total land area	
	Acres	Percent
Forest	2,732,400	47.4
Agricultural:		
In cultivation:		
Old cropland	2,385,600	41.4
New cropland	69,000	1.2
Out of cultivation:		
Idle	195,300	3.4
Abandoned	69,000	1.2
Improved pasture	221,400	3.8
Total agricultural	2,940,300	51.0
Other:		
Nonmeandered waterways, towns, villages, roads, railroads, etc.	93,700	1.6
Total area	5,766,400	100.0

Owing to the speculative value of land for agricultural use, and to the relatively high tax rate, land taxes are higher in the South Arkansas Delta than in the "hill-land" to the west. In addition to the ad valorem taxes, owners of those lands that are within the boundaries of organized drainage and levee districts (of which there are more than 100 separate enterprises in the unit) paid an average drainage and levee tax of 42¢ per acre in 1933, although in individual districts the tax was much greater. This adverse tax situation tends to discourage private timber growing except on the batture (i.e., lands lying between the levee and stream or river bank) or on other areas free in large part from excessive drainage and levee taxes.

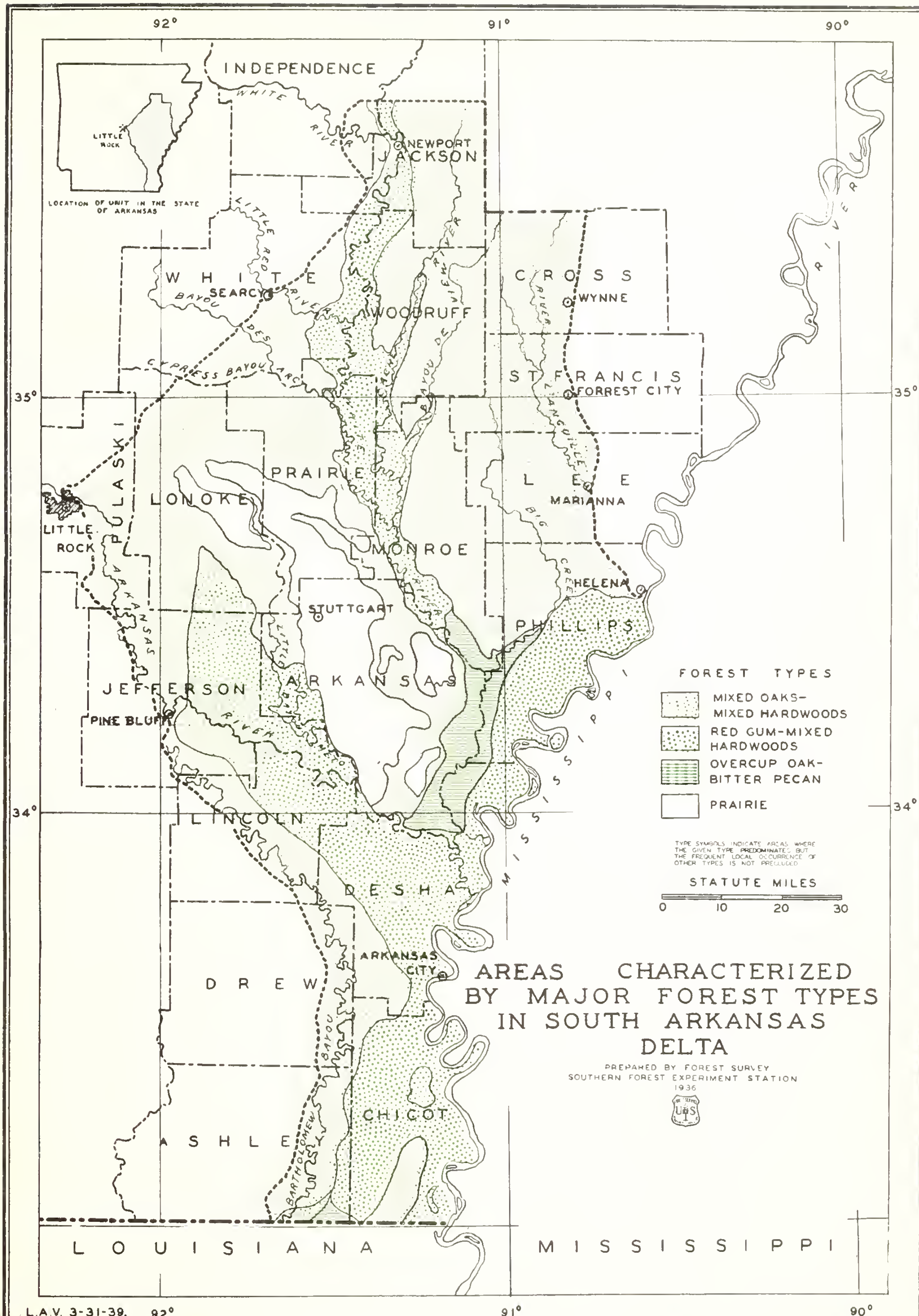

FIGURE 1.- FOREST TYPE MAP.

Forest Description

Except for the prairies already mentioned, this unit was originally forested with a dense stand of virgin hardwood timber. By the early 19th century, agricultural settlement was well under way along the frontlands of the Mississippi and Arkansas Rivers. In 1819, Nuttall [1/] recorded in his journal that along the lower reaches of the Arkansas River there existed a line of settlements, and that the greatest uninhabited interval did not exceed 30 miles. Timber cuttings were made almost exclusively for the clearing of land and for lumber to be used in local construction until about 1890, when sawmills were established to cut lumber for shipment by rail or water to Northern markets, part of the needs of which are still supplied by mills in this unit.

Practically all the large holdings of virgin timberland have been cut over, and the remaining areas of uncut old growth are mostly small and scattered. Although the most accessible and desirable land has been put into cultivation, much of the present forest area is potential agricultural land and may become so if future economic conditions warrant its improvement and use for this purpose. A few localities, such as the batture lands and the backwater area along the lower reaches of the Arkansas and White Rivers, which are subject to overflow almost yearly, can be expected to continue indefinitely in forest.

The situation in regard to the forest area is shown in greater detail in table 2, where this area is classified into nine forest types on the basis of species composition, and into five forest conditions on the basis of the character of the timber stands. The types shown here are somewhat more specific than those given in figure 1, where the small area of pine-hardwood type has been included with the mixed oaks-mixed hardwood type; and other types, unspecified in figure 1, have been included with the red gum-mixed hardwoods type. The mixed oaks-mixed hardwood type of the terraces covers the largest proportion of the forest area, with the red gum-water oak and hackberry-elm-ash types following in order. The overcup oak-bitter pecan type accounts for the largest proportion of the uncut old-growth condition, largely because the principal species of this type are not in demand at the present time.

The total forest area has been further subdivided on the basis of stand per acre and quality of timber into class-A and class-B areas. A class-A area is one that supports a stand of adequate quality and volume per acre to warrant operation under present market conditions for such higher-grade products as industrial lumber, cooperage stock, or veneer. Since practically all the forest area in this unit is accessible for logging during some season of the year, and since motor transportation makes practicable the logging of relatively sparse stands, forest areas bearing 1,000 board feet per acre or more of higher-grade material are considered to be in class A. Class-B areas include all forest lands that do not meet these qualifications; some of these areas, which frequently bear stands suitable for cross ties, structural timbers, and lumber for domestic use, in time will develop through growth into class-A areas.

1/ Nuttall, Thomas. In: Early Western Travels, 1748-1846. Vol. 13. Edited by Reuben G. Thwaites.

Table 2. -- Distribution of total forest area in the various forest types and forest conditions, 1935

Forest type	Old growth		Second growth, sawlog size		Second growth, under sawlog size, reproduction, and clear-cut	All conditions	
	Uncut	Partly cut	Uncut	Partly cut			
	------	------	------ Acres	------	------	------	Percent
Red gum-water oak	25,400	59,500	150,000	48,400	172,200	455,500	16.7
Mixed oak mixed hardwood	24,600	100,000	196,000	160,300	301,600	782,500	28.6
Overcup oak-bitter pecan	54,000	105,600	80,200	34,100	64,200	338,100	12.4
Water oak	8,700	53,100	113,500	76,200	67,500	319,000	11.7
Hackberry-elm-ash	21,400	108,700	150,800	39,700	97,600	418,200	15.3
Cottonwood-willow	-	-	78,600	15,900	107,900	202,400	7.4
Cypress-tupelo gum	6,300	23,000	21,400	19,900	19,900	90,500	3.3
Pine-hardwood	-	-	17,400	14,300	9,600	41,300	1.5
Scrub oak-scrub hardwood	1/	1/	5,500	5,500	65,100	84,900	3.1
Total	144,400	454,700	813,400	414,300	2/905,600	2,732,400	100.0
Percent of total	5.3	16.6	29.8	15.2	33.1	100.0	

1/ Although the Survey data show an area in this type and condition, it is too small to indicate accurately even the relative magnitude of the individual item. The area estimated, however, is carried in the total for the type and condition.

2/ Of this area, only about 4 percent can be classed as clear-cut.

Material of the higher grades is contained specifically in logs used for lumber and veneer, and other higher-quality logs suitable chiefly for the manufacture of cooperage and specialty stock. Lumber logs are those at least 14 inches (12 inches in ash) in diameter that can be expected to yield at least 30 percent of their lumber volume in grades No. 1 common and better. Logs in this class average about 60 percent of their volume in these grades of lumber. Cooperage logs and logs for specialty stock are at least 10 inches in diameter and of the same general quality as lumber logs, but they cannot be so classified because of their small diameter or excessive sweep. These small, higher-grade logs are suitable for industrial uses that require bolts or blocks rather than logs. In cypress and pine the higher-grade trees are those that will cut at least 80 to 90 percent of their lumber volume in grades No. 2 common and better, and that, in addition, will produce more than 5 percent in firsts and seconds or in B and better. Lower-grade logs of all species are those that do not meet the above qualifications. The volume of higher-grade material found in partly cut sawlog-size stands is largely made up of species that did not at the time of the last cutting have a well-established market, of logs that grew into their present size and quality since the last cutting, or of small logs suitable only for cooperage and specialty stock.

Of the total forest area, only about 340,000 acres, or 12 percent, supports a sufficient volume (1,000 board feet or more per acre) of higher-quality timber to be classified as class A. Of this class-A area, approximately 24 percent is in the old-growth uncut condition, 32 percent in the old-growth partly cut condition, and 44 percent in the second-growth sawlog-size conditions. More than two-fifths of the class-A forest area is in the red gum-mixed hardwoods type and the mixed oaks-mixed hardwoods type characteristic of the bottoms and terraces, respectively.

Forest Inventory

The volume estimate has been broken down into saw-timber volume, expressed in board feet, and into cordwood volume. The former includes the net volume of all usable logs in good trees of sawlog size, regardless of log grades. Such trees are at least 13.0 inches d.b.h.2/ (9.0 inches in pine) and contain at least one 12-foot usable butt log (i.e., one at least 50 percent sound and 10 inches or more in diameter at the small end in hardwood, and 6 inches or more in pine). If the butt log is cull, these trees must contain at least 50 percent of their volume in material suitable for the manufacture of lumber of commercial grade, low-grade structural material, low-grade box material, or railroad cross ties. The saw-timber volume, however, includes neither the volume of sound cull and rotten cull trees nor the cull volume in good trees.

The cordwood volume of trees under sawlog size (5.0 - 12.9 inches d.b.h. in hardwood and cypress, and 5.0 - 8.9 inches in pine) includes the wood and bark of the main stem to a usable top, the minimum allowable top being never

2/ "D.B.H." is the abbreviation for "diameter at breast height," which is the tree diameter at $4\frac{1}{2}$ feet above the ground. The Survey uses 2-inch diameter-classes; thus, for example, the lower and upper limits of the 14-inch diameter-class are 13.0 and 14.9 inches, respectively.

less than 4 inches and seldom more than 8. The cordwood volume is also net, i.e., the volume of cull material that normally would be left in the woods as waste has not been included.

Board-foot volume

The total net volume according to the Doyle log rule, as shown in table 3, is 4.6 billion board feet (1935). This total is distributed among the forest conditions as follows: 19 percent is in the old-growth uncut condition, 28 percent is in the old-growth partly cut condition, and 53 percent is in the remaining second-growth and reproduction conditions. Considering the total board-foot volume from another point of view, less than 37 percent is in the higher-quality (class-A) stands; approximately 45 percent of this is higher-grade material suitable for industrial lumber, veneer, and cooperage. In the stands of lower quality (class-B), only 10 percent of the total board-foot volume is higher-grade material. Of the total volume on both class-A and class-B areas, 23 percent is of the higher grades. The distribution of the higher- and lower-grade material among the sawlog-size forest conditions is shown in figure 2. These data indicate plainly that the timber volume in this unit is largely of lower quality and that it is largely in partly cut old-growth and in second-growth stands.

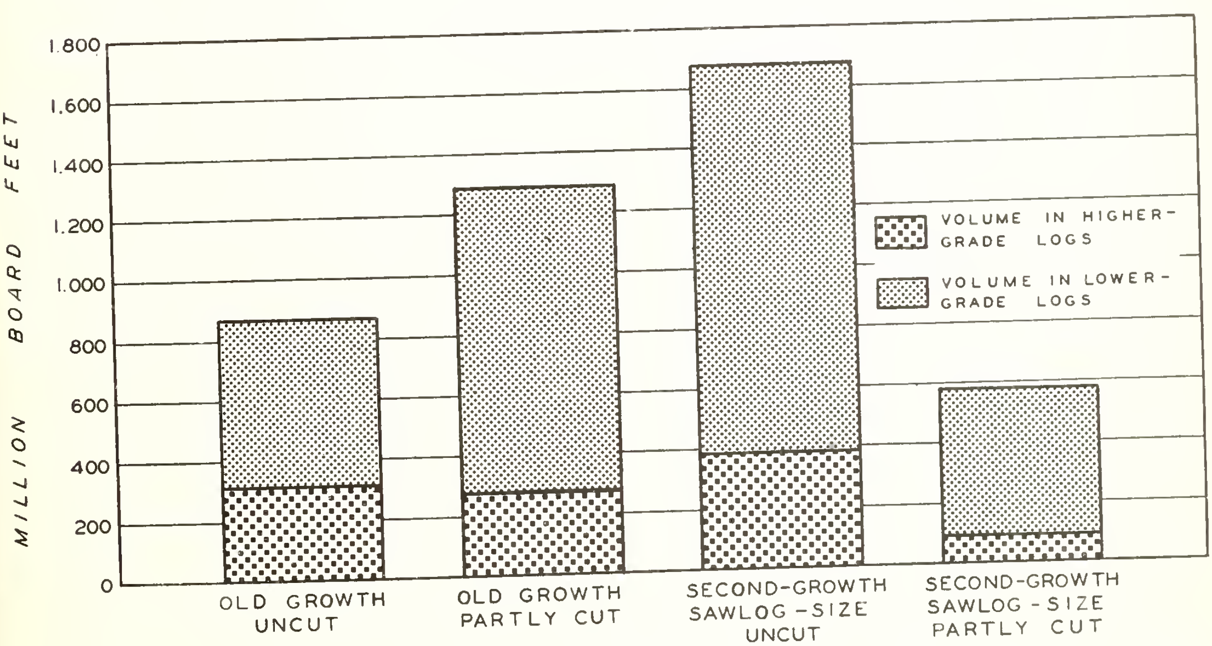

FIGURE 2.- TIMBER VOLUME BY FOREST CONDITIONS AND QUALITY-CLASSES.

Table 3. - Total net volume of good trees on forest areas, by forest conditions and species-groups, 1935

I. BY FOREST CONDITIONS

Forest condition and species-group	Volume on class-A areas			Volume on class-B areas			Total volume	
	Saw timber (Doyle)		Cordwood[1/]	Saw timber (Doyle)		Cordwood[1/]	Saw timber (Doyle)	Cordwood[1/]
	In higher-grade logs	In lower-grade logs		In higher-grade logs	In lower-grade logs			
	M bd.ft.	M bd.ft.	Cords	M bd.ft.	M bd.ft.	Cords	M bd.ft.	Cords
Old growth:								
Uncut	272,500	300,000	496,000	29,100	268,600	352,100	870,200	848,100
Partly cut	200,600	286,200	445,500	74,900	726,400	1,251,900	1,288,100	1,697,400
Second growth:								
Sawlog size:								
Uncut	256,800	274,000	720,900	126,500	1,015,900	4,034,100	1,673,200	4,755,000
Partly cut	33,200	54,100	182,800	57,800	440,500	1,994,700	585,600	2,177,500
Under sawlog size	-	-	-	7,300	135,500	3,382,000	142,800	3,382,000
Reproduction	-	-	-	-	4,500	10,300	4,500	10,300
Clear-cut	-	-	-	-	1,600	9,400	1,600	9,400
Total	763,100	914,300	1,845,200	295,600	2,593,000	11,034,500	4,566,000	12,879,700

II. BY SPECIES GROUPS

Red gum	151,800	137,000	196,300	38,400	176,800	1,133,900	504,000	1,330,200
Water oaks	52,700	131,700	134,600	46,500	645,600	1,950,000	876,500	2,084,600
Red oaks	23,400	28,000	48,800	21,100	141,900	935,000	214,400	983,800
White oaks	39,000	38,900	52,500	19,200	117,800	628,700	214,900	681,200
Overcup oak 2/	40,300	123,900	156,900	21,200	351,700	1,064,900	537,100	1,221,800
Ash	46,700	40,100	162,500	19,000	59,100	546,500	164,900	709,000
Cottonwood	107,700	97,400	30,100	9,000	111,300	239,800	325,400	269,900
Willows	25,200	19,400	59,900	8,400	57,500	350,500	110,500	410,400
Elms 3/	33,300	56,200	134,600	19,400	339,100	1,133,500	448,000	1,268,100
Black and tupelo gums 4/	50,900	40,000	103,200	16,200	52,800	261,800	159,900	365,000
Cypress	44,900	13,400	53,600	9,300	26,400	138,300	94,000	191,900
Bitter pecan	25,600	62,200	92,700	8,600	169,100	565,500	265,500	658,200
Hickories 5/	39,800	44,400	119,700	9,600	121,800	700,500	215,600	820,200
Hackberry	28,800	33,600	261,800	20,000	110,700	580,400	193,100	842,200
Miscellaneous 6/	53,000	48,100	238,000	29,700	111,400	805,200	242,200	1,043,200
Total	763,100	914,300	1,845,200	295,600	2,593,000	11,034,500	4,566,000	12,879,700

1/ Cordwood volume of trees under sawlog size, including the wood and bark of the main stem to a usable top, the minimum allowable top never being less than 4 inches and seldom more than 8. Cordwood volume was calculated on a basis of 80 cubic feet per cord for hardwood species and 90 cubic feet for pine and cypress. Only woods cull was deducted from the cordwood volume

2/ Approximately 10 percent of this volume is "hill" post oak

3/ Approximately 55 percent of this volume is white elm.

4/ Approximately 40 percent of this volume is black gum.

5/ Approximately 40 percent of this volume is sweet pecan.

6/ Includes a small volume of pine (approximately 44 million board feet and 67,000 cords).

The water oaks species-group has the largest volume, with a total of 876 million board feet. Overcup oak, red gum, and the elm group follow in order. It is significant from the point of view of wood utilization that nearly 90 percent of the board-foot volume in overcup oak and also in bitter pecan is in the lower-grade logs, for which the finding of a market outlet is a very important problem.

A sharper picture than that given in table 3 perhaps can be obtained from table 4, where the average stand per acre is shown on class-A and class-B areas by forest conditions, higher-grade and lower-grade material combined. Class-A areas averaged 4,970 board feet per acre and class-B areas 1,210 board feet. The average stand per acre of the total forest area was 1,670 board feet, but for the forest conditions that are characterized by sawlog-size stands it was 2,420 board feet.

Table 4 - Average number of board feet per acre (Doyle log scale) on class-A and class-B areas, classified by forest conditions, 1935.

Forest condition	Class-A areas	Class-B areas	Weighted average
	- - - - - - -	Board feet (Doyle)	- - - - - - -
Old growth:			
Uncut	7,010	4,750	6,000
Partly cut	4,580	2,300	2,830
Second growth:			
Sawlog size:			
Uncut	4,460	1,650	2,060
Partly cut	2,890	1,300	1,400
Under sawlog size, reproduction, clear-cut, and nonproductive areas	-	160	160
Weighted average, all conditions	4,970	1,210	1,670

Although the Doyle rule is the legal rule of Arkansas and is in general use for timber estimates in the South, its application to stands made up mainly of small trees results in an understatement of the actual volume recoverable in lumber. The volume in this Survey unit, according to the International $\frac{1}{4}$-inch log rule, which closely approximates green lumber tally, is 6.2 billion board feet; according to the Scribner log rule, it is 5.6 billion board feet. The average stand per acre, with the International $\frac{1}{4}$-inch rule, is 2,280 board feet as compared to 1,670 board feet with the Doyle rule. Hereafter in this report, because of the necessity of correlating drain expressed in lumber tally with volume and increment figures, the International $\frac{1}{4}$-inch rule is used to represent green lumber tally.

Cordwood volume

In addition to the saw-timber volume and the volume in sound trees under sawlog size already shown in table 3, there is, as determined by a very rough estimate, 14.1 million standard (4 x 4 x 8 feet) cords of sound wood including bark, which is classified as follows:

Source	Cords
Tops and limbs of good trees of sawlog size.........	9,254,000
Sound wood in stems, tops, and limbs of cull trees..	4,827,300
	14,081,300

In sawlog-size trees, this cordwood volume includes that portion of the main stem above the usable sawlog limit and also the volume of all hardwood and cypress limbwood over 4 inches in diameter. In cull trees, this volume includes all sound stemwood in trees 5.0 inches d.b.h. and larger, together with sound limbwood in sawlog-size hardwood and cypress trees. Although this material is sound and suitable for many uses, little is now being marketed because of lack of demand. The total cordwood volume, including good trees under sawlog size, tops and limbs of sawlog-size trees, and cull trees, is approximately 26,961,000 cords.

Cubic-foot volume

The cubic-foot equivalent of the total saw-timber volume is (1935) 1,089 million cubic feet inside bark, and the cubic volume of good trees under sawlog size, but at least 5.0 inches d.b.h., is 820 million cubic feet excluding bark; therefore, the total cubic volume in good trees only, excluding cull trees, tops, and limbs, is 1,909 million cubic feet.

Forest Increment

The net annual forest increment is the volume added during the year by growth to the individual trees, plus the merchantable volume newly created by small trees developing into merchantable sizes, and minus the losses due to mortality. This net increment represents, in a general way, the cut that can be made each year without reducing the volume of the original growing stock.

Board-foot increment, therefore, is made up of (1) the growth on trees already of sawlog size, plus (2) the total board-foot volume in trees becoming sawlog size during the year, minus (3) the losses due to mortality. This increment, which is expressed in green lumber tally, is based on good trees only, from which all cull material is excluded. Similarly, cubic-foot increment represents (1) the growth on sound stemwood in good trees at least 5.0 inches d.b.h. (including in sawlog-size trees only the saw-timber material), plus (2) the total volume (excluding cull material) of small trees becoming at least 5.0 inches d.b.h. during the year, minus (3) the losses due to mortality.

Table 5 shows the 1935 increment per acre in the various forest conditions in terms of board feet and cubic feet, excluding bark. In calculating these increments, deductions for natural mortality have been made; but no deductions have been made for material removed in timber-cutting operations or for the effect of this cutting on the year's increment. Cubic-foot increment includes material in the sawlog portion of sawlog-size trees, in the upper stems of sawlog-size pines, and in trees under sawlog size.

Table 5. - Average increment 1/ per acre of class-A and class-B forests by forest conditions, 1935.

Forest condition	Annual increment: Board feet (green lumber tally 2/)	Annual increment: Cubic feet (inside bark)
Class-A area:		
Old growth, uncut	143	20.4
Old growth, partly cut	70	14.5
Second growth, sawlog size	265	36.1
Class-B area:		
Old growth, uncut	121	18.3
Old growth, partly cut	60	13.9
Second growth, sawlog size	144	27.4
Second growth, under sawlog size	42	25.0
All conditions 3/	100	23.2

1/ Figures in this table do not include increment resulting from the change of class-B areas to class-A areas (see footnote 3, table 6).
2/ Based on International $\frac{1}{4}$-inch rule
3/ Reproduction and clear-cut conditions included

The average increment per acre for the entire forest was 100 board feet or 23.2 cubic feet in 1935. On the 149,300 acres of second-growth sawlog-size class-A area, the increment per acre averaged 265 board feet, or 36.1 cubic feet. The relatively high increment in the old-growth uncut stands is largely due to a high volume per acre and to the fact that even in stands characterized by old-growth trees some of the trees are of a younger age-class and are rapid growing.

Table 6 shows the total net volume of wood added to the inventory of good trees on the entire forest area during 1935, expressed in board feet (lumber tally) for sawlog-size material, and in standard cords (4 x 4 x 8 feet) for material under sawlog size. In arriving at these estimates, deductions were made for natural losses but not for the effect of timber cutting. The movement of trees from one diameter-group to another was also taken into account, as well as the advancement of certain areas from class B to class A. The total

Table 6. - Forest increment,[1] classified according to forest condition, 1935

Forest condition	Increment[2] in trees under sawlog size			Increment in sawlog-size trees						
				Diameter-classes 14-18 in.		Diameter-classes 20 in. and over		All sawlog-size trees		
	Class-A area[3]	Class-B area	Total	Class-A area[3]	Class-B area	Class-A area[3]	Class-B area	Class-A area[3]	Class-B area	Total
	- - - - Cords - - - - - -			- - - - - - - - - -M board feet (green lumber tally)- - - - - - - -						
Old growth:										
Uncut	3,000	2,400	5,400	7,600	100	15,700	[3] -4,100	23,300	[3] -4,000	19,300
Partly cut	10,200	32,000	42,200	6,500	2,000	13,500	6,400	20,000	8,400	28,400
Second growth:										
Sawlog size	14,800	131,700	146,500	49,600	63,200	69,700	12,500	119,300	75,700	195,000
Under sawlog size	500	267,600	268,100	400	33,700	2,300	[3] -3,500	2,700	30,200	32,900
Reproduction and clear-cut	-	[4] -4,300	[4] -4,300	-	[3] -1,100	-	[3] -800	-	[3] -1,900	[3] -1,900
Total all conditions	28,500	429,400	457,900	64,100	97,900	101,200	10,500	165,300	108,400	273,700

1/ These increment figures are based on the assumption that no cutting takes place. A total increment of 265,600 M board feet is obtained when the 1935 timber cut enters into the calculation.

2/ This increment includes the annual growth on trees at least 5.0 inches d.b.h. that remain under sawlog size throughout the year, plus the volume in trees that during the year move into the 6-inch diameter-class.

3/ The annual increment on class-A forest areas includes not only the increment on areas that were class-A at the beginning of the year, but also the total timber volume added through movement of areas from class-B to class-A as a result of 1 year's growth. A negative board-foot increment on class-B forest areas indicates (1) that the volumes on areas moving from class-B to class-A were greater than the increment on areas remaining in class-B, and (2) that the mortality in residual stands is heavy.

4/ A negative annual increment of trees under sawlog size means that the volume of trees changing from under sawlog size to sawlog size is greater than the increment of the trees that were under sawlog size at the end of the year (see footnote 2).

increment for all forest conditions was 273.7 million board feet. It is significant from the standpoint of the timber operation that 60 percent of this total occurred on class-A forest areas and 41 percent was in trees 20 inches d.b.h. and larger. It is therefore apparent that approximately half the board-foot increment is being laid on trees that either occur in stands that are attractive to operators or are of a size suitable for industrial utilization.

As might be expected, a very large proportion (94 percent) of the total cordwood increment of 457,900 cords is on class-B areas, where the proportion of trees under sawlog size is largest. This shows plainly that a very large part of the increment in trees under sawlog size is being added on areas that bear too small a volume of marketable material to be attractive at present to industrial lumber operators; these areas, aggregating 2.4 million acres, must be held until their timber reaches merchantable size.

Forest-Products Industries

In 1937, the South Arkansas Delta supported within its boundaries 201 forest-industrial plants, of which 143 were sawmills (fig. 3). In addition, 12 sawmills and 16 nonlumber forest-industrial plants located chiefly in Memphis, in west Mississippi, and in other parts of Arkansas, drew a substantial volume of logs from the forests of this unit.

Lumber industry

The medium-sized and large sawmills in this unit, of which there were 13 in 1937 (table 7), are the remnants of the industrial setup which during the past four decades cut the virgin hardwood timber for the nation's industrial hardwood-lumber market. These mills are still cutting some virgin timber, but for the most part they are relying on second and third cuttings of forest land. In the main, they are of the single-band type, are operated by steam power, and are equipped to produce standard grades of well-manufactured lumber, which is usually air dried. Owing to exhaustion of nearby timber supplies of a quality to meet their requirements, several of these mills probably will be abandoned or moved within the next few years. Others, especially those near the Mississippi River where water transportation lengthens the logging reach, and where fast-growing, low-cost batture timber is available, can be expected to continue longer, perhaps indefinitely.

The small portable mills, of which there were about 130 in 1937, differ from one another chiefly with respect to kind of ownership. Some are owned by farmers and operated intermittently in connection with farming; others are owned by commercial operators, who make a large part of their living by cutting lumber, timbers, or ties. The farm mills are usually operated by a steam or gasoline engine, and their equipment usually consists of only a circular saw ar a log carriage with occasionally an edger and cut-off saw. These mills, most c which have a capacity of 3,000 to 6,000 board feet per day, generally operate only 10 to 60 days during the year. The commercial mills may differ very litt in equipment from the farm mills, but they usually have a somewhat larger capacity and operate a greater portion of the year.

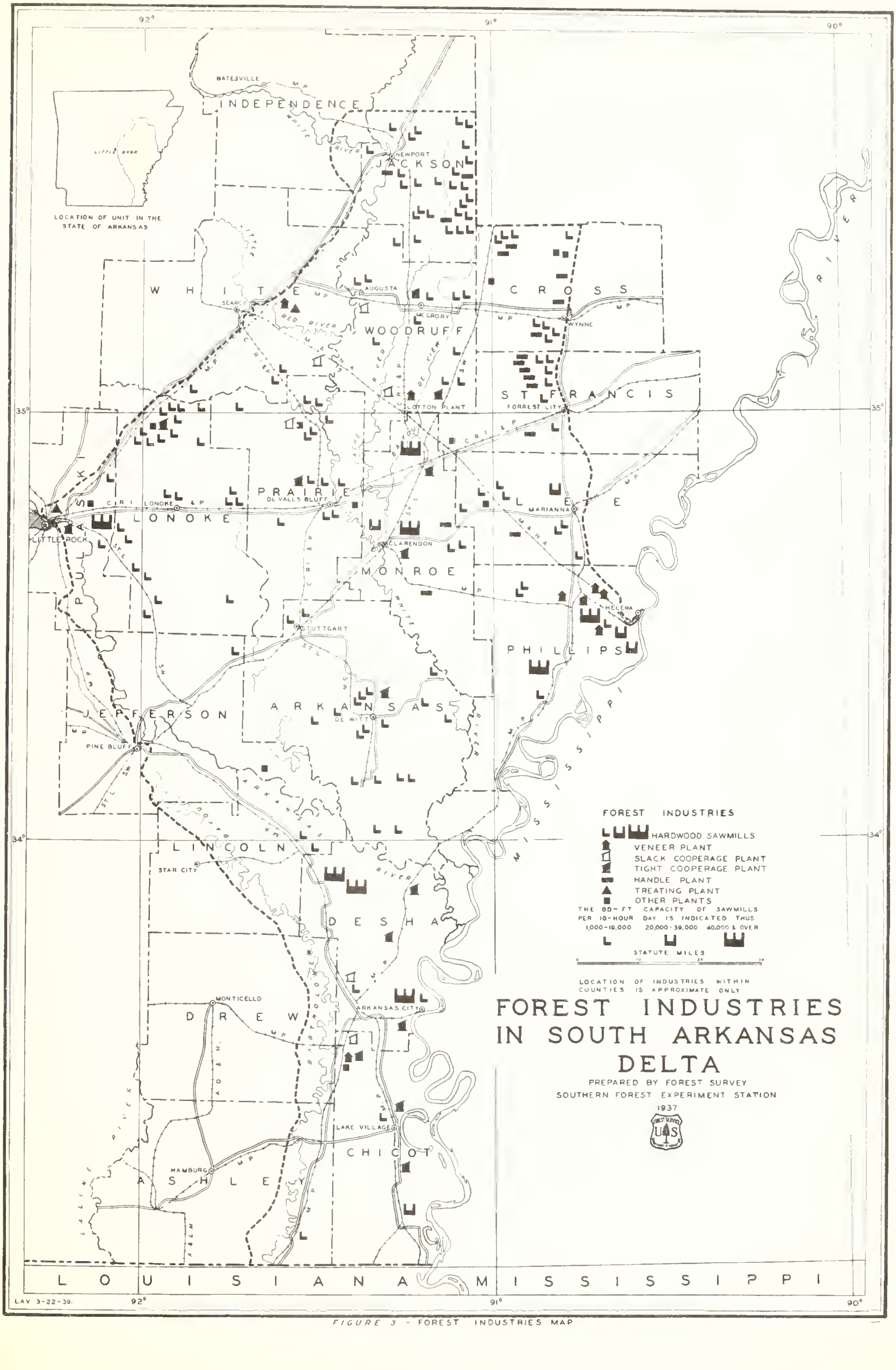

FIGURE 3 - FOREST INDUSTRIES MAP

Table 7. - Production and employment data in the lumber industry, 1937[1/]

Daily capacity	Mills	Produced by mills in the unit	Mill employment	Produced from forests of the unit	Woods employment
M bd. ft.	Number	M bd. ft.	Thousand man-days	M bd. ft.	Thousand man-days
Under 20	130	34,800	52	34,800	42
20 - 39	5	17,500	36	27,400	40
40 and over	8	62,900	110	103,000	134
Total	143	115,200	198	165,200	216

1/ Based on a 10-hour operating day and green lumber tally.

Although the medium-sized and large mills are scattered more or less indiscriminately throughout the unit, the small portable mills are concentrated in the north and west portions, away from the frontlands of the Mississippi River and the plantation country (fig. 3). These sawmills are found in the portion of the unit where small, isolated patches of workable timber occur, and where small, independent farm operators are common.

In 1937, the timber cut from the forests of the unit for manufacturing into lumber both inside and outside the unit amounted to 165 million board feet. Comparison of this figure with the 115 million board feet cut by sawmills of the unit indicates that more logs were cut and shipped outside for manufacturing than were cut outside and brought in for sawmilling. The 13 sawmills with a daily capacity of 20,000 board feet and over accounted for 70 percent of the lumber production, whereas the 130 small mills accounted for only 30 percent of the total cut (table 7). The production increased from 98 million board feet in 1935 to 129 million board feet in 1936, but dropped to 115 million in 1937.

Nonlumber industries

Table 8 shows in the unit 58 nonlumber primary wood-using plants, which can operate, in large part, on either smaller higher-quality trees and logs or on lower-quality material found in second-growth and partly cut old-growth stands; more than 80 percent of the board-foot volume in this unit is in such stands. These plants accounted for 227,000 man-days of mill employment, while the woods employment afforded by nonlumber forest-industrial plants drawing from this unit amounted to 246,000 man-days.

Table 8. - Production and employment data[1/] in the nonlumber forest industries, 1937

Kind of plant or commodity	Plants in unit	Produced by plants in unit	Plant employment	Produced from forests in unit	Woods employment
	Number	M bd.ft.	Thousand man-days	M bd.ft.	Thousand man-days
Veneer	7	35,000	42	41,100	54
		Pieces		Pieces	
Hewed cross ties	-	-	-	764,400	92
Poles and piles	-	-	-	1,600	1
		Cords		Cords	
Tight-cooperage material	14	15,000	18	14,500	23
Slack-cooperage material	6	18,000	29	15,500	16
Chemical wood	-	-	-	17,700	23
Handles	17	3,000	5	3,100	6
Pulpwood	-	—	-	14,400	15
Miscellaneous[2/]	14	114,200	133	10,800	16
Total	58		227		246

1/ Cordwood volume is expressed in standard (4 x 4 x 8 feet) cords, including bark. Board-foot volumes are in terms of the International $\frac{1}{4}$-inch log rule. Man-days are based on a 10-hour day.
2/ Includes 2 treating plants, 3 shingle mills, 7 small-dimension plants, 1 excelsior plant, and 1 plant making net hoops.

Employment

With the data available, it is impossible to translate the total employment figure of 887,000 man-days into the exact number of persons receiving either full- or part-time employment in the forest industries; on the basis, however, of 200 working days per year, this amount of employment would furnish full-time occupation for about 4,500 persons. In consideration of the number of small forest-industrial plants working intermittently, it is possible that as many as 9,000 persons receive full- or part-time employment in the forests and mills of this unit. To this should be added the labor involved in cutting the 0.6 million cords of fuel wood (from live growing stock and from dead and cull trees, cut both on and off farms) and the 3 million fence posts used in this unit; this probably amounts to approximately 816,000 man-days. Although only a small portion of this additional employment — possibly not more than 10 percent — was for cash wages, it represents an important employment item in the life of the people. The material thus produced, without cash outlay and usually without interference in normal gainful employment, is a substitute for material that would otherwise have to be purchased.

Forest Drain

In table 9 is shown the total volume of wood removed from the growing stock of the unit during 1937 for use in industry and for domestic purposes. This volume, termed forest drain, is the total volume of usable material removed from the growing stock by cutting. It does not include losses due to mortality, which are taken into account in calculating the increment; neither does it include material cut from cull and dead trees or from limbs, none of which is considered to be a part of the growing stock. Thus, drain in board feet in table 9 includes the volume actually used (from tables 7 and 8), plus the volume left in the woods as cutting waste because, although it met the Survey specifications for usable material, it did not meet the requirements of the particular user or of the current market. In the last column of table 9, drain is expressed in cubic feet, inside bark. It includes both the sawlog portion of sawlog-size trees and the contents of the main stem of good trees at least 5.0 inches d.b.h. but under sawlog size.

Table 9. - Net volume of timber drain from the growing stock, 1937

Commodity	From sawlog-size trees	From all trees 5.0 inches d.b.h. and larger
	- - - M bd. ft. - - -	- M cu. ft. (i.b.) -
Lumber	186,000	28,000
Veneer	46,500	6,760
Tight-cooperage material	9,900	1,490
Slack-cooperage material	10,600	1,630
Poles and piles	200	40
Hewed cross ties	35,600	6,000
Handles	1,300	340
Pulpwood	300	820
Material used by miscellaneous industries	5,400	2,280
Material cut in clearing land	17,800	5,230
Material cut for fuel, farm fence posts, and other domestic uses	29,700	17,210
Total	343,300	69,800

The total 1937 drain from sawlog-size trees of the growing stock was 343 million board feet, and corresponding drain against the total growing stock, including material in all trees 5.0 inches d.b.h. and larger was 70 million cubic feet. In 1936, the board foot and cubic-foot drain against the growing stock was 396 million board feet and 77 million cubic feet, respectively. In 1935, the comparable drain was 314 million board feet and 64 million cubic feet. It is estimated that at least 60 percent of this board-foot drain is taken from class A areas, which furnish a high proportion of the

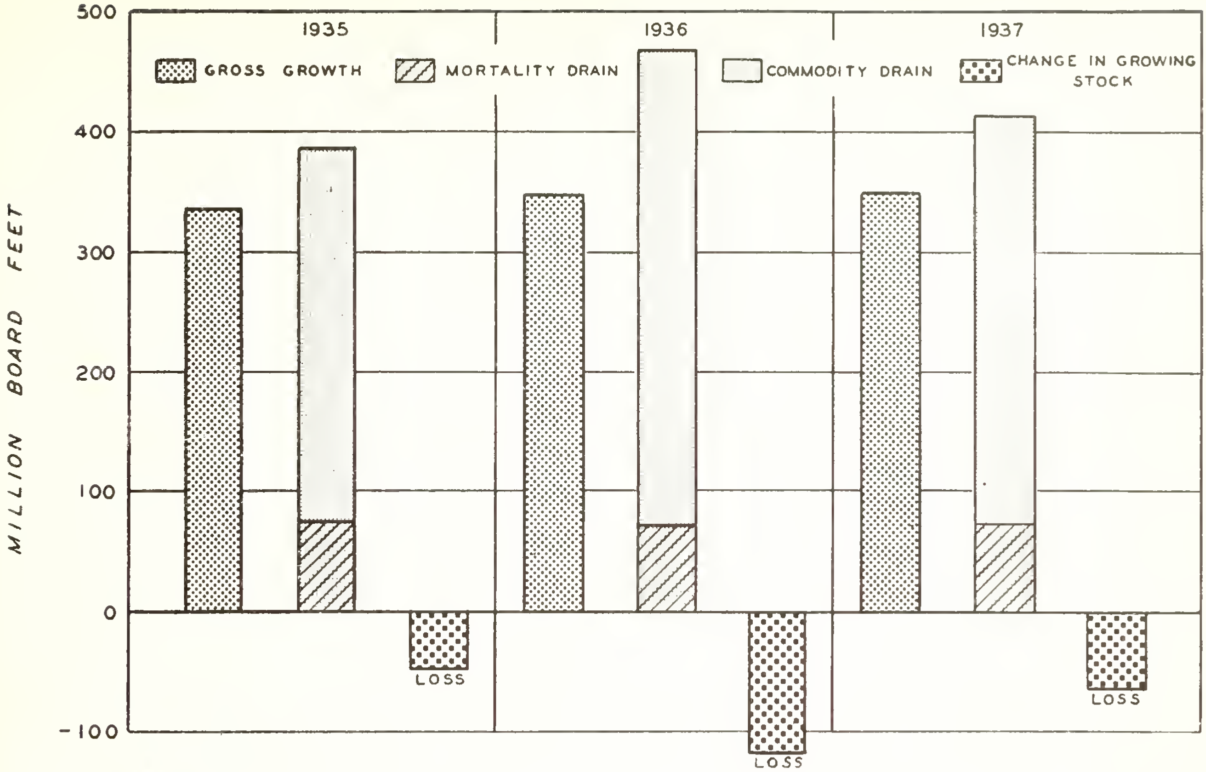

FIGURE 4. - COMPARISON OF GROSS GROWTH AND TOTAL DRAIN OF SAW-TIMBER MATERIAL

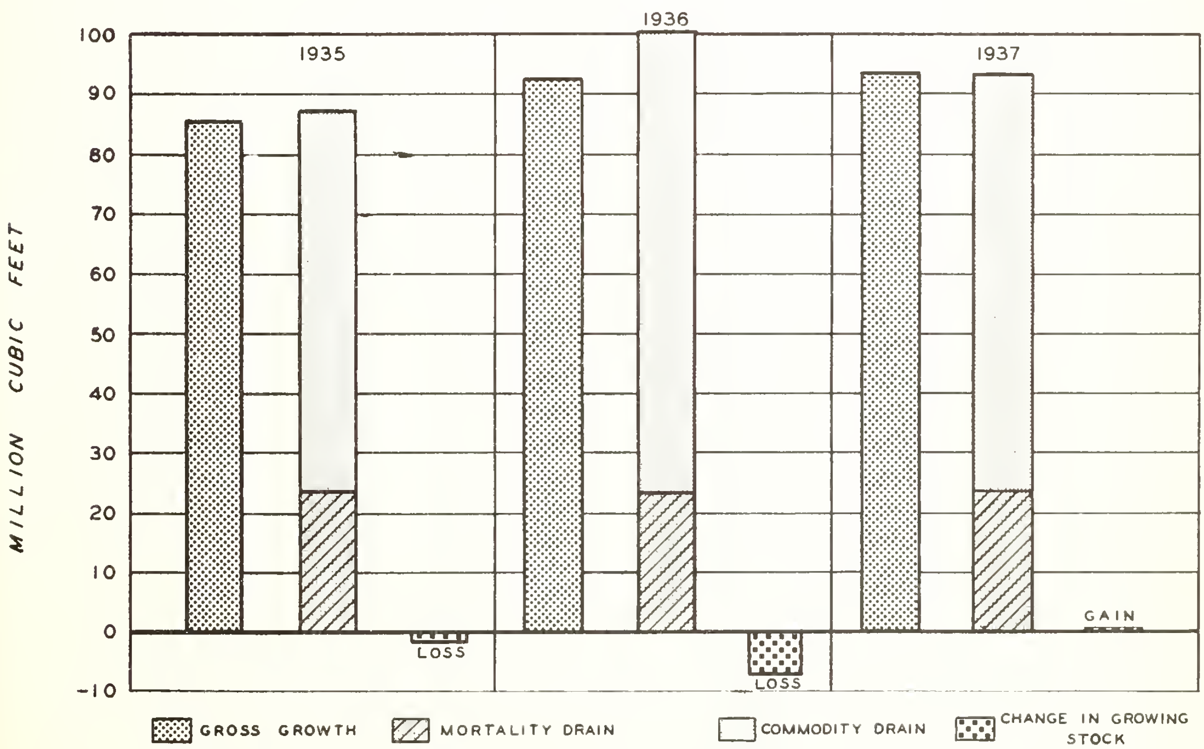

FIGURE 5.- COMPARISON OF GROSS GROWTH AND TOTAL DRAIN OF ENTIRE GROWING STOCK.

volume cut for lumber, veneer, and cooperage material. The remainder comes from class-B areas largely by clearing land, cutting fuel wood, and cutting for other domestic uses.

Comparison of Increment and Drain

Timber-inventory data are based on field work done chiefly during the latter part of 1934 and early 1935, and represent conditions as of Jan. 1, 1935. Subsequent changes in this growing stock caused by additions due to growth and by subtractions due to cutting timber and natural mortality are shown in table 10.

Table 10. - Changes in the growing stock

Date	Saw-timber material	All trees 5.0 inches d.b.h. and larger
	M bd. ft. (lumber tally)	M cu. ft. (i.b.)
Jan. 1, 1935	6,223,400	1,911,240
Jan. 1, 1936	6,174,800	1,909,250
Jan. 1, 1937	6,055,800	1,901,880
Jan. 1, 1938	5,991,700	1,901,980

From this table we see that both the board-foot volume and the cubic volume of the growing stock (all trees 5.0 inches d.b.h. and larger) have declined during the 3-year period. Although the total amount of this reduction is so small that no lack of wood supply seems probable for many years to come, the situation is by no means satisfactory. The most serious aspect of this comparison of increment and drain is from the point of view of timber of the kind and quality required by forest industries. It is estimated that in 1935 the increment on the higher-quality (class-A) areas was 160 million board feet, whereas the corresponding drain was more than 200 million board feet. In 1937 it is estimated that the drain on class-A areas had risen to more than 230 million board feet, which indicates an alarming overcut of the areas upon which the industrial plants of the unit chiefly rely for their raw material. Since over half the board-foot drain is the result of lumbering operations, it would appear that until a considerable part of the area now classed as class B is transformed into class A through growth and development, or unless the sawmill requirements for standing timber are reduced, this unbalanced condition will continue.

A more detailed picture of the balance of increment and drain is shown in table 11, where it is seen that the 1937 loss through natural mortality was 72 million board feet, or more than 20 percent of the commodity drain. To the extent that this loss can be either reduced or salvaged, the deficit in board-foot growing stock can be decreased without reducing the quantity cut. In figures 4 and 5 the gross growth and total drain are compared graphically, and in figure 6 is shown the net effect of growth and drain on the saw-timber growing stock.

Table 11. - Comparison of increment with drain, 1937

Item	Saw-timber material	All trees 5.0 inches d.b.h. and larger
	M bd.ft. (lumber tally)	M cu.ft. (i.b.)
Growing stock, Jan. 1, 1937	6,055,800	1,901,880
Growth	350,300	93,460
Mortality	71,600	23,630
Net increment	278,700	69,830
Commodity drain	342,800	69,730
Net change in growing stock	-64,100	100
Growing stock, Jan. 1, 1938	5,991,700	1,901,980

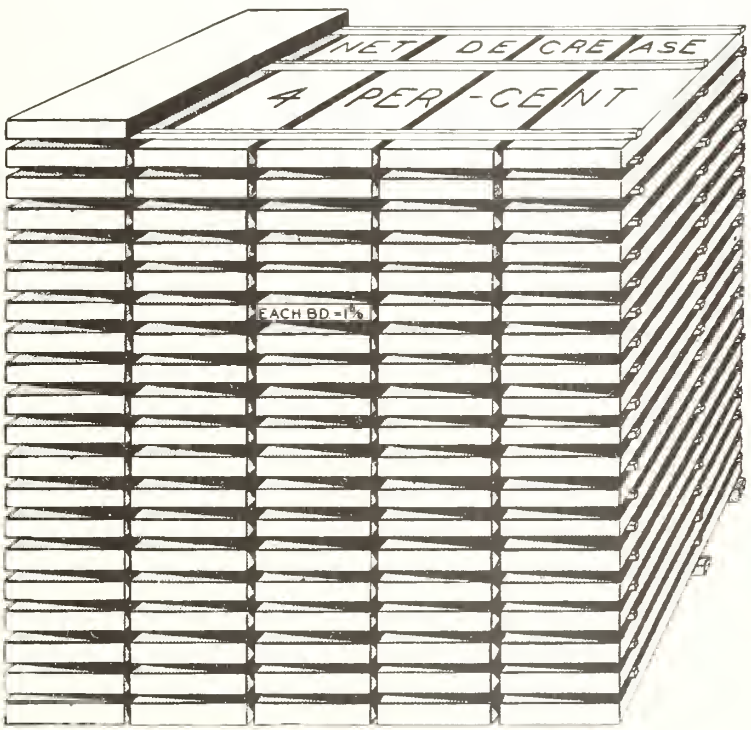

FIGURE 6.- SAW-TIMBER GROWING STOCK AND NET CHANGE DUE TO INCREMENT AND DRAIN FOR THE 3 YEARS ENDING DEC. 31, 1937.

Outlook for the Future

In general, the forests of this unit have deteriorated badly, and the present excess of board-foot drain over increment is depleting the forest capital still more. Only 12 percent of the total forest area bears at least 1,000 board feet per acre of the grade of logs usable for the manufacture of industrial lumber, veneer, cooperage material, and similar products. The remaining 88 percent is characterized either by thrifty, rapid-growing, but immature growing stock, or by residual, but largely unmerchantable, mature trees left after heavy cutting. From the point of view of merchantable raw materials, this unit has a glorious past and a promising future but a very limited present.

The soils of this unit are almost entirely alluvial and, in the main, are suitable for agriculture. There is every indication that, as low prices for agricultural crops tend to force farmers from the less fertile upland soils into the river bottoms, the clearing away of the forest to make more land available for agricultural use will continue and possibly be accelerated. It is doubtful, however, if the forest area ever will be reduced below 25 or 30 percent of the total area, and it does not seem likely that such a shrinkage will take place for many years. This means that at least $1\frac{1}{2}$ million acres of forest land can be expected to continue permanently in timber production. Of this total, approximately 150,000 acres is batture land along the Mississippi and Arkansas Rivers. Owing to its untenable position for farming, because of the flood hazard, and its very favorable tax situation, the continued use of this class of land for timber production by private landowners is practically assured.

For the immediate future, a shrinkage in the volume of timber used in the manufacture of industrial lumber, veneer, and cooperage, is inevitable. The growing stock in its present stage of development is unsuited, both in quantity and quality, to meet continuously the needs of the existing plants. Some of the larger sawmills presumably will cease operations in the relatively near future, owing to the lack of accessible timber supplies of suitable quality. Gradually, as the forest industries become adjusted to the quantity and quality of timber available for use, and as the present immature growing stock increases in volume through growth and approaches maturity, an expansion in the industries may be expected. As a matter of fact, even if the forest area is reduced eventually through continued agricultural development to the minimum of $1\frac{1}{2}$ million acres, but in the meantime the growing stock is built up to yield an average annual increment per acre equal to that of the better-stocked second growth stands, it will supply a larger sustained annual yield than the whole area does now; this yield would more than meet the present industrial and domestic overdraft on the area.

In order to increase the timber increment in this unit to a point that will permit the maximum permanent development of the forest industries, a number of improvements in forestry practices are needed:

1. An effective program for prevention and suppression of forest fires. Even on the wettest situations in the bottom lands, fires in the dry season damage severely the standing timber, causing a loss in actual volume, largely through subsequent decay, and a reduction in grade or quality of part of the timber that is not destroyed. Furthermore, these fires effectively prevent the establishment and development of an adequate stand of young trees.

2. Improvement in the quality and composition of forest stands. Defective and slow-growing trees and those of the commercially inferior species should be removed from all stands to make room for the establishment and growth of thriftier trees of the more valuable species. The taking of more of the domestic fuel wood, fence posts, and similar material from low-quality residual trees, from cull timber, and from thinnings rather than from sound, thrifty trees, would help to accomplish the desired end; and the development of the use of low-quality trees for conversion into chemicals, pulp, fibers, etc., would further materially the silvicultural betterment of the stands.

3. The full and most economic use of the trees cut. All portions of trees should be converted into the products for which they are best suited — sawlogs, cooperage and veneer stock, bolts, ties, etc. — rather than be used arbitrarily for a single product or discarded. This end can be accomplished best by the practice of diversified utilization, in which the landowner disposes of all the products of his forest. This could be done and an additional economy be attained if all the trees to be removed from a stand were cut in closely-timed operations, and the resulting logs and bolts marketed for the best use their size and quality permitted.

The first two measures, if generally carried out, will do much to place the 'orest land of this unit in a position for maximum timber production and thereby ermit the development of a diversified forest industry, in balance with its supply f raw material, furnishing employment to many people, and adding considerably to he local industrial income. The third measure will go far toward making practiable the type of selective cutting needed to improve the present stands through oordination with conservative management practices. In this unit, where farm and and woodland are generally intermingled, timber cropping of forest land hould be a desirable adjunct to agriculture, since it provides material for omestic use and off-season woods employment for farm labor; in addition, the ale of woods products adds to the farm or plantation income. Although the easures listed above can be applied by almost anyone interested in making his oodland contribute most to his needs, there is a demand for an expansion of xtension work to explain the idea of timber culture and to demonstrate that n this area there is a definite place for both timber culture and agriculture.

In brief, the outlook for the immediate future in this unit comprises a) a slowly shrinking forest area, as a result of conversion to agricultural ands; (b) a continuing excess of forest drain over increment; and (c) a derease in the volume of production of higher-grade industrial forest commodiies. Although the superior claim of farm crops to the fertile soils of this 'avorably located section of the Delta must be recognized, successful agriulture always will depend upon a convenient, adequate supply of wood for the roduction of fence posts, fuel wood and other domestic-use material, as well s raw materials for sale. Furthermore, in all parts of the unit there are ertain extensive areas primarily suitable for forests that cannot be converted eadily or economically to agricultural crops. On some of these areas, notably n the batture lands, the commercial growing of timber seems very feasible. wners of such lands and of other forest land not suited for crops should be aided to develop the forest possibilities of their lands to the full capacity of the sites, through tax relief, extension work in forestry, cooperative fire-protection service, and the development of new markets for material now unsalable. In this way will the forest lands best serve their owners and the communities in which they occur.

OREST SURVEY RELEASE NO. 47 DEC. 8, 1939

FOREST RESOURCES OF SOUTHEAST ALABAMA

by

A. R. Spillers
Associate Forest Economist

A Progress Report by

THE SOUTHERN FOREST SURVEY

I. F. Eldredge, Regional Survey Director

SOUTHERN FOREST EXPERIMENT STATION

E. L. Demmon, Director

New Orleans, La.

FOREWORD

The nation-wide Forest Survey, being conducted by the United States Forest Service, was authorized by the McSweeney-McNary Forest Research Act of 1928. Its five-fold object is: (1) to make an inventory of the present supply of timber and other forest products, (2) to ascertain the rate at which this supply is being increased through growth, (3) to determine the rate at which this supply is being diminished through industrial and local use, windfall, fire, and disease, (4) to determine the present requirement and the probable future trend in the requirement for timber and other forest products, and (5) to correlate these findings with existing and anticipated economic conditions, in order that policies may be formulated for the effective use of land suitable for forest production.

This release is based on a field survey made April 6 to July 13, 1935, and two field canvasses of forest industrial plants to determine forest drain, the last of which was made during May and June 1938. It should be regarded only as a progress report since it contains Forest Survey data that will be included in complete reports to be published later, and that, although considered reliable, are subject to correction or amplification as the work of computation proceeds. Item 4 above, which is being studied on a national basis, is not discussed in this report.

In the interpretation of these survey data, it must be noted that, owing to the sampling method used in collecting them, the greater the number of samples in any given classification the more accurate are the data for that classification. Hence classes that are of infrequent occurrence and relatively small in quantity generally cannot be determined with as high a degree of accuracy as classes that occur more frequently and in substantially greater quantities. Small tabular items are to be taken as showing, not the exact magnitude of the classes involved, but their relative magnitude in comparison with those of other classes.

In the South, the Forest Survey functions as an activity of the Southern Forest Experiment Station with headquarters at New Orleans, La.

Assisting Staff

E. B. Faulks, Associate Forest Economist, In Charge of Field Work
P. R. Wheeler, Forest Economist, In Charge of Mensurational Analyses

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Note: Assistance in the preparation of these materials was furnished by the personnel of Work Projects Administration Official Project 65-2-64-74.

FOREST RESOURCES OF SOUTHEAST ALABAMA

General Description

Southeast Alabama (Forest Survey Unit Alabama No. 3) has long been one of the principal agricultural areas of the deep South. Since its forests, however, are almost as extensive as its fields, a recent study has been made of the forest resources and wood-products industries of this area to determine how important they are and how their usefulness may be increased. The area, which includes 21 counties with an aggregate of 9 million acres in the southeast part of the State, extends from the Florida boundary line northward to about the middle of the State, and from the Georgia line westward to the west side of Dallas County (see map, fig. 1). Approximately 47 percent of the land (table 1) is forested with various southern pines, hardwoods, and cypress. More than three-fourths of the total population of 709,000 (1930 Census) is classed as rural; whereas less than one-fourth of the population is urban, residing in Montgomery (the largest city and State Capitol), Selma, Dothan, Phoenix City, and other towns of 2,500 or more.

Over four-fifths of the area lies in the Coastal Plain; the remainder, the northernmost part, is in the Piedmont. The principal soils of the Coastal Plain are grey-to-yellow sandy loams and sands, but the Black Belt Prairies, a fairly level area which runs east and west through Bullock, Macon, Montgomery, Lowndes, and Dallas Counties and occupies about one-tenth of the entire area, have black or brown friable soil underlain by whitish limestone material. In the Piedmont portion of the area, which includes Chambers, Tallapoosa, and parts of Lee, Elmore, and Chilton Counties, the soils are dominantly brownish-red clay loams and gray sandy-loams, developed largely from crystalline rocks.

Well drained by rivers that ultimately enter the Gulf of Mexico, southeast Alabama is gently rolling, with elevations ranging from about 100 feet above sea level along the Florida line to 800 feet in the Piedmont. On the Alabama River from Montgomery southwestward to Mobile (outside this area), and on the Chattahoochee River from Phoenix southward, shipping facilities by barge and flatboats are available. The Louisville & Nashville, the Southern, the Seaboard Air Line, the Atlantic Coast Line, the Central of Georgia, the Western Railway of Alabama, and other railroads provide excellent rail transportation, while a network of improved highways and country roads gives accessibility to all parts of the area.

Among the many natural resources, water power is one of the most important in the upper part of the unit, where large hydroelectric plants are located on both the Coosa and Tallapoosa Rivers.

With an average annual rainfall of 50 to 60 inches per year, and a growing season of about 8 months, the three important sources of employment in this area are agriculture, forest industries, and textile mills. The first provides work for more than half of the gainfully employed throughout the section, while the last is largely centered in Elmore, Tallapoosa, and Montgomery Counties, each of which has over 50,000 spindles. The 1935 Census of Agriculture reports that farmers worked for pay away from their own farms more than $1\frac{1}{2}$ million man-days, and it is believed that a large number of these farmers find part-time work in forest industries. Although agriculture broadly defined includes both farming and forestry, in this report agriculture is used to mean farming, and forestry to mean timber growing and utilization.

Table 1. - Land area classified according to land use, 1935

Land	Area	Proportion of total area
	Acres	Percent
Forest:		
Productive	4,292,900	47.2
Nonproductive	10,900	0.1
Total forest	4,303,800	47.3
Nonforest:		
Agriculture:		
In cultivation:		
Old cropland	3,467,000	38.1
New cropland	67,900	.7
Out of cultivation:		
Idle	269,300	3.0
Abandoned	306,800	3.4
Pasture	448,100	4.9
Total agriculture	4,559,100	50.1
Other nonforest	235,300	2.6
Total nonforest	4,794,400	52.7
Total	9,098,200	100.0

According to the Census of Agriculture approximately 71 percent of the total land area was in farms, of which there were 82,000 with a total area, including woodlands, of $6\frac{1}{2}$ million acres. These woodlands aggregated slightly less than $2\frac{1}{2}$ million acres (37 percent of the total farm area) and were the source of many important forest products either used on the farm or sold. Figure 2 shows the proportion of each county "available for crops" (including cropland and plowable pasture). Practically all the area not "available for crops" is farm woodland or other forest land.

Cotton and corn are the most important agricultural crops, but in southeast Alabama the corn yields are relatively poor -- about 10 bushels per acre -- as compared with the average of about 19 for the entire United States. The cotton yields per acre are about 1/3 of a bale, which is approximately the average for the entire cotton belt.

Between 1924 and 1934, according to the Census of Agriculture, the cropland area decreased about 3 percent. In this period, the acreage in cotton, the chief cash crop in this unit, declined 41 percent, a loss of over $\frac{1}{2}$ million acres. At the same time the sale price of cotton decreased from over 46 million dollars in 1924 to less than 19 million dollars in 1934 -- a decrease of more than 27 million dollars! Preliminary figures for 1938 indicate that the value of the cotton experienced a further decline to 14 million dollars.

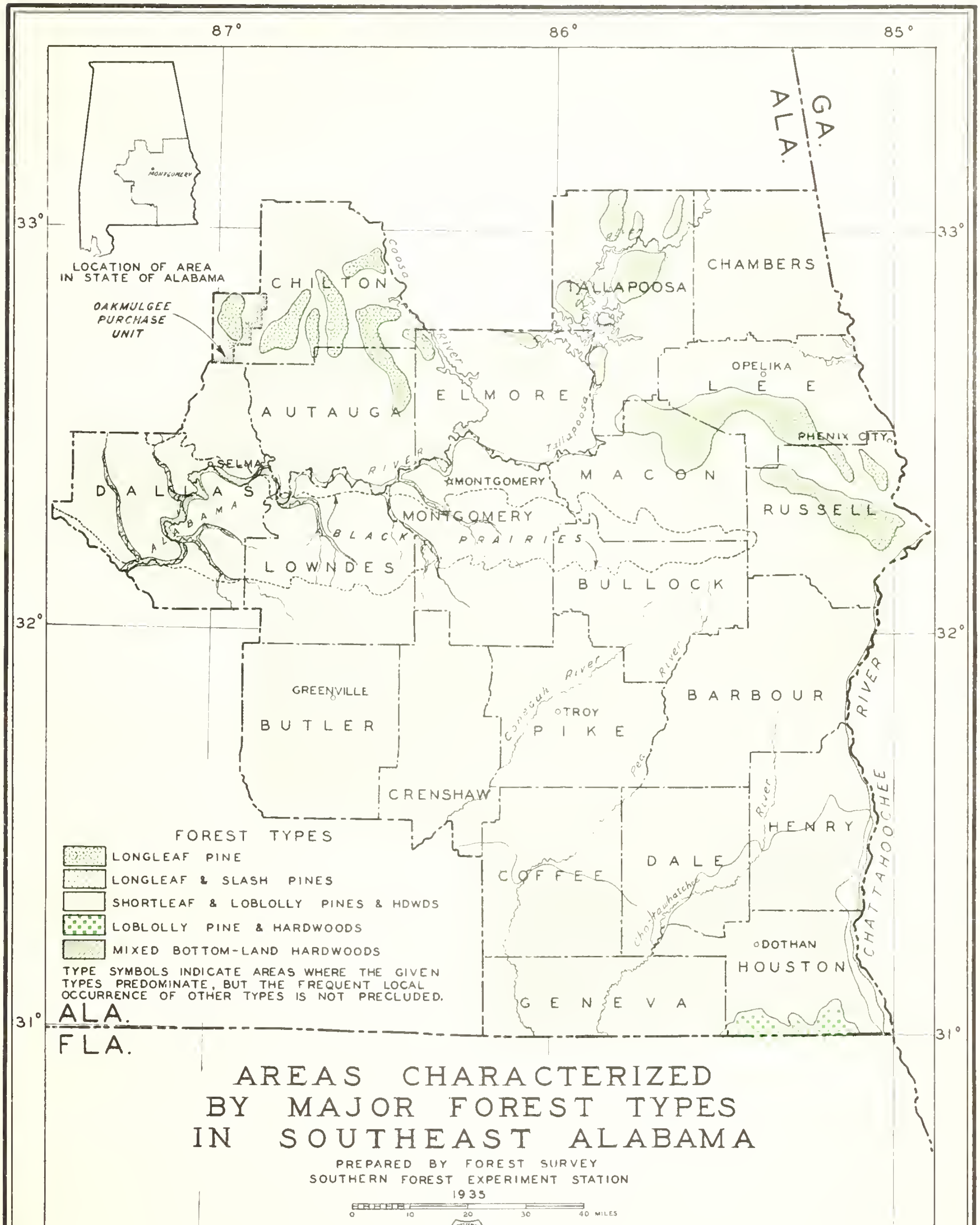

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FIGURE 1.— FOREST TYPE MAP.

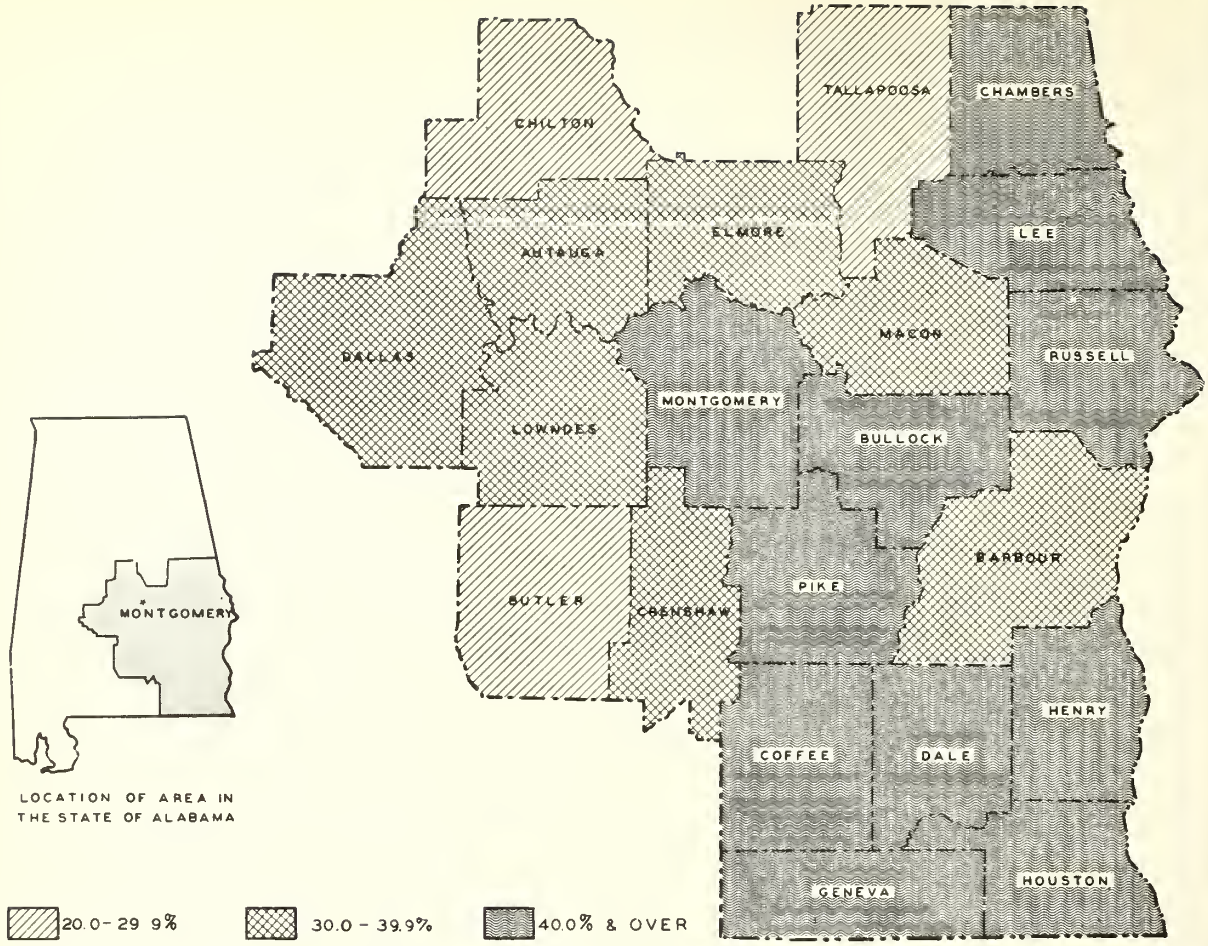

FIGURE 2. – PROPORTION OF COUNTY IN LAND AVAILABLE FOR CROPS
(CENSUS OF AGRICULTURE, 1935).

According to the forest survey made in 1935, there were 576,100 acres of idle and abandoned cropland, a large part of which probably will revert to forests unless: (1) the prices of cotton and corn increase substantially; (2) the acreage in some new crop such as tung oil is expanded; (3) the cattle industry is developed further. Also some areas now in cultivation for cotton probably will be abandoned and will revert to forests, for in growing cotton many parts of southeast Alabama apparently cannot compete successfully with the more fertile areas of the Mississippi Valley or the West.

The Forest Survey obtained a fairly accurate record of the well-marked and destructive stages of erosion. Ignoring the milder degrees of erosion, the field men recorded the following forms: (1) sheet erosion, where the soil is washing off from a generally smooth surface; (2) shoestring erosion, where the soil surface is cut into, and a system of small, branching gullies a few inches to 2 ft. deep is formed; and (3) gully erosion, where the soil surface is being destroyed by deep gully systems. As shown in table 2, some erosion is found on 39 percent of the abandoned cropland, 26 percent of the idle cropland, 20 percent of the cultivated land, and on 19 percent of the pasture, but on only 12 percent of the forests. It should be pointed out also that in many of the places where accelerated erosion is occurring in the forest, there is heavy run off from the field above or the forest has grown up on a critically eroded area, on which it has not yet checked the washing away of the soil. Once erosion has reached a critical stage, it usually continues after cultivation is abandoned until a grass, weed, or tree growth is well established either through natural processes or with the assistance of artificial run-off controls such as terraces and check dams.

Table 2. - Correlation of land use with erosion, 1935

Land use	Type of erosion				Total
	None or arrested	Sheet	Shoe-string	Gully	
	Acres				
Forest	3,799,900	212,000	128,800	163,100	4,303,800
Cropland in cultivation	2,824,400	424,100	219,200	67,200	3,534,900
Idle Cropland	198,200	33,700	28,300	8,600	269,300
Abandoned cropland	185,900	40,200	49,100	31,600	306,800
Pasture	362,200	38,500	28,200	19,200	448,100
Total	7,370,600	748,500	454,100	289,700	8,862,900
Percent of total	83.2	8.4	5.1	3.3	100.0

A study of land ownership of 20 of the 21 counties in this unit (Russell County is excluded) made in 1935 by the Bureau of Agricultural Economics, in cooperation with the Works Progress Administration of Alabama, shows that the land is held in about 39,000 ownerships. More than 83 percent of the holdings are less than 260 acres each, but the small percentage of large holdings (17 percent) includes almost two-thirds of the total land area.

Ownerships	Percent of the number	Percent of the area
Less than 100 acres	52	13
100 - 259 acres	31	25
260 - 499 acres	10	17
500 - 999 acres	5	15
1,000 acres and more	2	30
	100	100

In the Black Belt Prairies, the holdings are larger than the average; here four-fifths of the area is in ownerships of 260 acres or more.

In the 20 counties studied, 77 percent of the area was owned by residents of the same county; 12 percent, by residents of other counties in Alabama; 8 percent, by non-residents of the State; and 3 percent, by the public or by owners whose residence is unknown. Also noteworthy is the fact that farmers own most of the area (wood-using industries own only 3 percent of the total), as shown by the following summary of the proportion of the land owned by different business groups:

Business group	Percent of area owned	Business group	Percent of area owned
Farmers	66	Mining, power, and railroad companies	1
Merchants	4	Farming companies	1
Professional men	3	All other businesses	5
Administrators and executors	3	Business unknown	7
Banks and mortgage companies	6	Governmental agencies (publicly owned land)	1
Wood-using industries	3	Total	100

Forest Description

Loblolly pine, which makes up about one-third of all the forest volume, is the principal species of the area, but shortleaf pine and many hardwoods, especially gums, oaks, and yellow poplar, are also well represented (fig. 3). According to the various species present, the forest stands are classified in four major forest type-groups. The pine type-group has a composition by cubic volume (including bark) of 86 percent pine and 14 percent hardwood; the pine-hardwood type-group, 43 percent pine and 57 percent hardwood; the upland hardwoods, 8 percent pine and 92 percent hardwood, chiefly oaks, gums, hickories, and yellow poplar; and the bottom-land hardwood type-group is 4 percent pine and 96 percent hardwood, chiefly gums and red oaks.

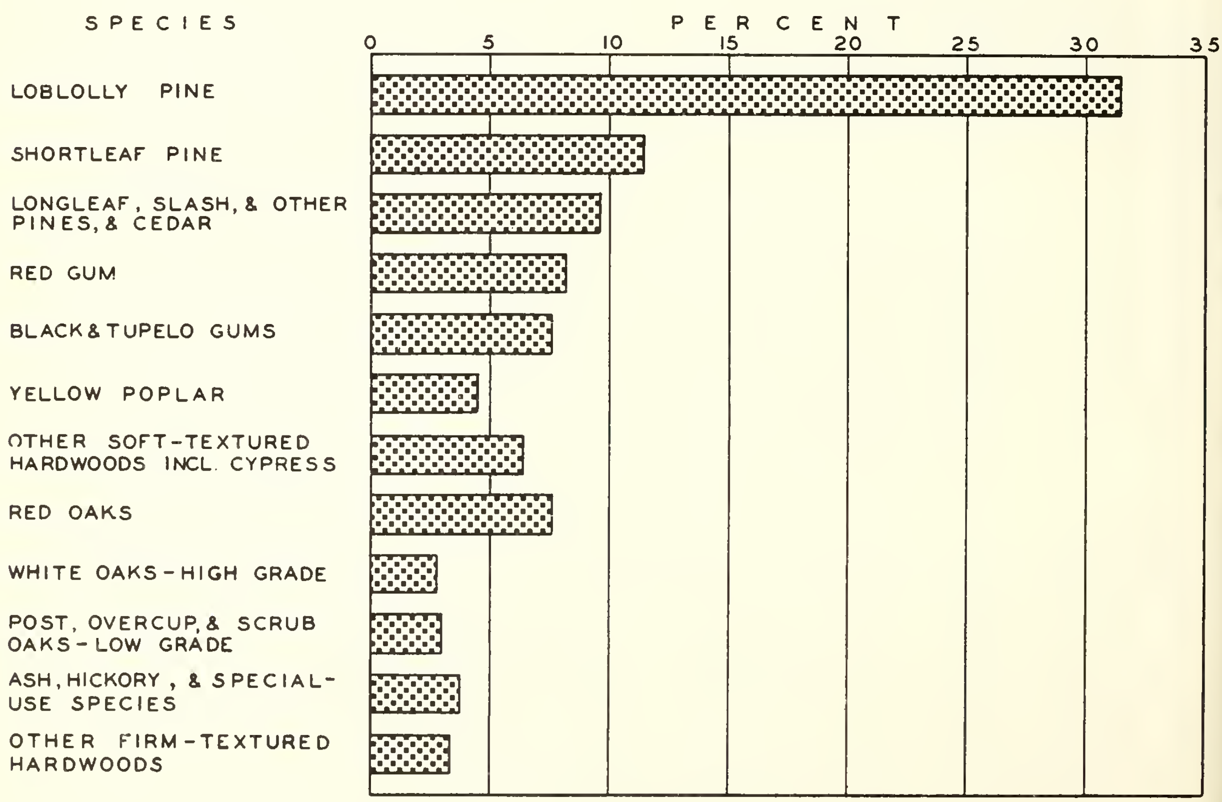

FIGURE 3.- PROPORTION OF TOTAL CUBIC VOLUME IN THE VARIOUS SPECIES.

The prevalence of certain characteristic forest types over large areas is shown in figure 1, although within the broad ranges delineated, occur many small intermingled areas of other types, as well as tracts of cleared land. With the exception of the bottom-land hardwood types, which are confined almost entirely to the river bottoms, branch heads, and swamps, practically all the forest area is in the rolling uplands. As shown in table 3, the pine type-group makes up 52 percent of the entire forest area; the remainder is well distributed among the other three type-groups.

Table 3. - Forest area[1/] classified according to forest condition and forest type-group, 1935

Forest condition	Forest type-group				Total all types	Proportion of total
	Pine	Pine-hardwood	Upland hardwood	Bottom-land hardwood[2/]		
	Acres					Percent
Old growth:						
Uncut	27,400	22,600	10,100	57,000	117,100	2.7
Partly cut	99,900	61,700	71,100	140,500	373,200	8.7
Total	127,300	84,300	81,200	197,500	490,300	11.4
Second growth:						
Sawlog size:						
Uncut	689,400	210,000	80,400	161,600	1,141,400	26.6
Partly cut	431,700	205,300	85,900	124,900	847,800	19.7
Under sawlog size	762,700	302,900	242,000	179,500	1,487,100	34.7
Reproduction[3/]	204,500	52,300	44,500	25,000	326,300	7.6
Total	2,088,300	770,500	452,800	491,000	3,802,600	88.6
Total all conditions	2,215,600	854,800	534,000	688,500	4,292,900	100.0
Percent of total forest area	51.6	19.9	12.4	16.1	100.0	

1/ Does not include 10,900 acres of nonproductive forest land.
2/ Includes 19,500 acres of cypress type.
3/ Includes 84,300 acres of clear-cut condition.

After many decades of forest utilization, only 11 percent of the present forest area can now be classed as "old growth," having the large, old, high-quality trees that are characteristic of the original growth. While most of the old growth is in relatively small, widely-scattered patches, a few large blocks remain. More than half the old growth is in the hardwood types. If less than 10 percent of the sawlog-size trees — pines and cypress at least 9.0 inches d.b.h. (diameter at breast height) and hardwoods at least 13.0 inches — has been cut from the stands, they are classed as "uncut." Uncut old-growth stands have an average volume of 10,400 board feet per acre (lumber tally, based on the International $\frac{1}{4}$-inch rule) in the pine type-group. The "partly cut" old-growth stands, which have an area over three times that of the uncut, have had 10 percent or more of their sawlog-size trees removed but are still characteristically old-growth. The pine type-group in this condition now has an average volume of 4,500 board feet per acre.

Upon much of the old cut-over land and in many of the fields that were abandoned years ago, the Survey found "second-growth" stands, which, although far from perfect, are remarkable in extent and development. That this second growth was not purposely grown by man, but happened to develop through natural means (often in spite of man's misuse) to the extent that it now occupies over 3 3/4 million acres, or 89 percent of the forest area, is indeed worthy of note. Uncut second-growth sawlog-size stands, which occupy almost $1\frac{1}{4}$ million acres, average, all types combined, about 3,800 board feet per acre; the partly cut stands, occupying over 750,000 acres, average about 2,700 board feet and have a minimum of 400 board feet.

"Under-sawlog-size" second-growth stands occupy $1\frac{1}{2}$ million acres, and although they contain an average of less than 300 board feet per acre in a few trees of saw-timber size, they have over 3 cords per acre of growing-stock material, including that in the associated smaller trees 5.0 inches d.b.h. and larger. The youngest forest stands, i.e., the "reproduction," which consists chiefly of seedlings and sprouts less than 1.0 inch d.b.h., occupy over 250,000 acres.

Areas showing less than 80 seedlings per acre are classed as "clear-cut" and comprise approximately 84,000 acres. Since these tracts have scattered seed trees, it is believed that many of them ultimately will be reforested if fires are controlled. Most of the seedling areas have the same species composition as the adjacent stands, but the more prolific seeders tend to capture the site. Thus in the last three decades the loblolly and shortleaf pines have increased their range and representation at the expense of the longleaf pine.

The classification of the areas dominated by loblolly or shortleaf pines according to site index — a measure of the productivity of the forest areas, based upon the average height in feet of average dominant trees at the age of 50 years — is as follows:

Site index in feet	Areas dominated by: Loblolly pine	Shortleaf pine
	Percent	Percent
90 or better	23	3
80	37	11
70	28	37
60	12	37
50 or less	-	12
Total	100	100

The proportion of good pine sites in this area is greater than the average of the other Forest Survey units of Alabama.

Figure 4, based on almost $2\frac{1}{2}$ million acres in the pine and pine-hardwood type-groups (excluding longleaf and slash pine types), gives for the existing stand the proportion of the area occupied by each 10-year age-class and the cubic feet of wood per acre in the respective age-classes. These volumes are compared with those for weighted-average sites in similar age-classes in the most heavily stocked 10 percent of the stands (i.e., the "well-stocked" stands). The area and volume per acre of the forest is diagrammed from data based on field determinations of the age-classes. Approximately 26 percent of the forest area is occupied by stands 0 to 20 years old; 38 percent, by stands 21 to 40 years old; 23 percent, by stands 41 to 60 years old; and only 13 percent, by stands more than 60 years old. The average gross volume per acre for the prevailing forest increases from almost nothing for the youngest age-class to almost 1,000 cubic feet for the 31- to 40-year age-class. The age-classes of 41-50 years and of 51-60 years show little increase over that of 31-40 years because of poor stocking, largely the result of partial cutting. The age-classes of 71 years and over average 1,500 cubic feet per acre. The prevailing forest stands are so poorly stocked that their volumes are less than half those found in well-stocked stands of corresponding ages and on the weighted average of similar sites, as indicated by the dotted line. At 40 years the volume of the most heavily stocked 10 percent of the stands has 2,200 cubic feet per acre and at 70 years, over 3,000.

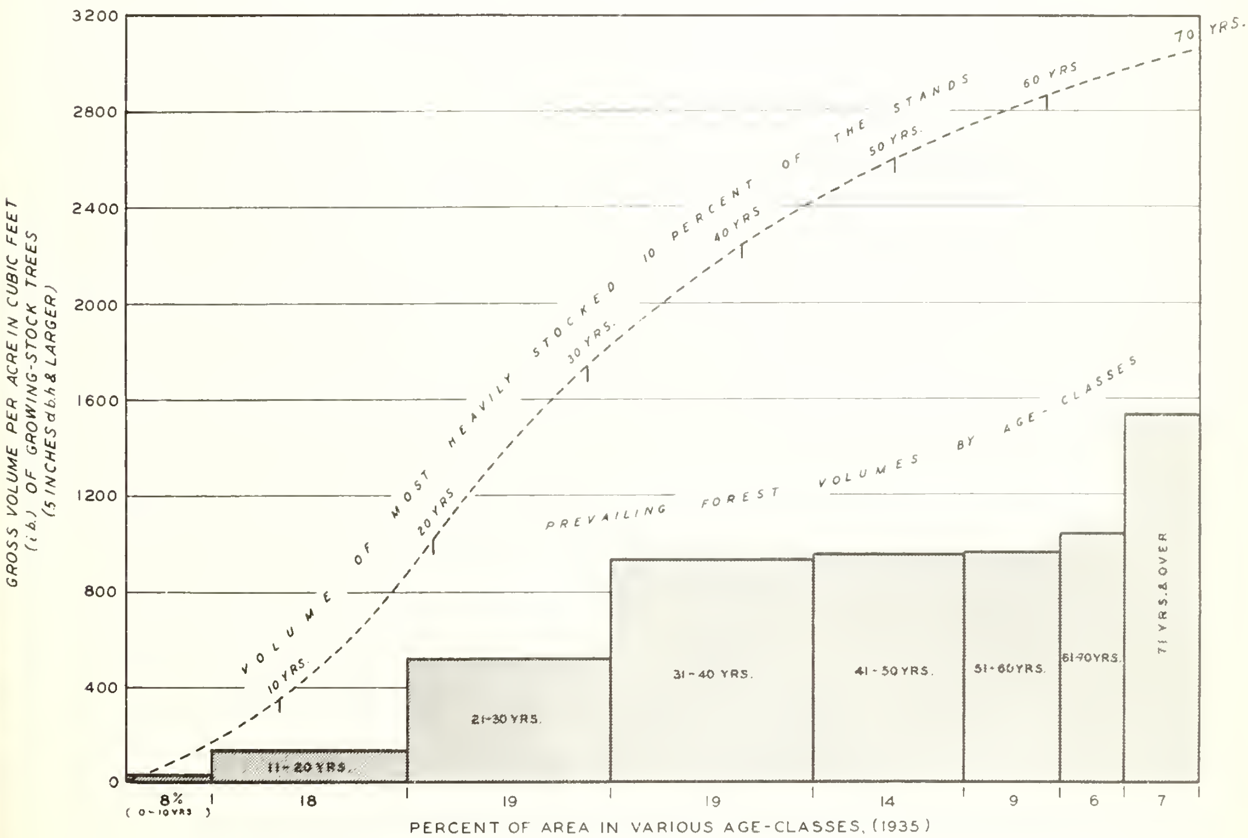

FIGURE 4 - PREVAILING VOLUMES, BY AGE-CLASSES, COMPARED WITH THOSE IN WELL-STOCKED STANDS (BASED ON PINE AND PINE-HARDWOOD TYPE-AREAS * OF 2,459,900 ACRES).

*EXCLUDING 610,500 ACRES IN THE LONGLEAF AND SLASH PINE TYPES.

A similar chart for the hardwood stands was not made, but an examination of sample plots indicates that the hardwood stands also are poorly stocked.

The stand diagrams in figure 5 show the number of trees by 2-inch classes (the 2-inch class includes trees 1.0 to 2.9 inches; the 4-inch class, those 3.0 to 4.9 inches; and so on) for the four important species-groups. These diagrams show a preponderant number of small trees, especially in the 2-, 4-, 6-, and 8-inch classes, and a relative scarcity of medium-sized and large trees. If all (or the greater part) of the small trees could be counted upon to grow into the larger size-classes and thus add to their very deficient stocking, an excellent future forest would be assured. Protection from fire is essential, however, if the smaller trees are to contribute all their potential value in building up the larger and more valuable size-classes.

Only 3 percent of the $4\frac{1}{4}$ million acres of forest land is in public ownership; 56 percent is in farm woodlands; and 41 percent is in privately owned industrial forests (i.e., in forests owned by sawmill companies, pulpmill companies, etc.) or in investment forests. A study of the forest practices on privately owned non-farm forest land recently made by the Division of State and Private Forestry of Region 8 of the Forest Service discloses that for 15 properties investigated in this Unit, aggregating 266,000 acres, approximately 64 percent of the forest land is "handled under good forestry practices for continuous forest crops"; 34 percent under practices that are "poor" but that leave the land productive; and only 2 percent is in "lands not left productive." Most of the properties included in this study were large; it is believed that the forestry practices on the smaller properties (generally farmer-owned) are not as good on the average.

Estimates of Timber Volume

Saw-timber volume

The saw-timber inventory includes only living trees of those species having commercial value. Such trees must be at least 9.0 in. d.b.h. in pines and cypress, and at least 13.0 in. d.b.h. in hardwoods; also they must have at least 50 percent of their volume sound, or have a sound butt log at least 12 ft. long. Although the top-diameter limit varies with the quality of the stem, no pine logs less than $5\frac{1}{2}$ in. in diameter, inside bark, at the small end, and no hardwood logs less than $8\frac{1}{2}$ in. are included; the top-diameters actually used averaged larger than these minima. All figures are net, as necessary deductions have been made for cull because of fire scar, rot, crook, limbiness, etc., as well as for loss in manufacture due to sweep and hidden defects.

Using the International $\frac{1}{4}$-inch rule, which closely approximates green lumber tally, the total volume is 9,714 million board feet; or, according to the Doyle rule, which is used locally (although it gives an understatement because of the large preponderance of small trees in the stand), the total volume is 6,279 million board feet. Approximately 61 percent of the total saw-timber volume is pine, using the lumber tally as a basis, and the greater part of the pine volume is loblolly (table 4). Hardwoods make up 39 percent of the total saw-timber volume, the principal species being gums, oaks, and yellow poplar.

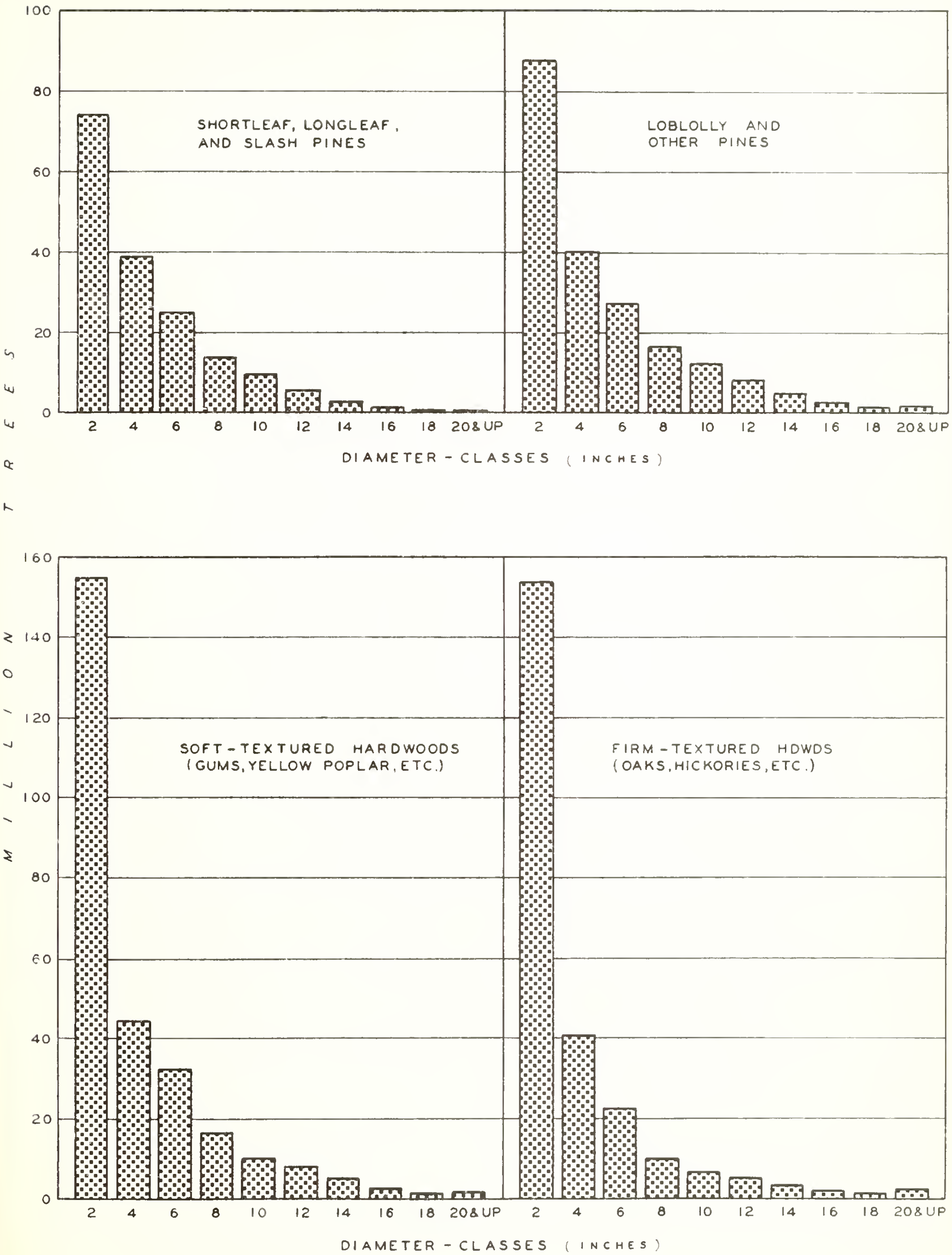

FIGURE 5.— STAND DIAGRAMS OF SOUND TREES.

Approximately half the white-oak volume listed is in the more valuable species such as forked-leaf white oak, while the other half is chiefly post oak. For all pine and hardwood species combined, almost three-fourths of the saw-timber volume is in second-growth stands.

Table 4. - Net board-foot volume (green lumber tally, based on International $\frac{1}{4}$-inch rule) in the various forest conditions, 1935

Tree species-group	Old growth		Second growth		Total	Proportion of total
	Uncut	Partly cut	Sawlog size	Under sawlog size1/		
	Thousand board feet					Percent
Pines:						
Loblolly pine	283,100	209,200	2,943,600	134,100	3,570,000	36.7
Shortleaf pine	73,800	105,300	949,800	55,300	1,184,200	12.2
Longleaf and slash pines	58,500	273,400	494,700	94,300	920,900	9.5
Other pines2/	29,900	69,800	130,800	10,100	240,600	2.5
Total pines	445,300	657,700	4,518,900	293,800	5,915,700	60.9
Hardwoods:						
Red gum	100,700	137,800	486,800	16,500	714,800	7.7
Black and tupelo gums	68,000	127,400	234,700	17,600	447,700	4.6
Yellow poplar	32,100	74,300	373,700	8,500	488,600	5.0
Other soft-textured hardwoods3/	83,900	149,000	211,100	14,600	458,600	4.7
Red oaks	90,600	233,000	403,500	33,200	760,300	7.9
White oaks	42,400	122,900	160,900	18,200	344,400	3.5
Other firm-textured hardwoods4/	70,900	210,400	249,200	26,400	556,900	5.7
Total hardwoods	488,600	1,054,800	2,119,900	135,000	3,798,300	39.1
Total all species	933,900	1,712,500	6,638,800	428,800	9,714,000	100.0
Percent of total	9.6	17.6	68.3	4.5	100.0	

1/ Includes 24,800 M board feet in the reproduction and clear-cut conditions.
2/ Includes cedar.
3/ Basswood, bay, box elder, cottonwood, cypress, magnolia, maple, willow, etc.
4/ Ash, beech, birch, elm, hackberry, hickory, sycamore, etc.

Figure 6, which indicates the proportional area and gross volume per acre of saw-timber stands, classified according to volume of saw timber per acre, shows that most of the stands in the sawlog-size conditions have volumes that greatly exceed the minimum per acre required for logging.

Considering the pine and pine-hardwood type-groups combined (chart A), ut one-third of the saw-timber area but only one-tenth of the volume is in nds of less than 2,000 board feet per acre; it follows that about two-thirds the area and nine-tenths of the volume are in stands having at least 2,000 rd feet per acre. For the upland hardwood and bottom-land hardwood types bined (chart B), about three-fourths of the saw-timber area and over nine-ths of the saw-timber volume are in stands having 2,000 board feet or more acre. Although some error is possible in the interpretation of the first ss (less than 1,000 board feet), owing to the fact that the data were taken $\frac{1}{4}$-acre plots, the combined figures for the first two classes show a reason-y accurate picture.

Although lumber and veneer producers in this area usually consider pines s than 13 in. d.b.h. and hardwoods less than 19 in. d.b.h. as somewhat un-irable for manufacturing purposes, over one-third of the pine saw-timber ume and over half of the hardwood saw-timber volume are in trees below these imum sizes (table 5).

ble 5. - Diameter distribution of net board-foot volume (green lumber tally, based on International $\frac{1}{4}$-inch rule) in the various forest conditions, 1935

Species-groups and diameter-classes (in inches)	Old growth		Second growth		Total	Proportion of total
	Uncut	Partly cut	Sawlog size	Under sawlog size[1]		
	Thousand board feet					Percent
es:						
) - 12	39,600	110,100	1,970,100	204,300	2,324,100	39.3
; - 16	88,300	195,800	1,524,000	67,500	1,875,600	31.7
3 - 20	121,400	150,800	674,300	16,100	962,600	16.3
2 and over	196,000	201,000	350,500	5,900	753,400	12.7
Total pines	445,300	657,700	4,518,900	293,800	5,915,700	100.0
lwoods:						
; - 18	187,500	456,700	1,453,500	110,800	2,208,500	58.2
) - 28	219,000	523,100	632,500	24,200	1,398,800	36.8
) and over	82,100	75,000	33,900	-	191,000	5.0
Total hardwoods	488,600	1,054,800	2,119,900	135,000	3,798,300	100.0

ncludes 24,800 M board feet in the reproduction and clear-cut conditions.
ncludes 21,700 M board feet of cypress in the 10- and 12-inch classes.

Having developed in open stands, many of the saw-timber trees are of rela-ely low quality. The Forest Survey, in a supplemental study, classified pine trees, according to the appearance of their stems, as "smooth," ıby," and "rough." As shown by table 6, more than half the loblolly and rtleaf pine saw-timber volume is in limby and rough trees. The old-growth es are much better suited for lumber than the second growth, which is char-rized by old-field stands.

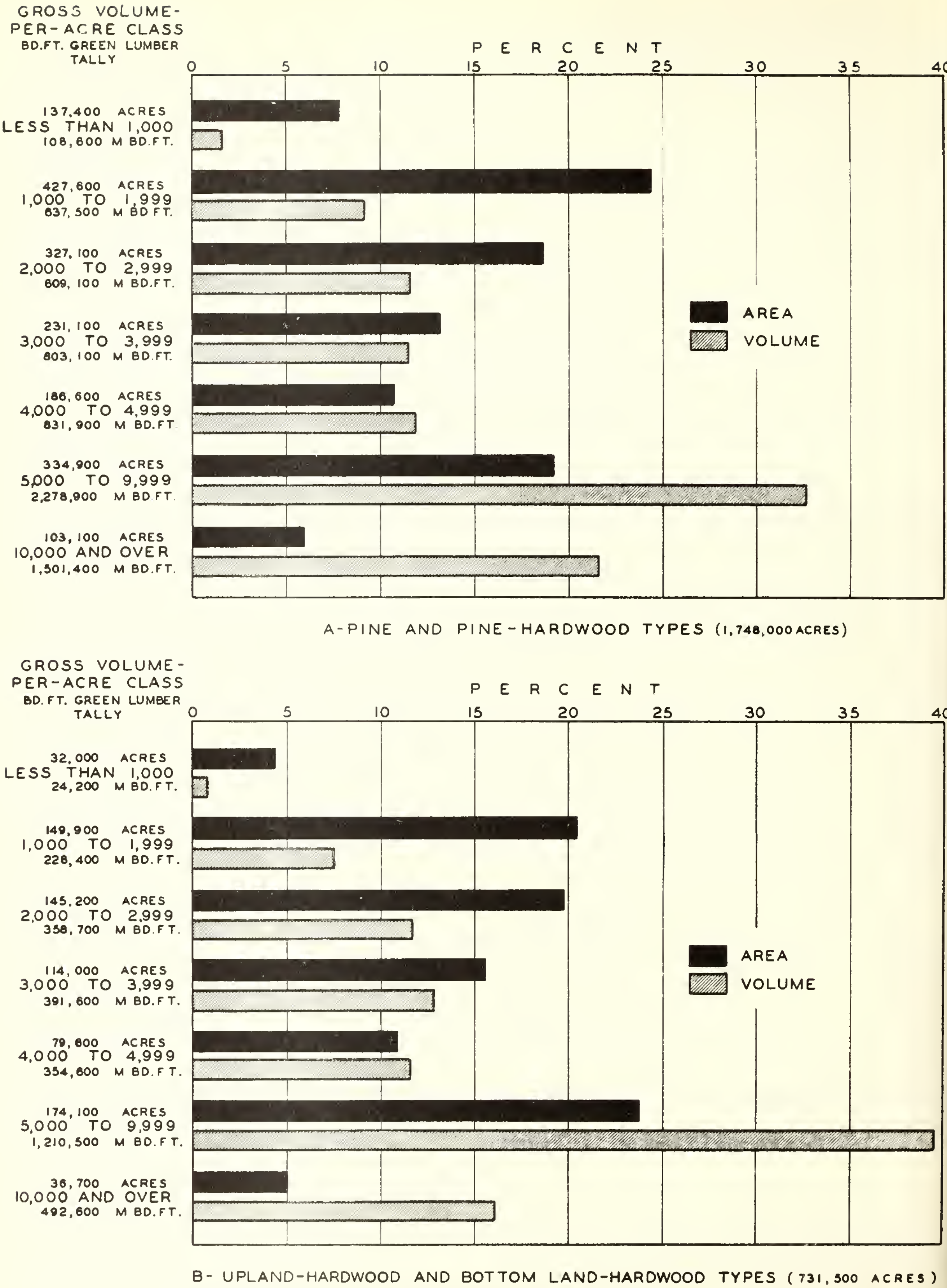

FIGURE 6. — PROPORTIONAL AREA AND VOLUME OF THE SAWLOG-SIZE CONDITIONS, CLASSIFIED ACCORDING TO VOLUME OF SAW TIMBER PER ACRE.

Table 6. - Classification of pines according to grade of trees of saw-timber quality

Species and stand condition	Tree grade 1/			Total
	Smooth	Limby	Rough	
	- - - - - - - - Percent of volume - - - - - - - -			
Loblolly pine:				
Old growth	94	6	-	100
Second growth	31	51	18	100
Weighted average	40	45	15	100
Shortleaf pine:				
Old growth	98	2	-	100
Second growth	49	40	11	100
Weighted average	56	34	10	100
Loblolly and Shortleaf pines:				
Old growth	95	5	-	100
Second growth	36	48	16	100
Weighted average	44	42	14	100

1/ Smooth trees have 20 ft. or more of clear length and at least 50 percent of their total usable length practically free of limbs and indications of knots; limby trees have at least 12 ft. of clear length and 30 to 49 percent of their total usable length practically free of limbs and indications of knots; rough trees have less than 12 ft. of clear length, or less than 30 percent of their total usable length practically free of limbs and knots.

Cordwood Volume

The entire usable volume of wood in all live trees 5.0 in. d.b.h. and larger, sawlog-size trees included, is over 54 million standard cords (4 x 4 x 8 ft.), including bark (table 7). Almost three-fourths of this is in pulping species, while one-fourth is in species usually considered nonpulping. Of the 40 million cords in pulping species, almost 22 million are in pine; and the remainder is in soft-textured hardwoods such as gum, yellow poplar, maple, magnolia, bay, and cypress. Oak, hickory, ash, elm, and beech which are mostly firm textured, are usually considered "nonpulping," although in the future some of these may be considered as a source of pulp. All the volumes mentioned herein are net, since necessary deductions have been made for unusable volumes.

In table 7, four sources of cordwood material are shown. Volumes in the first column include the sawlog portion of saw-timber trees shown in cords — this is the material given in the preceding section in board feet — and make up 41 percent of the usable cordwood from all sources. The second column includes the material above the sawlogs in saw-timber trees to a usable top, the minimum allowable top diameter never being less than 4 in. In pines the upper stems only are considered usable, while in hardwoods and cypress both the upper stems and larger limbs are included; combined they contain 14 percent of the total cordwood volume. In "sound trees under sawlog size," the full stems only (without limbs) are included up to a variable minimum top diameter but never less than 4 in.; this makes up 29 percent of the volume from all sources. "Cull trees" include the usable portions of cull trees and all scrub oaks; volume in such trees, most of which are hardwoods, is almost 9 million cords, or 16 percent of the total usable cordwood material.

Table 7. - Net cordwood volume in various classes of sound material, 1935

Species-group	Sound trees sawlog size		Sound trees under sawlog size	Cull trees1/	Total all classes
	Sawlog material	Upper stems			
	Cords (bark included)				
Pines	13,068,800	2,574,800	4,930,200	1,199,900	21,773,700
Hardwoods:					
Soft-textured	5,254,600	2,823,100	6,327,900	3,786,600	18,192,200
Firm-textured	4,026,400	2,276,500	4,190,400	3,714,000	14,207,300
Total hardwoods	9,281,000	5,099,600	10,518,300	7,500,600	32,399,500
Total all species	22,349,800	7,674,400	15,448,500	8,700,500	54,173,200

1/ Includes all scrub oaks.

Approximately two-thirds of the net cordwood volume of sound trees, cull trees omitted, is in sawlog-size trees (fig. 7).

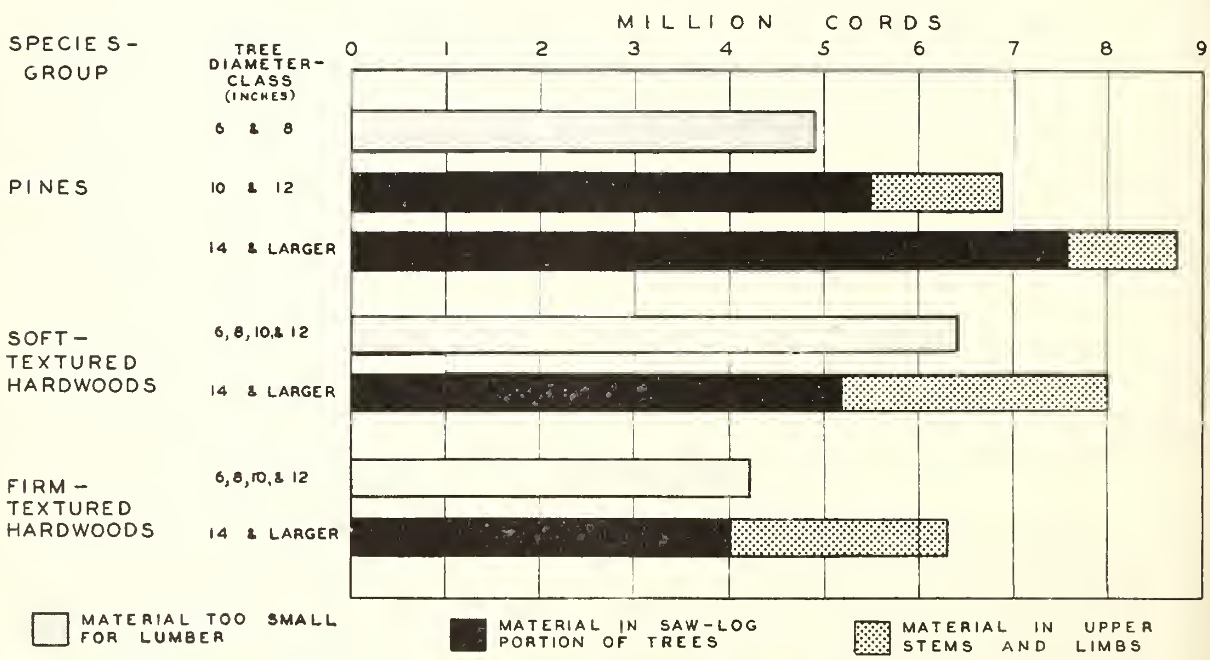

FIGURE 7.—CORDWOOD VOLUMES BY SIZE CLASSES, SOUND TREES ONLY.

Of the 54 million cords in the total cordwood volume, about 40 million are in the volume that constitutes the growing stock; the remaining 14 million cords are in cull trees and in the upper stems and limbs of sawlog-size hardwoods and cypress that are not included in the growing stock. The average cordwood volumes of growing stock per acre (as computed by dividing the total volumes by the corresponding forest areas) vary greatly with the forest condition and type-group, as shown in table 8.

Table 8. - Average volumes of cordwood per acre in growing-stock trees, 1935

Forest type-group	Old growth		Second growth			All conditions[1/]
	Uncut	Partly cut	Sawlog size: Uncut	Sawlog size: Partly cut	Under saw-log size	
	Cords (bark included)					
Pine	27.5	12.6	14.8	10.0	3.0	8.5
Pine-hardwood	30.8	16.9	16.1	11.9	3.4	10.1
Upland hardwood	13.3	12.2	12.2	9.3	2.4	6.3
Bottom-land hardwood	21.6	17.1	17.6	14.1	6.8	13.7
Weighted averages, all types	24.0	14.9	15.3	11.0	3.4	9.4

1/ Includes areas of reproduction and clear-cut conditions.

Poles and piles

Almost 12 million pine trees in southeast Alabama are suitable for conversion into poles and piles (table 9). Although these trees are included in previous volume estimates, the premium in stumpage price usually paid for trees suitable for poles and piles justifies a separate inventory. While it is difficult to judge accurately whether or not standing trees will meet the exacting specifications of the American Standards Association for poles, the present estimate of poles and piles is believed to be conservative and probably is under the actual number on the area. Three-fourths of the poles and piles are in loblolly and shortleaf pines; the remainder is in round or turpentined longleaf and slash pines. Over four-fifths of the pieces are in trees less than 13.0 in. d.b.h., outside bark; also, most of the pieces are 20 and 25 ft. long and are too short for many commercial uses. A growing tendency to use shorter poles is noted in rural areas, however, especially since the establishment of activities such as the Rural Electrification Agency and the Tennessee Valley Authority.

Table 9. - Total number of pine poles and piles, classified according to length, 1935

Species	Pole and pile length (feet) 20 and 25	30 and 35	40 and over	Total	Proportion of total
	- - - - Thousand	pieces	- - - -		Percent
Loblolly and shortleaf pines[1]	6,201	1,839	766	8,806	74.9
Round longleaf and slash pines	1,671	556	153	2,380	20.3
Turpentined longleaf and slash pines	378	166	18	562	4.8
Total all species	8,250	2,561	937	11,748	100.0
Percent of total	70.2	21.8	8.0	100.0	

1/ Includes a few other pines and also cedars.

Forest Increment

Net annual increment is defined as the difference between the growing-stock volume at the beginning and the end of any year, before the commodity drain for the same year is deducted. It is the volume added by growth to the individual trees, plus the merchantable volume newly created by small trees developing into merchantable sizes, and minus mortality. For trees cut during the year, only their growth until the time of their removal is included. Neither the volume in cull trees nor that in the upper stems and limbs of saw-log-size hardwoods and cypress is considered growing-stock material.

For the saw-timber part of the growing stock, the total growth in 1935 amounted to 641 million board feet (lumber tally); the mortality, 90 million board feet; and the resulting net increment, 551 million board feet. A large part of the mortality is caused either directly or indirectly by fires; if these and the resulting mortality were reduced, there would be a corresponding increase in the net increment. Approximately nine-tenths of the net increment of saw-timber material occurs in second-growth stands, and about two-thirds of it is pine (table 10).

For all growing-stock material, including trees to a minimum of 5.0 in. d.b.h. as well as those of saw-timber size, the net increment in 1935 amounted to 142 million cubic feet of wood without bark (table 10), or 2 million cords of wood with bark (table 11). Fifty-nine percent of the net cubic-foot increment for all growing-stock material was in pine and 41 percent was in hardwoods. Probably more than half the net hardwood increment was in soft-textured species.

Table 10. - Net increment in the various forest conditions, 1935

Forest condition	Saw-timber material			All growing-stock material		
	Pine component	Hardwood component 1/	Total	Pine component	Hardwood component 1/	Total
	- - Thousand board feet - - (Green lumber tally)			- Thousand cubic feet - - (Inside bark)		
i growth	19,800	38,900	58,700	4,310	9,740	14,050
cond growth:						
Sawlog size	251,500	126,300	377,800	50,360	33,460	83,820
Jnder sawlog size	84,500	29,000	113,500	28,810	14,620	43,430
production and clear-ut	1,200	200	1,400	340	360	700
Total all conditions	357,000	194,400	551,400	83,820	58,180	142,000

Includes cypress.

Table 11. - Net increment in cords classified according to forest condition, 1935

Forest condition	Pine	Hardwood 1/	Total
	- - - - - - Cords (including bark) - - - - - -		
i growth	55,700	144,600	200,300
cond growth:			
Sawlog size	661,400	510,600	1,172,000
Jnder sawlog size	393,500	229,800	623,300
production and clear-cut	4,500	5,600	10,100
Total all conditions	1,115,100	890,600	2,005,700

Includes cypress.

In 1935, the average net increment per acre for the entire forest area .e., including the reproduction and clear-cut areas), assuming that the ands had not been influenced by cutting, was 131 board feet of saw-timber terial, or 0.48 cord of all growing-stock material (table 12); these aver-es are slightly higher than the comparable figures for the State. The rgest increments per acre occurred in the uncut sawlog-size second-growth ands.

Table 12. - Average net increment per acre in the various forest conditions, uninfluenced by cutting, 1935

Forest condition	Pine component			Hardwood component 1/			Total per acre all species		
	Bd.ft.	Cu.ft.	Cords	Bd.ft.	Cu.ft.	Cords	Bd.ft.	Cu.ft.	Cords
Old growth:									
Uncut	58	9.4	0.12	100	28.7	0.42	158	38.1	0.54
Partly cut	38	9.2	0.12	75	17.5	.26	113	26.7	0.38
Second growth:									
Sawlog size:									
Uncut	165	33.8	0.45	68	19.3	0.29	233	53.1	0.74
Partly cut	85	15.8	0.21	59	13.9	0.21	144	29.7	0.42
Under sawlog size	57	19.9	0.27	20	10.0	0.16	77	29.9	0.43
Reproduction and clear-cut	3	1.0	0.01	1	1.1	0.02	4	2.1	0.03
Weighted averages	85	20.2	0.26	46	13.7	0.22	131	33.9	0.48

1/ Includes cypress.

Forest Industries

Southeast Alabama was settled early in the nineteenth century at a time when there were no important markets for its forest products. Agricultural development was rapid and, with the exception of that in Butler and a few other counties, much of the original forest was cut and burned to provide cropland. Although transportation facilities by railroad and steamboat were available before 1860, only a relatively few sawmills were located here before the World War. Within the last three decades, however, a large number of small sawmills have come into this area, and largely because of their great activity a peak of lumber production probably was reached about 1925.

In 1937 southeast Alabama produced 431 million board feet of lumber, about 25 percent of the total production for the State. That year the area contained 421 sawmills, of which 396 had a cutting capacity of less than 20,000 board feet per 10-hour day (fig. 8 and table 13). Powered by tractors, small steam engines, stationary motors, or old automobile engines, these "peckerwood" outfits are extremely mobile and when market conditions are favorable they come and go like swarms of locusts. In Lee County, for example, there were in 1929 about 35 small sawmills, in 1930 less than half of these remained, and in 1937 there were about 21. Generally several small sawmills scattered through the woods are operated in connection with one concentration yard and planing mill. The chief product is pine "roofers" — 1-inch, air-dried, surfaced boards, generally taken as log run and grading principally No. 2 common. While the amount of lumber cut in 1937 by these small sawmills varied greatly, their average production was 750,000 board feet and their total production was 296 million board feet, or 69 percent of all the lumber produced that year in southeast Alabama.

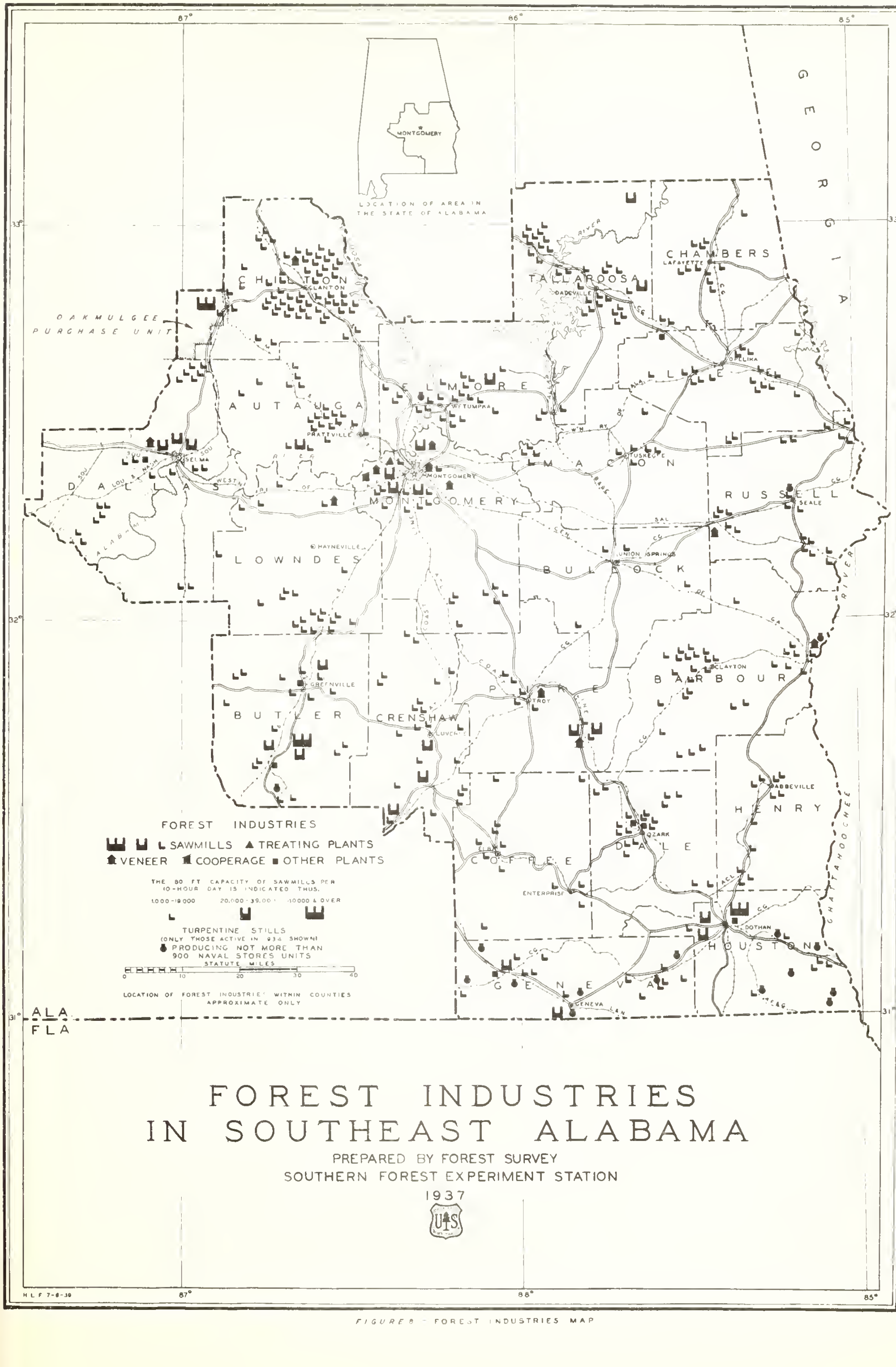

FIGURE 8 — FOREST INDUSTRIES MAP

Table 13. - Number and size of sawmills and amount of lumber produced, 1937

Daily (10-hours) rated capacity	Number of sawmills	Lumber produced,[1] 1937		
		Pine	Hardwood and cypress	Total
Thousand board feet		-Thousand board feet (lumber tally)-		
1 - 19 (small)	396	280,000	16,000	296,000
20 - 39 (medium-sized)	22	30,500	69,900	100,400
40+ (large)	3	31,700	2,700	34,400
Total	421	342,200	88,600	430,800

1/ From stands both within and without this area.

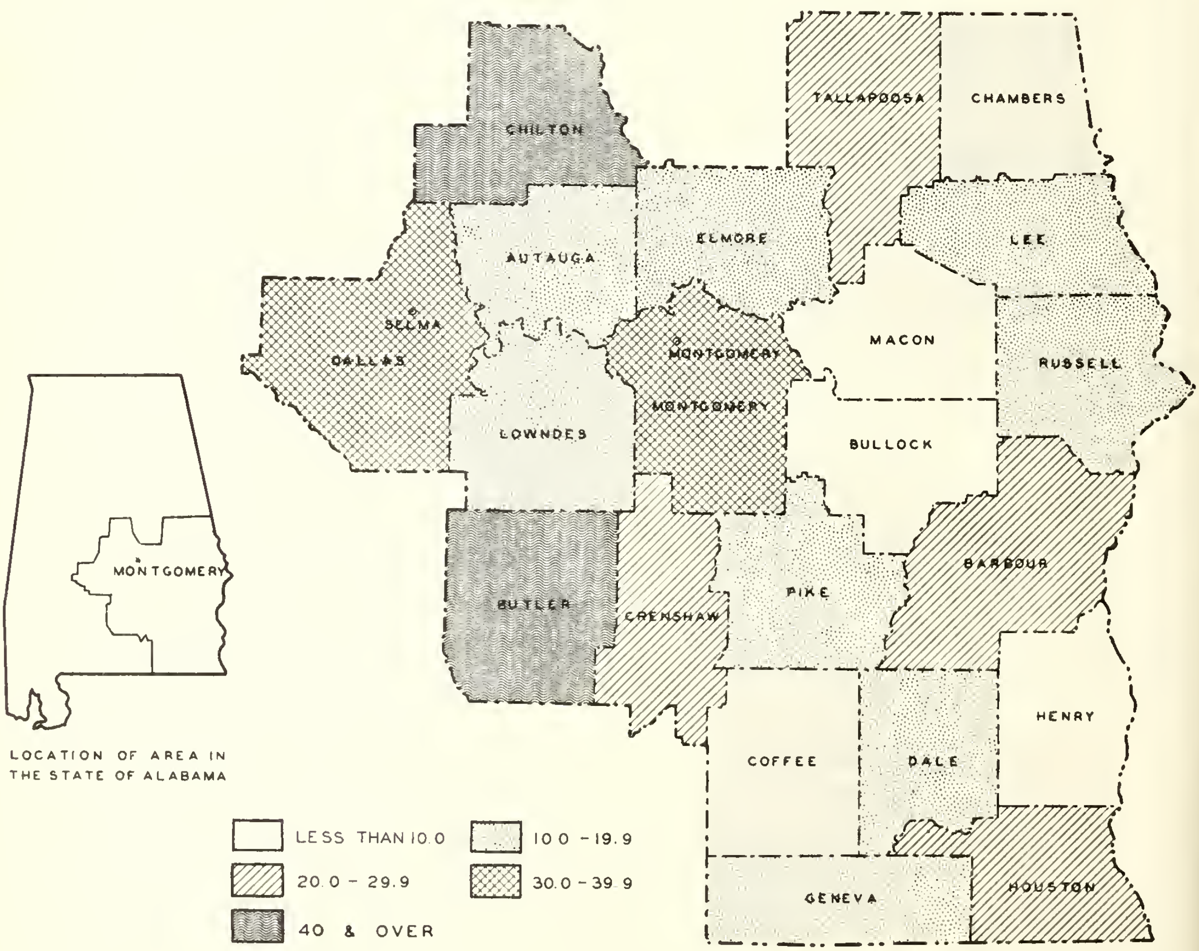

FIGURE 9. - LUMBER PRODUCTION IN MILLION BOARD FEET, BY COUNTIES, 1937.

With an average annual cut per mill of almost 5 million board feet of lumber, the 22 medium-sized sawmills (i.e., mills with a daily rated capacity of 20,000-39,000 board feet) had a total production in 1937 of over 100 million board feet, of which more than two-thirds was hardwood. These mills, which are relatively stationary, produce a variety of lumber items. Only three sawmills have an individual capacity of at least 40,000 board feet per day, but in 1937 these three produced a total of more than 34 million board feet.

As shown by figure 9, the lumber industry in both Butler and Chilton Counties produced 40 million board feet or more in 1937, whereas Bullock, Chambers, Coffee, Henry, and Macon Counties each produced less than 10 million.

In 1937, in addition to the 421 sawmills in the area, there were 11 veneer mills, 8 handle- and dimension-stock plants, 1 cooperage-stock mill, 1 wood-treating plant, and about 17 naval-stores stills. (In addition, there are some shingle mills, mostly small and cutting principally for local use; these are not shown on the industry map.) Most of the veneer produced was for packaging and was made from red and black gums, yellow poplar, pine, and magnolia. The handle plants used ash, white oak, and hickory; and the dimension plants used dogwood, ash, hickory, and hackberry. The naval-stores stills produced almost 5,000 barrels of turpentine and about 16,000 barrels of rosin (valued at about one-quarter million dollars) from the gum of living longleaf and slash pines. Approximately 1,209,000 cords of fuel wood and 3 million fence posts were produced, mostly for use on the farms of the area.

Table 14. - Wood-products employment, 1937

Industry or commodity	Employment		
	In woods	At plants	Total
	- Thousand man-days (10 hours each) -		
Sawmills:			
Small	340	555	895
Medium	126	193	319
Large	37	73	110
Total sawmills	503	821	1,324
Fuel wood	1,408	-	1,408
Gum naval stores	89	5	94
Pulpwood 1/	103	-	103
Veneer and cooperage	22	43	65
Cross ties, poles, and piles	53	-	53
Miscellaneous manufacturing 2/	11	24	35
Fence posts	49	-	49
Total all industries	2,238	893	3,131

1/ All the pulpwood produced in the unit is shipped to mills outside.
2/ Includes treating plants and shuttle, handle, dimension, and shingle plants.

All forest industries combined provided 3 million days of work (10 hours each) in 1937. Slightly less than half of this labor was devoted to the cutting and hauling of fuel wood and fence posts, mainly for farm use (table 14). It is difficult to estimate accurately how many people were employed in the forest-products plants and in the woods, for most of the industries operated only part-time, but excluding the labor involved in producing fuel wood and fence posts, it is roughly estimated that between 15,000 and 20,000 people had full or part-time employment in the woods and mills.

Commodity Drain from the Growing Stock

In 1937, the net increment was 558 million board feet, lumber tally, after deducting mortality, while for the same year, as shown by table 15, the commodity drain from saw-timber material for industrial and domestic use, amounted to 570 million board feet. This commodity drain also includes logs cut for mills outside the area and the saw-timber material wasted in logging. More than three-fourths of the commodity drain from saw-timber material comes from pine; less than one-fourth, from the hardwoods and cypress. Lumber, which makes up 75 percent of the total commodity drain from saw-timber material, is by far the biggest single item; but other important items of drain are fuel wood (10 percent), cross ties (4 percent), and pulpwood (4 percent).

Table 15. - Commodity drain from the sound-tree growing stock, 1937

Reason for drain	From saw-timber material			From all growing-stock material	
	Pine	Hardwood	Total		
	- - Thousand board feet - - (lumber tally)			Cords1/	Thousand cu.ft.2/
Lumber	345,800	81,900	427,700	995,600	76,230
Fuel wood3/	42,500	14,400	56,900	523,400	37,460
Pulpwood	22,200	-	22,200	95,400	7,220
Veneer and cooperage	3,000	12,200	15,200	29,800	2,290
Cross ties	17,100	4,400	21,500	51,600	3,950
Miscellaneous manufacturing	400	1,200	1,600	4,900	360
Poles and piles	1,500	-	1,500	5,600	430
Fence posts	100	1,500	1,600	24,900	1,730
Miscellaneous farm use	13,600	8,000	21,600	119,300	8,490
Total	446,200	4/123,600	569,800	1,850,500	138,160

1/ Outside bark, or bark included.
2/ Inside bark, or bark not included.
3/ Material cut on farms makes up over half the fuel-wood drain.
4/ Includes cypress.

In 1937, the total commodity drain from the sound-tree growing stock amounted to almost 2 million cords of wood, including the bark, or 138 million cubic feet of wood, excluding the bark. This total commodity drain includes drain of saw-timber material, upper stems of sawlog-size pines, and small trees below sawlog size but not less than 5.0 in. d.b.h. It also includes growing stock cut for plants outside the area and the material wasted in woods operations. Of the total commodity drain expressed in cords, lumber makes up 54 percent; fuel wood, 28 percent; miscellaneous farm use, 6 percent; pulpwood, 5 percent; and all other commodities, 7 percent. The total commodity drain, allocated to the commodities for which the trees were cut, is shown in table 15.

Comparison of Increment and Drain

For a 3-year period, Jan. 1, 1935 - Dec. 31, 1937, after making additions for growth and deductions for mortality and commodity drains, the growing stock volume in cubic feet of sound trees 5.0 in. d.b.h. and over was found to have increased about 2 percent (table 16). As shown graphically in figure 10, while the gross growth increased gradually from 1935 to 1937, the drain increased more rapidly than the growth, so that in 1937 the two were approaching a balance. Practically all the increase in drain for the 3 years occurred in industrial and domestic use. Although during 1937 "incomes" (increment) and "withdrawals" (drain) were nearly equal, this condition is not permanent, for drain for such products as lumber, pulpwood, cross ties, etc. easily may be increased to the point at which drain exceeds growth. Mortality drain, i.e., the loss due to fire, insects, wind, etc., makes up about one-fifth the total drain. Much of this mortality is preventable through fire protection and improvement cuttings, and it is apparent that a reduction in mortality would bring about a more favorable relationship between growth and drain. This would provide more material for industrial and commercial use and for building up the growing stock.

In 1935 and 1936, saw-timber growth exceeded the drain against it (table 17 and fig. 11), but during 1937 the rapidly increasing drain exceeded the growth by approximately 12 million board feet. If only one-seventh of the mortality had been prevented in 1937, the growth would have balanced the drain.

It should be remembered when dealing with growth and drain in southeast Alabama that, for 1935, 1936, and 1937 each amounts to not more than 7 percent of the growing stock, and that normal fluctuations in the growth and drain would change the growing stock very little. For the entire 3-year period ending Jan. 1, 1938, the saw-timber component of the growing stock increased approximately 2 percent.

Although the volume of the saw-timber growing stock increased slightly in the past 3 years, its quality has been lowered steadily (a) by woods burning, which increases the number of cull and defective trees, and (b) by the practice of cutting only the larger, good trees and leaving the poorer trees to accumulate. In the hardwood stands, deterioration of quality has been accelerated by cutting only the more valuable species, such as forked-leaf white oak, yellow poplar, and ash, and by leaving in the growing stock a steadily increasing proportion of the less valuable species, among which are black gum, post oak, bay, and elm.

Table 16. - Comparison of growth and drain for the entire growing stock for 1935, 1936, and 1937

Item	Pine	Hardwood[1]	Total
	- - - Thousand cubic feet (i.b.) - - -		
Net growing stock, Jan. 1, 1935	1,563,250	1,303,600	2,866,850
Growth, 1935	100,660	71,920	172,580
Mortality, 1935	16,840	13,740	30,580
Net increment, 1935	83,820	58,180	142,000
Commodity drain, 1935	83,450	27,550	111,000
Net change in growing stock, 1935	+370	+30,630	+31,000
Net growing stock, Jan. 1, 1936	1,563,620	1,334,230	2,897,850
Growth, 1936	103,590	73,150	176,740
Mortality, 1936	16,890	14,070	30,960
Net increment, 1936	86,700	59,080	145,780
Commodity drain, 1936	92,200	32,120	124,320
Net change in growing stock, 1936	-5,500	+26,960	+21,460
Net growing stock, Jan. 1, 1937	1,558,120	1,361,190	2,919,310
Growth, 1937	104,480	74,240	178,720
Mortality, 1937	16,950	14,380	31,330
Net increment, 1937	87,530	59,860	147,390
Commodity drain, 1937	104,750	33,410	138,160
Net change in growing stock, 1937	-17,220	+26,450	+9,230
Net growing stock, Jan. 1, 1938	1,540,900	1,387,640	2,928,540

1/ Includes cypress.

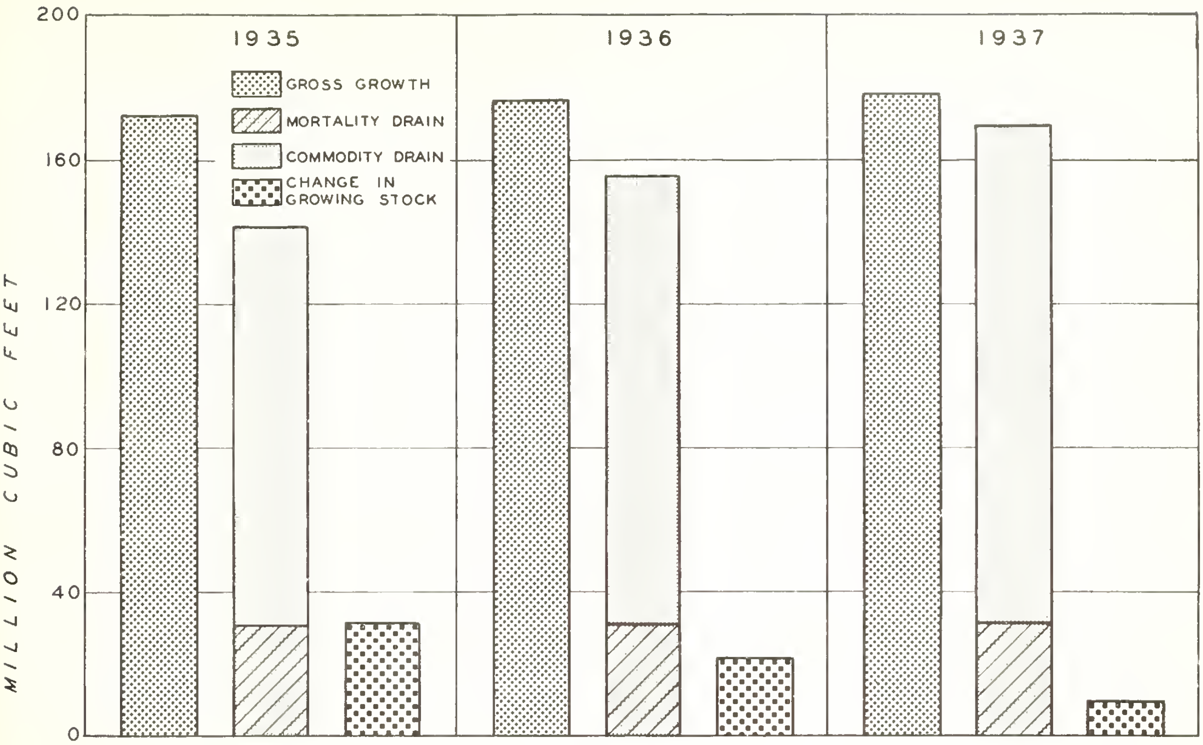

FIGURE 10.—COMPARISON OF GROWTH AND DRAIN FOR THE ENTIRE GROWING STOCK.

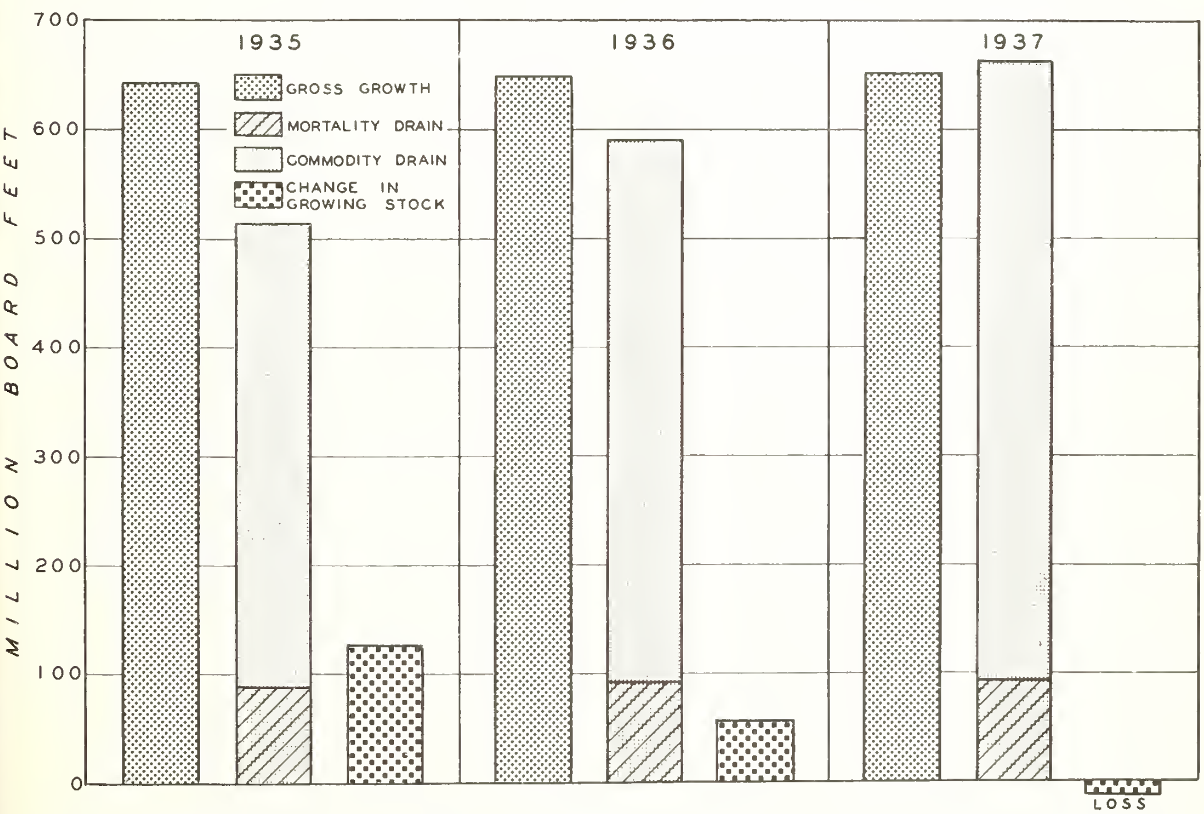

FIGURE 11.—COMPARISON OF GROWTH AND DRAIN FOR THE SAW-TIMBER COMPONENT OF THE GROWING STOCK.

Table 17. - Comparison of growth and drain for the saw-timber component of the growing stock for 1935, 1936, and 1937

Item	Saw-timber part of the growing stock		
	Pine	Hardwood[1]	Total
	- - - - Thousand board feet (lumber tally) [2] - - - -		
Net growing stock, Jan. 1, 1935	5,915,700	3,798,300	9,714,000
Growth, 1935	413,800	227,300	641,100
Mortality, 1935	56,800	32,900	89,700
Net increment, 1935	357,000	194,400	551,400
Commodity drain, 1935	335,100	89,200	424,300
Net change in growing stock, 1935	+21,900	+105,200	+127,100
Net growing stock, Jan. 1, 1936	5,937,600	3,903,500	9,841,100
Growth, 1936	418,400	230,400	648,800
Mortality, 1936	58,200	34,000	92,200
Net increment, 1936	360,200	196,400	556,600
Commodity drain, 1936	383,900	115,400	499,300
Net change in growing stock, 1936	-23,700	+81,000	+57,300
Net growing stock, Jan. 1, 1937	5,913,900	3,984,500	9,898,400
Growth, 1937	418,200	233,400	651,600
Mortality, 1937	59,100	34,900	94,000
Net increment, 1937	359,100	198,500	557,600
Commodity drain, 1937	446,200	123,600	569,800
Net change in growing stock, 1937	-87,100	+74,900	-12,200
Net growing stock, Jan. 1, 1938	5,826,800	4,059,400	9,886,200

1/ Includes cypress.
2/ Based on International $\frac{1}{4}$-inch rule.

Summary of the Forest Situation

Forests are valuable to the extent that they enrich the lives of people. The Forest Survey data are given by this report in such a way as to enable the reader to evaluate for himself the importance of the forest and to evolve plans of action to make this resource contribute more fully to the public welfare.

Southeast Alabama, one of the oldest agricultural areas of the South, presents a rolling surface with light soils, often severely eroded. Since cotton, the principal cash crop, no longer can be depended upon to give adequate economic support, new industries and greater sources of income are urgently needed. Over $4\frac{1}{4}$ million acres, or almost half the total area of 9 million acres, is classed as forest land. Only 3 percent of the forest area is in public ownership, while 56 percent is in farm woodlands and 41 percent is in privately owned non-farm forests.

Loblolly, shortleaf, longleaf, and other pines, and gums, oaks, and yellow poplar are the principal species; pine and pine-hardwood are the most prevalent forest type-groups. Sawlog-size second-growth stands cover almost half the forest area; under-sawlog-size second-growth stands make up two-thirds of the remainder. Old growth occupies only 11 percent; reproduction and clear-cut conditions combined, less than 8 percent.

Site quality, or the timber-producing capacity of the soils, averages medium to good, and the proportion of the better sites is higher than the average for similar forest types in other Forest Survey units of Alabama. The forest stands are so poorly stocked, however, owing to the prevalence of fire and to cutting, that the volumes per acre of the average forest stand are only one-third to one-half of the volume that could be expected under better care and management, as shown by the volumes found on the most heavily stocked 10 percent of the stands (fig. 4).

Most of the stands are young, i.e., less than 50 years old, and most of the trees are in the 2-, 4-, 6-, and 8-inch diameter-classes.

The forest inventory showed almost 10 billion board feet, lumber tally, of saw-timber material, mostly second growth. Much of this, however, was in trees less than 15 in. d.b.h. and in trees that were limby and rough. For the pine and pine-hardwood types, almost nine-tenths of the volume in saw-timber stands stood at the rate of 2,000 board feet or more per acre.

Considering all usable material, both saw timber and non-saw timber, in trees 5 in. d.b.h. and larger, the inventory was over 54 million cords, of which 22 million were in pines, 18 million in pulping hardwoods, and 14 million in nonpulping hardwoods.

Usable material in sound and rotten cull trees amounted to almost 9 million cords. Approximately half the net cordwood volume of sound trees (culls omitted) was in trees 13.0 in. d.b.h. and larger. Although only three-fourths of the total usable cordwood volume was included in the growing stock, the entire forest area, all conditions combined, had an average volume per acre of 9.4 cords of growing-stock material. Included in the inventory figures are almost 12 million pine trees suitable for conversion into poles and piles.

Many forest industries, including 421 sawmills, 11 veneer mills, and 10 other wood-products plants (mostly small), were found in southeast Alabama in 1937. Second only to agriculture, the forest-products industries both in the woods and in the mills provided 3 million man-days of employment. Lumber, fuel wood, and pulpwood were the most important items of commodity drain for industrial and domestic use. No pulp mill is located within southeast Alabama, but pulp mills in adjacent sections of Alabama and Florida draw pulpwood from many parts of this area. According to one authority,1/ wood economically accessible to a pulp mill includes "timber within 40 miles of a pulp or paper mill, or, within 12 miles of a railroad (allowing pulpwood rates) and not over approximately 200 miles from the mill, and within 12 miles of water transportation to a mill."

From Jan. 1, 1935, to Dec. 31, 1937, the volume of the growing stock in trees 5.0 inches d.b.h. and larger experienced a slight increase since growth exceeded drain. In 1937, the growth and drain for all species combined were almost equal; while pines showed a decrease, hardwoods increased.

In 1937, the saw-timber component of the growing stock, all species combined, was reduced 12 million board feet because drain exceeded growth. If the mortality drain had been reduced and the growth had been increased by fire protection and stand-improvement cuttings, this loss might not have occurred. For the 3-year period ending Dec. 31, 1937, the saw-timber growing-stock volume increased slightly.

So poorly stocked are the forest stands that fire protection and other good forest-management practices undoubtedly would increase the growth, but it will be some time before growing stock can be developed sufficiently to utilize fully the high productivity possible under the conditions of climate and forest soils found here. Although forest growth and drain are now approximately equal, forest industries in southeast Alabama could be expanded as and <u>if</u> steps are taken to increase the annual increment. Any expansion of the uses of forest raw materials, however, should be adjusted to the increased growth expected, the material in cull trees, that salvaged from thinnings, and that saved through the reduction of fire losses.

Measures Necessary to Improve the Situation

With only 3 percent of the forest in public ownership and with about 39,000 different private owners, many of whom neglect their forests and are not skilled in even the elements of good forest management, the problem of getting good forestry practices adopted throughout the area is difficult but not impossible. Today, in traveling through southeast Alabama, one is impressed with the large number of newly terraced fields, the wide use of cover and soil-building crops, and the developing cattle and dairy industries. All these recent improvements owe their existence largely to publicly directed extension work. Forestry and agriculture, with much in common, can be taught by approximately the same methods.

1/ Earl Porter, Southern Pine Forestry Notes, No. 54, March 1939. Dept. of Conservation, Southern Pine Ass'n., New Orleans, La.

Making personal contacts with individual forest owners, setting up of demonstration areas, and sample marking not only will build up a consciousness and appreciation of good forestry practice and its possibilities but will train individual owners in fire protection, thinning, improvement cutting, selective logging, careful utilization, and other steps necessary for sound forest management. If forestry-extension agencies first concentrate upon the larger properties (17 percent of the number of ownerships), the area involved will be almost two-thirds of the total. It is fundamental, however, that the general public, including tenants and urban residents, be taught the desirability of protecting and developing the forest.

Increased effort is needed in the prevention and suppression of forest fires, which damage the forest in two principal ways: (1) They cause a loss in actual volume and reduce the grade or quality of the timber not killed; and (2) they prevent the survival and development of many young trees which are badly needed to augment the stocking of the stands. Only a small part of southeast Alabama has organized fire protection. For prompt and effective results, it is essential that protection be extended to the entire area, possibly on a county-wide basis. As many forest fires in this area are either wilfully or carelessly set by the general public, a proportionate part of the costs of protection should be borne by the public.

Many trees, especially those in old field-stands, have grown in such open stands that they are limby, rough, and consequently of low quality for many uses. Also many trees are growing in stands so crowded that growth has stagnated, while fire-scars and other defects have placed still other trees in the class of culls. Stand-improvement cuttings are recommended for these stands, therefore, wherever the returns from products obtained in thinnings and the cutting of undesirable trees will pay at least the cost of the improvement measures.

In place of the present practice of cutting only the highest-quality trees, a system of selective logging should be adopted; the slow-growing and undesirable trees, as well as some of the best trees, should be removed, leaving the stand in a healthy, rapidly growing condition. Cuts, which should be gaged to the growth of the stands, should be as light and as frequent as economic conditions permit. After making several selective cuttings, an appreciable increase in both the volume and quality of the growth may be expected.

Effort should be made to secure for the landowners and forest-products manufacturers the full and most economic use of the trees cut. All usable parts of the tree should be converted into the product for which they are best suited. This involves integrated utilization, which means that the trees removed in any cutting are converted into sawlogs, poles and piles, cooperage and veneer stock, pulpwood, etc., depending upon which forest product yields the greatest stumpage returns. This would eliminate the cutting of saw-timber trees into fuel wood and would limit utilization for this purpose to the nearly 9 million cords in cull trees, which should be removed to improve the stands.

More forest industries that can use the low-grade raw materials of the old-field second-growth stands of southeast Alabama are sorely needed. A pulp mill, for which ample supplies of low-quality material are in sight, not only could use much of the material now without a market, but also could aid materially in furnishing rural labor a much-needed opportunity for full or part-time employment. The special Unemployment Census taken in Nov. 1937 disclosed that in this Survey unit there were 36,000 people either unemployed and wanting work, or on relief, and 35,000 partially employed and wanting more work.

If greater market demand for the forest products of this unit in the future can be anticipated, it may be expedient to plant abandoned fields and clear-cut forest areas that are so large or so far removed from seed trees that natural seeding from adjoining forests will be slow if not impossible. Of the total areas of idle or abandoned farm land and clear-cut forest land, which together amount to about 660,000 acres, it is roughly estimated that about 160,000 acres may justify artificial reforestation, while the remaining 500,000 acres can be expected to reforest naturally, if given fire protection.

Although the drain for industrial and domestic use and for mortality already approximates the growth, as previously brought out in this report, the present growth represents only a fraction of the potentialities of the sites, owing largely to the poorly stocked condition of the stands. In the long run, the forest-products industries must be kept within a sound pattern of sustained yield, in which the cut over a period of years may equal but not exceed the growth; but with a widespread adoption of good forest-management practices, the growth can be increased to a point probably double what it is at present. Then, enriched by greater supplies of raw materials for new and expanded industries on a permanent basis, the forests of southeast Alabama will help provide the people of this area with a better living and with greater security than they now enjoy.

FORREST SURVEY RELEASE NO. 48 JAN. 12, 1940

FOREST RESOURCES OF WEST CENTRAL ALABAMA

by

A. R. Spillers
Associate Forest Economist

A Progress Report by

THE SOUTHERN FOREST SURVEY

I. F. Eldredge, Regional Survey Director

SOUTHERN FOREST EXPERIMENT STATION

E. L. Demmon, Director

New Orleans, La.

FOREWORD

The nation-wide Forest Survey, being conducted by the United States Forest Service, was authorized by the McSweeney-McNary Forest Research Act of 1928. Its five-fold object is: (1) to make an inventory of the present supply of timber and other forest products; (2) to ascertain the rate at which this supply is being increased through growth; (3) to determine the rate at which this supply is being diminished through industrial and local use, windfall, fire and disease; (4) to determine the present requirement and the probable future trend in the requirement for timber and other forest products; and (5) to correlate these findings with existing and anticipated economic conditions, in order that policies may be formulated for the effective use of land suitable for forest production.

This release is based on a field survey made May 22, 1935, to July 13, 1935, and three field canvasses of forest industrial plants to determine forest drain, the last of which was made during May 1938. It should be regarded only as a progress report, since it contains Forest Survey data that will be included in complete reports to be published later and that, although considered reliable, are subject to correction or amplification as the work of computation proceeds. Item 4 above, which is being studied on a national basis, is not discussed in this report.

In the presentation of these survey data, it should be noted that owing to the sampling method used in collecting them, the greater the number of samples in any given classification the more accurate are the data for that classification. Hence classes that are of infrequent occurrence and relatively small in quantity generally cannot be determined with as high a degree of accuracy as classes that occur more frequently and in substantially greater quantities. Small tabular items are to be taken as showing, not the exact magnitude of the classes involved, but their relative magnitude in comparison with those of other classes.

In the South, the Forest Survey functions as an activity of the Southern Forest Experiment Station with headquarters at New Orleans, La.

Assisting Staff

E. B. Faulks, Associate Forest Economist, In Charge of Field Work
P. R. Wheeler, Forest Economist, In Charge of Mensurational Analyses

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Note: Assistance in the preparation of these materials was furnished by the personnel of Work Projects Administration official project 65-2-64-74.

FOREST RESOURCES OF WEST CENTRAL ALABAMA

General Description

Lying west of Birmingham and north of Demopolis, West Central Alabama (Forest Survey Unit Alabama No. 4) includes almost $4\frac{1}{2}$ million acres within the following 9 counties: Bibb, Fayette, Greene, Hale, Lamar, Marion, Perry, Pickens, and Tuscaloosa (map, fig. 1). This distinctly rural area includes only one incorporated city or town with a population of 2,500 people or more (Tuscaloosa, 1930 population 20,700). Of the total population (245,000 in 1930), about 66 percent live on farms, 26 percent in non-farm homes in rural areas, and 8 percent in Tuscaloosa. There are only 36 people per square mile, as compared with 52 for the entire State. Agriculture, the manufacture of forest products, and mining are the principal sources of employment. Although agriculture broadly defined includes both farming and forestry, in this report agriculture is used to mean farming, and forestry to mean timber growing and utilization.

Settled soon after 1800, this area, which was developed upon a cotton economy, received one calamitous setback during the War between the States and another during the boll-weevil epidemic. Moreover, erosion has so impoverished the light soils that many of the upland farmers cannot now compete successfully with the tillers of the more fertile cotton acres in the bottom lands. For this reason, the possibilities of supplementing the present sources of employment should be studied; and in this connection an account of the forest resource and the wood-products industries, based upon a recent study made by the Forest Survey, may be useful, especially when it is considered that more than 6 acres out of every 10 are in forests (table 1) and that there are more than 10 acres of forest for every acre planted to cotton.

Most of this unit is in the Coastal Plain with its gently rolling hills, although the northeast part (about 15 percent of the area) extends up into the Cumberland Plateau and into the Valley and Ridge Province, where some of the steep ridges reach elevations of more than 500 feet above sea level.

According to the Bureau of Agricultural Chemistry and Engineering, this area is dominated by gray to yellow, sandy and fine-sandy loams, with some fine sands. In the northeast part, grayish-yellow to reddish, fine-sandy and silt loams, developed from sandstones and shales, are found together with some brownish-red to red, silt and clay loams, developed from limestone. The southwest part—about one-seventh of the area, including parts of Perry, Hale, and Greene Counties—is in the Black Prairie; much of this fairly level area has black (or brown) friable soil underlain by whitish material high in lime.

Excellent freight-transportation facilities are available on the Black Warrior River, which flows from Birmingham southward across the unit towards Mobile and the Gulf of Mexico. The Tombigbee River (which forms the southwest boundary of this area) here has a shallow channel suitable for rafts and flatboats throughout its length in the unit. About five main highways, mostly paved, which radiate from Tuscaloosa to the boundaries of the area, are supplemented by many country roads. Several railroad lines, including the Southern, the Mobile and Ohio, and the St. Louis and San Francisco, serve the area.

Table 1. Land area classified according to land use, 1935

Land	Area	Proportion of total area
	Acres	Percent
Productive forest	2,711,700	61.8
Nonforest:		
Agriculture:		
In cultivation:		
Old cropland	1,155,100	26.3
New cropland	42,700	1.0
Out of cultivation:		
Idle	121,500	2.8
Abandoned	76,300	1.7
Pasture	234,000	5.3
Total agriculture	1,629,600	37.1
Other nonforest	49,100	1.1
Total nonforest	1,678,700	38.2
Total forest and nonforest	4,390,400	100.0

Although no large hydroelectric plants are located in the area, within 150 miles of Tuscaloosa are several large water-power developments, including those of the TVA at Muscle Shoals and Pickwick Landing, both on the Tennessee River.

Coal, the most important mineral resource, is mined in Bibb, Fayette, Marion, and Tuscaloosa Counties. Over a million tons were mined in 1934, almost half of which came from Bibb County; more than 2,000 people were employed at the mines in the unit.

Agriculture gives employment to over two-thirds of the gainfully employed workers. According to the 1935 Census of Agriculture, the total area in farms, including farm woodland, was 2,613,000 acres, or almost 60 percent of the entire area; the woodland on farms covered 1,330,000 acres. Cotton is the principal cash crop, although in 1934 it was harvested on only 256,000 acres, as compared with 407,000 acres of corn. From 1924 to 1934 the cotton acreage was reduced 70,000 acres, or about 22 percent, and this reduction caused a drop in employment of about 900,000 man-days of work in cotton cultivation and harvesting. Although the yield of cotton per acre increased during this period, the value of the cotton declined from about 11 million dollars to less than $6\frac{1}{2}$ million dollars; and the preliminary estimate by the U.S.D.A. for 1938 shows a probable decline to $4\frac{1}{2}$ million dollars. Yields of cotton are about two-fifths bale per acre—slightly above the average for the United States; but yields of corn are about 13 bushels per acre—far below the National average.

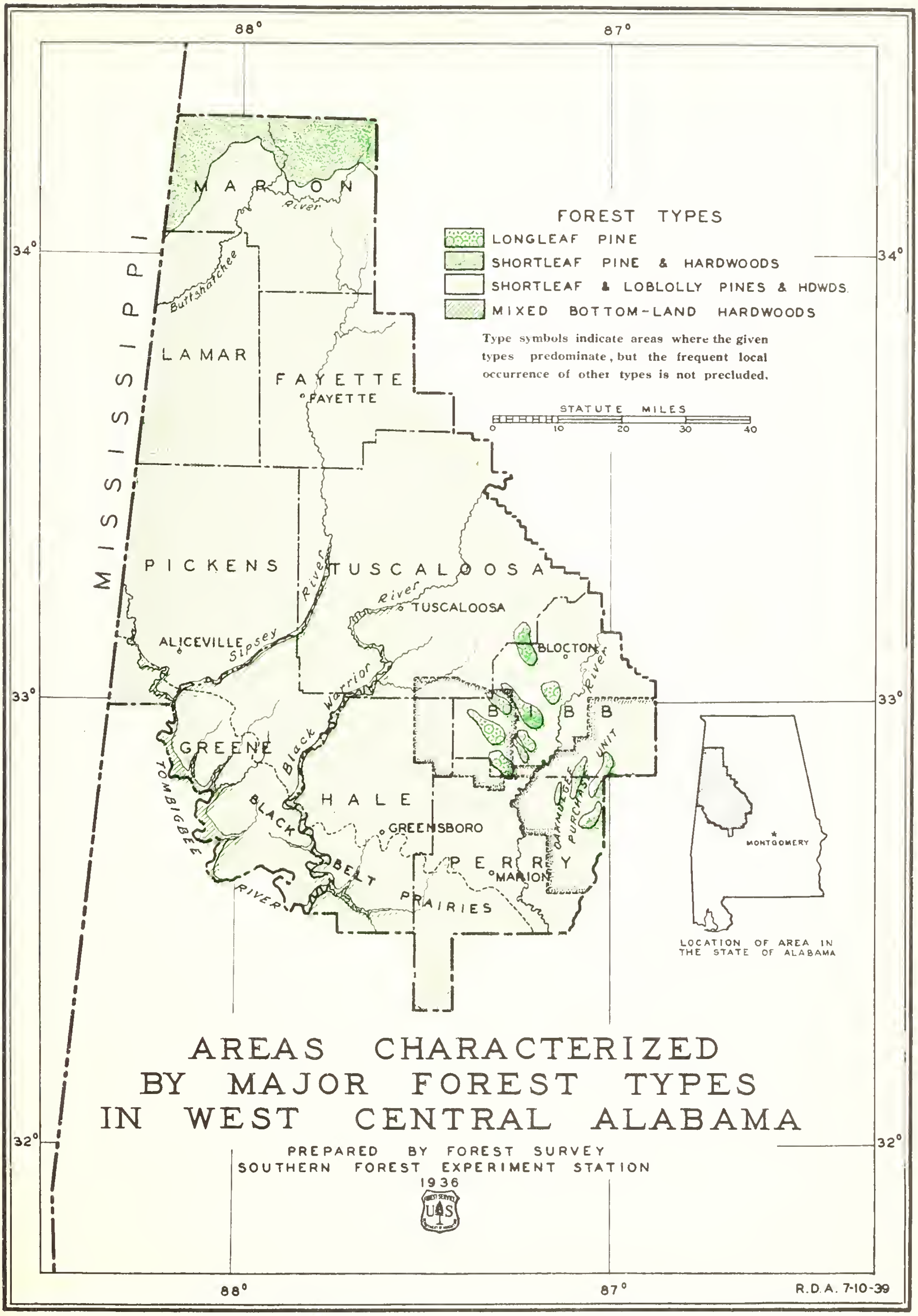


FIGURE 1.– FOREST TYPE MAP.

Some of the counties are more highly developed for agriculture than others. According to the 1935 Census of Agriculture, Greene, Hale, and Perry Counties, parts of which are in the Black Prairies, have at least 30 percent of their land "available for crops" (i.e., in cropland and plowable pasture); Marion, Lamar, Fayette, and Pickens, in the northern part of the area, have 20 to 29 percent; and Tuscaloosa and Bibb Counties, in the mountainous, eastern part of the unit, have less than 20 percent. Most of the land not available for crops is in some stage of forest cover.

A recent study of land ownership in this area made by the Bureau of Agricultural Economics of the U.S.D.A., in cooperation with the Works Progress Administration of Alabama, shows that the land is held in about 20,000 ownerships, only 14 percent of which are 260 acres or more. These larger ownerships, however, include almost two-thirds of the total land area, as shown in the following tabulation:

Size of ownership	Percent of the number	Percent of the area
Less than 100 acres	54	13
100 - 259 acres	32	25
260 - 499 acres	9	17
500 - 999 acres	3	13
1,000 acres and over	2	32
	100	100

In the Black Prairies of this area, the proportion of land in ownerships of 260 acres or more is much greater than in the remainder of the unit.

This study shows also that 70 percent of the area is owned by local residents; 22 percent by residents of other counties in Alabama; 6 percent by non-residents of the State; and 2 percent by the public or by owners whose residence is unknown.

Additional information furnished by this same study was the proportion of the land owned by different business groups, which is summarized as follows:

Business group	Percent of area owned
Farmers	56
Merchants	4
Professional men	3
Administrators and executors	6
Banks and mortgage companies	3
Real-estate agencies	2
Wood-using industries	5
Mining, power, and railroad companies	7
All other businesses, including farming companies	8
Governmental agencies (publicly owned land)	1
Unknown	5
Total	100

Soil erosion is occurring almost everywhere in the unit, but the Sur-
ey field men recorded only the following well-marked and destructive forms: 1) sheet erosion, in which the soil is washing off from a generally smooth urface; (2) shoestring erosion, in which the soil surface is cut into and a ystem of small, branching gullies a few inches to 2 feet deep is formed; and 3) gully erosion, in which the soil surface is being destroyed by systems of eep gullies. In one or more of the three forms, marked erosion is found on 0 percent of the cropland in cultivation, 20 percent of the idle cropland, 1 percent of the abandoned cropland, 10 percent of the pasture, and 14 per-ent of the forest land, which includes many old gullied fields with only a artial stocking of trees (table 2). The forest is usually located on the teeper slopes, which are more susceptible to erosion than gentle slopes. lso, accelerated erosion is often found in newly established forests, which nly recently had been abandoned fields. When a grass- or tree-growth be-omes well established, erosion is generally checked unless there is consid-rable drainage through the area from open fields higher up the slope.

Table 2. - Correlation of land use with erosion, 1935

Land use	Type of erosion				Total
	None or arrested	Sheet	Shoestring	Gully	
	Acres				
orest	2,342,100	201,200	67,300	101,100	2,711,700
ropland in cultivation	1,080,000	73,300	40,300	4,200	1,197,800
dle cropland	96,900	15,600	7,400	1,600	121,500
bandoned cropland	60,500	5,000	7,500	3,300	76,300
asture	210,200	8,200	7,400	8,200	234,000
Total	3,789,700	303,300	129,900	118,400	4,341,300
ercent of total	87.3	7.0	3.0	2.7	100.0

Description of the Forest

More than four-fifths of the entire forest area is in the rolling up-ands, the remainder being in river bottoms, branch heads, and swamps. Lob-olly and shortleaf pines, the principal forest species (fig. 2), are found lone or with hardwoods throughout the area. The prevalence of certain char-cteristic forest types over large areas is shown on the map (fig. 1), although ithin the broad ranges there delineated many small intermingled areas of other ypes occur as well as areas of cleared land.

As shown by table 3, the pine and the pine-hardwood type-groups com-ined cover 70 percent of the forest area, while the remainder is fairly evenly divided between the upland and the bottom-land hardwood type-groups. The first three of these type-groups are located mainly in the rolling uplands, whereas the fourth is confined to the river bottoms, branch heads, and swamps. Based upon cubic volume, the pine type-group is 86 percent pine and 14 percent hardwood; the pine-hardwood type-group is 44 percent pine and 56 percent hardwood, mainly oaks, gums, and hickories; the upland hardwood type-group is 10 percent pine and 90 percent hardwood, chiefly oaks, hickories, and gums; and the bottom-land hardwood type-group is only 3 percent pine and 97 percent hardwood, chiefly gums, oaks, yellow poplar, and hickories.

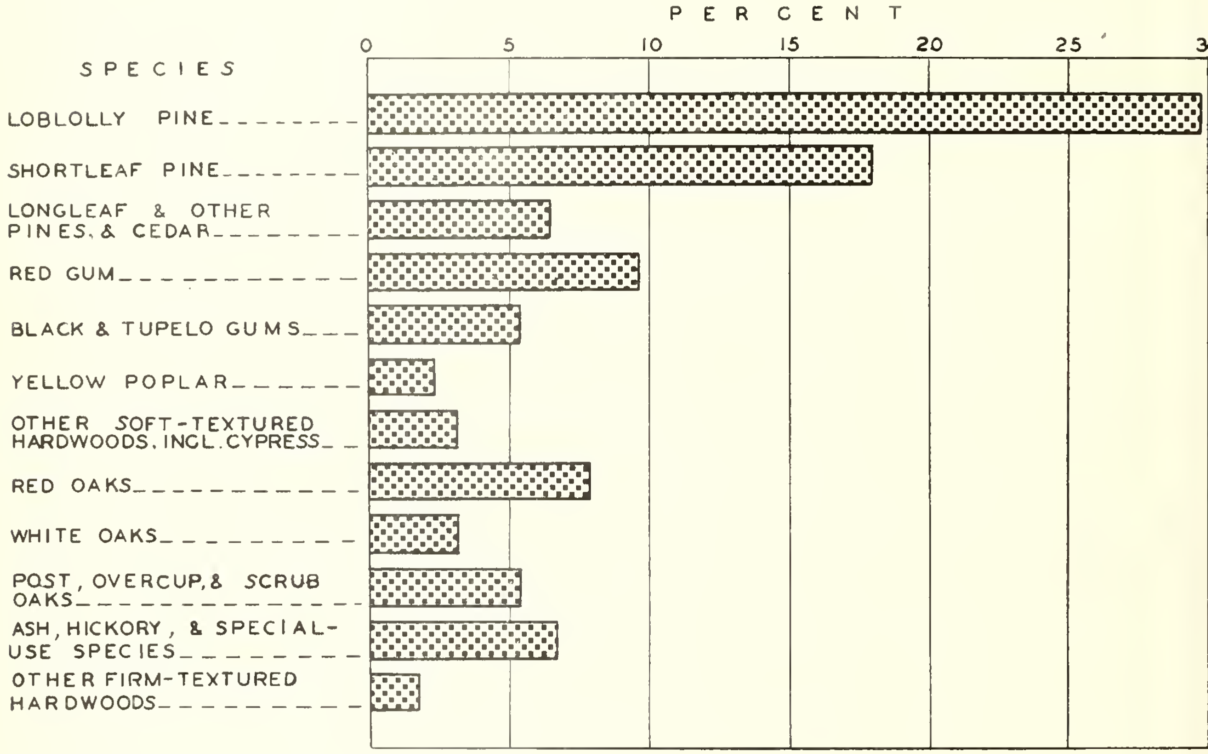


FIGURE 2.— PROPORTION OF THE VARIOUS SPECIES, BASED UPON CUBIC VOLUME.

Less than one-tenth of the entire forest area is classed as old growth, with large, old, high-quality, saw-timber trees. Most of the old growth is in the hardwood types; and, for all types combined, by far the greater part of the old growth is partly cut, with 10 percent or more of the sawlog-size trees[1/] removed. Old-growth uncut stands, which usually occur in small scattered tracts, have an average volume per acre of 7,300 board feet (lumber tally), whereas the old-growth partly cut stands average 3,700 board feet.

1/ Sawlog-size pines are at least 9.0 in. d.b.h. and hardwoods, 13.0 in.

Table 3. - Forest area classified according to forest condition and forest type-group, 1935

Forest condition	Forest type-group				Total all types	Proportion of total
	Pine	Pine-hardwood	Upland hardwood	Bottom-land hardwood		
	Acres					Percent
ld growth:						
Uncut	22,200	17,300	14,700	18,100	72,300	2.7
Partly cut	33,700	32,000	46,000	79,600	191,300	7.0
Total	55,900	49,300	60,700	97,700	263,600	9.7
econd growth:						
Sawlog size:						
Uncut	440,000	147,000	66,500	114,900	768,400	28.3
Partly cut	198,700	104,200	43,500	41,900	388,300	14.3
Under sawlog size	437,600	386,700	222,500	128,900	1,175,700	43.4
Reproduction[1]	50,000	25,400	32,900	7,400	115,700	4.3
Total	1,126,300	663,300	365,400	293,100	2,448,100	90.3
Total all conditions	1,182,200	712,600	426,100	390,800	2,711,700	100.0
ercent of total orest area	43.6	26.3	15.7	14.4	100.0	

/ Includes 16,400 acres of clear-cut condition.

It is noteworthy that the second-growth stands, having grown up naturally ver the old fields or above the stumps of previous forests, now make up 90 per-ent of the entire forest area. Almost half the second growth is classed as awlog size; here the uncut stands average 3,400 board feet per acre and the artly cut, 2,100 board feet with a minimum of 400. Second-growth stands that ave not reached saw-timber size but are made up chiefly of saplings (i.e., ines less than 9.0 in. d.b.h. and hardwoods less than 13.0 in.) are equally xtensive, but they have only a small saw-timber volume per acre, and this in few sawlog-size trees. Including all usable material in trees 5.0 in. d.b.h. nd larger, these stands have an average volume per acre of about 4 cords, in-luding bark. The small remaining area of second growth is in the reproduction ondition, in which the principal forest stands are seedlings and sprouts. sually when fields are abandoned, or the forest is cut over, natural repro-uction is quick to establish itself. In general, the reproduction has the ame species composition as the adjacent stands, although the more prolific eeders and the more fire-resistant species tend to take over the area.

The site index, or productive capacity, of the forest land is measured by the height in feet attained by average dominant trees at 50 years of age. Approximately 27 percent of the areas dominated by loblolly pine has a site index of 90 or over, which is indicative of the better sites; 34 percent, 80; 23 percent, 70; and 16 percent, 60 or less. Of the areas dominated by shortleaf pine, 6 percent has a site index of 80 or over; 25 percent, 70; 49 percent, 60; and 20 percent, 50 or less. These proportions compare favorably with those of other Survey units in the pine-hardwood region east of the Mississippi.

Figure 3 gives for the existing stand the proportion of the area occupied by each 10-year age-class and the cubic feet of wood per acre in the different age-classes. These data are based upon the pine and pine-hardwood type area of 1,741,300 acres (153,500 acres in the longleaf-pine types not included). Approximately 38 percent of the forest area is occupied by stands not over 30 years old; 45 percent, by stands 31 to 60 years old; and only 17 percent, by stands at least 61 years old.

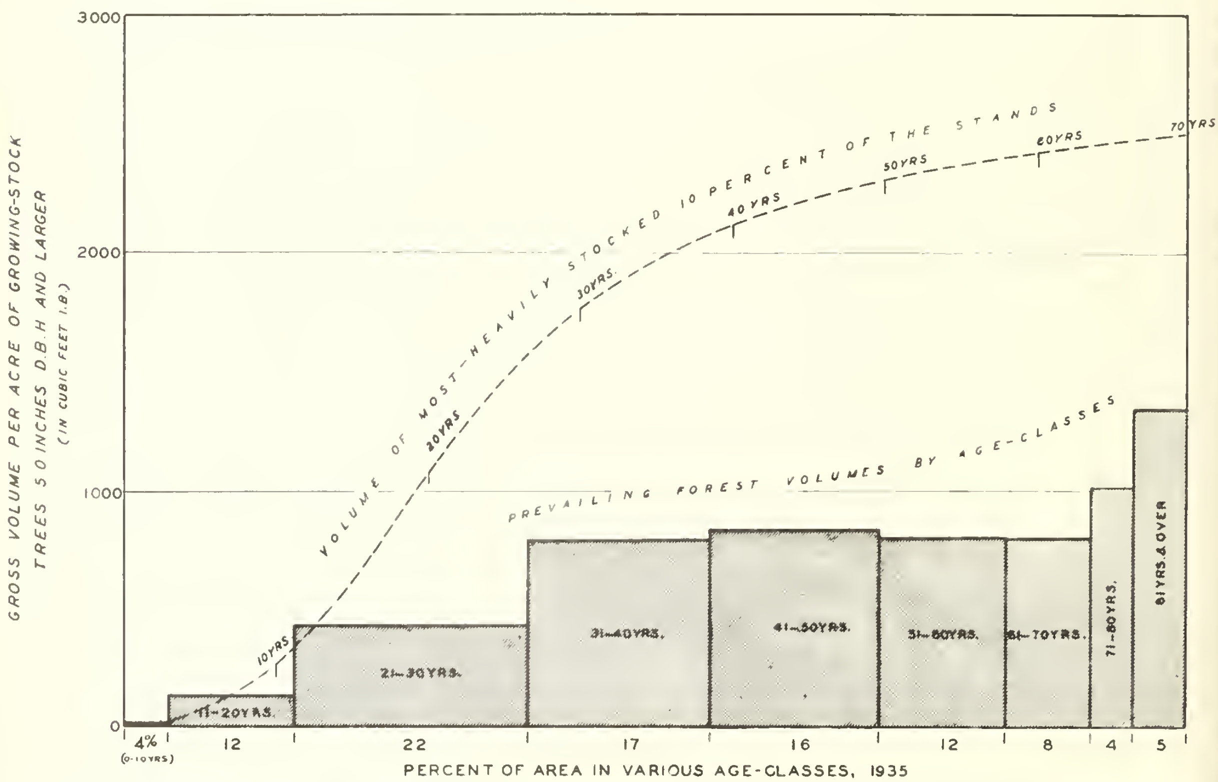


FIGURE 3.— PREVAILING VOLUMES, BY AGE-CLASSES, COMPARED WITH THOSE IN WELL-STOCKED STANDS (BASED ON PINE AND PINE-HARDWOOD TYPE-AREAS OF 1,741,300 ACRES)*

* EXCLUDING 153,500 ACRES IN THE LONGLEAF-PINE TYPES.

The average gross volume (bark omitted) ranges from practically nothing for the youngest stands to about 800 cubic feet per acre for the stands 31 to 70 years old, and to over 1,300 cubic feet per acre for the oldest stands. The average density of the stocking is far below the potential timber-growing capacity of the land. To arrive at some measure of the deficiency, the average stocking is compared with that on the average of the most-heavily stocked 10 percent of the stands having the same weighted site indexes. This comparison, which is shown in figure 3, indicates that the forest land is capable of maintaining over twice the volume of timber it now supports and indicates a striking opportunity for building up the growing stock, without which full use of the soil and optimum harvests cannot be expected.

Figure 4, which presents the number of trees in each diameter-class for four main species-groups, shows that most of the sound trees are in the 2- and 4-inch diameter-classes.[2] The soft-textured hardwoods, generally considered suitable for pulping, include gums, yellow poplar, sweet bay, red maple, cypress, and willow. The firm-textured hardwoods include oaks, hickories, elms, ash, and other hardwoods not generally pulped at present but which in the future may be found suitable. Numerically, the hardwoods have greater representation than the pines, although considering only the trees in the 6-inch and larger classes, the forest stands of the entire area are about evenly divided between the pines and hardwoods.

The relatively plentiful trees of the 2- and 4-inch classes are forest recruits of the future, since it is from them the growing stock may be built up. Protection from fire is essential if the smaller trees are to contribute their full potential value in ultimately building up the larger and more valuable size-classes. The stands are not well balanced, however, in that there is too small a proportion of large trees (18-inch class and larger) in which the greatest commercial values are found. Instead of the present practice of logging all merchantable trees, a system of selective cutting should be used in which the amount needed for the cutting is made from trees of as many sizes as is economically possible. Some of the largest and best trees, as long as they are growing rapidly, should be saved to build up the large-tree component of the stands.

Of the 2-3/4 million acres of forest land, 1,330,000 acres are in farm woodlands, 1,132,000 in non-farm private ownerships, and only 250,000 in public ownership. A recent study of forestry practices in the non-farm private forests, made by the Division of State and Private Forestry of Region 8 of the Forest Service, shows that for the 43 properties examined, aggregating 623,000 acres in this unit, about 24 percent is handled under "good" practices for continuous forest crops; 73 percent is handled under practices that are "poor" but that leave the land productive; and only 3 percent is in "lands not left productive." Less than one-fourth of the total forest area is included in this study, however, and most of the properties examined are large; probably the remaining three-fourths of the forest is not in such good condition, as indicated by the dearth of large trees and the surplus of small ones.

2/ The 2-inch class includes trees 1.0 to 2.9 in. d.b.h.; the 4-inch class, 3.0 to 4.9 in. d.b.h.; and so on.

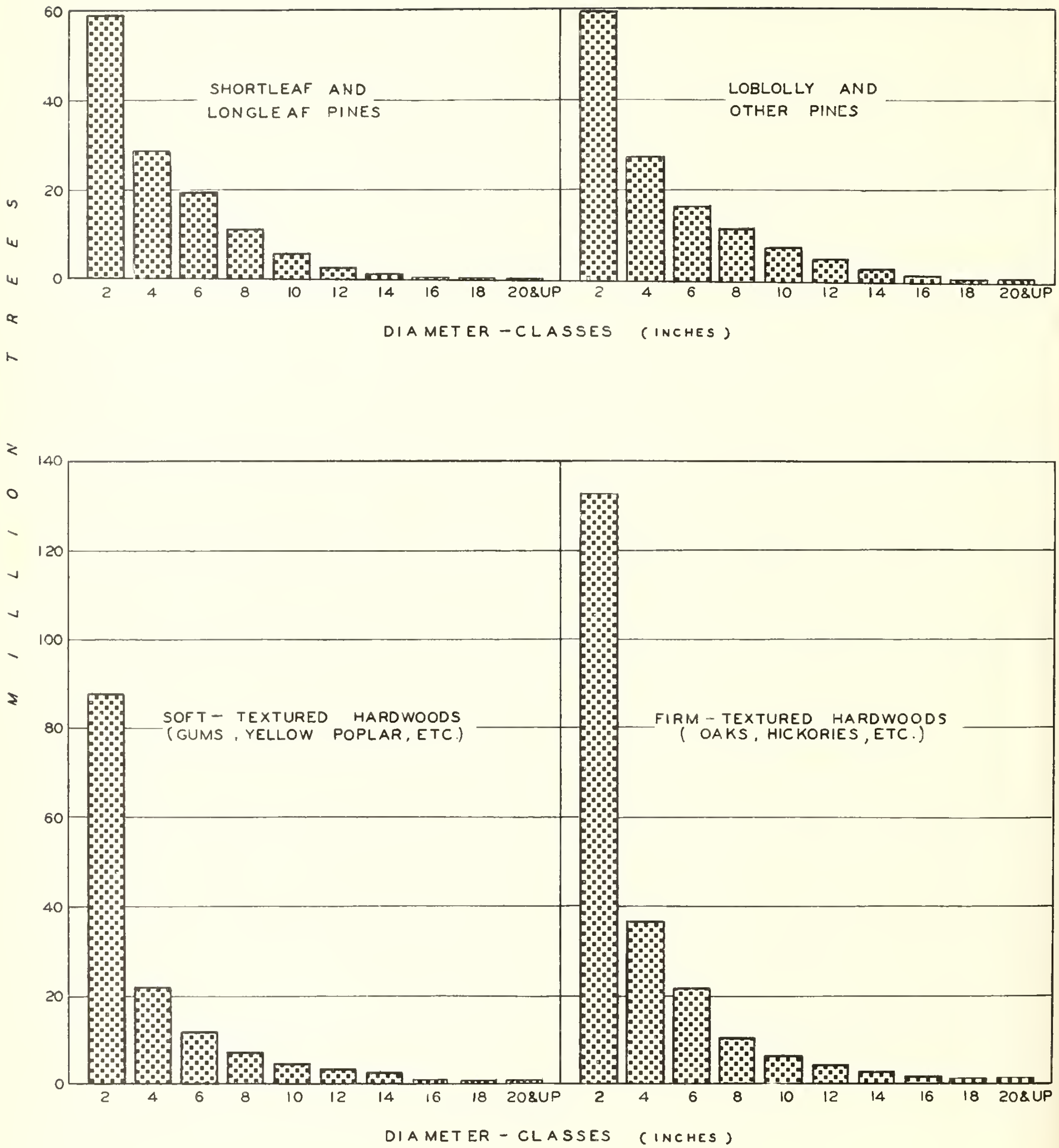


FIGURE 4.— STAND DIAGRAMS OF SOUND TREES.

Volume Estimates

Saw-timber volumes

In 1935 this Survey unit had a net volume of saw timber of about 5 bil-
.on board feet, lumber tally (table 4). According to the Doyle rule, which
s in general use in the South, the saw-timber volume is not much over 3 bil-
.on board feet, but because of the large volume in small logs in this unit,
ne Doyle rule underruns lumber tally by an average of 43 percent for the pine,
nd 29 percent for the hardwoods. Pines included in this estimate are at least
0 in. d.b.h., and hardwoods, 13.0 in.; and all trees have 50 percent or more
' their gross volume in sound material, or contain a sound butt log at least

'able 4. - Net board-foot volume (lumber tally, based on International ¼-inch rule) in the various forest conditions, 1935

Species-group	Old growth		Second growth			Total	Proportion of total
	Uncut	Partly cut	Sawlog size		Under sawlog size1/		
			Uncut	Partly cut			
	- - - - - -	- - - - - -	Thousand board feet	- - - - - -	- - - - - -	- - - - - -	Percent
.nes:							
Loblolly	146,600	108,200	1,244,400	274,500	88,400	1,862,100	37.2
Shortleaf	62,100	49,000	413,500	188,300	88,700	801,600	16.0
Longleaf	80,900	37,200	106,200	26,200	27,300	277,800	5.6
Others2/	14,900	8,900	84,300	18,800	5,700	132,600	2.7
Total pines	304,500	203,300	1,848,400	507,800	210,100	3,074,100	61.5
.rdwoods:							
Red gum	52,400	118,000	211,400	87,800	24,200	493,800	9.9
Black and tupelo gums	29,800	77,800	90,100	30,600	17,100	245,400	4.9
Yellow poplar	16,100	23,200	86,900	25,900	8,100	160,200	3.2
Other soft-textured hdwds.3/	10,700	44,600	41,100	12,800	6,300	115,500	2.3
Red oaks	36,200	81,000	136,500	71,300	41,900	366,900	7.4
White oaks4/	37,300	71,200	74,800	34,900	19,400	237,600	4.8
Other firm-textured hdwds.5/	37,900	89,900	90,400	48,900	34,500	301,600	6.0
Total hardwoods	220,400	505,700	731,200	312,200	151,500	1,921,000	38.5
Total all species	524,900	709,000	2,579,600	820,000	361,600	4,995,100	100.0
rcent of total	10.5	14.2	51.7	16.4	7.2	100.0	

Includes 6,500 M board feet in residual trees in the reproduction and clear-
t conditions.
Includes a small amount of cedar.
Includes sweet bay, red maple, cypress, and willow.
Includes about 65,600 M board feet in low-grade white oaks, such as post oak.
Includes hickories, elms, ash, beech, birch, pecan, and sycamore.

12 ft. long. Top diameters vary with the present usable limits, but no pine logs less than 5.5 in. in diameter, inside bark, and no hardwood logs less than 8.5 in. are included; the top diameters actually used averaged larger than these minima. All figures are net, deductions having been made for portions of the tree which cannot be manufactured into lumber on account of fire scars, rot, crooks, limbiness, bad knots, etc., as well as for loss in manufacture due to sweep and hidden defects.

Pines (loblolly pine has more volume than all other pines combined) make up slightly less than two-thirds of the saw-timber volume; hardwoods more than one-third. For all species combined, the sawlog-size second growth (uncut and partly cut conditions combined) includes more than two-thirds of all the saw-timber volume.

Of importance to the forest-products industries is the fact that the material at hand is in small trees; 47 percent of the pine saw-timber volume is found in trees 9.0 to 12.9 in. d.b.h., and 64 percent of the hardwood volume is in trees 13.0 to 18.9 in. d.b.h. (table 5).

Table 5. - Diameter distribution of net board-foot volume (lumber tally) in the various forest conditions, 1935

Species-groups and diameter-classes (in inches)	Old growth		Second growth			Total	Proportion of total
	Uncut	Partly cut	Sawlog size: Uncut	Sawlog size: Partly cut	Under sawlog size1/		
	Thousand board feet						Percent
Pines:							
10 - 12	36,400	58,000	878,200	302,500	175,300	1,450,400	47.2
14 - 16	64,900	80,500	600,200	131,200	30,700	907,500	29.5
18 - 20	83,500	37,900	242,200	56,500	4,100	424,200	13.8
22 and over	119,700	26,900	127,800	17,600	-	292,000	9.5
Total pines	304,500	203,300	1,848,400	507,800	210,100	3,074,100	100.0
Hardwoods:							
14 - 18	101,900	235,400	540,000	232,000	123,100	2/1,232,400	64.2
20 - 28	80,700	235,000	180,700	77,800	25,100	599,300	31.2
30 and over	37,800	35,300	10,500	2,400	3,300	89,300	4.6
Total hardwoods	220,400	505,700	731,200	312,200	151,500	1,921,000	100.0

1/ Includes 6,500 M board feet in residual trees in the reproduction and clear-cut conditions.
2/ Includes 4,600 M board feet of cypress in the 10- and 12-inch classes.

As shown by table 6, which is based on the supplemental volume-table study, more than half of the loblolly and shortleaf pine saw timber is in trees classes as "limby" or "rough," many of which are not suitable for high-grade lumber. The old growth, it will be seen, is much better in lumber quality than second growth, which often occurs in old-field stands.

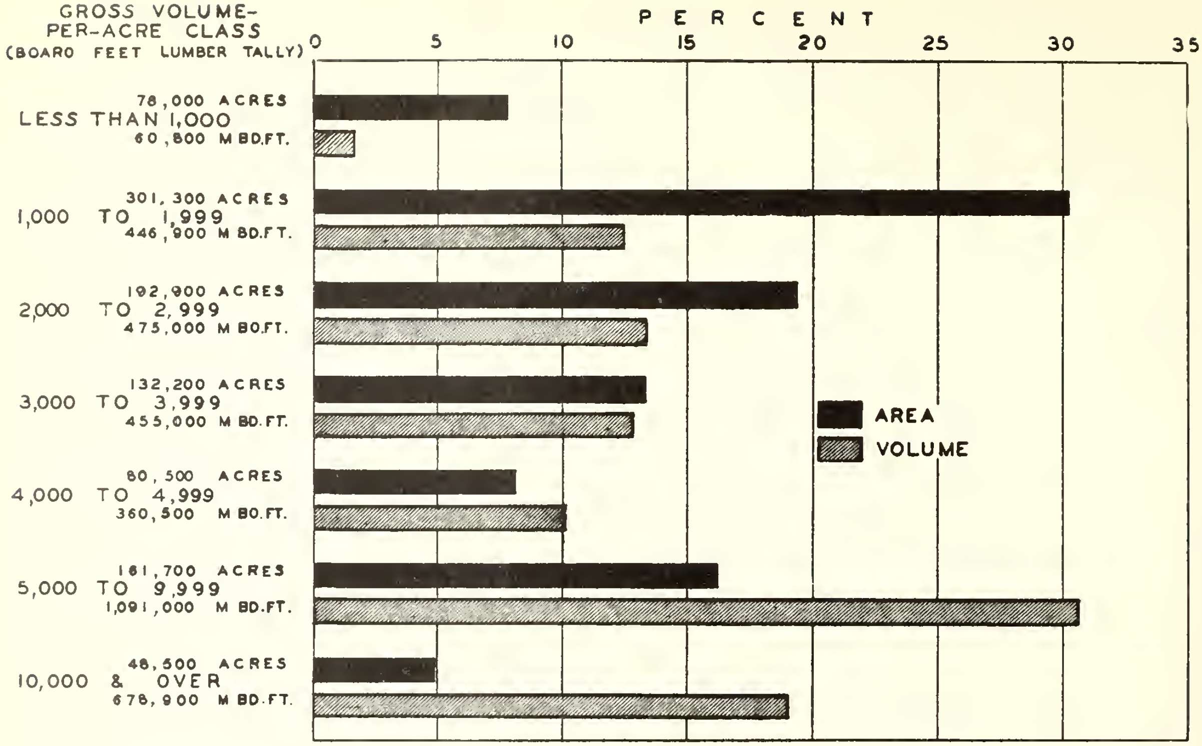
Table 6. - Classification of pines according to tree grade

Species and stand condition	Tree grade[1/]			Total
	Smooth	Limby	Rough	
	- - - - - - - Percent of volume - - - - - - -			
oblolly pine:				
Old growth	91	9	-	100
Second growth	28	52	20	100
Weighted average	36	47	17	100
ıortleaf pine:				
Old growth	97	3	-	100
Second growth	54	41	5	100
Weighted average	59	36	5	100
oblolly and shortleaf pines:				
Old growth	93	7	-	100
Second growth	36	49	15	100
Weighted average	44	43	13	100

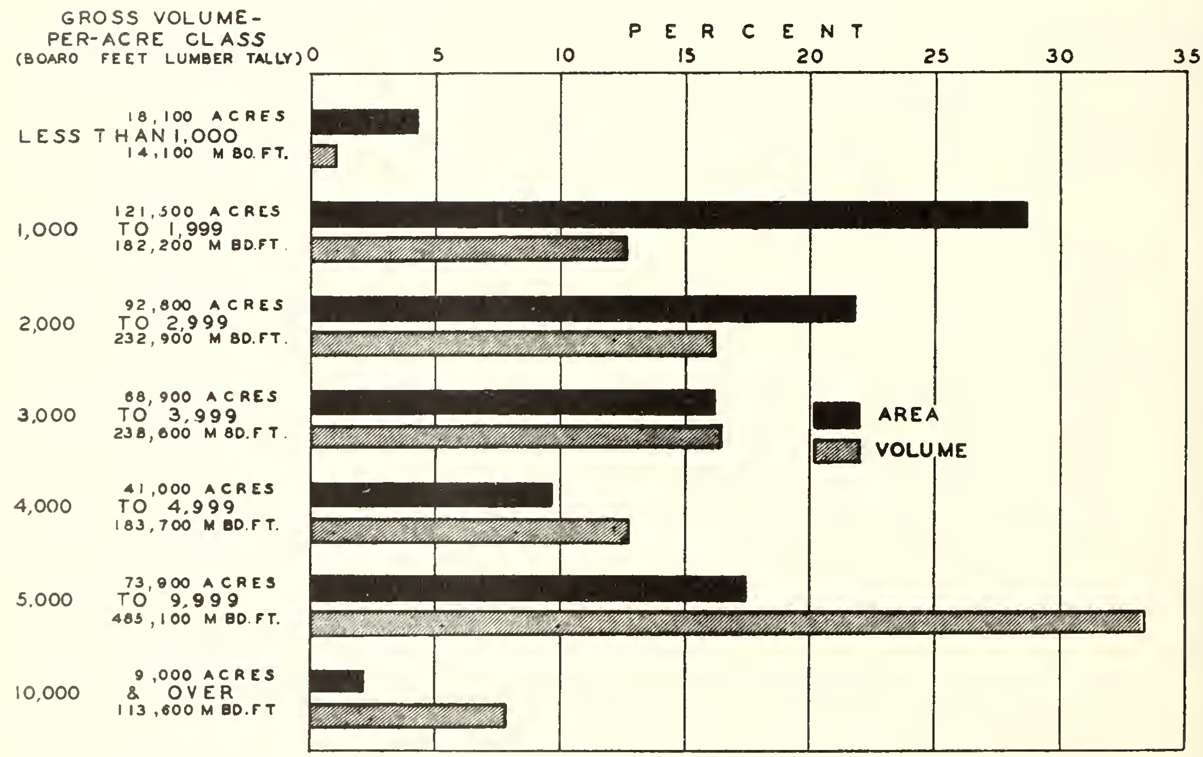
/ Smooth trees have at least 20 ft. of clear length and at least 50 percent ' their total usable length practically free of limbs and indications of knots; or limby trees, these figures are 12 ft. and 30 to 49 percent, respectively; ile rough trees have less than 12 ft. of clear length, or less than 30 percent ' their total usable length practically free of limbs and knots.

Since all except less than 3 percent of the entire forest has been cut er at least once, practically all of it may be considered accessible, espe-.ally to modern logging equipment. Figure 5, which indicates the proportional ea and gross volume of saw-timber stands, classified according to volume of w timber per acre, shows that almost two-thirds of the area in the sawlog-.ze conditions has at least 2,000 board feet per acre. It is possible that e data shown for the first class (less than 1,000 board feet) is subject to ror, owing to the fact that the data were taken on $\frac{1}{4}$-acre plots; the combined .gures for the first two classes, however, are relatively more accurate. ands with high volumes per acre generally are the most attractive economically, or the logging costs per M board feet are less in the heavy stands, all other ctors being equal.

Approximately 62 percent of the area of the sawlog-size stands of the .ne and pine-hardwood types (chart A) and 86 percent of their saw-timber olume are in stands that have at least 2,000 board feet per acre; while stands at have less than 2,000 board feet per acre consequently occupy 38 percent ' the area and make up only 14 percent of the volume. Approximately 67 per-ent of the area of the sawlog-size stands of the hardwood types (chart B) and percent of their saw-timber volume are in stands that have at least 2,000 oard feet per acre, leaving 33 percent of the area and 14 percent of the vol-e in stands with less than this amount.



A-PINE AND PINE-HARDWOOD TYPES (995,100 ACRES)



B-UPLAND HARDWOOD AND BOTTOM-LAND HARDWOOD TYPES (425,200 ACRES)

FIGURE 5. - PROPORTIONAL AREA AND VOLUME OF THE SAWLOG-SIZE CONDITIONS, CLASSIFIED ACCORDING TO VOLUME OF SAW TIMBER PER ACRE.

Cordwood volume

In the forests of west central Alabama, there was in 1935 a total net usable volume of $32\frac{1}{2}$ million standard cords (4 x 4 x 8 ft.) of wood, bark included (table 7). This volume includes all the sound material from the following sources:

1. The merchantable stems of sawlog-size trees (same material as that previously shown as saw timber).

2. That portion of saw-timber trees not suited for sawlogs but usable as cordwood. This includes the upper stems of all species to a variable top-diameter limit (but not less than 4 in.), and the limbs of hardwoods and cypress to a 4-inch minimum.

3. Sound trees under sawlog size at least 5.0 in. d.b.h., in which the entire stem of all species is included to a variable top-diameter (but not less than 4 in.).

4. The estimated sound material in cull trees, which includes all scrub oaks.

Sound trees of sawlog size contain 48 percent of the cordwood volume; sound trees under sawlog size, 31 percent; and cull trees, 21 percent. More than three-fifths of the cordwood volume from all sources is in hardwoods; less than two-fifths is in pines. Pulping species (i.e., the pines and the soft-textured hardwoods, chiefly gums and yellow poplar) contain 22 million cords, while the firm-textured hardwoods (i.e., oaks, hickories, etc.) contain $10\frac{1}{2}$ million cords. It is likely that, in the future, pulp and paper manufacturers will utilize some of the firm-textured species not now extensively pulped.

At the present time the principal uses for the 21 million cords of material not suited for sawlogs are for fuel, pulpwood, and miscellaneous farm use, including fence posts. For pulp and paper making in this unit, only pines are used at the present time; while for fuel and fence posts both pines and hardwoods are used.

With 21 percent of the cordwood volume in cull trees—the highest proportion in any Forest Survey unit in Alabama and caused largely by the accumulation of hardwoods—rapid utilization of these undesirable trees is needed to make available more room for the growth of desirable trees and for the establishment of the seedlings necessary to build up the growing stock. In addition, a large volume should be salvaged, wherever economically possible, by thinning over-dense stands and by utilizing tops and limbs of trees cut for sawlogs.

Table 7. - Net cordwood volume in various classes of sound material, 1935

Species-group	Sawlog portion of saw-timber trees	Upper stems of saw-timber trees	Sound trees under sawlog size	Sound and rotten cull trees	Total all classes
	Cords (bark included)				
Pines	7,034,600	1,195,400	3,883,500	692,600	12,806,100
Hardwoods:					
Soft-textured	2,480,600	1,347,500	2,725,100	2,743,600	9,296,800
Firm-textured	2,233,900	1,232,100	3,478,400	3,557,400	10,501,800
Total hardwoods	4,714,500	2,579,600	6,203,500	6,301,000	19,798,600
Total all species	11,749,100	3,775,000	10,087,000	6,993,600	32,604,700

Figure 6 shows the net cordwood volumes of sound trees (culls omitted) by species-group, diameter-class, and type of material. Under-sawlog-size trees make up less than one-third of the pine volume but almost half the hardwood volume.

Cull trees and the upper stems and usable limbs of sawlog-size hardwoods are not considered part of the growing-stock volume of 23 million cords, which is made up of 13 million cords in sound trees of sawlog size, including the tops of sawlog-size pines, and 10 million cords in sound trees over 5.0 in. d.b.h. and under sawlog size. Average volumes per acre in cords of growing-stock material (computed by dividing the volume in any forest condition or type by the corresponding forest area) are shown in table 8. The weighted average per acre for all forest conditions and type-groups is $8\frac{1}{2}$ cords.

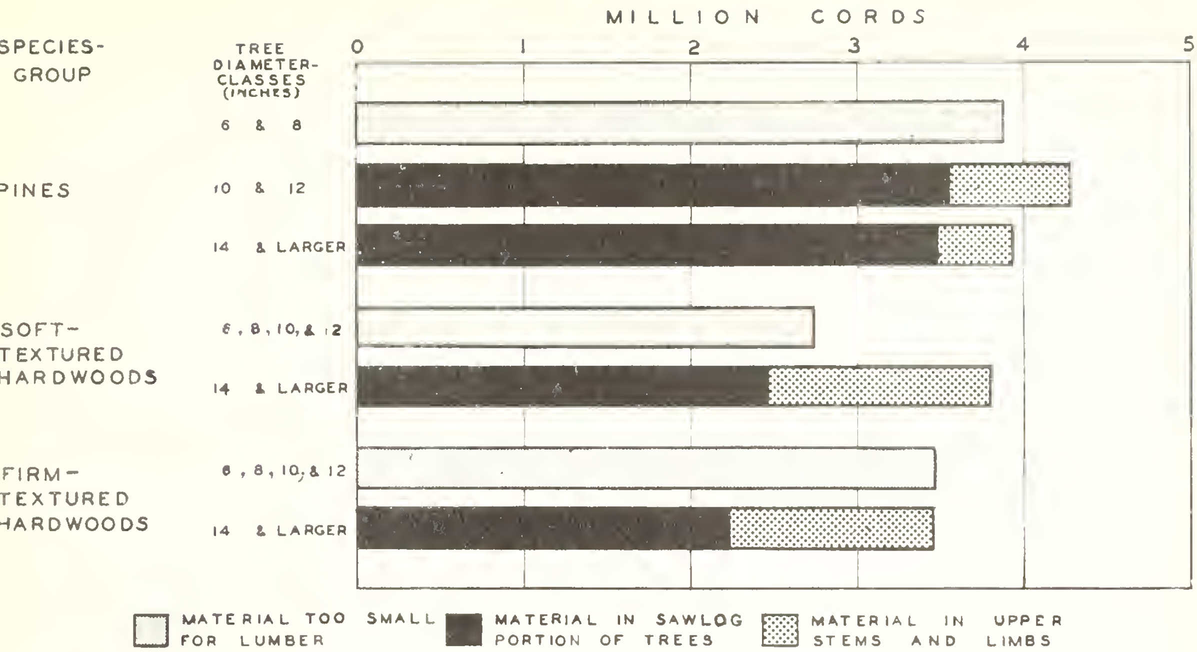


FIGURE 6. - CORDWOOD VOLUMES OF SOFT-TEXTURED AND FIRM-TEXTURED SPECIES BY SIZE-CLASSES, SOUND TREES ONLY.

Table 8. - Average volumes of cordwood per acre in growing-stock trees, 1935

Forest type-group	Old growth		Second growth			All conditions1/
	Uncut	Partly cut	Sawlog size: Uncut	Sawlog size: Partly cut	Under sawlog size	
	Cords (bark included)					
ne	24.8	11.9	15.1	9.2	3.6	9.3
ne-hardwood	22.4	12.3	13.2	9.6	3.9	7.3
land hardwood	14.3	11.4	9.1	9.4	3.1	5.8
ttom-land hardwood	19.3	15.1	14.5	12.8	4.7	11.2
All types (weighted average)	20.7	13.2	14.1	9.7	3.7	8.5

1/ Includes areas of reproduction and clear-cut forest conditions.

Poles and piles

Over $8\frac{1}{2}$ million trees (table 9) are suitable for conversion into poles (according to the specifications of the American Standards Association) or piles. Most of these trees have been included in the saw-timber (and all in the cordwood) inventory previously shown. Since it is difficult to judge pole and pile material in standing trees, the estimate of the number of pieces of the various lengths may be conservative, but that of the relative proportions of pieces of various lengths may be considered fairly accurate. About two-thirds of the pieces are in pine trees less than 11.0 in. d.b.h. outside bark, and a like proportion in 20- and 25-foot lengths, which are used principally in rural telephone or power lines.

Table 9. - Total number of pine poles or piles, classified according to length and diameter, 1935

D.B.H. of trees (outside bark)	Pole or pile lengths (feet)						Total	Proportion of total
	20	25	30	35	40	45 and over		
Inches	- - - - - - - - - -	Thousand pieces	- - - - - - - - - -					Percent
7.0 - 8.9	1,973	463	227	-	-	-	2,663	30.6
9.0 - 10.9	1,301	791	634	233	122	16	3,097	35.7
11.0 - 12.9	397	443	499	257	151	125	1,872	21.5
13.0 - 14.9	56	135	243	167	82	92	775	8.9
15.0 - 18.9		7	101	95	39	43	285	3.3
Total	3,727	1,839	1,704	752	394	276	8,692	100.0
Percent of total	42.8	21.2	19.6	8.7	4.5	3.2	100.0	

Forest Increment

In 1935 the forest increment for the saw-timber material amounted to about 310 million board feet, lumber tally (table 10), or to almost $1\frac{1}{4}$ million cords, including bark, for all growing-stock material. Forest increment, as used in this report, means the difference between the net volumes of growing-stock trees standing on the area at the beginning and the end of a year, before deducting the total commodity drain for the year. Net board-foot increment is made up of (a) the growth on sawlog-size trees, (b) the total board-foot volume of trees becoming sawlog size during the year, and (c) appropriate deductions for mortality. Cordwood increment represents (a) the growth on the sound stems of pines 5.0 in. d.b.h. and over, on under-sawlog-size hardwoods 5.0 to 12.9 in. d.b.h., and on the sawlog portion of hardwoods 13.0 in. d.b.h. and larger; (b) the total volume in pines and hardwoods that become 5.0 in. or larger during the year; and (c) deductions for mortality. Material in cull trees and in the upper stems and usable limbs of sawlog-size hardwoods is excluded from calculations of cordwood increment.

Table 10. - Net increment in board feet and cubic feet in the various forest conditions, 1935

Forest condition	Saw-timber material			All growing-stock material		
	Pine	Hardwood	Total	Pine	Hardwood	Total
	Thousand board feet (lumber tally)			Thousand cubic feet (inside bark)		
Old growth	8,300	19,300	27,600	1,810	5,200	7,010
Second growth:						
Sawlog size	145,700	57,400	203,100	29,270	17,300	46,570
Under sawlog size1/	60,400	18,400	78,800	22,480	12,280	34,760
Total all conditions	214,400	95,100	309,500	53,560	34,780	88,340

1/ Includes 500 M board feet or 220 M cubic feet in the reproduction and clear-cut conditions.

Second-growth stands produce 91 percent of the net saw-timber increment; old growth, only 9 percent. In all the forest conditions combined, more than two-thirds of the net saw-timber increment is pine, whereas the hardwoods produce less than one-third.

Net increment expressed in standard cords (4 x 4 x 8 ft.), including bark, is given in table 11; this is the same material as that given in cubic feet in table 10. It is believed that the hardwood net increment, expressed in cords, is about evenly divided between the soft-textured and firm-textured hardwoods.

Table 11. - Net increment in cords in the various forest conditions, 1935

Forest condition	Pine	Hardwood	Total	Proportion of total
	Cords			Percent
Old growth	23,400	77,600	101,000	8.1
Second-growth, sawlog size	385,000	264,900	649,900	52.2
Second-growth, under sawlog size1/	302,700	192,300	495,000	39.7
Total	711,100	534,800	1,245,900	100.0

1/ Includes 2,900 cords in residual trees in the reproduction and clear-cut conditions.

The average net increment per acre during 1935, assuming that the stands were not influenced by cutting, is shown in table 12. For saw timber, the average is 117 board feet per acre; for all growing-stock material (saw timber and trees too small for sawlogs combined), slightly less than ½ cord per acre. These averages are about the same as those for the entire State of Alabama. In this unit the greatest growth per acre occurs in the uncut second-growth sawlog-size stands, where the annual saw-timber increment is 203 board feet per acre and the over-all increment is 2/3 cord.

Table 12. - Average net increment per acre in the various forest conditions, uninfluenced by cutting, 1935

Forest condition	Pine component			Hardwood component			Total per acre, all species		
	Bd.ft.	Cu.ft.	Cords	Bd.ft.	Cu.ft.	Cords	Bd.ft.	Cu.ft.	Cords
Old growth									
Uncut	79	15.3	.20	78	19.0	.28	157	34.3	.48
Partly cut	18	4.4	.06	73	20.4	.30	91	24.8	.36
Second growth:									
Sawlog size:									
Uncut	149	29.8	.39	54	16.8	.26	203	46.6	.65
Partly cut	91	18.2	.24	45	12.0	.18	136	30.2	.42
Under sawlog size	51	19.2	.26	16	10.5	.16	67	29.7	.42
Reproduction and clear-cut	3	1.3	.02	1	0.5	.01	4	1.8	.03
Weighted averages	81	20.2	.27	36	13.0	.20	117	33.2	.47

Forest Industries

In 1937, approximately 356 sawmills in this area (table 13 and fig. 7) produced 266 million board feet of lumber, mostly pine. Over nine-tenths of the sawmills were classed as "small," for their individual capacities were less than 20 M board feet per 10-hour day; their average annual production per mill was less than 500,000 board feet, because many of them were operated only part of the time, usually between crops. Because of their mobility, rather than their operating efficiency, these small mills, generally powered by portable steam engines or tractors, are well adapted to cutting small tracts of timber. Their operators, being in such a transient business, are seldom interested in making any attempt to leave the cut-over forest in condition for a second cut at an early date. Destructive logging practices, however, are often encouraged also by landowners, who refuse to sell their timber except on a clear-cut logging basis.

Twelve of the mills, which were of "medium" size, i.e., with sawing capacities of 20 to 39 M board feet per 10-hour day, had an average production for 1937 of almost 4 million board feet. Also, there were 3 "large" sawmills (i.e., with a daily capacity of over 40 M board feet each) that had an average annual production of almost 17 million board feet per mill.

Table 13. - Number and size of sawmills and amount of lumber cut,[1] 1937

Daily rated capacity 10 hrs.	Lumber cut			Number of mills
	Pine	Hardwood	Total	
M bd. ft.	- - - - M bd. ft. lumber tally - - - -			
1 - 19 (small)	153,900	13,800	167,700	341
20 - 39 (medium sized)	38,000	9,300	47,300	12
40 + (large)	43,600	7,000	50,600	3
Total	235,500	30,100	265,600	356

1/ From stands both within and without this area.

More lumber is manufactured in Tuscaloosa County (note concentration and size of mills, fig. 7) than in any of the other counties in this unit; a relatively small amount is produced in Greene and Perry Counties, both of which lie partly within the Black Prairie.

In 1937, important wood-products plants, other than sawmills, included 5 veneer mills, 3 cooperage plants, 2 small-dimension plants, 1 pulp mill, and 1 treating plant. About 9 million board feet were cut into veneers of the type used for furniture, packages, and boxes; red gum, black gum, and yellow poplar were the principal species used. Most of the 5,800 cords of material cut into cooperage stock was used for "tight" barrels and only a small portion for "slack" barrels; oaks, gums, pines, yellow poplar, and cottonwood were the species used. Approximately 460,000 cords of fuel wood were used, obtained both on and off farms; and about 1 million fence posts were produced, chiefly for local farm use.

Cutting, hauling, and manufacturing forest products (table 14) provided in this unit in 1937 almost 2 million man-days of employment, about half of which was furnished by sawmills. Because most of the sawmills and other wood-products plants operate only a part of the year, it is impossible to estimate accurately the number of people who earn their living in forest-products industries, but it is probable that 13,000 or more received full- or part-time employment. The Census of Agriculture for 1935 shows that farmers of this area in 1934 obtained about 632,000 man-days of part-time employment for pay away from their own farms, much of which, it is believed, was in connection with the forest industries.

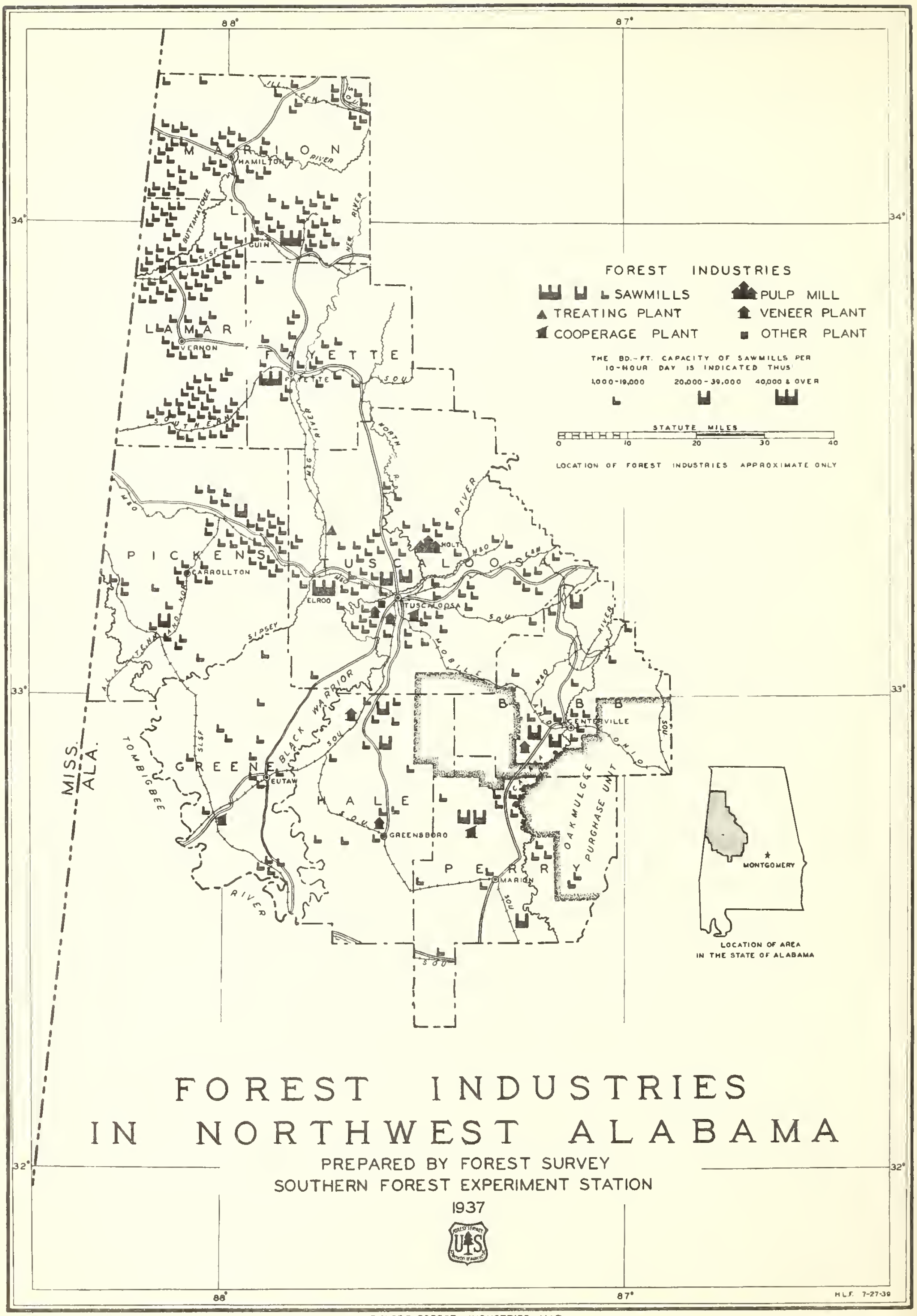


FIGURE 7—FOREST INDUSTRIES MAP

Table 14. - Wood-products employment, 1937

Industry or commodity	Employment		
	In woods	At plant	Total
	- - Thousand man-days (10 hours each) - -		
Sawmills:			
Small	191	317	508
Medium sized	81	98	179
Large	51	121	172
Total sawmills	323	536	859
Fuel	548	-	548
Veneer	15	60	75
Cross ties	69	-	69
Miscellaneous manufacturing (including pulpwood)	128	189	317
Fence posts	17	-	17
Total	1,100	785	1,885

Commodity Drain from the Growing Stock

Commodity drain, which should not be confused with the lumber cut, includes logs for mills outside as well as inside the area and the usable material wasted in logging. Not included in the commodity drain are materials from dead trees, cull trees, and the upper stems and limbs of sawlog-size hardwoods. The commodity drain from sawlog-size trees of the growing stock amounted to 380 million board feet in 1937 (table 15). The commodity drain from the total growing stock (i.e., trees 5.0 in. d.b.h. and larger, saw-timber and other material combined) amounted to over 1 million cords, or over 83 million cubic feet of wood, inside bark.

About 58 percent of the drain from the total growing stock, expressed in cubic feet, was for lumber; 17 percent, for fuel wood; 6 percent, for cross ties; and 19 percent for all other commodities, including pulpwood. In table 15, the commodity drain for industrial and domestic uses from the entire sound-tree growing stock is allocated to the commodities for which the trees were cut, but since only one pulp mill was cutting in this area in 1937, separate figures for pulpwood are not shown. More than three-fourths of the commodity drain from saw-timber material came from the pine component of the growing stock; less than one-fourth from the hardwood.

Table 15. - Commodity drain from the sound-tree growing stock, 1937

Reason for drain	From saw-timber material			From all growing-stock material	
	Pines	Hardwoods	Total		
	M bd.ft. (lumber tally)			Cords[1]	M cu.ft.[2]
Lumber	230,100	44,700	274,800	634,300	48,580
Fuel	15,600	5,600	21,200	201,100	14,340
Veneer	300	10,400	10,700	20,300	1,560
Cross ties	11,300	18,200	29,500	64,300	4,930
Cooperage	1,300	2,900	4,200	8,800	680
Miscellaneous manufacturing (including pulpwood)	20,400	1,300	21,700	88,300	6,700
Poles and piles	7,300	100	7,400	28,100	2,140
Fence posts	200	600	800	5,100	350
Miscellaneous farm use[3]	6,100	3,900	10,000	58,100	4,120
Total	292,600	87,700	380,300	1,108,400	83,400

1/ Bark included.
2/ Bark not included.
3/ Including land clearing.

Comparison of Growth and Drain

After making additions for growth and deductions for (a) mortality losses due to fire, windfall, rot, and insects, and (b) commodity drain, for 1935, 1936, and 1937, the entire growing-stock volume was found to have increased 54 million cubic feet. As shown by table 16 and figure 8, the greatest net increase occurred in 1935 and the least in 1937. For the 3-year period, the saw-timber part of the growing stock was reduced 46 million board feet. It may seem paradoxical that the entire growing stock in cubic feet showed a gain while the saw-timber growing stock showed a loss, but it must be remembered that the entire growing stock includes a relatively large number of trees less than 9.0 in d.b.h. and that, although these trees make up a considerable part of the growth, only relatively few of them are used. During this period, net increment per year for the saw-timber part of the growing stock remained practically constant; whereas, largely because of greater activity in forest-product industries, the commodity drain from the saw-timber material increased over 54 percent.

In 1937, the combined mortality and commodity drain against saw-timber growing stock amounted to 422 million board feet, which was over 68 million board feet more than the growth for that year (fig. 9). The pine component of the saw-timber growing stock decreased, while the hardwood component increased. It is to be noted also that the saw-timber stands are deteriorating in quality, owing to the common practice of taking out the larger and more valuable trees, and leaving the smaller and poorer ones. For this reason, in rdwood stands the proportion of species at present considered valuable is clining, owing to the taking of the ash, forked-leaf white oak, and other ghly desired species and leaving post oak, scrub oak, and other less desirable ones.

Table 16. - Balance between net increment and commodity drain, 1935, 1936, and 1937

Item	Saw-timber material			All growing stock (trees 5.0 in. d.b.h. & larger)		
	Pine	Hardwood	Total	Pine	Hardwood	Total
	Thousand board feet (lumber tally)			Thousand cubic feet (inside bark)		
owing stock, an. 1, 1935	3,074,100	1,921,000	4,995,100	919,200	714,800	1,634,000
Growth	241,900	108,800	350,700	62,720	40,770	103,490
Mortality	27,500	13,700	41,200	9,160	5,990	15,150
et increment	214,400	95,100	309,500	53,560	34,780	88,340
ommodity drain	171,400	74,800	246,200	38,880	17,760	56,640
et change in growing stock, 1935	+43,000	+20,300	+63,300	+14,680	+17,020	+31,700
owing stock, an. 1, 1936	3,117,100	1,941,300	5,058,400	933,880	731,820	1,665,700
Growth	243,500	109,600	353,100	65,000	41,620	106,620
Mortality	28,000	14,000	42,000	9,330	6,150	15,480
et increment	215,500	95,600	311,100	55,670	35,470	91,140
ommodity drain	276,900	74,400	351,300	60,220	17,630	77,850
et change in growing stock, 1936	-61,400	+21,200	-40,200	-4,550	+17,840	+13,290
owing stock, an. 1, 1937	3,055,700	1,962,500	5,018,200	929,330	749,660	1,678,990
Growth	243,300	110,200	353,500	65,600	42,270	107,870
Mortality	27,600	14,200	41,800	9,330	6,320	15,650
et increment	215,700	96,000	311,700	56,270	35,950	92,220
ommodity drain	292,600	87,700	380,300	63,770	19,630	83,400
et change in growing stock, 1937	-76,900	+8,300	-68,600	-7,500	+16,320	+8,820
owing stock, an. 1, 1938	2,978,800	1,970,800	4,949,600	921,830	765,980	1,687,810

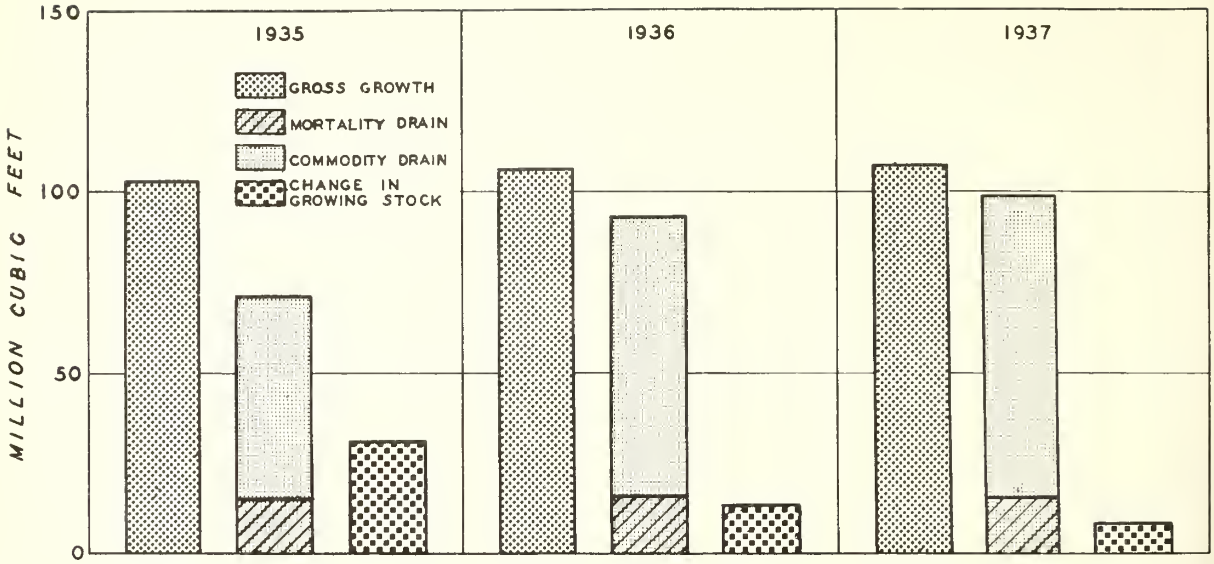


FIGURE 8.—COMPARISON OF GROWTH AND DRAIN FOR THE ENTIRE GROWING STOCK.

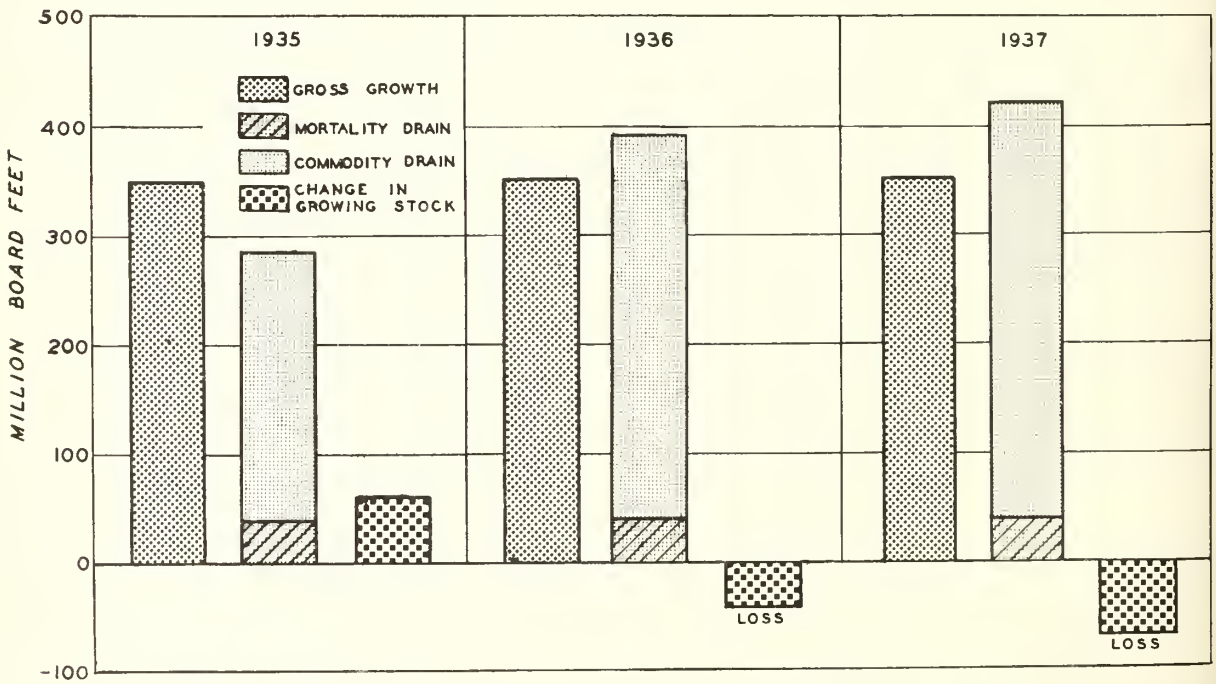


FIGURE 9.—COMPARISON OF GROWTH AND DRAIN FOR THE SAW-TIMBER COMPONENT OF THE GROWING STOCK.

As previously pointed out in this report, the stands of west central Alabama are so poorly stocked that the growth is only a fraction of the productive capacity of the sites. Growing stock can be increased by good forest management, but time is required before its effects are reflected in increased growth. Mortality drain, however, can be reduced promptly by fire protection, thinning, and other good forest practices; this would allow correspondingly greater amounts of material for use or for increasing the growing stock.

The trend of commodity drain on the entire growing stock and on its saw-timber component, as evidenced in 1935, 1936, and 1937, is decidedly upwards in both pines and hardwoods. Unless the growing stock of saw timber is increased by good forest management, the latter may be reduced eventually to such a small part of the stand that it will be inadequate to furnish existing industries with the class of material they require.

It should be noted, however, that in 1935, 1936, and 1937, neither the annual growth nor drain amounted to one-tenth of the growing stock, and that such fluctuations in growth and drain cause very little change in the growing stock. For the entire 3-year period ending Dec. 31, 1937, the saw-timber component of the growing stock decreased approximately 1 percent, and the entire growing stock increased slightly over 3 percent.

Summary and Conclusions

This Forest Survey unit in which the people depend for most of their livelihood upon products from field, forest, and mines, has never enjoyed a rich agricultural development like that of the Tennessee Valley in Alabama, nor has it experienced an industrial expansion such as the Birmingham or Mobile areas. The Census of 1935 indicates that only 18 percent of its $4\frac{1}{2}$ million acres is in "cropland harvested," as compared with 22 percent of the entire State; also, there are only 36 people per square mile, as compared with 52 for the State as a whole.

The ability of cotton, the chief cash crop, to continue to support most of the people seems to be decreasing. From 1924 to 1934, according to the Census, the area in cotton declined about 22 percent, and the value of the crop shrank over 40 percent, or $4\frac{1}{2}$ million dollars. This shrinkage in cotton growing involved a loss of about 900,000 days of employment in the cotton fields; and the loss in gainful work for truck drivers, railroad men, and other shippers, for workers in the manufacturing plants, and for others dependent upon the cotton income, is also serious. Preliminary figures for 1938 show a further drastic reduction in the value of the cotton crop.

It is doubtful whether cotton ever can become the "king" it once was in this area, for many of the sloping, eroded, upland fields cannot grow cotton again successfully. Opportunities for gainful employment have dwindled so drastically that the Special Census of Unemployment taken in October 1937 revealed that there were in this unit 14,000 people either unemployed and wanting work, or on relief, and 9,000 employed part time and wanting more work. These 23,000 either totally or partly idle workers make up almost one-tenth of the total population, or about one-fifth of the gainfully employed workers.

In the urgent search for sources of employment in productive enterprises, the expansion of the forest and wood-products industries must be considered. The forest of 2-3/4 million acres, which occupies an average of 6 acres out of every 10, contains 10 times as many acres as the cotton fields. Within the next decade, the forest area may expand still more, for the Survey found 197,800 acres of idle and abandoned cropland, much of which will revert to forests unless the price of cotton greatly increases. In addition, 44,500 acres now in cultivation, but being seriously eroded, may be thrown out of cultivation because of competition, loss in fertility, or as the result of crop-control programs; this area also may revert to forests.

Loblolly, shortleaf, and longleaf pines, gums, and oaks are the principal species, and pine and pine-hardwood are the most prevalent forest type-groups. Approximately 90 percent of the forest area is classed as second growth; only 10 percent remains as old growth. Mainly due to the common occurrence of fire, most of the stands are poorly stocked, especially in large trees; the 2- and 4-inch diameter-classes contain more trees than all others combined. Also, most of the stands are young—over four-fifths of the pine and pine-hardwood area is in stands less than 61 years old. The productive capacity of the forest soils is good, as shown by the large proportion of areas with site indexes of 70 and over, but so poorly stocked are the stands that their volumes per acre are less than half of what good management, including sustained protection from fires, could produce. Uncontrolled forest fires prevent the development of well-stocked stands, and every year fires injure or destroy some of the large trees and kill the small ones that are needed to build up the growing stock.

The inventory of saw-timber material in the growing stock shows about 5 billion board feet, mostly in second-growth pines. Forty-seven percent of the pine saw-timber volume is in trees less than 13.0 in. d.b.h. and probably more than half is in limby or rough trees. Over four-fifths of the total saw-timber volume, pines and hardwoods together, is in stands that have at least 2,000 board feet per acre.

Considering all sound usable material in live trees 5.0 in. d.b.h. and over, including those of sawlog size, the net usable volume is $32\frac{1}{2}$ million cords; this includes 7 million cords in cull trees, of which 90 percent is in hardwoods.

In 1937 the <u>growth</u> amounted to 354 million board feet, but <u>mortality</u> approximated 42 million, leaving a <u>net increment</u> of 312 million board feet before cutting. Most of the saw-timber increment was in the second-growth pine stands. For all growing-stock material in trees 5.0 in. d.b.h. and larger, the net increment was $1\frac{1}{4}$ million cords, bark included.

Forest industries include about 356 sawmills, 5 veneer mills, 3 cooperage plants, 2 small-dimension plants, 1 pulp mill, and 1 treating plant. In 1937 the commodity drain for industrial and domestic use from saw-timber material in sawlog-size trees was 380 million board feet, or over 68 million more than the net increment. Records for the 3 years beginning Jan. 1, 1935, indicate that, whereas the net increment remained constant, the commodity drain increased annually. All of the over-cutting occurred in pine; and, although hardwood showed a volume increase, it suffered a loss in quality, owing to the removal of trees of the most valuable species. As long as the saw-timber drain is greater than its growth, the growing stock will continue to shrink in volume; and, if the drain continues to increase in accordance with indicated trends, this shrinkage shortly will become serious. If the forest is to continue to meet the needs of expanding use, steps must be taken to increase the net increment by building up the growing stock through fire protection and other good-management practices.

Suggestions for improvement

Greater markets for timber stumpage are needed to establish prices that will encourage the landowners to protect and develop their forest resources. Small woodland owners have especial difficulty in finding profitable wood outlets and usually must depend upon transient small sawmills, whose lumber product, with the present crude methods of manufacturing, usually brings such low prices that stumpage returns are meagre. Markets for low-grade material, such as pulpwood and fuel wood, are needed in order that forest owners may salvage (a) the tree stems above the sawlogs and (b) the small trees that should be thinned out of dense stands.

For many years it has been the practice in this unit to cut the pines and leave the hardwoods. Where pine seed trees are left and the site conditions are favorable for pine, the cut-over forest usually comes back with a good representation of pines. In many places, however, especially on the poorer pine sites, the pine has been cut so clean that the proportion of hardwoods increases, sometimes completely excluding the pines. One of the most difficult problems which must be solved before the stands can be improved greatly is how to remove and utilize the hardwoods now considered undesirable. Approximately one-fifth of all the usable material (expressed in cords) in this unit is in cull hardwoods, some of which may be utilized profitably; encouragement should be given to the development of markets for them. Their utilization for small-dimension stock, pulp, paper, rayon, plastics, and other products should be studied; while cull trees should be used for fuel, fence posts, and similar products to a much larger extent than is now the practice.

Many of the cull hardwoods have such large bushy tops (often with limbs almost down to the ground) that they prevent the development of pines and desirable hardwoods. Where no market for low-grade products is either existent or anticipated, the landowner may wish to consider girdling these "wolf" trees, so that better trees may develop.

The forest resources should be made to contribute to the public welfare much more than they do now, when half the growing stock is missing. When the growing stock is built up—and this can be done by fire protection, thinning, improvement cutting, and selective logging—the annual growth of the forest can be increased enough to supply perpetually the raw materials for the present industries, as well as for many new and expanded ones.

Since the general public is responsible for most of the fires that are carelessly or wilfully set, increased financial assistance and other means of help should be extended to the landowners. Further expansion of the fire-protection work under the Clarke-McNary Act, involving the cooperation of landowners and of State and Federal Governments, is recommended as a means of getting coordinated action. Possibly this work can be undertaken on a county-wide basis.

With good fire protection, it is believed that natural reforestation will be successful on two-thirds of the abandoned fields. It may be expedient, however, to reforest artificially by planting the remaining one-third, if a prompt establishment of forest cover is desired.

Whether or not good forest management is practiced in west central Alabama will depend largely upon how convinced are the 20,000 different landowners that it is to their direct advantage to do so. These owners have widely varying financial limitations, and many of them have no idea of the extent of their forest resources or of the possible financial returns from managing them. Therefore, a widespread acceptance of good forestry practices, such as fire protection, stand improvement, economical utilization and planting, will require time and a well-organized education and extension program, which to be successful must reach not only all forest landowners, tenants, and wood consumers, but also the general public. Consequently, public aid, both State and Federal, should be given to this extension work, for the entire population will benefit from the highly developed forest resources and from the stable and expanded industries (with their greater payrolls for forest workers) that will result therefrom.

)REST SURVEY RELEASE NO. 49 MARCH 29, 1940

FOREST RESOURCES IN THE TENNESSEE VALLEY OF NORTH ALABAMA

by

James W. Cruikshank
Associate Forest Economist

A Progress Report by

THE SOUTHERN FOREST SURVEY

I. F. Eldredge, Regional Survey Director

SOUTHERN FOREST EXPERIMENT STATION

E. L. Demmon, Director

New Orleans, La.

FOREWORD

The nation-wide Forest Survey, being conducted by the United States Forest Service, was authorized by the McSweeney-McNary Forest Research Act of 1928. Its five-fold object is: (1) to make an inventory of the present supply of timber and other forest products; (2) to ascertain the rate at which this supply is being increased through growth; (3) to determine the rate at which this supply is being diminished through industrial and local use, windfall, fire and disease; (4) to determine the present requirement and the probable future trend in the requirement for timber and other forest products; and (5) to correlate these findings with existing and anticipated economic conditions, in order that policies may be formulated for the effective use of land suitable for forest production.

This release is based on a field survey made March 14, 1936, to May 2, 1936 and on two field canvasses of forest industrial plants to determine forest drain, the last of which was completed during May 1938. It should be regarded only as a progress report since it contains Forest Survey data that will be included in complete reports to be published later, and that, although considered reliable, are subject to correction or amplification as the work of computation proceeds. Item 4 above, which is being studied on a national basis, is not discussed in this report.

In the presentation of these survey data, it should be noted that owing to the sampling method used in collecting them, the greater the number of samples in any given classification the more accurate are the data for that classification. Hence classes that are of infrequent occurrence and relatively small in quantity generally cannot be determined with as high a degree of accuracy as classes that occur more frequently and in substantially greater quantities. Small tabular items are to be taken as showing, not the exact magnitude of the classes involved, but their relative magnitude in comparison with those of other classes.

In the South, the Forest Survey functions as an activity of the Southern Forest Experiment Station with headquarters at New Orleans, La.

Assisting Staff

J. M. Tinker, Assistant Timber Expert, In Charge of Field Work
P. R. Wheeler, Forest Economist, In Charge of Mensurational Analyses

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Note: Assistance in the preparation of these materials was furnished by the personnel of Work Projects Administration official project 65-2-64-74.

FOREST RESOURCES IN THE TENNESSEE VALLEY OF NORTH ALABAMA

General Description of the Unit

Forest Survey Unit No. 6 in north Alabama embraces 10 counties that lie almost exclusively in the watershed of the Tennessee River (fig. 2). The unit, containing 4,595,900 acres, extends entirely across the northern part of the State, with its southern boundary roughly parallel to, and about 50 miles south of, the Tennessee State line. The Tennessee River, which enters the unit in the northeast corner and flows through it for 200 miles before swinging northward to enter Tennessee, is highly important to the economy of this area, as it is under intensive development by the Tennessee Valley Authority. Flood control, power development, inland waterway transportation, production of fertilizer, soil conservation, and the encouragement of industrial development are some of the major objectives. Abundant power and water-transportation facilities should increase industrialization, but at present agriculture predominates; in 1935 three-fourths of the unit was in farms. Forest land, including that in farms, occupied 47 percent of the land area at the time of the survey in 1936.

Topography[1/] and soils are the more important factors influencing the use of land, as will be brought out later in this report. The variability of the terrain is indicated in figure 1, which shows the main physical divisions of the area. Lookout Mountain, with an elevation of 1,200 to 1,700 feet, is a flat-topped ridge averaging 5 miles in width, along the limiting escarpment of which considerable recreational development has occurred. Sand Mountain, which is 1,700 feet high at the Georgia line but becomes gradually lower toward the southwest, has a gently rolling, slightly concave top 8 to 18 miles wide, terminating at each edge in a steep escarpment. Both the Wills and Sequatchie Valleys, which average 5 miles in width, were cleared and used for agriculture in the early settlement period and at present are largely untimbered. The Tennessee River flows through the Sequatchie Valley as far south as Guntersville, where it turns northwest to flow through the Jackson County Mountains and the Highland Rim.

The Jackson County Mountains are flat-topped remnants of the original broad plateau. Their main drainage flows south and southeast into the Tennessee River, but numerous small creeks have cut through the ridges forming individual mountains. Elevations range from 1,100 feet just south of the Tennessee River to about 1,700 feet near the Tennessee line. The Highland Rim with an average altitude of about 600 feet is a gently rolling upland, a high proportion of which is used for cultivated crops.

The Warrior Basin, which slopes toward the south, is a much-broken and eroded plateau with an elevation of about 1,100 feet where it rises abruptly from Moulton Valley, a rolling open valley 3 to 10 miles wide and 575 to 650 feet above sea level. Streams starting in the escarpment of Warrior Basin cross Moulton Valley and cut through Little Mountain (600 to 800 feet high and 8 to 10 miles wide) in narrow ravines; between these streams on Little Mountain are some scattered tracts of level land, but most of the land is steeply rolling.

1/ Data for this and the following two paragraphs and figure 1 are taken from "Physical divisions of northern Alabama," Geological Survey of Alabama, Bull. No. 38, 1930.

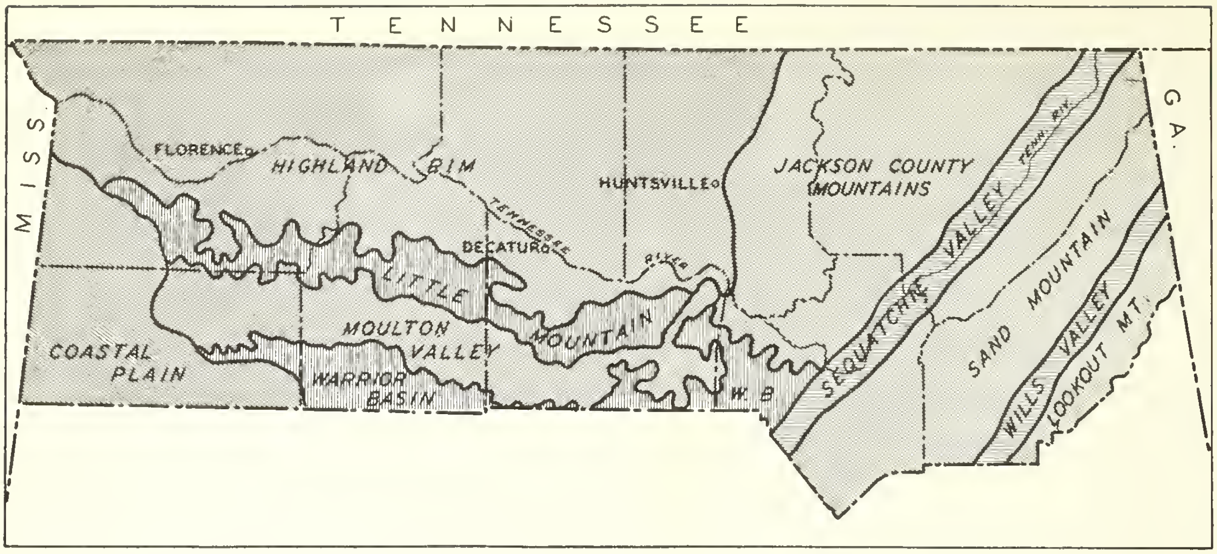


FIGURE 1 – PHYSICAL DIVISIONS OF ALABAMA UNIT NO. – 6.

The extreme southwest corner of the unit lies in the Gulf Coastal Plain which here has a very rough and broken surface owing to stream action on the unconsolidated coastal-plain material.

In the Highland Rim, and in Moulton and Sequatchie Valleys, the parent material of the soils is limestone; in the mountains, sandstones and shales predominate; and in the Coastal Plain, the unconsolidated materials are largely sands, clays, and limestones. About 40 soil series are represented, each of which is divided into several soil types. The DeKalb series, which is found on about one-fourth of the area, is most abundant in Jackson, Marshall and DeKalb Counties. This series, which occurs upon fairly level plateaus or flat mountain tops, is derived from decomposition of the underlying sandstone; its fine sandy loam is extensively used for agricultural crops. The Decatur series, which exemplifies the soils derived from the limestones, occupies about one-tenth of the unit area, chiefly in Madison, Limestone, Lawrence, and Colbert Counties; its clay-loam and loam are valuable agricultural lands. The Guin series (undifferentiated), one of the more common Coastal Plain soils, is found in Franklin County; it is chiefly used for timber production. Nearly one-tenth of the unit area is classified as rough or stony land, useless for agricultural crops, and of only mediocre value for growing timber.

The climate is temperate and comparatively uniform. The annual average temperature of the Tennessee Valley is 61° F. Average minimum and maximum summer temperatures at Florence, Ala., range from about 67° to 90°, whereas winter temperatures range from 32° to 53°. The frost-free growing season is about 210 days, compared with over 290 days along the Gulf Coast. Rainfall is heaviest in the winter and early spring, particularly in March, while the two driest months are September and October. Annual precipitation averages about 52 inches, of which a very small proportion falls as snow.

The run-off from Wills Valley and Lookout Mountain in DeKalb County is carried southwestward by several small streams into the Coosa River; while small areas in the south part of Lawrence, Morgan, and Marshall Counties (in the Warrior Basin) are drained by tributaries of the Black Warrior. Both these rivers, which flow southward by way of the Alabama and Tombigbee, empty ultimately into the Gulf of Mexico at Mobile. The drainage of the rest of the unit flows by means of many small streams into the Tennessee River, which empties into the Ohio River at Paducah, Ky.

Sheet erosion in varying degrees of intensity occurs throughout the unit except in limited areas along some of the streams. The largest areas of severe sheet erosion are found in Lauderdale, Colbert, Madison, DeKalb, and Franklin Counties. Moderate sheet erosion with occasional gullies is the rule in the Warrior Basin and on Lookout, Sand, and Little Mountains. Slight sheet erosion occurs throughout most of the Jackson County mountains north of the Tennessee River.2/ The prevalence of erosion according to land use is presented in table 1. These data are based upon a field classification of each sample plot taken by the Forest Survey. Although slight sheet erosion is found almost everywhere in the unit, only the more advanced stages, occurring on 20 percent of the area, were recorded by the Survey. Forest land is least affected by erosion, but half the idle and abandoned land shows evidence of serious soil loss.

Table 1. - Correlation of land use with erosion

Land use	Area	Type of erosion: None or arrested	Type of erosion: Sheet	Type of erosion: Shoe-string	Type of erosion: Gullies	Total
	Acres	Percent				
Forest	2,090,300	89.6	5.4	3.5	1.5	100.0
Pasture	171,700	80.3	10.3	6.6	2.8	100.0
Cropland:						
In cultivation	1,984,800	70.8	20.2	8.0	1.0	100.0
Idle and abandoned	139,400	50.3	24.3	17.9	7.5	100.0
All land-use classes1/	4,386,200	79.5	12.9	6.1	1.5	100.0

1/ Does not include acreage in towns, right-of-ways, or bodies of water.

In this unit, the Tennessee Valley Authority operates hydroelectric developments at Wilson Dam, Wheeler Dam, and Guntersville Dam.3/ Power is being produced at Wilson and Wheeler Dams, but at Guntersville Dam production is scheduled to start in January 1940. The combined initial generating capacity of these installations is 322,000 kilowatts, but provision is made for an ultimate capacity of 800,000 kilowatts. Furthermore, Pickwick Landing Dam, in Tennessee, just outside the unit, has an initial capacity of 72,000 kilowatts with an ultimate capacity of 216,000. The power produced at these dams was sold during the fiscal year ending June 30, 1938 to municipalities, cooperatives, industries, other electric utilities, and direct rural services at an average

2/ Reconnaissance erosion survey. Soil Conservation Service, 1934.
3/ Fifty inches of rain. Tennessee Valley Authority, 1939.

rate of 3.3 mills per kilowatt-hour. Towns and cities in the unit using TVA power include Athens, Florence, Guntersville, Muscle Shoals, Sheffield, and Tuscumbia.

Many parts of the unit are at least 25 miles from a railroad, although railroad transportation is provided by five main systems. A main line of the Southern Railway roughly parallels the Tennessee River across the unit and offers transportation between Memphis and northern and eastern points. Other systems are the Alabama Great Southern; Louisville and Nashville; and the Nashville, Chattanooga, and St. Louis. A branch line of the Illinois Central serves a small portion of Franklin County.

One Federal highway crosses the unit in an east-west direction, 3 extend north and south, and U. S. Highway No. 11, which runs northeast from Birmingham, crosses the unit in DeKalb County. These highways are paved, but many of the secondary roads are gravel or unimproved. The Federal highways provide reasonably well for through traffic, but local inter-county travel is often difficult in periods of wet weather. Large areas, particularly in Jackson and DeKalb Counties, are more than 10 miles from a paved highway.

The Tennessee Valley Authority is actively developing the Tennessee River for navigation, and when the program is completed there will be a 9-foot channel from Knoxville, Tenn., to the Ohio River at Paducah, Ky. As the Tennessee River flows through the heart of the unit for nearly 200 miles, the economies of water transportation will be available to a large part of the area.

The first white settlers in this region came chiefly from Virginia, Georgia, Tennessee, and the Carolinas. Settlements were established between 1800 and 1820, and county organization followed quickly after the removal of the Creek and Cherokee Indians during the early part of the century. In 1850 the population of the area was about 136,000, and by 1930 this number had increased to 388,000. Based on Census estimates of the population increase throughout the State between 1930 and 1936, the population of this unit in 1937 was about 425,000. At the time of the 1930 Census, 82 percent of the people were native-born whites, 17 percent were negroes, and a small minority were foreign-born whites and other races. Only 17 percent of the people lived in cities of more than 2,500 inhabitants, 14 percent lived in small towns and scattered communities, and 69 percent, or 266,000, lived on farms.

Of those persons gainfully employed, agriculture was the chief activity of 66 percent. Six percent were engaged in the textile industry, and nearly 2 percent were working in the wood-utilization industries. A smaller proportion was occupied in blast furnaces, mines, and iron and steel mills. In 1937 the unemployment Census found that 44,000 individuals, or about one-tenth of the estimated total population, were wholly or partly unemployed. Forty-five percent of these were farmers or farm laborers, and 10 percent were classified as other laborers. Skilled or semi-skilled workers numbered about 10,000, or 23 percent of all those needing employment. This reservoir of skilled workmen, plus cheap electric power and facilities for water shipment of freight, favors greater industrialization of the region.

At present agriculture is the chief land use. The 1935 Census of Agriculture found in the area over 53,200 farms, containing a total of 3,431,000 acres, or three-fourths of all the land in the unit. Tenants occupy 63 percent of the farms and operate half the farm land. The average farm contains 65 acres of which 32 are cropland, 6 are open pasture, 23 are woodland, and 4 are in miscellaneous uses. The 1,215,000 acres of farm woodlands constitute 58 percent of all the forest land. Eighty-four percent (table 2) of all the farms contain less than 100 acres, but they contain only 51 percent of the land. The largest proportion (40 percent) of the land is in farms ranging from 100 to 499 acres. More than half of the 74 farms of 1,000 acres or more are located in Jackson, Madison, and Lauderdale Counties.

Table 2. - Number and acreage of farms classified according to size, 1935[1]

Size	Number of farms	Proportion of total number	Total land in farms	Proportion of total acreage
Acres		Percent	Acres	Percent
Less than 50	31,537	59.3	839,843	24.5
50 - 99	13,194	24.8	916,638	26.7
100 - 499	8,115	15.2	1,360,641	39.7
500 - 999	301	.6	196,020	5.7
1,000 and over	74	.1	118,122	3.4
Total	53,221	100.0	3,431,264	100.0

1/ Data from Census of Agriculture.

General farming prevails throughout the area, but 80 percent of the cropland harvested in 1934 was planted in two crops, corn (714,000 acres) and cotton (469,000 acres). Hay and sorghums occupied the third largest acreage (224,000 acres). Other crops included wheat, oats, sweet and Irish potatoes and some truck crops. Madison County ranked first in the State in the production of corn and hay, and Lauderdale County ranked first in the production of wheat. Large numbers of cattle, hogs, and poultry are raised for home use throughout the unit. In recent years the trend has been toward a greater diversification of crops, with increasing emphasis on the production of foodstuffs for local consumption. Forest products, however, provide a supplementary cash income to many farmers; sales reported to the Census averaged $62.00 per farm reporting in 1934. Nearly half the farms reporting sales were in Franklin, Jackson, and DeKalb Counties.

An intensive study of rural land ownership in 1935 was made by the Bureau of Agricultural Economics of the U.S.D.A. in cooperation with the Works Progress Administration of Alabama. Information was obtained for each county in the unit, and a total of 31,620 ownerships containing 4,112,600 acres was recorded, the number and acreage of which are classified according to size in table 3. From the standpoint of carrying extension work in agricultural and forestry practices directly to the landowner, the ownership situation presents some difficulties, as nearly 29,000 owners control 54 percent of the acreage. Even on the largest ownerships (1,000 acres and over) more than 300 owners would have to be reached in order to influence practices on 18 percent of the area.

The study revealed that 81 percent of the land was owned by persons residing within the same county, 4 percent by persons residing in adjoining counties, 3 percent by people living elsewhere in Alabama, 7 percent by out-of-state owners, about 3 percent by public agencies, and 2 percent by owners whose addresses are unknown.

Table 3. - Number and acreage of rural ownerships classified according to size, 1935

Size	Number of ownerships	Proportion of total number	Lands owned	Proportion of total acreage
Acres		Percent	Acres	Percent
Less than 50	12,515	39.6	374,923	9.1
50 - 99	8,225	26.0	602,309	14.7
100 - 259	7,945	25.1	1,238,073	30.1
260 - 499	1,888	6.0	659,237	16.0
500 - 999	739	2.3	492,789	12.0
1,000 and over	308	1.0	745,285	18.1
Total	31,620	100.0	4,112,616	100.0

Classification of the rural-land ownership by business of owner shows that over two-thirds of the land is being lived upon and operated by the owners, chiefly farmers. Wood-using industries own a very small part of the land in the unit. The percentage of the land area owned by the various groups is as follows:

Business group	Percent of area owned	Business group	Percent of area owned
Farm owner-operators	68.0	Wood-using industries	1.4
Merchants	2.3	Mining, power, railroad, and farming companies	0.9
Professional men	2.0	All other businesses	9.2
Administrators and executors	1.4	Governmental agencies (publicly-owned land)	2.6
Banks and mortgage companies	2.8	Business unknown	8.8
Real-estate agencies	0.6		
		Total	100.0

Complete forest-land ownership data are not available. Most of the timbered area is in farm forests, which contain 1,215,000 acres, or 58 percent of the total. Wood-using industries, mining companies, and owners of undetermined status own about 700,000 acres. It was estimated in 1938 that approximately 175,000 acres were in public ownership, the major part about equally divided between National Forests and the Tennessee Valley Authority.

The general property tax in this unit, as in most of Alabama, is relatively low. The Alabama Constitution fixes the maximum ad valorem levy for State, county, and school purposes at 21 mills on an assessed valuation not exceeding 60 percent of the market value. Lands are assessed by the owners at average values with the approximate acreage that is improved, unimproved, or timbered indicated in the assessment. Many forest lands, which are classed as wild or unimproved, are assessed at $1.00 to $2.50 per acre, although heavily timbered stands may be assessed at a higher rate. The total tax per acre on forest land ranges upward from 2¢, depending upon assessed valuation; it averages about 5¢. Reasonable land taxes, plus strict enforcement of tax laws, have prevented excessive tax default. The area on which taxes were unpaid for 3 or more years, as of August 1934, was only 15,221 acres,[4] or 0.3 percent of the area.

Many factors have influenced the pattern of land use in this unit. For over a century, changing economic conditions have forced continuous readjustments in the use of land for cultivated crops, forests, and other purposes. Physiographic changes, such as erosion with its accompanying soil deterioration, have also caused a constant shift in land use. Forest land has been cleared, farmed, allowed to revert to forest, and cleared again. Table 4 shows that in 1936 about 2 percent of the area had been recently cleared for agriculture, while 3 percent was lying idle or abandoned. The extent to which this idle and abandoned land will revert to forest is unpredictable, but the indications are that the total area of forest land will increase rather than decrease.

Table 4. - Land area classified according to land use, 1936[1]

Land use	Area	Proportion of total area
	Acres	Percent
Forest	2,090,300	46.8
Nonforest:		
Agricultural:		
In cultivation:		
Old cropland	1,898,600	42.5
New cropland	86,200	1.9
Out of cultivation:		
Idle	103,100	2.3
Abandoned	36,300	.8
Pasture	171,700	3.8
Total agriculture	2,295,900	51.3
Other nonforest	83,800	1.9
Total nonforest	2,379,700	53.2
Total forest and nonforest	4,470,000	100.0

1/ Does not include 125,900 acres in area flooded by power dams.

4/ Craig, R. B. The extent of tax default in the Gulf States in 1934. Occasional Paper No. 49. Southern Forest Expt. Sta., Aug. 25, 1935.

Description of the Forest

Forests occupy 2,090,300 acres, or 47 percent, of the unit. The location of the forest land is shown on the map (fig. 2), which is based upon aerial photographs. It is apparent that the distribution of forest land is closely associated with the topography, as described earlier in this report. Originally, Sand Mountain, like the rest of the unit, was densely wooded, but the suitability of the soil for agriculture was recognized early, and much of the land has been cultivated for nearly half a century. The extreme north end of the mountain is predominantly forest land, but on most of the mountain the timbe stands occur only along water courses and on the odd portions of land commonly found in an agricultural section. Farm woodlots characterize the area, but they contribute an important amount of material for home-use and for sale.

An aerial view of the Jackson County Mountains shows an almost continuous forest cover with cultivated lands confined largely to the narrow stream bottoms and an occasional farm high on a level mountain top. Since thin soils, rough, stony land, and steep slopes are not conducive to successful agriculture, this will probably remain one of the most heavily forested areas in the unit, but even with the present forest cover the run-off is so rapid that serious flood damage has resulted on bottom-land farms along the Paint Rock River.

In the Highland Rim the forests, which occur as pasture woodlots, along small streams, and on patches of land too steep to cultivate, are chiefly associated with the farms. A similar distribution of forest land occurs in the Moulton, Sequatchie, and Wills Valleys. On Little Mountain also, the forest land is conjoined with the farms, but it exists in larger blocks than in the preceding two areas. The Warrior Basin and Coastal Plain areas are heavily wooded. Here large tracts of timberland are held by operators of forest industries, and almost 90,000 acres in the Black Warrior National Forest is under the administration of the U. S. Forest Service.

Shortleaf pine is the most abundant tree in the unit, followed by red oaks, hickories, and loblolly pine, but many other species, such as forked-leaf white oak, scrub oaks, Virginia pine, red gum, maple, chestnut oaks, and yellow poplar, are plentiful. The various species are greatly intermingled, but reference to figure 3 shows that on some areas certain species characteristically occur together. For example, the forests of Lookout Mountain, the northern end of Sand Mountain, the Coastal Plain section, and the western portion of the Highland Rim and Warrior Basin are dominated by shortleaf pine mixed with loblolly pine, hickory, and red, forked-leaf white, chestnut, and scrub oaks. In figure 2 these areas appear heavily forested with little agricultural land.

Where the proportion of agricultural land increases south of the Tennessee River, as in Moulton Valley, the eastern part of the Warrior Basin, and on Sand Mountain, the proportion of loblolly pine also increases. Restriction of the forests to the less tillable land, such as moist gullies and stream-heads, which are favorable for loblolly pine, partly accounts for the increased proportion of this species. On Sand Mountain these moist sites produce excellent stands of loblolly pine, which should serve well to supplement the financial return from cultivated crops.

North of the Tennessee River, the upland hardwoods occupy a large part of the forested land, of which there is a large proportion in the Jackson

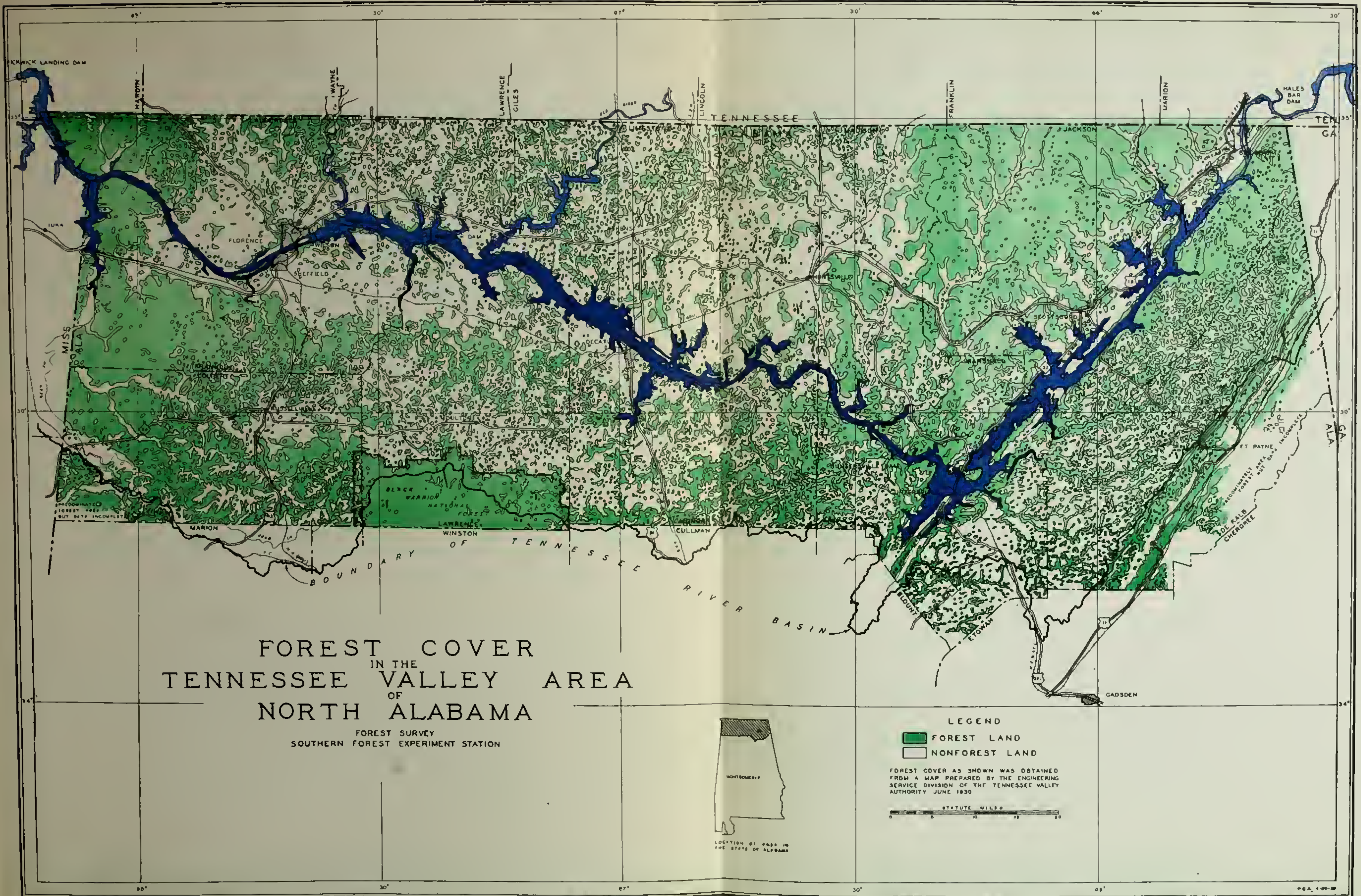

FOREST COVER
IN THE
TENNESSEE VALLEY AREA
OF
NORTH ALABAMA
FOREST SURVEY
SOUTHERN FOREST EXPERIMENT STATION
LEGEND
FOREST LAND
NONFOREST LAND
FOREST COVER AS SHOWN WAS OBTAINED FROM A MAP PREPARED BY THE ENGINEERING SERVICE DIVISION OF THE TENNESSEE VALLEY AUTHORITY JUNE 1930
STATUTE MILES
TENNESSEE
BOUNDARY OF TENNESSEE RIVER BASIN
HALES BAR DAM
FLORENCE
SHEFFIELD
DECATUR
CULLMAN
GADSDEN
FT PAYNE
IUKA
HARDIN
WAYNE
LAWRENCE
GILES
LINCOLN
FRANKLIN
MARION
JACKSON
WINSTON
BLOUNT
ETOWAH
DE KALB
CHEROKEE
MISS
ALA
GA
BLACK WARRIOR NATIONAL FOREST

FIGURE 2.

Acknowledgement

The forest cover map, processed by the Southern Forest Experiment Station, was prepared by the Engineering Service Division of the Tennessee Valley Authority on a scale of one inch to four miles. A base map was gridded into small quadrangles to which the forest cover information was transferred, freehand, from aerial photographs.

County Mountains and a small proportion in the Highland Rim (fig. 2). Oaks predominate throughout the upland hardwood type, but there are many hickories and other hardwoods. The Jackson County Mountains contain most of the red cedar in the unit. Although most of the cedar saw timber has been cut, there is a surprisingly large number of small cedar trees on the lower slopes. Many abandoned fields have restocked to pure stands of this species, and when large enough many of these trees are cut into fence posts, which are sold at the roadside for about 10¢ each. The coves of the Jackson County Mountains produce valuable white oak, yellow poplar, and ash, but on the mountain slopes and tops the hardwoods are generally of inferior quality, according to present utilization standards. There is thus both a need and an opportunity in this area for plants that can utilize the small, low-quality hardwoods.

Just west of the Jackson County Mountains there is an area in which loblolly pine is found with the hardwoods (fig. 3). The aggregate volume of pine in this area is not great, however, as most of the land is cultivated and the pine trees appear usually as scattered individuals. Bottom lands along the Tennessee River and its tributaries contain some good timber, chiefly red gum, red oaks, white oaks, hickory, black and tupelo gums, yellow poplar, and ash. Flooding of the reservoir areas made it necessary to cut a large acreage of bottom-land hardwood timber, and in some cases this has endangered the future timber supplies of forest-industrial plants.

Table 5. - Species composition of the forest type-groups, showing proportion of net cubic volume[1/] in various species, 1936

Species	Forest type-groups: Pine	Pine-hardwoods	Upland hardwoods	Bottom-land hardwoods	All type-groups
	Percent				
Shortleaf pine	40.4	33.9	2.5	0.7	20.1
Loblolly pine	22.5	10.9	0.6	1.0	9.5
Virginia pine	10.0	5.0	0.2	0.1	4.2
Cedar	4.6	0.4	0.7	0.2	1.8
Pines and cedar	77.5	50.2	4.0	2.0	35.6
Yellow poplar	0.4	1.6	3.6	6.6	2.6
Red gum	0.8	2.3	1.9	18.8	3.9
Black gum, maple, etc.	1.2	3.9	4.1	12.8	4.3
Soft-textured hardwoods	2.4	7.8	9.6	38.2	10.8
Red oaks	4.8	12.4	25.5	18.4	15.6
Forked-leaf white oak	2.4	6.7	15.0	7.2	8.4
Chestnut oak	0.9	3.1	7.2	1.2	3.6
Scrub oaks	3.1	6.0	4.6	3.8	4.3
Hickories	6.5	11.0	23.9	7.5	13.8
Ash	1.0	1.0	3.8	5.9	2.7
Dogwood, persimmon, etc.	0.5	0.6	1.4	1.6	1.0
Other hardwoods	0.9	1.2	5.0	14.2	4.2
Firm-textured hardwoods	20.1	42.0	86.4	59.8	53.6
Total	100.0	100.0	100.0	100.0	100.0

1/ Bark included.

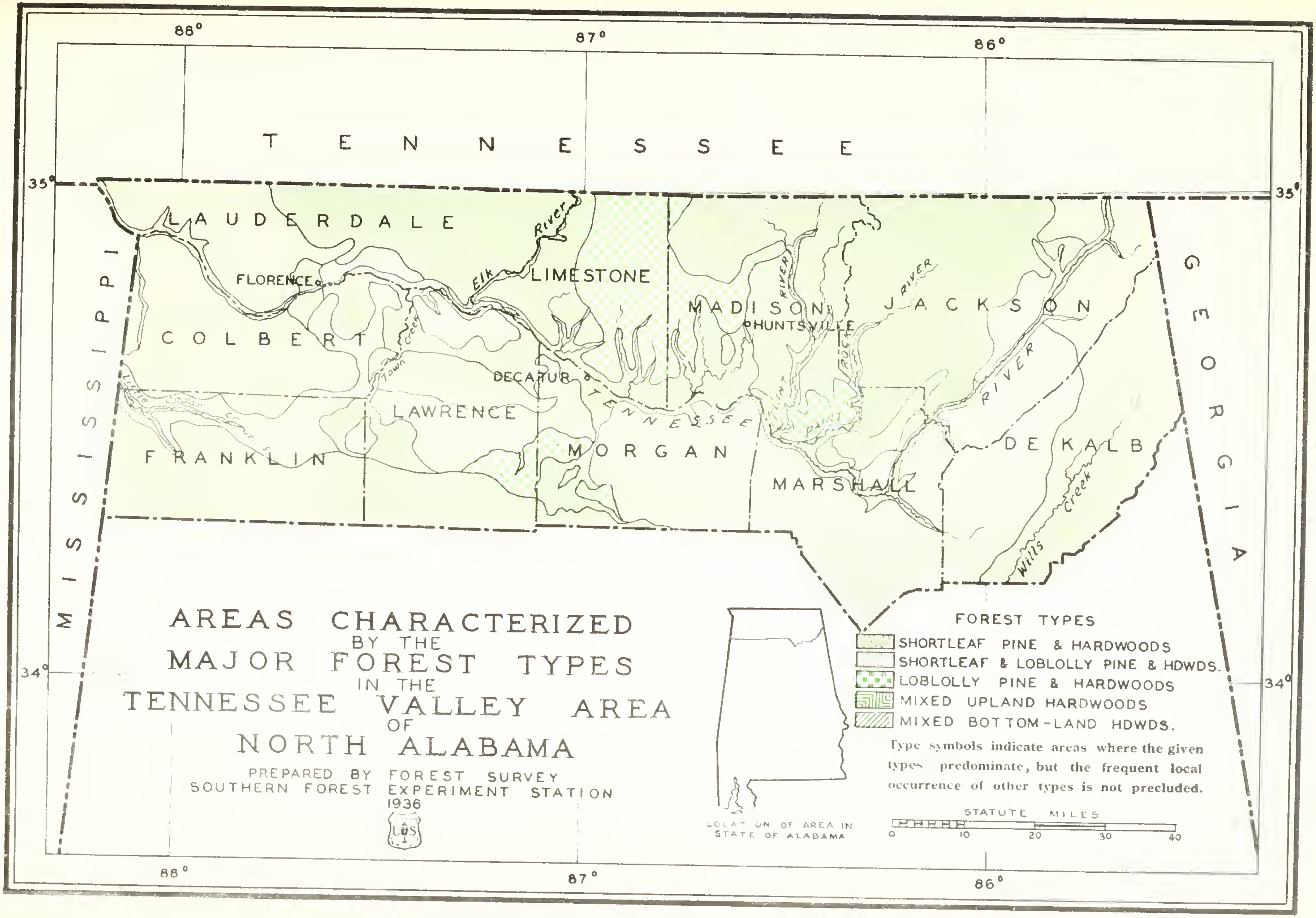

88°
87°
86°
TENNESSEE
35°
LAUDERDALE
FLORENCE
Elk River
LIMESTONE
MADISON
HUNTSVILLE
JACKSON
COLBERT
DECATUR
LAWRENCE
FRANKLIN
MORGAN
TENNESSEE
MARSHALL
DE KALB
Wills Creek
River
MISSISSIPPI
GEORGIA
34°
AREAS CHARACTERIZED
BY THE
MAJOR FOREST TYPES
IN THE
TENNESSEE VALLEY AREA
OF
NORTH ALABAMA
PREPARED BY FOREST SURVEY
SOUTHERN FOREST EXPERIMENT STATION
1936
LOCATION OF AREA IN STATE OF ALABAMA
FOREST TYPES
SHORTLEAF PINE & HARDWOODS
SHORTLEAF & LOBLOLLY PINE & HDWDS.
LOBLOLLY PINE & HARDWOODS
MIXED UPLAND HARDWOODS
MIXED BOTTOM-LAND HDWDS.
Type symbols indicate areas where the given types predominate, but the frequent local occurrence of other types is not precluded.
STATUTE MILES
0 10 20 30 40

FIGURE.— 3

The occurrence of the various species making up the pine, pine-hardwood, upland hardwood, and bottom-land hardwood type-groups is given in table 5. Here the net cubic volume (bark included) of each species in the type-group is expressed as a percentage of the volume in the type-groups.

Many years of forest use have reduced the virgin stand to a mere remnant (table 6). Less than 300,000 scattered acres of old-growth timber remain, and about half of this has been subject to partial cutting. Most of the old growth is in low-quality upland hardwood stands; all the small scattered patches of old-growth pine amount to less than 40,000 acres. Old-growth uncut stands in the pine type-group average 6,300 board feet (lumber tally) per acre, in the pine-hardwoods 3,900, in the upland hardwoods 3,000, and in the bottom-land hardwoods 5,000.

Table 6. - Forest area classified according to forest condition and forest type-group, 1936

Forest condition	Pine	Pine-hardwoods	Upland hardwoods	Bottom-land hardwoods	Total all types	Proportion of total
	Acres					Percent
Old growth:						
Uncut	13,700	8,100	110,400	31,400	163,600	7.9
Partly cut	10,500	6,400	81,400	36,300	134,600	6.4
Total	24,200	14,500	191,800	67,700	298,200	14.3
Second growth:						
Sawlog size:						
Uncut	170,800	91,100	133,700	34,700	430,300	20.6
Partly cut	238,500	87,800	133,800	40,300	500,400	23.9
Under sawlog size	126,500	231,300	380,400	76,500	814,700	39.0
Reproduction	11,300	11,300	1/ 15,300	2/ 8,800	46,700	2.2
Total	547,100	421,500	663,200	160,300	1,792,100	85.7
Total all conditions	571,300	436,000	855,000	228,000	2,090,300	100.0
Percent of total forest area	27.3	20.9	40.9	10.9	100.0	

1/ Includes 800 acres of clear-cut condition.
2/ Includes 1,600 acres of clear-cut condition.

The harvesting of the virgin stands has cleared the way for a new crop of trees. Nearly 1,800,000 acres bear this replacement growth, so that 86 percent of all the forested area is stocked with trees that represent the second (in some cases, the third) crop of timber since the area was settled. Pines, either pure or mixed with hardwoods, have come in on 54 percent of this second-growth area, upland hardwoods on 37 percent, and bottom-land hardwoods on 9 percent. The pine stands are more important commercially, as three-fourths of the pine area is stocked with sawlog-size timber (9 inches d.b.h.) and larger. The pine-hardwood and upland hardwood types have about two-fifths of their area in merchantable stands, while the bottom-land hardwoods have almost one-half. Volumes per acre of uncut second-growth sawlog-size stands average 4,100 board feet (lumber tally) in the pine type-group, 2,800 in the pine-hardwoods, 1,700 in the upland hardwoods, and 2,700 in the bottom-land hardwoods.

A commonly used measure of the potential productivity of the forest land is the height in feet of average dominant trees at 50 years of age, i.e., the site index. Measurements of this kind, which were made throughout the pine types, revealed that the pine areas in north Alabama are considerably below the average for the State in site quality. For the State as a whole, 57 percent of the area stocked to loblolly pine has a site index of 80 or more, while in this unit only 13 percent of the loblolly pine area has that large an index. Figure 4 shows a comparable situation on the shortleaf pine land, as the proportion in the best site-classes in this unit is far below the State average and the proportion in the poor site-classes is almost twice the average for the entire State.

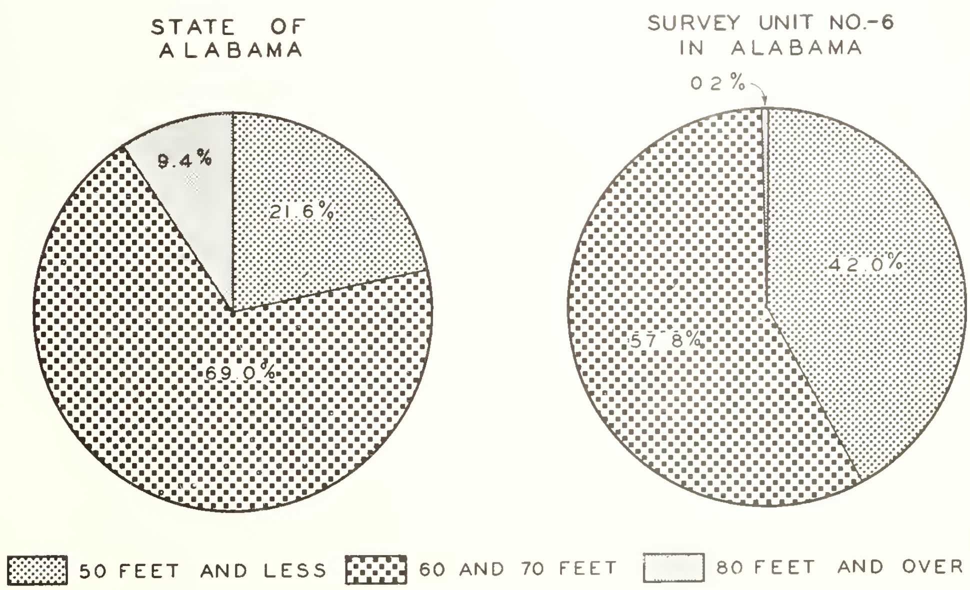


FIGURE 4.- PERCENTAGE OF SHORTLEAF PINE AREA IN VARIOUS SITES.

Although forest sites are poorer in this unit than in south Alabama, there is an opportunity to augment greatly the timber yield by increasing the forest growing stock, i.e., the number of stems per acre. There is, of course, optimum density beyond which further stocking will reduce the growth rate and yield per acre, but few forest stands in north Alabama have reached that density. The ability of the forest sites to bear a denser stand of trees is shown in figure 5, in which the average-per-acre stocking on the pine and pine-hardwood types is compared with that of the uncut best-stocked 14 percent of the same type-groups on similar sites. It appears that the average acre is almost fully stocked in the 2-inch diameter-class, but in the larger diameter-classes it could support 50 to over 100 percent more stems. Both the average and the better-stocked stands are deficient in larger trees, a situation that can be altered by a selection system of forest management dedicated to the production of high-quality saw timber.

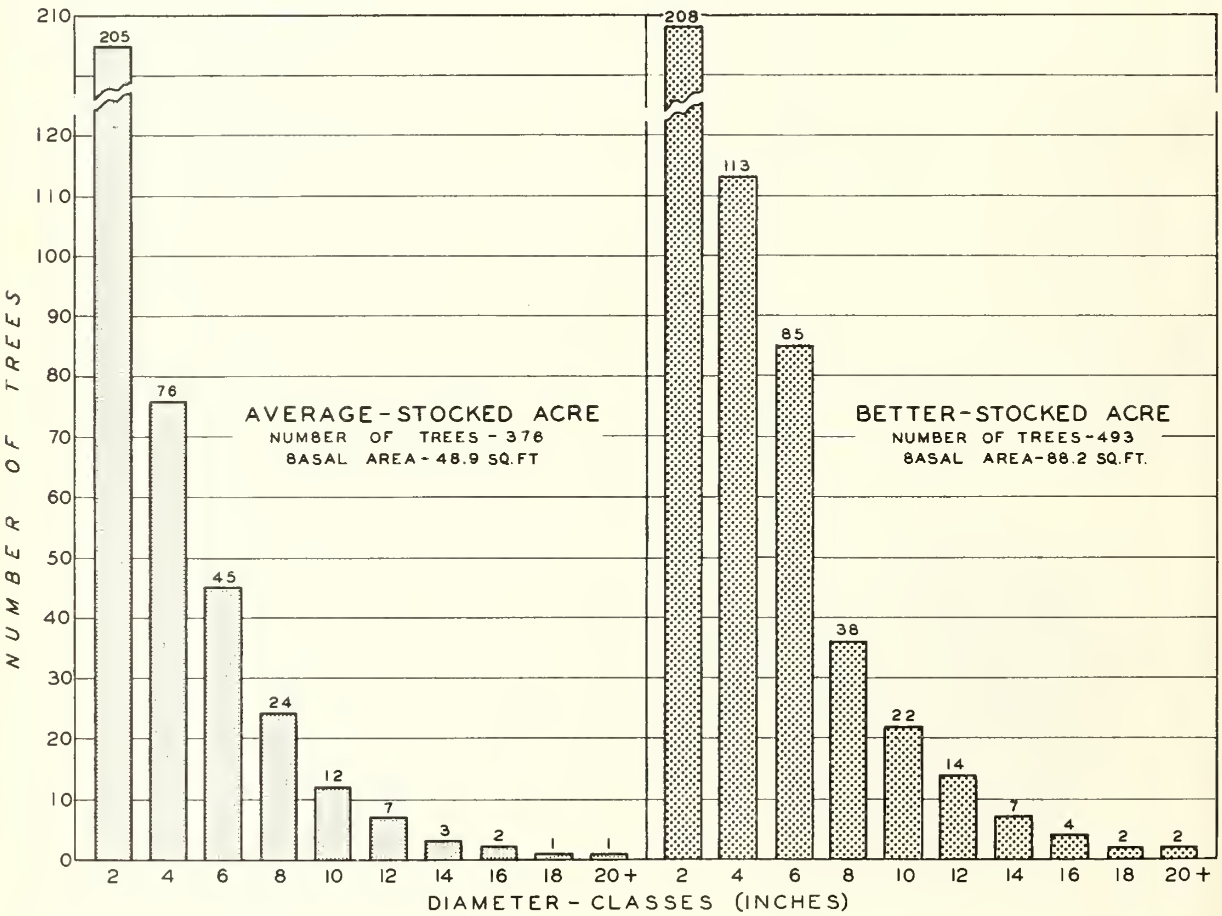


FIGURE 5 — NUMBER OF TREES BY DIAMETER-CLASSES ON AN ACRE OF AVERAGE STOCKING, COMPARED WITH THOSE ON A BETTER STOCKED ACRE (BASED ON PINE AND PINE-HARDWOOD TYPES).

The gain in volume per acre that can be expected through building up the present growing stock to the average of the better-stocked stands is portrayed graphically in figure 6, where the prevailing age-class and volume distribution of the pine and pine-hardwood types is shown along with the volume per acre of better-stocked stands at various ages. The volume figures used are cubic feet inside bark, and no deduction for woods cull has been made. The age-class area and volume per acre of the prevailing forest were determined from field data gathered throughout the 1 million acres in the pine and pine-hardwood types. The per-acre volume of the better-stocked forest are based upon the best stocked 10 percent of the uncut stands of weighted-average sites in these same types. The figure indicates that the area distribution of the age-classes throughout the forest is propitious for the development of sustained-yield management. With better treatment the forest growing stock can be increased greatly, since the volume per acre of many of the better-stocked stands is more than double that of the average stand, e.g., at 60 years the better-stocked stand has about 1,900 cubic feet per acre compared with 800 cubic feet in the average stand.

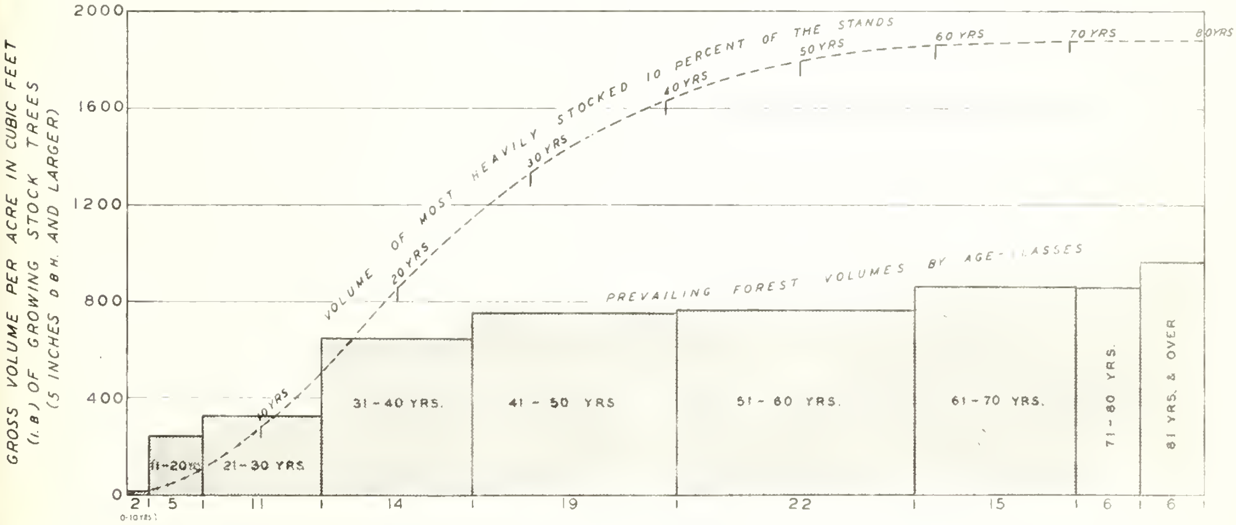


FIGURE 6. — PREVAILING VOLUMES, BY AGE-CLASSES, COMPARED WITH THOSE IN WELL-STOCKED STANDS (BASED ON PINE AND PINE-HARDWOOD TYPE-AREAS OF 1,007,300 ACRES).

It follows that the soil will produce more timber if foresters, landowners, loggers, and wood buyers will unite in a program of good forest management. This calls for fire protection and selective logging. At present, organized fire protection is limited to the Black Warrior National Forest and a small area in Colbert and Franklin Counties, although extensive protection, based on patrol and volunteer assistance, is county-wide in Madison and Colbert Counties. The rest of the forest area is without protection. Selective logging calls for light cuts, made as frequently as growth and market conditions warrant, with the object of increasing the yield from the larger trees through maintenance of a contributory stand of rapid-growing trees well distributed as to size.

Volume Estimates

Board-foot volume

The net volume of saw timber[5] is expressed in table 7 in the Doyle log scale, Scribner log scale, and in lumber tally, which is based upon the International $\frac{1}{4}$-inch scale. The Doyle scale is commonly used throughout the South, but its underestimate of the smaller sizes prevalent in this unit is indicated in table 7, where the volume by the Doyle scale is only 2.1 billion board feet as compared with 3.3 billion board feet lumber tally. The Scribner scale, generally used for U. S. Forest Service timber sales, shows a volume of 2.9 billion board feet, which is somewhat closer to lumber tally. Irrespective of the differences in log scales, the table shows clearly the contribution of the various species to the total board-foot timber resource.

Table 7. - Net volume in Doyle and Scribner scales, and lumber tally, classified according to species-group, 1936

Species-group	Doyle	Scribner	Lumber tally[1]
	Thousand board feet		
Pines:			
Shortleaf pine	408,800	670,600	805,000
Loblolly pine	332,500	473,800	548,200
Virginia pine	75,700	126,300	150,500
Cedar	25,900	39,300	42,000
Total pines	842,900	1,310,000	1,545,700
Hardwoods:			
Yellow poplar	100,100	122,600	134,800
Red gum	103,600	134,200	149,500
Black gum, maple, etc.	92,200	118,600	129,900
Red oaks	334,900	425,500	469,000
Forked-leaf white oak	184,000	227,700	250,900
Chestnut oak	85,800	104,400	113,500
Hickories	202,400	267,200	296,500
Ash	53,000	67,100	73,900
Other hardwoods[2]	107,900	132,400	144,900
Total hardwoods	1,263,900	1,599,700	1,762,900
All species	2,106,800	2,909,700	3,308,600

1/ Lumber tally is based on the International $\frac{1}{4}$-inch rule, which it closely approximates.
2/ Special use species and scrub oak are excluded.

5/ See appendix for description of material included in saw timber.

The net volume (lumber tally) is given by species and forest condition in table 8. Nearly one-third of all the board-foot volume is concentrated in the old-growth conditions, even though they occupy only 14 percent of the forest area. In the pines, 12 percent of the volume is in old-growth stands, 82 percent in second-growth sawlog-size stands, and 6 percent in under-sawlog-size stands. Nearly half the hardwood volume is in old-growth stands, whereas 46 percent is in sawlog-size second growth, and only 6 percent is in stands below saw-timber size. The hickories and ash have a higher proportion of their volume in second-growth stands, and the chestnut oaks have a higher proportion of timber volume in old-growth stands, than any of the other hardwoods.

Table 8. - Net volume, lumber tally, classified according to species-group and forest condition, 1936

Species-group	Old growth		Second growth			Total	Proportion of total
	Uncut	Partly cut	Sawlog size		Under sawlog size1/		
			Uncut	Partly cut			
	Thousand board feet						Percent
Pines:							
Shortleaf	53,800	37,300	436,200	218,800	58,900	805,000	24.3
Loblolly	49,200	35,800	307,800	138,600	16,800	548,200	16.6
Virginia2/	14,000	2,700	98,200	67,800	9,800	192,500	5.8
Total pines	117,000	75,800	842,200	425,200	85,500	1,545,700	46.7
Hardwoods:							
Yellow poplar	48,200	14,900	40,500	28,900	2,300	134,800	4.1
Red gum	33,500	32,400	36,900	42,000	4,700	149,500	4.5
Black gum, maple, etc.	32,400	35,800	31,100	22,700	7,900	129,900	3.9
Red oaks	123,700	85,900	126,500	101,500	31,400	469,000	14.2
Forked-leaf white oak	66,800	61,900	57,000	53,000	12,200	250,900	7.6
Chestnut oak	59,400	14,100	25,100	8,600	6,300	113,500	3.4
Hickories	75,600	45,200	76,700	71,000	28,000	296,500	9.0
Ash	16,900	12,900	17,800	21,600	4,700	73,900	2.2
Other hardwoods	33,400	49,500	26,000	29,700	6,300	144,900	4.4
Total hardwoods	489,900	352,600	437,600	379,000	103,800	1,762,900	53.3
Total all species	606,900	428,400	1,279,800	804,200	189,300	3,308,600	100.0
Percent of total	18.3	12.9	38.7	24.3	5.8	100.0	

1/ Includes areas classified as reproduction; clear-cut areas are negligible.
2/ Includes 42 million board feet of cedar.

From a sawmilling standpoint, it is discouraging to find such a large proportion of the volume in the smaller diameters, as is shown in table 9. In the pines over half the volume is in trees in the 10- and 12-inch diameter-classes, a size that offers little opportunity for profit. These small sizes are preferred by mill operators manufacturing "roofers," however, as larger logs are too difficult to handle. Only 17.5 percent of the pine volume is in trees at least 17.0 inches d.b.h., where high-quality lumber and good profits are to be had. The hardwoods likewise are deficient in the larger trees, as nearly two-thirds of the volume is in trees in the 14- to 18-inch diameter-classes. Few of the trees of this size will produce the best grade of logs, since the Survey considers that Grade 1 logs should have a top diameter of at least 14 inches.

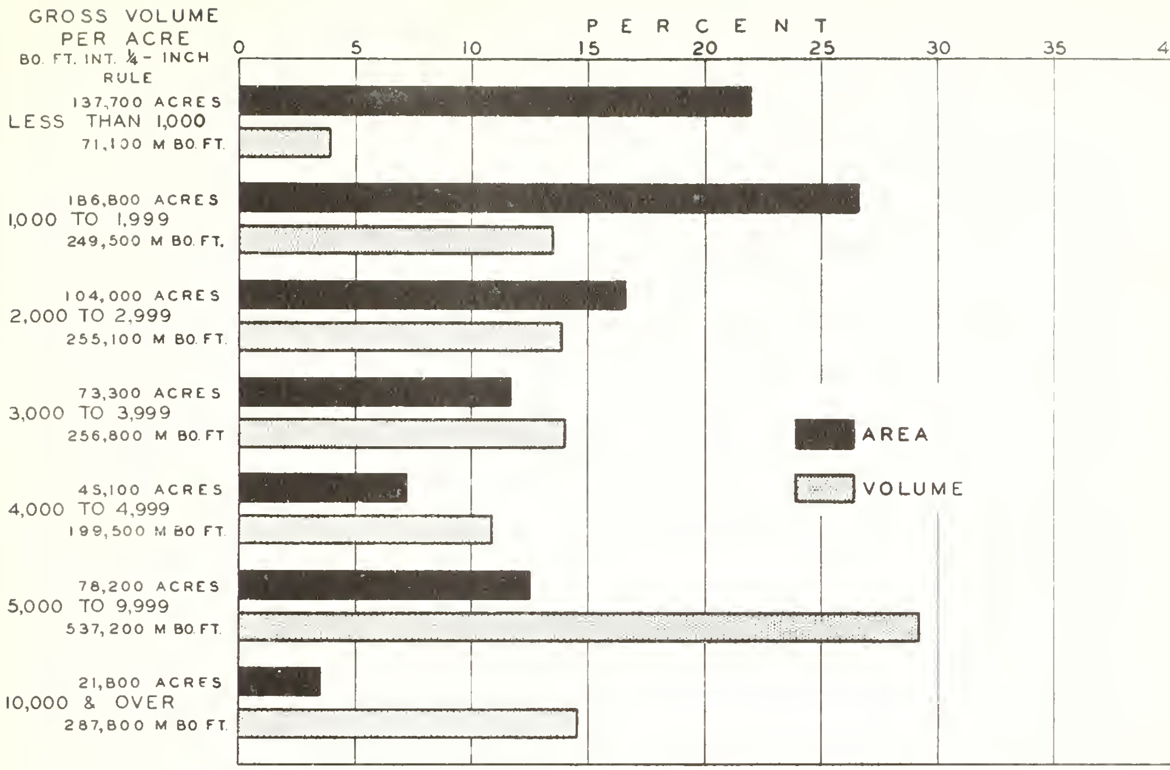
Table 9.-Diameter distribution of net volume, lumber tally, in the various forest conditions, 1936

Species-groups and diameter-classes (inches)	Old growth		Second growth			Total	Proportion of total
	Uncut	Partly cut	Sawlog size: Uncut	Sawlog size: Partly cut	Under sawlog size		
	Thousand board feet						Percent
Pines:							
10 - 12	26,900	15,000	432,100	261,800	79,200	815,000	52.7
14 - 16	30,100	19,200	291,800	113,300	5,700	460,100	29.8
18 - 20	29,900	21,800	100,500	40,800	600	193,600	12.5
22 and over	30,100	19,800	17,800	9,300	-	77,000	5.0
Total pines	117,000	75,800	842,200	425,200	85,500	1,545,700	100.0
Hardwoods:							
14 - 18	228,000	176,200	333,100	285,600	94,500	1,117,400	63.4
20 - 28	233,800	149,700	102,600	90,100	9,300	585,500	33.2
30 and over	28,100	26,700	1,900	3,300	-	60,000	3.4
Total hardwoods	489,900	352,600	437,600	379,000	103,800	1,762,900	100.0

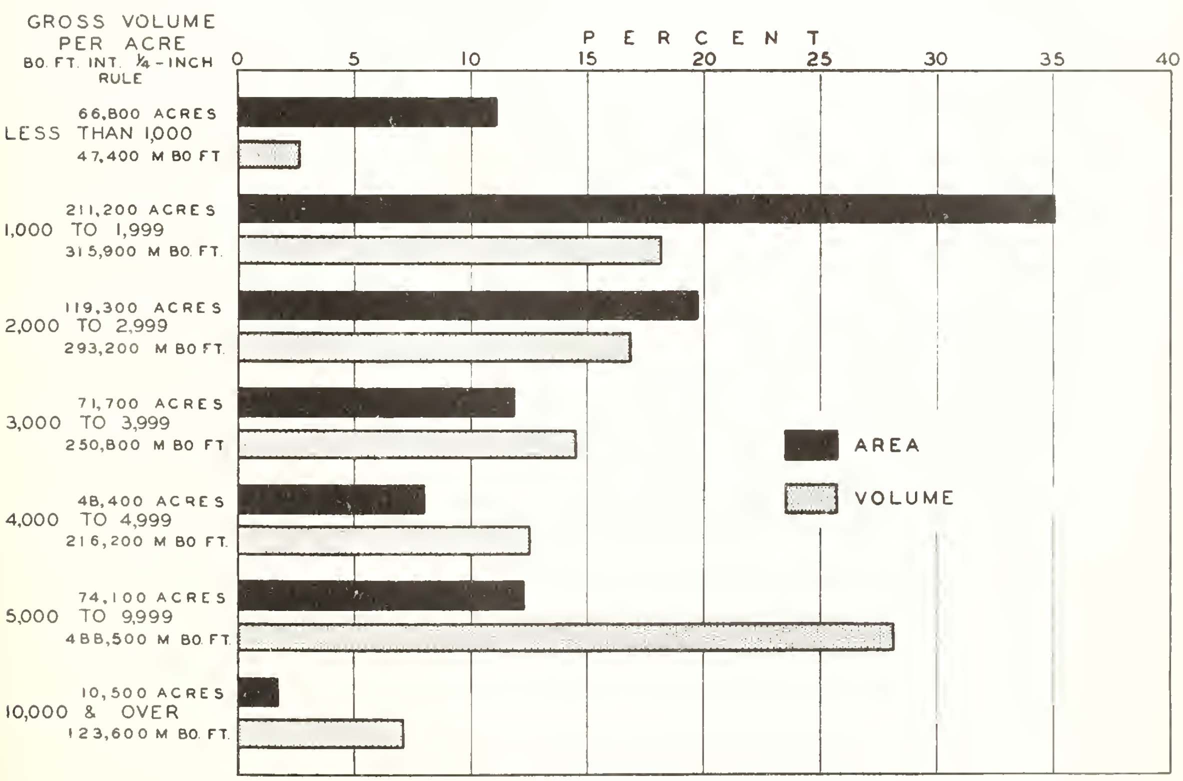
The proportion of the forest area supporting different volumes per acre, and the proportion of the total volume in these volume-per-acre classes, are shown for the sawlog-size stands in figure 7. All the volumes are gross, as no woods cull has been deducted. The pine and pine-hardwood types, which occupy 626,900 acres, contain 1.8 billion board feet gross volume. Eighty-three percent of this volume is in stands of 2,000 board feet per acre or more, but 48 percent of the area is stocked with less than 2,000 board feet of timber per acre, emphasizing the need for building up the growing stock.

The upland and bottom-land hardwood types, which occupy 602,000 acres, contain 1.7 billion board feet gross volume. Seventy-nine percent of the volume is in stands of 2,000 board feet per acre or more, of which over two-fifths is in stands of 5,000 board feet or more concentrated on 14 percent of the type-group area. Since 46 percent of the area is stocked with less than 2,000 board feet per acre, here also, as in the pines, it should be possible to increase the growing stock.

In order to obtain information concerning the quality of the timber stands, the Survey made a rough classification (see appendix) of the pine



A-PINE AND PINE-HARDWOOD TYPE-GROUPS



B-HARDWOOD TYPE-GROUPS

FIGURE 7.— PROPORTIONAL AREA AND VOLUME OF THE SAWLOG-SIZE CONDITIONS, CLASSIFIED ACCORDING TO VOLUME OF SAW TIMBER PER ACRE.

saw-timber trees into "smooth," "limby," and "rough." This revealed (table 10) that 57 percent of the pine saw-timber volume is in smooth trees, 37 percent in limby, and 6 percent in rough trees. Shortleaf pine is of good quality, in both old-growth and second-growth stands, as only 1 percent of the total volume in this species is in rough trees. Loblolly pine is somewhat poorer, but the lowest quality stands are Virginia pine, which have only 5 percent of their volume in smooth trees.

Table 10. - Classification of pines according to tree grade

Species and stand condition	Tree grade			Total
	Smooth	Limby	Rough	
	- - - - - - - - Percent of volume - - - - - - - -			
Shortleaf pine:				
Old growth	93	7	-	100
Second growth	69	29	2	100
Weighted average	72	27	1	100
Loblolly pine:				
Old growth	93	7	-	100
Second growth	42	52	6	100
Weighted average	50	45	5	100
Virginia pine	5	60	35	100
All pines:				
Old growth	93	7	-	100
Second growth	52	41	7	100
Weighted average	57	37	6	100

Cordwood volume

In a region where skilled workmen are idle, power is abundant and cheap, railroad and highway facilities are adequate, and water transportation will soon be available for shipping heavy goods, it is pertinent to consider the wood supplies that might contribute to a pulp and paper industry. While a knowledge of the total volume of wood is essential, it is misleading without a knowledge of the facts concerning its present and prospective uses. Table 11,[6] for example, shows that there were nearly 26 million cords of sound material in the unit in 1936. This amount, if it were all available for pulping, would be ample for several pulp mills, but (1) the requirements of the existing industries and uses (mainly lumber and fuel) are considerably greater than the current annual increment of the present growing stock; (2) until the growing stock can be built up, general increased use would seriously threaten the permanency of the present wood-using industries; and (3) a large part of the material is in species not now widely used for pulp.

6/ See appendix for description of various classes of cordwood material.

Table 11. - Net volume in various classes of sound material, expressed in cords, 1936

Species-group	Sound trees, sawlog size: Sawlog material	Sound trees, sawlog size: Upper stems	Sound trees under sawlog-size	Cull trees	Total all classes	Proportion of total
	Cords	- - (bark included)	- -			Percent
Pines	3,492,400	398,300	2,666,600	83,100	6,640,400	25.8
Hardwoods:						
Soft-textured1/	1,049,000	583,700	1,196,300	600,800	3,429,800	13.3
Firm-textured2/	3,548,000	2,027,000	3/6,679,400	3,431,000	15,685,400	60.9
Total hdwds.	4,597,000	2,610,700	7,875,700	4,031,800	19,115,200	74.2
Total all species	8,089,400	3,009,000	10,542,300	4,114,900	25,755,600	100.0
Percent of total	31.4	11.7	40.9	16.0	100.0	

1/ Red, black, and tupelo gums, red maple, yellow poplar, buckeye, basswood, cucumber, willow, etc.
2/ Oak, hickory, elm, ash, hard maple, beech, hackberry, dogwood, persimmon, sycamore, etc., are not considered as commercial pulping material at present.
3/ Includes all diameter classes of special use species.

There are reasons, however, why the pulp industry should be established. In certain areas, such as the Jackson County Mountains, a pulp mill using low-grade hardwoods is needed to provide a market for material that must be removed before the productivity of the stands can be increased. Experience has shown that forest values may be destroyed as completely by the pulpwood industry as by lumbermen, but present trends indicate that the pulp and paper industry, for the most part, has decided to do its share in keeping forest lands productive. A pulp mill, operated on a permanent basis by a progressive, forestry-minded company, would be more profitable for the local population, less destructive of the forest resource, and better from a social viewpoint than the host of small, inefficient, and temporary pine sawmills now operating in the unit.

A large part of the cordwood volume is in the smaller trees (fig. 8), a distribution that favors pulpwood production rather than saw timber. This is particularly true in the firm-textured hardwoods that are at the moment considered unsuitable for pulping, where nearly two-thirds of the volume is in trees below sawlog size. Since many of these trees will never attain the size and quality requisite for saw timber, some use other than fuel wood must be found for them if they are to bring in any important cash return.

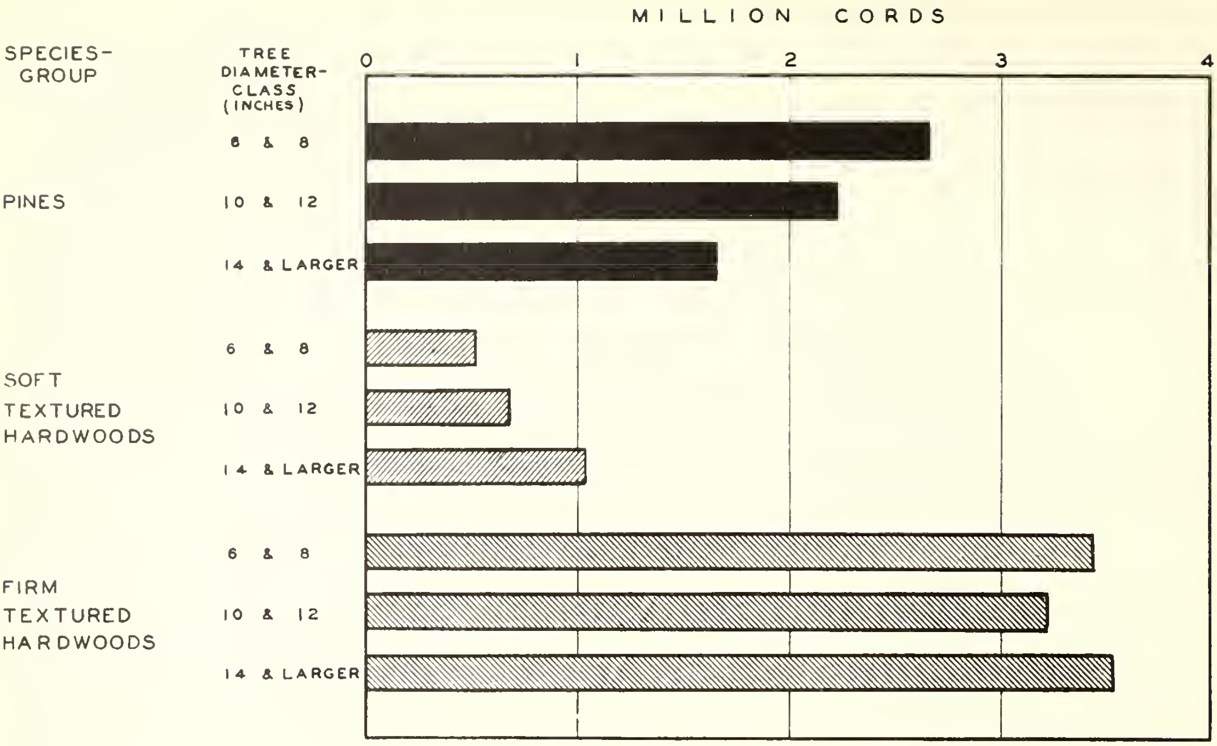


FIGURE 8. — CORDWOOD VOLUMES BY SIZE-CLASSES; SOUND TREES ONLY, 1936.

The average stand of sound tree growing stock per acre amounts to 9 cords (table 12). The bottom-land hardwood type-group, which has the highest average volume per acre in most of the forest conditions, averages 12 cords per acre for all conditions. The old-growth uncut condition, weighted for all types, averages only 15 cords per acre compared with 14 cords in the second-growth sawlog-size uncut condition. The old-growth stands may be on poor sites, but Survey data indicate that a close approach to maximum cordwood volume may be attained by pine stands when they are 50 to 70 years of age (fig. 6).

Table 12. - Average volumes of cordwood per acre in growing-stock trees, 1936

Forest type-group	Old growth		Second growth			All conditions 1/
			Sawlog size		Under sawlog size	
	Uncut	Partly cut	Uncut	Partly cut		
	- - - - - - - - - Cords (bark included) - - - - - - - - -					
Pine	18.6	15.1	16.5	8.3	4.4	10.1
Pine-hardwood	14.5	15.4	14.5	9.9	4.5	7.9
Upland hardwood	13.6	11.1	10.9	9.5	5.3	8.4
Bottom-land hardwoods	20.2	16.5	14.4	13.4	5.2	11.7
All types (weighted average)	15.3	13.1	14.2	9.3	4.9	9.1

1/ Includes reproduction and clear-cut areas.

Poles and piles

The Survey found that about 15 percent of the total number of pine and cedar trees between 7.0 and 18.9 inches in diameter would meet the pole and pile specifications, the former of the American Standards Association. About $4\frac{1}{4}$ million trees (table 13) in north Alabama, therefore, are considered suitable for conversion into poles or piles; their volume, however, has been included in previous volume estimates. Seventy-six percent of these trees will yield pieces less than 30 feet long, and only 3.5 percent will yield pieces at least 35 feet long. Seventy percent of the pieces are in trees less than 11.0 inches d.b.h. It follows that the timber stands in this unit can produce a large number of poles that after preservative treatment would be extremely useful in a rural electrification program using TVA power, but the majority will be of the shorter lengths and smaller sizes.

Table 13. - Total number of pine poles or piles, classified according to length and diameter, 1936

D.B.H. of trees (outside bark)	Pole or pile lengths (feet)					Total	Proportion of total
	20	25	30	35	40 or over		
Inches	Thousand pieces						Percent
7.0 - 8.9	880	525	139	-	-	1,544	36.1
9.0 - 10.9	716	443	229	29	14	1,431	33.5
11.0 - 12.9	318	212	301	35	18	884	20.7
13.0 - 14.9	41	76	164	22	13	316	7.4
15.0 - 16.9	4	21	46	9	4	84	2.0
17.0 - 18.9	-	3	6	2	1	12	.3
Total	1,959	1,280	885	97	50	4,271	100.0
Percent of total	45.8	30.0	20.7	2.3	1.2	100.0	

Forest Increment

Forest increment, as used in this report, denotes the volume of wood added by growth to the individual trees, plus the volume of small trees developing into measurable sizes, and minus losses due to mortality. The estimate of increment for the saw-timber portion of the growing stock, expressed in board feet lumber tally, is made up of: (1) the growth of trees already sawlog size, plus (2) the board-foot volume of trees that become sawlog size, and minus (3) the volume of trees of sawlog size that die. Estimates of increment for the entire growing stock, expressed in cubic feet (excluding bark) and cords (including bark), cover: (1) the growth of sound stemwood in pines and under-sawlog-size hardwoods, and the sawlog portion of sawlog-size hardwoods, (2) the volume of small trees becoming 5.0 inches d.b.h. or larger during the year, and (3) deduction for mortality losses. Increment on cull trees and on tops and limbs of sawlog-size hardwoods is not included.

Board-foot and cubic-foot increment in the different forest conditions during 1936 is shown in table 14. This is the only year for which increment can be presented accurately by forest conditions because changes in area in the different forest conditions since the field survey have not been determined. The net increment of old-growth pine saw timber is comparatively small because of the small proportion of this class of timber and because of a slow growth rate and relatively high mortality rate. The large board-foot increment in the under-sawlog-size condition is due, primarily, to the large acreage in this condition (39 percent of the forest area), and to the large number of small trees attaining sawlog size during the year.

Table 14. - Net increment in board feet and cubic feet in the various forest conditions, 1936

Forest condition	Saw-timber material			All material		
	Pine	Hardwood	Total	Pine	Hardwood	Total
	Thousand board feet (lumber tally)			Thousand cubic feet (inside bark)		
Old growth	3,800	18,300	22,100	730	4,140	4,870
Second growth:						
Sawlog size	64,300	28,400	92,700	11,460	11,090	22,550
Under sawlog size	24,500	17,100	41,600	6,980	7,760	14,740
Reproduction and clear cut	100	-	100	30	10	40
Total all conditions	92,700	63,800	156,500	19,200	23,000	42,200

Although there is more board-foot growing stock in the hardwood species than in the pine (table 8), the net board-foot increment of the pines exceeds that of the hardwoods (table 14). This is due to (1) the faster growth of the pines, (2) the larger number of small pines becoming of merchantable size during the year, and (3) the lower mortality of the pines. Of the total net board-foot increment, 59 percent is pine and 41 percent hardwood. Old-growth stands produced only 14 percent of the net increment, over half of which is volume recruited from small understory trees that became of merchantable size. Sawlog-size second-growth stands account for 59 percent of the total increment, whereas under-sawlog-size stands produced 27 percent. The major part of the board-foot increment in these younger stands is a result of small trees attaining saw-timber size during the year.

The net increment, expressed in standard cords (4 x 4 x 8 feet), is shown in table 15. The material covered by this estimate is identical with that given in cubic feet in table 14, except that it includes bark. The fact that the hardwood increment in cords is greater than the pine increment in cords, while the hardwood increment in board feet is less than the pine increment, is explained largely by the use of different saw-timber size limits and cordwood factors for the two species-groups (13.0 inches d.b.h. and 80 cubic feet per cord for hardwood, and 9.0 inches and 90 cubic feet for pine).

Table 15. - Net increment in cords of wood with bark classified according to forest condition, 1936

Forest condition	Pine	Hardwood	Total
	Cords		
Old growth	9,400	62,400	71,800
Second growth, sawlog size	149,200	170,700	319,900
Second growth, under sawlog size	93,300	122,100	215,400
Reproduction and clear-cut	400	100	500
Total all conditions	252,300	355,300	607,600

The poor stocking and poor sizes prevalent throughout the area are reflected in Table 16, which shows the average increment per acre in 1936 in stands uninfluenced by cutting. An average increment of 77 board feet per acre for the entire forest area is low; only in the sawlog stands of uncut second growth does the increment approach a more satisfactory figure. These better growing stands occur, however, on only 21 percent of the forest area. Cordwood increment amounted to 0.3 cords per acre, and hardwoods make up over half of this.

Table 16. - Average net increment per acre in the various forest conditions, uninfluenced by cutting, 1936

Forest condition	Pine component			Hardwood component			Total per acre, all species		
	Bd.ft.	Cu.ft.	Cords	Bd.ft.	Cu.ft.	Cords	Bd.ft.	Cu.ft.	Cords
Old growth:									
Uncut	11	2.7	.03	44	10.5	.16	55	13.2	.19
Partly cut	16	2.5	.03	87	18.8	.28	103	21.3	.31
Second growth:									
Sawlog size:									
Uncut	106	17.6	.23	34	12.9	.20	140	30.5	.43
Partly cut	43	8.7	.11	29	11.5	.18	72	20.2	.29
Under sawlog size	31	8.8	.12	21	9.6	.15	52	18.4	.27
Reproduction and clear-cut	2	0.7	.01	-	negl.	negl.	2	0.7	.01
Weighted averages	46	9.5	.13	31	11.2	.17	77	20.7	.30

Forest Industries

The lumber industry

Small, portable sawmills dominate the forest industrial scene in north Alabama (fig. 10). In 1937 there were at least 508 of these mills, all having a capacity of less than 20,000 board feet of lumber per day, and many of less than 5,000 board feet; their average production was less than one-quarter million board feet. In figure 9 is shown their numerical occurrence by counties, along with the quantity of lumber they produced. In 1937 101.9 million board feet of pine was produced and 13.6 million board feet of hardwood; this includes 0.6 million board feet of sawn pine cross ties and 1.6 million feet of sawn hardwood ties. About 17 million board feet of pine logs and over 1 million feet of hardwood were brought into the unit, chiefly from Mississippi and Tennessee. Logs definitely known to have been shipped outside the unit amounted to almost 4 million board feet, chiefly pine.

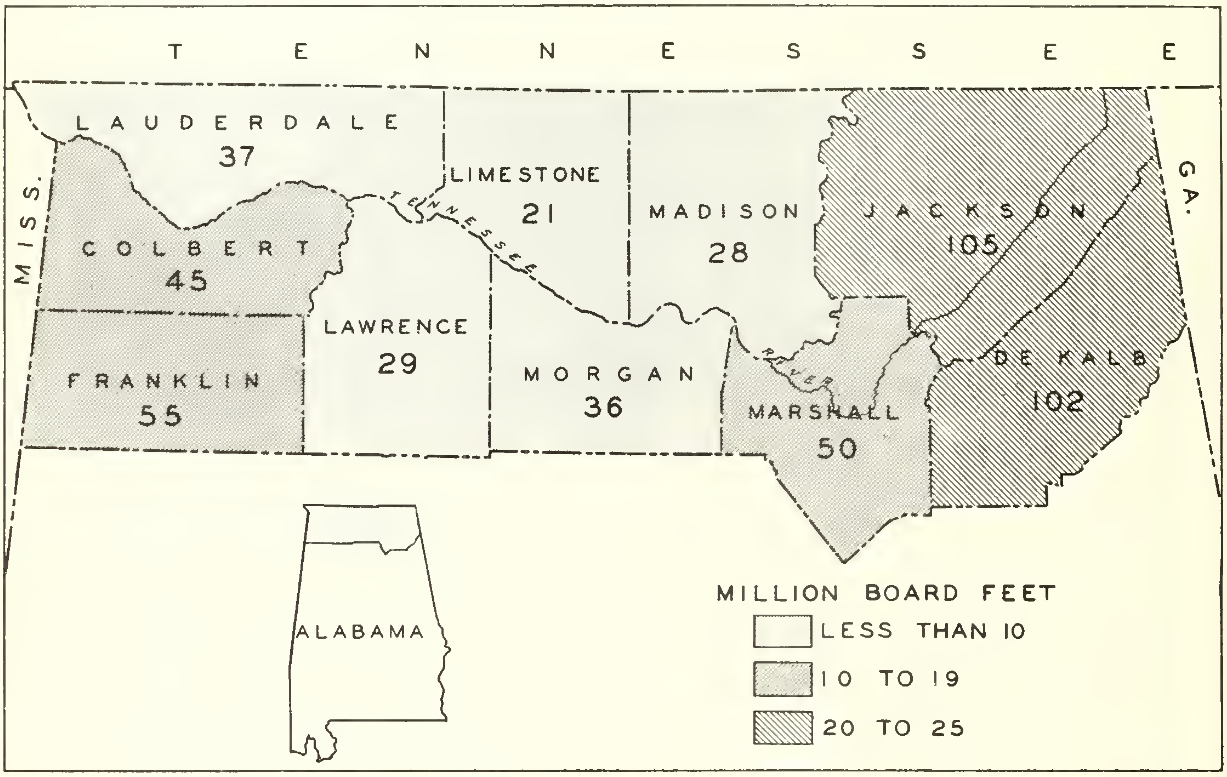


FIGURE 9.— LUMBER PRODUCTION BY COUNTIES DURING 1937, (INDICATED BY HATCHING) AND APPROXIMATE NUMBER OF SAWMILLS (SHOWN BY NUMERALS).

Many of the mills operate in conjunction with cotton gins, grist mills, and farmsteads. Others circulate throughout the area cutting lumber for local use and for sale to concentration yards. Custom sawing makes up a large part of the cut of many mills, as the 53,200 farm operators grow much of the timber needed to maintain their buildings. Sawing costs vary from $3.00 to $6.00 per M board feet, and this is often paid for in kind, i.e., with additional logs. Some mills also have equipment for manufacturing shingles, which they produce

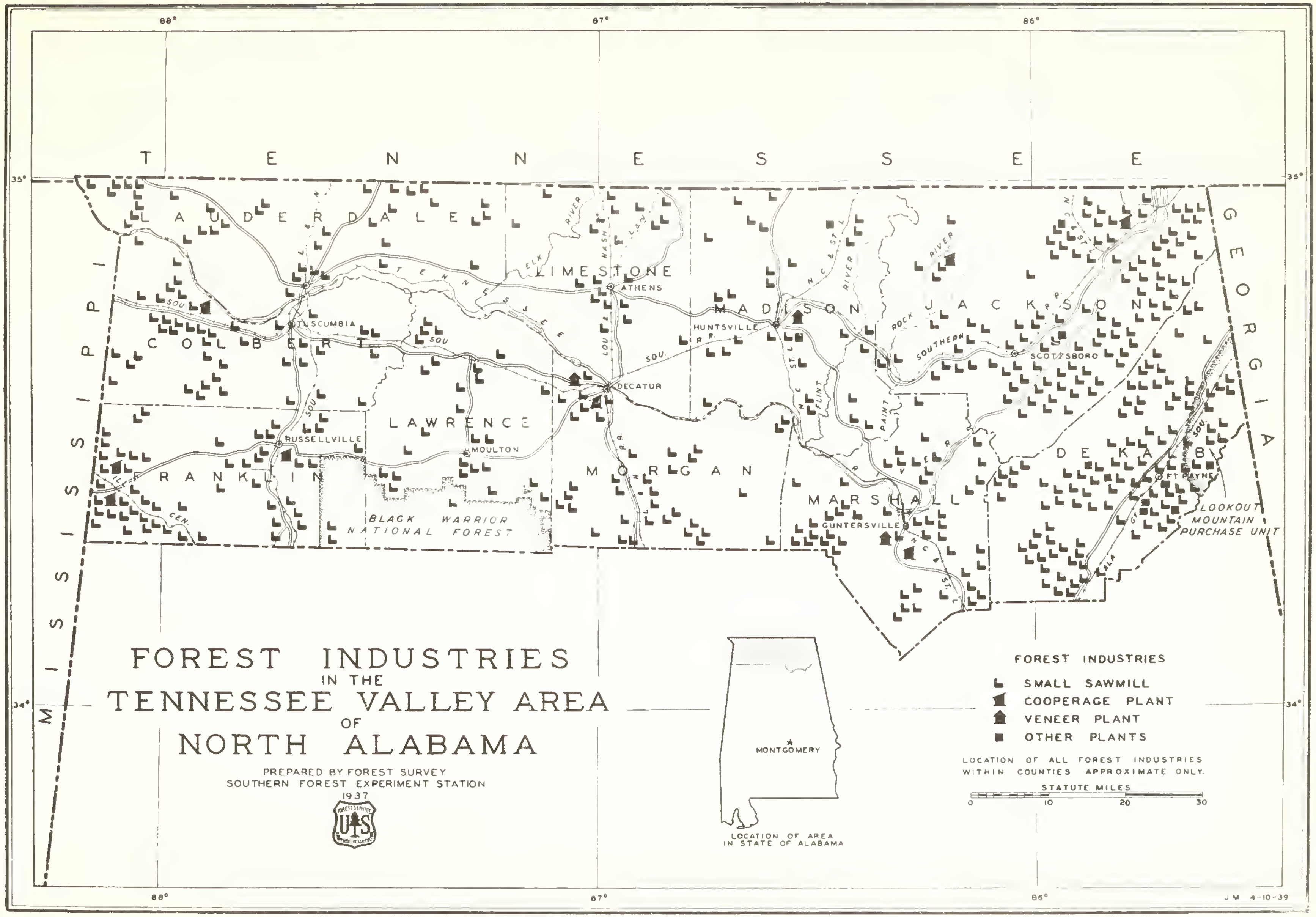


FIGURE 10—FOREST INDUSTRIES MAP

for local consumption on much the same basis as the custom-sawn lumber. Data gathered in Blount County, which adjoins this unit, indicate that the lumber used to maintain the farm buildings in the entire unit approximates 56 million board feet per year; this is about half the total lumber produced in 1937.

The 12 concentration yards in the area handled 57 percent of the total lumber production of 1937. Only a small part of their finished lumber is sold to local users. Concentration yards in Lauderdale, Colbert, and Franklin Counties, on the west side of the unit, and in Jackson and DeKalb Counties, on the east side, furnish the bulk of the commercial lumber, which they ship into northern and eastern markets.

Other forest industries

In 1937 8 cooperage plants were operating within the unit (table 17), but 2 discontinued their activity about the middle of the year. Their chief product is tight cooperage, but a few of the larger plants make both tight and slack cooperage. White oak is used chiefly for staves to be assembled into whiskey, oil, syrup, and turpentine barrels, while ash, gum, elm, and maple are used for the slack cooperage. These plants used 6,400 cords of wood in 1937, most of which came from within the unit.

Only 3 veneer plants were in the area in 1937. One of these plants has been operating more or less continuously for 50 years, one for 40 years, and one for 20 years. They manufacture basket veneer, baskets, broom fibre, hampers, and vegetable containers from red, black, and tupelo gums, red and white oaks, hickory, elm, hackberry, sycamore, maple, yellow poplar, and pine. In 1937 nearly 6 million board feet were used, about nine-tenths of which was cut within the unit and in general was trucked to the plants, whereas the remainder was produced outside the unit and came in chiefly by rail.

Other wood-using establishments in the unit that draw upon the forest resource include: 1 tannic acid plant, 1 hardwood dimension plant, 1 handle plant, and 2 shuttle block mills (using dogwood). Shingle mills are often attached to small sawmills and were not considered separately. The tannic acid plant is by far the most important of these five; it uses a large quantity of chestnut wood and chestnut oak wood and bark, employs many men regularly throughout the year, and is permanently established, having been in operation here more than a half a century.

A large quantity of semi-manufactured material produced in the woods was used locally or shipped out of the unit without further manufacture. About 142,000 hewn cross ties were sold to treating plants and railroads, 30,000 poles and piles were produced, and 2,800 cords of hardwood pulpwood were shipped to Tennessee. Nearly 2,000 cords of hardwood went to handle and bentwood-products plants in Tennessee, and 5,900 cords of pine and hardwood cooperage stock were shipped to plants in Tennessee, Georgia, and adjacent regions of Alabama. A small quantity of export logs also were taken from the unit. Material produced entirely for local use included 766,000 pine and 962,000 hardwood posts, 375,900 cords of pine and 646,700 cords of hardwood fuel wood, cut both on and off farms; also about 23,000 cords of pine and hardwood material were used in an unsawed condition for the maintenance of farm buildings.

Employment

The labor required in the 524 forest-industrial plants amounted in 1937 to 278,000 man-days (table 17). This includes labor spent in processing material cut within the unit and material shipped into it from other areas. Woods labor amounted to 848,000 man-days, representing all the labor involved in cutting material to be sent out of the unit as well as that used locally. A large part of the woods labor is involved in the production of fuel wood, fence posts, and saw timber for farm use. This labor returns scarcely any cash directly to the individual, but it does reduce expenditures for these necessary items. Since a majority of the farmers do some forest work during the year, it is difficult to estimate the total number of individuals engaged in forest work, but studies made by the Department of Forestry Relations of the Tennessee Valley Authority aid in making a rough approximation of the number engaged in the lumber industry. Data gathered in Marshall County in 1935 showed that the average small mill employed about 7 men in both woods and mill, indicating that over 3,500 individuals may be employed in the lumber industry within the unit, exclusive of those employed in the concentration yards.

Table 17. - Wood-products production and employment, 1937

Industry or commodity	Number of plants	Cut in woods	Produced or used by plants	Employment: In woods	Employment: In plants	Employment: Total
		Thousand board feet (lumber tally)		Thousand man-days (10 hours each)		
Sawmills	508 1/	100,700	115,500	100	235	335
Veneer	3	5,300	5,800	9	16	25
		M pieces				
Cross ties (hewn)	-	142	-	22	-	22
Poles and piles	-	30	-	32	-	32
Fence posts	-	1,728	-	22	-	22
		Cords				
Pulpwood	-	2,800	-	3	-	3
Fuel wood	-	1,022,600	-	638	-	638
Cooperage	8	11,900	6,400	12	9	21
Miscellaneous	5 2/	5,300	21,800	10	18	28
Total	524	-	-	848	278	1,126

1/ All these mills are small with a rated capacity of less than 20 M board feet per day.
2/ Includes 1 tannic acid plant, 1 hardwood-dimension plant, 1 handle plant, and 2 shuttle block mills.

Commodity Drain

The commodity drain from the sound-tree growing stock includes both the utilized material and the sound usable material left in felled trees. The drain on the saw-timber portion of the trees, including both the utilized and wasted portions, is expressed in board feet, while the volumes given in cubic feet include drain on saw-timber material, upper stems of sawlog-size pines, and small trees ranging from 5.0 inches d.b.h. to sawlog size.

The total amount of saw-timber material removed from the sound-tree growing stock in 1937 amounted to 188.2 million board feet (table 18), of which 63 percent was pine and 37 percent hardwood. Three-fourths of the pine drain was caused by the lumber industry, and most of the remainder by local needs for fuel wood and miscellaneous farm-construction material. The hardwoods contribute to a greater variety of products than the pines, but a large part of the hardwood drain of saw-timber size was for fuel wood. If this reflects the poor quality of much of the hardwood timber, it is a justifiable use, but timberland owners should realize that there is an immense amount of material in cull trees (table 11) and in small trees of inferior species that is entirely satisfactory for fuel wood. The importance of the fuel-wood drain is further emphasized in the portion of table 18 showing drain of all material in cubic feet; where it is seen that fuel-wood drain amounts to nearly 15 million cubic feet as compared with 17½ million cubic feet used for lumber.

Table 18. - Commodity drain from the sound-tree growing stock, 1937

Reason for drain	From saw-timber material			From all growing stock material[1]		
	Pine	Hardwood	Total	Pine	Hardwood	Total
	- Thousand board feet - (lumber tally)			- Thousand cubic feet - (inside bark)		
Lumber	88,900	13,700	102,600	15,450	2,080	17,530
Cross ties (hewn)	400	8,600	9,000	80	1,350	1,430
Poles and piles	800	-	800	250	-	250
Veneer	1,500	4,500	6,000	250	650	900
Cooperage	900	7,500	8,400	130	1,080	1,210
Misc. manufactures	negl.	3,200	3,200	negl.	500	500
Pulpwood	-	-	-	-	190	190
Fuel wood	17,400	26,000	43,400	7,460	7,340	14,800
Fence posts	800	600	1,400	380	510	890
Misc. farm use and land clearing	8,500	4,900	13,400	4,140	5,230	9,370
Total	119,200	69,000	188,200	28,140	18,930	47,070

1/ This material expressed in cords of wood with bark equals 370,300 cords of pine and 272,100 cords of hardwood.

Comparison of Increment and Drain

In 1937, the total commodity drain was 32.3 million board feet more than the net increment (table 19). Commodity drain exceeded the net increment by 27.1 million board feet in the pines and 5.2 million board feet in the hardwoods. Under present methods of handling the timber stands, the commodity drain obviously is too high. More intensive forest management would increase the use of material now lost through mortality, thus reducing the discrepancy between net increment and commodity drain. Gross growth in the hardwoods was greater than the commodity drain in 1937, but, because of mortality losses, the net increment was less than the drain. In the pines commodity drain exceeded the gross growth, and the loss of 20.1 million board feet by mortality served to further increase the deficit. With close attention to the health of the forests, fire protection, and selective cutting, the mortality losses can be reduced and utilization possibilities increased accordingly.

Table 19. - Balance between net increment and commodity drain of saw-timber material, 1937

Item	Pines	Hardwoods	Total
	Thousand board feet (lumber tally)		
Growing stock, Jan. 1, 1937	1,533,600	1,760,700	3,294,300
Growth	112,200	92,300	204,500
Mortality	20,100	28,500	48,600
Net increment	92,100	63,800	155,900
Commodity drain	119,200	69,000	188,200
Net change in growing stock, 1937	-27,100	-5,200	-32,300
Growing stock, Jan. 1, 1938	1,506,500	1,755,500	3,262,000

A comparison of growth with mortality and commodity drain is presented in figure 11, for 1936 and 1937. Growth, which is the amount of new wood added to the saw-timber growing stock, represents the amount of increase of the forest stand each year, before deducting the volume of trees that died or were cut. Mortality and commodity drain are large items, however, and a glance at figure 11 shows that their combined volume was greater than the growth in each species-group. As a result the growing stock decreased in total volume both in 1936 and 1937. The remedy commonly advanced for a declining forest resource is a reduction in the cut, i.e., in the commodity drain. In practice, this would work a hardship upon forest workers, forest-industrial operators, and domestic users. Therefore, since the forest sites are capable of a much larger timber production, it seems more reasonable to advocate management practices that will put the area in a better "budget" condition by increasing the net increment. Volume gained in this way can be utilized to meet commodity-drain requirements or can be reserved as growing stock to contribute additional future growth. In either case, the deficit shown in figure 11 would be reduced greatly, if not eliminated.

The total sound-tree growing stock above 5.0 inches d.b.h. decreased 4.2 million cubic feet in 1937 (table 20). There was not, however, a decrease in both hardwoods and pines. In the former, the net increment exceeded the drain by 4.1 million cubic feet, increasing the hardwood growing stock by that amount, but this increase was offset by the fact that the pine growing stock was reduced 8.3 million cubic feet. The stand as a whole, therefore, decreased slightly during the year.

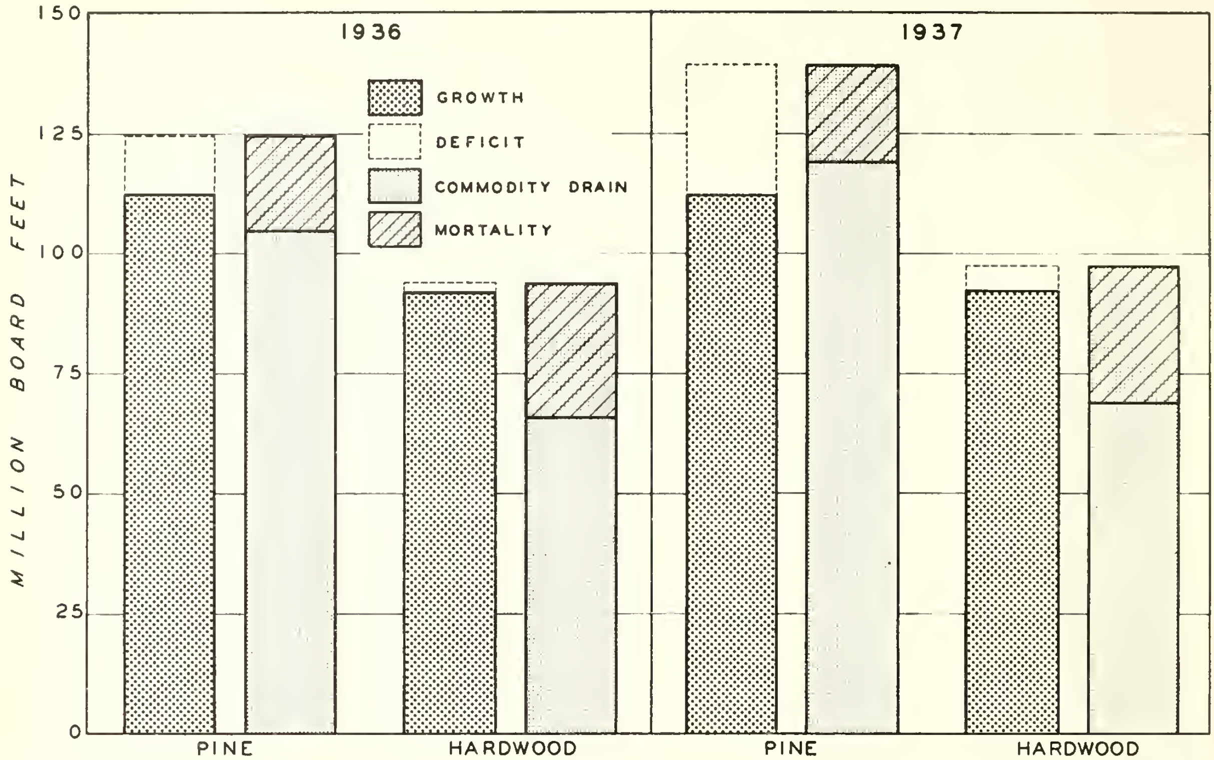


FIGURE 11. — COMPARISON OF GROWTH WITH MORTALITY AND COMMODITY DRAIN, 1936 AND 1937.

Table 20. - Balance (in cubic feet) between net increment and commodity drain of saw-timber and cordwood material, 1937

Item	Pines	Hardwoods	Total
	- - - - Thousand cubic feet (inside bark)	- - - -	
Growing stock, Jan. 1, 1937	495,830	816,530	1,312,360
Growth	28,560	37,310	65,870
Mortality	8,690	14,280	22,970
Net increment	19,870	23,030	42,900
Commodity drain	28,140	18,930	47,070
Net change in growing stock, 1937	-8,270	+4,100	-4,170
Growing stock, Jan. 1, 1938	487,560	820,630	1,308,190

The cubic-foot volumes in table 20 are expressed in cords of wood with bark in table 21. It is interesting to note that the volume of pine lost through mortality during the year is sufficient to supply the annual requirements of an average-sized pulp mill.

Table 21. - Balance (in cords) between net increment and commodity drain of saw-timber and cordwood material, 1937

Item	Pines	Hardwoods	Total
	Cords		
Growing stock, Jan. 1, 1937	6,472,400	12,553,500	19,025,900
Growth	375,700	554,600	930,300
Mortality	113,400	219,500	332,900
Net increment	262,300	335,100	597,400
Commodity drain	370,300	272,100	642,400
Net change in growing stock, 1937	-108,000	+63,000	-45,000
Growing stock, Jan. 1, 1938	6,364,400	12,616,500	18,980,900

Summary and Conclusions

Agriculture is the chief activity in this area, where three-fourths of all the land is in farm ownership. Where farms are concentrated, the soil is so suitable for cultivation that a continued agricultural economy is probable, but where the farms are scattered on the less fertile soils, they will tend to revert to forest land if prices for farm commodities remain low. At present there are slightly over 2 million acres of forest land in the unit, more than half of which is made up of farm woodlands. Areas that are predominantly forest land include the Jackson County Mountains, the north end of Sand Mountain, the Coastal Plain, and areas in the western part of the Warrior Basin and Highland Rim.

The forests are an important supplement to local agriculture. In a region where topography and soils limit the amount of tillable land, the forest stands provide revenue from land that would otherwise lie idle. The forests also are a valuable source of material for local construction. It is estimated that the 53,200 farms in this area require annually approximately 56 million board feet of lumber for maintenance of buildings alone. Also more than a million cords of fuel wood are consumed by rural, urban, and industrial users. These products have a market value of at least 5 million dollars.

On the forest land are 1.5 billion board feet of pine and 1.8 billion board feet of hardwood (lumber tally). The chief worth of this timber lies not in its immediate conversion value but in the fact that it provides a forest capital that will produce an annual interest in the form of wood for use by the forest industries and local population. In 1937 this interest (forest increment) amounted to 155.9 million board feet, after losses caused by mortality were deducted. Wood used by the 524 forest-industrial plants, plus all other sawlog material removed directly from the forest, amounted to 188.2 million board feet in 1937. As a result, the already sadly depleted growing stock was reduced further by 32.3 million board feet; while not a large overdraft in itself, this indicates that there is at present a distinct limitation to the general expansion of the forest industries.

Employment is provided to many people through cutting, transporting, and manufacturing forest products. In 1937, over 1 million man-days of labor were utilized in wood-products activities; this is equivalent to 5,600 man-years if 200 days are considered a working year. As a matter of fact, however, the number of individuals working for the forest-industrial plants (full and part-time) probably is close to 4,000, while practically every farm operator (53,200) spends several weeks each year cutting fuel wood and fence posts for home use as well as various forest products for sale.

Deficiencies in the present forest

1. Over-cutting, careless handling, and uncontrolled fires have so depleted the forest stand that the annual yield of wood is only one-fourth to one-half that which the soils and climate of north Alabama can produce.

2. The proportion of larger pines and hardwoods is so small that there is little opportunity for sawmills to produce the better grades of lumber; this restricts the sawmill industry to small portable mills that generally produce lumber of inferior quality.

3. There is an excess of small and poor-quality hardwoods; 62 percent of the net volume of all sound hardwood material is in trees below 13.0 inches d.b.h. and in cull trees (table 11).

4. The volume of growing stock lost through mortality is equivalent to almost one-third the total growth.

5. Organized fire protection is lacking on about four-fifths of the forest area.

Measures for improving the forest

Intensive, unit-wide forest-fire control is the primary need in this area. The forest land can never yield more than a fraction of its full productivity as long as forest fires are allowed to burn unchecked. The elimination of fire also will go far to reduce the excessive mortality in the stands. An increased timber resource, properly utilized, contributes directly to the public welfare, but at present the general public causes most of the forest fires. It seems logical, therefore, that fire protection for all forest land in the unit should be provided through cooperative funds furnished by public agencies and private landowners.

Throughout the farming areas there is an excellent opportunity, and a definite need, for extension workers to educate the farm operators in better forest-management practices. Fifty-eight percent of the forest land is on farms, and most of it contributes constantly toward the farm maintenance or income. While the farmers are aware of the importance of their timber land, they have failed to grasp the value of growing continuous crops of timber on their woodlots. There is also a general lack of thrift in wood utilization; too much good saw timber is used for fire wood, while many inferior trees and species that would serve equally well are left in the stand. The need of the farmers for large quantities of fuel wood and low-grade construction material provides an excellent opportunity for practicing good forest management through improvement cuttings, since they are among the few forest owners who have a home market for low-grade material while reserving the high-grade saw timber for sale.

A market for low-quality hardwoods must be developed, however, before forest management can make much progress in the main forest areas. This is particularly true in the Jackson County Mountains. A pulp mill located on the Tennessee River, where it would have access to cheap water transportation and electric power, and using all species of hardwoods, could be a definite asset in improving the forest stands.

It would be desirable to reduce the saw-timber cut until the effects of fire protection, improved management practices, and better utilization are evident in an increased growing stock and greater annual yields. This is especially true in the pine stands, but from a practical standpoint, it is difficult to see how this reduction in cut can be expected under prevailing conditions and the present requirements for cash and woods material. The factor most likely to cause a reduction in cut is the increasing scarcity of suitable saw timber, followed by a gradual but temporary migration of the small sawmills to more favorable regions.

Now is the time for interested public agencies and private individuals to formulate, finance, and execute a forest policy for this area that will develop the forest resource to its full productivity. Successful accomplishment means profitable use of 2 million acres of non-agricultural land, expanded forest industries, a broader tax base, more employment, and an increased income for the people. Surely these benefits are worthy of concerted action and sustained effort by all who will profit from a greater forest resource.

APPENDIX

Forest Type-Groups

Pine.- Includes the following forest types: shortleaf pine, loblolly pine, shortleaf-other pine, loblolly-other pine, Virginia pine, Virginia pine-other pine, cedar. About 63 percent of the net cubic volume is shortleaf and loblolly pine (table 5).

Pine-hardwood.- Includes the following forest types: shortleaf-hardwoods, loblolly-hardwoods, Virginia pine-hardwoods, mixed hardwoods-pine. About 45 percent of the net cubic volume is shortleaf and loblolly pine.

Upland hardwood.- Includes the following forest types: oak-chestnut, mixed upland hardwoods, scrub hardwoods. About 96 percent of the net cubic volume is mixed hardwoods; scattered pines and cedar account for the remainder.

Bottom-land hardwood.- Includes the following forest types: cove-hardwoods, bottom-land hardwoods. About 38 percent of the net cubic volume is red, black, and tupelo gums, red maple, yellow poplar, and other pulping hardwoods; the remainder is in species such as oaks, hickories, ash, beech, elm, and hackberry, with a small amount of pine.

Forest Conditions

Old-growth uncut.- Old-growth stands from which less than 10 percent of the volume has been cut.

Old-growth partly cut.- Old-growth stands from which 10 percent or more of the volume has been cut, but in which the remaining old-growth saw timber contains at least 1,000 board feet per acre of hardwood, or 600 board feet of pine or pine and hardwood mixed.

Second-growth sawlog-size uncut.- Second-growth stands from which less than 10 percent of the sawlog-size trees have been cut and in which the remaining saw timber contains at least 600 board feet per acre.

Second-growth sawlog-size partly cut.- Second-growth stands from which 10 percent or more of the sawlog-size trees have been cut, and in which the remaining saw timber contains at least 400 board feet per acre.

Second-growth under sawlog size.- Second-growth stands composed largely of under-sawlog-size trees, and containing less than 600 board feet per acre.

Reproduction.- Areas insufficiently stocked to classify as second growth, but bearing per acre more than 80 seedlings less than 1 inch d.b.h.

Clear-cut.- Cut-over areas in which an insufficient quantity of young growth has come in to classify them either as second growth or as reproduction.

Diameters

D.B.H. (diameter at breast height).- Diameter, outside of bark, $4\frac{1}{2}$ feet above the ground.

A 2-inch diameter-class includes diameters 1 inch below and 0.9 inch above the stated midpoint, e.g., the 6-inch class includes trees 5.0 to 6.9 inches d.b.h. Corresponding limits apply to the other diameter-classes.

Tree Classification

Sawlog-size tree.- A pine tree at least 9.0 inches d.b.h., or a hardwood tree at least 13.0 inches d.b.h., which will produce 1 sound butt log at least 12 feet long, or which contains at least 50 percent of its gross saw-timber volume in sound material in case the butt log is a cull.

Under-sawlog-size tree.- Any tree between 1.0 inch and the minimum merchantable diameter at breast height, at least 75 percent sound and with a reasonably straight stem. Only trees 5.0 inches d.b.h. and larger have been included in cordwood and cubic-foot estimates.

Cull tree.- A sound tree which, because of form, crook, extreme limbiness, or other sound defect, is not, and never will become, suitable for saw timber; or a sawlog-size tree that is more than 50 percent defective; or an under-sawlog-size tree that is more than 25 percent defective.

Volume Estimates

Board-foot volume.- Only sawlog-size trees are included in this estimate. Top diameters vary with the limits of usable material, but no hardwood logs less than 8.5 inches in diameter at the small end, nor any pine logs less than 5.5 inches, are included. Deductions are made for woods cull, such as rot, fire scar, crook, limbiness, and similar defects, as well as for loss in sawing at the mill due to sweep and hidden defects. Board-foot volumes, based on the International $\frac{1}{4}$-inch rule, closely approximate the lumber tally of green boards in the mill. No deduction has been made for kiln, yard, and other losses before shipping.

Cordwood volume.- This includes the entire stand of sound trees at least 5.0 inches d.b.h., outside bark, and contains material from:

1. Sound trees sawlog size—the merchantable sawlog portion of saw-timber trees.

2. Upper stems of sawlog-size pine trees—the portion of saw-timber trees not used as sawlogs but usable as cordwood. This includes only the upper stems to a variable top-diameter limit (but not less than 4 inches).

3. Sound trees under sawlog size—the full stems of both pines and hardwoods at least 5.0 inches d.b.h. to a variable usable top-diameter (but not less than 4 inches).

Deduction is made for woods cull, such as rot, fire scar, excessive crook, bad knots, or other defects.

Additional material included in table 11 is the estimated sound usable portion of cull trees at least 5 inches d.b.h. and the upper stems and limbs of sawlog-size hardwoods.

Cubic-foot volume contains the material described under "Cordwood volume" but excludes the bark, except in table 5.

Pine Tree Grades

Smooth tree.- A tree with at least 20 feet of clear length and at least 50 percent of the total usable length practically free of limbs and knots.

Limby tree.- A tree with at least 12 feet of clear length and with 30 to 49 percent of the total usable length practically free of limbs and knots.

Rough tree.- A merchantable tree not clear enough to be put in either of the previous classes.

FOREST SURVEY RELEASE NO. 50 SEPTEMBER 30, 1940

FOREST RESOURCES OF NORTH CENTRAL ALABAMA

By

James W. Cruikshank
Associate Forest Economist

A Progress Report by

THE SOUTHERN FOREST SURVEY

I. F. Eldredge, Regional Survey Director

SOUTHERN FOREST EXPERIMENT STATION

E. L. Demmon, Director

New Orleans, La.

FOREWORD

The Nation-wide Forest Survey, being conducted by the United States Forest Service, was authorized by the McSweeney-McNary Forest Research Act of 1928. Its five-fold object is: (1) To make an inventory of the present supply of timber and other forest products; (2) to ascertain the rate at which this supply is being increased through growth; (3) to determine the rate at which this supply is being diminished through industrial and local use, windfall, fire, and disease; (4) to determine the present requirement and the probable future trend in the requirement for timber and other forest products; and (5) to correlate these findings with existing and anticipated economic conditions, in order that policies may be formulated for the effective use of land suitable for forest production.

This release is based on a field survey made June 29, 1935 to October 5, 1935 and on two field canvasses of forest industrial plants to determine forest drain, the last of which was completed during May 1937. It should be regarded as a progress report only, since it contains Forest Survey data that will be included in complete reports to be published later; such data, although considered reliable, are subject to correction or amplification as the work of computation proceeds. Item 4 above, which is being studied on a national basis, is not discussed in this report.

In the presentation of these survey data, it should be noted that owing to the sampling method used in collecting them, the greater the number of samples in any given classification the more accurate are the data for that classification. Hence classes that are of infrequent occurrence and relatively small in quantity generally cannot be determined with as high a degree of accuracy as classes that occur more frequently and in substantially greater quantities. Small tabular items are to be taken as showing, not the exact magnitude of the classes involved, but their relative magnitude in comparison with those of other classes.

In the South, the Forest Survey functions as an activity of the Southern Forest Experiment Station with headquarters at New Orleans, La.

Assisting Staff

E. B. Faulks, Associate Forest Economist, In Charge of Field Work
P. R. Wheeler, Forest Economist, In Charge of Mensurational Analyses

Note: Assistance in the preparation of these materials was furnished by the personnel of Work Projects Administration official project 65-2-64-74.

FOREST RESOURCES OF NORTH CENTRAL ALABAMA

General Description

. The area in north central Alabama designated as Survey Unit No. 5 (fig. 1) includes 6.6 million acres, contained in 15 counties. It embraces a large part of the Appalachian Highlands in Alabama, which occur as a series of mountains and low ridges running northeast and southwest, separated by valleys of varying widths. The rich deposits of coal, iron ore, marble, and other minerals that underlie much of the area make the section around Birmingham one of the Nation's important coal and iron districts. Since fertile soil is found in the valleys and on some of the plateaus, agricultural use of the land is important and widespread, but does not compare in extent with that used for timber production. The forest resource occupies 4 million acres of forest land and comprises more than 8 billion board feet of timber.

Topographically[1/] the area is made up of three main physical divisions: The Piedmont Upland, the Valley and Ridge Province, and the Cumberland Plateau. The Piedmont Upland is represented by the Ashland Plateau, the mountainous portion of the Piedmont. Elevations range from 2,407 feet on Cheaha Mountain, the highest point in the State, to 500 feet along the Coosa River.

The Valley and Ridge Province includes the Weisner Ridges, Coosa Valley, Coosa Ridges, Cahaba Valley, Cahaba Ridges, and the Birmingham-Big Canoe Valley (fig. 1). The Weisner Ridges, which are the highest, have a maximum elevation of 2,130 feet. The Coosa Valley is about 100 miles long and has a maximum width of 20 miles, whereas the other two valleys are somewhat shorter and are less than 10 miles wide.

The Cumberland Plateau contains the southwest extremities of Lookout Mountain, Wills Valley, Sand Mountain, and Sequatchie Valley. Blount Mountain, a branch of Sand Mountain, is entirely within this area, as is Murphee Valley. As a rule the valleys are about 5 miles wide. The mountains, which are flat-topped with precipitous sides, are about 1,000 to 1,500 feet high. The Warrior Basin, a plateau sloping from about 1,000 feet at its northern edge to about 500 feet at the southwestern boundary of the unit, makes up by far the largest part of the plateau.

There are more than 50 soil series in this area; these are divided into a number of soil types that basically are clay, silt, sandy, gravelly, and stony loams. In the Piedmont Upland the soils were derived through the weathering of underlying crystalline rocks. The Louisa and Cecil soils, which are the most extensive and erode severely, occur over wide areas in Randolph, Clay, Coosa, and Cleburne counties and occupy about 13 percent of the unit area. The loams and sandy loams are the best for agriculture.

The soils of the Valley and Ridge Province and of the Cumberland Plateau are the result of the decomposition of sandstones, shales, and limestones. The Dekalb series, which is most common and occupies nearly a third of the unit area, is widespread in Jefferson, Cullman, Blount, and Walker counties. Other common

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1/ Data for these three paragraphs and figure 1 are taken from "Physical divisions of northern Alabama," Geological Survey of Alabama. Bull. No. 38. Univ. Ala., 1930.

soils are those of the Hanceville and Talladega series, which together occupy about 11 percent of the unit area; large areas of one or the other of these soils are found in Cleburne, Walker, and St. Clair counties. Ten percent of the total land area is classified as rock outcrops, or as rough stony land. In general, agricultural crops are found on the more fertile soils, but forest stands occur on all soil types.

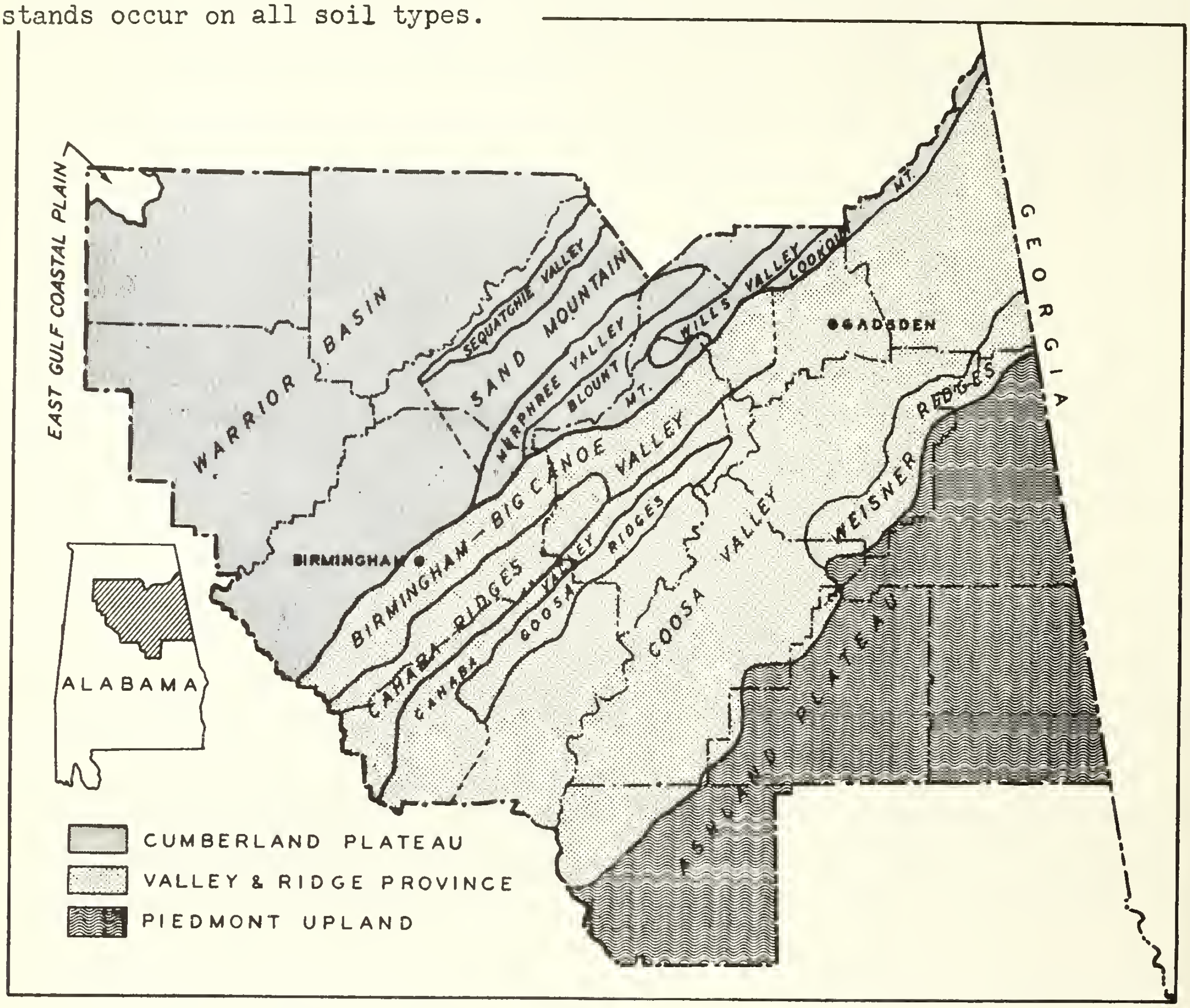

FIGURE 1. — PHYSICAL DIVISIONS OF ALABAMA UNIT NO. 5.

The area is drained by the Black Warrior, Cahaba, Coosa, and Tallapoosa rivers, which flow southwestward to combine their waters with larger streams that empty into the Gulf of Mexico at Mobile. There are many small streams in the watersheds of these four main rivers, and the abundant rainfall, along with the steep slopes and the erodible soils, makes flood control a major problem.

Erosion is serious throughout the unit. Practically the entire area is subject to moderate or severe sheet erosion with occasional gully formation. Most of the severe erosion is in the Coosa Valley and on the Ashland Plateau. Moderate erosion is most common in the Warrior Basin, but large areas of severely eroded land also occur here.2/ The type and degree of erosion classified according to land use is presented in table 1. These data are based upon

2/ Reconnaissance erosion survey, Soil Conservation Service, 1934.

a field classification by the Forest Survey. Sheet and shoestring erosion were most common in cultivated and in idle and abandoned agricultural lands, while pasture lands showed the highest proportion of gully erosion. Sheet erosion is the most common type on the forested lands, which are least subject to erosion.

Table 1.--Correlation of land use with erosion

Land use	Type of erosion				Total
	Sheet	Shoestring	Gully	None or arrested	
	Percent				
Forest	8.7	2.7	1.8	86.8	100.0
Pasture	11.9	5.4	5.9	76.8	100.0
Cropland:					
In cultivation	20.1	6.5	0.9	72.5	100.0
Idle and abandoned	21.7	15.8	4.5	58.0	100.0
All land-use classes	12.8	4.6	1.7	80.9	100.0

At least nine main railroad systems operate within this area, as well as numerous secondary railroads. Since Birmingham is the largest industrial city, it is the focal point for most of the important lines, including the Southern and the Louisville & Nashville, which have the most extensive trackage. In Blount, Clay, Cleburne, Cullman, Coosa, Randolph, and Winston counties, however, large areas are almost devoid of rail transportation, whereas the more industrialized counties, such as Jefferson and those in the Coosa Valley, are served by a veritable network of railroads.

Water traffic from Cordova in Walker County to Mobile is by way of the Mulberry Fork, Black Warrior, and Tombigbee rivers. An 8-foot channel is maintained for all-year traffic over this 500-mile watercourse. At Port Birmingham a railroad operated by the Warrior River Terminal Co. carries waterborne freight to the Birmingham district. Crossing the unit are four paved federal highways, three of which intersect at Birmingham, so that paved roads radiate like the spokes of a wheel to the surrounding territory. The interconnecting roads are chiefly gravel and reasonably numerous.

The population has steadily increased since 1870. In the three decades between 1870 and 1900, there was a threefold increase; between 1900 and 1930 the population doubled. According to the Bureau of the Census, the population in 1930 was 882,000. Forty-five percent lived in cities, 24 percent in towns or settlements of less than 2,500 inhabitants, and 31 percent on farms. Three-fourths of the urban population in 1930 was in Jefferson County, in which Birmingham (1930 pop. 260,000) and Bessemer (1930 pop. 21,000) are located. Negroes made up 28 percent of the total population in 1930, and about two-thirds of them lived in the Birmingham district.

Of the 330,000 gainfully employed workers in the unit enumerated by the 1930 census, 26 percent were engaged in agriculture, 19 percent in mining and the steel industries, 4 percent in textile mills, 2 percent in the wood-using industries, and the remainder in miscellaneous manufacturing and service industries. In 1937 the Unemployment Census found that 103,200 persons were totally or partially unemployed. More than half of these lived in Birmingham and the surrounding county. Sixteen percent of the total needing employment were farmers and farm laborers, 18 percent were other laborers, and 30 percent were skilled and semiskilled workers. In 1937 there was a large surplus of skilled and semiskilled workers in the Birmingham industrial area, as nearly 17,000 needed more employment. Improved conditions in the steel and coal industries undoubtedly would take up much of this slack.

The major industrial development in this area is the manufacture of iron and steel and their products. Blast furnaces and rolling mills have centered around the iron, coal, and limestone deposits of the Birmingham district, and at Gadsden and Alabama City. Plants at Anniston and Birmingham manufacture a large part of the cast iron pipe produced in the United States. The Census of Manufactures, taken in 1935, lists 56 plants in Alabama making iron and steel products. These plants, practically all of which are in this unit, employed 17,000 men in 1934 and manufactured products valued at about 68 million dollars

Alabama produces more coal than any other state in the South, most of which comes from fields within this unit. The most important coal basin is the Warrior, which includes parts of Jefferson, Walker, Blount, Cullman, and Winston counties, as well as several counties outside the unit. The Cahaba coal basin, which is second in importance, occupies parts of St. Clair, Jefferson, and Shelby counties. The Coosa coal basin, also in St. Clair and Shelby counties, has large reserves that are relatively undeveloped. In these three coal basins, which underlie approximately one-fifth of all the land in the unit, $8\frac{1}{2}$ million tons of coal were mined in 1934 by 16,000 mine workers. About $7\frac{1}{4}$ million tons of this total were mined in Jefferson and Walker counties

The development of the modern textile industry dates from 1880. The passage of legislation in 1893 authorizing counties to extend tax-exemption privileges gave the textile industry a further impetus, and by 1935 the census listed 81 plants in the State as cotton or cordage manufacturers. In 1934, these plants employed 33,000 people, and their product was valued at 89 million dollars. Forty-eight of these textile plants were located in this unit in 1936 operating about 17,000 looms and 700,000 spindles, and giving employment to approximately 20,000 wage earners.

The Bureau of the Census reported that in 1935 there were 59,000 farms in this unit, containing 3,960,000 acres of land. In 1934, crops were harvested from 34 percent of this acreage, forests and woodland pastures occupied 48 percent, and 18 percent was used for other purposes. The 1,891,000 acres of farm woodlands constitute 47 percent of all the forest land. Tenants occupied 55 percent of the number of farms in 1934, but only 16 percent of the 32,000 tenants have stayed upon the same land for as long as 5 years, with the result that there has been constant soil deterioration through failure to complete soil-building crop rotation. A frost-free growing season of about 200 days, aided by an average rainfall of 53 inches, favors the production of general crops such as corn, cotton, oats, wheat, hay, potatoes, and vegetables. Between 1929 and 1934 there was a great increase in the production of forage crops for livestock and in foodstuffs for human consumption; the increased acreage of corn alone exceeded the acreage reduction in cotton.

The number of farms increased by 8,500 between 1929 and 1934; this was caused largely by miners and other industrial workers moving to small farms as employment was curtailed during the depression. In Jefferson County, for example, the number of farms increased 94 percent, while the average size of farm decreased from 53 to 31 acres. Many of the farms (table 2) are too small to support a family adequately, and part-time employment is needed to supplement the farm income. Data gathered by the census showed that farmers worked more than 1,700,000 man-days away from their farms in 1934, an average of 29 days per farmer.

Table 2.—Number and acreage of farms, classified according to size, 1935 (data from Census of Agriculture)

Size in acres	Number of farms	Proportion of total number	Total land in farms	Proportion of total acreage
		Percent	Acres	Percent
Less than 50	32,566	55.1	817,352	20.6
50 - 99	15,094	25.5	1,062,754	26.9
100 - 499	11,179	18.9	1,826,512	46.2
500 - 999	232	.4	148,207	3.7
1,000 and over	61	.1	104,844	2.6
Total	59,132	100.0	3,959,669	100.0

The Bureau of Agricultural Economics of the United States Department of Agriculture cooperating with the Works Progress Administration in Alabama, made an intensive study of rural-land ownership in 1935. Information was compiled for each county in the unit, and 44,100 ownerships, containing 5,827,800 acres, were recorded. In table 3 the number and acreages of these ownerships are classified according to size. It is obvious that a great number of people own small parcels of land, as almost 41,000 owners (92 percent of the total) together control only half the acreage. Good land-use practices probably would be promoted most effectively through extension, if present efforts to further the program were concentrated upon the larger owners (8 percent of the total) who possess the other half of the rural land.

Seventy-four percent of the land was owned by persons living within the county where the land was situated and 11 percent by persons residing in adjoining counties. About 6 percent was owned by persons living elsewhere in Alabama, 4 percent by out-of-state owners, 4 percent by public agencies, and 1 percent by owners whose addresses were unknown.

Table 3.--Number and acreage of rural ownerships, classified according to size, 1935

Size in acres	Number of owners	Proportion of total number	Total land	Proportion of total acreage
		Percent	Acres	Percent
Less than 50	19,539	44.3	535,876	9.2
50 - 99	10,735	24.3	797,019	13.7
100 - 259	10,349	23.5	1,591,998	27.3
260 - 499	2,203	5.0	761,270	13.1
500 - 999	858	1.9	569,929	9.8
1000 and over	446	1.0	1,571,703	26.9
Total	44,130	100.0	5,827,795	100.0

Over 58 percent of the land is being lived upon and operated by farm owners. Mining companies own 9 percent, while wood-using industries own only 3 percent. The percentage of the land area owned by various business groups is as follows:

Business group	Percent of area owned	Business group	Percent of area owned
Farm owner-operators	58.5	Wood-using industries	3.0
Merchants	3.4	Mining companies	9.2
Professional men	2.4	Power, railroad, and farming companies	1.1
Administrators and executors	2.0	All other businesses	5.2
Banks and mortgage companies	2.7	Governmental agencies	3.8
Real estate agencies	3.9	Unknown	4.8

The forest land is controlled by a large number and variety of owners. The largest proportion (1,891,000 acres) is in small scattered tracts on thousands of farms. Private industrial and investment companies own about 1,780,000 acres. Some of this acreage is held by lumber companies, but the major part of the land in this category is held by coal and iron companies and by land speculators. Most of the 369,000 acres in public ownership is in the Black Warrior and Talladega National Forests.

The general property tax is relatively low as compared with that in other southern states. The Alabama Constitution fixes the maximum ad valorem levy for State, county, and school purposes at 21 mills on an assessed valuation not exceeding 60 percent of the market value. The State share is restricted to a $6\frac{1}{2}$-mill maximum, of which 3 mills are for special school purposes. The counties levy additional school district taxes, but they are a part of the 21-mill maximum. Lands are assessed by the owners at average values with no separate assessments for the improved, unimproved, or timbered acreage, although their approximate extent is indicated. Forest lands, which are classified as wild or unimproved, are assessed generally at $1.50 to $2.50 per acre, although assessments on heavily timbered stands may be higher. The total tax per acre ranges from 3 cents upward, depending upon assessed valuation, but it averages about 5 cents. A severance tax of several cents per ton is levied upon the coal and iron ore, in addition to the general property tax on the coal lands. Reasonable taxes, along with strict enforcement of tax laws, have prevented excessive tax default. The area on which taxes were unpaid for 3 or more years, as of August 1934, was only 45,000 acres,[3/] or 0.7 percent of the area.

The surface use of 61 percent of the land is for timber production (table 4). The forest land owned by mining companies and land speculators is in large blocks, but almost half of the total forest area is held in small tracts on farms. Idle and abandoned agricultural land greatly exceeds new cropland in extent, and it is probable that this relation will continue, leading eventually to an increased acreage of forest land.

Table 4.—Land area classified according to land use, 1936

Land use	Area	Proportion of total area
	Acres	Percent
Forest:		
Productive	4,035,800	61.0
Nonproductive	4,100	.1
Total forest	4,039,900	61.1
Agricultural:		
In cultivation:		
Old cropland	1,889,000	28.6
New cropland	36,200	.5
Out of cultivation:		
Idle	215,900	3.3
Abandoned	114,500	1.7
Pasture	138,400	2.1
Total agricultural	2,394,000	36.2
Other nonforest	181,100	2.7
Total nonforest	2,575,100	38.9
All land-use classes	6,615,000	100.0

3/ The extent of tax default in the Gulf States in 1934. Occasional Paper No. 49, Southern Forest Expt. Sta., August 25, 1935.

Description of the Forest

Forest stands occupy a vast area (4,035,800 acres) throughout the unit. Most of the forests are on land that has always been timbered, but some stands occur in abandoned fields that have restocked naturally. Almost all (88 percent) of the forested land is stocked with second-growth timber, much of which is below sawlog size. Based on cubic volume, the forest is two-thirds pine and one-third hardwoods, loblolly pine being the most abundant single species, followed closely by shortleaf pine. Based on acreage, half the forest is predominantly pine (table 6). Hardwoods are generally present, even in "pure" pine stands, and in the mixed pine-hardwood forest (27 percent of the total), they make up a considerable part of the volume. The most common hardwoods are red oaks, hickories, white oaks, redgum,[4/] yellowpoplar, and blackgum.

Longleaf pine occurs on the tops of some of the ridges and occasionally in isolated patches elsewhere (fig. 2). Originally it covered a much larger area, but as it was logged off it was often replaced by loblolly or shortleaf pines. Longleaf pine grows naturally in pure stands, some of which occur in this area. More usual on the cut-over lands, however, is the occurrence of scattered longleaf pine trees in stands of shortleaf or loblolly pines mixed with hardwoods. In many places, the pines give way to upland hardwoods, and although these areas are not large enough to be indicated in figure 2, in the aggregate they occupy 20 percent of the total forest area.

Along the streams are found the bottomland hardwoods, which consist chiefly of redgum and blackgum, water oaks, yellowpoplar, elms, American beech, hickory, and maple. As a rule the bottomland hardwoods are of much higher quality than the upland hardwoods. Since they occur on the more fertile alluvial soils, most of them have been cleared off, and at present they occupy less than 3 percent of the forested land.

4/ The common name recently accepted by the Forest Service for Liquidambar styraciflua is sweetgum.

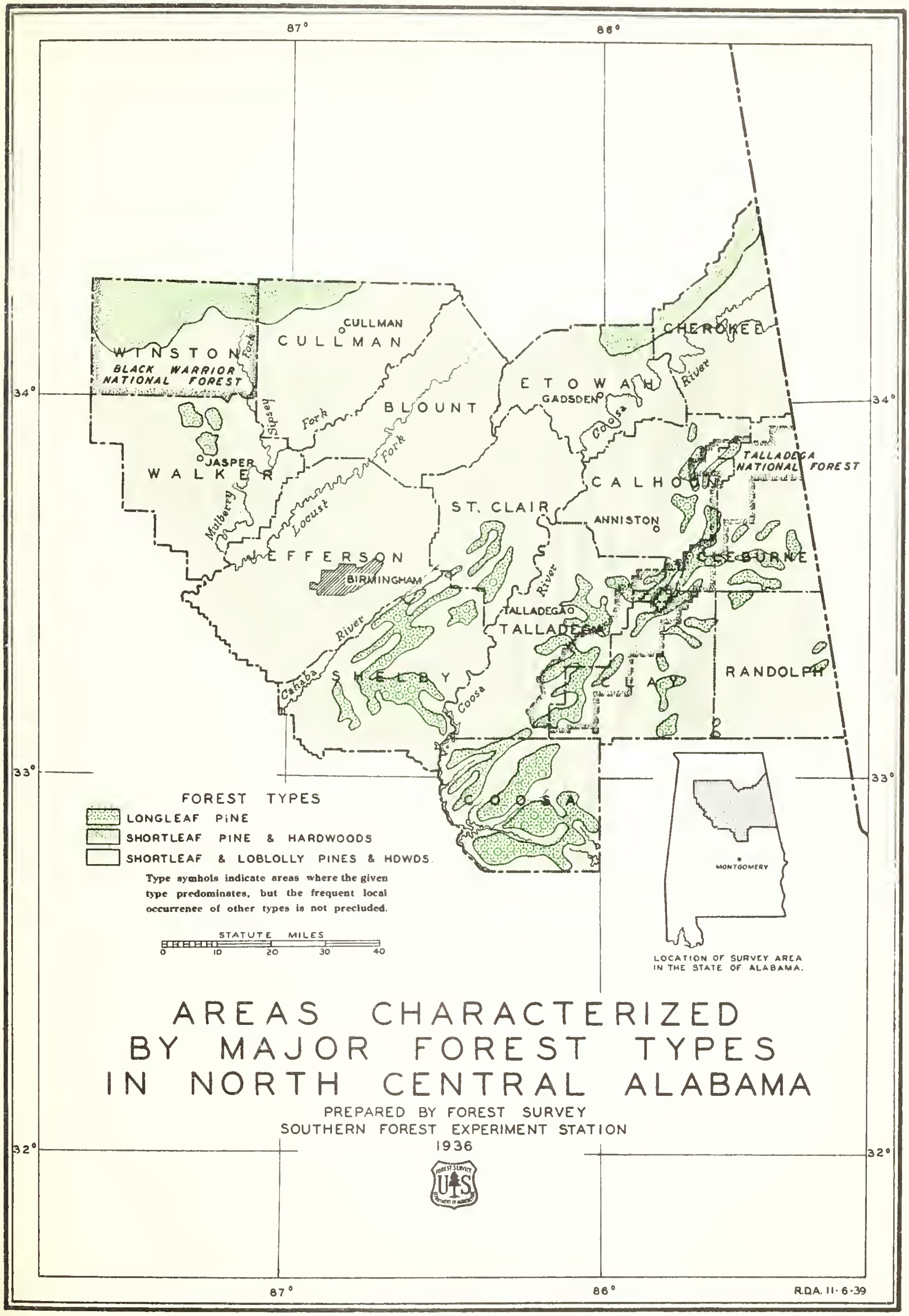

FIGURE 2. - FOREST TYPE MAP

The relative abundance of the various species in the pine, pine-hardwoo upland hardwood, and bottomland hardwood type groups[5] is given in table 5, in which the net cubic volume of each species in the type group is expressed as a percentage of the volume in the type group.

Table 5.—Species composition of the forest type groups, showing proportion of net cubic volume[1] in various species

Species	Forest type groups				All type groups
	Pine	Pine-hardwoods	Upland hardwoods	Bottomland hardwoods	
	Percent				
Pines:					
Loblolly pine	38.4	22.9	3.1	4.6	29.3
Shortleaf pine	29.0	20.0	3.8	-	22.9
Longleaf pine	14.7	5.5	1.3	-	10.5
Virginia pine	4.7	2.6	0.6	negl.	3.6
Other pine and cedar	0.6	0.2	0.3	-	0.4
Total	87.4	51.2	9.1	4.6	66.7
Soft-textured hardwoods:					
Yellowpoplar	0.5	3.6	8.5	7.5	2.4
Redgum	0.9	4.5	5.0	24.7	2.9
Blackgum	0.6	2.1	3.2	9.0	1.5
Red maple, willow, sweet-bay, etc.	0.1	1.2	2.4	9.3	0.9
Total	2.1	11.4	19.1	50.5	7.7
Firm-textured hardwoods:					
Red oaks	3.0	11.6	21.1	18.1	7.8
Forked-leaf white oak	1.2	5.4	8.7	3.8	3.2
Chestnut oak	0.6	2.0	6.7	-	1.7
Other white oaks	1.7	4.7	5.7	3.5	2.9
Scrub oaks	0.7	1.3	2.1	-	1.0
Hickories	2.9	10.3	22.0	4.5	7.1
Dogwood and persimmon	0.1	0.2	0.6	0.3	0.2
Elms, ash, beech, etc.	0.3	1.9	4.9	14.7	1.7
Total	10.5	37.4	71.8	44.9	25.6
All species	100.0	100.0	100.0	100.0	100.0

1/ Includes bark.

Old-growth timber, which makes up only a small part (11 percent) of the total forest area (table 6), occurs in scattered tracts, often in small clumps. More than half of it has been partly cut over for selected trees or for specialized products. Most of it is in the pine stands; it is very rare in the bottomland hardwoods. Old-growth uncut stands in the pine type group average 7,500 board feet (lumber tally) per acre, in the pine-hardwoods 4,600 board feet, in the upland hardwoods 3,700, and in the bottomland hardwoods 5,400.

5/ See appendix for types included in each type group.

Table 6.—Forest area classified according to forest condition and forest type group, 1936

Forest condition	Pine	Pine-hardwoods	Upland hardwoods	Bottom-land hardwoods	All type groups	Proportion of total
	- - - - - - - - - - - - - Acres	- - - - - - - - - - - - -				Percent
Old growth:						
Uncut	89,800	30,500	50,300	6,500	177,100	4.4
Partly cut	121,100	57,600	89,800	7,500	276,000	6.8
Total	210,900	88,100	140,100	14,000	453,100	11.2
Second growth:						
Sawlog size:						
Uncut	890,500	279,300	106,200	28,100	1,304,100	32.4
Partly cut	318,000	124,400	51,100	18,900	512,400	12.7
Under sawlog size	533,000	584,800	452,300	37,900	1,608,000	39.8
Reproduction	51,100	33,800	53,500	4,100	142,500	3.5
Total	1,792,600	1,022,300	663,100	89,000	3,567,000	88.4
Clear-cut	13,200	900	800	800	15,700	0.4
All forest conditions	2,016,700	1,111,300	804,000	103,800	4,035,800	100.0
Percent of total forest area	50.0	27.5	19.9	2.6	100.0	

Second-growth stands, which form most of the forest cover, occupy $3\frac{1}{2}$ million acres of forest land. The areas of sawlog and under-sawlog-size stands are approximately equal for the second-growth forest as a whole, but about two-thirds of the pine stands are of sawlog size. Uncut second-growth sawlog-size stands average 3,900 board feet (lumber tally) per acre in the pine type group, 2,900 in the pine-hardwoods, 2,000 in the upland hardwoods, and 3,900 in the bottomland hardwoods.

The relative productivity of the forest land is indicated by the height in feet attained by average dominant trees at 50 years, a measure that is known as the site index. Determinations of the site index were made throughout the pine types, and it was found that the pine sites of this unit are lower than the average of the State. This is apparent in figure 3, which shows that 57 percent of the loblolly pine area in the State has at least an 80-foot site compared with only 36 percent of the area in this unit. An 80-foot site is considered above average throughout the South.

The distribution of the total number of trees by size-classes is shown in figure 4. It is seen that there is a scarcity of trees over 14 inches d.b.h. and a great abundance of smaller trees, which undoubtedly will soon grow into larger ones—a circumstance that has a direct and favorable bearing

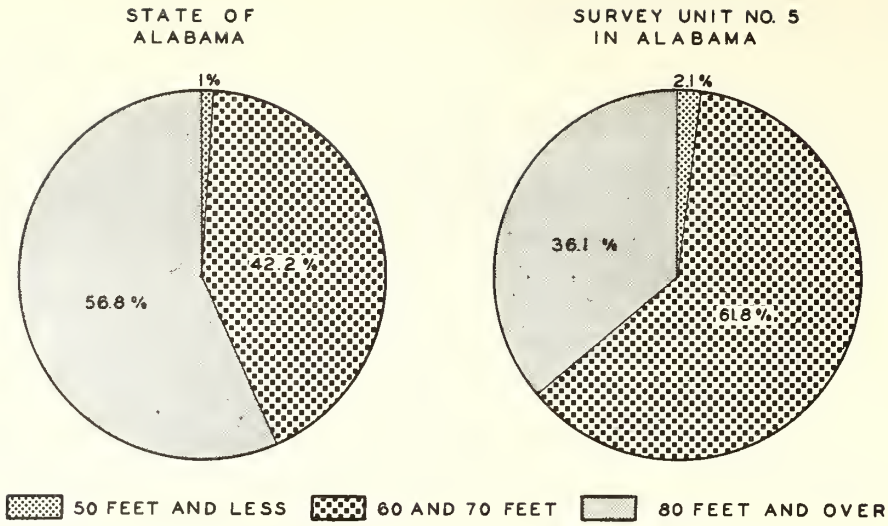

FIGURE 3.— PERCENTAGE OF LOBLOLLY PINE AREA IN VARIOUS SITES.

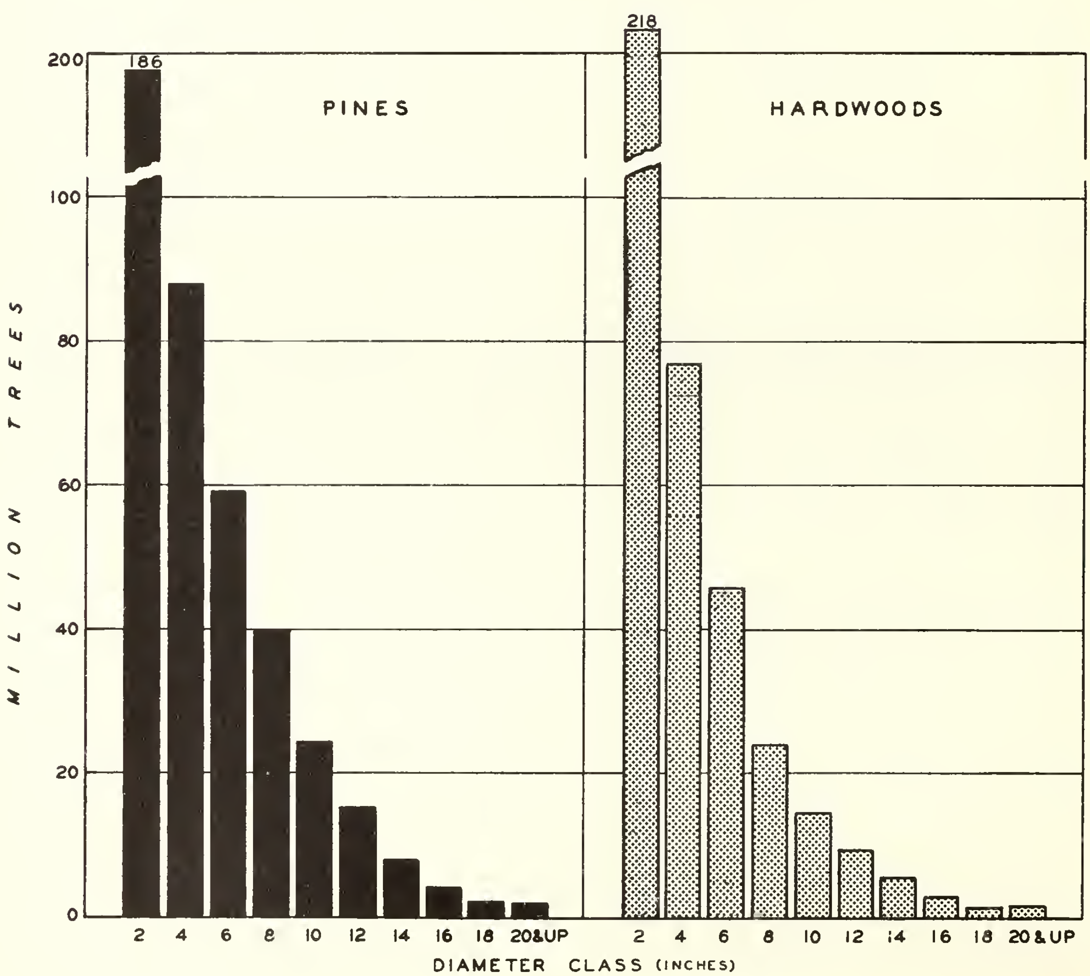

FIGURE 4.— STAND DIAGRAMS.

upon future industrial development and upon the practical attainment of successful forest management.

The results that can be expected from forest-management practices are indicated in figure 5, where the prevailing age-class and volume distribution of the pine and pine-hardwood types (excluding longleaf) are compared with the volumes per acre of better-stocked stands. The volume figures used are cubic feet inside bark, without deduction for woods cull. The age-class area and volume per acre of the prevailing forest were determined from field data gathered throughout the $2\frac{1}{2}$ million acres in the pine and pine-hardwood types, omitting the longleaf types. The per-acre volumes of the better-stocked stands are based upon the best stocked 10 percent of the uncut stands of weighted-average sites in these same types, and represent a yield from the forest land realizable under simple forest-management practices. With an abundant supply of young trees already on the ground, the chief requisite is a selective system of logging designed to increase the quality and quantity of the growing stock.

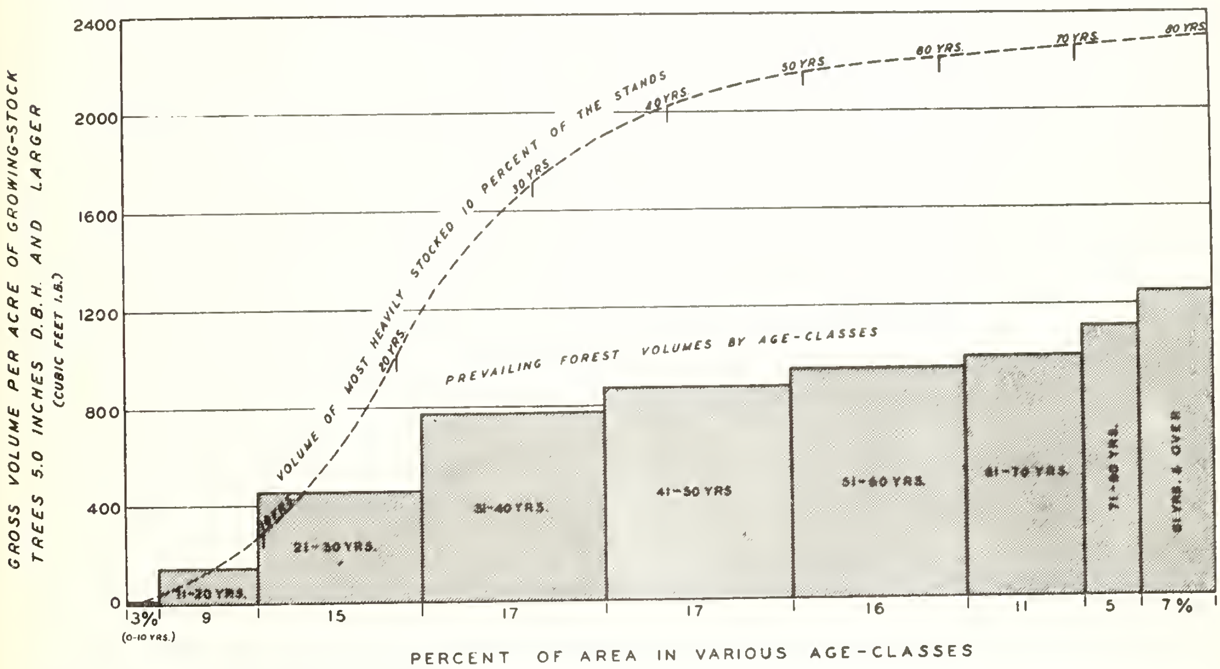

FIGURE 5.— PREVAILING VOLUMES, BY AGE-CLASSES, COMPARED WITH THOSE IN WELL-STOCKED STANDS (BASED ON PINE AND PINE-HARDWOOD TYPE-AREAS* OF 2,577,700 ACRES).

*EXCLUDING 550,300 ACRES IN THE LONGLEAF TYPES

Fire protection is a fundamental part of any forest-management program. This is particularly true in the loblolly and shortleaf pine forests of this unit. At present intensive fire protection is limited to the Black Warrior and Talladega national forests, or to less than one-tenth of the forest land. Extensive county-wide protection, based upon patrol and volunteer assistance, is sponsored by the State and by Walker, Jefferson, and Shelby counties. The rest of the forest area has little protection. Organized unit-wide fire protection is imperative, if this important forested section is to produce the volume of wood products of which it is capable.

Volume Estimates

Board-foot volume

The estimate of the saw-timber[6/] volume is given in table 7 and is expressed in the Doyle log scale, the Scribner log scale, and in lumber tally, which is based upon the International $\frac{1}{4}$-inch scale. The use of the Doyle scale is common throughout the South, but in the small timber characteristic of this unit it underestimates by about 40 percent the number of board feet of lumber that can be cut.

Table 7.--Net volume in Doyle and Scribner log scales, and in lumber tally, classified according to species group, 1936

Species group	Doyle	Scribner	Lumber tally
	- - - - - - - Thousand board feet - - - - - - -		
Pines:			
Loblolly pine	2,010,700	2,836,600	3,262,900
Shortleaf pine	958,900	1,543,400	1,854,200
Longleaf pine	709,000	1,024,100	1,190,400
Virginia pine[1/]	190,600	295,000	349,500
Total pines	3,869,200	5,699,100	6,657,000
Hardwoods:			
Yellowpoplar	189,100	231,100	254,500
Redgum	138,500	182,300	203,400
Blackgum	64,600	84,700	93,900
Red maple, willow, sweet-bay, etc.	31,300	40,800	45,300
Red oaks	255,000	330,500	366,200
Forked-leaf white oak	112,000	141,100	155,400
Chestnut oak	52,200	64,000	70,200
Other white oaks	76,800	100,800	111,700
Hickories	183,300	242,500	268,700
Ash	12,700	16,000	17,600
Elms, beech, etc.	55,200	68,900	75,900
Total hardwoods	1,170,700	1,502,700	1,662,800
All species	5,039,900	7,201,800	8,319,800

1/ Includes other pines and cedar.

6/ See appendix for description of material included in saw timber.

Eighty percent of the net lumber-tally volume is in pines (table 8), chiefly loblolly, shortleaf, and longleaf. The volume in the hardwoods (20 percent of the total) is distributed among many species, yellowpoplar being the most abundant. As a group, however, the red oaks are most common, followed by the hickories. In the pines, 21 percent of the saw-timber volume is in old-growth stands, 74 percent in second-growth sawlog-size stands, and 5 percent in under-sawlog-size stands. Half the longleaf pine volume is in old-growth stands, while 87 percent of the loblolly pine and 84 percent of the shortleaf pine volume is in second growth. Thirty-five percent of the hardwood saw-timber volume is in the old-growth conditions, 57 percent in the second-growth sawlog-size, and 8 percent in the under-sawlog-size conditions. Among the hardwoods the chestnut oak group has the highest proportion of its volume in old-growth stands, and redgum has the highest proportion in second-growth stands.

Table 8.--Net volume, lumber tally, classified according to species group and forest condition, 1936

Species group	Old growth		Second growth			All forest conditions	Proportion of total
			Sawlog size		Under sawlog size 1/		
	Uncut	Partly cut	Uncut	Partly cut			
	Thousand board feet						Percent
Pines:							
Loblolly pine	252,200	183,200	2,216,800	506,200	104,500	3,262,900	39.2
Shortleaf pine	153,300	144,000	1,158,800	275,200	122,900	1,854,200	22.3
Longleaf pine	313,900	286,200	375,000	135,300	80,000	1,190,400	14.3
Virginia pine 2/	48,800	28,000	212,600	44,300	15,800	349,500	4.2
Total pines	768,200	641,400	3,963,200	961,000	323,200	6,657,000	80.0
Hardwoods:							
Yellowpoplar	44,400	58,400	111,300	28,900	11,500	254,500	3.1
Redgum	16,300	21,500	105,700	49,400	10,500	203,400	2.4
Blackgum, red maple, etc.	14,100	27,000	66,400	20,100	11,600	139,200	1.6
Red oaks	56,800	62,100	153,200	62,400	31,700	366,200	4.4
Forked-leaf white oak	38,000	29,400	65,700	12,900	9,400	155,400	1.9
Chestnut oak and other white oaks	34,400	46,900	65,900	16,300	18,400	181,900	2.2
Hickories	37,800	59,100	93,200	41,800	36,800	268,700	3.3
Elms, ash, beech, etc.	26,400	16,500	35,600	12,600	2,400	93,500	1.1
Total hardwoods	268,200	320,900	697,000	244,400	132,300	1,662,800	20.0
All species	1,036,400	962,300	4,660,200	1,205,400	455,500	8,319,800	100.0
Percent of total	12.4	11.6	56.0	14.5	5.5	100.0	

1/ Includes areas classified as reproduction and clear-cut.
2/ Includes 9,300 M board feet of cedar and 49,200 M board feet of other pines.

A large proportion of the board-foot volume is in the smaller trees (table 9). Three-fourths of the pine volume is in trees in the 10- to 16-inch diameter classes—48 percent of the pine volume in old-growth stands and 82 percent in second-growth stands. In the hardwoods, two-thirds of the volume is in 14- to 18-inch diameter classes—46 percent of the old-growth volume and 79 percent of the second-growth. Generally speaking, the volume of timber in the larger trees is not sufficient at present to support widespread, large-scale, sawmilling operations.

Table 9.—Diameter distribution of net volume, lumber tally, in the various forest conditions, 1936

Species group and diameter class	Old growth		Second growth			All forest conditions	Proportion of species group
	Uncut	Partly cut	Sawlog size		Under sawlog size[1]		
			Uncut	Partly cut			
	Thousand board feet						Percent
Pines:							
10 - 12	127,000	134,200	1,805,400	499,000	264,400	2,830,000	42.5
14 - 16	225,400	183,900	1,374,800	306,500	47,100	2,137,700	32.1
18 - 20	183,100	154,900	578,900	124,800	8,800	1,050,500	15.8
22 and over	232,700	168,400	204,100	30,700	2,900	638,800	9.6
Total pines	768,200	641,400	3,963,200	961,000	323,200	6,657,000	100.0
Hardwoods:							
14 - 18	126,300	145,800	544,200	186,700	117,900	1,120,900	67.4
20 - 28	127,000	151,600	148,500	57,700	14,400	499,200	30.0
30 and over	14,900	23,500	4,300	-	-	42,700	2.6
Total hardwoods	268,200	320,900	697,000	244,400	132,300	1,662,800	100.0

1/ Includes areas classified as reproduction and clear-cut.

A large part of the saw-timber volume in the sawlog-size conditions is in stands of more than 2,000 board feet per acre. In figure 6, the proportion of the forest area supporting different volumes per acre is shown along with the proportion of the total volume in these volume-per-acre classes. All the volumes are gross, as no woods cull has been deducted. The pine and pine-hardwood types occupy 1,911,200 acres and contain 7.6 billion board feet gross volume. Almost 89 percent of the volume in these types is in stands of more than 2,000 board feet per acre. Only 32 percent of the pine saw-timber area is stocked with less than 2,000 board feet per acre, and only 5 percent has less than 1,000.

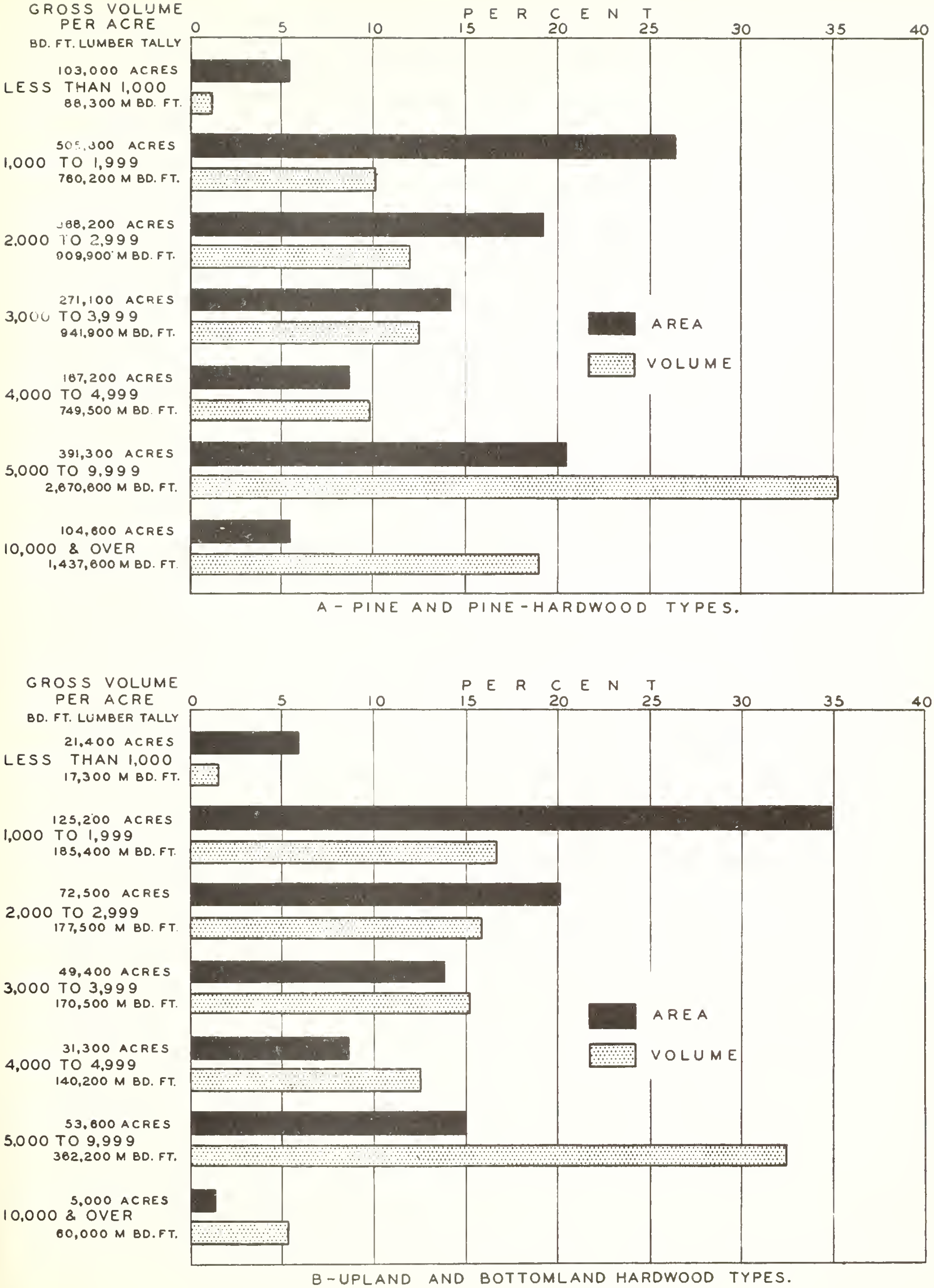

FIGURE 6.— PROPORTIONAL AREA AND VOLUME OF THE SAWLOG-SIZE CONDITIONS, CLASSIFIED ACCORDING TO VOLUME OF SAW TIMBER PER ACRE.

The sawlog-size conditions of the upland and bottomland hardwood types occupy 358,400 acres and contain 1.1 billion board feet gross volume; 82 percent of the volume in these types is in stands of more than 2,000 board feet per acre. Forty-one percent of the area is stocked with less than 2,000 board feet per acre, but only 6 percent has less than 1,000.

The Survey roughly classified the pine saw-timber trees into three categories: "smooth," "limby," and "rough." This classification (table 10) brought out clearly the difference in quality between old-growth and second-growth timber. The older trees, with the exception of Virginia pine, are predominantly smooth and of high quality. Second growth, on the other hand, has a large proportion of limby and rough trees. Longleaf pine has the best quality second growth, followed by shortleaf. Two-thirds of the loblolly pine second growth, and almost all the Virginia pine, is in limby or rough trees.

Table 10.—Classification of pine according to saw-timber quality

Species and stand condition	Tree grade			Total
	Smooth	Limby	Rough	
	- - - - - - - - -	Percent of volume	- - - - - - - - -	
Loblolly pine:				
Old growth	98	2	-	100
Second growth	33	56	11	100
Shortleaf pine:				
Old growth	94	6	-	100
Second growth	60	33	7	100
Longleaf pine:				
Old growth	98	2	-	100
Second growth	72	26	2	100
Virginia pine:				
Old growth	40	60	-	100
Second growth	3	56	41	100

Cordwood volume

Although there is only a relatively small amount of large saw timber, the total volume of sound wood in all classes[7] of trees is enormous, as seen in table 11, where the cordwood volumes include the net volume in the entire stand of sound trees at least 5.0 inches d.b.h. outside bark, and also the net sound volume in cull trees 5.0 inches d.b.h. and larger. These volumes are expressed in terms of standard cords (4 x 4 x 8 feet), estimated to contain 90 cubic feet if pine or 80 cubic feet if hardwood, both including bark.

Slightly over half the total cordwood volume is pine. Nearly three-fifths of the pine volume is in the sawlog portion of sawlog-size trees. Young trees under saw-timber size contain nearly 7 million cords. Suitable for pulpwood, but at present largely unsalable, are the 3.4 million cords of pine in the upper stems of sawlog-size trees and in cull trees.

Table 11.—Net volume in various classes of sound material, expressed in cords, 1936

Species group	Sound trees, sawlog size		Sound trees under sawlog size	Cull trees	All classes of material	Proportion of total
	Sawlog material	Upper stems				
	Cords (bark included)					Percent
Pines	14,628,500	2,326,200	6,773,100	1,119,600	24,847,400	52.3
Hardwoods:						
Soft textured[1]	1,497,700	833,800	1,619,400	1,572,700	5,523,600	11.6
Firm textured[2]	2,907,300	1,641,200	6,855,400	5,718,900	17,122,800	36.1
Total hardwoods	4,405,000	2,475,000	8,474,800	7,291,600	22,646,400	47.7
All species	19,033,500	4,801,200	15,247,900	8,411,200	47,493,800	100.0
Percent of total	40.1	10.1	32.1	17.7	100.0	

1/ Yellowpoplar, redgum, blackgum, and tupelo, basswood, red maple, willow, sweetbay, etc.
2/ Oaks, hickories, ash, beech, birch, elms, dogwood, persimmon, and sycamore, at present are now used commercially for pulping in this section.

Forty-eight percent of the cordwood volume is in hardwoods. The soft-textured hardwoods, those species commercially pulped at present, make up one-fourth of the total hardwood volume. In these species there are 1.6 million cords of sound wood in cull trees that could be used as pulpwood. The firm-

7/ See appendix for description of various classes of cordwood material.

textured hardwoods are not used as a source of commercial pulping fibre at present, but recent tests at the Forest Products Laboratory at Madison, Wisconsin, indicate that satisfactory liner-board can be made from a species as poor as scrub oak. Experiments such as these will go far to increase the use of the firm-textured species for pulpwood and eventually may create a market for the low-grade material in these species now so abundant in this unit.

The cordwood volume of the sound-tree growing stock is shown in figure 7, classified according to species group and diameter class. In this figure the volume in cull trees, scrub oaks, and tops and limbs of sawlog-size hardwood trees is entirely excluded. Approximately 29 percent of the pine volume, 52 percent of the soft-textured hardwood volume, and 70 percent of the firm-textured hardwood volume, are in trees below sawlog size. Thinning of dense stands would be good silviculture in certain localities, but most of the small pines and soft-textured hardwoods should be left to augment the saw-timber growing stock. In the firm-textured hardwoods occurs the highest proportion of trees that will never grow into good saw timber, and it would be good management to remove them as soon as a market becomes available.

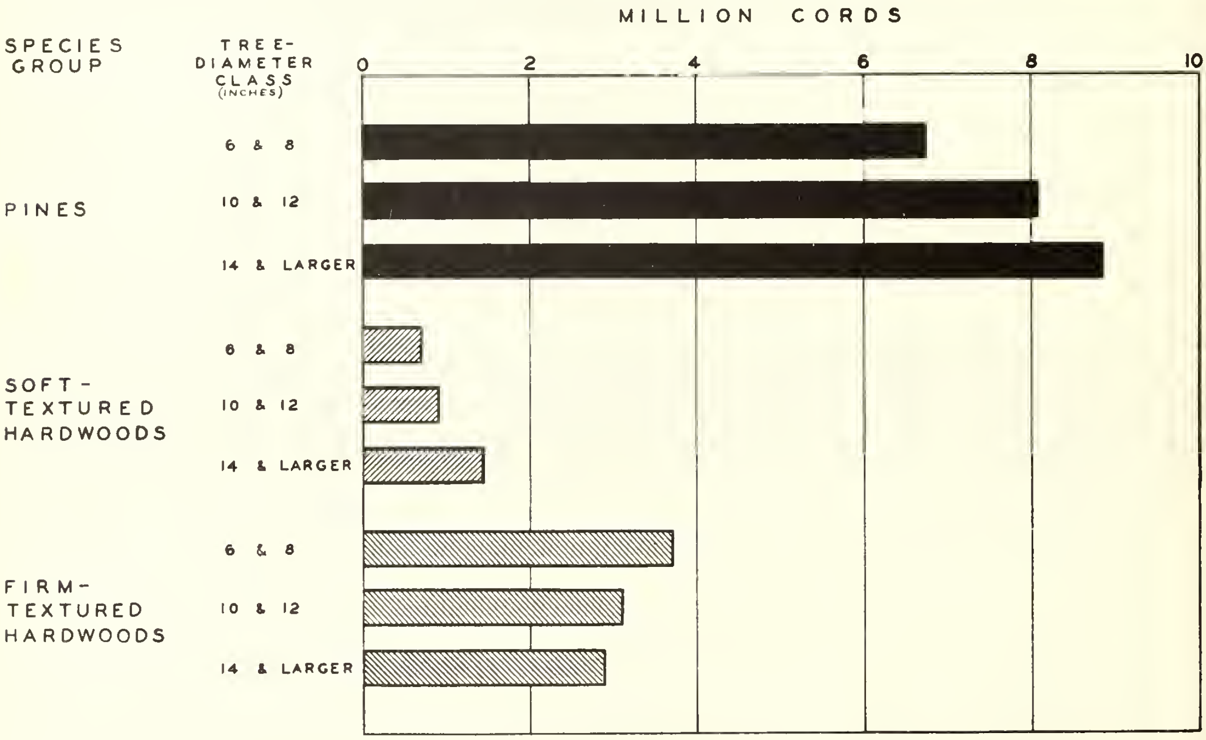

FIGURE 7.—CORDWOOD VOLUMES OF PINES AND HARDWOODS, BY SIZE CLASSES; SOUND TREES ONLY, 1936.

The average stand for the entire unit is 9.1 cords of sound trees per acre (table 12). The bottomland hardwood type group has the highest average volume per acre in most of the forest conditions, but the area in this type group is relatively small. Most important from the standpoint of area and volume is the second-growth sawlog-size uncut condition in the pine type group, which averages 15.3 cords per acre and occupies 890,500 acres of land; 37 percent of all the cordwood growing stock volume in sound trees in the unit is in this condition and type group.

Table 12.—Average volumes of cordwood per acre of growing stock by type groups and forest conditions, 1936

Type group	Old growth		Second growth			All forest conditions 1/
	Uncut	Partly cut	Sawlog size		Under sawlog size	
			Uncut	Partly cut		
	Cords (bark included)					
Pine	19.9	12.0	15.3	10.4	3.8	11.0
Pine-hardwood	15.2	11.9	13.0	10.1	3.8	7.4
Upland hardwood	13.7	10.3	11.0	8.7	3.8	6.2
Bottomland hardwood	18.4	17.8	18.3	12.0	5.5	11.6
All types (weighted average)	17.3	11.6	14.5	10.3	3.8	9.1

1/ Includes reproduction and clear-cut areas.

Poles and piles

The Survey classified the pine and cedar trees between 7.0 and 18.9 inches d.b.h. for their suitability as poles and piles, and found that about one in six, or over 15 million trees (table 13), would meet the pole and pile specifications of the American Standards Association. The volume of these trees also has been included in the previous volume estimates, since many of them will be used for lumber or other products. Sixty-four percent of the trees will yield pieces less than 30 feet long, 18 percent will make 30-foot poles or piles, and 18 percent will make poles or piles at least 35 feet long. The proportion of the trees suitable for the longer lengths in this unit is higher than the State average.

Table 13.—Total number of pine poles or piles, classified according to length and diameter, 1936

Tree-diameter class (inches) 1/	Pole or pile length (feet)						All lengths	Proportion of total
	20	25	30	35	40	45 or over		
	Thousand pieces							Percent
7.0 - 8.9	2,809	812	301	72	-	-	3,994	26.2
9.0 - 10.9	2,331	1,348	900	311	162	89	5,141	33.8
11.0 - 12.9	856	883	1,035	496	239	187	3,696	24.3
13.0 - 14.9	218	314	359	398	224	142	1,655	10.9
15.0 - 16.9	49	95	115	154	122	78	613	4.0
17.0 - 18.9	-	18	23	31	28	22	122	0.8
Total	6,263	3,470	2,733	1,462	775	518	15,221	100.0
Percent of total	41.1	22.8	18.0	9.6	5.1	3.4	100.0	

1/ Measured at breast height outside bark.

Forest Increment

"Forest increment" is the net volume of wood created by growth of the forest growing stock. In the tables dealing with forest increment, except table 16, the calculations for each year are based upon (1) the growth of the sound trees already of measurable size that remained in the stand; and (2) the volume of those trees that grew into measurable size; minus (3) the volume lost because of mortality, rot, and other natural causes. The board-foot increment includes the growth on the saw-timber portion of sawlog-size trees. The cordwood increment, which includes bark, is the growth on the sound stemwood of pines 5.0 inches d.b.h. and over, on under-sawlog-size hardwoods, and on the sawlog portion of sawlog-size hardwoods. Increment on cull trees and limbs of all species is omitted. Cubic-foot volumes are for wood without bark; otherwise the material is identical with that included in the cordwood tables.

The increment of the forest stands in 1936 is given in tables 14 and 15. This is the latest year for which increment was calculated by forest conditions, as the changes in the area of these conditions, due to cutting and growth, have not been determined since the inventory was made. The total increment of the pines and hardwoods in 1937 can be calculated, however, and these increment values are used in tables 20, 21, and 22 to compare the 1937 commodity drain with the increment.

In 1936 the total forest increment was 375.6 million board feet, of which 80 percent was in the pines and 20 percent in the hardwoods. Growth of trees just coming into the measurable sizes was responsible for 55 percent of the board-foot increment in the pines and 70 percent of that in the hardwoods. Ninety-four percent of the increment is in second-growth stands, and more than half is represented by trees in the minimum sawlog sizes, where logging costs are high and the yield of high-grade lumber is low. It is possible that the lumber industry will continue to be dominated by the small portable sawmills that use small timber and operate at little, if any, profit; but it may give way to the pulp and paper industry, which can use this small second-growth timber more advantageously. The lack of suitable timber may cause a reduction or migration of the sawmill industry and provide a temporary respite in which the trees can increase in number, size, and quality.

Table 14.—Net increment in board feet (lumber tally) and cubic feet in the various forest conditions, 1936

Forest condition	Saw-timber material			All material		
	Pine	Hardwood	Total	Pine	Hardwood	Total
	- Thousand board feet -			Thousand cubic feet (i.b.)		
Old growth	9,100	11,800	20,900	1,650	3,660	5,310
Second growth:						
Sawlog size	219,000	46,800	265,800	37,610	16,060	53,670
Under sawlog size	72,200	16,200	88,400	27,120	9,350	36,470
Reproduction and clear-cut	400	100	500	140	60	200
All forest conditions	300,700	74,900	375,600	66,520	29,130	95,650

The estimate of the net increment expressed in standard cords (4 x 4 x 8 feet) is given in table 15. The material included here is the same as that shown in cubic feet in table 14, except that bark is included.

Table 15.—Net increment in cords of wood with bark, classified according to forest condition, 1936

Forest condition	Pine	Hardwood	Total
	Cords		
Old growth	21,300	55,100	76,400
Second growth:			
Sawlog size	491,900	247,700	739,600
Under sawlog size	364,300	147,100	511,400
Reproduction and clear-cut	1,800	900	2,700
All forest conditions	879,300	450,800	1,330,100

An estimate of the average increment per acre in the various forest conditions in 1936 is presented in table 16. These values are based on the 1936 inventory and on the assumption that no trees were harvested during that year. The increment for the whole area averages only 96 board feet per acre; this is somewhat lower than the 118 board-foot average increment per acre in southwest Alabama but is higher than the 77 board feet per acre in the Tennessee Valley of Alabama. The increment in the second-growth sawlog-size uncut stands is indicative of the timber-producing ability of the soil and climate, but even in these stands the increment can be increased with proper management. An average annual yield per acre of at least 200 board feet, or 0.7 of a cord, is within the realm of possibility, if the entire forest area were under good management.

Table 16.—Average increment per acre in the various forest conditions, uninfluenced by cutting, 1936

Forest condition	Pine component			Hardwood component			Total per acre		
	Bd.ft.	Cu.ft.	Cords	Bd.ft.	Cu.ft.	Cords	Bd.ft.	Cu.ft.	Cords
Old growth:									
Uncut	2	-.7	-.01	36	9.0	.14	38	8.3	.13
Partly cut	39	7.7	.10	21	7.7	.12	60	15.4	.22
Second growth:									
Sawlog size:									
Uncut	142	23.9	.31	27	9.6	.15	169	33.5	.46
Partly cut	79	15.0	.20	24	7.2	.11	103	22.2	.31
Under sawlog size	45	17.1	.23	10	5.9	.09	55	23.0	.32
Reproduction and clear-cut	2	.9	.01	1	.3	.01	3	1.2	.02
Weighted average	77	17.0	.23	19	7.3	.11	96	24.3	.34

The lumber industry

Over 81 percent of the lumber is cut by small circular sawmills having a capacity of less than 20,000 board feet per day. In 1937 there were at least 636 of these mills, distributed throughout the unit (fig. 8). Approximately 20 percent of them are farm or neighborhood mills that produce lumber chiefly for local construction and repairs. The others are small commercial mills that sell their rough lumber to concentration yards. Many yards finance the mills, but one yard seldom controls more than 15, and a few yards operate their own small mills directly. There were about 80 concentration yards in the unit in 1937.

Fourteen percent of the lumber was produced by the 15 sawmills having a capacity of 20,000 to 39,000 board feet per day (table 17). Most of these mills have facilities for finishing and kiln-drying their lumber and are at least "semipermanent." Some buy logs delivered by truck to the mill, others log their own land, and a few log the lands of mining and land-holding companies. Most of their pine lumber is sold finished, but most of the hardwood is sold in rough form. Only 5 percent of the lumber was cut by the 3 pine sawmills with a capacity of more than 40,000 board feet per day. These mills are large stationary plants, well equipped to manufacture lumber of high quality.

Table 17.--Number of sawmills, lumber production, and extent of employment, classified according to size of mill, 1937

Rated capacity 1/ in M bd. ft. per 10-hour day	Number of sawmills	Lumber production			Employment provided		
		Pine	Hardwood	Total	In woods 2/	In mill	Total
		- Thousand board feet - -			- Thousand man-days - -		
Under 20	636	290,100	9,100	299,200	346	624	970
20 to 39	15	43,400	6,100	49,500	60	107	167
40 to 79	3	16,700	200	16,900	41	46	87
All mills	654	350,200	15,400	365,600	447	777	1,224

1/ Rated capacity indicates size of mill rather than actual average daily production.
2/ Includes employment utilized in producing logs for sawmills outside the unit.

Ninety-six percent of the lumber was cut from the pines, and 4 percent from the hardwoods. Red and white oaks, yellowpoplar, redgum, hickory, and ash were the chief hardwood species utilized. All but 3 million board feet of the pine production was cut from forest stands within this unit, while less than 1 million board feet of hardwoods was brought in from outside sources. More saw timber was shipped out of the unit for manufacture than was brought into it, however, as nearly 12 million board feet of pine and 4 million of

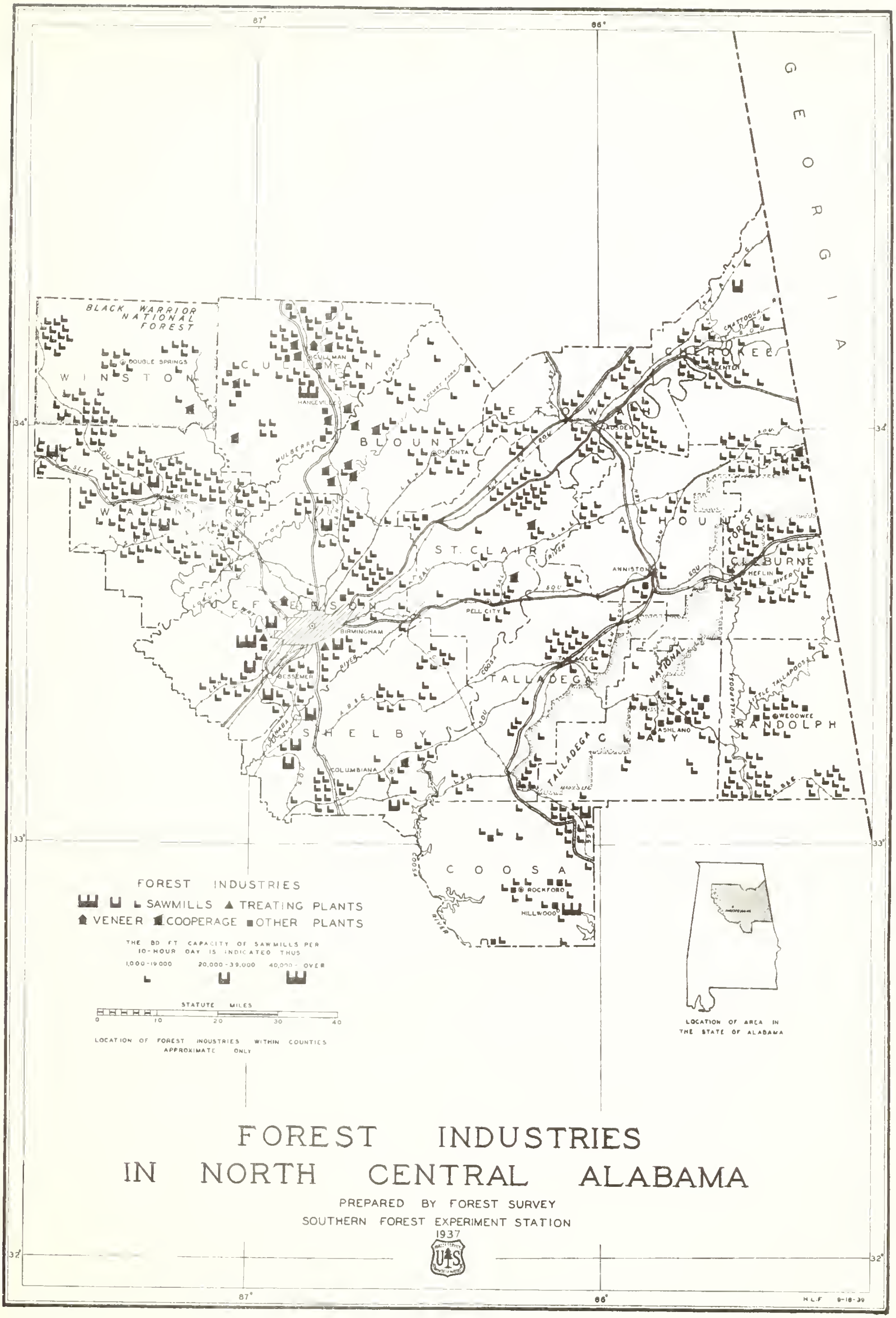

FIGURE 8.- FOREST INDUSTRIES MAP

hardwoods were taken in log form to sawmills in Alabama south and west of this unit.

The number of sawmills in the various counties is shown in figure 9. The shading indicates the total quantity of lumber produced by the mills in each county. Although the sawmills are fairly evenly distributed, those in Walker and Jefferson counties sawed 30 percent of all the lumber cut within the unit.

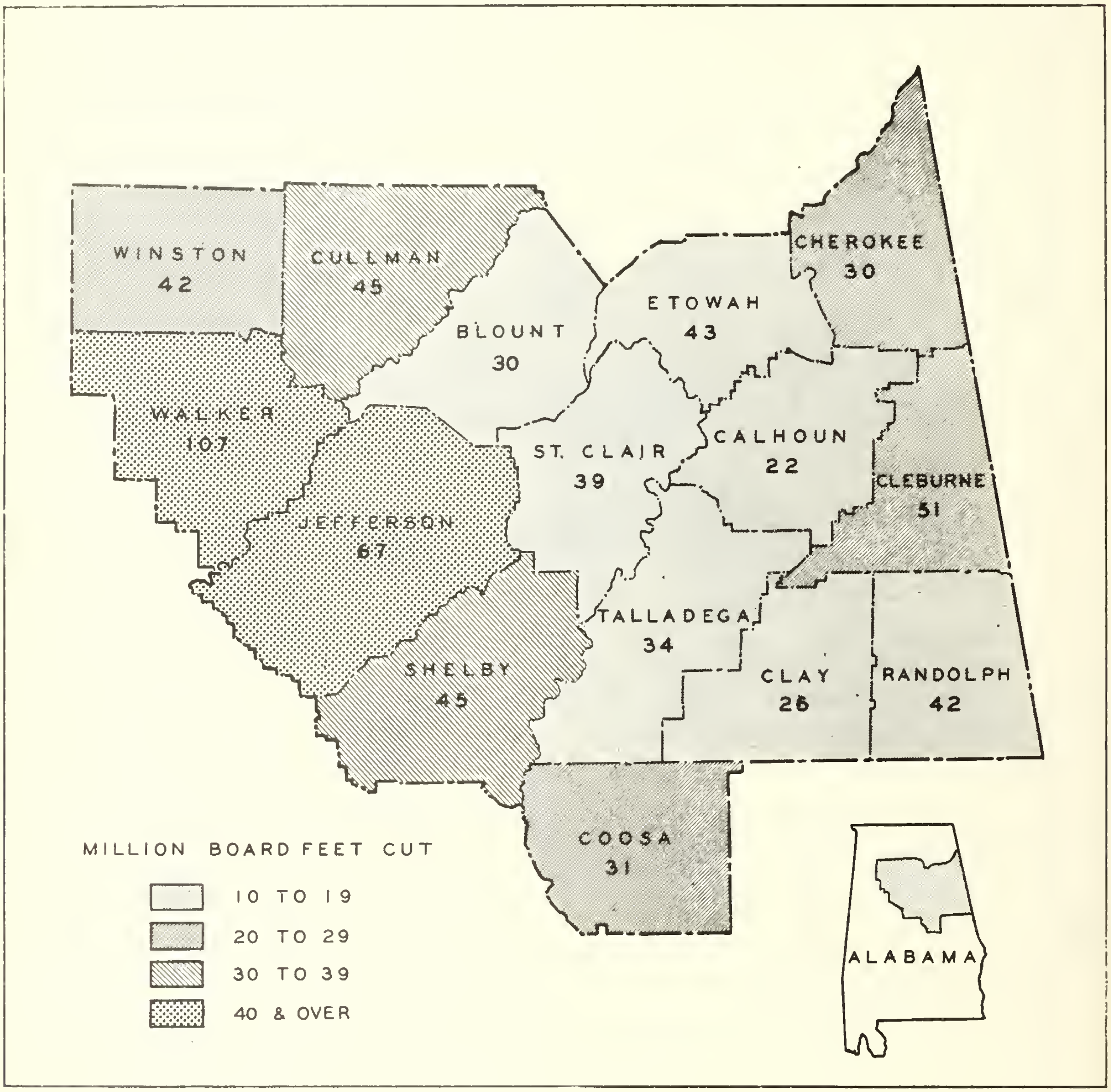

FIGURE 9.— LUMBER PRODUCTION BY COUNTIES DURING 1937 (INDICATED BY HATCHING), AND APPROXIMATE NUMBER OF SAWMILLS (SHOWN BY NUMERALS)

Other forest industries

In 1937 there were 18 cooperage plants operating within the unit (table 18 Twelve of these manufactured heading for slack cooperage, using pine and small amounts of redgum and yellowpoplar. Five of them made slack staves from pine and one made tight staves out of white oak. These plants used 57,300 cords of pine and 1,900 cords of hardwood in 1937. Practically all this timber was cut within the unit.

Three small veneer plants were operating in 1937; they cut veneer and fabricated it into fruit, strawberry, and market baskets, and into strawberry crates, using redgum, blackgum, yellowpoplar, and pine. Only 200,000 board feet were used in 1937, all cut locally.

Table 18.—Wood-products production and employment, 1937

Industry or commodity	Number of plants	Cut in woods	Produced or used by plants	Thousand man-days of employment		
				In woods	In plants	Total
		--- M bd. ft. ---				
Lumber	654	377,900	365,600	447	777	1,224
Veneer	3	600	200	1	1	2
		--- M pieces ---				
Cross ties (hewn)	-	436	-	62	-	62
Poles and piles	-	101	-	16	-	16
Fence posts	-	1,555	-	23	-	23
		--- Cords ---				
Cooperage	18	62,100	59,200	62	82	144
Pulpwood	-	19,900	-	20	-	20
Fuel wood	-	518,800	-	716	-	716
Miscellaneous 1/	33	93,700	2/ 6,300	165	3/ 35	200
Total	708			1,512	895	2,407

1/ Includes 24 shingle mills, 1 handle plant, 2 excelsior mills, 3 shuttle block mills, 1 dimension and 2 treating plants.
2/ Amount of material treated by treating plants not included.
3/ Includes labor in treating plants.

In 1937 numerous other forest-industrial plants were utilizing the timber resource, including 24 small shingle mills, 1 handle plant, 2 excelsior plants, 3 shuttle block mills, 1 small dimension plant, and 2 treating plants. The shingle mills used pine and yellowpoplar; the excelsior mills used only pine; the shuttle-block mills required dogwood; and the treating plants processed poles, piles, posts, cross arms, cross ties, lumber, and mine timbers, largely pine. These small industries, exclusive of the treating plants, used 4,200 cords of pine and 2,100 cords of hardwood. All the pine came from this unit, but a few hundred cords of hardwood were brought in from nearby units in Alabama.

Likewise, a large quantity of material was cut in the woods and used locally without further refinement or shipped to manufacturing plants outside the unit. This included 436,000 hewn cross ties, 101,000 poles and piles, 89,000 cords of mine timbers, 1½ million fence posts, and about half a million cords of fuel wood. In addition, about 24,000 cords of cooperage stock, veneer blocks, and pulpwood were shipped to plants outside the unit.

The numerous wood-using activities provided employment for a great many individuals. It is impractical to determine the total number, but it is safe to say that a large majority of the 59,000 farm operators made some part of their living from working in the woods and forest-industrial plants. Moreover, there are several thousand other persons who earn the major part of their livelihood from this source. In 1937 the forest industries furnished 2,407,000 man-days of employment, distributed among many people in many mills and forest activities. Over half the employment was in the lumber industry, 30 percent in the production of fuel wood, and 6 percent in the cooperage industry; 63 percent was in the woods and 37 percent in the wood-using plants.

Commodity Drain

The commodity drain from the sound-tree growing stock includes both the utilized material and the sound usable material left in felled trees. The drain on the saw-timber portion of the trees, including both the utilized and wasted portions, is expressed in board feet, whereas the volumes given in cubic feet include drain on saw-timber material, upper stems of sawlog-size pines, and small trees ranging from 5.0 inches d.b.h. to sawlog size.

In 1937 about 529 million board feet of material was removed from the sound-tree growing stock to meet farm needs and those of the various wood-using industries (table 19). Ninety percent of this commodity drain was pine; the remainder was hardwood. Lumber accounted for 73 percent of

Table 19.—Commodity drain from sound-tree growing stock, 1937

Reason for drain	Saw-timber material			All material		
	Pine	Hardwood	Total	Pine	Hardwood	Total
	- Thousand board feet - -			- Thousand cubic feet - -		
Lumber	368,300	20,200	388,500	65,130	3,070	68,200
Cross ties (hewn)	14,200	13,600	27,800	2,530	2,190	4,720
Poles and piles	5,700	-	5,700	1,330	-	1,330
Veneer	-	600	600	-	100	100
Cooperage	24,800	1,400	26,200	5,250	230	5,480
Miscellaneous manufactures	9,200	2,400	11,600	5,470	1,570	7,040
Pulpwood	4,800	-	4,800	1,340	50	1,390
Fuel wood	38,500	12,800	51,300	13,690	7,090	20,780
Fence posts	300	900	1,200	90	470	560
Miscellaneous farm use and land clearing	8,900	2,300	11,200	2,950	1,490	4,440
Total[1/]	474,700	54,200	528,900	97,780	16,260	114,040

1/ Drain from growing stock in cords with bark: Pine, 1,281,800, hardwood, 233,200; total, 1,515,000.

the drain, and fuel wood, hewn cross ties, and cooperage, a large portion of the rest. More than 95 percent of the board-foot drain received its primary manufacturing within the unit or was used locally. The total of all material removed from the sound-tree growing stock was 114 million cubic feet, of which fuel wood accounted for 18 percent. On a cordwood basis, the total drain was over 1.5 million cords of pine and hardwoods.

Comparison of Increment and Drain

The inventory volume estimated by the Survey as of January 1, 1936 has been revised to allow for the effects of growth, mortality, and commodity drain during the year to obtain the net volume of growing stock on January 1, 1937. The similar procedure followed in tables 20, 21, and 22 leads to an estimate of the volume of growing stock as of January 1, 1938.

During 1937 the board-foot growing stock decreased by 154 million board feet, or 1.9 percent (table 20). This decrease is due to overcutting in the pines, where the commodity drain exceeded not only the net increment but the total growth. Fire protection and good forest-management practices will go far to reduce the large volume lost through mortality; but unless the present cut is reduced and an increased volume of growing stock is allowed to accumulate, progress will be extremely slow.

Table 20.--Balance between increment and drain of saw-timber material, 1937

Item	Pines	Hardwoods	Total
	Thousand board feet		
Net growing stock, Jan. 1, 1937	6,526,700	1,684,300	8,211,000
Growth, 1937	389,900	92,200	482,100
Mortality, 1937	90,100	17,300	107,400
Net increment, 1937	299,800	74,900	374,700
Commodity drain, 1937	474,700	54,200	528,900
Net change in growing stock, 1937	-174,900	+20,700	-154,200
Net growing stock, Jan. 1, 1938	6,351,800	1,705,000	8,056,800

A surplus of increment over commodity drain exists in the hardwoods. Discrimination in the use of the various hardwood species results in a concentration of the drain on the better individuals of such species as yellowpoplar, redgum, and red and white oaks. The increment shown, however, is that of all species and trees, regardless of quality, if they are sound, sawlog-size trees that contain material suitable at least for rough construction. Although the hardwoods show an excess of increment over drain, there is a likelihood that the more valuable species are being depleted faster than they are being replaced through growth, while the supply of the less valuable species is increasing.

The total sound-tree growing stock larger than 5.0 inches d.b.h. decreased almost 16 million cubic feet in 1937 (table 21). The pine growing stock was reduced 29 million cubic feet, whereas the hardwoods increased by 13 million cubic feet. Even with reductions in mortality through increased fire protection and better management the pine volume will continue to decrease, unless the existing use is temporarily curtailed. Although the hardwood volume is increasing, the effect is to stock the forest land with an even higher proportion of low-quality species. If the present trends are continued the forest resource will constantly dwindle in quantity and quality, leading to a reduction in forest industries and lowered income to the people.

Table 21.—Balance (in cubic feet) between increment and drain of saw-timber and cordwood material, 1937

Item	Pines	Hardwoods	Total
	Thousand cubic feet		
Net growing stock, Jan. 1, 1937	1,787,180	849,460	2,636,640
Growth, 1937	98,350	39,120	137,470
Mortality, 1937	29,620	9,560	39,180
Net increment, 1937	68,730	29,560	98,290
Commodity drain, 1937	97,780	16,260	114,040
Net change in growing stock, 1937	-29,050	+13,300	-15,750
Net growing stock, Jan. 1, 1938	1,758,130	862,760	2,620,890

A comparison of growth with mortality and commodity drain for 1937 is made in figure 10. Growth, which is the amount of new wood added to the growing stock, represents the amount by which the stands would increase each year if none of the trees died and if no commercial use were made of them. Mortality is a direct loss that can be reduced through fire protection and intensive management of the timber stands—practices that also will increase the volume of growth. Commodity drain, however, is one measure of the usefulness of the forest to man and within limits must continue. The deficit in the pine stands between growth on the one hand and mortality and commodity drain on the other must be eliminated if the forest industries are to remain, and the situation must be reversed if forest industries are to increase in importance in this unit.

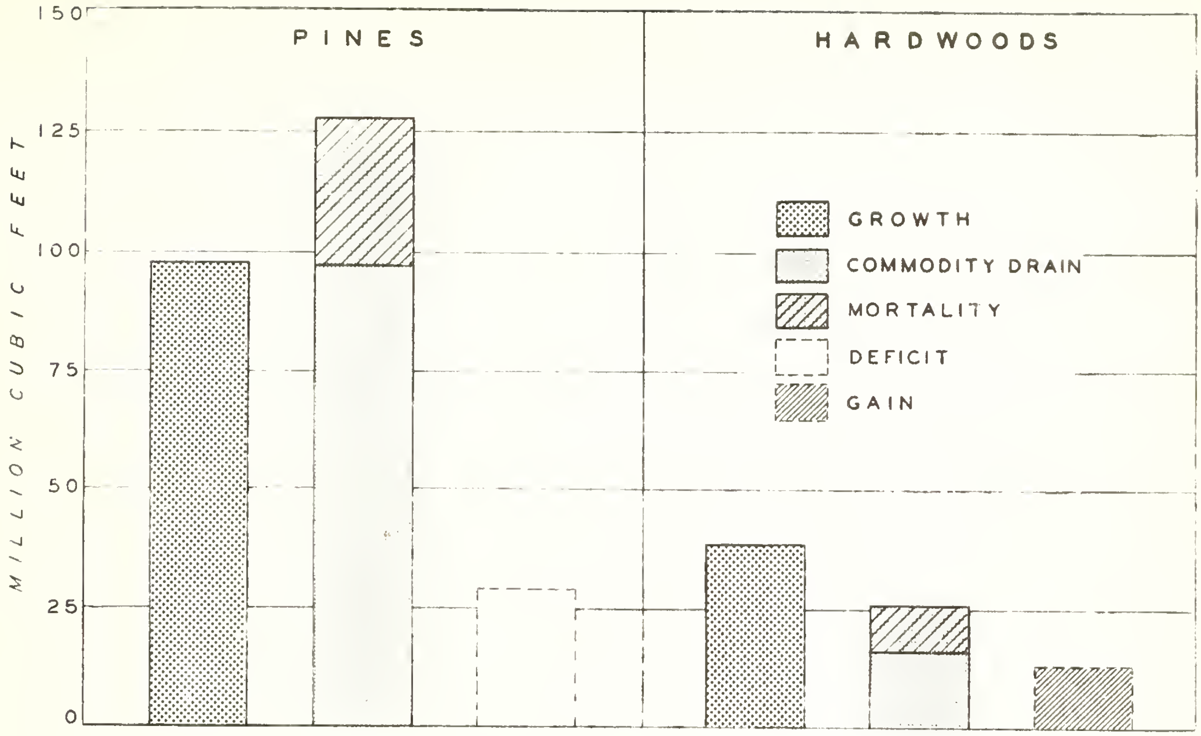

FIGURE 10.—COMPARISON OF GROWTH WITH MORTALITY AND COMMODITY DRAIN, 1937

A comparison of growth, mortality, and commodity drain is given in cords in table 22. The material included is the same as that shown in cubic feet in table 21 except that bark is included.

Table 22.--Balance (in cords) between increment and drain of saw-timber and cordwood material, 1937

Item	Pines	Hardwoods	Total
		Cords	
Net growth stock, Jan. 1, 1937	23,412,100	13,103,800	36,515,900
Growth, 1937	1,289,300	585,900	1,875,200
Mortality, 1937	388,000	147,500	535,500
Net increment, 1937	901,300	438,400	1,339,700
Commodity drain, 1937	1,281,800	233,200	1,515,000
Net change in growing stock, 1937	-380,500	+205,200	-175,300
Net growing stock, Jan. 1, 1938	23,031,600	13,309,000	36,340,600

Summary and Conclusions

North central Alabama is one of the most highly industrialized areas in the South. Vast deposits of coal, iron, and other minerals occur in close proximity to one another, and their development has made the Birmingham district world-famous as a coal, iron, and steel center. In addition, 48 textile mills are scattered throughout the area, yielding products valued at many millions of dollars annually and employing thousands of people. Outside of the industrial centers, however, it is a short step to the rural areas, where agriculture is the chief source of livelihood and thousands of farmers struggle to make a living from their cultivated crops, livestock, and forest products. Other rural dwellers engage full- or part-time in the forest industries, for here, as in most other parts of the South, forests occupy the major portion of the land; 4 of the 6.6 million acres in the unit are woodland. Forest lands, by their very abundance, should make a large and important contribution in renewable resources for the use of people and industry.

Nearly half of the land in farms is covered with forests, the management of which has an important bearing on the farm income. The majority of the farmers have not yet realized that their forested acres can be made to yield an annual crop of timber; and it is unfortunate that their principal technical advisers, including county agents, agricultural economists, and farm-management specialists, have all too often failed to appreciate the revenue-producing possibilities of the forest land. If forest practices on the farm forests of this unit are to be improved, foresters as a group first must secure the cooperation and support of those agricultural workers who most often come in contact with the farmers.

The coal and iron industries own many thousands of acres of land, a considerable part of which is forested. In the past, the surface use of this land has received little attention, but it is encouraging to find that this laissez-faire policy is gradually changing and that some of the larger companies are taking steps to manage their forest resource for continuous yields. The general adoption of forest-management practices by the mineral companies would greatly increase forest production in this area, with a corresponding increase in employment and industry.

The State and local governing bodies have not fully recognized the importance of the forest stands; at least the expenditures for fire control in Alabama are among the lowest in the South. In this unit, about 90 percent of the forest land is without intensive fire protection. What is needed is an annual State appropriation for fire control large enough to enable the State to meet its share of the cost of protection. In this unit, more of the individual counties should consider the establishment of a county-wide system, financed jointly by the county, State, and Federal governments and under the supervision of the State forestry organization. In the South increasing use is being made of the county-wide plan of fire control, which has the advantages of placing every acre of forest land in the county under protection and of distributing the cost equitably among more landowners.

Examples of organized management of forest land for sustained yields of forest products are difficult to find in this unit. A few of the larger companies are practicing minimum forestry measures, and probably some of the farm owners are cutting their woodlands with future crops in mind; but throughout most of the forested area the stands are being cut with little regard for their continued productivity. As a result, there is a scarcity of the larger trees, from which better grades and more profit can be obtained; the stands are greatly understocked; revenues from forest lands are at a minimum; and the future of the wood-using industries is endangered. Landowners, wood-using industrialists, and the public should decide immediately whether they will continue to allow the forest resource to deteriorate and to decrease in importance or whether they will take steps to build it up to its maximum productivity.

At the outset it should be realized that increasing the forest production is a long process and one that requires enthusiasm, receptiveness, and concentrated effort on the part of all concerned. The need for increased production is evident: the commodity drain was 154 million board feet more than the increment in 1937! Since forest management means more jobs for more people, it should be encouraged, and the deficit obliterated by gradually increasing the forest increment. It should be possible to double the increment with (1) intensive fire protection; (2) an educational program to carry the best forestry practices to industrial and farm owners; and (3) the application of such good forestry measures as making improvement cuttings to remove trees that are defective and of poor form, thinning dense stands of young growth, utilizing trees of inferior species, and cutting conservatively to leave the forest growing stock in the best condition to produce a larger and more valuable crop in the future. These are minimum requirements, but their fulfillment would gradually reduce the overcut and in time would provide an increased volume of increment for the use of new industries.

New forest industries can be developed in this area when the sustained-yield capacity of the forest is increased and markets are developed. In a region where fuel is abundant and cheap; where water, rail, and highway transportation is available; where skilled workers are idle; and where raw material can be supplied at reasonable cost, there seems little justification for pessimism as to future forest industrial development. The forest resource can, and should, play a greater role in the rural and industrial organization of north central Alabama.

APPENDIX

Forest Type Groups

Pine.—Includes the following forest types: Longleaf pine, longleaf-other pine, loblolly pine, loblolly-other pine, shortleaf pine, shortleaf-other pine, Virginia pine, Virginia pine-other pine. About 87 percent of the net cubic volume is pine of various species (table 5).

Pine-hardwood.—Includes the following forest types: Longleaf-hardwood, loblolly-hardwood, shortleaf-hardwood, Virginia pine-hardwood, mixed hardwood-pine. About half the net cubic volume is pine.

Upland hardwood.—Includes the following forest types: Upland hardwoods, scrub hardwoods. Over 90 percent of the net cubic volume is mixed hardwoods; scattered pines account for the remainder.

Bottomland hardwood.—Includes the following forest types: Cypress-tupelo, bottomland hardwoods. About 50 percent of the net cubic volume is redgum, blackgum, tupelo, sweetbay, red maple, and other soft-textured hardwoods; the remainder is in species such as oaks, hickories, ash, beech, elms, and hackberry, with a small amount of loblolly pine.

Forest Conditions

Old-growth uncut.—Old-growth stands from which less than 10 percent of the volume has been cut.

Old-growth partly cut.—Old-growth stands from which 10 percent or more of the volume has been cut, but in which the remaining old-growth saw timber contains at least 1,000 board feet per acre of hardwood, or 600 board feet of pine or pine and hardwood mixed.

Second-growth sawlog-size uncut.—Second-growth stands from which less than 10 percent of the sawlog-size trees have been cut and in which the remaining saw timber contains at least 600 board feet per acre.

Second-growth sawlog-size partly cut.—Second-growth stands from which 10 percent or more of the sawlog-size trees have been cut, and in which the remaining saw timber contains at least 400 board feet per acre.

Second-growth under sawlog size.—Second-growth stands composed largely of under-sawlog-size trees, and containing less than 600 board feet per acre.

Reproduction.—Areas not falling into any of the other classifications, but bearing per acre more than 80 seedlings less than 1 inch d.b.h.

Clear-cut.—Cut-over areas in which an insufficient quantity of young growth has come in to classify them either as second growth or as reproduction.

Diameters

D.b.h. (diameter at breast height).—Diameter, outside of bark, $4\frac{1}{2}$ feet above the ground.

A 2-inch diameter class includes diameters 1 inch below and 0.9 inch above the stated midpoint, e.g., the 6-inch class includes trees 5.0 to 6.9 inches d.b.h. Corresponding limits apply to the other diameter classes.

Tree Classification

Sawlog-size tree.—A pine or cypress tree at least 9.0 inches d.b.h., or a hardwood tree at least 13.0 inches d.b.h., which will produce 1 sound butt log at least 12 feet long, or which contains at least 50 percent of its gross saw-timber volume in sound material in case the butt log is a cull.

Under-sawlog-size tree.—Any tree between 1.0 inch and the minimum merchantable diameter at breast height, at least 75 percent sound and with a reasonably straight stem. Only trees 5.0 inches d.b.h. and larger have been included in cordwood and cubic-foot estimates.

Cull tree.—A sound tree which, because of form, crook, extreme limbiness, or other sound defect, is not, and never will become, suitable for saw timber. Also a sawlog-size tree that is more than 50 percent defective, or an under-sawlog-size tree that is more than 25 percent defective.

Volume Estimates

Board-foot volume.—Only sawlog-size trees are included in this estimate. Top diameters vary with the limits of usable material, but no hardwood logs less than 8.5 inches in diameter at the small end, nor any pine logs less than 5.5 inches, are included. Deductions are made for woods cull, such as rot, fire scar, crook, limbiness, and similar defects, as well as for loss in sawing at the mill due to sweep and hidden defects. Board-foot volumes, based on the International $\frac{1}{4}$-inch rule, closely approximate the lumber tally of green boards in the mill. No deduction has been made for kiln, yard, and other losses before shipping.

Cordwood volume.—This includes the entire stand of sound trees at least 5.0 inches d.b.h., outside bark, and contains material from:

1. Sound trees sawlog size—the merchantable sawlog portion of saw-timber trees.

2. Upper stems of sawlog-size pine trees—the portion of saw-timber trees not used as sawlogs but usable as cordwood. This includes only the upper stems to a variable top-diameter (but not less than 4 inches).

3. Sound trees under sawlog size—the full stems of both pines and hardwoods at least 5.0 inches d.b.h. to a variable usable top-diameter (but not less than 4 inches).

Deduction is made for woods cull, such as rot, fire scar, excessive crook, bad knots, or other defects.

Additional material included in table 11 is the estimated sound usable portion of cull trees at least 5 inches d.b.h. and the upper stems and limbs of sawlog-size hardwoods and cypress.

Cubic-foot volume contains the material described under "Cordwood Volume." It includes no bark except in table 5.

Pine Tree Grades

Smooth tree.—A tree with at least 20 feet of clear length and at least 50 percent of the total usable length practically free of limbs and surface indication of knots.

Limby tree.—A tree with at least 12 feet of clear length and with 30 to 49 percent of the total usable length practically free of limbs and knots.

Rough tree.—A merchantable tree not clear enough to be put in either of the previous classes.

FOREST SURVEY RELEASE NO. 51 NOVEMBER 29, 1940

PRIMARY WOOD-PRODUCTS INDUSTRIES IN THE LOWER SOUTH

By

H. F. Smith
Specialist in Forest Industries

A Progress Report by

THE SOUTHERN FOREST SURVEY

I. F. Eldredge, Regional Survey Director

SOUTHERN FOREST EXPERIMENT STATION

E. L. Demmon, Director

New Orleans, La.

FOREWORD

The Nation-wide Forest Survey, being conducted by the United States Forest Service, was authorized by the McSweeney-McNary Forest Research Act of 1928. Its five-fold object is: (1) To make an inventory of the present supply of timber and other forest products; (2) to ascertain the rate at which this supply is being increased through growth; (3) to determine the rate at which this supply is being diminished through industrial and local use, windfall, fire, and disease; (4) to determine the present requirement and the probable future trend in the requirement for timber and other forest products; and (5) to correlate these findings with existing and anticipated economic conditions, in order that policies may be formulated for the effective use of land suitable for forest production. In the South, the Forest Survey functions as an activity of the Southern Forest Experiment Station with headquarters at New Orleans, La.

This release is based on studies made between 1934 and 1939 to determine the number, character, and location of forest industrial plants, and to ascertain the drain against the forest growing stock for both industrial and domestic purposes, including the use of wood for fuel and farm needs as mentioned under items 3 and 4 above. It should be regarded as a progress report only, since it contains Forest Survey data that will be included in complete reports to be published later; such data, although considered reliable, are subject to correction or amplification as the work of computation proceeds. A preliminary report was distributed in 1937 as Survey Release No. 25. The same basic information on sawmills, somewhat revised and brought up to date, is used in this report, with the addition of data on the nonlumber industries.

Information on equipment, logging, and employment was obtained by the Forest Survey in 1934 and 1935. The data on production, number, character, and location of industrial plants were collected in 1937 and 1938 and revised currently for some of the industries. All of the major nonlumber plants and the medium- and large-sized sawmills were visited by investigators carrying a questionnaire. Because of the great number of small sawmills, it was possible to examine only about 10 percent of them; for the remainder, information was obtained indirectly, but from sources considered reliable. The relative accuracy of the findings is greater for the large mills than for the small ones.

Assisting Staff

P. R. Wheeler, Forest Economist, In Charge of Mensurational Analyses

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Note: Assistance in the preparation of these materials was furnished by the personnel of Work Projects Administration official project 65-2-64-74.

PRIMARY WOOD-PRODUCTS INDUSTRIES IN THE LOWER SOUTH

The region covered by the Forest Survey in the lower South embraces the commercially timbered areas of the Gulf States, Georgia, and parts of Arkansas, Oklahoma, Missouri, Tennessee, and Kentucky.1/ This region is divided into four subregions, the longleaf-slash pine, the delta-hardwoods, and two pine-hardwood areas, east and west. The longleaf-slash pine area, which is the seat of the naval stores industry, is characterized by forests of longleaf and slash pine, with a varying admixture of hardwoods, cypress, loblolly, and other pines. In the two pine-hardwood subregions the forests are chiefly loblolly and shortleaf pines with a considerable volume of intermixed hardwoods, although in parts of southeastern Texas and southwestern Louisiana longleaf pine is also important from a production standpoint. The forests of the Mississippi River bottoms are almost entirely hardwoods.

In figure 1 is shown an allocation by product of the total volume of wood cut from the sound-tree growing stock of the lower South, which in 1937 was 41,302,000 standard cords. The volume considered commercial, of course, is that which entered the direct channels of trade. The volume shown as noncommercial, no less important in its use value, was utilized chiefly by farmers and landowners, though small quantities of fuel wood and fence posts were sold locally.

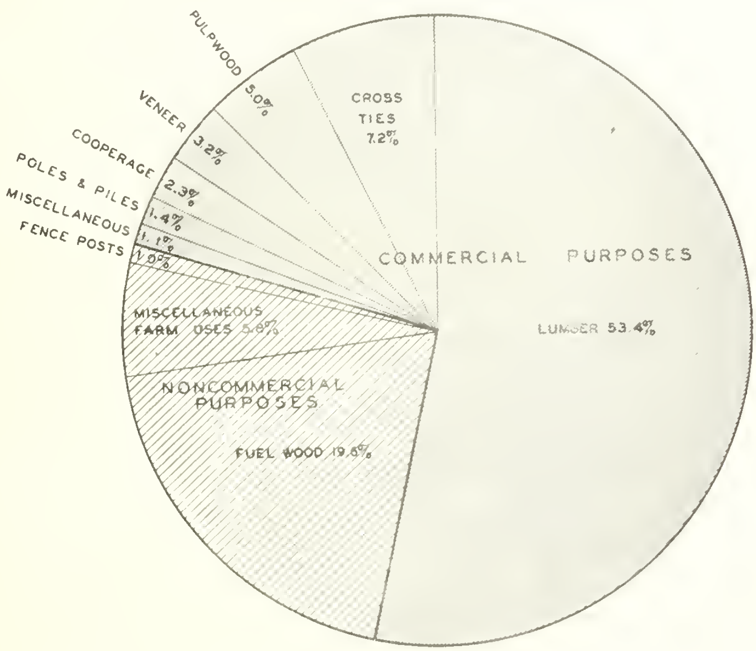

FIGURE 1. - PERCENTAGES OF TOTAL DRAIN FROM SOUND TREES FOR VARIOUS COMMODITY USES, 1937.

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1/ The data for the Delta portions of Missouri, Kentucky, and Tennessee have been combined with Arkansas Survey Unit No. 2 in the text and tables, but kept separate on the maps throughout the report.

Lumber ranks first among the commodity drains on the forest, causing 53 percent of the total depletion for all commodities. Present indications are that the manufacture of lumber will continue to be the major forest industry, notwithstanding the steady expansion in the manufacture of other forest products such as pulp and paper, cellulose, and veneers.

The standing of the states or parts of states in each of six important industrial forest uses is shown in figure 2. For many commodities the relative standing of the states in the region is not the same for any length of time. In 1937, for instance, Alabama led in cubic-foot volume removed from the forest for the manufacture of lumber; the previous year (1936), Mississippi had the lead; and 5 years from now the leadership in this use may be in some state not now in the first three.

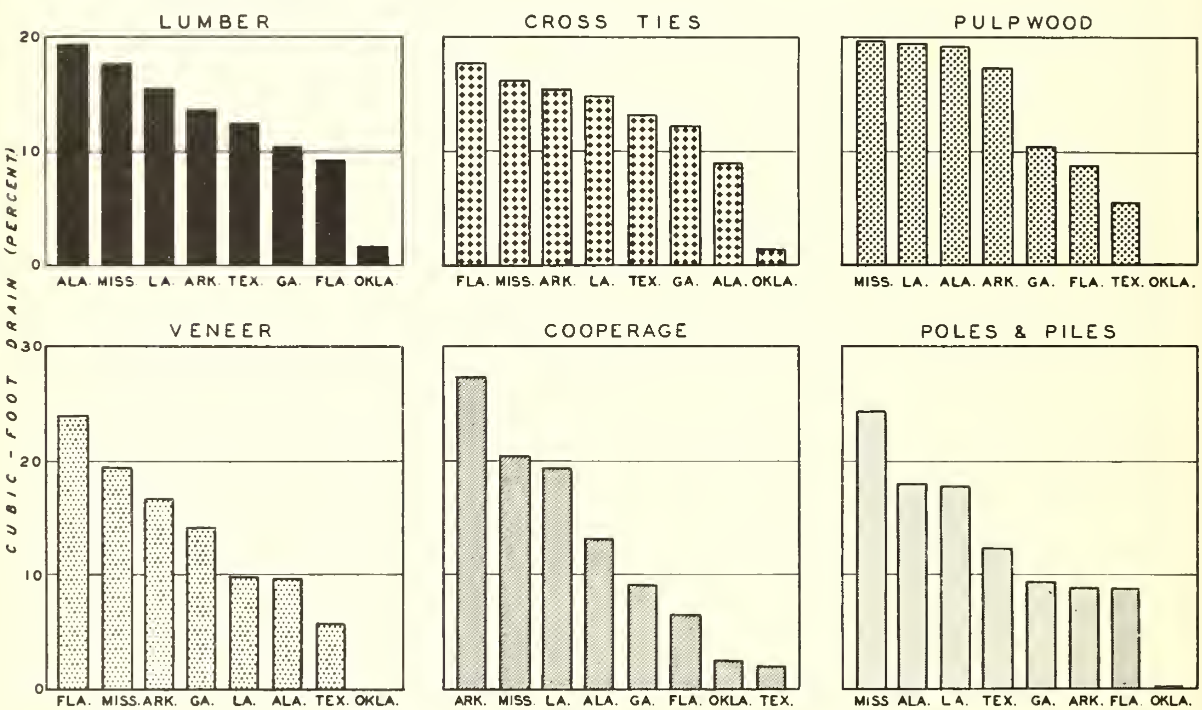

FIGURE 2.— RELATIVE STANDING OF THE STATES IN CHIEF ITEMS OF COMMERCIAL DRAIN, 1937.

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The Lumber Industry

The production of lumber, as an industry of the South, began in the early days, but until about 1875 the forests were logged mainly for local consumption, except along the Atlantic Coast where an export trade had long existed. A commercial expansion gradually developed, which received added impetus in the late eighties, when the progressive exhaustion of northern timber supplies turned the larger mills southward. For the next 40 years great areas of virgin forest, particularly longleaf pine, throughout the South were bought up in extensive consolidated tracts and subjected to rapid, large-scale mechanized exploitation. Similar liquidation of the hardwood and shortleaf pine forests of the lower South did not begin so early and has not progressed so rapidly.

As the larger pine operators, particularly those who had logged their holdings less intensively, relinquished certain areas, small mills began to appear; as the residual stands were bolstered up with second growth, the number and production of these plants increased. In the bottomland hardwood districts, the large mills are succeeded not so often by small sawmills as by plants manufacturing slack staves, handle stock, cross ties, and other nonlumber commodities.

Classes of sawmills

In 1937 there were in the entire area more than 8,000 sawmills of all sizes, both portable and stationary. They ranged in size from the smallest, producing a few thousand board feet per annum for local use, to the largest, cutting as much as 80 million board feet a year. The total number of sawmills is listed in table 1 by states, further classified according to size and, for the mills with a daily capacity of 20 M board feet and over, by principal species cut. The map (fig. 3) shows the approximate location of the mills.[2/]

The three species groups into which mills are classified are pine, hardwood, and cypress. All mills cutting more than 50 percent of their volume from pine species in 1937 are classified as pine mills. Hardwood mills, the second group, are those that cut more than 50 percent of their total production from hardwood species. Similarly, to be classified as a cypress mill, a mill must cut more than 50 percent of its production in cypress lumber. In many cases, a mill manufacturing pine, hardwood, or cypress at the time of the survey may have changed later to some other species.

All mills listed as having a daily capacity of 40 M board feet or more are stationary mills, operating generally throughout the year. In the Delta region, hardwood mills of 20 to 39 M board feet capacity are usually stationary also. Many of the pine mills of this size remain on one site for a long time, but others are occasionally moved to new blocks of timber. Most mills of a daily capacity of 19 M board feet and less are easily moved and shift

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2/ It will be noted that table 1 shows the number of sawmills in the region in 1937, the latest year for which data on all plants were complete. The map (fig. 3) showing the location of plants was revised to the latest year for which data were available; in the states west of the Alabama-Mississippi line, the locations are as of 1938; in the eastern states the locations are as of 1937.

Table 1.--Number of sawmills in the lower South, 1937

Survey unit	Species group and size class of mill (10-hour M feet b.m. capacity)														
	Pine			Hardwood			Cypress			All mills					
	80+	40-79	20-39	80+	40-79	20-39	80+	40-79	20-39	80+	40-79	20-39	1-19	Total
Alabama #1	1	5	13	-	4	3	-	-	-	1	9	16	83	109
" #2	1	2	25	-	-	4	-	-	-	1	2	29	130	162
" #3	1	2	9	-	-	13	-	-	-	1	2	22	396	421
" #4	1	2	10	-	-	2	-	-	-	1	2	12	341	356
" #5	-	3	14	-	-	1	-	-	-	-	3	15	636	654
" #6	-	-	-	-	-	-	-	-	-	-	-	-	508	508
Total Alabama	4	14	71	-	4	23	-	-	-	4	18	94	2,094	2,210
Arkansas #1	-	-	-	1	7	5	-	-	-	1	7	5	130	143
" #2 1/	-	-	-	2	2	7	-	-	-	2	2	7	234	245
" #3	8	7	35	1	-	4	-	-	-	9	7	39	250	305
" #4	2	-	5	-	1	-	-	-	-	2	1	5	163	171
Total Arkansas	10	7	40	4	10	16	-	-	-	14	17	56	777	864
Florida #1	3	-	7	1	1	1	3	-	6	7	1	14	153	175
" #2	2	5	18	1	3	1	-	-	-	3	8	19	176	206
" #3	2	2	10	-	-	1	-	4	3	2	6	14	152	174
" #4	-	1	10	-	-	-	-	-	1	-	1	11	39	51
Total Florida	7	8	45	2	4	3	3	4	10	12	16	58	520	606
Georgia #1	-	2	10	-	-	7	-	-	-	-	2	17	222	241
" #2	-	1	13	-	-	2	-	-	-	-	1	15	102	118
" #3	-	3	9	-	3	2	-	-	-	-	6	11	516	533
" #4	-	-	-	-	-	-	-	-	-	-	-	-	369	369
" #5	-	-	-	-	-	-	-	-	-	-	-	-	346	346
Total Georgia	-	6	32	-	3	11	-	-	-	-	9	43	1,555	1,607
Louisiana #1	-	-	1	2	7	4	-	-	-	2	7	5	89	103
" #2	-	-	4	-	11	10	-	1	2	-	12	16	123	151
" #3	9	5	3	3	6	-	-	-	-	12	11	3	69	95
" #4	2	1	4	1	-	1	1	-	-	4	1	5	59	69
" #5	1	6	22	-	2	4	-	-	-	1	8	26	104	139
Total Louisiana	12	12	34	6	26	19	1	1	2	19	39	55	444	557
Mississippi #1	-	-	-	1	2	10	-	-	-	1	2	10	109	122
" #2	-	-	3	-	3	6	-	-	-	-	3	9	681	693
" #3	4	8	22	-	2	13	-	-	-	4	10	35	551	600
" #4	4	1	7	1	3	-	-	-	-	5	4	7	198	214
Total Mississippi	8	9	32	2	10	29	-	-	-	10	19	61	1,539	1,629
Oklahoma #1	3	-	2	-	-	1	-	-	-	3	-	3	69	75
Texas #1	12	10	31	2	2	5	-	-	-	14	12	36	146	208
" #2	2	2	22	-	1	2	-	-	-	2	3	24	301	330
Total Texas	14	12	53	2	3	7	-	-	-	16	15	60	447	538
Grand total	58	68	309	16	60	109	4	5	12	78	133	430	7,445	8,086

1/ Includes Delta portion of Missouri, Kentucky, and Tennessee; refer to map (fig. 3).

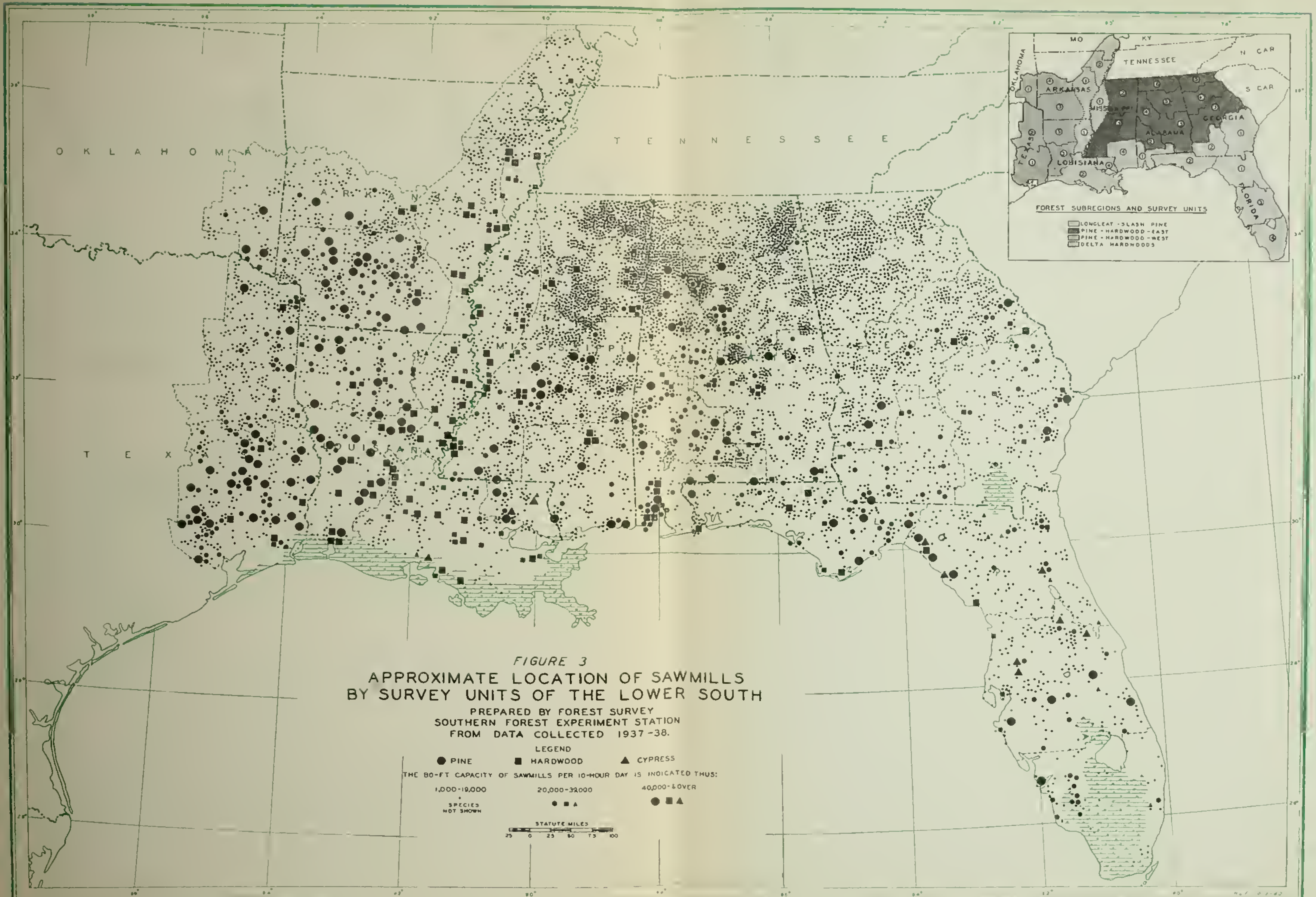


FIGURE 3

APPROXIMATE LOCATION OF SAWMILLS BY SURVEY UNITS OF THE LOWER SOUTH

PREPARED BY FOREST SURVEY
SOUTHERN FOREST EXPERIMENT STATION
FROM DATA COLLECTED 1937-38.

frequently from place to place as new timber supplies are purchased. A considerable number of this group, however, particularly some of the smallest mills, operate with the surplus power of cotton gins, grist mills, etc., strictly for local needs, and are therefore stationary.

Of the total number of mills (table 1), approximately 1 percent have a capacity of at least 80 M board feet per 10-hour day, 2 percent have a daily capacity of 40 to 79 M board feet, 5 percent are in the 20 to 39 M class, and 92 percent are small units with a capacity less than 20 M board feet. Of the large mills (40 M board feet and over), about 60 percent are classified as pine mills, 36 percent as hardwood, and 4 percent as cypress. In the medium-sized class (20 - 39 M board feet), 72 percent are pine, 25 percent are hardwood, and 3 percent are cypress.

The small mills (1 - 19 M board feet) are not subdivided on the basis of species classification in the 1937 tables; however, in the Delta region these mills generally cut hardwood, while in the uplands most of the mills cut pine. Small portable mills can be set up to cut several thousand to several million board feet of timber at a "set," and if logs are available, can be operated economically from a few weeks in a season to a full working year. Ordinarily this type of mill does not accumulate large inventories, but works on a "hand-to-mouth" basis. Such mills may cut any quality and size of timber, but usually operate in small second-growth stands.

Concentration yards

Throughout the pine regions, pine lumber sawed by groups of small mills is generally seasoned, surfaced, and graded either at nearby planing mills or at concentration yards. These yards are usually equipped with dry kilns, planers, and adequate grading, storage, and shipping facilities. From them a considerable proportion of the pine lumber finds its way to markets, both local and distant. In the lower South there are about 500 of these concentration yards, and more than 500 sawmills which act in this capacity. Most of them (over four-fifths) are located in the pine-hardwood subregion (east), the area with the greatest number of small mills. The remaining one-fifth are divided between the longleaf-slash pine area and the pine-hardwood area (west).

In the production of hardwood lumber, concentration yards do not play an important part, and rough air-dried lumber produced by small mills is usually shipped directly to one of the manufacturing plants throughout the country for final finishing and fabrication.

Lumber cut by mills of the various size classes

The growing share of the small sawmills in the total amount of lumber cut has been apparent for many years, particularly during the past two decades, when many of the large mills of the earlier period discontinued operations. The proportion of the 1937 lumber production cut by mills in the different size groups and in the different subregions is shown graphically in figure 4 for pine, figure 5 for hardwoods, and figure 6 for cypress.

The small mills, constituting 92 percent of all mills, accounted for 44 percent of the total production of pine lumber in 1937. In Alabama and

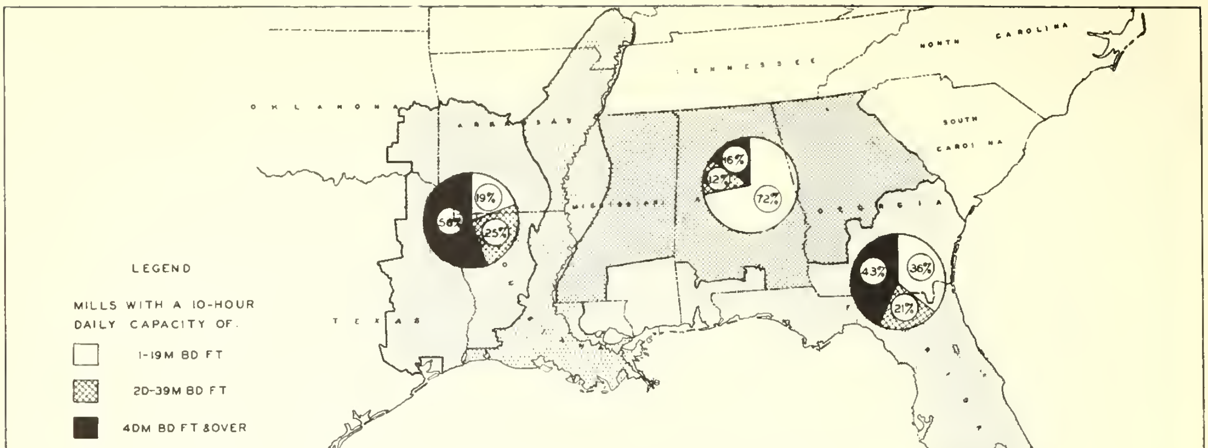


FIGURE 4 - PERCENT OF PINE LUMBER CUT BY MILLS OF DIFFERENT SIZE CLASSES - 1937 IN 3 SUBREGIONS

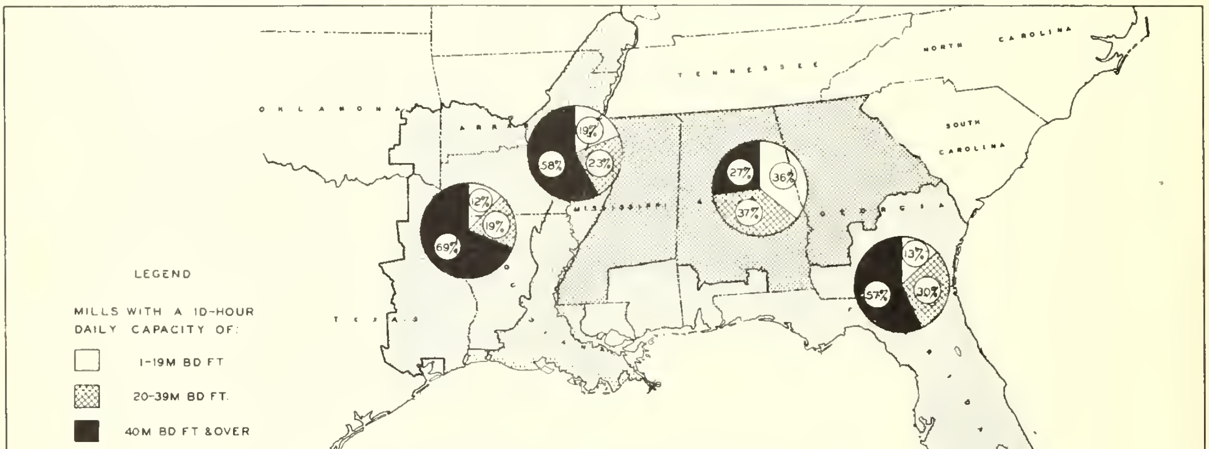


FIGURE 5 - PERCENT OF HARDWOOD LUMBER CUT BY MILLS OF DIFFERENT SIZE CLASSES - 1937 IN 4 SUBREGIONS.

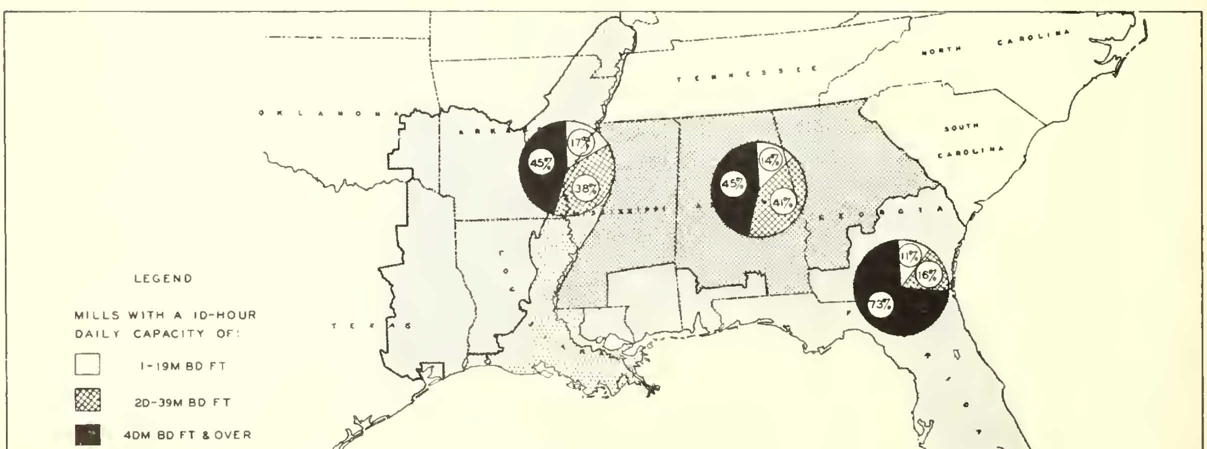


FIGURE 6 - PERCENT OF CYPRESS LUMBER CUT BY MILLS OF DIFFERENT SIZE CLASSES - 1937 IN 3 SUBREGIONS

northwestern Louisiana, information procured from operators during the 1935 canvass indicated that about two-fifths of the small-mill pine production was cut by mills that moved at least once in three years. It is probable that this was characteristic of small-mill pine production throughout the lower South in 1935. Movement of mills at that time was at a low point, owing to the small volume of business. The proportion cut by migratory mills was undoubtedly much greater in 1937.

The large mills, which amounted to only 3 percent of the total number of mills, cut 37 percent of the pine lumber. The mills in the medium-sized class made up 5 percent of the total number of mills and accounted for the remaining 19 percent of the pine-lumber production. Although the large mills cut only a little more than a third of all pine lumber, the value of their production is considerably greater than a third of the total value of pine lumber produced, because the lumber manufactured in these mills is of higher quality and is graded and marketed to better advantage.

Of the hardwood cut in the region, approximately 51 percent is produced by large mills, 27 percent by the medium-sized mills, and 22 percent by small mills.

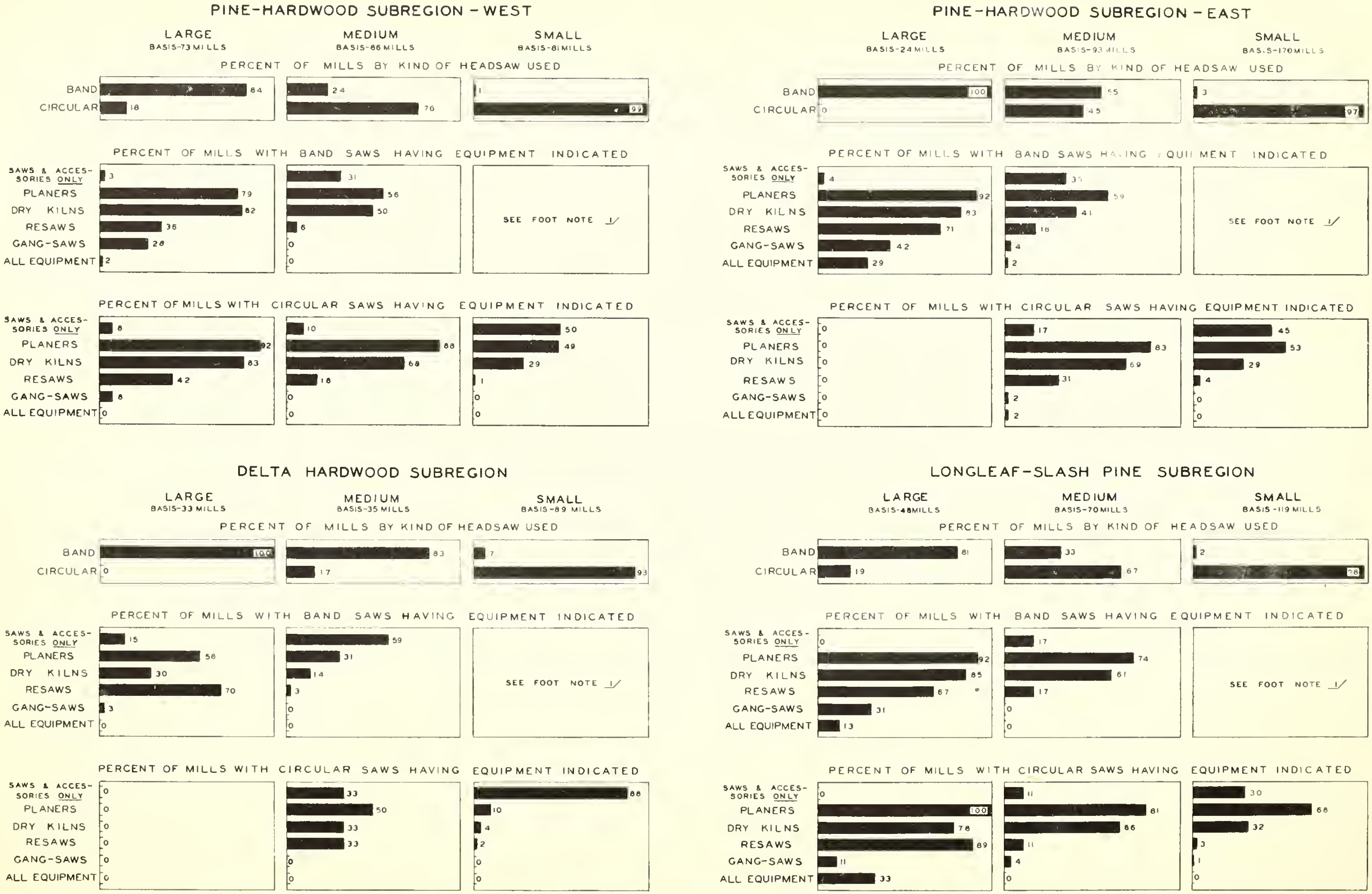
At present, the cypress mills are located chiefly in Florida and southern Louisiana. Of the cypress lumber produced in the territory covered by the survey 68 percent is cut by large mills, 20 percent by medium-sized, and 12 percent by small mills.

The number of small mills is steadily increasing, and their production, although it rises and falls with the demand for lumber, is also increasing in amount and in proportion of the total cut. Between 1935 and 1940, 45 large mills—including the largest mill in the South—with a total yearly production capacity of more than a billion board feet, ceased operation. Moreover, many mills in this and the medium-sized class reduced their capacity and now fall within a smaller class. A few of the mills in the two upper size groups switched from the production of one species group to another. A majority of the large mills that have ceased operation were set up on a forest depletion or liquidation basis, chiefly in the original longleaf pine stands.

Sawmill equipment

As to equipment, sawmills in the lower South vary from the completely equipped mill, containing headsaw, resaw, gang-saw, dry kiln, planer, and accessories such as edgers and trimmers, to the portable mill with a headsaw only.

In 1934-35, the Survey recorded the type of equipment used by 901 representative mills visited, to obtain a pattern of equipment used. The sample includes data for 178 large mills, 264 medium-sized mills, and 459 small mills distributed over the 4 forest subregions somewhat in proportion to the total number of mills in each. Figure 7 shows the equipment pattern found. Band saws were used by 88 percent of the large mills, 45 percent of the medium mills, and about 3 percent of the small mills. While most of the circular-saw mills were in the small-sized group, there were a few large mills still using circular headsaws, generally old mills whose original equipment had never been replaced.



1/ THE SAMPLE IN THESE CLASSIFICATIONS WAS NOT CONSIDERED REPRESENTATIVE ENOUGH TO PERMIT CONCLUSIVE PRESENTATION OF DATA.

FIGURE 7.- SAWMILL-EQUIPMENT PATTERN.
(BASED ON SURVEY OF 1934-35)

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More than half of the small mills sampled had only headsaws, with or without accessories. A few of the large and one-fourth of the medium-sized mills were found to have similarly limited equipment. Dry kilns and planers were found in mills of all sizes, but less often, of course, in small mills, and rarely in portable mills. Resaws and gang-saws were found chiefly in the large mills. Less than one-tenth of the large mills had all four items. Few of the medium and none of the small mills were so equipped.

Transportation of logs

Moving logs to the place of manufacture generally includes two separate steps: The bunching or yarding in the woods or on the roadside, and the final transportation to the mill. In a large portion of the lower Coastal Plain, termed the "flatwoods," the logs are loaded directly on trucks and taken to the mill without any preliminary yarding. This practice is carried on chiefly by small mills. During the canvass in 1934-35 the Survey gathered information to obtain a general pattern of the logging practices of sawmills. This pattern is shown in figures 8 and 9 for the two operations.

In the bunching process, a majority of the sawmills sampled were using animals, chiefly mules, either skidding the logs or hauling them with high wheels or wagons. Some of these mills used animals in combination with tractors, or with skidders propelled by gasoline or steam engines. Although horses were found on a few operations, oxen were being employed on about one out of every eight.

Figure 8 shows graphically for each subregion the percentage of the mills in each size class using specific types of equipment for bunching, singly or in combination. Each bar should be considered individually, for it represents the percentage of all mills of the size class in the subregion using a given type, even though other methods are used also.

In the transportation of logs from the bunching area in the woods to the log pond or mill deck, about 90 percent of the small and medium mills and 60 percent of the large mills used trucks, logging and common carrier railroads and water transport being the means used in other instances. Logging railroads, although still used by a number of mills, chiefly large installations, are gradually being abandoned in favor of trucks. Many of the large mills use a combination of trucks and railroads. The haul by truck is as much as 40 miles in some places; that by rail may reach 150 miles. Combinations of water and truck transportation are being utilized in some sections of the South, distances up to several hundred miles being traversed by inland waterways.

Figure 9 shows graphically, by subregions, the percentage of mills in each size class using specific types of equipment for transportation to the mill, either solely or in combination with other equipment. Since 1934-35, when the samples were taken, the use of tractors, trucks, and small gas skidders has increased and the employment of animals, heavy steam skidders, and logging railroads has declined. The increase in mileage of improved roads throughout the South has made, and is still making, the use of trucks in the haul to the mill more general. At the same time the volume of logs hauled by common carrier railroads has increased somewhat as the use of private logging railroads has declined.

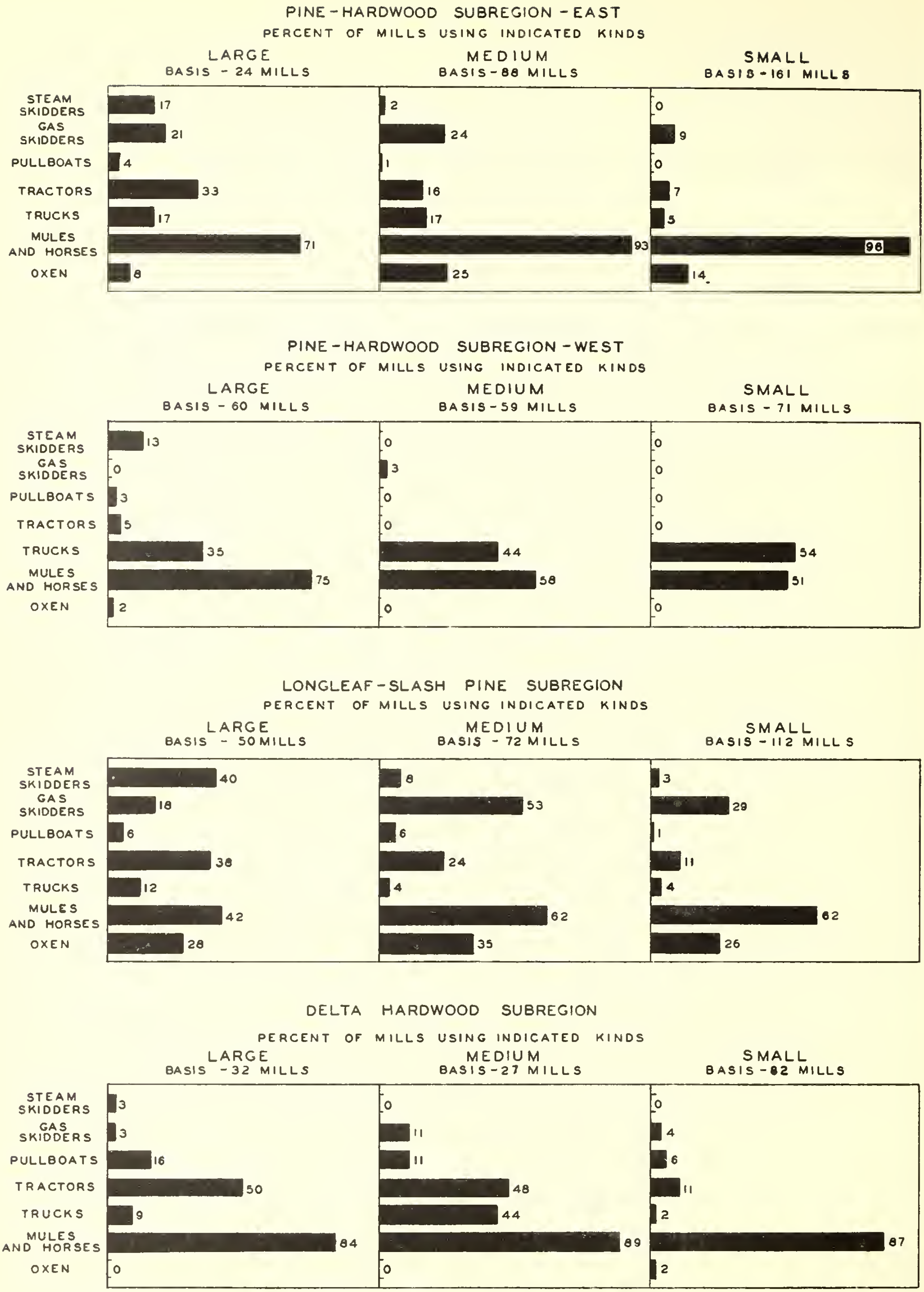

FIGURE 8.— PATTERN OF MOTIVE POWER USED IN BUNCHING LOGS.
(BASED ON SURVEY OF 1934-35)

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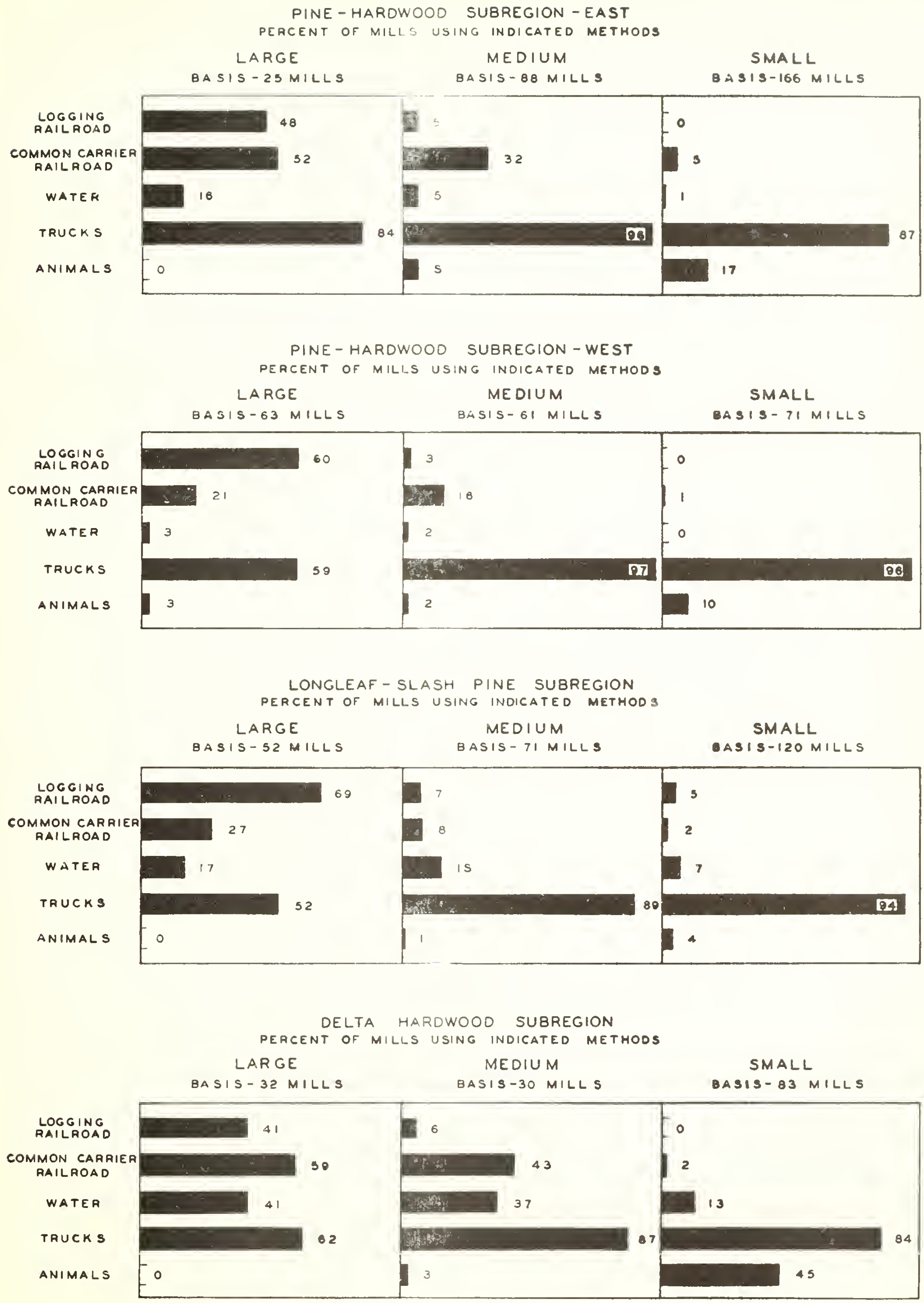

FIGURE 9.— PATTERN OF PRINCIPAL METHODS OF TRANSPORTING LOGS FROM WOODS TO MILL 1934-35.

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The Nonlumber Industries

Other important wood-using industries in the lower South produce cross ties, pulpwood, veneer, cooperage, poles, etc., and together account for 20 percent of the utilization drain. Domestic and farm uses of timber such as for fuel wood and fence posts, along with cutting for such purposes as land clearing, are chargeable for more than 26 percent of the utilization drain, but these items are not considered as industries in the commercial sense of the word and are not discussed here.

Only the eight leading primary nonlumber industries, which get their raw material in the form of logs, bolts, or stumps, are considered in this report (table 2, fig. 10). Secondary industries such as furniture and casket factories, assembly mills for boxes, barrels, and other containers, paper mills using purchased pulp, etc., are not included, nor are industries dealing in forest products other than wood, such as gum turpentine and rosin, spanish moss, cedar oils, etc.

Pulp

From the standpoint of capital invested and value of product, the wood pulp industry leads in the nonlumber wood-using group. This industry has expanded in recent years; since 1935, 11 new mills have been built and are in production, 4 mills are now (1940) under construction, and several of the 25 mills in the region have increased their capacity in the last 3 years. By far the larger portion of the pulp is made by the sulphate process, although mechanical and sulphite processes are used in a few of the plants. The major products are kraft pulp and paper, container board, bleached papers, and wall board. Newsprint and rayon pulps are also made, at 1 mill each. In the present year (1940) Louisiana, with 7 mills, still leads in number of plants. Insofar as the drain of pulpwood is concerned, the data (fig. 2) indicate that Mississippi, Louisiana, and Alabama were in the forefront in 1937, but this situation is not static and the relative standing of states in pulpwood drain is likely to show pronounced changes when all mills are in full production.

Treating

The wood-preserving industry is expanding; during the period 1936 to 1939 inclusive, 12 new plants were established, while only 2 were abandoned. Most of the 63 plants operating in 1939 employed pressure processes, using chiefly creosote in the treatment of cross ties, poles, piles, lumber, and other wood products. The plants are rather well distributed through the region, Louisiana leading with 12 plants in 1939.

Extracting

The extraction of gums, resins, acids, and oils from wood is an industry that plays an important role in salvaging low-grade wood of little or no value for other purposes. An active demand exists for these commodities. Arkansas has the only destructive hardwood plant in the South, producing wood alcohol, acetic acid, charcoal, and derived products. In northern Alabama a tannic acid plant has been operating for years, using oak and chestnut. The major wood-extractive industry of this region, however, engages in the production of turpentine, rosin, rosin oils, tar, charcoal, and derived products in the longleaf-slash pine area. This industry does not use live trees, but seasoned stumps and topwood of longleaf pine trees cut in decades past when the lumber industry exploited the vast stands of virgin pine timber. About half of the 26 plants in operation in 1939 used the steam-solvent process; these are chemical plants of a highly specialized nature requiring large capital investment. The other half of the wood naval stores industry uses the destructive distillation process and the plants are of smaller size. The industry has expanded in recent years, 5 new plants having been established between 1935 and 1939, all using the steam-solvent process.

Veneers

Rotary-cut veneer production is a relatively stable industry in the South, 184 plants being in operation in 1937. The veneers produced are chiefly for the package industry, but increasingly large quantities of furniture and plywood face veneers are made. The face veneers are cut chiefly in the hardwood bottomlands of the Mississippi River and in other extensive river bottoms where suitable hardwood species are available. Package veneers are made of pine and hardwood and the plants are scattered all over the region, but usually are situated near a point of utilization. Florida, which ships large quantities of fruit and vegetables, ranks first in volume of wood utilized for veneers, chiefly for packages (fig. 2). The veneer industry continues to expand slowly in the South and the number of plants has increased since 1935, a few of them having changed location in the same period.

Cooperage stock

Plants manufacturing barrel staves, heading, and hoops are quite numerous and well distributed; there were 228 installations in 1937. Arkansas leads in both number of plants and volume of timber used. Most of the plants in the Southeast manufacture slack cooperage stock, chiefly from the soft-textured hardwoods; this stock is used mainly for fruit and vegetable containers. Centering in South Georgia is a group of 44 plants that make staves and heading for rosin barrels.

The production of tight staves is centered in Arkansas and the northern sections of the region, where important quantities of rived white oak stave billets for export are produced also. These tight-stave plants are migratory in character, being set up for local supplies of white oak as they become available.

The plants shown in figure 10 are chiefly producers of rough staves and heading, and generally do not finish the staves or assemble the barrels. A few make wooden hoops. There seems to be no marked general tendency towards expansion; the number of plants has remained fairly constant in recent years. In the naval stores section of the region, there is a decline owing to the trend toward the use of steel drums and paper bags for the shipment of rosins.

Table 2.--Number of nonlumber, primary wood-using plants in the lower South, 1937

Survey unit		Treating	Veneer	Cooperage stock	Pulp	Handles and dimension stock	Pine wood distillation		Miscellaneous	All plants
							Destructive	Steam-solvent		
Alabama	#1	2	5	5	3	2	-	3	11	31
"	#2	-	5	6	-	6	-	-	3	20
"	#3	1	11	1	-	4	-	-	17	34
"	#4	1	5	3	1	1	-	-	1	12
"	#5	2	3	18	-	2	-	-	29	54
"	#6	-	3	8	-	2	-	-	7	20
Total Alabama		6	32	41	4	17	-	3	68	171
Arkansas	#1	2	7	20	-	25	-	-	4	58
"	#2 1/	-	5	9	-	8	-	-	15	37
"	#3	2	3	13	2	19	-	-	27	66
"	#4	-	4	10	-	7	-	-	10	31
Total Arkansas		4	19	52	2	59	-	-	56	192
Florida	#1	3	18	11	2	1	2	-	25	62
"	#2	1	5	6	2	1	7	1	52	75
"	#3	1	21	-	-	-	-	-	11	33
"	#4	1	-	-	-	-	-	-	2	3
Total Florida		6	44	17	4	2	9	1	90	173
Georgia	#1	2	8	19	2	1	2	1	4	39
"	#2	-	4	10	-	2	-	-	12	28
"	#3	2	12	-	-	7	-	-	14	35
"	#4	2	-	4	-	3	-	-	14	23
"	#5	-	1	3	-	-	-	-	6	10
Total Georgia		6	25	36	2	13	2	1	50	135
Louisiana	#1	-	2	17	1	2	-	-	1	23
"	#2	2	5	8	-	1	2	-	3	21
"	#3	3	1	3	1	2	-	1	4	15
"	#4	2	5	-	1	1	-	1	1	11
"	#5	5	2	5	4	1	-	-	1	18
Total Louisiana		12	15	33	7	7	2	2	10	88
Mississippi	#1	-	1	5	1	2	-	-	1	10
"	#2	2	1	10	-	19	-	-	3	35
"	#3	5	10	17	-	6	-	-	6	44
"	#4	4	11	4	2	3	-	6	4	34
Total Mississippi		11	23	36	3	30	-	6	14	123
Oklahoma	#1	1	-	8	-	-	-	-	3	12
Texas	#1	7	9	4	2	5	-	-	13	40
"	#2	3	17	1	-	1	-	-	50	72
Total Texas		10	26	5	2	6	-	-	63	112
Grand total		56	184	228	24	134	13	13	354	1,006

1/ Includes Delta portion of Missouri, Kentucky, and Tennessee.

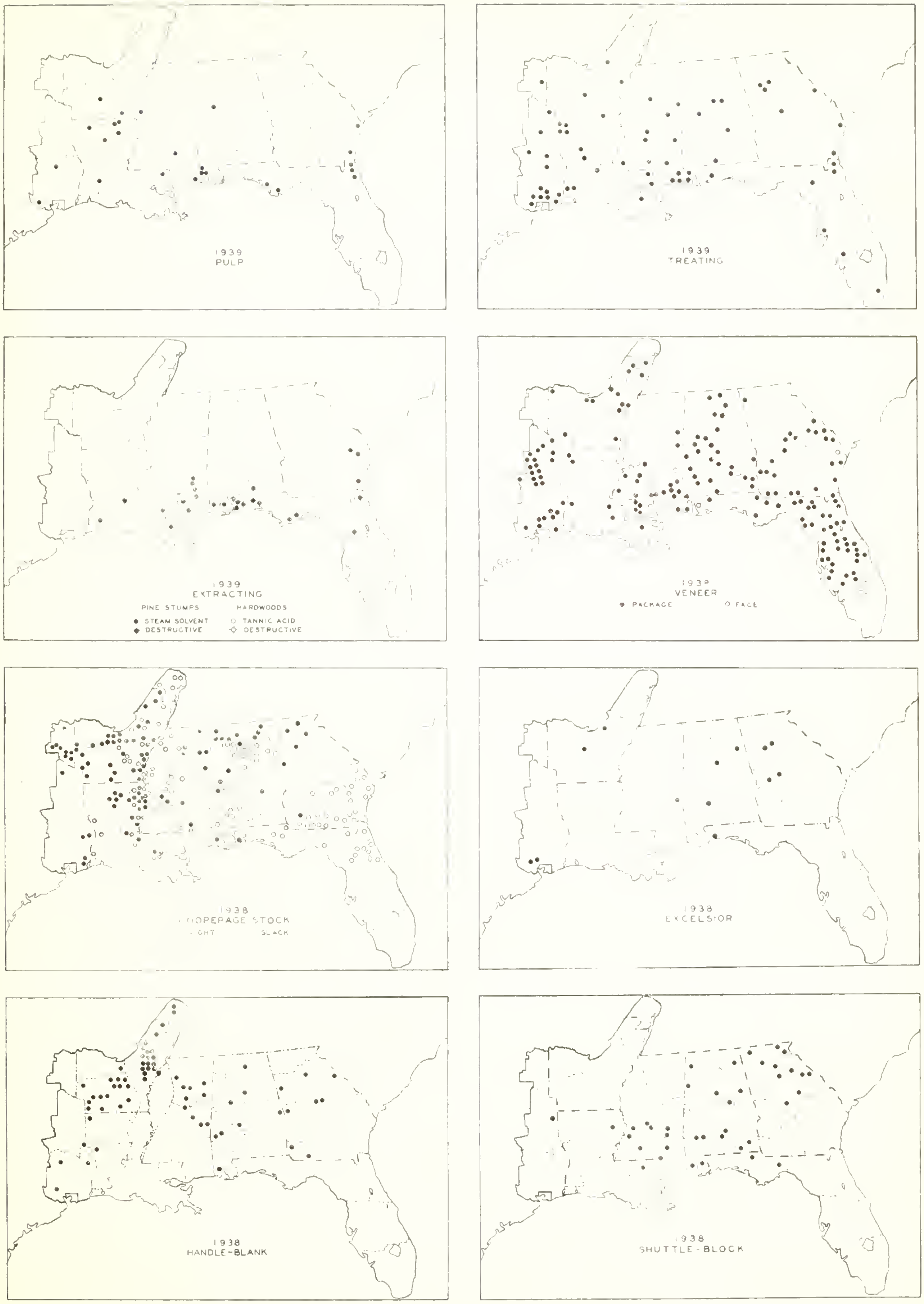

FIGURE 10.—APPROXIMATE LOCATION OF PRIMARY NONLUMBER FOREST-INDUSTRIAL PLANTS IN THE LOWER SOUTH.

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Table 3.—Employment provided by primary forest industries in the lower South, 1937

Site of work and industry or commodity	Total	Alabama	Arkansas 1/ 2/	Florida	Georgia	Louisiana	Mississippi	Oklahoma 2/	Texas 2/
	Thousands of man-hours								
In the woods:									
Lumber	110,070	21,200	14,500	12,040	10,820	17,510	19,760	1,640	12,600
Cross ties (hewn)	30,290	2,490	5,520	4,540	3,160	5,020	5,080	560	3,920
Poles and piles	4,940	1,130	450	380	430	810	1,150	10	580
Veneer	9,990	1,010	1,490	2,470	1,500	910	2,040	negl.	570
Cooperage	7,060	990	2,000	470	600	1,410	1,280	170	140
Pulpwood	21,180	4,180	3,730	1,860	2,110	4,130	4,090	-	1,080
Extractives	8,870	1,100	3/	3,200	880	820	2,870	-	-
Miscellaneous industries	8,300	2,260	3,280	160	640	210	1,240	400	110
Total	200,700	34,360	30,970	25,120	20,140	30,820	37,510	2,780	19,000
In the plants:									
Lumber	184,570	34,670	22,060	19,310	19,300	29,990	33,910	3,210	22,120
Treating	8,980	750	1,010	870	690	1,440	1,800	-	2,420
Veneer	20,980	2,250	1,430	4,030	2,560	2,230	5,560	-	2,920
Cooperage	9,640	1,170	3,120	550	820	1,750	1,950	130	150
Pulpwood	35,640	4,510	1,880	3,490	2,380	17,090	4,190	-	2,100
Extractives	8,010	450	3/	2,140	1,980	870	2,570	-	-
Miscellaneous industries	3,960	470	1,720	140	600	260	640	negl.	130
Total	271,780	44,270	31,220	30,530	28,330	53,630	50,620	3,340	29,840
Grand total	472,480	78,630	62,190	55,650	48,470	84,450	88,130	6,120	48,840

1/ Includes Delta portions of Missouri, Kentucky, and Tennessee; refer to map, figure 3.
2/ Part of State only; refer to figure 3.
3/ Grouped under miscellaneous to avoid disclosure of data on one plant.

Handles, excelsior, etc.

There are several specialty industries in the area, utilizing particular species of trees or making special products. Examples are the manufacture of excelsior from pine and yellowpoplar; handles, utilizing pine, hickory, and ash; and small-dimension plants producing blanks and squares for golf heads, bat blanks, ski stock, dowel pins, paper plugs, etc. Most of these plants are more or less permanent in character, since the demand for the products creates no exhaustive drain on the species used. Another industry, using dogwood and persimmon in the manufacture of blocks for shuttles and bobbins, is migratory in character because of its dependence on local supplies of bolts.

Labor Requirements

More than 472 million man-hours of gainful employment were provided in 1937 by the forest industries mentioned in this release, as shown in table 3. While it is difficult to state the exact number of persons given employment, an estimate can be made on the basis of an average of 8 hours per day per person for 100 working days per year. On this assumption these industries provided more than half a million persons with work, from which they earned all or a part of their livelihood. While employees in the mill or factory generally depend entirely upon their wages for cash income, woods workers, except in large operations, supplement their wages with part-time farm work or other employment. In addition to the figures shown in table 3 is the employment provided by transportation facilities such as common carriers, waterways, etc.

Table 4 shows the average number of man-hours of labor required to produce a thousand feet, board measure, of logs in the woods and a thousand board feet of lumber in the mill. The data are further subdivided according to the species cut and the three size classes of mills.

Table 4.—Average labor in the woods and in the mill required to produce 1,000 board feet of lumber, 1937

Species cut	Logging			Milling			Combined logging and milling		
	Size of mill			Size of mill			Size of mill		
	Small	Medium	Large	Small	Medium	Large	Small	Medium	Large
	Man-hours								
Pine	10.6	11.3	12.2	19.7	19.4	21.5	30.3	30.7	33.7
Hardwood	11.8	14.7	13.6	19.0	19.0	20.6	30.8	33.7	34.2
Cypress	16.8	17.5	17.6	19.9	21.0	23.3	36.7	38.5	40.9
Weighted average, all species	10.8	12.5	12.9	19.6	19.3	21.3	30.4	31.8	34.2

Mill operations for producing pine lumber, which usually include planing, require more labor per thousand board feet than does milling of hardwood, because much of the hardwood lumber is shipped rough to other plants, where manufacturing processes are continued. However, logging in hardwoods is commonly more difficult than in pine stands; so the combined logging and milling labor requirements for hardwood are greater than those for pine. Cypress production requires more labor than either pine or hardwood because of the greater difficulty in logging and the higher degree of finishing of the lumber.

Labor required per unit volume produced in each species group tends to increase in both logging and milling as the mill increases in size (table 4). But in the case of mills of over 80 M board feet capacity, the labor requirements in logging are relatively low, and in milling the figure is slightly less than that for the next smaller class (fig. 11). These differences in labor requirements, as is well known, are due to variations in (1) type of logging, (2) proximity to the timber, (3) kind of product manufactured, (4) amount of machinery used, and (5) general efficiency.

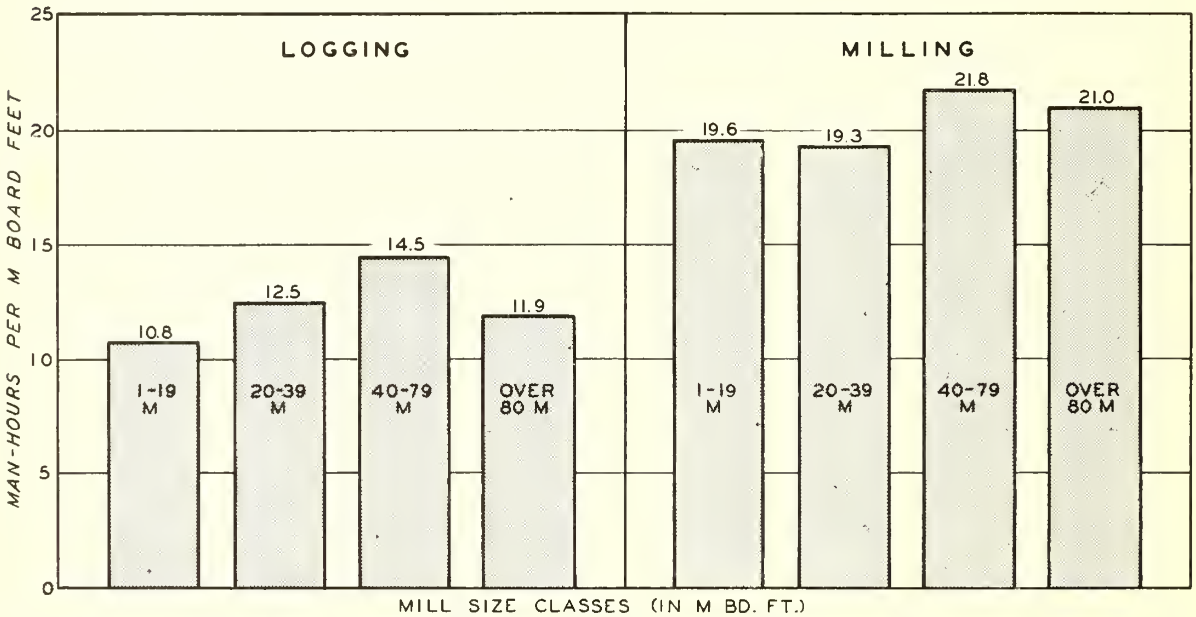

FIGURE 11.— AVERAGE LABOR REQUIREMENTS FOR LOGGING AND MILLING IN SAWMILLS OF VARIOUS SIZE CLASSES 1937.

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Studies made by the Forest Survey show that the pulp and paper industry provides more man-hours of work per unit volume of wood removed than any other forest industry in the South. While the lumber industry provides the greatest amount of employment in total man-hours (table 3), the ratio of amount of wood used to number of man-hours of labor provided places this industry fourth in the list, as is shown in figure 12.

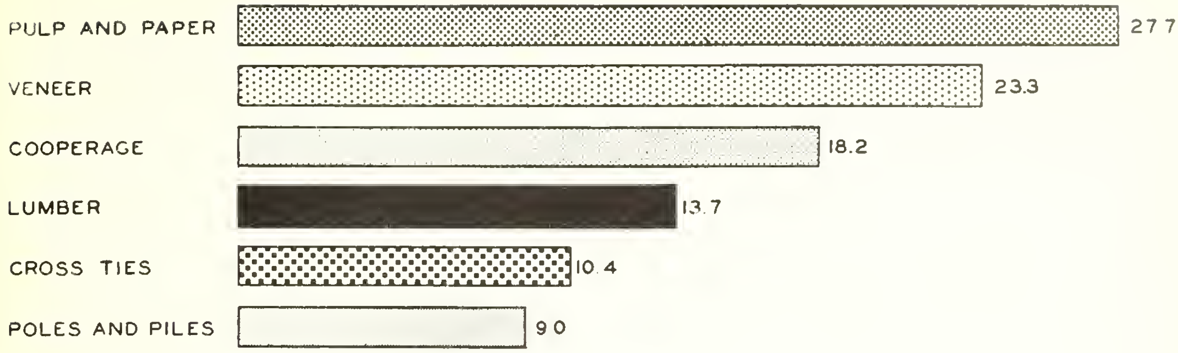

FIGURE 12.— NUMBER OF MAN-HOURS OF GAINFUL EMPLOYMENT PROVIDED FOR EACH UNIT OF VOLUME (CORD) CUT AND PROCESSED BY MAJOR INDUSTRIES IN THE SOUTH.

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Forest utilization in the lower South supports an industry that ranks high in the industrial economy of the region. The supply of timber, as estimated by the Forest Survey, is sufficient to maintain this industry for many more years on a production scale as large as that indicated in this report. However, changes that are taking place in the composition of the forest stands are working to diversify and alter the character of the industry. Large sawmills dependent upon great blocks of virgin pine and hardwood, operating logging railroads and heavy steam skidders, are rapidly giving way to smaller mills, often portable and transient, with a marked trend to light gasoline skidders, tractors, and similar equipment adapted to sparse and scattered stands, which receive their logs by truck from isolated stands over a wide countryside. Concentration yards for the storing, seasoning, grading, finishing, and marketing of the rough lumber produced by these small mills are increasingly prevalent.

A considerable degree of competition for timber that would some day make sawlog material has been caused by the great expansion in the pulp and paper industry, by virtue of the market it creates for the small, low-quality trees. This competition is being further increased because of the outright purchase by these companies of forest land, upon which cutting may be restricted and the supply of standing timber withdrawn from the open market.

Considering all the factors in the situation together, the primary wood-products industrial set-up of the South is going through a period of change. It will be worth while to survey the results of this transformation periodically, at intervals of about 10 years, recording the outcome of the contest between the old-line lumber manufacturing industry and the new, dynamic, and fast-growing conversion of the forest resources of the South into commodities by chemical and other diversified means.

FOREST SURVEY RELEASE NO. 52 DECEMBER 30, 1940

A CURSORY SURVEY OF THE FOREST RESOURCE OF THE EAST TEXAS POST OAK BELT

By

V. B. Davis
Associate Forest Economist

A Progress Report by

THE SOUTHERN FOREST SURVEY

I. F. Eldredge, Regional Survey Director

In cooperation with

THE TEXAS FOREST SERVICE

E. O. Siecke, Director

SOUTHERN FOREST EXPERIMENT STATION

E. L. Demmon, Director

New Orleans, La.

FOREWORD

The Forest Survey, which is a part of the United States Forest Service, was authorized by the McSweeney-McNary Forest Research Act of 1928 to make a Nation-wide study of our forest resources. The fivefold object of this study is: (1) To make an inventory of the present supply of timber and other forest products; (2) to ascertain the rate at which this supply is being increased through growth; (3) to determine the rate at which this supply is being diminished through industrial and local use, windfall, fire, and disease; (4) to determine the present requirement and probable future trend in the requirement for timber and other forest products; and (5) to correlate these findings with existing and anticipated economic conditions, in order that policies may be formulated for the effective use of land suitable for forest production. In the South, the Forest Survey functions as an activity of the Southern Forest Experiment Station with headquarters at New Orleans, Louisiana.

In this release no attempt is made to determine the rate of growth or to present detailed information on the utilization and drain of forest materials. The inventory is based on an extensive field survey made by the author in April and May 1937, and by J. W. Cruikshank in May 1939, in cooperation with the Texas Forest Service. The field survey was made by observers using an automobile equipped with a crop-meter and covered a network of 3,552 miles of roads well distributed over the unit. The extent of the various land-use classes was recorded on the crop-meter, and the estimate of area in each of the land-use classes and forest types was computed from the percentages so obtained. The character of the stand and the saw-timber and cordwood volume were determined by measurements and records taken on many representative sample plots.

A check of the area of forest land was made by Chris Nelson, Jr., of the Texas Forest Service through a study of aerial photograph mosaics covering approximately one-third of the area. It showed that the crop-meter method produced an underestimate of the forest area because land cleared for agriculture occurs in greater proportion along roads and highways than elsewhere. From this check a corrective factor was obtained which, when applied, increased the figure for forest acreage by about 10 percent of the total gross area. The figures for brush and mesquite were increased in proportion and those for the various agricultural classifications reduced accordingly. Timber-volume estimates were based on the corrected forest acreages and the per-acre volumes determined from the sample plots.

These procedures made possible the survey of a large area in a relatively short time and at small expense, but the results obtained are only rough approximations and do not approach the accuracy obtained by the line-plot survey used throughout the other Survey units of the South, where higher forest values justified greater expenditure.

Note: Assistance in the preparation of these materials was furnished by the personnel of Work Projects Administration official project 65-2-64-74.

A CURSORY SURVEY OF THE FOREST RESOURCE OF THE EAST TEXAS POST OAK BELT

General Description

The area covered by this report[1/] lies in the eastern half of Texas and may be called the East Texas post oak belt. It is irregular in outline, approximately 400 miles long and 20 to 80 miles wide, and contains a total land area of 11,661,700 acres. From Lamar County on the north, it extends southwest to Atascosa and Bee Counties (see fig. 1). On the east, it is bounded by the East Texas pine Survey units and the coastal prairies; on the west, by the blackland prairies; and on the south, by the brushy plains. The natural limits of the post oak belt extend across the county lines selected as the western boundary of Texas Survey Unit No. 2, and a considerable additional area and volume of post oak in that unit is dealt with in Forest Survey Release No. 40, "Forest Resources of Northeast Texas."

The terrain of this area is characterized by low rolling hills separated by wide flat valleys. The general elevation ranges from 250 feet to 500 feet above sea level. Drainage flows in a southeasterly direction, contributing to the Sulphur, Sabine, Neches, Trinity, Navasota, Brazos, Colorado, Guadalupe, San Antonio, and other rivers, which cross or border the area.

Light-colored sandy soils low in organic matter prevail throughout the upland timbered areas that make up the major portion of this unit. The principal soil series represented are Norfolk, Susquehanna, Lufkin, Kirvin, and Ruston. The soils of the prairie areas are brown, gray, and black loams or clays of the Crockett, Wilson, and Houston series. While prairie soils occur to a considerable extent in Hopkins County near the north end of the unit, they are found on only a small part of the area north of the Brazos River; south of the Brazos they occur with increasing frequency. A belt of prairie land, occasionally broken by patches and strips of timber, extends southwestward through Washington, Fayette, and Gonzales Counties and the western parts of Austin, Colorado, Lavaca, and DeWitt Counties, to the indentation in the southern boundary of the unit (fig. 1).

Rainfall in this area averages from 25 inches annually in the extreme southwestern part to about 40 inches in the northeastern part. Most of the unit, however, has between 30 and 40 inches per annum, fairly well distributed throughout the year. The lightest precipitation usually occurs in July, August, January, and February. The summers are warm, with a mean temperature for June, July, and August of 82° F. in the area north of the Brazos River, and 84° F. in the area south of the river. Winters are mild except for short cold periods—generally accompanied by a "norther"—when the thermometer often drops 30° or more in a few hours. In the winter months the mean temperature ranges from 55° F. in the southern part of the unit to 46° F. at the northern end.

1/ Texas Survey Unit No. 3.

According to the 1930 Census, the total population was approximately 530,000, an average of 29 per square mile. No cities or towns in the unit had a population in excess of 10,000, and only 13 of them exceeded 2,500. Agriculture provides the chief occupation of more than half of the gainfully employed workers of this area. Cotton and corn are the principal crops, but dairying and the raising of stock and poultry contribute materially to the farm income throughout the region and are particularly important in the southern part.

Table 1 shows a classification of the area according to present land use. Forests cover 4,401,100 acres, or 38 percent of the total. Much of this area is fenced and used as range for livestock. Agricultural land, making up over 54 percent of the unit, is shown under three classifications: "Cultivated" land is now in crops and has been cleared 5 years or more; "newly cleared" land is cropland or pasture cleared of forest growth within the past 5 years; "other agricultural" includes pasture and small amounts of idle and abandoned cropland. The brush and mesquite land, which, like the forested land, is mostly fenced for stock range, makes up 6 percent of the unit. The area occupied by towns, villages, roads, railroads, and other cultural features accounts for the remaining 2 percent. Land clearing and the reversion of abandoned agricultural land to forest are both proceeding at a slow rate in this region, and the general conclusion is that very little change is currently taking place in the total forest area.

Table 1.—Area of the unit classified according to land use

Land use	Area		Proportion of total	
	- - - Acres - - -		- - - Percent - - -	
Forest		4,401,100		37.8
Nonforest:				
Agricultural:				
Cultivated	2,919,100		25.0	
Newly cleared	81,700		0.7	
Other agricultural	3,393,500		29.1	
Total agricultural		6,394,300		54.8
Brush and mesquite		657,700		5.6
Towns, rights-of-way, etc.		208,600		1.8
Total forest and nonforest		11,661,700		100.0

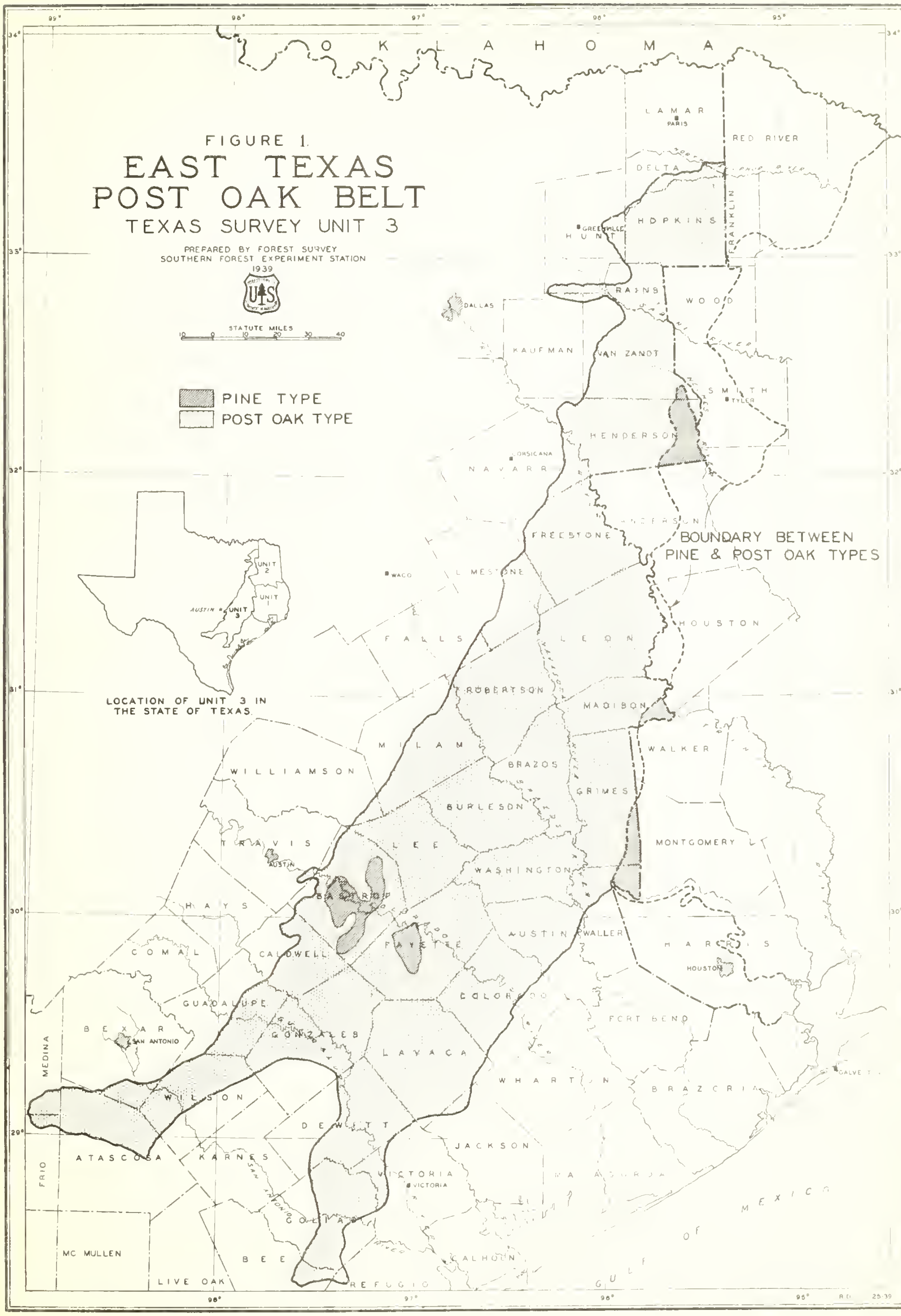

FIGURE 1.
EAST TEXAS
POST OAK BELT
TEXAS SURVEY UNIT 3
PREPARED BY FOREST SURVEY
SOUTHERN FOREST EXPERIMENT STATION
1939
STATUTE MILES
PINE TYPE
POST OAK TYPE
LOCATION OF UNIT 3 IN THE STATE OF TEXAS
BOUNDARY BETWEEN PINE & POST OAK TYPES
OKLAHOMA
LAMAR
RED RIVER
DELTA
HOPKINS
FRANKLIN
HUNT
RAINS
WOOD
KAUFMAN
VAN ZANDT
SMITH
HENDERSON
NAVARRO
FREESTONE
HOUSTON
FALLS
LEON
ROBERTSON
MADISON
MILAM
WILLIAMSON
BRAZOS
WALKER
GRIMES
BURLESON
MONTGOMERY
TRAVIS
LEE
WASHINGTON
HAYS
AUSTIN
WALLER
HARRIS
COMAL
CALDWELL
FAYETTE
GUADALUPE
COLORADO
FORT BEND
BEXAR
GONZALES
LAVACA
MEDINA
WHARTON
BRAZORIA
WILSON
DEWITT
JACKSON
ATASCOSA
KARNES
VICTORIA
FRIO
MC MULLEN
BEE
CALHOUN
LIVE OAK
REFUGIO
GULF OF MEXICO

Description of the Forest

In table 2 the forest area is classified into four main forest type groups and two principal forest conditions. The scrub-hardwood types occur chiefly on the light sandy upland soils and occupy 93 percent of the forest area. In these types post oak predominates, often occurring in almost pure stands. Blackjack oak and hickory are common associates, and replace the post oak entirely in some of the scrub-hardwood stands. Elm and hackberry occur frequently along the borders of the prairies, and live oak is common in the southern portion of the belt. The trees in this scrub-hardwood type group are short-boled and limby. At maturity, they average 40 to 50 feet in height throughout most of the unit, but where the forest gives way to prairie or brush areas they seldom exceed 30 feet.

Table 2.—Forest area classified according to forest type group and condition

Forest type group	Saw timber	Cordwood and reproduction	Total	Proportion of total forest area
	Acres			Percent
Scrub hardwood	-	4,090,000	4,090,000	93.0
Commercial hardwood	57,300	115,500	172,800	3.9
Pine	20,800	50,000	70,800	1.6
Cedar	-	67,500	67,500	1.5
All type groups	78,100	4,323,000	4,401,100	100.0

The commercial hardwoods are found chiefly in the river bottoms and to a smaller extent on the better sites in the uplands. The principal species are redgum, oaks, pecan, elms, and cottonwood. In the bottoms along the Trinity River, the largest areas of this type group occur; here the trees have the size and quality characteristic of the species elsewhere in the South. Similar stands in smaller quantities are found along the Neches, Sabine, and Sulphur Rivers; but along the rivers to the south and west of the Trinity this type group occurs in progressively decreasing quantities. Furthermore, the trees become shorter and of poorer quality, while the stands contain less redgum and more elm and pecan.

The pine types are very limited in area and somewhat scattered as to distribution. They occur in several places along the eastern border of the unit, where it meets and partly overlaps the main pine belt of East Texas. Small isolated areas or "islands" of pines are also found in Bastrop and Fayette Counties, but the timber, though of commercial quality, is shorter than the general run of southern pine. The average usable length for saw timber varies from one 16-foot log per tree on the dry, gravelly ridges, to two and one-half logs per tree on the better sites. On the eastern side of this unit, both loblolly and shortleaf pines are found, while loblolly alone is found in Bastrop and Fayette Counties. The cedar types, which consist chiefly of Eastern redcedar, either pure or mixed with scrub hardwoods, also occur chiefly in these two counties.

Uses of the Forest

Because the timber in the scrub-hardwood type is short and poor in quality, it has very little value for saw timber. In the local economy, however, this timber is highly important as a source of fuel wood and materials for general farm use. Studies in East Texas indicate that the average rural farm family uses 8 to 10 cords of fuel wood per year. It follows that a total of about three-fourths of a million cords of wood are consumed annually on the farms of the post oak region, as virtually every farmstead uses wood for fuel. At $2.50 per standard cord stacked in the woods, this firewood has a value of close to 2 million dollars. In addition to the firewood used locally, a considerable quantity of scrub hardwood is shipped to the larger cities, such as Houston, Dallas, and Austin. Several small communities reported shipping from two to six thousand cords per year at a selling price of $2.50 to $3.00 per cord loaded on the car. Most of this commercial fuel wood is cut during the winter months, and its sale provides a supplementary income that is indeed welcome to the farmers of this area.

It is estimated that at least three-fourths of the fence posts used in this region are cut from scrub hardwood, chiefly post oak. It is difficult to estimate the total number of posts required annually, but the number is enormous, as practically all of the land is under fence. In recent years the use of cedar posts from the Cedar Brakes region farther west has increased, but they cost from 4 to 10 cents each, delivered in the county; consequently, a majority of the farmers still cut their posts themselves from their own woodlots.

Several portable sawmills are at work in the pine stands of Leon, Bastrop, and Grimes Counties and the bottomland hardwood stands of the larger rivers. Most of their output of lumber and rough construction materials is used locally, but a small quantity is shipped outside the unit. A cedar mill at Bastrop, in Bastrop County, produces cabinet lumber that is sold largely to outside markets. A few other small mills, some of which are run in connection with cotton gins that in turn use the slabs and edgings for fuel, are found here and there in the unit, operating at very irregular intervals. These mills for the most part do custom sawing for cash or a share of the product. They saw lumber for local consumption from the better quality post oaks and the cottonwoods, elms, and red oaks of the stream bottoms.

In addition to providing fuel wood, fence posts, rough construction material, and lumber to the value of several million dollars yearly, the forests are of undoubted benefit in preventing erosion and retarding run-off on land that is not suited for agriculture or is not now in demand for agricultural purposes. Their effectiveness in controlling erosion needs to be increased, however, as overgrazing and burning have so reduced the ground cover and compacted the soil that run-off is too rapid and gullies are all too numerous.

New developments in the pulp and paper industry may create new values in the hitherto despised post oaks. A pulp mill has successfully used bleached pulp made from Texas post oak mixed with pine sulphate pulp to produce coated magazine papers on a commercial scale. Should this use become general in the industry, the position of Texas as a source of pulping material will be strengthened.

Volume Estimates

On the basis of data from sample plots in the various forest types, the estimate of the volume of usable material is shown in table 3. Saw-timber volume includes pines 9.0 inches or more d.b.h. (diameter at breast height) and, in the commercial hardwood areas, hardwoods 13.0 inches d.b.h. or larger. Cordwood volumes include not only the saw-timber material listed, but also the sound material in cull trees and the entire usable volume of all sound trees both large and small, except that no material under 4 inches in diameter is included in the commercial types nor under 2 inches in diameter in the scrub-hardwood types. The smallest trees tallied as containing such material were 5.0 and 3.0 inches d.b.h., respectively. All cordwood volumes include bark.

Of the total volume of 33,348,700 cords, 91 percent is in the scrub-hardwood types, which furnish the greater part of the fuel wood cut in this area. The average stand for the scrub-hardwood types is almost 7½ cords per acre.

Table 3.—Saw-timber and cordwood volumes

Species group	Saw-timber volume (lumber tally)	Cordwood volume 1/
	M board feet	Cords 2/
Hardwoods	186,500	3/ 32,691,000
Pines	67,600	477,300
Cedar	-	180,400
Total	254,100	33,348,700

1/ These volumes include the saw-timber volumes in the column to the left.
2/ Standard cords (4 x 4 x 8 feet).
3/ 30,437,700 cords are in the scrub-hardwood type.

Fire Damage

Table 4 shows the fire damage as determined from the sample plots examined during the survey. It is evident that by far the greatest damage occurs in the pine types. In the commercial hardwood types of the bottomlands, fire protection is less difficult and fires are less frequent because of the naturally moist conditions (and the consequent lack of dry forest litter) that prevail at most seasons of the year. The fires that do occur, however, not only kill some trees, but also reduce the quantity and quality of the saw timber in many of the surviving ones by burning them at the base and permitting decay to begin.

Table 4.—Area of each forest type group classified according to presence or absence of fire damage

Forest type groups	No evidence of fire	Evidence of fire, but no damage	Fire damage evident
	- - - - - - - - - -	Percent	- - - - - - - - - -
Scrub hardwoods	71	6	23
Commercial hardwoods	94	2	4
Pines	6	17	77
Cedar	91	0	9

The scrub-hardwood types, though not so subject to fire as the pines nor so severely damaged, show definite evidences of fire; much of the decay in the larger trees is traceable to this cause. While large expenditures for fire protection may not be justified by commercial timber values in these types, better protection than they now receive would result in increased water infiltration and storage capacity of the soil. The result would be improved maintenance of stream flow and reductions in erosion, flood peaks, and silt load of streams.

Good Management and the Public Interest

The species making up both the commercial and the scrub hardwoods reproduce themselves prolifically by seed and sprouts. Cut-over areas will restock naturally to a satisfactory degree, for where seed trees are lacking, sprout growth usually forms a new stand. Although inherently capable of restocking adequately, many of the scrub-hardwood stands are understocked. Probably the chief reason for this is found in the efforts of many landowners to maintain open stands favorable to the growth of grass for livestock. Fire is next in importance as a cause of the depletion of the forest cover. Besides being poorly stocked, many of the stands have been allowed to deteriorate in quality as a result of the continued cutting of the best trees, while partly rotten and poorly formed trees are left to occupy space that should be maintaining trees of better quality. The lack of data on forest growth and drain makes an accurate determination of the present trend impossible, but it seems likely that a gradual reduction of growing stock is still under way. Improvement in the quality and yield of the scrub-hardwood stands is possible, but it depends upon action by the owner to effect proper coordination of grazing with good forest management practices, including fire protection. It is obvious that there will be no material improvement in forest management until and unless there is a marked improvement in the extent and character of the market for the wood produced.

The pine types, though small in extent, are important to this region as a source of local supply for much-needed construction material. The land on which they grow is not well suited for agriculture, and the continued production of saw timber is desirable. At present, however, the pine stands have been so heavily cut over that the yields of saw timber per acre will be very low for a long time. In most cases enough trees have been left to restock the land to pine, but frequent fires have prevented the survival of many pine seedlings. Hardwoods seem to be replacing the pine in the most heavily cut sections of Bastrop County. If new stands of pine are to develop, fires must be controlled. Once protection from fire is assured, natural reproduction will keep the stands well stocked and productive if an adequate number of seed trees is left at each cutting.

The forests of the East Texas post oak belt do not compare with the commercial forests of the South in the production of lumber or other high-priced commodities, but they are nevertheless of very great importance to the people in the extensive area in which they are found. They provide annually several million dollars' worth of forest products such as fuel wood, fence posts, farm construction materials, and lumber. Much of this material is produced by farmers for their own use. Some is cut and sold by the rural population and furnishes a needed source of cash income during slack seasons. Over and above these benefits, the forests serve as a natural cover to prevent both wind and water erosion in an area where soils without adequate vegetative cover erode severely and deteriorate quickly. There is a good chance that they may eventually become a source of raw material for the pulp and paper industry.

These facts would seem to justify immediate action on the part of landowners to effect better forest management, as well as greater expenditures by State and Federal agencies to provide (1) assistance in protection from fire and overgrazing, (2) research in management methods, and (3) extension services to the forest landowners.

FOREST SURVEY RELEASE NO. 53 JUNE 15, 1942

FOREST RESOURCES OF THE DELTA SECTION OF MISSISSIPPI

By

W. S. Stover
Associate Forest Economist

A Progress Report by

THE SOUTHERN FOREST SURVEY

I. F. Eldredge, Regional Survey Director

SOUTHERN FOREST EXPERIMENT STATION

E. L. Demmon, Director

New Orleans, La.

FOREWORD

The Forest Survey, which is a function of the United States Forest Service, was authorized by the McSweeney-McNary Forest Research Act of 1928 to make a nation-wide study of our forest resources. Its fivefold object is: (1) To make an inventory of the present supply of timber and other forest products, (2) to ascertain the rate at which this supply is being increased through growth, (3) to determine the rate at which this supply is being diminished through industrial and local use, windfall, fire, and disease, (4) to determine the present requirement and the probable future trend in the requirement for timber and other forest products, and (5) to correlate these findings with existing and anticipated economic conditions, in order that policies may be formulated for the effective use of lands suitable for forest production. Item 4 is being studied on a national basis and is not discussed in this report.

This release is based on a field survey made chiefly between April and August 1932, and on three field canvasses of forest industrial plants to determine forest drain, the last of which was made in cooperation with the Census and completed during June 1939. This release should be regarded only as a progress report, since it contains Forest Survey data that will be included in complete reports to be published later and that, although considered reliable, are subject to correction or amplification as the work of computation proceeds.

In the interpretation of these data, it should be noted that, owing to the sampling method used in collecting them, the greater the number of samples in any given classification the more accurate are the data for that classification. Classes that are of infrequent occurrence and relatively small in quantity generally were not determined with as high a degree of accuracy as classes that occurred more frequently and in substantially greater quantities. Small tabular items are to be taken, therefore, as showing not the exact magnitude of the classes involved, but their relative magnitude in comparison with those of other classes.

In the South, the Forest Survey is an activity of the Southern Forest Experiment Station with headquarters at New Orleans, La.

Assisting Staff*

M. M. Lehrbas, Silviculturist, and J. A . Putnam, Associate Forest Economist, In Charge of Field Work
P. R. Wheeler, Forest Economist, In Charge of Mensurational Analyses.

*The inventory field work in the Middissippi Delta Unit was organized and begun by G. H. Lentz, who, prior to March 15, 1932, was Acting Regional Survey Director.

Note: Assistance in the preparation of these materials was furnished by the personnel of Work Projects Administration official project 65-2-64-74.

FOREST RESOURCES OF THE DELTA SECTION OF MISSISSIPPI[1/]

Location and General Description

The Delta Region of the State of Mississippi (Forest Survey Unit No. 1) is a portion of the Mississippi River alluvial plain, roughly elliptical in shape, located between Vicksburg, Mississippi, and Memphis, Tennessee. Lying between the river and the bluffs forming the edge of the highland to the east, it includes all of ten counties and parts of nine others, as shown in figure 1, and has a land area of 4,411,100 acres. Although the Mississippi River was undoubtedly the major factor in its origin, the Delta unit is now drained almost entirely by the Yazoo River and its tributaries, which also drain a large portion of the neighboring upland.

Originally covered with hardwood forest, the alluvial soils of the Delta are in general very productive when protected from floods and properly drained. At the time of this survey (1932) approximately 57 percent of the area was in cropland or improved pasture. From early settlement, cotton has been the chief money crop in agriculture, and its culture has dominated the economy and development of the region. In recent years there has been a trend towards diversification, but cotton is still the dominant money crop. Cotton produced in the Delta is of excellent quality, and the region has the largest production of long-staple cotton in the United States. The city of Greenwood is recognized as the world's largest market of long-staple cotton.

Occupying 40 percent of the total land area, the forests of the Delta section contribute importantly in giving Mississippi fifth rank in the United States as a producer of hardwood lumber. A considerable local industrial development depends upon these forests for raw material for the manufacture of veneer, cooperage, wallboard, lumber and other products. They also provide a large volume of wood for fuel and farm use.

The population of the Delta in 1930, according to the Census, was about 465,000 persons, of whom 340,000 or 73 percent, were negroes. Agriculture at that time accounted for more than 80 percent of the workers gainfully employed. The census of 1940 gives the population as 480,000 with the gain entirely in the urban section. The rural population suffered a small reduction. Greenville, Greenwood, and Clarksdale are the principal towns with populations in 1940 of from 10- to 20-thousand persons each. Three Federal Aid highways run in a north-south direction through the region, and state and county highways are numerous except in the extreme southern part. Rail transportation is by the Yazoo and Mississippi Valley Railroad, a part of the Illinois Central System, and by the Columbus and Greenville which crosses the area from east to west near its middle. On the Mississippi River, Greenville and nearby Vicksburg and Memphis are important shipping and receiving points, and all- or part-season navigation is feasible on the Yazoo River and on

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1/ An earlier report on the Mississippi Delta (Forest Survey Release No. 6, Preliminary report on the forest survey of the bottomland hardwood unit in Mississippi. November 30, 1934--out of print) was based on a somewhat different system of classification than was used for the rest of Southern territory; for the present report, the original data were reworked to conform to the Survey's present system of classification.

portions of the Sunflower, Tallahatchie, Coldwater, and Yalobusha Rivers. Between New Orleans and points north of Memphis, regular barge service is maintained by several lines.

Land Use

The alluvial soils of the Delta are in general characterized by high natural fertility, but fully two thirds are heavy clays which without proper drainage are not well suited to farming. At the time of the original field survey (1932), 57 percent of the land area in the Delta region was given over to agriculture, 40 percent was in forest compared to 58 percent for the lower South, and 3 percent was occupied by towns, villages, roads, railroads, etc., as shown in table 1. The highest proportion of land in agriculture was in Sunflower, Coahoma, Bolivar, and Leflore counties; the lowest proportion in Issaquena and Sharkey counties and the Delta portion of Warren county. In the years that have elapsed since the survey field work, changes have undoubtedly occurred in individual counties in the areas in the different classifications, due both to land clearing and to cropland abandonment. For the region as a whole, however, the area available for crops has changed remarkably little according to the Agricultural Census figures for 1929, 1934, and 1939. In the 10 years from 1929 to 1939 the number of farms was reduced in all except 3 of the 19 counties and these 3 were included in those in which only a portion of their area is in the Delta. This reduction in number is reflected in the fact that the average area per farm increased from 37 to 50 acres, or about 37 percent in the same period.

Table 1.—Land area classified according to major land uses, 1932

Land use	Total land area 1/	
	Acres	Percent
Forest	1,743,900	39.5
Agricultural:		
In cultivation:		
Old cropland	2,217,300	50.3
New cropland	126,600	2.9
Out of cultivation:		
Idle	75,500	1.7
Abandoned	46,500	1.1
Improved pasture	58,000	1.3
Total agriculture	2,523,900	57.3
Other:		
Nonmeandered waterways, towns, villages, roads, railroads, etc.	143,300	3.2
Total area	4,411,100	100.0

1/ Does not include Pittman Island, 9,262 acres.

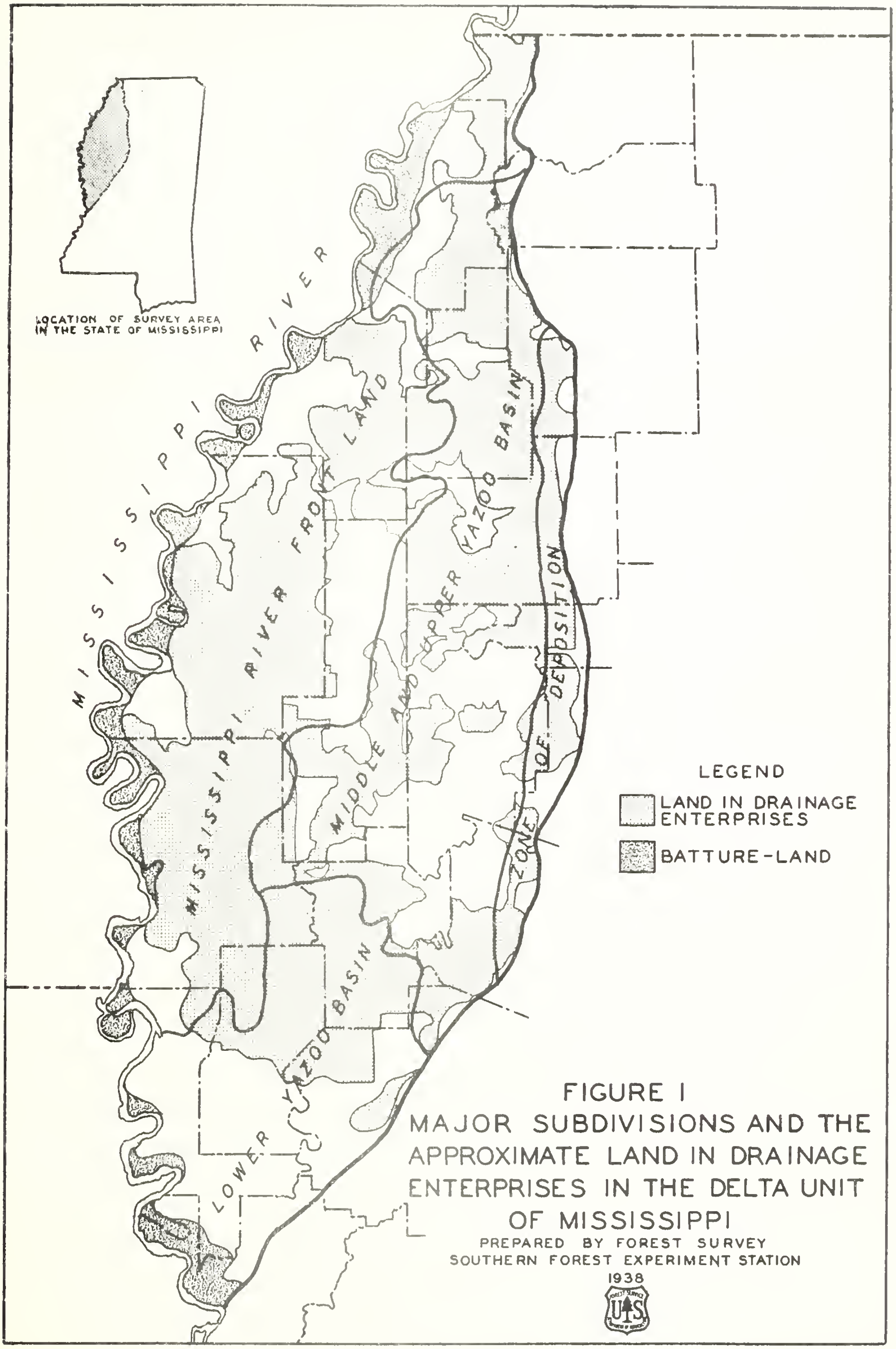


FIGURE I
MAJOR SUBDIVISIONS AND THE APPROXIMATE LAND IN DRAINAGE ENTERPRISES IN THE DELTA UNIT OF MISSISSIPPI

PREPARED BY FOREST SURVEY
SOUTHERN FOREST EXPERIMENT STATION
1938

The topography of the Delta region is that of a very gently undulating, alluvial plain, modified by the present courses and former beds of extremely sinuous, slow-moving streams. The higher lands are natural levees fronting present or former stream-courses. The interstream areas are lower and form poorly drained swales, except as modified by artificial drainage. In 1930 approximately half of the area was in organized drainage districts (fig. 1). Of the land in drainage enterprises, 30 percent was woodland.

On a basis of broad differences in drainage conditions, the Delta region is characterized by four natural subareas (fig. 1): (1) an extensive natural "front land" area bordering the Mississippi River, where the land is relatively high and better drained; (2) the middle and upper basin (in the Delta) of the meandering Yazoo River and its tributaries, where the land is lower lying; (3) the lower Yazoo basin, where backwaters from the Mississippi and Yazoo Rivers periodically inundate a large area for extended periods; and (4) a narrow zone below the bluffs, extending from central Panola County to southern Holmes County, where the bottomland soils have been buried beneath coarser material washed from the neighboring upland. Early agricultural development was confined to the Mississippi River front-land area, where natural drainage was most favorable and the damaging effect of annual floods least, and to the higher areas in the Yazoo basin, again, fronting on the major streams. With the building of artificial levees, beginning about 1850, and with the institution of artificial drainage, more extensive development of the Delta section began.

At present a high proportion of the Mississippi River front-land area is in cultivation, except between the main levees and the bank of the river (the batture), where only a negligible area is devoted to crops. In the middle and upper Yazoo basin the land is lower lying except along the river banks drainage costs are usually higher, the crop hazard is greater, and a slightly lower proportion of the land area is in cultivation. In the lower Yazoo basin, an extensive area above Vicksburg is thinly populated and little developed because of flood hazard and the drainage problem. A National Forest Purchase Unit now embraces much of this backwater area. The major problem, flooding, originates primarily from high levels on the Mississippi River, and until the larger problem of flood control on the main river is met, the area will probably remain thinly populated and little developed. In the fourth zone, deposition has elevated the area and reduced the flood menace, but, except for a narrow strip immediately adjacent to the loessal bluffs, the coarser upland materials that have been deposited are less fertile than the underlying heavier soils.

To control stream flow and erosion in a portion of the tributary uplands, and to reduce the drainage and flood problem in the upper and middle Yazoo basin, a project embracing the highland portion of the Tallahatchie River watershed has been initiated by the U. S. Department of Agriculture; the Soil Conservation Service, Bureau of Agricultural Economics, and Forest Service cooperate in the work. A primary aid in flood control is the dam near Sardis, recently completed by the Corps of Engineers, U. S. Army.

Land taxes in the Delta are generally high. In addition to State, local, and levee taxes, the half of the area that is in drainage districts must pay additional taxes for drainage improvements. Except on the Mississippi River batture and in the lower Yazoo backwater area, even State and local taxes on forest land are commonly high relative to the income-producing capacity of the soil. In the case of forest land in drainage districts, drainage taxes constitute a distinct, and often unbearable burden without compensating benefits, and act as a serious obstacle to the practice of forestry. Most drainage districts have been enabled to reduce tax rates through refinancing, but as far as forest land is concerned, the reductions have not been adequate. In both the upper and lower portions of the Yazoo basin, considerable areas in drainage districts have reverted to the State for nonpayment of taxes.2/

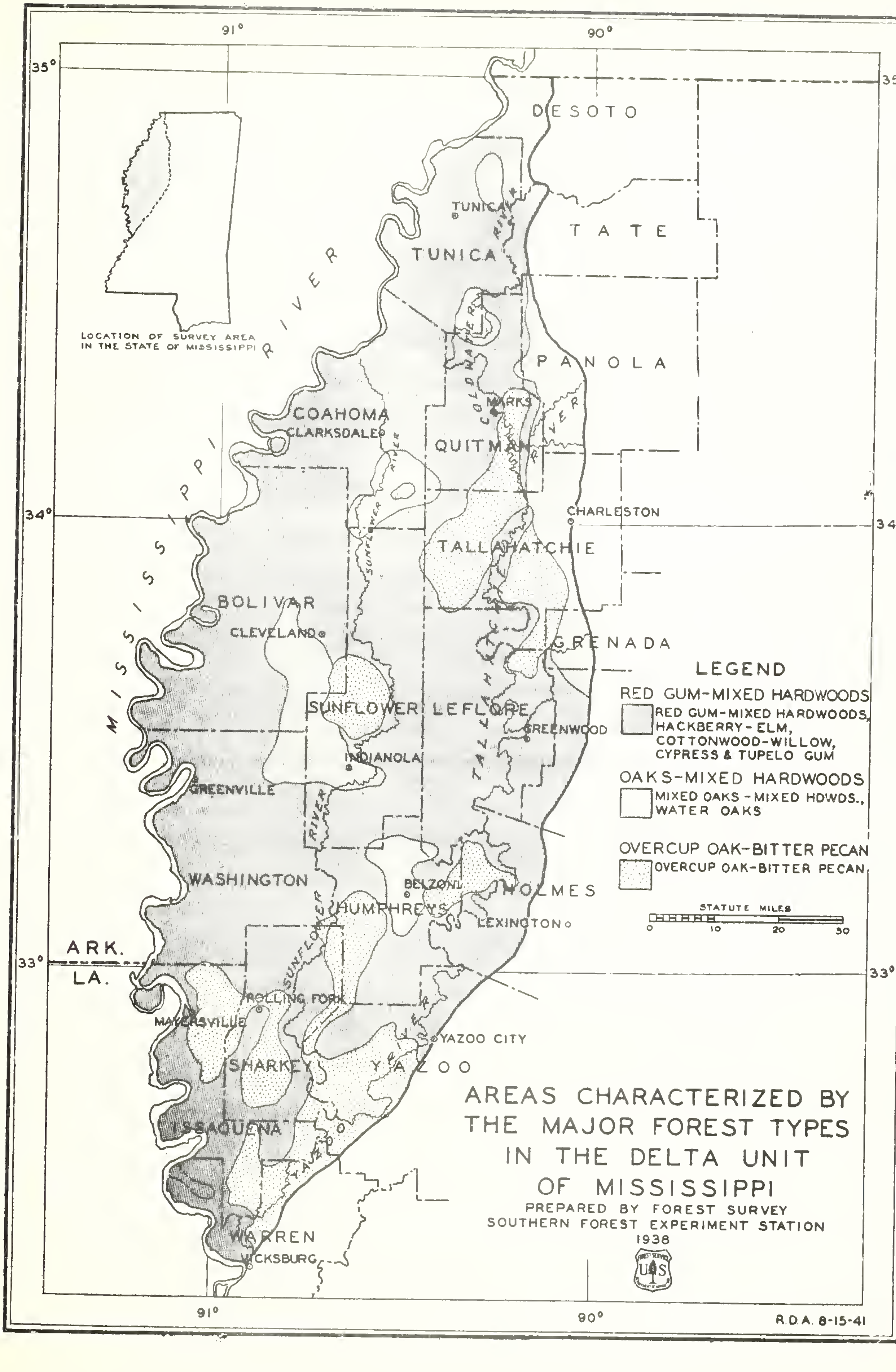
Forest Description

The present forest land in the Delta is confined chiefly to the backwater area above Vicksburg, to the Mississippi River batture, and to poorly drained interstream swales. Except for the backwater area in the southern part, few large unbroken areas of forest land remain. Approximately 80 percent of the forest acreage is held by owners of cotton plantations, more than two-thirds of it in holdings of less than 1,000 acres. Holdings of lumber companies and other timber operators make up most of the remainder and are important because they contain the principal concentrations of merchantable timber. A substantial percentage of the better-grade hardwood timber is located on the batture. In the farming areas, the forests are usually badly deteriorated.

The forests of the Delta unit are composed of a mixture of bottomland hardwood species (fig. 2), and in general have been cut over one or more times for sawlogs or other products. In table 2, the forest area is classified into seven forest types on a basis of species composition, and into five forest conditions on a basis of the character of the timber stands. Most prevalent is the overcup oak-bitter pecan type, occupying 26 percent of the forest area. It predominates on the poorly drained, waxy clay soils of backwater areas and also occurs commonly throughout the unit in shallow sloughs and basins. Second in order of area occupied, and most important commercially, is the redgum-mixed hardwoods type, which occurs on the better drained soils of low ridges throughout the Delta. The hackberry-elm type, in the old-growth partly-cut condition, is largely a residual stand left after the redgum-mixed hardwoods type has been logged. The cottonwood-willow type consists in reality of two separate, but closely related, forest types growing almost entirely on the batture, the two species seldom occurring together except in young stands. The cypress-tupelo type is primarily characteristic of swamps; in the better drained portions of the Delta it occurs as meandering "stringers," along the sloughs.

Old-growth timber stands at the time of this survey were found to occur on 30 percent of the forest area in the Delta. The area actually occupied by virgin old-growth timber was relatively small—less than 5 percent, the remainder having had many of its larger and more valuable trees removed. Of the area classed as old-growth timber, almost half was in the overcup oak-bitter pecan type, the principal species of which are in limited demand at the present time. Saw-timber size stands of second growth occurred on 43 percent of the forest area, while under-sawlog-size second-growth stands were found on most of the remaining 27 percent.

2/ A comprehensive study of the tax situation in the Mississippi Delta is contained in Occasional Paper No. 74, "Taxation of forest land in the Yazoo Delta of Mississippi," by Ronald B. Craig. July 23, 1938.



AREAS CHARACTERIZED BY THE MAJOR FOREST TYPES IN THE DELTA UNIT OF MISSISSIPPI

PREPARED BY FOREST SURVEY
SOUTHERN FOREST EXPERIMENT STATION
1938

R.D.A. 8-15-41

Table 2.—Distribution of total forest area by forest type and forest condition, 1932

Forest type	Old growth		Second-growth sawlog size		Second-growth under sawlog size, reproduction, and clear-cut	All conditions	
	Uncut	Partly cut	Uncut	Partly cut			
	- - -	- - -	- - -	Acres	- - -	- - -	Percent
Redgum-mixed hardwoods	21,400	58,700	125,100	43,500	112,000	360,700	20.7
Mixed oak-mixed hardwoods	-	12,200	61,000	36,600	25,200	135,000	7.7
Overcup oak-bitter pecan	41,200	205,200	72,400	22,100	109,800	450,700	25.8
Water oaks	5,300	27,500	44,200	20,600	25,900	123,500	7.1
Hackberry-elm	4,600	77,000	107,500	45,700	77,800	312,600	17.9
Cottonwood-willow	-	-	91,500	27,400	98,400	217,300	12.5
Cypress-tupelo gum	3,800	63,200	46,500	13,000	17,600	144,100	8.3
Total	76,300	443,800	548,200	208,900	466,700	1,743,900	100.0
Percent of total	4.4	25.4	31.4	12.0	26.8	100.0	

In this survey, the forest area in the Delta is further classified, on a basis of stand per acre and quality of timber, into class-A and class-B areas. A class-A area is defined as one that supports a stand of sufficient volume and quality to warrant operation under existing market conditions for such higher-grade products as industrial lumber, veneer, and cooperage stock. Since motor transportation makes practicable the logging of relatively light stands, areas bearing 1,000 board feet or more per acre of higher-grade logs[3/] are considered as meeting this requirement. Class-B areas include all forest lands that do not meet these qualifications. The class-B areas include many stands, however, which are suitable for the production of cross ties, structural timbers, and lumber for domestic use, and which will in time develop through growth into class-A areas. As of 1932, the class-A forest areas comprised 456,700 acres, or 26 percent of the forest area. Of this class-A area, approximately 13 percent was in the old-growth uncut condition, 40 percent in the old-growth partly cut condition, and 47 percent in the second-growth sawlog-size conditions.

Forest Inventory

In taking stock of the forest stands in this unit, four classes of live trees were recognized: (1) sound sawlog-size trees, (2) sound under-sawlog-size trees, (3) sound cull trees, and (4) rotten cull trees.[4/] The first two groups are considered as constituting the forest growing stock, and estimates of growth, mortality, and utilization drain for this portion of the stand (excluding the tops and limbs of saw-timber trees) are later shown. The last two groups constitute an accumulation of inferior trees that ordinarily are not cut for industrial uses at present, and whose removal is desirable from a forest management standpoint. These trees, together with the tops and limbs of saw timber, contain much sound material that is basically suitable for many purposes.

Estimates of volume are given here in three units of measure: board feet (saw timber only); cords, including bark; and cubic feet, excluding bark. All estimates are on a net basis, that is, allowance is made for material that would be left in the woods because of rot, fire scar, crook, limbiness, or other defects. In the saw-timber estimates, allowance is also made for mill cull.

3/ Higher-grade logs are defined as being 14 or more inches in diameter (12 inches in ash) and of such quality that they can be expected to yield at least 30 percent of their volume in lumber of grades No. 1 Common or better, or as being 10 inches or more in diameter and of the same general quality but suitable primarily for industrial uses that require bolts or blocks rather than logs. Included in the latter category are logs suitable for veneer, cooperage, or special products, but not suitable for lumber purposes because of excessive sweep, crook, or small diameter.

4/ A sound sawlog-size tree is defined as one that is 13.0 inches or larger in diameter at breast height (outside bark), that contains at least one usable 12-foot log, and that will yield at least 50 percent of its gross volume in sound material; a sound under sawlog-size tree is one that gives promise of becoming a saw-timber tree; a sound cull tree is one that because of crook, limbiness, or other sound defects is not or will not become a saw-timber tree; and a rotten cull tree is one not sufficiently sound to be placed in any of the other classifications.

Board-foot volume

The saw-timber component of the forest stand at the time of survey (1932) had a net volume (table 3) of 4.0 billion board feet by the Doyle log rule, 4.8 billion board feet Scribner, or 5.2 billion feet International ($\frac{1}{4}$-inch saw kerf). The Doyle rule is the legal log rule in Mississippi and is commonly used for measuring logs throughout the South, although it understates the board measure volume of small timber by a considerable margin. The International ($\frac{1}{4}$-inch saw kerf) rule most nearly approximates green lumber tally for all sizes of timber and is used later in this report for measuring tree growth, mortality, utilization drain, and changes in the forest growing stock.

Table 3.—Net volume in Doyle, Scribner, and International ($\frac{1}{4}$-inch kerf) log scales, classified according to species group, 1932

Species group	Doyle	Scribner	International
	- - - - - - -	Thousand board feet	- - - - - - - -
Redgum	463,800	516,700	569,000
Water oaks	526,500	592,700	647,100
Red oaks	34,700	41,900	46,500
White oaks	48,200	57,800	64,500
Low-grade white oaks	637,200	737,400	798,500
Ash	122,100	160,600	179,400
Cottonwood	260,400	296,500	318,400
Willow	152,400	195,000	217,000
Elms	312,500	382,800	425,700
Blackgum and tupelo	329,600	424,200	466,600
Cypress	320,100	371,900	409,400
Bitter pecan (water hickory)	354,200	409,300	449,600
Hickory	22,900	29,200	33,000
Sweet pecan	65,200	75,200	82,500
Hackberry	119,000	158,200	181,000
Miscellaneous	268,800	305,800	329,300
Total	4,037,600	4,755,200	5,217,500

The total net volume of 4.0 billion board feet, Doyle, was distributed 15 percent in the old-growth uncut condition, 38 percent in the old-growth partly-cut condition, and 47 percent in the remaining conditions (table 4a). In the order named, low-grade white oaks, wateroaks, and redgum occurred in greatest volume (table 4b). Sixty-five percent of the volume in saw timber was in higher-quality (class-A) stands. Of the volume in class-A stands, approximately 62 percent was in higher-quality logs; of the volume on class-B areas, 24 percent was in higher-quality logs. The fact that overcup oak and bitter pecan are hard to market is at least partially explained by the finding that 71 percent of the board-foot volume in low-grade white oaks and 53 percent of the bitter pecan was in lower-grade logs.

Table 4a.—Total net volume of good trees on forest areas, by forest conditions, 1932
(Board-foot volumes by Doyle log rule)

Forest conditions	Volume on class-A areas: Saw timber: In higher-grade logs	Volume on class-A areas: Saw timber: In lower-grade logs	Volume on class-A areas: Under sawlog-size trees	Volume on class-B areas: Saw timber: In higher-grade logs	Volume on class-B areas: Saw timber: In lower-grade logs	Volume on class-B areas: Under sawlog-size trees	Total volume: Saw timber	Total volume: Under sawlog-size trees
	- - M board feet - -		Cords	- M board feet -		Cords	M board feet	Cords
Old growth:								
Uncut	342,000	197,700	179,700	5,300	50,100	32,700	595,100	212,400
Partly cut	655,200	383,300	432,000	100,400	394,200	552,700	1,533,100	984,700
Second growth:								
Sawlog size:								
Uncut	554,500	358,300	722,900	156,400	396,100	1,683,100	1,465,300	2,406,000
Partly cut	80,200	62,700	140,200	59,300	131,300	592,100	383,500	732,300
Under sawlog size	-	-	-	14,500	41,600	1,154,800	56,100	1,154,800
Reproduction	-	-	-	1,100	3,300	7,100	4,400	7,100
Clear cut	-	-	-	negl.	100	1,300	100	1,300
Noncommodity	-	-	-	-	-	600	-	600
Total	1,631,900	1,002,000	1,474,800	337,000	1,066,700	4,024,400	4,037,600	5,499,200

Table 4b.—Total net volume of good trees on forest areas, by species groups, 1932
(Board-foot volumes by Doyle log rule)

Species group	Volume on class-A areas			Volume on class-B areas			Total volume	
	Saw timber		Under sawlog-size trees	Saw timber		Under sawlog-size trees	Saw timber	Under sawlog-size trees
	In higher-grade logs	In lower-grade logs		In higher-grade logs	In lower-grade logs			
	- M board feet - -		Cords	- M board feet - -		Cords	M board feet	Cords
Redgum	234,100	134,900	126,000	23,800	71,000	377,200	463,800	503,200
Water oaks	154,900	122,100	152,100	51,500	198,000	576,500	526,500	728,600
Red oaks	8,300	4,200	14,400	-	22,200	50,700	34,700	65,100
White oaks	13,100	6,800	27,600	7,200	21,100	56,200	48,200	83,800
Low-grade white oaks	164,200	210,400	85,400	18,800	243,800	237,200	637,200	372,600
Ash	52,900	27,700	102,900	25,200	16,300	246,800	122,100	349,700
Cottonwood	124,400	75,100	23,300	20,500	40,400	158,700	260,400	182,000
Willow	61,900	36,500	62,800	18,300	35,700	551,000	152,400	613,800
Elms	73,100	62,900	144,200	41,100	135,400	428,300	312,500	572,500
Blackgum and tupelo	193,300	84,700	167,100	32,100	19,500	154,600	329,600	321,700
Cypress	223,600	44,100	68,600	11,300	41,100	55,000	320,100	123,600
Bitter pecan (water hickory)	121,000	79,400	97,600	43,900	109,900	264,900	354,200	362,500
Hickory	3,200	6,500	13,300	4,200	9,000	82,800	22,900	96,100
Sweet pecan	34,800	11,400	20,100	3,500	15,500	95,400	65,200	115,500
Hackberry	20,300	41,600	131,200	14,900	42,200	272,200	119,000	453,400
Miscellaneous	143,800	53,700	183,200	20,700	45,600	366,900	268,800	555,100
Total	1,631,900	1,002,000	1,474,800	357,000	1,066,700	4,024,400	4,037,600	5,499,200

In table 5 is shown the average stand per acre on class-A and class-B areas in the different forest conditions. Class-A areas averaged 5,770 board feet Doyle per acre and class-B areas 1,090 board feet. The average stand per acre for the total forest area was 2,320 board feet Doyle.

Table 5.—Average volume in board feet per acre (Doyle log scale) on class-A and class-B areas, classified by forest conditions, 1932

Forest condition	Class-A areas	Class-B areas	Weighted average
	Board feet (Doyle)		
Old growth:			
Uncut	9,320	3,010	7,800
Partly cut:	5,670	1,900	3,450
Second growth:			
Sawlog size:			
Uncut	5,140	1,490	2,670
Partly cut	3,750	1,410	1,840
Under sawlog size, reproduction, clear-cut, and nonproductive areas	-	130	130
Weighted average, all conditions	5,770	1,090	2,320

Cordwood volume

The volume of sound material in various classes of trees and parts of trees, including saw timber, expressed in standard (4 x 4 x 8 feet) cords, was as follows:

Source	Cords
Under-sawlog-size trees	5,499,200
Sawlog-size trees:	
Sawlog material	12,869,900
Tops and limbs	6,946,900
Total	19,816,800
Cull trees	3,167,900
Grand total	28,483,900

The cordwood volume of under-sawlog-size trees includes the main stem of trees 5.0 inches d.b.h. or larger to a usable minimum top of 4 inches. The volume of saw-timber trees expressed in cords is separated into two categories, material in the sawlog portion and material above the sawlog portion, including limbwood over 4 inches in diameter. The volume in cull trees includes trees 5.0 inches and larger.

Cubic-foot volume

The volume of sound-tree growing stock (excluding cull trees, and the tops and limbs of saw-timber trees) was 1,251 million cubic feet, inside bark. The volume in saw-timber material was 906 million cubic feet, and the volume in under-sawlog-size trees, 345 million cubic feet.

Forest Increment

During the period 1932-1938 the volume of wood added annually in the forests of the Delta, through growth, averaged 255 million board feet per year for the saw-timber component of the growing stock, and 60 million cubic feet, or 860 thousand cords, for the total growing stock of trees 5.0 inches and larger (including saw timber). The average loss from mortality (but not cutting) was estimated at 49 million board feet per year for saw timber, and 15 million cubic feet, or 228 thousand cords, for all sizes (including saw timber). Average net growth or increment, therefore, was 206 million board feet per year for the saw-timber component, and 45 million cubic feet, or 632 thousand cords, for the total growing stock including both saw timber and smaller trees.

Included in the estimate of board-foot growth is: (1) the growth of trees already of sawlog size, and (2) the volume of trees becoming sawlog size. Included in the estimates of total cubic growth are (1) the growth of sound trees 5.0 inches d.b.h. and larger, and (2) the volume of small trees becoming 5.0 inches d.b.h. during the period. The mortality estimates include volume losses due to normal causes, such as crowding in dense stands, suppression, and maturity, and also losses due to destructive agencies, such as fire, wind, rot, and insects.

Table 6 shows the net volume of wood added to the inventory of sound trees during 1932, and its distribution by forest condition and tree diameter groups. The increase for the sawlog-size portion of the stand is expressed in board feet, lumber tally, and the increase for the under-sawlog-size portion in standard cords (4 x 4 x 8 feet). In arriving at these estimates, the movement of trees from one diameter group to another was taken into account. The net increment for all forest conditions, excluding the effect of current timber cutting operations, was 207.8 million board feet; 55 percent of this total occurred in trees 20 inches d.b.h. and larger, that is in trees that are of a size to return the greatest values.

Table 6.—Forest increment by tree size and forest condition, 1932

Forest condition	In trees under sawlog size	In sawlog-size trees: Diameter-group 14-18	In sawlog-size trees: Diameter-group 20 and up	In sawlog-size trees: Total
	Cords	M board feet (green lumber tally)		
Old growth:				
Uncut	4,500	1,700	5,700	7,400
Partly cut	38,300	10,800	33,600	44,400
Second growth:				
Sawlog size	92,600	66,000	76,800	142,800
Under sawlog size 1/	86,500	15,900	-2,700	13,200
Total all conditions	221,900	94,400	113,400	207,800

1/ Includes reproduction and clear-cut.

The increment per acre in 1932 in the various forest conditions, in terms of board feet and cubic feet, excluding bark is given in table 7. In arriving at these estimates, deductions for natural mortality have been made, but no deductions have been made for material removed in timber-cutting operations or for the effect of this cutting on the year's increment. Cubic-foot increment includes material in the sawlog portion only of sawlog-size trees, and the full stem in trees under sawlog size. No limbwood is included in either.

Table 7.—Average increment per acre by forest conditions, 1932

Forest type group and condition	Annual increment: Board feet (green lumber tally 1/	Annual increment: Cubic feet (inside bark)
Mixed hardwoods:		
Old growth:		
Uncut	128	21.8
Partly cut	114	23.8
Second growth:		
Sawlog size:		
Uncut	221	39.5
Partly cut	146	30.7
Under sawlog size	38	19.2
Overcut oak-bitter pecan:		
Old growth:		
Uncut	70	12.9
Partly cut	84	16.7
Second growth:		
Sawlog size:		
Uncut	120	28.4
Partly cut	65	16.2
Under sawlog size	24	11.5
All conditions 2/	119	25.7

1/ Based on International $\frac{1}{4}$-inch rule.
2/ Reproduction and clear-cut conditions included.

The average increment per acre for the entire forest was 119 board feet or 25.7 cubic feet in 1932. On the 475,800 acres of second-growth sawlog-size uncut area in the mixed hardwoods type group, the increment per acre averaged 221 board feet, or 39.5 cubic feet. The lower increment in overcup oak-bitter pecan stands is due chiefly to the slower growth rate of these species.

In 1938 there were in the Mississippi Delta 175 forest-industrial plants, of which 165 were sawmills (fig. 3). In addition, 17 sawmills and 9 nonlumber forest-industrial plants located outside of the unit at Helena, Memphis, Arkansas City, and Vicksburg drew a substantial volume of logs from the forests of this unit.

The lumber industry

The medium-sized and large sawmills (20,000 board feet or more daily capacity) in this unit, of which there were 14 in 1938 (table 8), are the remnants of the industrial set up which during the past four decades cut the virgin hardwood timber for the nation's industrial hardwood lumber market. These mills are still cutting some virgin timber, but for the most part they are relying on second and third cuttings from the same forest land. In the main they are of the single band type, are operated by steam power, and are equipped to produce standard grades of well-manufactured lumber, which is usually air dried. Owing to exhaustion of nearby timber supplies of a quality to meet their requirements, several of these mills probably will be abandoned or moved within the next few years. Others, especially those near the Mississippi River where water transportation lengthens the logging reach, and where fast-growing, low-cost batture timber is available, can be expected to continue longer, perhaps indefinitely. A census of the plants in 1940 indicated that there were then 12 mills of this size in the unit.

Table 8.—Production and employment data in the lumber industry, 1938 1/

Daily capacity	Mills	Produced by mills in the unit	Mill employment	Produced from forests of the unit	Woods employment
M bd.ft.	Number	M bd.ft.	Thousand man-days	M bd.ft.	Thousand man-days
Under 20	151	19,400	30	15,200	19
20 - 39	11	33,700	44	38,300	54
40 and over	3	21,500	39	27,700	36
Total	165	74,600	113	81,200	109

1/ Based on a 10-hour operating day and green lumber tally.

The small mills, of which there were about 151 in 1938 and about 146 in 1940, are for the most part owned and operated intermittently in connection with farming. A few, however, are owned by commercial operators producing lumber, timbers, or ties, for shipment to the open market. The farm mills usually have a capacity of 3,000 to 6,000 board feet per day and operate only 10 to 60 days during the year. The commercial small mills frequently have a somewhat larger capacity and operate a greater portion of the year.

In 1938 the sawlogs cut from the forests of the unit amounted to 81 million board feet. Comparison of this figure with the 75 million board feet manufactured at sawmills in the unit reveals that a considerable volume was exported from the unit for manufacture in other sections. The 14 sawmills with a daily capacity of 20,000 or more board feet accounted for 74 percent of the lumber production, whereas the 151 small mills accounted for only 26 percent (table 8). From 38 million board feet in 1932, the production of lumber by mills in the unit rose to 100 million board feet in 1936, then declined to 75 million in 1938. With a resumption of general industrial activity in 1939 and under the stimulus of defense activities in 1940, the cut in the latter year rose to approximately 25 percent above the 1938 level.

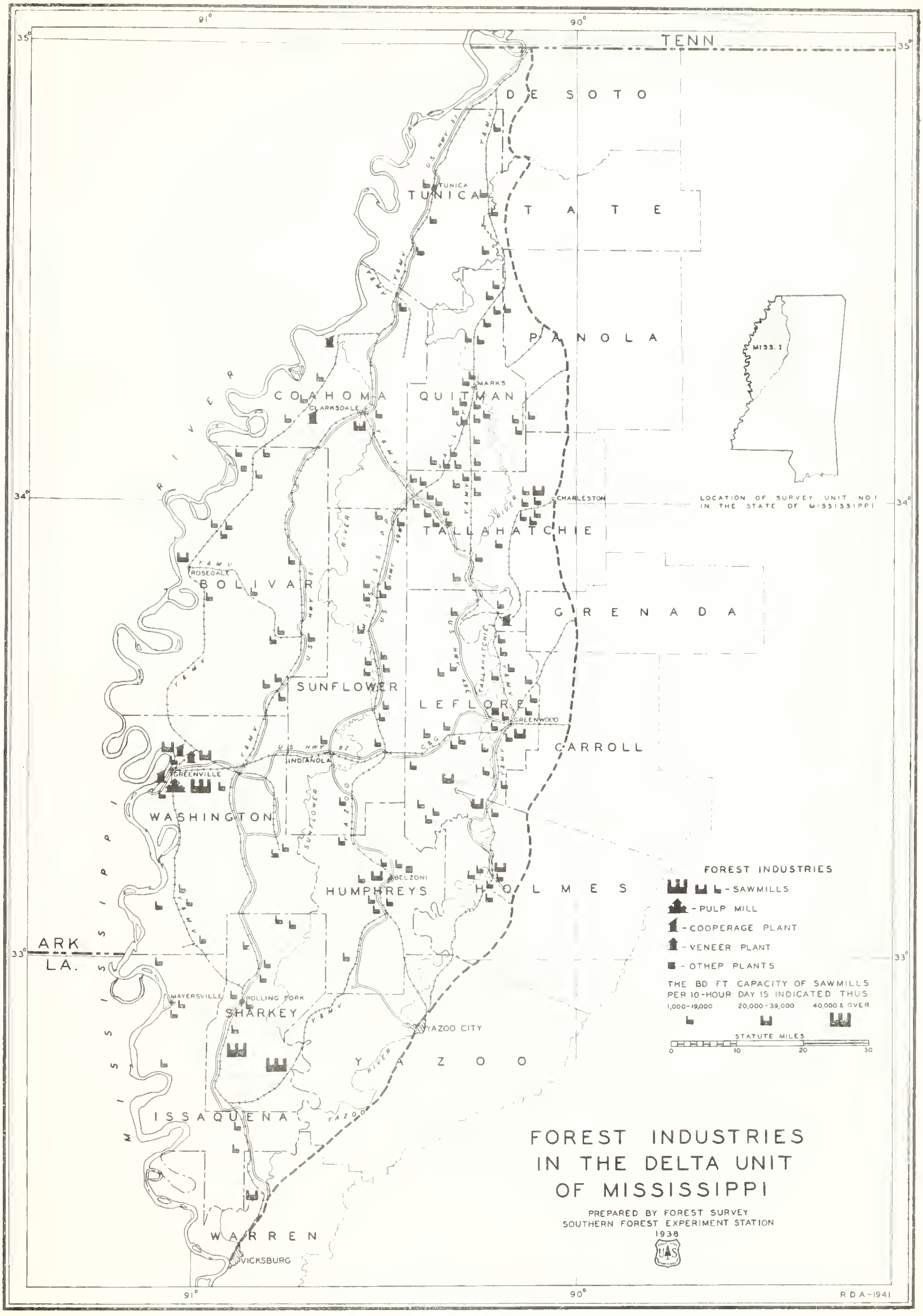
Nonlumber industries

Nonlumber primary wood-using plants in the Delta during 1938 included 1 pulp mill, 1 veneer plant, 5 establishments making cooperage stock, and 3 others—total 10. These plants, together with outside nonlumber plants drawing from this unit, and the production of railroad cross ties, poles, and piles accounted for 136,000 man-days of employment (table 9). There is little competition for timber between the lumber and nonlumber industries since the latter operate, in large part, either on very high-quality trees or logs smaller in size than required by the lumber industry, or on lower-quality material found in second-growth and partly cut old-growth stands. In 1940 the number of nonlumber wood-using plants was the same as in 1938.

Table 9.—Production and employment data[1/] in the nonlumber forest industries, 1938

Kind of plant or commodity	Plants in unit	Produced by plants in unit	Plant employment	Produced from forests in unit	Woods employment
	Number	M bd.ft.	Thousand man-days	M bd.ft.	Thousand man-days
Veneer	1	17,700	33	15,900	21
		Pieces		Pieces	
Hewed cross ties	-	-	-	104,000	12
Poles and piles	-	-	-	2,000	1
		Cords		Cords	
Cooperage material	5	8,500	15	11,300	10
Pulpwood	1	21,000	26	8,400	10
Miscellaneous	3	1,700	5	1,900	3
Total	10	-	79	-	57

1/ Cordwood volume is expressed in standard (4 x 4 x 8 feet) cords, including bark. Board-foot volumes are in terms of the International $\frac{1}{4}$-inch log rule. Man-days are based on a 10-hour day.



FOREST INDUSTRIES
IN THE DELTA UNIT
OF MISSISSIPPI
PREPARED BY FOREST SURVEY
SOUTHERN FOREST EXPERIMENT STATION
1938
FOREST INDUSTRIES
- SAWMILLS
- PULP MILL
- COOPERAGE PLANT
- VENEER PLANT
- OTHEP PLANTS
THE BD FT CAPACITY OF SAWMILLS PER 10-HOUR DAY IS INDICATED THUS
1,000-19,000
20,000-39,000
40,000 & OVER
STATUTE MILES
0
10
20
30
LOCATION OF SURVEY UNIT NO I IN THE STATE OF MISSISSIPPI
MISS. I
TENN
ARK
LA.
DE SOTO
TUNICA
TATE
PANOLA
COAHOMA
QUITMAN
TALLAHATCHIE
BOLIVAR
GRENADA
SUNFLOWER
LEFLORE
CARROLL
WASHINGTON
HUMPHREYS
HOLMES
SHARKEY
YAZOO
ISSAQUENA
WARREN
TUNICA
MARKS
CLARKSDALE
CHARLESTON
ROSEDALE
GREENWOOD
INDIANOLA
GREENVILLE
BELZONI
MAYERSVILLE
ROLLING FORK
YAZOO CITY
VICKSBURG
MISSISSIPPI RIVER
YAZOO RIVER
SUNFLOWER RIVER
TALLAHATCHIE RIVER
91°
90°
35°
34°
33°
RDA-1941

FIGURE 3

Employment

With the data available, it is not possible to translate confidently the total employment of 358,000 man-days into the number of persons receiving either full- or part-time employment in the forest industries. Taking into account the intermittent character of the employment in many of the various activities it is probable that at least 3,500 people look to mill or forest work for all or part of their employment. To this should be added the labor involved in cutting 654 thousand cords of fuel wood and $2\frac{1}{4}$ million fence posts from live, dead, and cull trees; this probably amounts to approximately 609,000 man-days. Only a small portion of this additional employment was for cash wages, but it represents an important employment item. The material thus produced, without cash outlay and usually without interference with normal gainful employment, is a substitute for material that would otherwise have to be purchased.

Utilization Drain

In table 10 is shown the volume of material removed from the sound-tree growing stock during 1938 for industrial and domestic purposes. This volume, termed utilization drain, includes material meeting Survey specifications (see footnote 4 p. 10) but left in the woods as cutting waste; it does not include material cut from cull trees, dead trees, limbwood, or tops of saw-timber trees, which are not considered part of the growing stock.

Table 10.—Net volume of timber drain from the growing stock, 1938

Commodity	From sawlog-size trees	From all trees 5.0 inches d.b.h. and larger
	M bd.ft. (lumber tally)	M cu.ft. (i.b.)
Lumber	91,400	13,840
Veneer	18,200	2,650
Tight-cooperage material	100	10
Slack-cooperage material	7,400	1,160
Poles and piles	400	70
Hewed cross ties	4,800	840
Handles	300	50
Pulpwood	300	540
Material used by miscellaneous industries	900	160
Material cut in clearing land	41,800	11,070
Material cut for fuel, farm fence posts, and other domestic uses	49,400	23,180
Total	215,000	53,570

The 1938 drain from the saw-timber component of the growing stock was 215 million board feet, and the drain against the growing stock trees, 5.0 inches d.b.h. and larger, was 54 million cubic feet, or 763 thousand cords. In 1937, the board-foot and cubic-foot drain against the growing stock was somewhat greater; 274 million board feet and 63 million cubic feet, respectively, while the 7-year average for 1932-38 was 223 million board feet and 52 million cubic feet. Of interest is the fact that fuel, farm use, and land clearing account for almost two-thirds of the total drain. A high proportion of the volume cut for lumber, veneer, and cooperage material is taken from class-A areas (see p. 10).

Comparison of Increment and Drain

Estimate of changes in the forest inventory for the Delta region during the years 1932-1938, as a result of gains from growth, losses from mortality, and removal for industrial and domestic use are shown in table 11. Both the volume of saw timber and the volume of the total growing stock (including saw timber) declined during the 7-year period. The reduction was relatively small, slightly over 2 percent in the case of saw timber; but as regards the important matters of timber size, timber quality, and maintenance of a desirable proportion of more valuable species, the situation was less favorable. More than half of the saw-timber drain was for the manufacture of lumber, veneer, and cooperage, and came largely from the stock of higher-quality timber of the more valuable species. Even for the other uses, the general practice is, and long has been, to select the better trees for cutting and to leave trees of low quality and less valuable species. Regardless of the reasons back of such practice, the result of it is reflected in a high proportion of low-grade grees and less valuable species in many of the present stands. Reversal of this trend will depend largely on the extent to which timber comes to be handled as a crop instead of as something that just grows.

From 1932 through 1937, the saw-timber draft on the growing stock has tended to increase. From a surplus of growth over drain of 23 million board feet in 1932, the situation has shifted to a deficit of growth of 68 million board feet in 1937 (fig. 4). A similar trend obtained in respect to total drain and increment in cubic feet (fig. 5). In 1938, owing to a sharp decline in commodity drain arising from lowered demand, this trend was reversed. Since then, however, and particularly in 1940, it is estimated that the deficit of saw-timber increment in relation to drain is higher than it was three years previously.

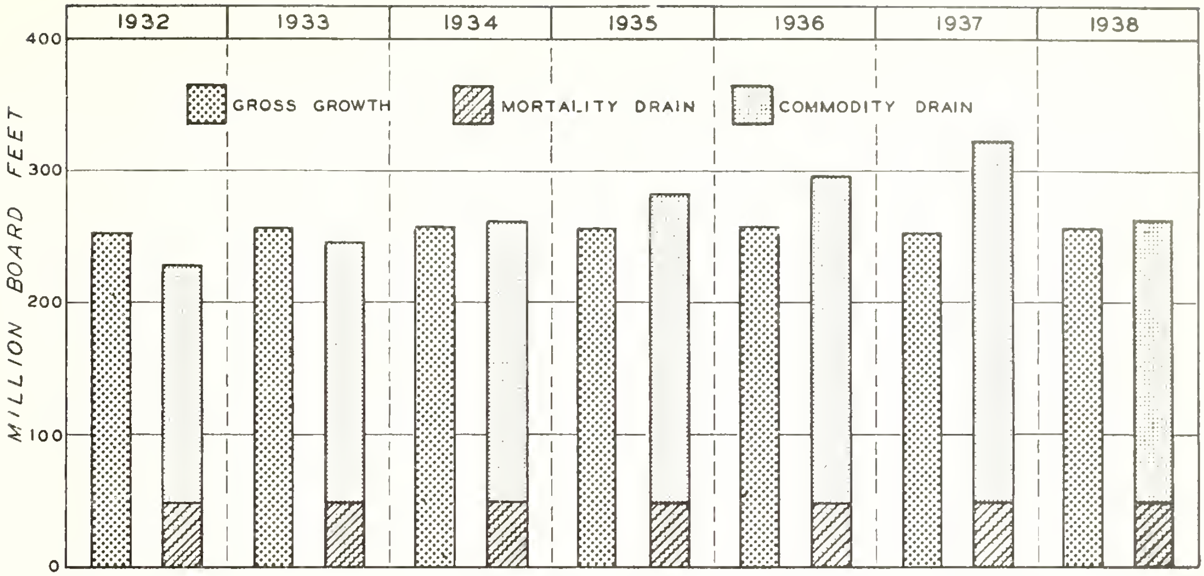


FIGURE 4.— COMPARISON OF GROSS GROWTH AND TOTAL DRAIN OF SAW-TIMBER MATERIAL.

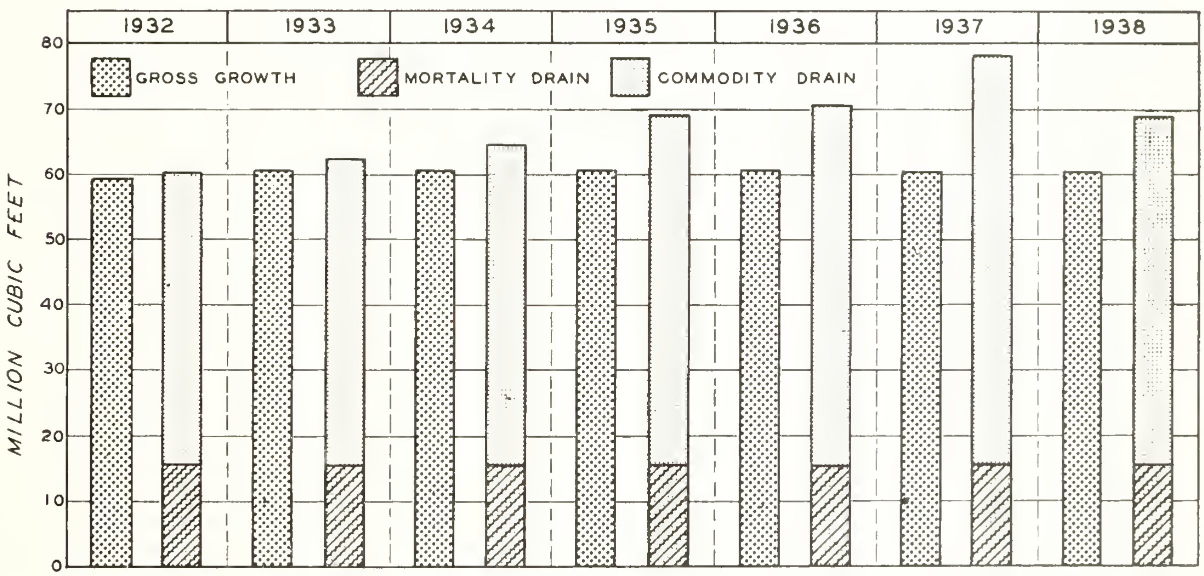


FIGURE 5.— COMPARISON OF GROSS GROWTH AND TOTAL DRAIN OF ENTIRE GROWING STOCK.

Table 11.—Increment, drain, and changes in the growing stock, 1932-1938

Item	1932	1933	1934	1935	1936	1937	1938
				Million board feet (lumber tally)			
Growing stock, Jan. 1	5,217.5	5,240.9	5,251.0	5,246.9	5,219.0	5,178.5	5,110.1
Growth	251.8	255.2	256.2	256.0	255.6	254.8	255.4
Mortality	48.8	48.9	49.0	48.8	48.8	49.2	49.2
Net increment	203.0	206.3	207.2	207.2	206.8	205.6	206.2
Commodity drain	179.6	196.2	211.3	235.1	247.3	274.0	215.0
Net change in growing stock	+23.4	+10.1	-4.1	-27.9	-40.5	-68.4	-8.8
Growing stock, Dec. 31	5,240.9	5,251.0	5,246.9	5,219.0	5,178.5	5,110.1	5,101.3
				Million cubic feet (inside bark)			
Growing stock, Jan. 1	1,250.6	1,249.8	1,248.0	1,244.2	1,235.8	1,225.7	1,207.7
Growth	59.4	60.6	60.8	60.7	60.6	60.4	60.2
Mortality	15.7	15.7	15.7	15.7	15.4	15.5	15.4
Net increment	43.7	44.9	45.1	45.0	45.2	44.9	44.8
Commodity drain	44.5	46.7	48.9	53.4	55.3	62.9	53.6
Net change in growing stock	-0.8	-1.8	-3.8	-8.4	-10.1	-18.0	-8.8
Growing stock, Dec. 31	1,249.8	1,248.0	1,244.2	1,235.8	1,225.7	1,207.7	1,198.9

Outlook for the Future

With its extensive reaches of deep, rich alluvial soil, the Delta portion of Mississippi has long been and no doubt will continue to be one of the outstanding agricultural sections of the South. At the time of this survey, more than 57 percent of its land area was in agricultural use. Nevertheless, after more than a century of agricultural development nearly 40 percent of the land area is still in forest cover. There is no reason to believe that the proportion of forests has reached its permanent level; on the contrary because of the many factors favorable to agriculture, it is to be expected that the use of land for tilled and forage crops will gradually extend even further into much of the area now occupied by forest growth.

The movement of cotton growers from the relatively less productive nearby upland regions into the more favorable soils of the Delta seems destined to continue until all of the land needed and suitable for agriculture has been put under the plow. The forests will be driven back until they occupy those areas where periodic floods, poor drainage conditions or unsuitable soils will give them a permanent tenure. In addition to these refractory sites, a large number of small tracts of farm woodlands will be maintained throughout the area in connection with individual farms and plantations to meet domestic needs for fuel, fence posts, and construction material and for woodland pasture. Without a good soil classification map it is difficult, if not impossible, to form an accurate estimate as to the minimum area on which forests may eventually stand in the unit. It is conceivable that in time the proportion of forest land may be reduced to as little as 30 percent. Whether or not the wooded area of the Delta unit is reduced to the extent here indicated, the forest resource must inevitably continue to play, as it always has, an important, if not essential, role in the economy of the section.

Private forest land management falls into two clearly differentiated classes. On the one hand are the farm forests, areas of comparatively small size owned and operated by farmers for the production of essential commodities needed in the farm economy and as sources of supplementary cash income and outlets for surplus between crop labor. On the other, are the more extensive forest areas operated as business enterprises in themselves, either independently or in conjunction with established wood-using manufacturing plants. These forests are located partly in the batture—that long unprotected strip of land lying between the river and the levee and extending from the Tennessee line southward to Vicksburg—and partly in the extensive "backwater" sections at the South end of the unit between the Mississippi and the Yazoo Rivers where lack of levee protection subjects the low-lying terrain to periodic inundation. In addition to these two main industrial forest areas, there are smaller nonfarmer-owned wooded areas scattered throughout the unit occupying terrain characterized by comparatively poor soils or with difficult drainage problems.

In neither farm nor industrial forest areas are there any natural factors that would tend to prohibit or even materially limit the successful growing of one crop after another of native hardwood species in well-stocked stands. The obstacles in the way of the development of the timber resource are almost entirely man-made and are by no means insuperable. Among the outstanding difficulties are, first, a lack of knowledge of the art of forestry, that is, what to do and how to do it, to turn the present badly deteriorated low-yielding second-growth stands into the high-grade forests the sites are capable of supporting; second, inadequate market outlets for low-grade forest material. Before the growing and harvesting of timber crops can be undertaken as a business enterprise, there must be a marked broadening of the markets for the comparatively low-grade hardwood product that both now and for some time to come must make up a large part of the annual yield while the characteristically young second-growth stands are being brought to maturity. The long-established well-organized industrial hardwood lumber industry has always supplied the main outlet for the stumpage of the Delta. It was, and in the main still is, based upon the utilization of large, fully matured high-quality trees that characterized the original forest. The supply of such trees has been greatly reduced, and the industry can, and will, adapt itself to some extent at least to the radical change in the character of the forest, it will not be able to consume the great mass of comparatively low-quality material at hand and to be expected. The same thing may be said of the cooperage and veneer industries. A new market must be found for a great part of the intrinsically sound but industrially low-grade material. Large-scale expansion of the use of this wood for chemical conversion, particularly for paper and fibre board would go a long way in establishing a sound economic incentive for intensive forest management.

A third major obstacle is that interposed by an unfavorable tax situation. Even when the two obstacles first described have been overcome, forest management on any long-time basis would be a hazardous, if not an entirely uneconomic venture, if the present inequitable taxation situation were to continue to exist. Except for the batture strip and in some part of the backwater sections, where, in most cases, a drainage tax is not added to the regular State and county taxes, many forest areas are so burdened with high taxes as to make their continued use for forestry an uninviting prospect.

To surmount these main obstacles and encourage the development of good forest management it would seem that a well-planned attack, in which both public and private agencies must have a hand, must be simultaneously made along the whole front. The Federal Forest Service, the Soil Conservation Service, and the Mississippi Forest and Agricultural Extension Services should cooperatively undertake to educate forest-land owners, both farmers and industrialists, how to handle their forest stands to get best results. The same groups through other agricultural agencies, the public schools, the press and the radio should intensify their efforts to educate the general public also—state and county officials, bankers, users of forest products, chambers of commerce, the man on the street and at the cross roads, and, not least, the coming generation of citizens—as to the important role that a fully developed forest resource can play in their communities.

To be effective, this educational effort must be a sustained one, continued from year to year, intensified and varied to take advantage of established gains and increased interest. It should be bolstered and supplemented by the maintenance of publicly owned and operated demonstration forests, both large and small, where people may see for themselves how various forest situations should be handled and what results, both in trees and in money, can be attained. The State should maintain a number of conveniently located but not necessarily extensive demonstration forests, primarily for the education of the nonindustrial and farm woodland owner. The experimental and demonstration forest now established near Stoneville, in which silvicultural and management problems common to the Delta are being studied by the Southern Forest Experiment Station of the U. S. Forest Service in cooperation with the Mississippi State Agricultural Experiment Station, should be continued with intensified activity.

For the purpose of demonstrating good forestry practices for the benefit of the industrial forest-land owners, a large scale intensively managed national forest is very desirable. Such a national forest is now in process of acquisition in the backwater section of the Delta unit. The lands within the authorized purchase area should be acquired by the Government as rapidly as possible and a fully organized and intensively operated national forest established.

There is a marked trend in recent years towards the use of some of the more common hardwoods in the manufacture of pulp for paper, containers, and building board, but so far progress in this direction has been slow and limited in extent. The conversion of hardwoods by distillation into industrial chemicals has been worked out, and there are several such plants in operation in other parts of the country. It has been stated that the field for expansion here was somewhat limited, but progress in the field of chemistry is so great and so unpredictable that it is within the realm of possibility that the presence of huge supplies of cheap raw material, such as is found in this and other sections of the bottomland hardwoods of the Mississippi flood plains, coupled with possible post-war changes in world trade may bring development of industries of this nature in this unit. The same thing might be said concerning industries based upon the manufacture of plastics.

The Forest Products Laboratory of the Forest Service at Madison, Wisconsin, is very much alive to the great need for developing new uses and extending established ones for low-grade hardwoods and are actively at work along these lines. This research should be intensified and continuously maintained.

The tax problem as it concerns forest land in this unit is one that the local people and the citizens of the State generally must solve for themselves. It is a complicated one with deep-seated difficulties. The State government has already shown consciousness of the need and has made commendable preliminary progress towards its solution. Achievement in developing an equitable and adequate tax system will, in large measure, be paced by the educational program in forestry; successful tax reform cannot be expected until the people of the State are sufficiently forestry minded to define and demand it.

This Delta unit of Mississippi was once the home of one of the finest and most valuable hardwood forests in the nation. The natural factors that produced it are still there. Even after all of the best tillable land has been dedicated to agricultural crops, there will remain a sufficient area of strong forest soil upon which another forest of hardwood, even more valuable than the original one can be grown. The first crop, now almost gone, matured through the centuries without either the interference or the aid of man. The next crop, now on its way, can be grown to a successful and valuable maturity only through sustained protection and conscious management by man. The nucleus of a new forest is at hand. Nature's efforts to repeat the cycle can be stultified through ignorance and abuse or they can be speeded up and greatly aided through wise husbandry.

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BASIC DATA ON FOREST AREA AND TIMBER VOLUMES FROM THE SOUTHERN FOREST SURVEY, 1932-36

By

Forest Economics Staff

William A. Duerr, In Charge

SOUTHERN FOREST EXPERIMENT STATION

Chas. A. Connaughton, Director

New Orleans, La.

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CONTENTS

BASIC DATA ON FOREST AREA AND TIMBER VOLUMES

FROM THE SOUTHERN FOREST SURVEY, 1932-36

INTRODUCTION

In response to strong demand, estimates from the Forest Survey of 1932-36 are presented in this report on forest acreage and timber volumes by county in the States of the lower South. Although these figures are old and are highly unreliable for individual counties, they are useful as source data in compiling information for groups of counties that differ from the units used in the Forest Survey (see map).

The tendency to use the data as presented for individual counties must be guarded against, because of the likelihood of great error. Generally speaking, the information is reasonably good only for areas totaling at least a few million acres:

If the total land area is—	Then there are 19 chances in 20 that the sampling error in— Forest area is no more than—	Total board-foot volume is no more than—
50,000,000 acres	2 percent	3 percent
10,000,000 acres	5 percent	8 percent
5,000,000 acres	7 percent	11 percent
1,000,000 acres	13 percent	25 percent
500,000 acres	17 percent	35 percent
50,000 acres	65 percent	100 percent

Sampling errors in estimates of total cord volume are smaller than those shown for board-foot volume. Errors in either softwood or hardwood volume are greater than the errors in the corresponding total volume. Sampling errors vary, not only with total land area, but with the shape and location of the unit, the proportion of forest land, and the condition and variability of the timber stand. The above percentages, therefore, are not precise: they serve merely as a general indication of the reliance to be placed on compilations that may be prepared from the tables.

EXPLANATION OF TABLES

Date of Forest Survey

Following are the dates of inventory that apply to the data for counties in each Forest Survey unit:

State	Units	Date
Alabama	1,2,3,4	1935
	5,6	1936
Arkansas	1,2	1935
	3,4	1936
Florida	1	1934
	2	1935
	3,4	1936
Georgia	1,2	1934
	3,4,5	1936
Louisiana	1	1934
	2,3,4,5	1935
Mississippi	1	1932
	2	1933
	3,4	1935
	5	1934
Oklahoma	1	1936
Texas	1,2	1935

Area Statistics

Total land area of counties is taken from the Census of 1935. Forest area includes noncommercial as well as commercial forest. Recently cut-over and nonrestocking areas not converted to some other primary use are classed as forest land.

In north Alabama, 125,900 acres flooded by power dams are excluded from the area statistics.

A number of counties in Arkansas, Oklahoma, and Texas were not covered by the Forest Survey.

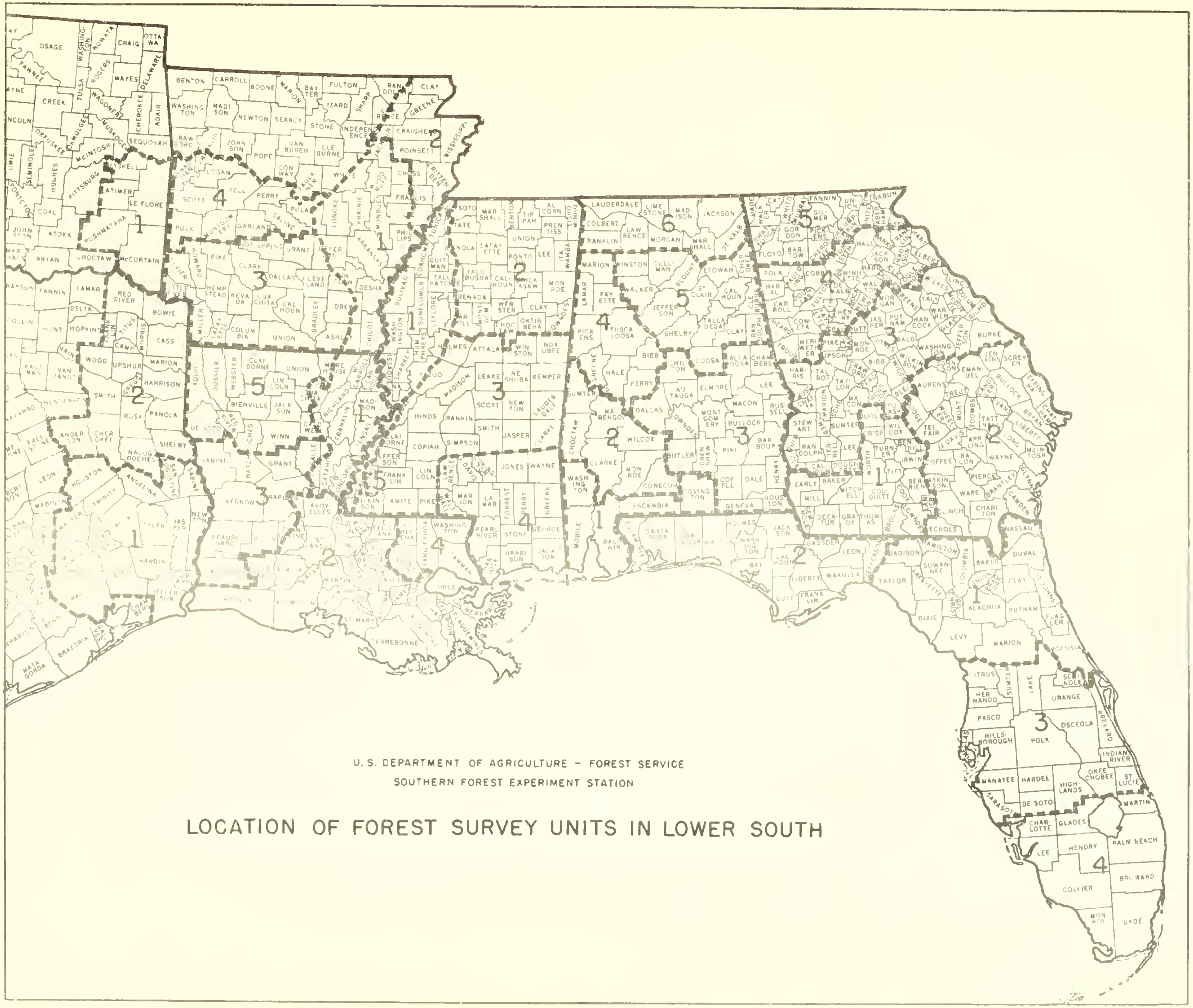
Volume Statistics

Both sawlog and total volumes include growing stock only.

Sawlog net volume is the cull-free volume, by International $\frac{1}{4}$-inch rule, of merchantable sawlogs in softwood trees 9.0 inches and larger in diameter breast high, in hardwoods 13.0 inches and larger, and in cypress 9.0 inches and larger—except in the Mississippi River Delta units, where the lower limit for cypress is 13.0 inches.

Total net volume is the cull-free volume, in standard cords including bark, of all material for which sawlog net volume is computed (see above); all thrifty, well-formed trees of less than sawlog size but at least 5.0 inches in diameter breast high; and the upper stems of sawlog-size softwoods, above merchantable sawlogs.

Cypress volume is in all cases included with hardwood volume. In the Arkansas Delta (units 1 and 2), hardwood volume includes small quantities of pine.



U. S. DEPARTMENT OF AGRICULTURE - FOREST SERVICE
SOUTHERN FOREST EXPERIMENT STATION

LOCATION OF FOREST SURVEY UNITS IN LOWER SOUTH

Table 1.—Estimated forest area and timber volume by county in Alabama, 1935-1936

County	Land area		Sawlog net volume (Int'l ¼" log rule)			Total net volume (Standard cords)		
	Total	Forest	Softwood	Hardwood	Total	Softwood	Hardwood	Total
	Thous. acres	Thous. acres	Million bd. ft.	Million bd. ft.	Million bd. ft.	Thous. cords	Thous. cords	Thous. cords
Autauga	373.8	202.1	205.8	126.5	332.3	683.2	813.9	1,497.1
Baldwin	1,020.8	834.9	766.5	397.4	1,163.9	3,876.8	2,015.9	5,892.7
Barbour	583.7	274.7	352.1	184.1	536.2	1,283.5	1,078.7	2,362.2
Bibb	405.8	307.0	306.9	125.7	432.6	1,207.2	894.7	2,101.9
Blount	415.4	247.7	547.7	100.2	647.9	1,997.7	783.3	2,781.0
Bullock	390.4	144.1	174.5	119.3	293.8	587.4	435.3	1,022.7
Butler	488.3	314.6	788.6	301.3	1,089.9	2,564.7	1,552.1	4,116.8
Calhoun	393.6	199.3	236.0	41.9	277.9	853.3	393.9	1,247.2
Chambers	391.7	149.6	185.8	102.0	287.8	699.0	497.1	1,196.1
Cherokee	367.4	205.3	290.6	63.5	354.1	960.8	547.8	1,508.6
Chilton	456.3	296.2	370.3	133.5	503.8	1,472.4	1,073.6	2,546.0
Choctaw	596.5	459.2	766.1	380.6	1,146.7	2,615.5	1,916.0	4,531.5
Clarke	778.2	629.8	1,192.3	893.0	2,085.3	3,650.2	3,691.4	7,341.6
Clay	393.0	270.0	265.7	93.7	359.4	967.8	773.8	1,741.6
Cleburne	364.2	301.3	548.8	65.8	614.6	1,650.0	595.5	2,245.5
Coffee	433.9	205.5	289.0	155.1	444.1	960.2	993.2	1,953.4
Colbert	386.7	242.6	136.3	166.8	303.1	670.3	1,363.6	2,033.9
Conecuh	543.4	374.0	622.0	187.0	809.0	2,018.1	1,226.1	3,244.2
Coosa	419.2	282.3	403.3	129.4	532.7	1,546.0	976.4	2,522.4
Covington	666.9	434.7	519.1	162.4	681.5	1,667.5	1,049.6	2,717.1
Crenshaw	395.5	197.1	316.9	207.0	523.9	1,097.3	1,309.8	2,407.1
Cullman	488.3	213.6	434.2	122.0	556.2	1,573.8	907.7	2,481.5
Dale	360.3	150.4	211.2	165.8	377.0	672.9	938.9	1,611.8
Dallas	612.5	275.6	341.4	399.8	741.2	1,041.2	1,775.9	2,817.1
DeKalb	503.0	258.0	401.0	107.5	508.5	1,731.3	1,010.0	2,741.3
Elmore	405.8	180.2	163.8	194.5	358.3	662.9	979.8	1,642.7
Escambia	612.5	446.4	794.7	162.8	957.5	2,523.5	1,077.9	3,601.4
Etowah	347.5	149.2	218.5	59.3	277.8	772.5	412.9	1,185.4
Fayette	411.5	289.9	325.9	161.2	487.1	1,461.4	1,019.8	2,481.2
Franklin	414.1	258.5	138.8	150.7	289.5	714.3	1,245.4	1,959.7
Geneva	369.9	180.3	199.1	210.8	409.9	681.2	1,089.2	1,770.4
Greene	406.4	199.9	194.0	200.0	394.0	705.4	924.1	1,629.5
Hale	413.4	177.3	317.4	184.3	501.7	983.2	873.1	1,856.3
Henry	358.4	167.6	227.2	182.3	409.5	766.5	843.8	1,610.3

Table 1.—Estimated forest area and timber volume by county in Alabama, 1935-1936 (Cont'd.)

County	Land area		Sawlog net volume (Int'l ¼" log rule)			Total net volume (Standard cords)		
	Total	Forest	Softwood	Hardwood	Total	Softwood	Hardwood	Total
	Thous. acres	Thous. acres	Million bd. ft.	Million bd. ft.	Million bd. ft.	Thous. cords	Thous. cords	Thous. cords
Houston	370.6	124.0	157.8	120.4	278.2	493.1	699.2	1,192.3
Jackson	705.3	471.3	266.1	504.1	770.2	1,069.7	3,216.9	4,286.6
Jefferson	716.8	498.2	1,102.0	237.3	1,339.3	3,720.4	1,821.7	5,542.1
Lamar	384.6	239.0	252.5	176.4	428.9	1,108.5	1,032.8	2,141.3
Lauderdale	427.3	162.9	49.0	72.4	121.4	337.6	784.8	1,122.4
Lawrence	439.3	195.5	173.5	280.2	453.7	675.2	1,707.3	2,382.5
Lee	398.1	198.8	272.6	93.8	366.4	1,027.8	380.3	1,408.1
Limestone	356.6	87.4	24.1	104.4	128.5	69.0	570.2	639.2
Lowndes	473.0	218.4	373.5	207.6	581.1	1,367.9	945.6	2,313.5
Macon	393.0	210.5	316.5	187.0	503.5	1,046.4	805.4	1,851.8
Madison	516.6	168.7	15.2	192.0	207.2	133.2	1,337.7	1,470.9
Marengo	618.2	313.3	430.8	289.4	720.2	1,753.2	1,338.4	3,091.6
Marion	475.5	299.2	201.1	157.9	359.0	935.2	1,232.8	2,168.0
Marshall	354.1	113.2	246.5	88.5	335.0	817.5	579.5	1,397.0
Mobile	784.6	633.9	349.9	112.1	462.0	1,535.7	892.9	2,428.6
Monroe	647.7	412.1	811.2	610.9	1,422.1	2,594.4	2,415.4	5,009.8
Montgomery	515.2	174.9	134.6	170.9	305.5	486.9	757.2	1,244.1
Morgan	366.9	132.2	95.2	96.3	191.5	339.2	650.2	989.4
Perry	471.7	218.3	247.4	97.8	345.2	968.4	570.4	1,538.8
Pickens	560.0	372.6	409.5	350.2	759.7	1,615.3	1,797.5	3,412.8
Pike	429.4	186.0	226.3	238.3	464.6	758.2	1,310.9	2,069.1
Randolph	377.6	180.4	225.0	67.6	292.6	880.2	445.7	1,325.9
Russell	410.2	173.3	289.4	108.8	398.2	913.2	488.6	1,401.8
St. Clair	414.7	230.1	387.0	86.0	473.0	1,397.6	773.2	2,170.8
Shelby	524.2	371.6	558.2	160.8	719.0	2,035.0	1,175.2	3,210.2
Sumter	581.1	271.6	464.3	309.3	773.6	1,411.3	1,403.1	2,814.4
Talladega	483.2	249.0	262.1	70.1	332.2	1,016.5	639.8	1,656.3
Tallapoosa	488.3	279.9	319.3	189.5	508.8	1,307.9	1,014.5	2,322.4
Tuscaloosa	861.4	608.5	819.4	467.5	1,286.9	3,128.9	2,568.5	5,697.4
Walker	506.9	337.8	651.9	173.6	825.5	2,388.1	1,368.7	3,756.8
Washington	695.7	638.3	927.1	381.5	1,308.6	3,157.2	1,990.8	5,148.0
Wilcox	573.4	283.8	468.0	155.1	623.1	1,673.2	902.2	2,575.4
Winston	403.2	304.1	526.0	191.6	717.6	1,968.1	1,262.2	3,230.3
All Counties	32,692.7	18,877.7	25,304.5	13,186.5	38,491.0	91,449.0	75,959.8	167,408.8

Table 2.—Estimated forest area and timber volume by county in Arkansas, 1935-1936

County	Land area		Sawlog net volume (Int'l ¼" log rule)			Total net volume (Standard cords)		
	Total	Forest	Softwood	Hardwood	Total	Softwood	Hardwood	Total
	Thous. acres	Thous. acres	Million bd. ft.	Million bd. ft.	Million bd. ft.	Thous. cords	Thous. cords	Thous. cords
Arkansas	640.0	260.7	-	930.7	930.7	-	3,722.3	3,722.3
Ashley	601.6	418.5	1,038.0	630.3	1,668.3	3,374.7	3,114.5	6,489.2
Bradley	421.8	334.3	556.8	602.3	1,159.1	2,011.5	2,436.4	4,447.9
Calhoun	402.6	307.5	472.4	336.3	808.7	1,850.3	1,811.3	3,661.6
Chicot	389.1	227.5	-	519.1	519.1	-	2,234.6	2,234.6
Clark	564.5	383.7	648.4	328.3	976.7	2,501.2	2,068.6	4,569.8
Clay 1/	413.8	118.6	-	61.1	61.1	-	591.9	591.9
Cleveland	385.9	274.6	530.7	512.6	1,043.3	1,762.4	2,522.2	4,284.6
Columbia	502.4	277.8	619.2	424.0	1,043.2	2,312.3	2,163.3	4,475.6
Conway 1/	52.9	39.8	26.7	23.9	50.6	233.2	158.8	392.0
Craighead	439.7	189.9	-	172.6	172.6	-	1,468.1	1,468.1
Crittenden	372.5	100.5	-	147.6	147.6	-	688.4	688.4
Cross	396.2	168.0	-	348.5	348.5	-	1,436.2	1,436.2
Dallas	434.6	373.8	878.2	403.2	1,281.4	3,261.3	2,500.3	5,761.6
Desha	477.4	310.0	-	1,080.1	1,080.1	-	4,175.1	4,175.1
Drew	542.1	347.8	457.4	489.7	947.1	1,552.6	2,886.1	4,438.7
Franklin 1/	134.8	36.6	2.4	16.1	18.5	10.9	116.8	127.7
Garland	472.3	363.0	741.3	124.5	865.8	2,703.6	1,050.1	3,753.7
Grant	407.7	338.1	814.4	406.4	1,220.8	2,780.3	2,666.5	5,446.8
Greene	359.0	172.5	-	214.1	214.1	-	1,468.5	1,468.5
Hemstead	465.3	200.5	281.8	296.6	578.4	1,045.6	1,521.3	2,566.9
Hot Springs	392.3	297.0	583.9	157.8	741.7	2,353.0	1,452.9	3,805.9
Howard	385.3	232.9	574.8	214.5	789.3	2,032.0	1,162.6	3,194.6
Independence 1/	78.3	47.6	-	80.7	80.7	-	467.9	467.9
Jackson 1/	369.7	187.8	-	323.7	323.7	-	1,711.3	1,711.3
Jefferson	577.9	285.3	331.7	364.4	696.1	1,202.8	1,848.1	3,050.9
Lafayette	336.0	209.1	443.0	327.4	770.4	1,551.7	1,774.4	3,326.1
Lawrence 1/	240.2	131.5	-	184.7	184.7	-	1,016.6	1,016.6
Lee	384.6	196.3	-	349.1	349.1	-	1,743.7	1,743.7
Lincoln	365.4	196.3	100.0	283.9	383.9	324.3	1,529.3	1,853.6
Little River	349.4	202.2	382.5	202.6	585.1	1,460.0	1,251.6	2,711.6
Logan	464.6	232.9	156.4	79.4	235.8	763.2	557.6	1,320.8

Table 2.—Estimated forest area and timber volume by county in Arkansas, 1935-1936 (Cont'd.)

County	Land area		Sawlog net volume (Int'l 1/4" log rule)			Total net volume (Standard cords)		
	Total	Forest	Softwood	Hardwood	Total	Softwood	Hardwood	Total
	Thous. acres	Thous. acres	Million bd. ft.	Million bd. ft.	Million bd. ft.	Thous. cords	Thous. cords	Thous. cords
Lonoke 1/	489.6	158.4	-	240.1	240.1	-	1,475.7	1,475.7
Miller	398.7	246.9	355.0	275.7	630.7	1,287.5	1,700.8	2,988.3
Mississippi	506.9	136.7	-	187.7	187.7	-	909.6	909.6
Monroe	385.9	230.7	-	603.6	603.6	-	2,616.4	2,616.4
Montgomery	501.8	409.3	609.4	139.5	748.9	2,194.9	1,184.0	3,378.9
Nevada	396.8	193.8	282.0	310.0	592.0	1,146.7	1,567.2	2,713.9
Ouachita	469.1	326.3	437.4	495.4	932.8	1,701.6	2,540.9	4,242.5
Perry	353.3	276.3	615.7	58.2	673.9	2,277.4	441.0	2,718.4
Phillips	442.9	232.8	-	537.2	537.2	-	2,146.4	2,146.4
Pike	384.6	288.5	528.6	144.0	672.6	2,227.8	1,008.1	3,235.9
Poinsett	461.4	247.2	-	264.4	264.4	-	1,862.6	1,862.6
Polk	541.4	422.4	650.0	192.7	842.7	2,600.7	1,348.4	3,949.1
Prairie	423.7	174.7	-	227.9	227.9	-	1,592.2	1,592.2
Pulaski	498.6	241.1	199.1	89.3	288.4	1,012.4	736.5	1,748.9
Randolph 1/	109.9	73.4	-	150.3	150.3	-	747.0	747.0
St. Francis	401.9	179.5	-	246.3	246.3	-	1,491.4	1,491.4
Saline	475.5	378.5	868.4	131.3	999.7	3,345.3	1,283.7	4,629.0
Scott	620.8	486.8	1,073.1	154.8	1,227.9	3,674.1	1,262.6	4,936.7
Sebastian	339.8	129.2	29.5	53.2	82.7	115.5	360.9	476.4
Sevier	366.1	224.2	501.8	278.1	779.9	1,776.2	1,208.7	2,984.9
Union	670.8	496.5	987.0	743.4	1,730.4	3,833.9	3,519.3	7,353.2
White 1/	253.9	160.0	-	431.4	431.4	-	2,009.1	2,009.1
Woodruff	369.3	181.7	-	255.6	255.6	-	1,435.2	1,435.2
Yell	611.2	386.8	784.5	143.1	927.6	2,573.6	1,003.2	3,576.8
All Counties	23,293.8	13,744.3	17,561.5	16,989.4	34,550.9	64,854.5	90,768.2	155,622.7

1/ Surveyed portion only (see map).

Table 3.—Estimated forest area and timber volume by county in Florida, 1934-1936

County	Land area		Sawlog net volume (Int'l ¼" log rule)			Total net volume (Standard cords)		
	Total	Forest	Softwood	Hardwood	Total	Softwood	Hardwood	Total
	Thous. acres	Thous. acres	Million bd. ft.	Million bd. ft.	Million bd. ft.	Thous. cords	Thous. cords	Thous. cords
Alachua	581.8	372.3	360.3	181.1	541.4	1,910.6	739.2	2,649.8
Baker	379.5	353.3	330.2	121.4	451.6	1,603.9	911.9	2,515.8
Bay	499.8	443.5	167.4	36.5	203.9	839.3	224.2	1,063.5
Bradford	186.2	143.6	104.9	78.1	183.0	581.0	356.4	937.4
Brevard	656.0	263.3	112.8	6.7	119.5	466.9	76.1	543.0
Broward	775.7	125.6	7.1	1.9	9.0	43.9	20.0	63.9
Calhoun	339.8	281.1	229.3	120.7	350.0	924.0	596.7	1,520.7
Charlotte	446.1	281.9	80.0	19.8	99.8	319.7	141.5	461.2
Citrus	396.8	335.8	113.5	34.6	148.1	529.3	258.9	788.2
Clay	393.6	380.2	219.2	107.0	326.2	1,125.6	490.7	1,616.3
Collier	1,306.9	997.3	316.9	494.6	811.5	1,185.7	2,330.7	3,516.4
Columbia	506.9	370.5	367.4	185.8	553.2	1,681.9	1,140.3	2,822.2
Dade	1,292.2	215.4	21.4	0	21.4	209.0	0	209.0
DeSoto	409.6	134.8	23.8	10.5	34.3	106.2	65.0	171.2
Dixie	454.4	393.5	532.8	399.3	932.1	1,747.5	1,797.1	3,544.6
Duval	500.5	381.8	355.6	280.8	636.4	1,695.6	1,250.8	2,946.4
Escambia	420.5	354.1	161.7	42.9	204.6	987.6	393.7	1,381.3
Flagler	314.2	287.8	190.6	196.4	387.0	1,050.9	942.9	1,993.8
Franklin	346.2	333.1	200.2	96.2	296.4	862.7	538.8	1,401.5
Gadsden	345.6	213.7	274.4	125.0	399.4	957.9	734.5	1,692.4
Gilchrist	225.3	181.6	119.5	93.8	213.3	483.9	324.5	808.4
Glades	489.0	97.8	51.6	12.5	64.1	180.3	69.6	249.9
Gulf	357.1	342.5	200.3	238.0	438.3	852.9	1,038.7	1,891.6
Hamilton	337.9	279.4	256.9	284.9	541.8	1,240.8	1,192.7	2,433.5
Hardee	404.5	299.1	59.7	24.7	84.4	265.2	201.8	467.0
Hendry	749.4	271.3	235.9	42.5	278.4	751.5	206.1	957.6
Hernando	318.1	283.6	137.3	76.6	213.9	558.8	464.7	1,023.5
Highlands	653.4	295.8	92.9	12.8	105.7	408.0	114.0	522.0
Hillsborough	663.0	476.5	196.6	111.8	308.4	891.8	643.0	1,534.8
Holmes	302.7	246.8	186.1	244.8	430.9	737.5	1,247.4	1,984.9
Indian River	318.1	132.1	20.4	8.2	28.6	78.1	89.1	167.2
Jackson	601.0	363.3	191.9	190.0	381.9	723.7	1,101.7	1,825.4

Table 3.—Estimated forest area and timber volume by county in Florida, 1934-1936 (Cont'd.)

County	Land area		Sawlog net volume (Int'l ¼" log rule)			Total net volume (Standard cords)		
	Total	Forest	Softwood	Hardwood	Total	Softwood	Hardwood	Total
	Thous. acres	Thous. acres	Million bd. ft.	Million bd. ft.	Million bd. ft.	Thous. cords	Thous. cords	Thous. cords
Jefferson	339.2	236.5	270.6	341.9	612.5	989.4	1,721.3	2,710.7
Lafayette	353.9	290.9	214.0	197.3	411.3	1,062.2	981.9	2,044.1
Lake	670.7	472.1	268.2	111.2	379.4	1,023.1	637.1	1,660.2
Lee	523.5	426.2	154.3	48.8	203.1	644.5	299.6	944.1
Leon	457.6	263.8	320.2	122.6	442.8	1,235.0	853.3	2,088.3
Levy	732.2	594.4	567.0	311.7	878.7	2,405.0	1,416.3	3,821.3
Liberty	526.7	504.7	374.0	432.9	806.9	1,508.2	1,887.7	3,395.9
Madison	495.4	268.5	329.2	217.4	546.6	1,404.4	1,306.1	2,710.5
Manatee	526.7	413.9	82.1	5.7	87.8	407.7	39.9	447.6
Marion	1,054.1	778.2	540.9	307.0	847.9	2,398.4	1,254.2	3,652.6
Martin	382.7	255.9	51.9	10.2	62.1	217.7	51.4	269.1
Monroe	704.0	522.0	0	0	0	0	0	0
Nassau	403.2	329.8	347.6	248.9	596.5	1,594.8	1,178.7	2,773.5
Okaloosa	611.8	574.6	339.8	40.3	380.1	1,316.4	290.4	1,606.8
Okeechobee	478.1	163.0	16.9	19.2	36.1	80.3	141.4	221.7
Orange	593.9	443.8	395.2	56.2	451.4	1,224.1	385.0	1,609.1
Osceola	867.9	567.0	264.9	142.5	407.4	949.5	1,038.5	1,988.0
Palm Beach	1,241.6	326.6	22.3	0.7	23.0	148.7	negl.	148.7
Pasco	490.9	414.9	139.4	108.3	247.7	653.9	679.9	1,333.8
Pinellas	187.5	71.2	33.9	19.9	53.8	126.3	75.5	201.8
Polk	1,220.5	855.4	383.5	245.2	628.7	1,601.0	1,649.1	3,250.1
Putnam	481.3	407.8	171.5	197.6	369.1	924.8	951.7	1,876.5
St. Johns	389.1	315.6	271.2	242.9	514.1	1,277.0	1,221.9	2,498.9
St. Lucie	371.2	141.3	29.1	9.2	38.3	125.3	68.1	193.4
Santa Rosa	656.0	581.4	212.0	149.6	361.6	1,389.9	822.8	2,212.7
Sarasota	329.0	175.9	46.4	0.2	46.6	225.3	negl.	225.3
Seminole	205.4	139.7	65.0	49.8	114.8	234.0	336.6	570.6
Sumter	373.1	240.8	85.2	202.8	288.0	403.3	928.5	1,331.8
Suwannee	442.9	208.6	161.3	23.3	184.6	782.3	145.0	927.3
Taylor	668.8	593.2	546.0	553.7	1,099.7	2,166.0	2,591.3	4,757.3
Union	158.7	87.6	102.8	29.6	132.4	561.9	165.2	727.1
Volusia	718.7	584.3	421.6	415.6	837.2	1,787.6	1,972.3	3,759.9

Table 3.— (Cont'd.)

County	Land area		Sawlog net volume (Int'l. ¼" log rule)			Total net volume (Standard cords)		
	Total	Forest	Softwood	Hardwood	Total	Softwood	Hardwood	Total
	Thous. acres	Thous. acres	Million bd. ft.	Million bd. ft.	Million bd. ft.	Thous. cords	Thous. cords	Thous. cords
Wakulla	385.3	333.7	249.4	176.9	426.3	1,063.6	944.5	2,008.1
Walton	700.8	648.4	380.7	192.6	573.3	1,356.3	983.2	2,339.5
Washington	396.8	314.0	224.6	334.4	559.0	781.9	1,682.3	2,464.2
All Counties	35,111.0	23,478.1	14,001.3	9,446.0	23,447.3	60,071.5	48,403.4	108,474.9

Table 4.—Estimated forest area and timber volume by county in Georgia, 1935-1936

County	Land area		Sawlog net volume (Int'l ¼" log rule)			Total net volume (Standard cords)		
	Total	Forest	Softwood	Hardwood	Total	Softwood	Hardwood	Total
	Thous. acres	Thous. acres	Million bd. ft.	Million bd. ft.	Million bd. ft.	Thous. cords	Thous. cords	Thous. cords
Appling	290.6	237.7	218.4	59.6	278.0	1,151.2	468.7	1,619.9
Atkinson	211.2	194.7	164.6	60.3	224.9	885.2	518.3	1,403.5
Bacon	173.4	144.8	116.0	24.2	140.2	586.8	228.4	815.2
Baker	228.5	95.8	89.7	14.7	104.4	403.7	87.3	491.0
Baldwin	196.5	112.8	305.1	67.0	372.1	1,095.5	407.7	1,503.2
Banks	142.1	56.4	93.8	35.1	128.9	340.5	241.1	581.6
Barrow	107.5	29.5	115.6	11.6	127.2	318.2	96.8	415.0
Bartow	301.4	149.5	185.3	32.3	217.6	745.4	259.3	1,004.7
Ben Hill	163.8	88.9	62.7	29.0	91.7	347.9	162.1	510.0
Berrien	291.2	228.8	182.0	112.6	294.6	849.3	648.8	1,498.1
Bibb	177.3	99.7	116.7	127.8	244.5	385.3	940.9	1,326.2
Bleckley	131.2	44.5	65.6	38.8	104.4	233.7	214.4	448.1
Brantley	277.8	258.0	348.2	98.0	446.2	1,432.2	902.2	2,334.4
Brooks	329.0	190.5	267.1	95.3	362.4	1,242.3	540.2	1,782.5
Bryan	275.8	231.8	386.5	237.4	623.9	1,571.4	1,317.5	2,888.9
Bulloch	427.5	260.1	330.3	203.1	533.4	1,491.1	1,128.3	2,619.4
Burke	611.8	226.4	282.6	192.4	475.0	830.1	954.6	1,784.7
Butts	129.9	60.8	182.5	31.2	213.7	596.5	201.4	797.9
Calhoun	181.8	92.2	117.7	140.1	257.8	356.3	694.2	1,050.5
Camden	455.0	291.9	456.6	180.1	636.7	1,990.6	1,020.3	3,010.9
Candler	145.9	86.0	114.7	54.6	169.3	450.5	407.0	857.5
Carroll	314.8	117.8	160.4	57.9	218.3	489.7	468.3	958.0
Catoosa	108.2	53.6	81.2	26.7	107.9	315.4	186.0	501.4
Charlton	506.9	464.1	354.7	105.4	460.1	1,622.2	983.5	2,605.7
Chatham	236.8	118.7	125.7	85.8	211.5	467.5	477.2	944.7
Chattahoochee	139.5	104.7	347.2	53.6	400.8	1,016.8	420.4	1,437.2
Chattooga	209.9	121.9	162.7	42.6	205.3	595.7	298.5	894.2
Cherokee	274.6	187.4	344.5	85.4	429.9	1,233.5	611.9	1,845.4
Clarke	73.0	21.3	21.6	12.5	34.1	111.7	61.4	173.1
Clay	129.9	40.3	37.2	12.3	49.5	143.8	56.6	200.4
Clayton	90.9	33.9	81.0	31.1	112.1	281.8	141.5	423.3
Clinch	478.1	463.5	340.9	264.6	605.5	1,900.1	1,636.7	3,536.8

Table 4.-- (Cont'd.)

County	Land area		Sawlog net volume (Int'l $\frac{1}{4}$ log rule)			Total net volume (Standard cords)		
	Total	Forest	Softwood	Hardwood	Total	Softwood	Hardwood	Total
	Thous. acres	Thous. acres	Million bd. ft.	Million bd. ft.	Million bd. ft.	Thous. cords	Thous. cords	Thous. cords
Cobb	222.7	81.6	167.6	55.0	222.6	597.6	283.9	881.5
Coffee	404.5	290.2	262.6	28.2	290.8	1,376.8	286.1	1,662.9
Colquitt	338.6	172.4	222.0	27.2	249.2	916.7	174.6	1,091.3
Columbia	224.0	118.1	258.5	35.2	293.7	948.0	272.7	1,220.7
Cook	154.2	93.9	111.6	36.7	148.3	461.6	294.8	756.4
Coweta	283.5	136.3	241.0	67.2	308.2	917.4	433.5	1,350.9
Crawford	204.2	139.8	163.8	106.6	270.4	623.4	617.5	1,240.9
Crisp	177.3	54.2	147.1	28.8	175.9	478.5	131.7	610.2
Dade	119.0	88.6	62.6	45.1	107.7	282.7	361.6	644.3
Dawson	138.2	94.9	163.2	62.7	225.9	577.3	416.4	993.7
Decatur	373.1	251.2	281.2	75.3	356.5	1,058.5	483.3	1,541.8
De Kalb	174.1	68.9	145.2	52.4	197.6	470.5	260.3	730.8
Dodge	275.8	120.7	207.6	36.3	243.9	918.6	309.4	1,228.0
Dooly	254.1	94.4	148.5	62.5	211.0	596.7	277.2	873.9
Dougherty	218.9	83.2	119.6	175.5	295.1	329.8	643.2	973.0
Douglas	133.1	82.2	109.6	28.9	138.5	390.5	204.3	594.8
Early	335.4	163.0	193.0	98.9	291.9	801.3	478.7	1,280.0
Echols	231.7	224.0	207.9	166.3	374.2	1,284.2	795.0	2,079.2
Effingham	286.7	226.8	276.4	353.6	630.0	1,233.0	1,453.4	2,686.4
Elbert	231.0	70.5	73.5	21.9	95.4	293.1	140.2	433.3
Emanuel	489.0	272.1	384.1	69.6	453.7	1,694.4	536.5	2,230.9
Evans	183.7	109.0	218.9	68.1	287.0	797.3	483.6	1,280.9
Fannin	256.6	216.0	191.8	205.6	397.4	624.7	1,256.4	1,881.1
Fayette	149.8	69.8	90.8	95.9	186.7	414.5	513.4	927.9
Floyd	325.7	163.8	316.6	44.8	361.4	1,192.5	317.6	1,510.1
Forsyth	158.1	77.8	191.0	62.0	253.0	677.6	487.2	1,164.8
Franklin	178.6	44.0	80.9	22.4	103.3	283.1	153.1	436.2
Fulton	349.4	149.1	391.1	96.8	487.9	1,210.1	592.8	1,802.9
Gilmer	281.6	242.8	302.2	166.6	468.8	1,138.0	1,437.0	2,575.0
Glascock	108.8	52.4	88.2	153.7	241.9	254.4	599.7	854.1
Glynn	281.0	180.1	248.2	179.9	428.1	1,097.9	1,161.5	2,259.4
Gordon	235.5	111.4	93.5	30.7	124.2	355.5	238.7	594.2

Table 4.—Estimated forest area and timber volume by county in Georgia, 1935-1936 (Cont'd.)

County	Land area		Sawlog net volume (Int'l ¼" log rule)			Total net volume (Standard cords)		
	Total	Forest	Softwood	Hardwood	Total	Softwood	Hardwood	Total
	Thous. acres	Thous. acres	Million bd. ft.	Million bd. ft.	Million bd. ft.	Thous. cords	Thous. cords	Thous. cords
Grady	284.2	158.0	443.2	141.7	584.9	1,426.7	688.0	2,114.7
Greene	266.2	171.7	290.9	72.1	363.0	1,242.2	465.4	1,707.6
Gwinnett	281.6	99.0	289.4	62.2	351.6	950.5	383.8	1,334.3
Habersham	185.6	127.1	231.0	52.5	283.5	836.5	492.8	1,329.3
Hall	279.7	125.0	181.3	37.7	219.0	779.4	385.2	1,164.6
Hancock	339.2	210.5	386.4	167.7	554.1	1,335.1	803.0	2,138.1
Haralson	181.8	70.3	109.0	32.3	141.3	354.8	258.6	613.4
Harris	320.6	236.7	493.9	78.9	572.8	1,970.4	499.0	2,469.4
Hart	167.0	45.2	46.2	13.1	59.3	196.8	85.4	282.2
Heard	182.4	93.8	130.9	31.5	162.4	482.8	242.4	725.2
Henry	207.4	77.8	145.2	55.0	200.2	554.4	317.1	871.5
Houston	283.5	118.5	180.4	173.5	353.9	551.9	975.5	1,527.4
Irwin	241.9	109.0	143.1	30.4	173.5	699.9	198.7	898.6
Jackson	227.2	66.5	90.0	33.5	123.5	355.4	185.1	540.5
Jasper	205.4	134.9	268.0	87.9	355.9	1,016.0	446.9	1,462.9
Jeff Davis	192.0	143.8	123.2	15.8	139.0	653.8	155.9	809.7
Jefferson	413.4	147.3	269.1	165.4	434.5	788.3	783.8	1,572.1
Jenkins	218.9	106.3	142.6	101.9	244.5	525.3	597.4	1,122.7
Johnson	186.9	66.3	99.3	64.1	163.4	406.3	385.6	791.9
Jones	241.3	164.2	414.5	55.9	470.4	1,448.3	560.5	2,008.8
Lamar	117.8	39.0	69.2	27.6	96.8	228.0	133.1	361.1
Lanier	122.2	97.4	136.7	18.0	154.7	586.3	167.7	754.0
Laurens	515.8	224.7	354.4	222.7	577.1	1,421.4	1,218.4	2,639.8
Lee	208.6	69.5	90.8	94.3	185.1	247.9	383.8	631.7
Liberty	347.5	271.5	383.8	209.7	593.5	1,545.4	1,149.5	2,694.9
Lincoln	186.2	83.2	118.8	23.6	142.4	428.7	225.5	654.2
Long	251.5	235.4	205.9	207.6	413.5	930.7	1,160.4	2,091.1
Lowndes	309.1	210.0	238.0	59.3	297.3	1,179.9	382.8	1,562.7
Lumpkin	179.2	153.8	269.1	100.8	369.9	904.9	674.9	1,579.8
McDuffie	183.7	85.2	206.8	53.4	260.2	683.9	436.2	1,120.1
McIntosh	300.8	191.1	311.5	318.9	630.4	1,135.8	1,579.1	2,714.9
Macon	212.5	76.1	114.0	113.6	227.6	339.4	557.7	897.1

Table 4. —Estimated forest area and timber volume by county in Georgia, 1935-1936 (Cont'd.)

County	Land area		Sawlog net volume (Int'l. $\frac{1}{4}$" log rule)			Total net volume (Standard cords)		
	Total	Forest	Softwood	Hardwood	Total	Softwood	Hardwood	Total
	Thous. acres	Thous. acres	Million bd. ft.	Million bd. ft.	Million bd. ft.	Thous. cords	Thous. cords	Thous. cords
Madison	181.8	54.2	135.1	30.4	165.5	466.7	172.4	639.1
Marion	230.4	140.1	174.8	92.7	267.5	569.2	520.4	1,089.6
Meriwether	317.4	132.2	265.6	106.9	372.5	876.6	578.2	1,454.8
Miller	161.9	103.8	98.1	41.8	139.9	458.2	220.7	678.9
Mitchell	350.7	112.9	129.1	8.1	137.2	543.7	45.7	589.4
Monroe	300.8	173.3	347.6	93.6	441.2	1,356.8	452.3	1,809.1
Montgomery	121.6	70.3	78.8	42.0	120.8	430.8	235.6	666.4
Morgan	249.6	162.9	318.2	118.1	436.3	1,162.3	735.9	1,898.2
Murray	218.9	167.8	237.7	72.5	310.2	920.4	565.0	1,485.4
Muscogee	150.4	83.2	422.3	33.6	455.9	1,063.6	325.8	1,389.4
Newton	167.7	67.7	129.9	27.3	157.2	475.7	181.7	657.4
Oconee	110.1	46.0	120.2	16.9	137.1	400.6	82.3	482.9
Oglethorpe	322.6	145.5	321.6	56.1	377.7	1,224.1	390.5	1,614.6
Paulding	207.4	113.9	193.6	29.5	223.1	631.3	283.1	914.4
Peach	114.6	49.6	116.0	28.1	144.1	319.5	189.2	508.7
Pickens	147.8	108.0	151.9	45.9	197.8	603.1	352.7	955.8
Pierce	220.8	184.6	197.5	62.3	259.8	894.1	600.6	1,494.7
Pike	151.7	45.1	114.3	16.3	130.6	375.4	135.8	511.2
Polk	202.9	84.9	121.8	11.0	132.8	428.5	126.6	555.1
Pulaski	165.1	64.7	83.8	90.2	174.0	256.5	454.7	711.2
Putnam	231.0	157.0	300.3	64.1	364.4	1,182.4	409.8	1,592.2
Quitman	92.2	57.6	77.3	20.6	97.9	296.8	219.7	516.5
Rabun	241.3	203.0	416.0	201.8	617.8	1,234.9	1,139.3	2,374.2
Randolph	263.7	114.9	168.2	107.1	275.3	489.6	646.0	1,135.6
Richmond	204.2	97.1	129.0	94.2	223.2	433.0	409.4	842.4
Rockdale	76.2	29.6	50.3	9.2	59.5	234.4	41.2	275.6
Schley	98.6	36.7	73.5	20.6	94.1	214.6	121.6	336.2
Screven	508.2	275.6	483.8	553.8	1,037.6	1,716.2	2,200.8	3,917.0
Seminole	153.6	81.2	40.4	46.3	86.7	211.8	172.7	384.5
Spalding	133.8	47.6	57.9	84.6	142.5	240.3	411.6	651.9
Stevens	106.2	58.9	95.5	10.0	105.5	370.0	138.2	508.2
Stewart	263.0	175.9	600.4	88.3	688.7	1,934.9	600.4	2,535.3
Sumter	291.8	113.0	238.5	114.1	352.6	604.7	578.6	1,183.3
Talbot	199.7	155.2	376.0	65.4	441.4	1,399.6	498.6	1,898.2
Taliaferro	135.7	86.3	166.0	59.4	225.4	624.3	251.3	875.6
Tattnall	298.2	219.6	190.9	199.3	390.2	846.5	930.9	1,777.4

Table 4. —Estimated forest area and timber volume by county in Georgia, 1935-1936 (Cont'd.)

County	Land area		Sawlog net volume (Int'l. ¼" log rule)			Total net volume (Standard cords)		
	Total	Forest	Softwood	Hardwood	Total	Softwood	Hardwood	Total
	Thous. acres	Thous. acres	Million bd. ft.	Million bd. ft.	Million bd. ft.	Thous. cords	Thous. cords	Thous. cords
Taylor	217.6	124.9	155.7	53.7	209.4	482.7	451.4	934.1
Telfair	238.7	161.2	219.9	65.8	285.7	1,003.8	413.2	1,417.0
Terrell	206.1	46.3	159.4	78.9	238.3	399.2	418.3	817.5
Thomas	339.2	188.6	483.8	63.3	547.1	1,646.3	401.1	2,047.4
Tift	155.5	71.5	94.1	7.8	101.9	437.6	86.9	524.5
Toombs	251.5	143.2	168.2	32.2	200.4	764.3	338.8	1,103.1
Towns	115.8	85.1	12.7	110.1	122.8	50.9	590.5	641.4
Treutlen	167.7	103.3	202.4	18.7	221.1	898.5	213.9	1,112.4
Troup	278.4	139.0	226.3	40.6	266.9	880.5	262.5	1,143.0
Turner	147.8	93.9	97.9	11.7	109.6	442.8	66.6	509.4
Twiggs	201.0	121.0	212.5	178.7	391.2	719.5	789.6	1,509.1
Union	207.4	160.8	38.5	205.1	243.6	160.4	1,165.0	1,325.4
Upson	202.9	107.8	403.8	39.3	443.1	1,217.8	270.6	1,488.4
Walker	276.5	139.6	176.4	66.5	242.9	654.3	484.3	1,138.6
Walton	211.8	74.1	244.3	25.7	270.0	726.1	169.4	895.5
Ware	493.4	426.5	190.2	60.7	250.9	1,012.2	425.1	1,437.3
Warren	258.6	116.8	297.1	109.4	406.5	960.7	598.0	1,558.7
Washington	428.2	199.7	427.7	198.3	626.0	1,444.7	1,223.0	2,667.7
Wayne	393.6	331.5	280.9	335.4	616.3	1,408.9	1,503.4	2,912.3
Webster	193.3	83.7	113.2	134.5	247.7	381.6	554.6	936.2
Wheeler	169.0	114.4	157.6	61.0	218.6	633.2	338.4	971.6
White	156.8	123.6	202.2	77.6	279.8	714.9	479.3	1,194.2
Whitfield	181.1	77.7	102.1	29.3	131.4	433.9	229.9	663.8
Wilcox	257.9	159.3	143.9	46.8	190.7	655.3	209.7	865.0
Wilkes	293.1	162.4	254.3	70.2	324.5	1,078.3	505.4	1,583.7
Wilkinson	302.1	195.0	319.0	298.0	617.0	1,120.8	1,487.9	2,608.7
Worth	416.6	201.7	269.2	40.9	310.1	1,153.5	245.1	1,398.6
All Counties	37,584.0	21,432.5	32,270.4	13,528.4	45,798.8	122,959.0	79,197.2	202,156.2

Table 5.—Estimated forest area and timber volume by county in Louisiana, 1934-1935

County	Land area		Sawlog net volume (Int'l ¼" log rule)			Total net volume (Standard cords)		
	Total	Forest	Softwood	Hardwood	Total	Softwood	Hardwood	Total
	Thous. acres	Thous. acres	Million bd. ft.	Million bd. ft.	Million bd. ft.	Thous. cords	Thous. cords	Thous. cords
Acadia	414.1	77.2	-	240.0	240.0	-	876.7	876.7
Allen	424.3	353.6	227.0	191.4	418.4	787.4	1,073.3	1,860.7
Ascension	182.4	121.1	-	270.6	270.6	-	1,387.4	1,387.4
Assumption	309.8	207.7	-	232.4	232.4	-	1,738.1	1,738.1
Avoyelles	542.1	350.2	15.9	735.2	751.1	83.3	2,813.4	2,896.7
Beauregard	750.1	676.6	370.7	223.0	593.7	1,301.2	1,300.7	2,601.9
Bienville	542.7	337.7	702.6	432.1	1,134.7	2,455.7	2,195.8	4,651.5
Bossier	552.3	374.1	464.7	368.3	833.0	1,813.6	1,871.2	3,684.8
Caddo	563.2	284.8	391.7	301.5	693.2	1,265.6	1,680.9	2,946.5
Calcasieu	695.0	272.6	165.0	245.1	410.1	689.8	1,130.8	1,820.6
Caldwell	339.8	286.6	681.7	622.9	1,304.6	2,192.2	2,398.0	4,590.2
Cameron	960.6	0	0	0	0	0	0	0
Catahoula	459.5	373.4	96.3	1,249.1	1,345.4	414.9	4,300.9	4,715.8
Claiborne	497.9	207.0	301.3	211.5	512.8	1,212.6	1,180.3	2,392.9
Concordia	457.0	385.6	-	1,809.9	1,809.9	-	5,460.8	5,460.8
De Soto	558.1	307.0	545.6	315.8	861.4	2,015.4	1,750.5	3,765.9
E. Baton Rouge	291.2	174.0	-	393.3	393.3	-	1,542.7	1,542.7
East Carroll	268.8	178.6	-	748.8	748.8	-	2,642.3	2,642.3
East Feliciana	297.0	142.5	-	407.6	407.6	-	1,533.2	1,533.2
Evangeline	435.8	273.4	39.1	818.6	857.7	161.4	2,808.4	2,969.8
Franklin	403.2	205.3	-	592.2	592.2	-	2,170.4	2,170.4
Grant	437.1	348.4	494.5	318.9	813.4	1,763.2	1,445.3	3,208.5
Iberia	377.0	148.6	-	234.8	234.8	-	1,376.7	1,376.7
Iberville	373.8	263.3	-	513.4	513.4	-	2,649.3	2,649.3
Jackson	369.9	263.4	605.5	387.2	992.7	2,208.0	1,949.9	4,157.9
Jefferson	272.6	52.6	-	49.7	49.7	-	455.9	455.9
Jefferson Davis	466.6	83.7	48.4	184.7	233.1	148.1	596.8	744.9
Lafayette	178.6	28.8	-	80.4	80.4	-	341.4	341.4
Lafourche	634.2	193.5	-	277.8	277.8	-	2,197.5	2,197.5
La Salle	409.6	358.8	345.8	376.7	722.5	1,171.9	1,742.6	2,914.5
Lincoln	302.1	143.5	249.5	142.6	392.1	956.5	861.3	1,817.8
Livingston	427.5	388.2	319.0	818.0	1,137.0	1,153.9	3,136.8	4,290.7
Madison	416.0	323.0	-	1,440.6	1,440.6	-	5,218.6	5,218.6
Morehouse	534.4	348.6	162.3	667.2	829.5	526.6	2,505.6	3,032.2
Natchitoches	825.0	617.4	1,101.6	614.2	1,715.8	3,617.8	2,969.6	6,587.4
Orleans	125.4	22.1	-	1.4	1.4	-	61.6	61.6

Table 5.—Estimated forest area and timber volume by county in Louisiana, 1934-1935 (Cont'd.)

County	Land area		Sawlog net volume (Int'l ¼" log rule)			Total net volume (Standard cords)		
	Total	Forest	Softwood	Hardwood	Total	Softwood	Hardwood	Total
	Thous. acres	Thous. acres	Million bd. ft.	Million bd. ft.	Million bd. ft.	Thous. cords	Thous. cords	Thous. cords
Ouachita	410.9	261.2	149.8	316.4	466.2	617.0	1,519.1	2,136.1
Plaquemines	644.5	14.3	-	-	-	-	25.6	25.6
Pointe Coupee	368.6	277.6	-	733.0	733.0	-	2,903.8	2,903.8
Rapides	876.8	636.3	888.8	702.3	1,591.1	2,393.3	3,046.9	5,440.2
Red River	256.0	117.1	200.6	210.6	411.2	662.3	960.6	1,622.9
Richland	359.0	188.5	-	462.7	462.7	-	1,823.6	1,823.6
Sabine	652.8	525.5	1,073.6	811.0	1,884.6	4,095.6	3,349.7	7,445.3
St. Bernard	394.9	60.7	-	57.6	57.6	-	870.8	870.8
St. Charles	188.8	106.2	-	173.8	173.8	-	1,269.6	1,269.6
St. Helena	268.8	202.4	366.7	144.1	510.8	1,380.6	909.1	2,289.7
St. James	161.3	53.6	-	109.8	109.8	-	555.3	555.3
St. John the Baptist	149.1	35.7	-	25.5	25.5	-	384.1	384.1
St. Landry	617.0	301.9	-	694.8	694.8	-	3,007.6	3,007.6
St. Martin	336.0	251.7	-	379.9	379.9	-	2,206.6	2,206.6
St. Mary	404.5	116.1	-	172.4	172.4	-	1,145.0	1,145.0
St. Tammany	579.8	475.7	714.0	651.4	1,365.4	2,069.3	2,516.4	4,585.7
Tangipahoa	505.6	405.2	424.8	552.0	976.8	1,532.5	1,954.5	3,487.0
Tensas	404.5	287.8	-	1,122.5	1,122.5	-	3,841.1	3,841.1
Terrebonne	1,123.8	61.9	-	73.2	73.2	-	462.5	462.5
Union	587.5	374.8	836.5	616.5	1,453.0	2,801.2	2,474.6	5,275.8
Vermillion	776.3	58.4	-	170.5	170.5	-	744.7	744.7
Vernon	874.9	800.3	605.1	983.4	1,588.5	2,025.1	3,481.9	5,507.0
Washington	419.2	317.3	487.6	284.6	772.2	1,442.9	1,425.2	2,868.1
Webster	389.8	197.5	280.8	303.6	584.4	1,077.1	1,501.5	2,578.6
W. Baton Rouge	137.0	72.0	-	350.9	350.9	-	1,162.0	1,162.0
West Carroll	234.2	145.6	-	322.4	322.4	-	1,423.1	1,423.1
West Feliciana	225.3	163.7	-	537.2	537.2	-	1,859.1	1,859.1
Winn	620.2	513.8	1,077.9	509.5	1,587.4	3,632.4	2,827.0	6,459.4
All Counties	29,061.8	16,195.7	14,434.4	27,988.5	42,422.9	49,668.4	119,015.7	168,684.1

Table 6.—Estimated forest area and timber volume by county in Mississippi, 1932-1935

County	Land area		Sawlog net volume (Int'l. ¼" log rule)			Total net volume (Standard cords)		
	Total	Forest	Softwood	Hardwood	Total	Softwood	Hardwood	Total
	Thous. acres	Thous. acres	Million bd. ft.	Million bd. ft.	Million bd. ft.	Thous. cords	Thous. cords	Thous. cords
Adams	272.6	188.7	211.7	532.7	744.4	585.4	1,958.9	2,544.3
Alcorn	247.0	85.0	35.8	89.4	125.2	253.6	555.5	809.1
Amite	457.0	275.0	524.8	227.8	752.6	1,790.5	1,160.3	2,950.8
Attala	457.6	229.0	274.5	209.8	484.3	1,174.7	1,127.2	2,301.9
Benton	253.4	111.2	55.3	126.1	181.4	254.4	805.0	1,059.4
Bolivar	562.5	143.8	-	360.0	360.0	-	1,391.9	1,391.9
Calhoun	370.6	183.7	226.2	162.0	388.2	1,059.8	1,052.8	2,112.6
Carroll	399.4	148.3	157.0	214.3	371.3	554.7	1,033.3	1,588.0
Chickasaw	320.6	105.8	48.7	71.2	119.9	189.4	627.6	817.0
Choctaw	265.0	172.8	284.9	164.5	449.4	1,117.2	1,181.5	2,298.7
Claiborne	313.0	203.5	289.0	580.2	869.2	782.2	2,277.9	3,060.1
Clarke	432.0	296.9	327.0	222.5	549.5	1,318.0	1,222.9	2,540.9
Clay	261.1	103.9	6.7	214.8	221.5	20.7	1,170.0	1,190.7
Coahoma	339.2	106.3	-	501.0	501.0	-	1,564.8	1,564.8
Copiah	492.2	327.7	635.4	414.8	1,050.2	2,165.8	1,975.2	4,141.0
Covington	262.4	165.2	256.8	123.9	380.7	896.8	825.6	1,722.4
DeSoto	304.0	44.6	-	111.0	111.0	-	431.1	431.1
Forrest	295.7	222.0	108.0	45.6	153.6	409.3	317.0	726.3
Franklin	350.1	255.8	527.2	255.1	782.3	1,993.4	1,336.3	3,329.7
George	304.0	271.1	242.8	260.2	503.0	860.8	1,244.3	2,105.1
Greene	454.4	415.8	416.8	184.2	601.0	1,405.4	1,187.5	2,592.9
Grenada	282.9	157.4	134.0	265.1	399.1	516.3	1,143.0	1,659.3
Hancock	300.2	257.7	157.2	97.7	254.9	765.4	578.3	1,343.7
Harrison	364.8	316.7	166.1	82.1	248.2	778.5	549.1	1,327.6
Hinds	549.1	199.3	335.1	302.1	637.2	963.4	1,241.3	2,204.7
Holmes	480.6	185.3	130.9	550.5	681.4	497.1	1,959.0	2,456.1
Humphreys	261.1	132.0	-	382.6	382.6	-	1,304.3	1,304.3
Issaquena	259.8	179.5	-	528.4	528.4	-	1,767.5	1,767.5
Itawamba	338.6	198.8	148.5	228.0	376.5	731.7	1,079.4	1,811.1
Jackson	454.4	388.7	184.5	228.3	412.8	796.2	1,268.7	2,064.9
Jasper	426.9	265.7	567.9	210.6	778.5	1,729.9	1,094.4	2,824.3
Jefferson	324.5	204.2	379.5	682.3	1,061.8	1,165.2	2,068.1	3,233.3
Jefferson Davis	258.6	130.1	156.1	78.0	234.1	533.0	491.0	1,024.0
Jones	445.4	313.1	330.5	193.4	523.9	1,122.4	1,277.3	2,399.7

Table 6.—Estimated forest area and timber volume by county in Mississippi, 1932-1935 (Cont'd.)

County	Land area		Sawlog net volume (Int'l. ¼" log rule)			Total net volume (Standard cords)		
	Total	Forest	Softwood	Hardwood	Total	Softwood	Hardwood	Total
	Thous. acres	Thous. acres	Million bd. ft.	Million bd. ft.	Million bd. ft.	Thous. cords	Thous. cords	Thous. cords
Kemper	481.3	291.1	451.0	293.6	744.6	1,579.4	1,608.4	3,187.8
Lafayette	425.0	188.2	159.7	204.8	364.5	617.7	1,173.3	1,791.0
Lamar	316.8	261.4	191.5	120.8	312.3	696.1	773.2	1,469.3
Lauderdale	448.0	267.9	471.1	197.7	668.8	1,585.7	1,130.3	2,716.0
Lawrence	267.5	170.2	201.6	177.9	379.5	749.6	885.3	1,634.9
Leake	368.6	209.9	775.5	305.0	1,080.5	2,153.4	1,370.6	3,524.0
Lee	286.7	60.9	9.8	53.5	63.3	30.3	336.8	367.1
Leflore	366.1	108.9	-	354.0	354.0	-	1,317.6	1,317.6
Lincoln	369.9	212.1	334.9	128.4	463.3	1,234.5	852.3	2,086.8
Lowndes	319.4	83.1	79.0	183.1	262.1	256.2	793.8	1,050.0
Madison	464.0	152.4	92.2	279.6	371.8	345.8	1,041.1	1,386.9
Marion	342.4	244.3	208.2	180.0	388.2	725.6	1,046.5	1,772.1
Marshall	441.0	66.4	4.9	144.7	149.6	13.2	707.7	720.9
Monroe	492.8	212.7	176.7	255.7	432.4	677.0	1,411.5	2,088.5
Montgomery	254.7	124.5	139.4	141.5	280.9	606.8	751.1	1,357.9
Neshoba	359.0	202.0	404.9	182.4	587.3	1,295.2	1,014.6	2,309.8
Newton	363.5	139.8	222.3	156.3	378.6	730.9	828.6	1,559.5
Noxubee	436.5	156.2	240.0	154.0	394.0	724.2	831.7	1,555.9
Oktibbeha	292.5	98.3	83.8	70.8	154.6	400.9	632.6	1,033.5
Panola	445.4	146.7	0.2	222.3	222.5	-	1,175.5	1,175.5
Pearl River	510.0	457.3	251.9	312.6	564.5	936.8	1,585.8	2,522.6
Perry	412.2	372.8	229.0	129.9	358.9	878.2	836.5	1,714.7
Pike	260.5	111.4	172.5	109.4	281.9	593.4	581.9	1,175.3
Pontotoc	316.2	88.3	65.4	91.0	156.4	289.8	594.8	884.6
Prentiss	261.8	115.6	84.2	121.8	206.0	436.9	709.0	1,145.9
Quitman	252.8	85.8	-	143.3	143.3	-	648.8	648.8
Rankin	506.2	371.9	567.8	442.1	1,009.9	1,871.0	1,793.2	3,664.2
Scott	382.1	203.6	185.1	124.9	310.0	703.0	654.5	1,357.5
Sharkey	270.1	150.4	-	626.3	626.3	-	1,880.4	1,880.4
Simpson	368.0	235.6	259.9	196.6	456.5	883.2	1,136.1	2,019.3
Smith	400.6	271.8	351.9	299.7	651.6	1,179.7	1,310.6	2,490.3
Stone	283.5	258.4	190.2	126.3	316.5	688.1	738.0	1,426.1
Sunflower	431.4	75.1	-	207.2	207.2	-	719.3	719.3
Tallahatchie	402.6	169.4	50.5	324.5	375.0	161.1	1,277.1	1,438.2

Table 6.— (Cont'd.)

County	Land area		Sawlog net volume (Int'l. $\frac{1}{4}$" log rule)			Total net volume (Standard cords)		
	Total	Forest	Softwood	Hardwood	Total	Softwood	Hardwood	Total
	Thous. acres	Thous. acres	Million bd. ft.	Million bd. ft.	Million bd. ft.	Thous. cords	Thous. cords	Thous. cords
Tate	256.0	29.5	-	94.2	94.2	-	376.7	376.7
Tippah	285.4	131.5	97.7	155.9	253.6	418.5	912.3	1,330.8
Tishomingo	273.9	166.4	159.2	116.7	275.9	827.6	853.3	1,680.9
Tunica	267.5	133.4	-	322.6	322.6	-	1,412.3	1,412.3
Union	263.7	77.3	51.0	73.6	124.6	169.1	458.6	627.7
Walthall	249.0	132.1	81.4	70.1	151.5	284.1	417.7	701.8
Warren	366.1	266.9	79.3	727.4	806.7	206.1	2,492.7	2,698.8
Washington	462.7	130.7	-	301.2	301.2	-	1,133.3	1,133.3
Wayne	519.6	413.6	447.4	181.1	628.5	1,609.7	1,223.4	2,833.1
Webster	266.2	155.3	167.0	120.2	287.2	803.3	858.8	1,662.1
Wilkinson	426.9	279.3	603.9	519.2	1,123.1	1,617.9	2,024.5	3,642.4
Winston	382.1	220.9	387.4	282.5	669.9	1,285.7	1,531.2	2,816.9
Yalobusha	313.6	101.6	58.5	101.1	159.6	252.6	674.2	926.8
Yazoo	579.2	301.1	17.4	780.4	797.8	65.5	2,766.1	2,831.6
All Counties	29,671.7	15,888.6	16,124.2	19,808.1	35,932.3	57,015.0	91,551.6	148,566.6

Table 7.—Estimated forest area and timber volume by county in Oklahoma, 1936

County	Land area		Sawlog net volume (Int'l. $\frac{1}{4}$" log rule)			Total net volume (Standard cords)		
	Total	Forest	Softwood	Hardwood	Total	Softwood	Hardwood	Total
	Thous. acres	Thous. acres	Million bd. ft.	Million bd. ft.	Million bd. ft.	Thous. cords	Thous. cords	Thous. cords
Haskell	393.6	176.1	13.5	19.2	32.7	35.8	207.9	243.7
Latimer	470.4	357.2	126.5	74.9	201.4	471.9	773.1	1,245.0
LeFlore	1,032.9	714.6	583.1	212.7	795.8	2,033.3	1,757.6	3,790.9
McCurtain	1,214.1	994.4	866.4	585.9	1,452.3	2,930.5	4,402.3	7,332.8
Pushmataha	915.2	718.7	924.8	213.8	1,138.6	2,556.2	1,555.5	4,111.7
All Counties	4,026.2	2,961.0	2,514.3	1,106.5	3,620.8	8,027.7	8,696.4	16,724.1

Table 8.—Estimated forest area and timber volume by county in Texas, 1935

County	Land area		Sawlog net volume (Int'l. ¼" log rule)			Total net volume (Standard cords)		
	Total	Forest	Softwood	Hardwood	Total	Softwood	Hardwood	Total
	Thous. acres	Thous. acres	Million bd. ft.	Million bd. ft.	Million bd. ft.	Thous. cords	Thous. cords	Thous. cords
Anderson	600.3	358.3	437.6	293.6	731.2	1,495.4	1,611.5	3,106.9
Angelina	601.6	498.7	985.2	452.0	1,437.2	3,725.1	2,355.8	6,080.9
Bowie	558.7	246.1	206.0	135.0	341.0	929.3	860.9	1,790.2
Camp	132.5	38.4	81.2	25.5	106.7	278.6	122.8	401.4
Cass	608.6	284.9	424.5	338.6	763.1	1,783.5	1,907.9	3,691.4
Cherokee	671.4	299.0	461.7	191.1	652.8	1,871.8	1,165.5	3,037.3
Franklin	185.0	62.9	18.6	79.1	97.7	68.8	427.5	496.3
Gregg	199.7	89.5	138.6	79.8	218.4	595.9	518.8	1,114.7
Hardin	551.7	503.0	968.5	712.5	1,681.0	3,256.3	3,488.3	6,744.6
Harris	1,058.5	193.9	383.6	234.8	618.4	1,487.0	1,071.9	2,558.9
Harrison	558.1	224.4	306.1	232.9	539.0	1,204.1	1,256.0	2,460.1
Houston	787.8	416.7	846.1	243.3	1,089.4	2,988.1	1,382.1	4,370.2
Jasper	625.9	579.9	927.6	733.7	1,661.3	2,945.5	2,972.5	5,918.0
Jefferson	588.8	80.9	214.9	101.8	316.7	741.3	544.8	1,286.1
Liberty	742.4	451.3	566.2	834.4	1,400.6	2,202.4	3,991.7	6,194.1
Marion	250.2	157.7	336.5	126.0	462.5	1,410.4	803.9	2,214.3
Montgomery	650.9	525.0	916.9	344.1	1,261.0	3,973.9	2,057.9	6,031.8
Morris	165.8	67.8	98.1	58.9	157.0	330.1	399.8	729.9
Nacogdoches	677.8	387.2	749.0	148.6	897.6	3,193.5	1,161.0	4,354.5
Newton	569.0	493.8	744.0	399.3	1,143.3	2,508.2	2,084.5	4,592.7
Orange	232.3	171.1	158.2	268.1	426.3	715.7	1,169.4	1,885.1
Panola	538.9	301.0	538.8	352.0	890.8	1,974.0	1,654.7	3,628.7
Polk	778.9	643.5	1,859.9	722.8	2,582.7	6,024.5	3,169.2	9,193.7
Red River	665.0	238.0	177.1	209.1	386.2	544.0	1,141.8	1,685.8
Rusk	629.1	321.0	573.6	262.5	836.1	2,169.0	1,540.0	3,709.0
Sabine	377.0	329.0	445.7	443.2	888.9	1,802.2	1,951.0	3,753.2
San Augustine	398.1	247.0	260.0	223.6	483.6	1,131.6	1,117.1	2,248.7
San Jacinto	371.8	294.1	653.9	352.3	1,006.2	2,489.8	1,596.2	4,086.0
Shelby	533.1	287.3	700.6	165.3	865.9	2,740.7	1,119.9	3,860.6
Smith	588.8	162.7	125.5	117.8	243.3	501.2	764.3	1,265.5
Titus	254.7	96.2	5.4	111.8	117.2	19.1	605.7	624.8
Trinity	458.2	355.8	713.2	190.1	903.3	2,693.2	1,144.3	3,837.5

Table 8. —Estimated forest area and lumber volume by county in Texas, 1935 (Cont'd.)

County	Land area		Sawlog net volume (Int'l. ¼" log rule)			Total net volume (Standard cords)		
	Total	Forest	Softwood	Hardwood	Total	Softwood	Hardwood	Total
	Thous. acres	Thous. acres	Million bd. ft.	Million bd. ft.	Million bd. ft.	Thous. cords	Thous. cords	Thous. cords
Tyler	581.1	518.6	1,139.1	606.5	1,745.6	3,822.2	3,127.4	6,949.6
Upshur	384.0	168.8	225.4	102.5	327.9	922.6	691.7	1,614.3
Walker	519.7	318.9	626.8	128.6	755.4	2,255.0	865.4	3,120.4
Wood	420.5	155.0	115.5	71.1	186.6	554.5	480.3	1,034.8
All Counties	18,515.9	10,567.4	18,129.6	10,092.3	28,221.9	67,348.5	52,323.5	119,672.0