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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-

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.

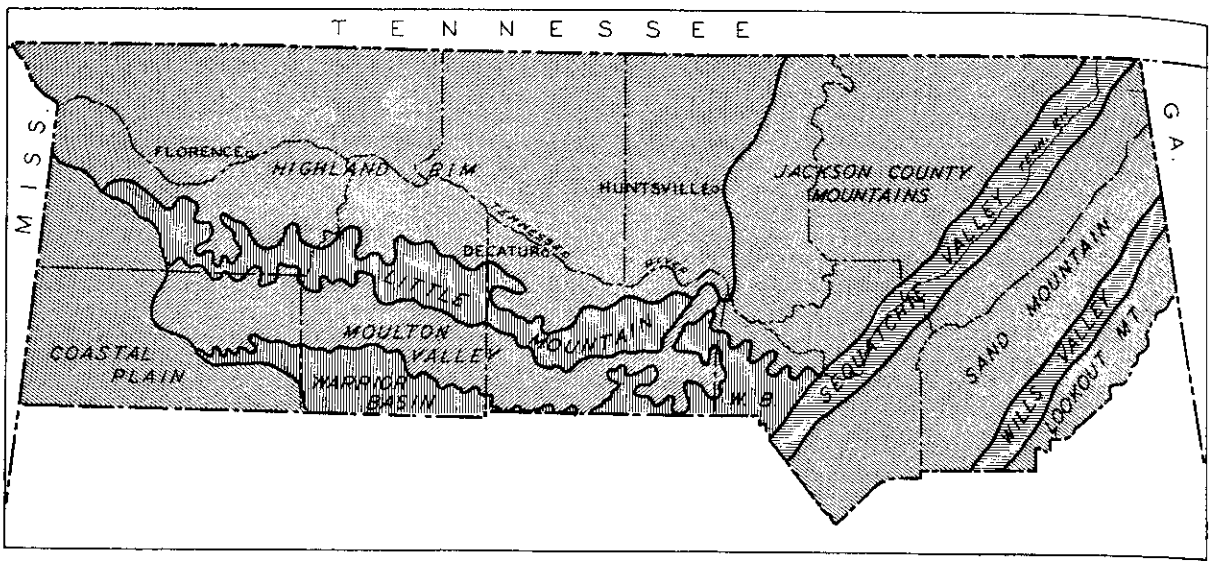


FIGURE 1 - PHYSICAL DIVISIONS OF ALABAMA UNIT NO. - 6.

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				Total
		None or arrested	Sheet	Shoe-string	Gullies	
	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 timber 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.

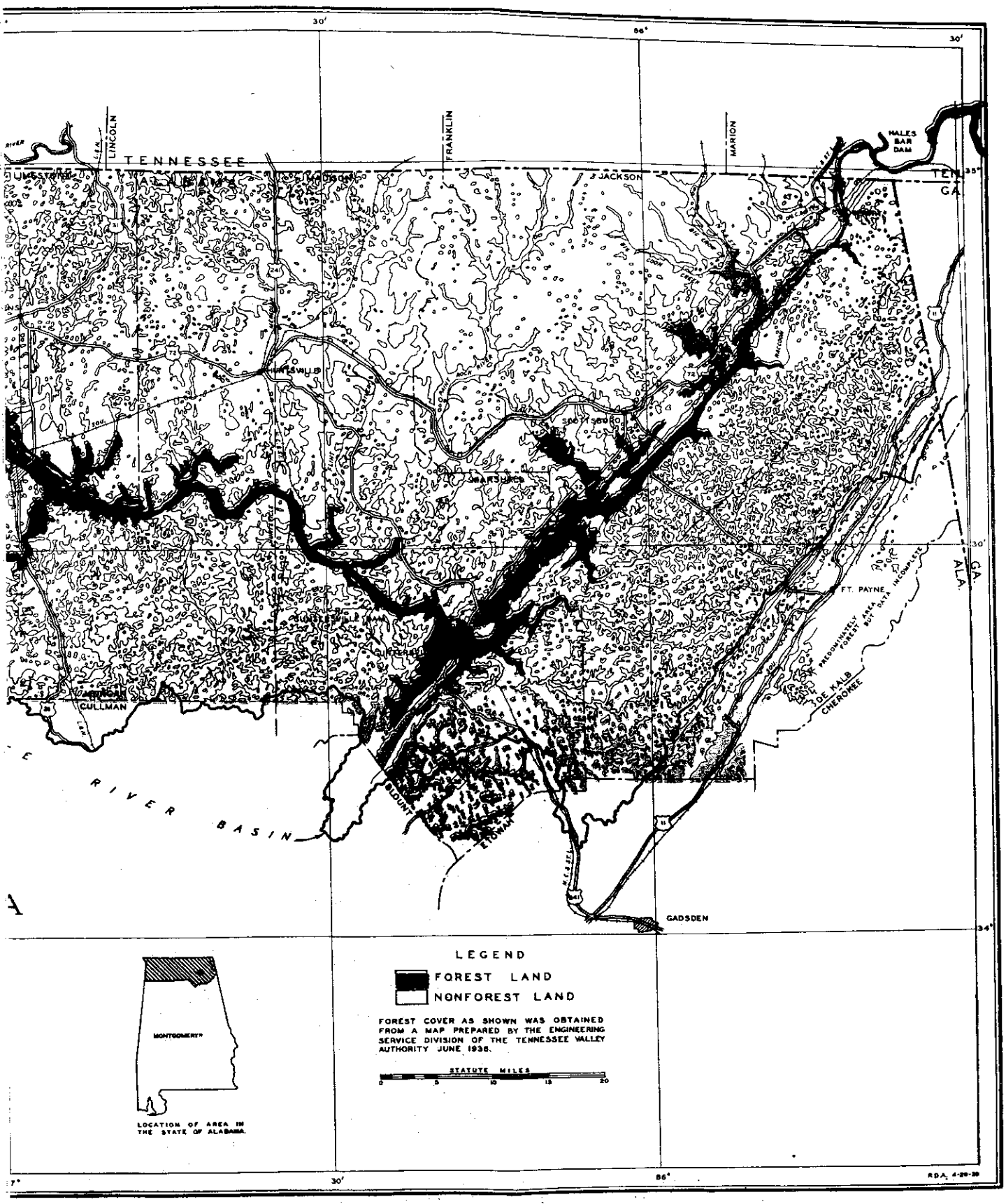
An aerial view of the Jackson County Mountains shows an almost continuous forest cover with cultivated lands confined largely to the narrow stream bottoms and an occasional farm high on a level mountain top. Since thin soils, rough, stony land, and steep slopes are not conducive to successful agriculture, 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.

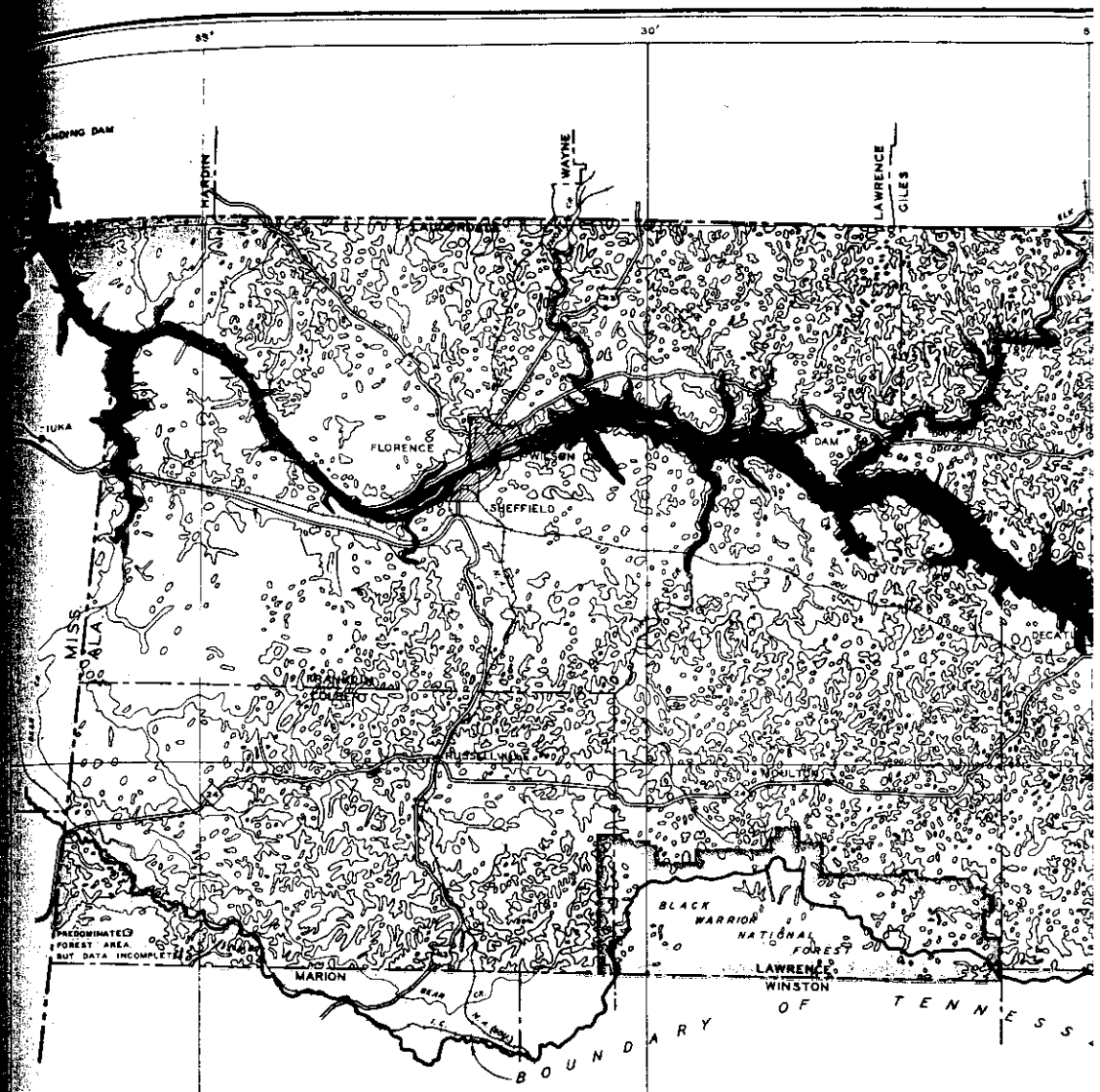
Shortleaf pine is the most abundant tree in the unit, followed by red oaks, hickories, and loblolly pine, but many other species, such as forked-leaf white oak, scrub oaks, Virginia pine, red gum, maple, chestnut oaks, and yellow poplar, are plentiful. The various species are greatly intermingled, but 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


30'
86°
TENNESSEE
LINCOLN
FRANKLIN
MARION
JACKSON
WALES BAR DAM
TEN
GA
ALA
FT. PAYNE
DE KALB
CHEROKEE
CULLMAN
GADSDEN
RIVER BASIN
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 1936.
STATUTE MILES
0 5 10 15 20
MONTGOMERY
LOCATION OF AREA IN THE STATE OF ALABAMA.
RDA 4-20-39

GURE 2.



FOREST COVER
IN THE
TENNESSEE VALLEY AREA
OF
NORTH ALABAMA

FOREST SURVEY
SOUTHERN FOREST EXPERIMENT STATION

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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 volume1/ in various species, 1936

Species	Forest type-groups				All type-groups
	Pine	Pine-hardwoods	Upland hardwoods	Bottom-land hardwoods	
	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.

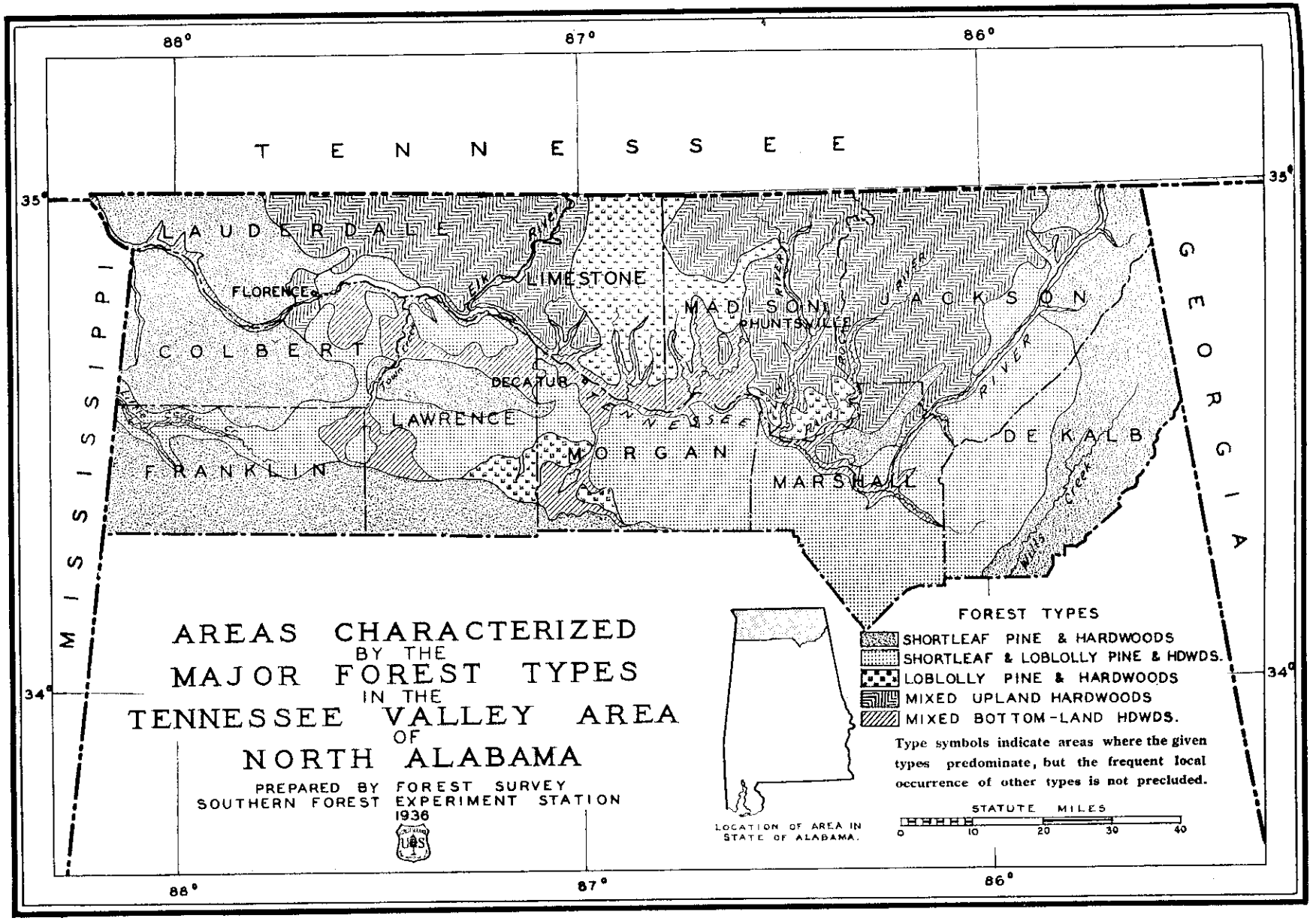

88°
87°
86°
TENNESSEE
35°
LAUDERDALE
FLORENCE
LIMESTONE
MADISON
HUNTSVILLE
JACKSON
COLBERT
DECATUR
LAWRENCE
MORGAN
MARSHALL
DE KALB
FRANKLIN
MISSISSIPPI
GEORGIA
34°
AREAS CHARACTERIZED
BY THE
MAJOR FOREST TYPES
IN THE
TENNESSEE VALLEY AREA
OF
NORTH ALABAMA
PREPARED BY FOREST SURVEY
SOUTHERN FOREST EXPERIMENT 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.

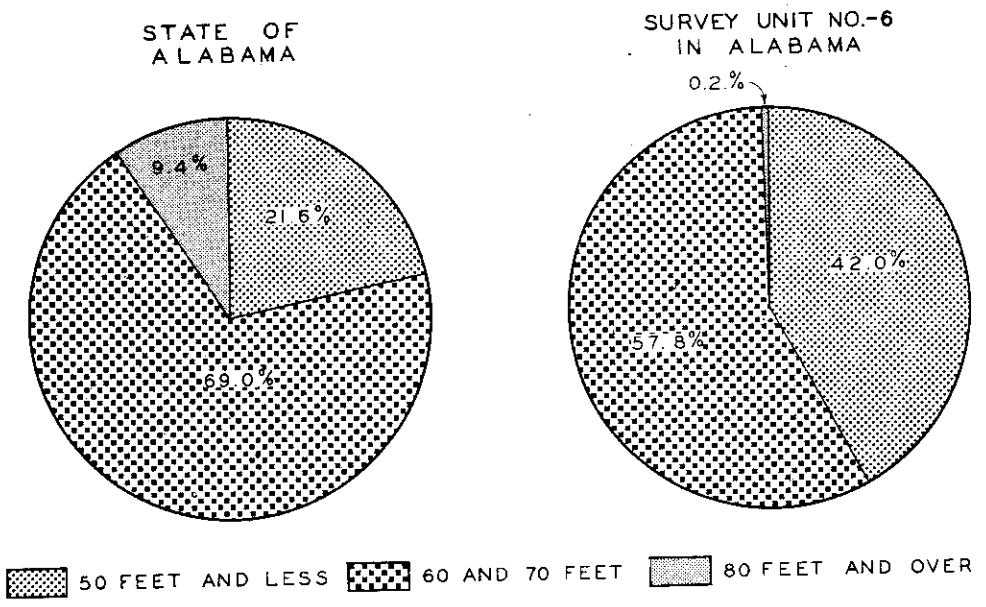


FIGURE 4.- PERCENTAGE OF SHORTLEAF PINE AREA IN VARIOUS SITES.

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.

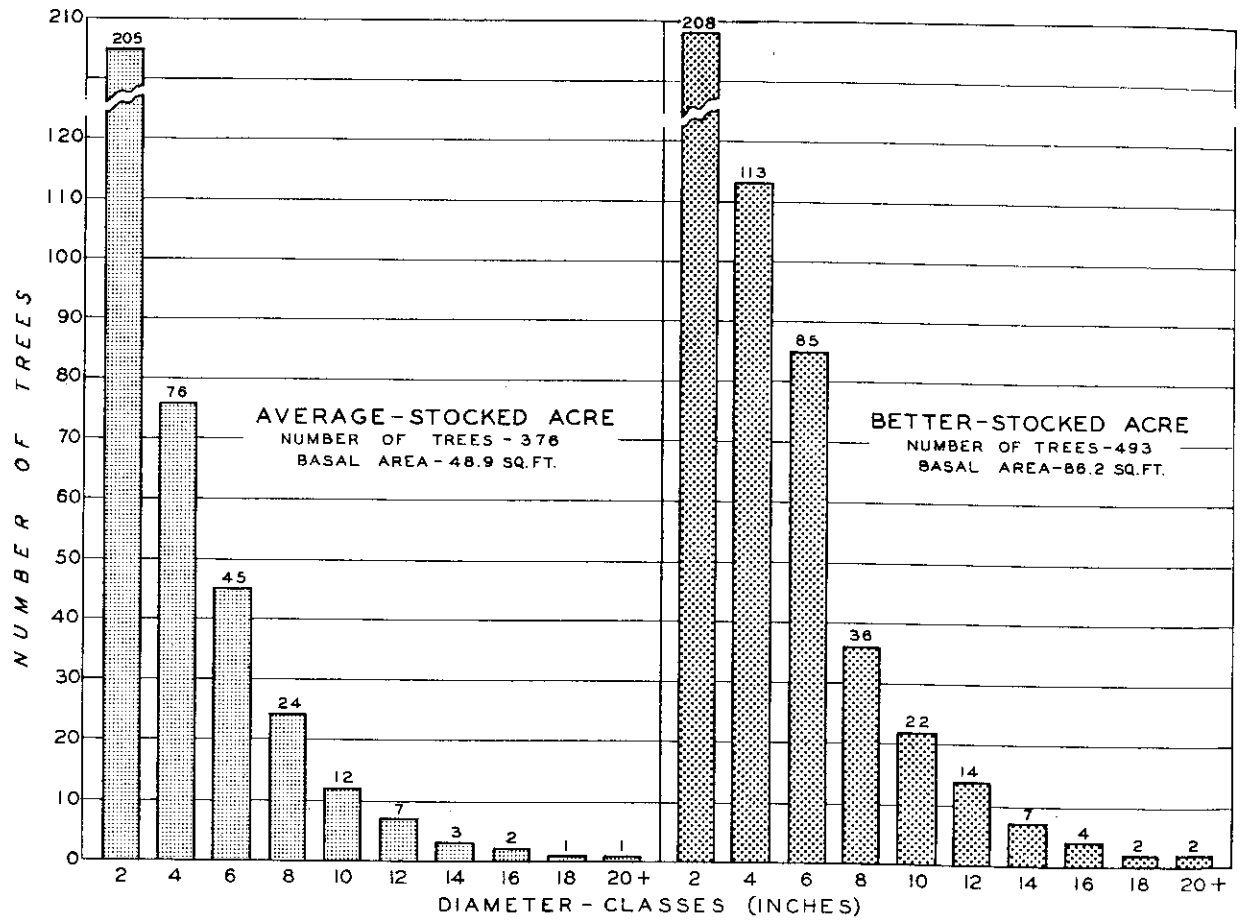


FIGURE 5 – NUMBER OF TREES BY DIAMETER-CLASSES ON AN ACRE OF AVERAGE STOCKING, COMPARED WITH THOSE ON A BETTER STOCKED ACRE (BASED ON PINE AND PINE-HARDWOOD TYPES).

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.

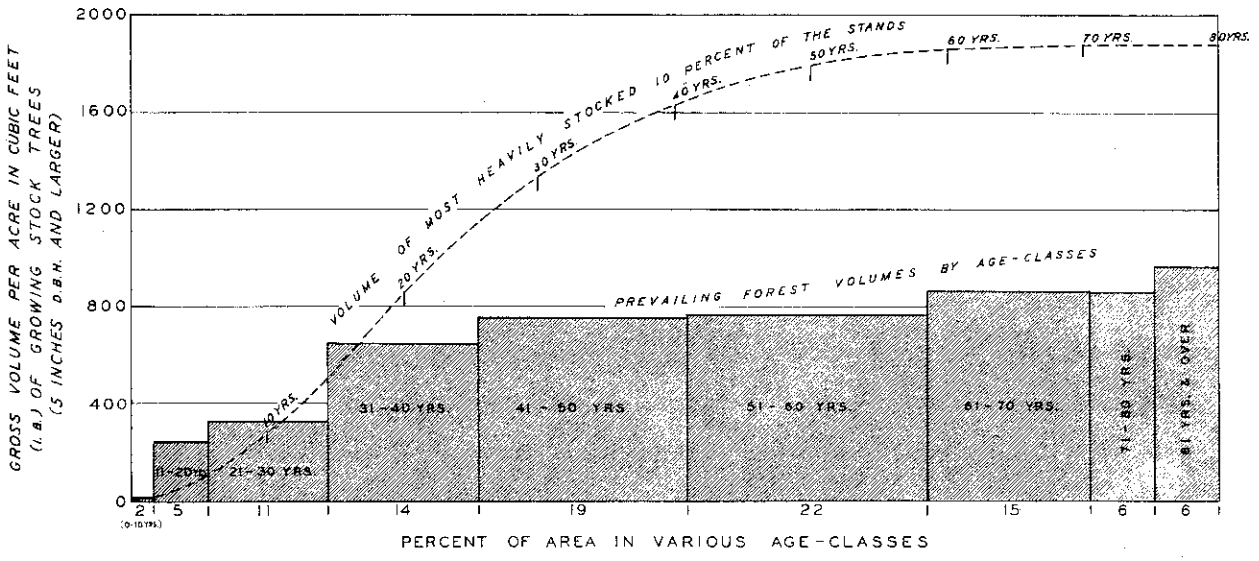


FIGURE 6. — PREVAILING VOLUMES, BY AGE-CLASSES, COMPARED WITH THOSE IN WELL-STOCKED STANDS (BASED ON PINE AND PINE-HARDWOOD TYPE-AREAS OF 1,007,300 ACRES).

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 ¼-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 ¼-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: Uncut	Sawlog size: Partly cut	Under sawlog size 1/		
	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
Virginia 2/	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.

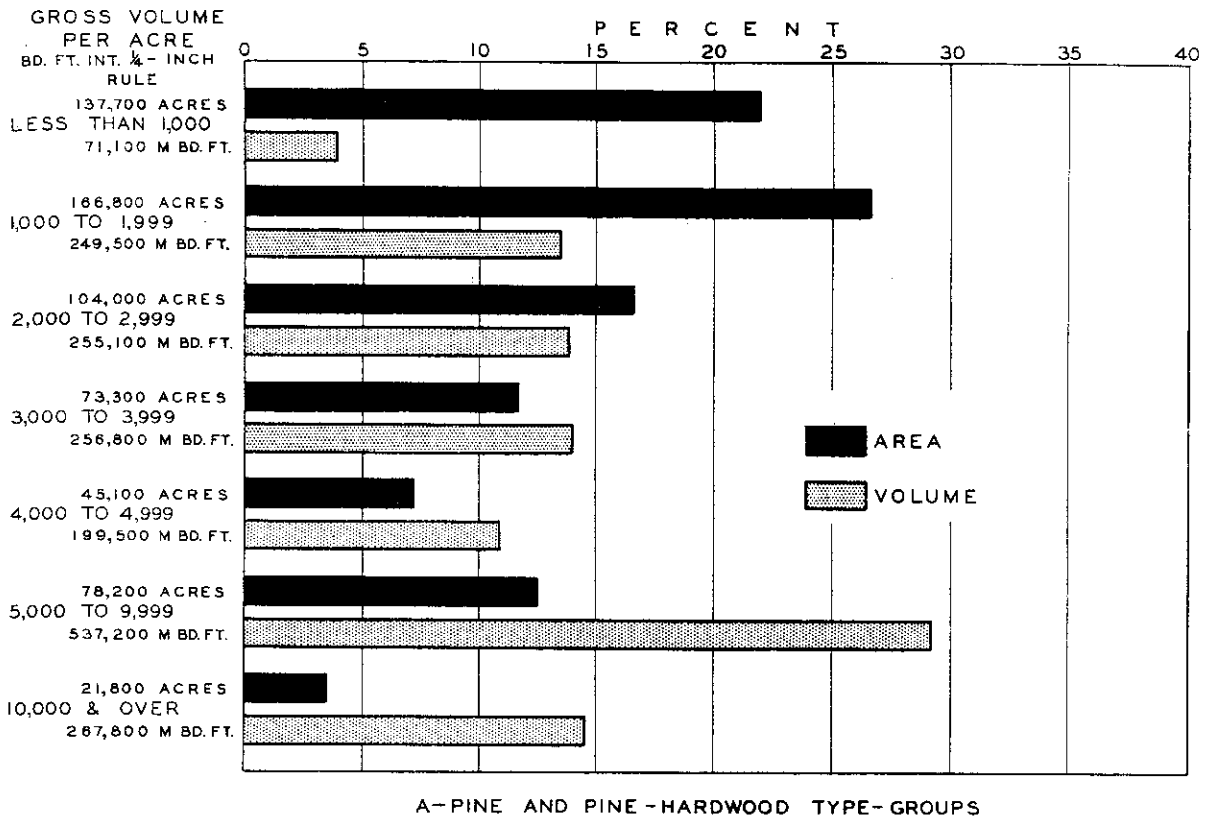
Table 9.-Diameter distribution of net volume, lumber tally, in the various forest conditions, 1936

Species-groups and diameter-classes (inches)	Old growth		Second growth			Total	Proportion of total
	Uncut	Partly cut	Sawlog size		Under sawlog size		
			Uncut	Partly cut			
	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

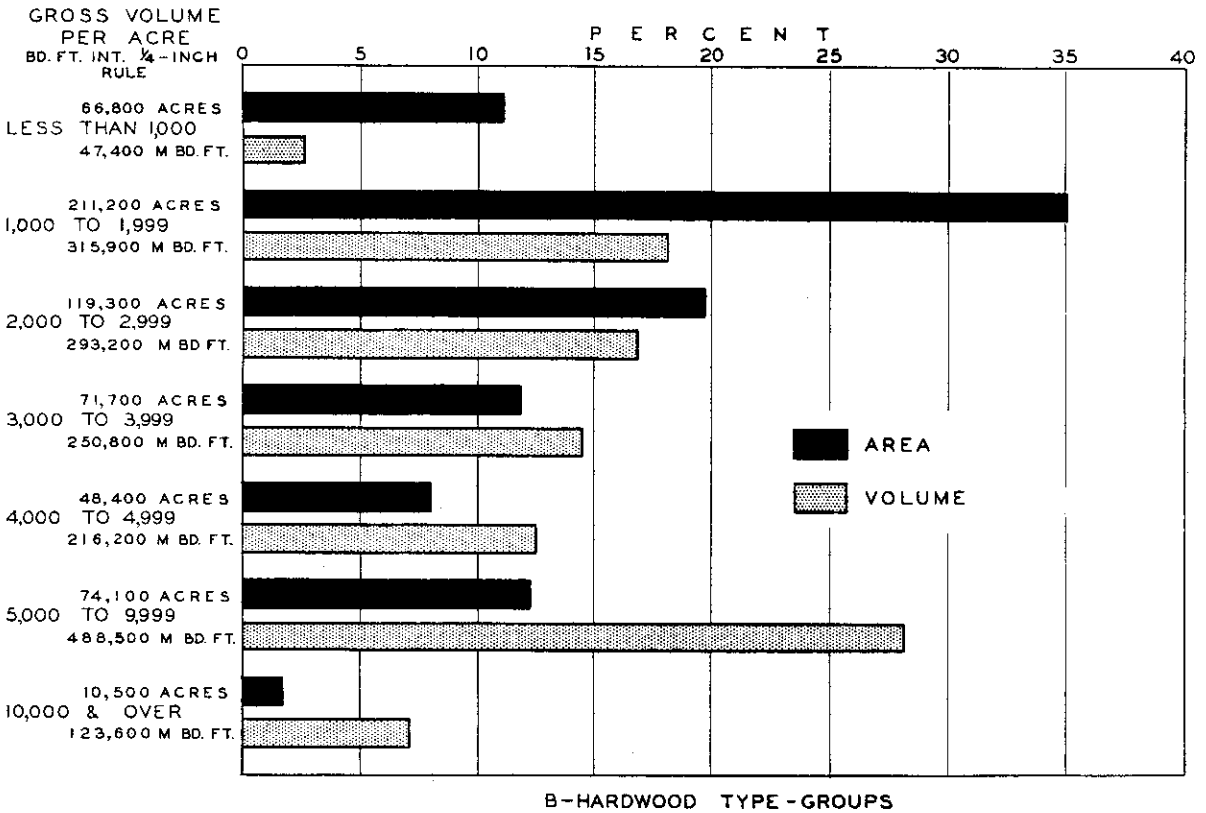
The proportion of the forest area supporting different volumes per acre, and the proportion of the total volume in these volume-per-acre classes, are shown for the sawlog-size stands in figure 7. All the volumes are gross, as no woods cull has been deducted. The pine and pine-hardwood types, which occupy 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		Sound trees under sawlog-size	Cull trees	Total all classes	Proportion of total
	Sawlog material	Upper stems				
	- - - - - - - - - - Cords - - (bark included) - -					Percent
Pines	3,492,400	398,300	2,666,600	83,100	6,640,400	25.8
Hardwoods:						
Soft-textured[1]	1,049,000	583,700	1,196,300	600,800	3,429,800	13.3
Firm-textured[2]	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.

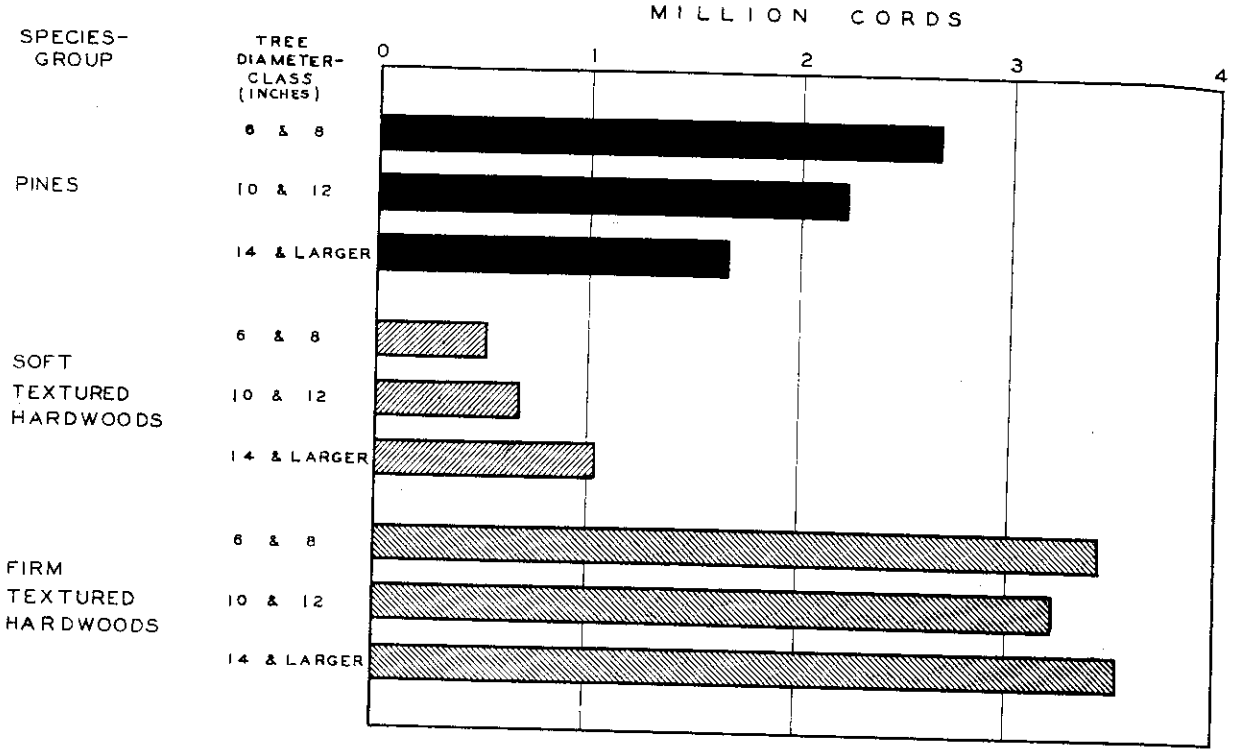


FIGURE 8. — CORDWOOD VOLUMES BY SIZE-CLASSES; SOUND TREES ONLY, 1936.

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/]
	Uncut	Partly cut	Sawlog size		Under sawlog size	
			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 4¼ 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.

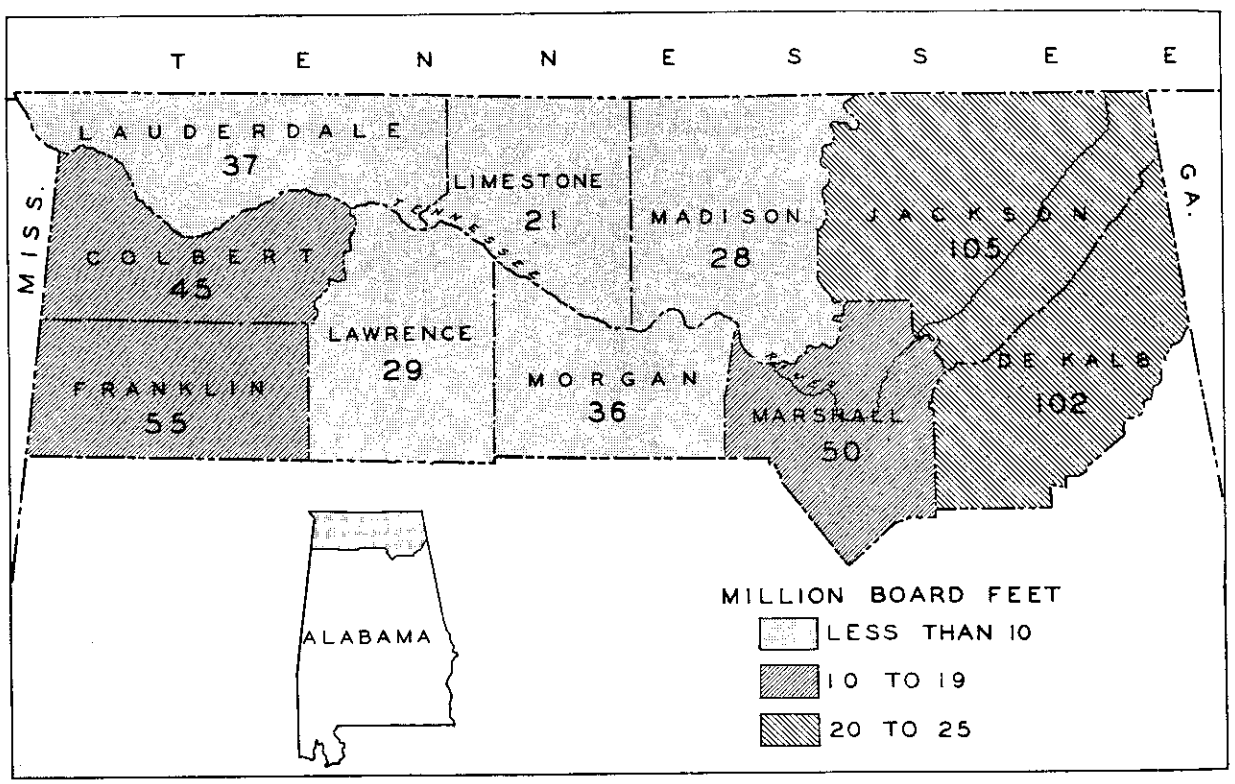


FIGURE 9.— LUMBER PRODUCTION BY COUNTIES DURING 1937, (INDICATED BY HATCHING) AND APPROXIMATE NUMBER OF SAWMILLS (SHOWN BY NUMERALS).

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

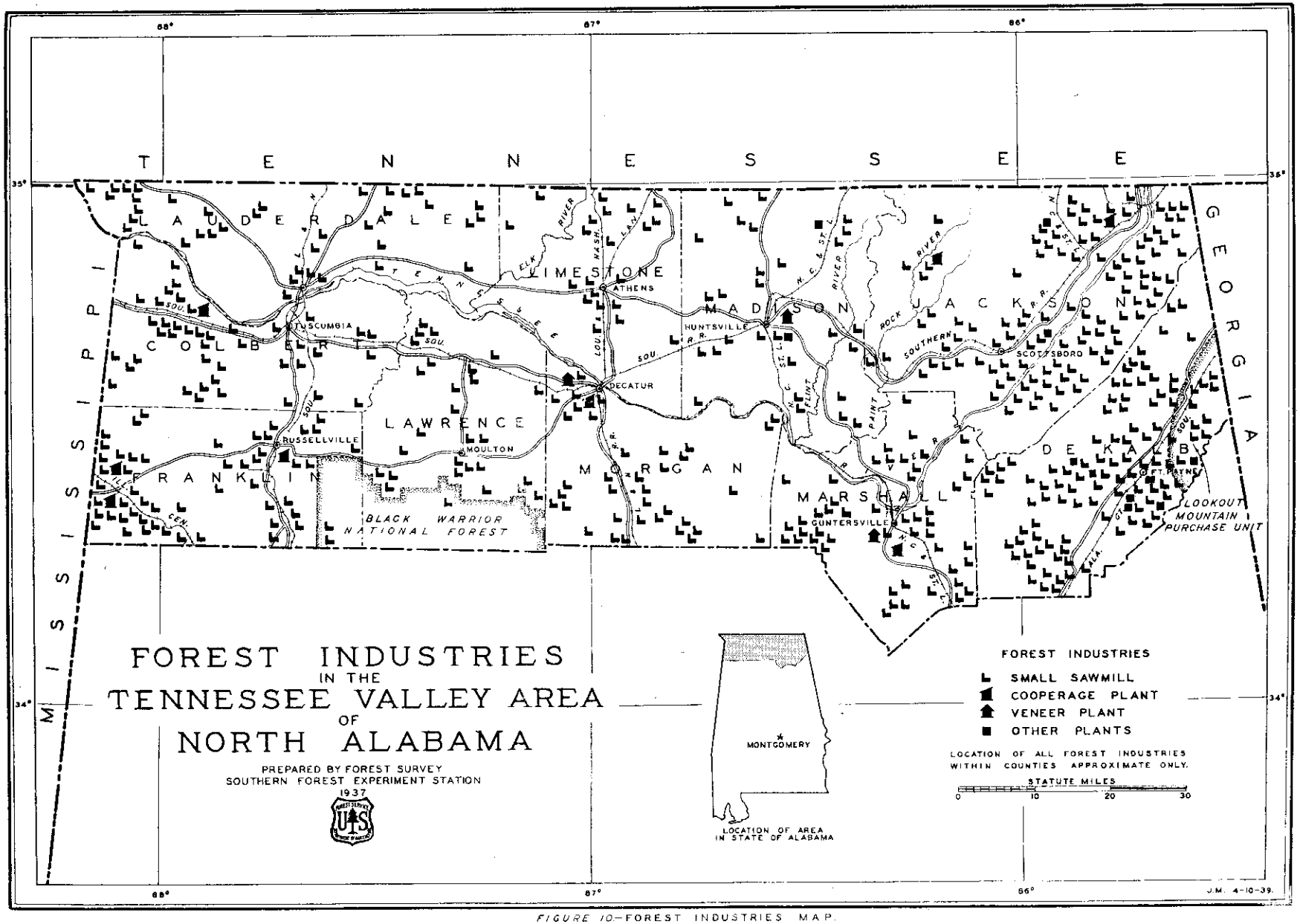


FIGURE 10—FOREST INDUSTRIES MAP.

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	In plants	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 hard woods. 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.

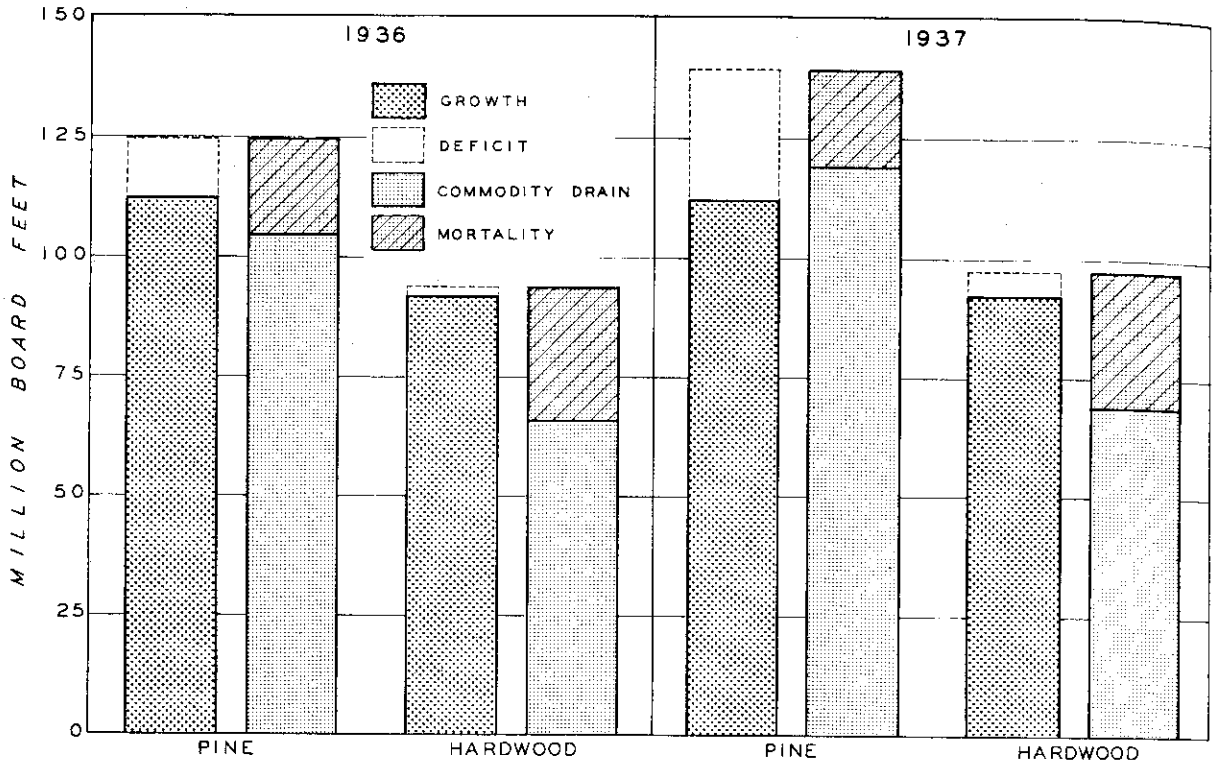


FIGURE 11. — COMPARISON OF GROWTH WITH MORTALITY AND COMMODITY DRAIN, 1936 AND 1937.

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.