

ARKANSAS FOREST RESOURCE PATTERNS

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The Resource in Perspective

A new forest survey of Arkansas reveals that forests cover 55 percent of the land in the State. In all, 18.2 million acres are available for and capable of growing industrial timber.

Substantial change has occurred in the timber resource. In the 10 years preceding the new survey, forest area declined by one-eighth. Clearing for cropland and pasture claimed more than 2 million acres. Another one-half million acres were yielded to urban and other uses.

The impact of clearing was heaviest on the hardwood resource, and especially on forests in the highly productive bottom lands of the Mississippi Delta. Clearing there reached a peak in the mid-1960's as soybeans were planted on more and more acres. A considerable area was also cleared for pasture on the Ozark Plateau.

Despite the loss of forest acreage, the total volume of timber increased slightly. Softwood growing stock volume rose 16 percent while hardwood fell 7 percent. There are now 6.4 billion cubic feet of softwood and 8.8 billion cubic feet of hardwood growing stock. In both species groups, the stand structure shifted to smaller trees, but the change was most noticeable for hardwoods. Hardwood harvesting is concentrated on large trees.

Forest industries in Arkansas used 42 percent more roundwood in 1968 than they did a decade ago. Saw logs and pulpwood were the leading commodities with veneer logs third. Miscellaneous items such as poles, posts, piling, and cooperage made up 6 percent. Softwood, mainly pine, accounted for two-thirds of the harvest.

Total removals of growing stock—including trees cut for nonindustrial purposes such as fuelwood together with unsalvaged growing stock removed in land clearing—were slightly higher for hardwoods than for softwoods. In the 10-year span, more hardwood timber was burned or otherwise disposed of than was used for products.

Nevertheless, in 1968 growth exceeded removals for both hardwoods and softwoods. It now appears that both species groups are making moderate gains. Stocking has improved considerably. Statewide, growing stock now averages 840 cubic feet per acre, as compared to 720 cubic feet in 1959. Moreover, only about 10 percent of the forest land can be considered seriously understocked.

There still are numerous opportunities for future improvement. At present, oak-pine and oak-hickory types occupy 8 million acres of land better suited to growing pines than hardwoods. Conversion to pure pine would considerably increase the productivity of these acres. Another ever-present problem is the high proportion of cull trees, mainly hardwoods.

These are, in brief, the findings of the new survey. The following pages analyze current resource patterns and trends indicated by earlier surveys. Those who wish to study the resource in detail will find help in the references cited. Work on the new survey began late in 1967, and the last sample plot was measured in April 1970. In this report, 1969 is taken as the nominal date of the resource information. Estimates of growth, cut, and industrial output are from 1968.



Figure 1. Forest Survey regions in Arkansas.

Changing Resource Patterns

Forests occupy 18.3 million acres or 55 percent of the land in Arkansas. This is 12 percent less than was reported by the previous survey 10 years earlier (Sternitzke 1960). The reduction was widespread. Only six of Arkansas' 75 counties have more forest today than they did in 1959.

Almost all of the forest land is classed as commercial—both available for, and capable of, growing crops of industrial wood. About 71,000 acres are not, mainly because they are in public holdings withheld from timber harvesting.

Agriculture is continually vying with forest use for occupancy of the land. At the time of the 1959 survey, forest area had been gaining, a trend that probably began in the 1930's. This time, losses were recorded in each of the State's survey regions (table I). The decline in the Delta was no surprise, since farms had been displacing prime hardwood lands there for decades. In the past, reversions in the western part of the State had partly offset the loss, but in the early 1960's Delta clearing accelerated as soybeans were planted on more and more acres (Sternitzke and Christopher 1970). Large acreages were also cleared in the uplands of both mountain regions and the southwestern Coastal Plain, primarily for pasture.

Table I.—Commercial forest land in 1969 and change since 1959

Survey region	Commercial forest	Change since last survey	Proportion of region forested ¹
	Thousand acres	Percent	Percent
Delta	1,975.0	- 39	21
Southwest	6,645.1	- 5	75
Ouachita	3,319.1	- 7	70
Ozark	6,267.5	- 10	60
All regions	18,206.7	- 12	55

¹Total forest including noncommercial as a proportion of total area in the region.

There was also a discernible shift to nonagricultural uses. The change was concentrated in the counties surrounding Little Rock and Hot Springs and obviously represents urban expan-

sion. Elsewhere, clearing was undertaken for projects such as pipelines, highways, reservoirs, and mines.

The impact of clearing is more pronounced than might be implied by the net change shown in table I. Most of the cleared acres had manageable stands of young growing stock. Reversion acres, unless planted promptly, may remain idle for years. Moreover, the land chosen for farming is usually better suited to tree-growing than are the reverted lands.

Hardwood Lands Suffer Heavy Losses

Forest lands in Arkansas may be separated into essentially three site classes—pine, upland hardwood, and bottom-land hardwood. These site classes indicate the suitability of the land for growing each kind of forest. They do not necessarily describe the forest types actually present. As figure 2 shows, hardwood types occupy a considerable proportion of pine sites.

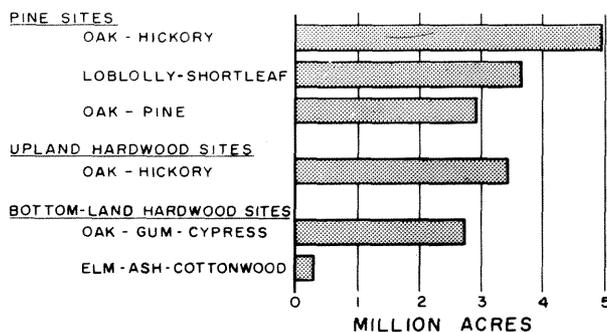


Figure 2. Area by forest types and sites.

The distribution of pine and hardwoods is often a product of circumstance rather than site, and thus oak-hickory and oak-pine types are constantly in flux. Disturbances such as cutting, timber stand improvement, or fire may change species composition. Analysis of changes in forest type between surveys is complicated by changes in the classification standards. Since basic site suitabilities are not affected by stand disturbances or type definitions they provide a better basis for analyzing shifts in forest land (fig. 3).

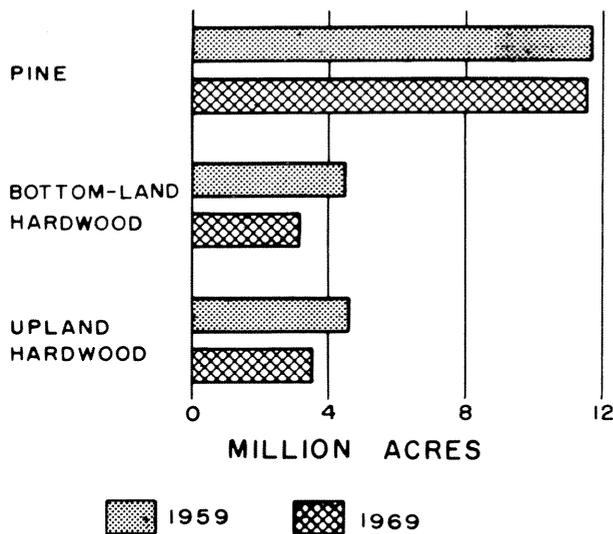


Figure 3. Forest area by sites, 1959 and 1969.

There are now about 3 million acres in bottom-land forests, almost equally divided between the Delta and the Coastal Plain. The 1.4 million acres in the Delta are all that remain of more than 4 million acres of forest growing there at the time of the first survey in 1935 (Sternitzke 1956). The drainages of the Arkansas, White, Ouachita, and Red Rivers contain most of the other 1.6 million acres. In 1959, three-fifths of the State's bottom-land forest was in the Delta.

One consequence of land clearing in the Mississippi River bottoms is that the remaining bottom-land timber is scattered and fragmented—hence more difficult to market than are contiguous stands.

Upland hardwood sites total 3.5 million acres. All but one-tenth are on the Ozark Plateau. The remainder are on Crowley's Ridge in the Delta. The loss of upland hardwood sites during the intersurvey period was 1.1 million acres, or slightly less than the 1.3 million acres lost in the bottoms. Combined, hardwood sites have declined by one-fourth since 1959.

Almost 12 million acres are classified as pine sites. They are defined as upland areas either presently or formerly demonstrating the capability for growing pines. In Arkansas, virtually all of the forested uplands from the Coastal Plain up to and including the Boston Mountains are considered pine sites. Forest losses in the Ouachitas and the Southwest were essentially on such lands. Statewide, the area of pine sites remained about the same. Small gains in the Ozarks partly compensated for losses elsewhere.

Arkansas Forests Contain 18 Billion Cubic Feet of Wood

The 1969 inventory included only trees on commercial forest land. Otherwise, trees of all species and sizes were counted, even those considered too rough or rotten to be utilized (fig. 4). Trees whose quality made them suitable for saw logs, either presently or prospectively, were designated as growing stock. Their reported volume is measured from a 1-foot stump to a 4-inch top. Sawtimber volume was also inventoried. The volume of growing stock trees larger than a specified diameter limit was reported in board feet (Hedlund and Earles 1970).

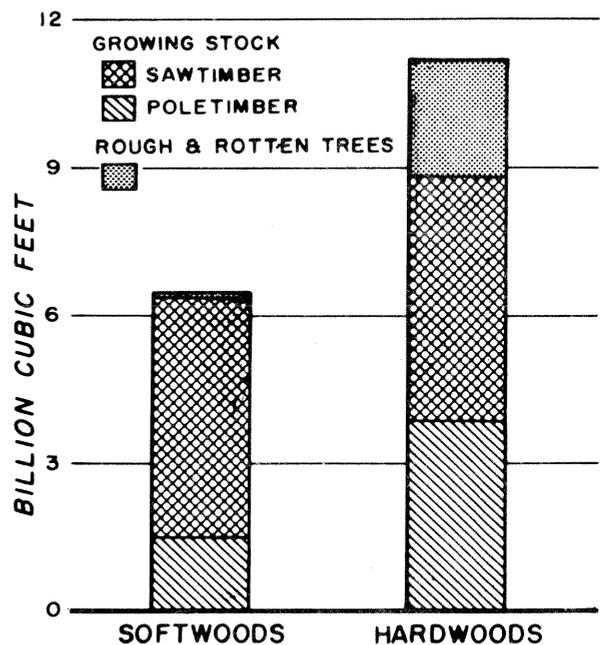


Figure 4. Volume of softwoods and hardwoods by class of timber.

Because of changes in volume specifications, data for the 1969 inventory cannot be compared directly with those derived from earlier surveys. For this report, however, earlier estimates have been revised to comply with the new standards.

Pine Volume Is Increasing

Volume of softwood growing stock in Arkansas rose 16 percent in the decade between surveys (table II). Most of the 6.4 billion cubic feet are loblolly and shortleaf pine. Four percent is in eastern redcedar and cypress, largely the latter (fig. 5).

Table II.—Growing stock volume in 1969 and change since 1959

Survey region	Softwood		Hardwood	
	Volume	Change	Volume	Change
	Million cu. ft.	Percent	Million cu. ft.	Percent
Delta	170.2	- 1	1,772.7	- 30
Southwest	3,787.5	+ 16	3,157.8	(1)
Ouachita	1,923.5	+ 13	976.9	+ 6
Ozark	541.2	+ 43	2,898.8	+ 1
All regions	6,422.4	+ 16	8,806.2	- 7

¹ Negligible.

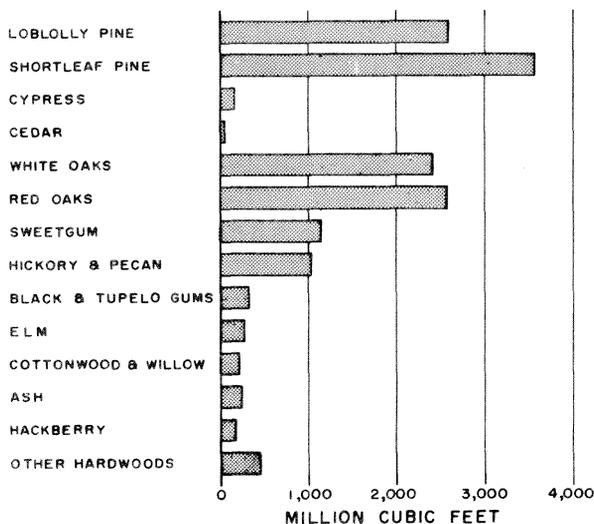


Figure 5. Growing stock by species.

Because of their inherently good form and low incidence of decay, virtually all of the pines are considered growing stock. The exceptions are mainly open-grown and limby trees, or those deformed by insects and disease. Three-fourths of the softwood growing stock is of sawtimber size, the rest is poletimber. About 90 percent of the volume in sawtimber trees is considered suitable for making saw logs—a volume equivalent to 25 billion board feet (table III). The remainder is in upper stems and may be used for pulpwood or products with similar wood requirements.

As figure 6 shows, the gains in softwood volume were not uniformly distributed throughout the range of diameter classes. Most of the volume accrued in small sawtimber trees, 9 to 15 inches in diameter. Not shown in the figure is a sizable gain in the number of sapling-size trees, 2 to 4 inches in diameter. These young pines can

Table III.—Sawtimber volume in 1969 and change since 1959

Region	Softwood		Hardwood	
	Volume	Change	Volume	Change
	Million bd. ft.	Percent	Million bd. ft.	Percent
Delta	774.8	+ 5	5,552.6	- 28
Southwest	15,829.3	+ 16	7,830.8	- 5
Ouachita	6,533.1	+ 20	1,810.3	+ 2
Ozark	1,676.9	+ 52	6,181.2	- 2
All regions	24,814.1	+ 18	21,374.9	- 11

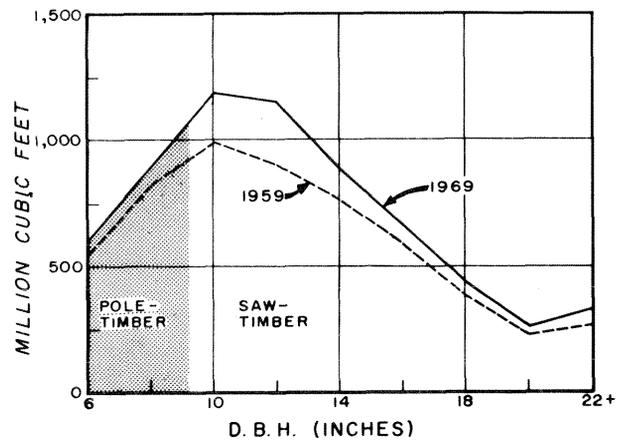


Figure 6. Softwood growing stock volume by tree diameter, 1959 and 1969.

be counted on to increase the future growing stock, as they will soon attain pole size.

The State's pine resource contains somewhat more shortleaf than loblolly pine. Shortleaf predominates in the Ouachita and Ozark Mountains, which are well within its natural range. Loblolly is seldom found north of the Coastal Plain, for cold winters damage the young trees. On the Coastal Plain, however, it grows faster than shortleaf and is superior in form.

Forest industries own more pine sawtimber than landowners of any other class (fig. 7). Industrial ownership is concentrated in the Southwest and Ouachita units, and during the last two decades these lands have, on the whole, received a much higher level of management than the lands of other private owners. Though volume on industrial ownerships diminished slightly over the decade, it still averages 1,100 cubic feet of growing stock per acre, or 4,300 board feet in sawtimber equivalents. Stocking on lands of private nonindustrial owners improved, rising from 600 to 700 cubic feet per acre.

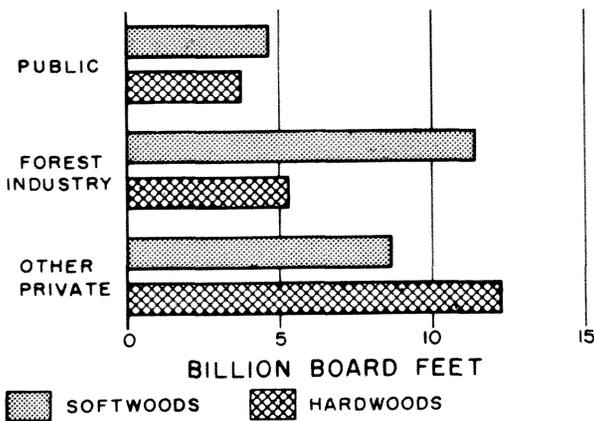


Figure 7. Sawtimber volume by class of ownership.

Hardwood Volume Is Declining

Acreage losses such as those sustained in Arkansas can have but one consequence. Timber volume will eventually suffer. It is remarkable that the decline was small. Measured in terms of present Forest Survey standards, hardwood volume was reduced by 7 percent during the decade and probably is at a historic low. Even so, hardwood growing stock exceeds pine by a ratio or four to three.

There are about 11 billion cubic feet of hardwood in Arkansas' forests. Of this, 8.8 billion are in trees good enough to be classed as growing stock. The rest, one-fifth of the total volume, is in rough and rotten culls.

The value of the hardwood resource is closely related to tree quality. Prices for logs may range widely depending on species, size, and proportion of clear material recoverable. And logs make up three-fifths of the industrial products.

For decades Arkansas' hardwood forests have been high-graded for specialized products. The Ozark region, for example, continues to be an important supplier of white oak cooperage. In the Delta, sweet and tupelo gums have been in high demand for veneer and saw logs to be made into containers, panels, and factory lumber. Various cutting practices, together with land-use shifts and hardwood control on pine sites, have changed the species composition. The gums, cottonwood, willow, elm, ash, and hackberry have all declined, so that the soft-textured species now make up a smaller portion of the inventory than heretofore. Oaks and hickories have gained. The differences in most species were small and only serve to express long-term

trends. Black walnut is probably the exception. Log buyers have been searching the mountain regions for walnut logs, and the supply has suffered. This valuable species makes up less than one-half percent of the total hardwood volume, and some of the harvest undoubtedly includes trees from fence rows and other sources not even included in the inventory.

Shifts in hardwood stand structure, as shown in figure 8, are also indicative of a reduction in resource quality. Tree size is the dominant factor in assessing quality. Clear cuttings are especially important in lumber used to make products such as furniture parts, and defects tend to be more widely spaced in large than in small logs. Logs 18 inches and larger are the mainstay of the hardwood industry, and they are becoming scarce. Moreover, the reduction in inventories between surveys indicates that smaller trees necessary to replenish the supply are not forthcoming.

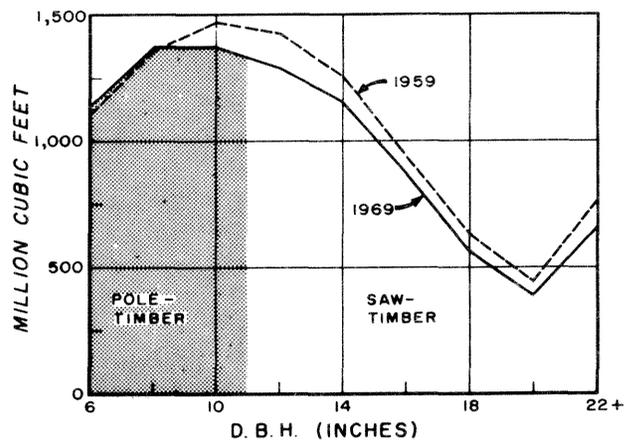


Figure 8. Hardwood growing stock volume by tree diameter, 1959 and 1969.

Of the substantial volume in hardwood culls, two-thirds is in sound trees that are more or less uniformly represented in all diameter classes. The proportion of rotten culls increases in the large diameter classes. While valueless for saw logs, culls contain considerable boltwood.

North, South, East, and West

Arkansas' forest resource is far from uniformly distributed. Several contrasts between the State's major geographic regions have already been drawn. With the help of figure 9, the unique features of each region will be enlarged upon.

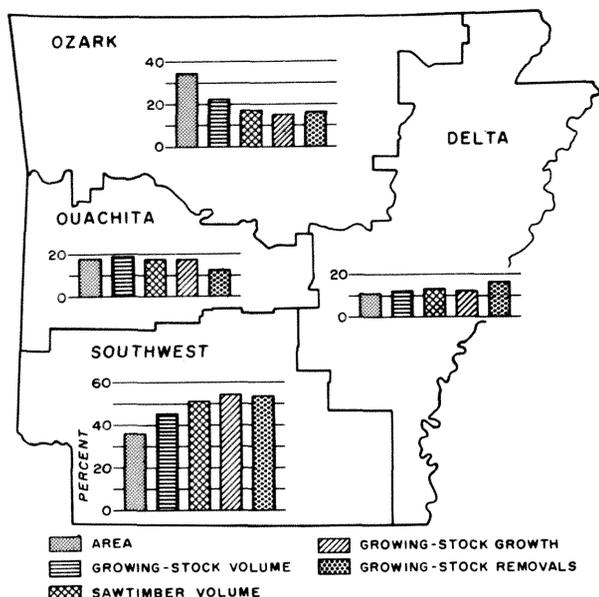


Figure 9. *Relative importance of forest resources, by region.*

In the north, the Ozark highlands contain 6 million acres of forest—one-third of the State's total. Timber-growing capacity of these hardwood sites is limited, but the Ozarks have fine potential for recreation. Five streams in the area have been nominated for preservation, and wealth of canoeing, fishing, camping, and natural beauty is available regionwide (Arkansas Planning Commission 1969). Development of these opportunities will in many cases be compatible with some degree of timber production.

The Southwest region contains one-third of the State's forest area and almost half of the total timber volume. The proportion of land lost to other uses in the past decade was 5 percent, less than in any other region. Forest industries own 45 percent of the timberland. Nonindustrial ownerships sustained most of the acreage loss

but made some gains in pine stocking. The seven counties east of the Ouachita River have long been considered a forestry showcase for their well-developed sawtimber stands and conservative cutting practices (Southern Forest Experiment Station 1953). Since 1959 timber volumes there have declined slightly. A rapid influx of wood-processing facilities has intensified harvesting. The reduction in inventory may signify a trend toward shorter rotations and smaller crop trees. In the 13 counties comprising the western portion of the region, timber volume is increasing. Pine gained almost one-third, much of it in trees of large diameter. The 13 counties are now as well stocked as the seven-county area.

The Arkansas Delta is now only one-fifth forested. Alterations in the slope and drainage of agricultural lands, and protection from the rising waters of the Mississippi, have made much of the Delta far too valuable to grow trees on. Two million acres remain, but the forest on many areas is too scattered to sustain good markets. As always, it pays to move the best logs. Between surveys, however, more than half of the timber removed from the Delta was wasted in land-clearing operations rather than being sold for products.

In the Ouachita Mountains, almost half of the forest is in public ownership, mainly the Ouachita National Forest. As in the Ozarks, the rugged topography results in sizable areas of refractory sites. Shortleaf pine is the best species on much of the area. It makes up 63 percent of the entire growing stock volume, three-fourths of the sawtimber. The Ouachitas also have excellent recreation potential. Although the Forest Survey does not classify recreational quality of forest land, a sizable proportion of the region probably rates as high for that purpose as it does for timber production.

Timber Marketing and Manufacturing

Arkansas' forests supplied 430 million cubic feet of products in 1968. One-tenth was used for domestic purposes, chiefly fuel; the rest went to the State's rapidly expanding forest industry. Saw logs and pulpwood were the mainstay of the timber economy. Together, they made up three-fourths of the roundwood output. Since the previous industrial survey in 1958, sawmills have become larger but less numerous. The pulp industry has doubled its capacity. And Arkansas has pioneered in southern pine plywood production, now using almost one-tenth of its timber output for veneer.

About half of Arkansas' 1968 timber harvest was made into saw logs, as is shown by figure 10. Two-thirds of the 1.2 billion board feet of logs were softwood species, nearly all pine. Other softwoods, redcedar and cypress, accounted for less than 1 percent. Oaks supplied 57 percent of the hardwoods used; sweetgum, blackgum, and tupelo, most of the remainder.

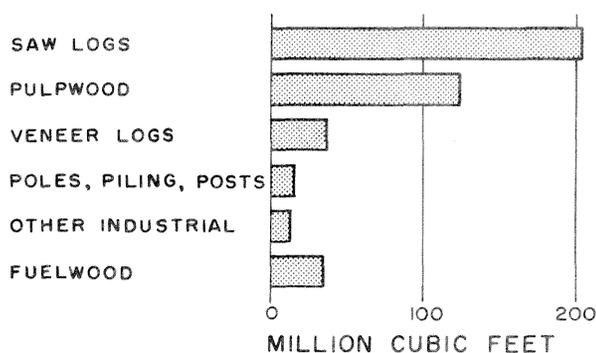


Figure 10. Output of Arkansas roundwood by product, 1968.

Ten years ago logs harvested for veneer were almost entirely hardwood, but now 90 percent are pine. Veneer logs must be of somewhat better quality than saw logs and must be slightly longer. Otherwise, they are generally indistinguishable from saw logs. Measured in saw-log equivalents, veneer logs totaled 226 million board feet.

More than 1.5 million cords of pulpwood were harvested in Arkansas during 1968. Pulpwood production has been increasing in the years since the previous survey. Although the cut of pine roundwood remained remarkably stable at about 1 million cords per year, the hardwood output rose from 148,000 to more than 500,000 cords annually.

Poles, posts, and piling, together with other products, made up 6 percent of the industrial output. By comparison with the 1958 survey, the output of most of these items has remained relatively constant. Arkansas is a major producer of both cooperage and handle stock. Very little slack cooperage is being made nowadays. Tight cooperage is almost entirely white oak for bourbon barrels. Handle stock is mainly hickory for striking tools. Ash and even oak are used for other kinds of handles.

Fuelwood consumed by rural dwellers amounts to 8 percent of the total harvest. It is virtually all hardwood. In contrast to industrial products, much of the fuelwood is taken from culls and other nongrowing stock sources. Wood used for fuel has declined by half during the last 10 years, and the trend promises to continue as the population shifts to cities. Nevertheless, the volume is still significant.

Arkansas was a net importer of timber in 1968, although the margin was small. Pulpwood was the most mobile product. One-fourth of the State's production went to out-of-State plants. Meanwhile, a slightly smaller amount was shipped to Arkansas from surrounding States. Mill locations account for much of the movement, since procurement strategies generally ignore State lines. In fact, the construction of two new pulpmills announced recently, one in Texas and one in Oklahoma, should substantially benefit Arkansas' pulpwood markets. Of the saw-log volume, more than half is processed by plants in the county where the timber is grown (Beltz 1970). While saw logs move mostly by truck, a sizable volume of pulpwood is transported by rail.

Sixty-two percent of the State's timber harvest came from the Southwest region (fig. 11). Combined, the Southwest and Ouachita regions account for virtually all of the softwood production. As might be expected, harvesting of hardwoods is distributed somewhat more uniformly. Again the Southwest is foremost, but the Delta and Ozark regions are also important.

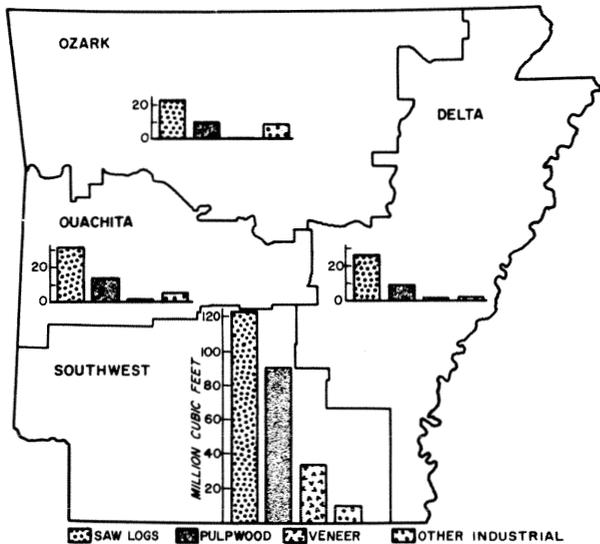


Figure 11. Relative importance of forest products, by region.

In general, hardwood harvesting is both more specialized and less mechanized than for pines. Buyers of hardwood saw logs, pulpwood, and veneer logs usually have species preferences. Plants classified as "miscellaneous industrial" require hardwood to be delivered in a wide variety of forms such as white oak cooperage bolts of specified size and quality, or dogwood shuttle block bolts.

Forest Industry

Arkansas timber supplied the raw material for some 600 manufacturing plants within the State and was shipped to about 40 plants in adjoining States during 1968 (Beltz 1970). Almost every Arkansas county had some kind of primary wood-using industry (fig. 12). Sawmills were by far the most numerous, and took half of the timber harvested.

The number of sawmills in Arkansas has been trending downward since the peak years of the Second World War. A census of sawmills re-

vealed 1,736 active in 1946. By 1968 the number had dwindled to about 450, but average mill size had trebled. The increase in average size accounts for a slightly rising lumber output at the same time that mills were going out of business.

The sawmills range in size from multimillion dollar manufacturing plants to small portable mills, but the bulk of the lumber is sawn at large mills (i.e., those cutting more than 3 million board feet annually). Thus, 10 mills saw 40 percent of the lumber, and one-fifth of the sawmills get 90 percent of the saw-log production. This situation is the result of many years of gradual change.

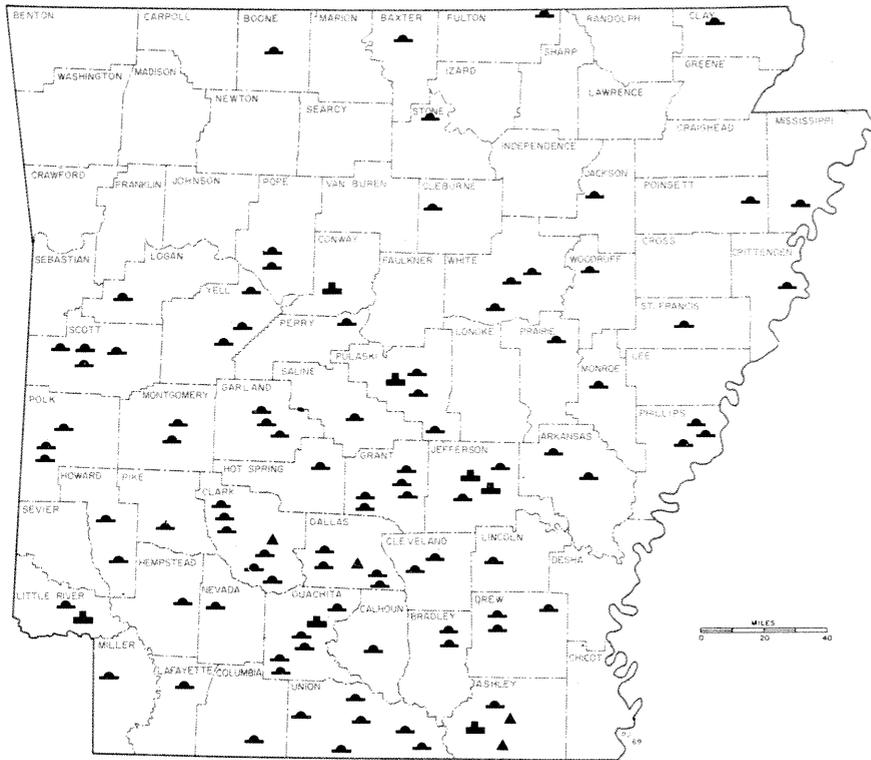
Industrial change has favored large sawmills in a number of ways. Increasing mechanization amplified the advantages of scale at large plants. One example may be found in the development of chippers for salvage of coarse residues. Initially these machines were large and expensive, and were installed only at the largest mills. More recently, development of compact chipping equipment permitted utilization of smaller concentrations of residues.

The advantages of scale also tended to benefit pine manufacturers more than hardwood producers, since a large proportion of the hardwood lumber is made at small mills. In addition, pine logs are, in effect, a more uniform raw material. Species separation is unnecessary, and lumber seasoning and grading are less critical than for hardwoods.

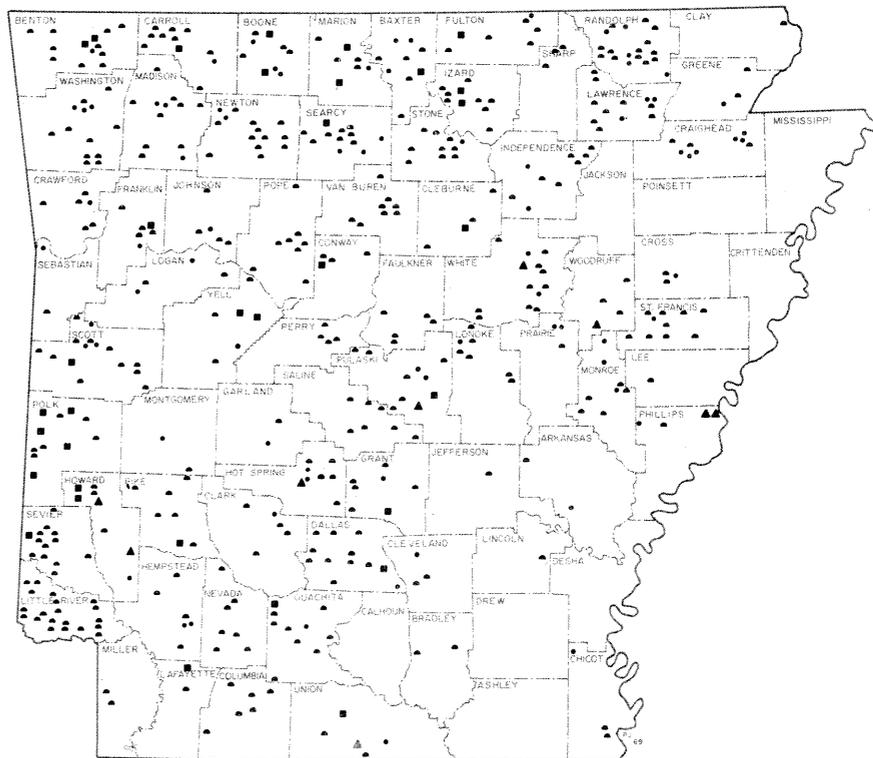
Pulpwood consumption by Arkansas mills almost doubled between 1958 and 1968. Increased hardwood use was partly responsible. More important, however, was the steadily rising supply of chips and other byproducts from primary wood-using industries. Arkansas' total pulpwood production was 2.3 million cords in 1968. One-third was supplied from wood residues. This proportion is well above the South-wide average of one-fifth, a fact that attests to the State's well-developed chip marketing system.

While pulpmills are few in number (seven in 1968) when compared with sawmills, they collect roundwood at more than 50 permanently established woodyards plus many lesser shipping points. A typical woodyard may add as much to the local economy as the average sawmill. Fifty-seven of Arkansas' 75 counties shipped pulpwood in 1968 (Beltz 1969).

Arkansas' veneer industry numbers 13 plants. The four pine plywood plants rival the largest



Wood pulp mills
 Large sawmills
 Pine veneer mills



Small sawmills
 Hardwood veneer mills
 Other plants
 Post, pole, and piling plants

Figure 12. Primary wood-using plants in Arkansas, 1968.

sawmills in size. The hardwood plants are much smaller. They are about equally divided between mills making container veneers for baskets and crates, and those making other kinds of veneers.

In addition to the manufacturing facilities already described, Arkansas has approximately 100 other primary wood-using plants. About 18 make cooperage, 14 produce handle stock, 14 are wood-preserving plants, 13 make veneers, 11 operate charcoal kilns, and about 30 make miscellaneous industrial products. The majority of these plants are small, but they contribute to the diversity of Arkansas' forest industry and indirectly to the efficient utilization of the resource.

The remanufacture of plant residues is a strong and relatively recent trend. In 1968, primary manufacture created approximately 3 million tons of residues. Three-fifths was wood

material, both coarse and fine; the rest was bark. Coarse wood residues are those suitable for chipping, such as veneer cores, cut-off pieces from poles, or slabs and edgings at sawmills. A high proportion of the coarse material is made into byproducts. Most of the material is used in pulping, but veneer cores are commonly ripped into 2-by-4 studs. Barbeque chips are typical of minor byproducts.

Although three-fourths of the coarse residues are ultimately converted, only about half of the fines are used. Boiler fuel is the largest single outlet for fines, followed by fiber products and then animal bedding. Small amounts of sawdust are sold for meat packing.

More than half of the 1.2 million tons of bark received by Arkansas plants in 1968 were burned for fuel, but only pulpmills and some of the larger sawmills utilize bark in this way. At most other plants it is disposed of as waste.

Elements of Change

The inventory trends discussed thus far are the result of many interacting factors. Shifts in land use and the vagaries of timber markets are largely uncontrollable. On the other hand, trends may be altered by measures which regulate stocking, growth, mortality, and species composition.

Growth, Mortality, and Removals

As an index of future trends, the relationship between current net annual growth and removals may be better than indicators based on longer trends. Softwoods are currently growing at a rate of 6 percent, hardwoods at 4 percent. In 1968, growth exceeded removals for both softwoods and hardwoods (fig. 13). The rate of land clearing appears to have slowed. Thus, it seems that the decline observed between surveys has been arrested and the total resource is now gaining slightly.

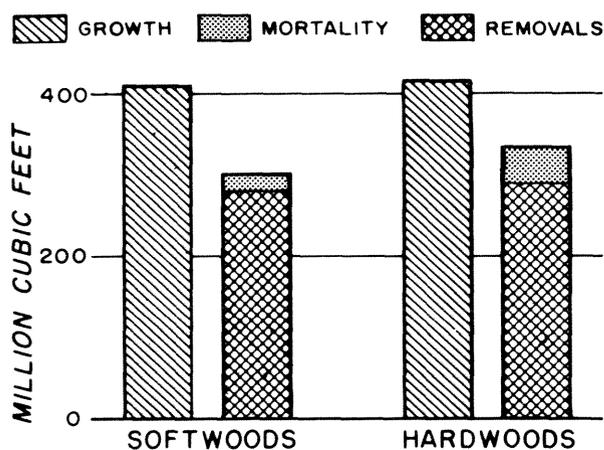


Figure 13. Growth, mortality, and removals of growing stock, 1968.

Timber removals include both harvesting and other man-caused losses. That is, growing stock may be destroyed or removed in land clearing, logging, timber stand improvement, and thinning. For softwoods the volume of noncommercial removals was small. For hardwoods it was not.

The downward trend in the hardwood resource was associated with the peak years of land clearing in the middle of the decade, when less than half of the volume removed went into products. While some of the timber was too small to be of value to the traditional hardwood industries, stands were usually windrowed and burned without concern for merchantability. Most landowners were solely interested in getting rid of the forest in time to plant agricultural crops.

The causes of mortality are not easy to identify. Forest Survey cruisers were asked to specify the reasons for mortality, but in most cases death derived from a combination of causes or was unknown. Fire was the most common specific agent.

The excess of growth over removals reported in 1968 is hardly a surplus. Statewide, stocking of both pines and hardwoods should be improved. It will be essential now and in the future to continue to set aside a portion of the annual growth for increasing the growing stock base. Furthermore, the distribution of cutting throughout the range of tree sizes is rarely matched by growth. The cushion of extra growth is in small trees and only partially offsets the heavy cutting in larger diameter classes, especially for hardwoods.

Productivity

How good is Arkansas forest land and how much timber could it grow? Since the answer to these questions depends on variables of climate, soil, aspect, and species composition, a measure of productivity by the Forest Survey must necessarily be a compromise. With this qualification, the average productivity at the culmination of mean annual increment is estimated to be 70 cubic feet per acre—about 1,300 million cubic feet annually for the entire State. Sites average 50 cubic feet per acre in the Ozarks and 60 in the Ouachitas. In the Delta and Coastal Plain the average acre can grow about 90 cubic feet annually.

Growing stock in Arkansas forests is currently averaging only 45 cubic feet of growth. The State total is 827 million cubic feet or about 470 million cubic feet less than the potential. Essentially four factors reduce growth below potential. In brief, they are a high proportion of culls, inadequate stocking, an unfavorable stand structure, and a large acreage needing conversion to fast-growing species.

It has been mentioned that rough and rotten trees comprise 14 percent of the total timber volume. This condition has long been considered a major cause of yield loss, and it is estimated that almost 120 million cubic feet of growth per year are wasted on these trees. This leaves more than 350 million cubic feet of difference unexplained.

The desirable degree of stocking is difficult to define, since it partially depends on management objectives. Nevertheless, the Forest Survey estimates that at least one-tenth of Arkansas' forest land is seriously understocked with growing stock trees. Some of this land is occupied by culls. However, empty space probably limits growth by an amount similar to that lost on culls.

Stand structure affects volume growth. In the Ozarks 60 percent of the forest is in stands of seedlings and saplings. Although these trees are biologically productive, the volume they add is not recorded in Forest Survey inventories. Gross annual growth in the Ozarks is currently 40 percent of the estimated potential. In the Southwest, where the proportion of sawtimber is high, gross growth averages 75 percent of potential.

Finally, many acres are growing trees that are inappropriate to maximum industrial timber production. The foremost instance is the 8 million acres in oak-pine and oak-hickory types that occupy pine sites. Stand conversion offers a major opportunity for improvement.

Lesser influences also curtail output. Fire, disease, insects, and other natural hazards combine for significant losses that can be reduced somewhat but not eliminated. Current fire protection is highly effective.

Statements identifying sources of productivity loss do not necessarily constitute a recommendation that corrective measures be taken. On the contrary, under good management many of the poorer sites may never be tended. It is often better to concentrate on lands of high potential rather than dissipate efforts.

Specific opportunities for forest investment depend on available timber markets and on the objectives of the landowner. There is little doubt, however, that Arkansas has numerous unexploited chances for forest development. In the Southwest and Ouachita regions, where strong pine markets exist, 1.5 million acres of good pine sites are occupied mainly by hardwoods. These are prime sites capable of growing more than 1 cord of pine pulpwood per acre per year. Hardwoods invariably reduce the productivity of these lands. Current pine stumpage prices for both saw logs and pulpwood are double those of hardwoods.

Although the overall productivity of the Ozark region is low, the protected mountain slopes and benches have good hardwood growing potential. Individually the workable stands are often small, but together they aggregate more than 2 million acres. While poorly developed markets in this area make improvement cuts unprofitable, some long-range forestry programs might be undertaken in conjunction with efforts to develop recreational opportunities and improve wildlife habitat. Improvement in the timber resource may eventually improve markets.

Bottom-land forests that are protected from flooding will probably continue to suffer from agricultural encroachment. This is all the more reason to start managing the rest of the stands. At least half of the 3 million acres of remaining bottom-land hardwood sites are in backwater and batture areas that represent a high risk for farming. These lands can be expected to remain in forest. Their management is complex and not completely understood. However, the best growth potential in the State is in the bottoms, and forest landowners can scarcely afford to let these areas languish.

Resource Outlook

It has become almost axiomatic that national demand for timber will greatly increase in the years ahead. If prices remain at recent levels, demand is roughly expected to double for saw logs, triple for veneer logs, and quadruple for pulpwood by the end of the century (Hair and Ulrich 1970). The South is expected to supply a greater proportion of these needs than it now does. How much of the future market Arkansas is able to capture depends on her ability to sustain a flow of timber products at favorable prices. Since timber growing requires time, preparations for the future must begin now.

One way to evaluate the prospects for Arkansas is through projections of current resource trends. Projections are not predictions, since the assumptions upon which they are based only partially duplicate anticipated conditions. Nevertheless, projections can help in formulating the predictions necessary for planning.

Prospective Timber Supplies

A projection for examining the long-term impact of current trends is presented here as prospective cut. Its starting point is the 1968 growing season. At that time, growth of both hardwoods and softwoods exceeded cut. From then on, the projected cut is gradually increased until it is equal with growth—an assumption that is consistent with sustained-yield objectives (fig. 14). It is also assumed that the present mixture of forest products will be maintained as long as the resource can supply the requisite kinds of timber.

Thus, an extension of recent trends to the end of the century will double the softwood cut and raise hardwood cut to half again its present level (figs. 14 and 15). As the cut is gradually increased the inventory continues to gain volume, and hence growth of all species is boosted by one-third. In addition to increases in inventory volume, shifts in the stand structure are simultaneously occurring.

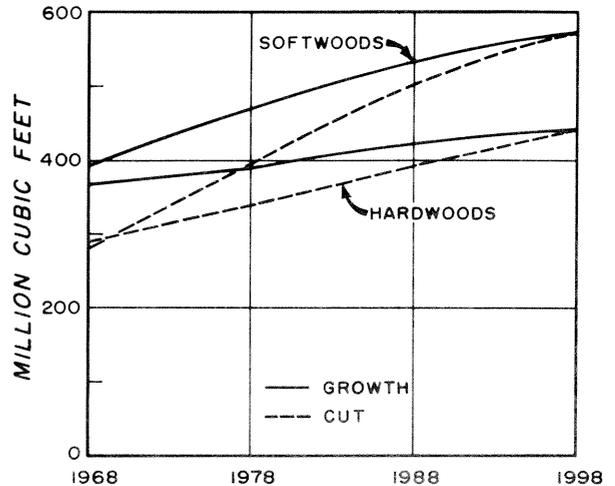


Figure 14. Prospective growth and cut of growing stock, 1968-1998.

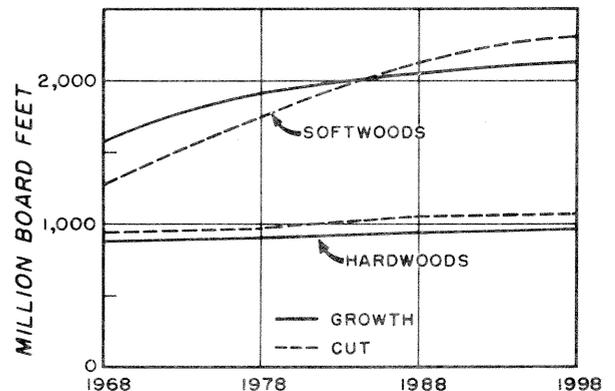


Figure 15. Prospective growth and cut of sawtimber, 1968-1998.

The future inventory might look something like that shown in figures 16 and 17. The situation is favorable for softwoods. Present cutting is fairly well distributed between logs and bolts. Even so, the volume in large trees will be partly curtailed in the future. The outlook for hardwoods is not encouraging. Most hardwood products require logs yielding high proportions of clear wood, and thus the harvest of large trees is out of all proportion to their

occurrence. If this trend continues to the end of the century, over-cutting will reduce the inventory of all hardwood size classes larger than 14 inches. The consequences are also illustrated by figure 15. Hardwood sawtimber is already being harvested faster than it is growing. For softwoods, the sawtimber break-even point is about 15 years hence.

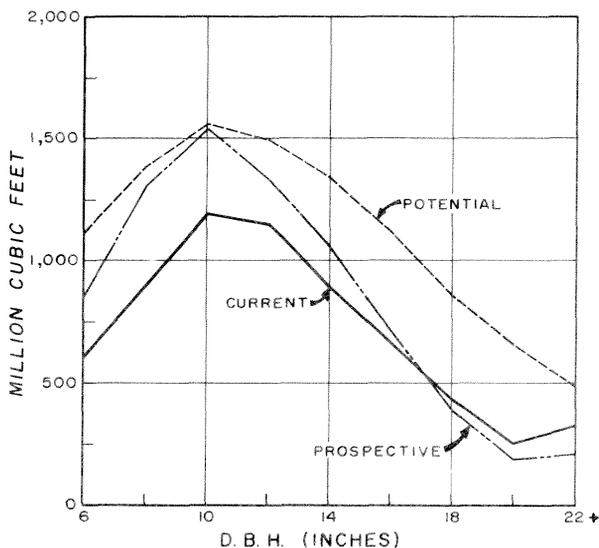


Figure 16. Comparison of 1969 softwood growing stock with prospective and potential inventories of 1999.

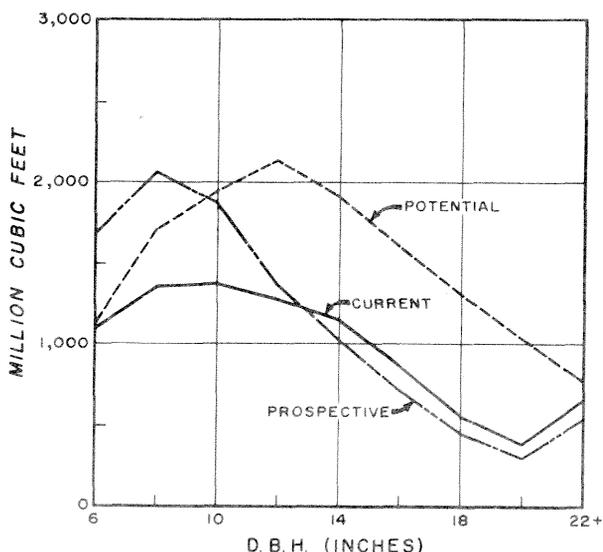


Figure 17. Comparison of 1969 hardwood growing stock with prospective and potential inventories of 1999.

Meeting Future Demands

The future for Arkansas' forest resource as portrayed by the prospective cut is neither

inevitable nor even likely if forest management is accelerated. Arkansas currently has some 4 million acres that are either bare or support unproductive trees. If we suppose, therefore, that a concerted effort will be devoted to alleviating this condition, the outcome might be different.

The projection of potential cut—as distinguished from prospective cut—incorporates the assumptions that the areas in oak-pine forest will eventually be converted to pure pine, and that by improving the stocking on sparsely stocked acres an average of 90 square feet of basal area can be maintained. It is also presumed that cutting will eventually be adjusted so as to maintain an advantageous balance of tree sizes in the inventory. The inventory of both pines and hardwoods needed to accomplish these goals is shown in figures 16 and 17.

A contrast is immediately apparent between levels of growing stock needed to support the potential cut and levels projected for prospective cut. Hardwood volume would need to improve by 35 percent, and pine volume by 20 percent. These levels of growing stock would not significantly change the cubic volume grown by the forest each year. But, as would be expected, there is a big gain in sawtimber growth. The annual output of pine sawtimber could be sustained at 20 percent more than its prospective level, and hardwoods would benefit from a 60-percent advantage.

Resource improvements such as those indicated by the potential-cut projection cannot be obtained without some sacrifice. A more rapid rate of industrial development is indicated for the earlier years of the prospective-cut projection; for the potential-cut projection industrial growth would have to be deferred to permit the needed inventory improvements. However, a balanced output of products appears to be the best way to get the most from the resource. By developing the inventory as shown, it would be possible to maintain the growth of all segments of forest industry. A given volume of sawtimber stumpage currently sells for considerably more than an equal volume of pulpwood-size trees. Since future prices probably will continue to favor logs over bolts, the value of the potential output would greatly exceed that of the prospective.

It is possible to make any number of additional projections. For example, one might wish to speculate about the outcome of converting to pure pine all of Arkansas' potential pine acres

rather than only the area now in oak-pine types. Or it might be argued that genetically improved pine growing stock will soon be available in quantity and that its impact should be accounted for. The projections presented here are intended mainly to contrast two approaches to planning Arkansas' forest resource development.

More Resource Improvement Possibilities

Several suggestions for improving the forest resource have already been made. Foremost was the conversion of several million acres of hardwood types to pine production. Perhaps equally significant is the need to upgrade the quality of growing stock on acres that are adequately stocked otherwise.

Desirable trees, those suited to the sites upon which they occur and of good form and surface quality, now stock only one-fourth of the forest acreage. On pine sites, this condition largely results from the hardwood component. Figure 18 shows the proportion of desirable trees in each forest type. In loblolly-shortleaf, oak-pine, and oak-hickory types the desirable-tree component consists mainly of pines. Rough and rotten culls are almost exclusively hardwoods. Hardwood control on pine sites is a continuing need and is in many instances indistinguishable from type conversion.

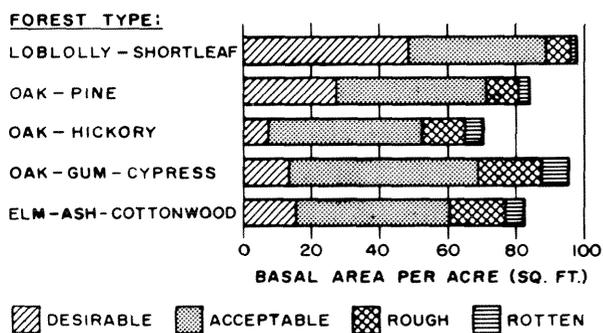


Figure 18. Stand components by tree class and forest type.

Whether the desirable-tree component on hardwood sites can be improved depends on a number of conditions. Forest industry and public ownership of hardwood timber is small in

comparison to pine holdings. In forest area these ownerships aggregate only about one-fourth of the hardwood sites. The private nonindustrial landowners who control the other three-fourths are not likely to make forestry investments until they are attracted by stumpage prices or are provided with other incentives, possibly public assistance. Hunting clubs and other users provide small revenues, but only when stumpage prices reflect the costs of management will these lands achieve equal status with pinelands. Until then, hardwood industries may have to be content to salvage the better hardwood logs as they occur in unmanaged stands.

A leading opportunity for conserving the resource is through closer utilization of timber removals. Most of the hardwood timber removed in land clearing was in poor market areas and was not utilized. Expected increases in demand may help expand markets for limited sizes and species of hardwoods. But a more positive source of improvement must be sought through research in marketing and manufacturing techniques. The same applies to 63 million cubic feet of logging residues that, by definition, are within the drawing territories of some manufacturing facility. Cutting practices associated with single-product harvesting leave large amounts of logging residues, usually low-grade material but still suitable for some purposes. For pines, multiproduct processing has reduced this loss. Diversification of manufacturing may apply equally for hardwoods, but the problems are much more complex.

Another possibility is in integrated marketing systems. One such system, called the Timber Development Organization, is being tried in several States. The objective is to reduce costs by combining management, marketing, and manufacturing functions. Presumably the savings would be shared by both timber grower and buyer. Systems involving forestry consultants may also prove workable. They all have two things in common: growing good timber, and obtaining fair prices for it.

For the most part, Arkansas' present forests reflect the economic and social values that prevailed during the 1960's. Land use is intensifying, both for agriculture and for forestry. Many forest practices that have previously been marginal are now fully justified. The problem lies in the considerable time lag in benefits from these measures. It will be essential in the years ahead to anticipate forest resource needs so that necessary investments can be made in advance.

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Appendix

SURVEY METHODS

The data on forest acreage and timber volume in this report were secured by a sampling method involving a forest-nonforest classification on aerial photographs and on-the-ground measurements of trees at sample locations. The sample locations were at the intersections of a grid of lines spaced 3 miles apart. In Arkansas, 155,487 photographic classifications were made and 6,787 ground sample locations were visited.

The initial estimates of forest area that were obtained with the aerial photographs were adjusted on the basis of the ground check.

A cluster of 10 variable-radius plots were installed at each ground sample location. Each sample tree on the variable-radius plots represented 3.75 square feet of basal area per acre. Trees less than 5.0 inches in diameter were tallied on fixed-radius plots around the plot centers. Together, these samples provided most of the information for the new inventory. A subsample of trees on the plots was measured in detail to obtain data for calculating timber volumes.

The plots established by the prior survey were remeasured to determine the elements of change and were the basis for estimating growth, mortality, removals, and changes in land use.

With the assistance of the Arkansas Forestry Commission, a special study was made to determine product output. It consisted of a canvass of all primary wood-using plants active in Arkansas during 1968. Out-of-State firms known to use Arkansas roundwood were also contacted. Additionally, fuelwood and other domestic uses were determined from an area sample.

Reliability of the Data

Reliability of the estimates may be affected by two types of errors. The first stems from the use of a sample to estimate the whole and from variability of the items being sampled. This type is termed sampling error; it is susceptible to a mathematical evaluation of the probability of

error. The second type—often referred to as reporting or estimating error—derives from mistakes in measurement, judgment, or recording, and from limitations of method or equipment. Its effects cannot be appraised mathematically, but the Forest Survey constantly attempts to hold it to a minimum by proper training and good supervision, and by emphasis on careful work.

Statistical analysis of the data indicates a sampling error of plus or minus 0.3 percent for the estimate of total commercial forest area, 1.3 percent for total cubic volume, and 1.9 percent for total board-foot volume. As these totals are broken down by forest type, species, tree diameter, and other subdivisions, the possibility of error increases and is greatest for the smallest items. The order of this increase is suggested in the following tabulation, which shows the sampling error to which the timber volume and area estimates are liable, two chances out of three.

Commercial forest area	Sampling error ¹	Cubic volume ²	Sampling error ¹	Board-foot volume ³	Sampling error ¹
<i>Thousand acres</i>	<i>Percent</i>	<i>Million cubic feet</i>	<i>Percent</i>	<i>Million board feet</i>	<i>Percent</i>
18,206.7	0.3				
1,638.6	1.0	15,228.6	1.3	46,189.0	1.9
409.6	2.0	6,434.1	2.0	41,685.6	2.0
182.1	3.0	2,859.6	3.0	18,526.9	3.0
102.4	4.0	1,608.5	4.0	10,421.4	4.0
65.5	5.0	1,029.5	5.0	6,669.7	5.0
16.4	10.0	257.4	10.0	1,667.4	10.0
7.3	15.0	114.4	15.0	741.1	15.0
4.1	20.0	64.3	20.0	416.9	20.0
2.6	25.0	41.2	25.0	266.8	25.0

¹By random-sampling formula.

²Growing-stock volume on commercial forest land.

³Sawtimber volume on commercial forest land.

The sampling error to which the estimates of growth, mortality, and removals are liable, on a probability of two chances out of three, are:

Net annual growth				Annual removals			
Cubic volume	Sampling error ¹	Board-foot volume	Sampling error ¹	Cubic volume	Sampling error ¹	Board-foot volume	Sampling error ¹
<i>Million cubic feet</i>	<i>Percent</i>	<i>Million board feet</i>	<i>Percent</i>	<i>Million cubic feet</i>	<i>Percent</i>	<i>Million board feet</i>	<i>Percent</i>
758.6	1.8						
614.5	2.0	2,463.3	2.2	570.6	2.8	2,227.6	2.7
273.1	3.0	1,324.7	3.0	497.1	3.0	1,804.4	3.0
153.6	4.0	745.1	4.0	279.6	4.0	1,015.0	4.0
98.3	5.0	476.9	5.0	178.9	5.0	649.6	5.0
24.6	10.0	119.2	10.0	44.7	10.0	162.4	10.0
10.9	15.0	53.0	15.0	19.9	15.0	72.2	15.0
6.1	20.0	29.8	20.0	11.2	20.0	40.6	20.0
3.9	25.0	19.1	25.0	7.2	25.0	26.0	25.0

¹By random-sampling formula.

DEFINITIONS OF TERMS

Forest Land Class

Forest land.—Land at least 16.7 percent stocked by forest trees of any size, or formerly having such tree cover and not currently developed for nonforest use.

Commercial forest land.—Forest land that is producing or is capable of producing crops of industrial wood and not withdrawn from timber utilization.

Nonstocked land.—Commercial forest land less than 16.7 percent stocked with growing-stock trees.

Productive-reserved forest land.—Productive public forest land withdrawn from timber utilization through statute or administrative regulation.

Unproductive forest land.—Forest land incapable of yielding crops of industrial wood because of adverse site conditions.

Tree Species

Commercial species.—Tree species presently or prospectively suitable for industrial wood products; excludes so-called weed species, such as blackjack oak and blue beech.

Hardwoods.—Dicotyledonous trees, usually broad-leaved and deciduous.

Softwoods.—Coniferous trees, usually evergreen, having needle or scale-like leaves.

Forest Type

Loblolly-shortleaf pine.—Forests in which southern pine and eastern red cedar, except longleaf or slash pine, comprise a plurality of the stocking. Common associates include oak, hickory, and gum.

Oak-pine.—Forests in which hardwoods (usually upland oaks) comprise a plurality of the stocking but in which softwoods, except cypress, comprise 25-50 percent of the stocking. Common associates include gum, hickory, and yellow-poplar.

Oak-hickory.—Forests in which upland oaks or hickory, singly or in combination, comprise a plurality of the stocking except where pines comprise 25-50 percent, in which case the stand is classified oak-pine. Common associates include elm, maple, and black walnut.

Oak-gum-cypress.—Bottom-land forests in which tupelo, blackgum, sweetgum, oaks, or southern cypress, singly or in combination, comprise a plurality of stocking except where pines comprise 25-50 percent, in which case the stand is classified oak-pine. Common associates include cottonwood, willow, ash, elm, hackberry, and maple.

Elm-ash-cottonwood.—Forests in which elm, ash, or cottonwood, singly or in combination, comprise a plurality of the stocking. Common associates include willow, sycamore, beech, and maple.

Class of Timber

Growing stock trees.—Sawtimber trees, poletimber trees, saplings, and seedlings; that is, all live trees except rough and rotten trees.

Desirable trees.—Growing-stock trees that have no serious defects to limit present or prospective use, are of relatively high vigor, and contain no pathogens that may result in death or serious deterioration before rotation age. They comprise the type of trees that forest managers aim to grow; that is, the trees favored in silvicultural operations.

Acceptable trees.—Trees meeting the specifications for growing stock but not qualifying as desirable trees.

Sawtimber trees.—Live trees of commercial species, 9.0 inches and larger in diameter at breast height for softwoods and 11.0 inches and larger for hardwoods, and containing at least one 12-foot saw log.

Poletimber trees.—Live trees of commercial species, 5.0 to 9.0 inches in d.b.h. for softwoods and 5.0 to 11.0 inches for hardwoods, and of good form and vigor.

Saplings.—Live trees of commercial species, 1.0 inch to 5.0 inches in d.b.h. and of good form and vigor.

Rough and rotten trees.—Live trees that are unmerchantable for saw logs now or prospectively because of defect, rot, or species.

Salvable dead trees.—Standing or down dead trees that are considered currently or potentially merchantable.

Stand-Size Class

Sawtimber stands.—Stands at least 16.7 percent stocked with growing-stock trees, with half or more of this stocking in sawtimber or poletimber trees, and with sawtimber stocking at least equal to poletimber stocking.

Poletimber stands.—Stands at least 16.7 percent stocked with growing-stock trees, with half or more of this stocking in sawtimber or poletimber trees, and with poletimber stocking exceeding that of sawtimber stocking.

Sapling-seedling stands.—Stands at least 16.7 percent stocked with growing-stock trees, with more than half of this stocking in saplings or seedlings.

Nonstocked areas.—Commercial forest lands less than 16.7 percent stocked with growing-stock trees.

Stocking

Stocking is a measure of the extent to which the growth potential for the site is utilized by trees or preempted by vegetative cover. Stocking is determined by comparing the stand density in terms of number of trees or basal area with a specified standard. Full stocking is assumed to range from 100 to 133 percent of the stocking standard.

The tabulation below shows the density standard in terms of trees per acre, by size class, required for full stocking:

D.b.h. (inches)	Number of trees	D.b.h. (inches)	Number of trees
Seedlings	600	16	72
2	560	18	60
4	460	20	51
6	340	22	42
8	240	24	36
10	155	26	31
12	115	28	27
14	90	30	24

Volume

Volume of sawtimber.—Net volume of the saw-log portion of live sawtimber trees, in board feet of the International rule, 1/4-inch kerf.

Volume of growing stock.—Volume of sound wood in the bole of sawtimber and poletimber trees from stump to a minimum 4.0-inch top outside bark or to the point where the central stem breaks into limbs.

Volume of timber.—The volume of sound wood in the bole of growing stock, rough, rotten, and salvable dead trees 5.0 inches and larger in d.b.h. from stump to a minimum 4.0-inch top outside bark or to the point where the central stem breaks into limbs.

Log Grades

Log grades are based on the standards presented by the USDA Forest Service in Res. Pap. SE-39, "Southern Pine Log Grades for Yard and Structural Lumber," issued by the Southeastern Forest Experiment Station in 1968, and "Hardwood Log Grades for Standard Lumber," issued by the Forest Products Laboratory under the designation D1737A in 1961.

Hardwood log grades include, in addition to the grades for standard lumber, a grade-4 tie and timber log. Specifications for tie and timber logs are based chiefly on knot size and log soundness; clear cuttings are not required.

Area Condition Class

A classification of commercial forest land based upon stocking by desirable trees and other conditions affecting current and prospective timber growth.

Class 10.—Areas 100 percent or more stocked with desirable trees and not overstocked.

Class 20.—Areas 100 percent or more stocked with desirable trees and overstocked with all live trees.

Class 30.—Areas 60 to 100 percent stocked with desirable trees and with less than 30 percent of the area controlled by other trees, inhibiting vegetation, slash, or nonstockable conditions.

Class 40.—Areas 60 to 100 percent stocked with desirable trees and with 30 percent or more of the area controlled by other trees, or conditions that ordinarily prevent occupancy by desirable trees.

Class 50.—Areas less than 60 percent stocked with desirable trees, but with 100 percent or more stocking with growing-stock trees.

Class 60.—Areas less than 60 percent stocked with desirable trees, but with 60 to 100 percent stocking with growing-stock trees.

Class 70.—Areas less than 60 percent stocked with desirable trees and with less than 60 percent stocking with growing-stock trees.

Miscellaneous Definitions

Basal area.—The area in square feet of the cross section at breast height of a single tree or of all the trees in a stand, usually expressed as square feet per acre.

D.b.h. (Diameter breast high).—Tree diameter in inches, outside bark, measured at 4½ feet above ground.

Diameter classes.—The 2-inch diameter classes extend from 1.0 inch below to 0.9 inch above the stated midpoint. Thus, the 12-inch class includes trees 11.0 inches through 12.9 inches d.b.h.

Site classes.—A classification of forest land in terms of inherent capacity to grow crops of industrial wood.

Gross growth.—Annual increase in net volume of trees in the absence of cutting and mortality.

Net annual growth.—The increase in volume of a specified size class for a specific year. Components of net annual growth include the increment in net volume of trees at the beginning of the specific year surviving to its end plus volume of trees reaching the size class during the year minus the volume of trees that died during the year minus the net volume of trees that become rough or rotten during the year.

Mortality.—Number or sound-wood volume of live trees dying from natural causes during a specified period.

Timber removals.—The net volume of growing-stock trees removed from the inventory by harvesting, cultural operations such as timber-stand improvement, land clearing, or changes in land use.

Timber products.—Roundwood products and plant byproducts. Timber products output includes roundwood products cut from growing stock on commercial forest land; from other sources, such as cull trees, salvable dead trees, limbs, and saplings; from trees on noncommercial and nonforest lands, and from plant byproducts.

Roundwood products.—Logs, bolts, or other round sections cut from trees for industrial or consumer uses. Included are saw logs, veneer logs and bolts, cooperage logs and bolts, pulpwood, fuelwood, piling, poles and posts, hewn ties, mine timbers, and various other round, split, or hewn products.

Logging residues.—The unused portions of trees cut or killed by logging.

Plant byproducts.—Wood products, such as pulp chips, obtained incidental to manufacture of other products.

Plant residues.—Wood materials from manufacturing plants not utilized for some product. Included are slabs, edgings, trimmings, miscuts, sawdust, shavings, veneer cores and clippings, and pulp screenings.

STANDARD TABLES

NOTE: Regional tables, identical in format to standard State tables 1-22, are available for each of the four Forest Survey regions in Arkansas. They are free on request to the Southern Forest Experiment Station.

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Table 1. Area by land classes, Arkansas, 1969

Land class	Area
	<i>Thousand acres</i>
Forest:	
Commercial	18,206.7
Productive-reserved	41.3
Unproductive	29.9
Total forest	<u>18,277.9</u>
Nonforest:	
Cropland ¹	8,525.2
Pasture and range ¹	2,373.0
Other ²	4,148.1
Total nonforest	<u>15,046.3</u>
All land ³	<u>33,324.2</u>

¹ Source: 1964 Census of Agriculture.

² Includes swampland, industrial and urban areas, other nonforest land, and 100,300 acres, classed as water by Forest Survey standards, but defined by the Bureau of the Census as land.

³ Source: United States Bureau of the Census, Land and Water Area of the United States, 1960.

Table 2. Area of commercial forest land by ownership classes, Arkansas, 1969

Ownership class	Area
	<i>Thousand acres</i>
Public:	
National forest	2,378.2
Bureau of Land Management	1.1
Indian	...
Other federal	302.8
State	236.9
County and municipal	19.5
Total public	<u>2,938.5</u>
Private:	
Forest industry ¹	3,950.7
Farmer	4,800.0
Miscellaneous private:	
Individual	5,759.4
Corporate	758.1
Total private	<u>15,268.2</u>
All ownerships	<u>18,206.7</u>

¹ Not including 10,700 acres of farmer-owned and miscellaneous private lands leased to forest industry.

Table 3. Area of commercial forest land by stand-size and ownership classes, Arkansas, 1969

Stand-size class	All ownerships	National forest	Other public	Forest industry	Farmer and misc. private
	<i>Thousand acres</i>				
Sawtimber	5,443.4	732.6	220.7	1,863.8	2,626.3
Poletimber	4,759.5	863.0	119.1	745.2	3,032.2
Sapling and seedling	7,922.1	782.6	214.9	1,322.4	5,602.2
Nonstocked areas	81.7	...	5.6	19.3	56.8
All classes	<u>18,206.7</u>	<u>2,378.2</u>	<u>560.3</u>	<u>3,950.7</u>	<u>11,317.5</u>

Table 4. Area of commercial forest land by stand-volume and ownership classes, Arkansas, 1969

Stand-volume per acre ¹	All ownerships	National forest	Other public	Forest industry	Farmer and misc. private
	<i>Thousand acres</i>				
Less than 1,500 board feet	8,760.9	815.7	234.0	959.4	6,751.8
1,500 to 5,000 board feet	6,577.7	1,195.3	193.9	1,657.2	3,531.3
More than 5,000 board feet	2,868.1	367.2	132.4	1,334.1	1,034.4
All classes	<u>18,206.7</u>	<u>2,378.2</u>	<u>560.3</u>	<u>3,950.7</u>	<u>11,317.5</u>

¹ International 1/4-inch rule.

Table 5. Area of commercial forest land by stocking classes based on selected stand components, Arkansas, 1969

Stocking percentage	Stocking classified in terms of					Rough and rotten trees	Inhibiting vegetation
	All trees	Growing-stock trees					
		Total	Desirable	Acceptable			
----- Thousand acres -----							
160 or more	...	...	...	...	...	...	...
150 to 160	483.4	104.4	13.4	...	...	...	...
140 to 150	1,677.7	368.2	5.8	5.1	...	...	...
130 to 140	3,422.1	958.2	23.7	52.4	...	...	...
120 to 130	4,086.9	1,739.5	35.4	216.0	...	...	...
110 to 120	3,441.6	2,518.3	87.2	458.6	...	...	...
100 to 110	2,381.0	2,620.3	121.9	862.5	53.5	...	...
90 to 100	1,434.0	2,670.9	246.9	1,523.0	27.3	...	...
80 to 90	690.8	2,380.0	411.9	2,054.8	134.7	...	...
70 to 80	344.8	1,979.8	620.0	2,895.2	239.1	...	...
60 to 70	159.4	1,210.6	962.2	2,703.6	308.7	...	...
50 to 60	49.0	741.1	1,218.0	2,609.8	880.1	...	...
40 to 50	21.1	450.1	1,512.2	2,003.5	1,385.5	...	...
30 to 40	5.6	216.0	2,164.2	1,352.9	2,422.6	4.5	...
20 to 30	...	139.2	2,834.5	915.3	3,948.6	8.5	...
10 to 20	5.1	84.7	3,103.0	409.7	4,578.6	53.3	...
Less than 10	4.2	25.4	4,846.4	144.3	4,228.0	18,140.4	...
All areas	18,206.7	18,206.7	18,206.7	18,206.7	18,206.7	18,206.7	18,206.7

Table 6. Area of commercial forest land by area-condition and ownership classes, Arkansas, 1969

Area-condition class	All owner-ships	National forest	Other public	Forest industry	Farmer and misc. private
----- Thousand acres -----					
10	201.7	32.8	5.4	62.7	100.8
20	85.7	17.7	...	50.5	17.5
30	136.1	34.8	...	37.5	63.8
40	2,104.9	520.9	16.2	827.3	740.5
50	6,051.6	891.3	202.5	1,320.0	3,637.8
60	7,970.2	789.9	292.4	1,423.0	5,464.9
70	1,656.5	90.8	43.8	229.7	1,292.2
All classes	18,206.7	2,378.2	560.3	3,950.7	11,317.5

Table 7. Area of commercial forest land by site and ownership classes, Arkansas, 1969

Site class	All owner-ships	National forest	Other public	Forest industry	Farmer and misc. private
----- Thousand acres -----					
165 cu. ft. or more	214.5	...	6.4	67.1	141.0
120 to 165 cu. ft.	909.8	2.6	76.9	420.0	410.3
85 to 120 cu. ft.	3,650.0	111.9	112.4	1,469.3	1,956.4
50 to 85 cu. ft.	8,303.4	1,299.2	227.5	1,733.5	5,043.2
Less than 50 cu. ft.	5,129.0	964.5	137.1	260.8	3,766.6
All classes	18,206.7	2,378.2	560.3	3,950.7	11,317.5

Table 8. Area of commercial forest land by forest types and ownership classes, Arkansas, 1969

Type	All ownerships	Public	Private
--- Thousand acres ---			
Loblolly-shortleaf pine	3,668.0	685.5	2,982.5
Oak-pine	3,039.6	573.0	2,466.6
Oak-hickory	8,446.3	1,373.2	7,073.1
Oak-gum-cypress	2,774.7	278.4	2,496.3
Elm-ash-cottonwood	278.1	28.4	249.7
All types	18,206.7	2,938.5	15,268.2

Table 9. Area of noncommercial forest land by forest types, Arkansas, 1969

Type	All areas	Productive- reserved areas	Un- productive areas
--- Thousand acres ---			
Loblolly-shortleaf pine	14.7	14.7	...
Oak-pine	7.7	7.7	...
Oak-hickory	48.5	18.6	29.9
Oak-gum-cypress	.3	.3	...
All types	71.2	41.3	29.9

Table 10. Number of growing-stock trees on commercial forest land by species and diameter classes, Arkansas, 1969

Species	Diameter class (inches at breast height)										
	All classes	5.0- 6.9	7.0- 8.9	9.0- 10.9	11.0- 12.9	13.0- 14.9	15.0- 16.9	17.0- 18.9	19.0- 20.9	21.0- 28.9	29.0 and larger
--- Thousand trees ---											
Softwood:											
Shortleaf pine	417,244	158,151	108,499	75,201	42,430	18,785	9,127	3,543	1,044	464	...
Loblolly pine	282,314	129,939	59,338	35,809	23,712	14,634	8,707	5,162	2,793	2,168	52
Cypress	8,465	1,321	2,006	1,616	945	702	552	425	260	409	229
Redcedar	22,074	15,898	3,731	1,277	943	198	...	13	14	...	...
Total	730,097	305,309	173,574	113,903	68,030	34,319	18,386	9,143	4,111	3,041	281
Hardwood:											
Select white oaks ¹	189,385	96,913	43,770	22,438	12,322	7,184	3,883	1,504	775	568	28
Select red oaks ²	65,505	23,283	16,942	10,319	5,660	4,099	2,440	1,239	870	626	27
Other white oaks	193,576	94,516	46,911	24,230	12,133	6,938	4,000	2,102	1,388	1,286	72
Other red oaks	227,988	94,467	53,336	34,089	18,760	12,032	7,475	3,841	1,772	2,029	187
Pecan	14,396	6,080	2,466	2,048	984	997	638	409	227	480	67
Other hickories	149,990	78,253	38,284	17,232	8,841	4,268	1,791	644	335	334	8
Sweetgum	141,161	65,884	32,899	18,592	10,930	6,803	3,075	1,700	741	510	27
Tupelo and blackgum	37,206	17,009	7,331	4,514	2,708	2,362	1,417	668	465	662	70
Hard maple	4,677	2,972	928	345	183	105	100	34	10	...	...
Soft maple	10,269	4,967	2,671	1,542	506	260	134	111	27	46	5
Beech	3,206	778	418	635	430	277	277	113	136	136	6
Ash	28,328	12,554	7,253	3,823	1,794	1,205	626	436	303	318	16
Cottonwood	4,132	1,354	413	412	422	574	455	215	163	106	18
Basswood	1,496	460	594	190	99	45	28	38	...	42	...
Yellow-poplar	144	...	44	...	25	56	...	12	7	...	...
Black walnut	4,055	1,436	1,140	678	552	87	115	47	...	...	...
Black cherry	3,799	2,001	809	566	277	61	58	18	9	...	...
Willow	11,090	4,864	1,684	1,327	956	897	597	328	210	227	...
Magnolia	96	...	...	43	...	...	38	15	...	...	...
American elm	17,921	8,842	4,047	2,394	932	765	332	277	86	202	44
Other elms	36,290	22,023	7,492	4,198	1,379	653	238	139	82	83	3
Hackberry	20,772	8,095	4,519	3,377	1,486	1,312	951	471	272	289	...
Sycamore	4,492	1,214	572	861	687	307	331	211	152	149	8
Other hardwoods	33,601	19,405	8,000	3,235	1,695	782	194	83	82	125	...
Total	1,203,575	567,370	282,523	157,088	83,761	52,069	29,193	14,655	8,112	8,218	586
All species	1,933,672	872,679	456,097	270,991	151,791	86,388	47,579	23,798	12,223	11,259	867

¹Includes white, swamp chestnut, chinkapin, Durand, swamp white, and bur oaks.

²Includes cherrybark, shumard, and northern red oaks.

Table 11. Volume of timber on commercial forest land by class of timber and by softwoods and hardwoods, Arkansas, 1969

Class of timber	All species	Soft-wood	Hard-wood
Sawtimber trees:			
Saw-log portion	8,067.1	4,432.5	3,634.6
Upper-stem portion	1,767.5	477.1	1,290.4
Total	9,834.6	4,909.6	4,925.0
Poletimber trees	5,394.0	1,512.8	3,881.2
All growing stock	15,228.6	6,422.4	8,806.2
Rough trees	1,597.5	53.3	1,544.2
Rotten trees	848.4	24.8	823.6
Salvable dead trees	29.5	11.9	17.6
All timber	17,704.0	6,512.4	11,191.6

Table 12. Volume of growing stock and sawtimber on commercial forest land by ownership classes and by softwoods and hardwoods, Arkansas, 1969

Ownership class	Growing stock			Sawtimber		
	All species	Soft-wood	Hard-wood	All species	Soft-wood	Hard-wood
--- Million cubic feet --- --- Million board feet ---						
National forest	2,280.1	1,205.7	1,074.4	6,711.3	4,302.3	2,409.0
Other public	532.2	89.1	443.1	1,814.4	367.6	1,446.8
Forest industry	4,542.9	2,637.1	1,905.8	16,798.8	11,484.1	5,314.7
Farmer and misc. private	7,873.4	2,490.5	5,382.9	20,864.5	8,660.1	12,204.4
All ownerships	15,228.6	6,422.4	8,806.2	46,189.0	24,814.1	21,374.9

Table 13. Volume of growing stock on commercial forest land by species and diameter classes, Arkansas, 1969

Species	Diameter class (inches at breast height)										
	All classes	5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0 and larger
----- Million cubic feet -----											
Softwood:											
Shortleaf pine	3,588.4	342.3	594.1	807.9	733.6	496.3	338.8	168.7	65.7	41.0	...
Loblolly pine	2,603.8	250.2	283.5	357.9	398.5	374.1	313.9	246.8	173.5	196.7	8.7
Cypress	182.0	2.0	9.7	12.3	10.9	14.3	16.2	19.6	14.3	30.4	52.3
Redcedar	48.2	20.2	10.8	6.5	7.9	2.0	...	.2	.6	...	...
Total	6,422.4	614.7	898.1	1,184.6	1,150.9	886.7	668.9	435.3	254.1	268.1	61.0
Hardwood:											
Select white oaks	1,212.6	214.0	218.7	199.8	184.1	153.6	112.7	55.4	36.7	33.4	4.2
Select red oaks	625.4	54.0	85.4	92.3	85.1	92.9	72.4	51.7	44.0	44.1	3.5
Other white oaks	1,191.5	180.2	209.3	190.9	166.8	126.4	103.2	68.0	58.2	78.8	9.7
Other red oaks	1,961.5	195.2	276.8	314.1	287.7	269.6	218.0	144.7	87.9	141.4	26.1
Pecan	193.0	13.3	12.2	18.7	15.8	23.6	21.7	17.2	13.2	47.8	9.5
Other hickories	812.0	141.5	168.7	143.9	138.7	93.4	53.6	27.6	18.2	25.2	1.2
Sweetgum	1,139.4	128.4	168.6	186.3	196.9	175.7	110.2	75.9	41.4	45.7	10.3
Tupelo and blackgum	316.3	28.7	35.0	38.6	41.0	52.2	41.1	23.5	20.0	32.2	4.0
Hard maple	23.9	7.0	4.5	2.6	3.3	2.6	2.1	1.5	.3	...	...
Soft maple	58.6	10.3	11.2	12.1	7.5	5.4	3.7	3.4	1.2	3.4	.4
Beech	52.6	1.8	2.2	4.7	7.0	5.9	9.0	4.2	7.1	10.1	.6
Ash	221.1	28.8	35.5	33.1	28.2	27.0	18.6	16.0	12.9	19.2	1.8
Cottonwood	84.1	2.8	2.4	4.6	7.9	16.3	17.8	10.1	10.0	8.5	3.7
Basswood	14.2	1.1	2.0	2.0	1.5	.9	1.3	2.0	...	3.4	...
Yellow-poplar	2.9	...	.4	...	.5	1.1	...	.5	.4	...	...
Black walnut	29.5	3.4	5.5	5.4	7.7	2.2	3.3	2.0	...	...	...
Black cherry	21.5	4.3	3.8	4.6	4.8	1.3	1.8	.5	.4	...	...
Willow	129.0	10.9	7.6	12.6	15.8	24.0	18.8	13.1	10.0	16.2	...
Magnolia	2.8	...	...	.5	...	...	1.5	.8	...	...	...
American elm	127.4	15.7	17.1	19.0	14.8	15.6	9.1	10.6	4.4	14.7	6.4
Other elms	163.0	39.8	33.3	33.8	19.3	13.5	6.4	7.2	3.3	5.9	.5
Hackberry	188.7	16.8	20.6	25.7	20.8	29.1	27.0	17.1	12.6	19.0	...
Sycamore	72.1	3.4	2.9	7.7	11.6	6.1	10.7	8.8	8.4	11.7	.8
Other hardwoods	163.1	40.0	37.0	26.1	24.9	15.9	5.8	2.3	3.2	7.9	...
Total	8,806.2	1,141.4	1,360.7	1,379.1	1,291.7	1,154.3	869.8	564.1	393.8	568.6	82.7
All species	15,228.6	1,756.1	2,258.8	2,563.7	2,442.6	2,041.0	1,538.7	999.4	647.9	836.7	143.7

Table 14. Volume of sawtimber on commercial forest land by species and diameter classes, Arkansas, 1969

Species	Diameter class (inches at breast height)								
	All classes	9.0- 10.9	11.0- 12.9	13.0- 14.9	15.0- 16.9	17.0- 18.9	19.0- 20.9	21.0- 28.9	29.0 and larger
----- Million board feet -----									
Softwood:									
Shortleaf pine	13,204.5	3,229.0	3,683.3	2,719.2	1,948.8	987.9	386.9	249.4	...
Loblolly pine	10,645.4	1,134.6	1,897.0	2,012.9	1,806.4	1,465.2	1,052.6	1,225.2	51.5
Cypress	912.0	32.5	43.1	71.2	85.0	113.1	81.5	178.3	307.3
Redcedar	52.2	12.4	27.2	7.8	...	1.2	3.6	...	...
Total	24,814.1	4,408.5	5,650.6	4,811.1	3,840.2	2,567.4	1,524.6	1,652.9	358.8
Hardwood:									
Select white oaks	2,458.3	...	678.4	633.9	520.5	261.5	174.8	165.8	23.4
Select red oaks	1,742.1	...	315.4	404.1	325.4	242.8	219.2	217.6	17.6
Other white oaks	2,653.7	...	613.9	538.4	468.8	314.8	278.2	392.5	47.1
Other red oaks	5,032.5	...	1,020.0	1,120.9	975.2	681.6	415.4	691.3	128.1
Pecan	692.8	...	60.0	103.8	93.3	79.3	68.3	239.8	48.3
Other hickories	1,537.7	...	527.6	407.1	248.7	128.6	90.0	129.1	6.6
Sweetgum	2,886.6	...	704.0	785.9	522.9	367.5	207.9	248.7	49.7
Tupelo and blackgum	930.0	...	135.0	224.7	193.7	112.8	93.1	153.6	17.1
Hard maple	40.9	...	12.4	11.5	8.1	7.2	1.7	...	...
Soft maple	103.2	...	25.8	21.8	15.8	14.7	6.4	16.9	1.8
Beech	201.6	...	25.9	27.1	41.6	21.4	33.3	48.3	4.0
Ash	535.6	...	100.0	113.2	91.0	68.2	62.1	94.5	6.6
Cottonwood	336.4	...	26.2	69.6	80.8	49.1	48.6	42.0	20.1
Basswood	46.2	...	6.6	3.2	7.7	11.3	...	17.4	...
Yellow-poplar	10.7	...	1.9	4.1	...	2.4	2.3	...	...
Black walnut	56.8	...	25.2	8.8	13.1	9.7	...	...	...
Black cherry	37.2	...	18.2	6.8	8.8	2.2	1.2	...	...
Willow	433.3	...	56.4	104.0	88.0	60.6	47.9	76.4	...
Magnolia	10.8	...	...	...	6.6	4.2	...	...	...
American elm	339.6	...	57.4	67.8	43.1	50.4	21.3	74.6	25.0
Other elms	247.1	...	73.7	57.3	28.9	35.4	16.9	32.4	2.5
Hackberry	531.3	...	72.5	122.6	112.3	81.4	55.7	86.8	...
Sycamore	268.6	...	41.0	25.0	50.1	45.0	41.8	61.9	3.8
Other hardwoods	241.9	...	87.7	64.9	25.1	11.2	15.2	37.8	...
Total	21,374.9	...	4,685.2	4,926.5	3,969.5	2,663.3	1,901.3	2,827.4	401.7
All species	46,189.0	4,408.5	10,335.8	9,737.6	7,809.7	5,230.7	3,425.9	4,480.3	760.5

Table 15. *Volume of sawtimber on commercial forest land by species and log grade, Arkansas, 1969*

Species	All grades	Grade 1	Grade 2	Grade 3	Grade 4
----- Million board feet -----					
Softwood:					
Yellow pines	23,849.9	1,363.5	6,097.6	9,327.7	7,061.1
Cypress	912.0	128.0	214.6	369.3	200.1
Other softwoods	52.2	52.2	...	...	...
Total	<u>24,814.1</u>	<u>1,543.7</u>	<u>6,312.2</u>	<u>9,697.0</u>	<u>7,261.2</u>
Hardwood:					
Select white and red oaks	4,200.4	517.4	876.2	2,160.4	646.4
Other white and red oaks	7,686.2	898.6	1,492.1	3,759.8	1,535.7
Hickory	2,230.5	335.8	378.7	1,111.9	404.1
Hard maple	40.9	3.5	4.4	25.1	7.9
Sweetgum	2,886.6	340.2	597.0	1,438.3	511.1
Ash, walnut, and black cherry	629.6	141.4	138.7	292.8	56.7
Yellow-poplar	10.7	1.2	1.9	6.3	1.3
Other hardwoods	3,690.0	653.6	796.3	1,671.1	569.0
Total	<u>21,374.9</u>	<u>2,891.7</u>	<u>4,285.3</u>	<u>10,465.7</u>	<u>3,732.2</u>
All species	<u>46,189.0</u>	<u>4,435.4</u>	<u>10,597.5</u>	<u>20,162.7</u>	<u>10,993.4</u>

Table 16. *Annual growth and removals of growing stock on commercial forest land by species, Arkansas, 1968*

Species	Net annual growth	Annual removals
<i>Million cubic feet</i>		
Softwood:		
Yellow pines	378.2	278.9
Cypress	7.0	1.7
Other softwoods	5.3	.7
Total	<u>390.5</u>	<u>281.3</u>
Hardwood:		
Select white and red oaks	72.2	37.3
Other white and red oaks	140.3	117.2
Hickory	48.1	26.0
Hard maple	1.5	.4
Sweetgum	40.6	35.4
Tupelo and blackgum	14.2	12.5
Ash, walnut, and black cherry	15.9	10.8
Yellow-poplar	.1	(¹)
Other hardwoods	35.2	49.7
Total	<u>368.1</u>	<u>289.3</u>
All species	<u>758.6</u>	<u>570.6</u>

¹ Negligible.

Table 17. Annual growth and removals of growing stock on commercial forest land by ownership classes and by softwoods and hardwoods, Arkansas, 1969

Ownership class	Net annual growth			Annual removals		
	All species	Soft-wood	Hard-wood	All species	Soft-wood	Hard-wood
----- Million cubic feet -----						
National forest	90.5	52.7	37.8	44.7	27.5	17.2
Other public	21.9	4.4	17.5	13.8	5.3	8.5
Forest industry	239.0	150.9	88.1	203.8	149.7	54.1
Farmer and misc. private	407.2	182.5	224.7	308.3	98.8	209.5
All ownerships	758.6	390.5	368.1	570.6	281.3	289.3

Table 18. Annual growth and removals of sawtimber on commercial forest land by species, Arkansas, 1968

Species	Net annual growth	Annual removals
----- Million board feet -----		
Softwood:		
Yellow pines	1,533.7	1,282.1
Cypress	32.5	9.3
Other softwoods	3.8	1.5
Total	<u>1,570.0</u>	<u>1,292.9</u>
Hardwood:		
Select white and red oaks	172.1	155.7
Other white and red oaks	331.4	355.2
Hickory	92.0	68.8
Hard maple	2.2	.6
Sweetgum	116.6	115.9
Tupelo and blackgum	24.8	51.0
Ash, walnut, and black cherry	26.1	31.3
Yellow-poplar	.3	(¹)
Other hardwoods	127.8	155.7
Total	<u>893.3</u>	<u>934.7</u>
All species	<u>2,463.3</u>	<u>2,227.6</u>

¹ Negligible.

Table 19. Annual growth and removals of sawtimber on commercial forest land by ownership classes and by softwoods and hardwoods, Arkansas, 1968

Ownership class	Net annual growth			Annual removals		
	All species	Soft-wood	Hard-wood	All species	Soft-wood	Hard-wood
----- Million board feet -----						
National forest	301.6	235.5	66.1	190.9	138.5	52.4
Other public	73.7	17.6	56.1	57.6	23.0	34.6
Forest industry	947.2	721.1	226.1	961.1	760.2	200.9
Farmer and misc. private	1,140.8	595.8	545.0	1,018.0	371.2	646.8
All ownerships	2,463.3	1,570.0	893.3	2,227.6	1,292.9	934.7

Table 20. Mortality of growing stock and sawtimber on commercial forest land by species, Arkansas, 1968

Species	Growing stock	Sawtimber
	Million cubic feet	Million board feet
Softwood:		
Yellow pines	18.3	46.2
Cypress	1.4	7.9
Other softwoods	(¹)	(¹)
Total	<u>19.7</u>	<u>54.1</u>
Hardwood:		
Select white and red oaks	4.4	11.4
Other white and red oaks	10.9	29.1
Hickory	4.1	11.2
Hard maple	1.0	1.2
Sweetgum	6.4	17.3
Tupelo and blackgum	3.4	10.8
Ash, walnut, and black cherry	2.4	5.5
Yellow-poplar	(¹)	(¹)
Other hardwoods	16.0	45.9
Total	<u>48.6</u>	<u>132.4</u>
All species	68.3	186.5

¹ Negligible.

Table 21. Mortality of growing stock and sawtimber on commercial forest land by ownership classes and by softwoods and hardwoods, Arkansas, 1968

Ownership class	Growing stock			Sawtimber		
	All species	Soft-wood	Hard-wood	All species	Soft-wood	Hard-wood
	—Million cubic feet—			—Million board feet—		
National forest	8.4	3.3	5.1	21.2	8.2	13.0
Other public	4.0	.2	3.8	15.4	...	15.4
Forest industry	21.8	8.9	12.9	65.3	29.7	35.6
Farmer and misc. private	34.1	7.3	26.8	84.6	16.2	68.4
All ownerships	68.3	19.7	48.6	186.5	54.1	132.4

Table 22. Mortality of growing stock and sawtimber on commercial forest land by causes and by softwoods and hardwoods, Arkansas, 1968

Cause of death	Growing stock			Sawtimber		
	All species	Soft-wood	Hard-wood	All species	Soft-wood	Hard-wood
	—Million cubic feet—			—Million board feet—		
Fire	6.2	1.7	4.5	17.8	6.7	11.1
Insects	.7	.6	.1	2.6	2.6	...
Disease	.4	.2	.2	1.0	.6	.4
Other	9.0	2.7	6.3	29.2	7.2	22.0
Unknown	52.0	14.5	37.5	135.9	37.0	98.9
All causes	68.3	19.7	48.6	186.5	54.1	132.4

Table 23. Total output of timber products by product, by type of material used, and by softwoods and hardwoods, Arkansas, 1968

Product and species group	Standard units	Total output		Roundwood products		Plant byproducts	
		Number	M cu. ft.	Number	M cu. ft.	Number	M cu. ft.
Saw logs:							
Softwood	M bd. ft. ¹	789,599	129,889	789,599	129,889	...	...
Hardwood	M bd. ft. ¹	448,877	74,828	448,877	74,828	...	...
Total	M bd. ft. ¹	1,238,476	204,717	1,238,476	204,717	...	...
Veneer logs and bolts:							
Softwood	M bd. ft.	206,196	33,920	206,196	33,920	...	...
Hardwood	M bd. ft.	20,216	3,392	20,216	3,392	...	...
Total	M bd. ft.	226,412	37,312	226,412	37,312	...	...
Pulpwood:							
Softwood	Std. cords ²	1,671,191	135,367	1,011,888	81,963	659,303	53,404
Hardwood	Std. cords ²	626,479	50,118	520,254	41,620	106,225	8,498
Total	Std. cords ²	2,297,670	185,485	1,532,142	123,583	765,528	61,902
Cooperage:							
Softwood	M bd. ft.	...	...	...	...	...	...
Hardwood	M bd. ft.	22,459	3,232	22,459	3,232	...	...
Total	M bd. ft.	22,459	3,232	22,459	3,232	...	...
Piling:							
Softwood	M linear ft.	2,410	1,804	2,410	1,804	...	...
Hardwood	M linear ft.	...	...	...	...	...	...
Total	M linear ft.	2,410	1,804	2,410	1,804	...	...
Poles:							
Softwood	M pieces	548	5,778	548	5,778	...	...
Hardwood	M pieces	...	...	...	...	...	...
Total	M pieces	548	5,778	548	5,778	...	...
Commercial posts (round and split):							
Softwood	M pieces	6,741	3,783	6,741	3,783	...	...
Hardwood	M pieces	1	1	1	1	...	...
Total	M pieces	6,742	3,784	6,742	3,784	...	...
Other: ³							
Softwood	M cu. ft.	11,437	11,437	1,644	1,644	9,793	9,793
Hardwood	M cu. ft.	9,446	9,446	8,599	8,599	847	847
Total	M cu. ft.	20,883	20,883	10,243	10,243	10,640	10,640
Total industrial products:							
Softwood	...	...	...	...	258,781	...	63,197
Hardwood	...	...	...	...	131,672	...	9,345
Total	...	...	...	...	390,453	...	72,542
Noncommercial posts (round and split):							
Softwood	M pieces	637	408	637	408	...	...
Hardwood	M pieces	3,807	2,436	3,807	2,436	...	...
Total	M pieces	4,444	2,844	4,444	2,844	...	...
Fuelwood:							
Softwood	Std. cords	200,709	15,373	1,586	119	⁴ 199,123	⁴ 15,254
Hardwood	Std. cords	521,073	39,153	451,245	33,843	⁴ 69,828	⁴ 5,310
Total	Std. cords	721,782	54,526	452,831	33,962	⁴ 268,951	⁴ 20,564
All products:							
Softwood	...	...	...	...	259,308	...	78,451
Hardwood	...	...	...	...	167,951	...	14,655
Total	...	...	...	...	427,259	...	93,106

¹ International ¼-inch rule.² Rough wood basis (for example, chips converted to equivalent standard cords).³ Includes chemical wood, handle stock, miscellaneous dimension and other minor industrial products. Additionally, byproducts include material used for livestock bedding, mulch, etc.⁴ Includes plant byproducts used for industrial and domestic fuel.

Table 24. Output of roundwood products by source and by softwoods and hardwoods, Arkansas, 1968

Product and species group	All sources	Growing-stock trees ¹			Rough and rotten trees ¹	Salvable dead trees ¹	Other sources ²
		Total	Saw-timber	Pole-timber			
----- Thousand cubic feet -----							
Industrial products:							
Saw logs:							
Softwood	129,889	129,021	128,547	474	158	...	710
Hardwood	74,828	72,045	71,955	90	988	1,750	45
Total	204,717	201,066	200,502	564	1,146	1,750	755
Veneer logs and bolts:							
Softwood	33,920	33,693	33,569	124	41	...	186
Hardwood	3,392	3,334	3,334	...	44	...	14
Total	37,312	37,027	36,903	124	85	...	200
Pulpwood:							
Softwood	81,963	78,050	53,809	24,241	543	...	3,370
Hardwood	41,620	33,435	18,777	14,658	6,312	107	1,766
Total	123,583	111,485	72,586	38,899	6,855	107	5,136
Misc. industrial products:							
Cooperage:							
Softwood	...	...	...	...	...	...	...
Hardwood	3,232	3,189	3,188	1	21	...	22
Total	3,232	3,189	3,188	1	21	...	22
Piling:							
Softwood	1,804	1,797	1,797	...	...	...	7
Hardwood	...	...	...	...	...	...	...
Total	1,804	1,797	1,797	...	...	...	7
Poles:							
Softwood	5,778	5,735	5,072	663	...	...	43
Hardwood	...	...	...	...	...	...	...
Total	5,778	5,735	5,072	663	...	...	43
Commercial posts (round and split):							
Softwood	3,783	3,448	...	3,448	...	...	335
Hardwood	1	1	...	1	...	...	...
Total	3,784	3,449	...	3,449	...	...	335
Other:							
Softwood	1,644	1,521	614	907	...	...	123
Hardwood	8,599	7,216	4,903	2,313	547	268	568
Total	10,243	8,737	5,517	3,220	547	268	691
All misc. industrial products:							
Softwood	13,009	12,501	7,483	5,018	...	...	508
Hardwood	11,832	10,406	8,091	2,315	568	268	590
Total	24,841	22,907	15,574	7,333	568	268	1,098
All industrial products:							
Softwood	258,781	253,265	223,408	29,857	742	...	4,774
Hardwood	131,672	119,220	102,157	17,063	7,912	2,125	2,415
Total	390,453	372,485	325,565	46,920	8,654	2,125	7,189
Noncommercial posts (round and split):							
Softwood	408	368	200	168	18	...	22
Hardwood	2,436	2,198	640	1,558	106	...	132
Total	2,844	2,566	840	1,726	124	...	154
Fuelwood:							
Softwood	119	88	2	86	6	5	20
Hardwood	33,843	24,909	10,153	14,756	1,759	1,310	5,865
Total	33,962	24,997	10,155	14,842	1,765	1,315	5,885
All products:							
Softwood	259,308	253,721	223,610	30,111	766	5	4,816
Hardwood	167,951	146,327	112,950	33,377	9,777	3,435	8,412
Total	427,259	400,048	336,560	63,488	10,543	3,440	13,228

¹ On commercial forest land.² Includes noncommercial forest land, nonforest land such as fence rows, trees less than 5.0 inches in diameter, and treetops and limbs.

Table 25. Timber removals from growing stock on commercial forest land by items and by softwoods and hardwoods, Arkansas, 1968

Item	All species	Soft-wood	Hard-wood
— Thousand cubic feet —			
Roundwood products:			
Saw logs	201,066	129,021	72,045
Veneer logs and bolts	37,027	33,693	3,334
Pulpwood	111,485	78,050	33,435
Cooperage logs and bolts	3,189	...	3,189
Piling	1,797	1,797	...
Poles	5,735	5,735	...
Posts	6,015	3,816	2,199
Other	8,737	1,521	7,216
Fuelwood	24,997	88	24,909
All products	400,048	253,721	146,327
Logging residues	63,278	24,384	38,894
Other removals	107,253	3,186	104,067
Total removals	570,579	281,291	289,288

Table 26. Timber removals from live sawtimber on commercial forest lands by items and by softwoods and hardwoods, Arkansas, 1968

Item	All species	Soft-wood	Hard-wood
— Thousand board feet —			
Roundwood products:			
Saw logs	1,201,675	780,045	421,630
Veneer logs and bolts	223,315	203,701	19,614
Pulpwood	286,684	213,929	72,755
Cooperage logs and bolts	21,458	...	21,458
Piling	10,656	10,656	...
Poles	29,313	29,313	...
Posts	3,276	795	2,481
Other	28,170	2,813	25,357
Fuelwood	4,702	9	4,693
All products	1,809,249	1,241,261	567,988
Logging residues	130,469	43,978	86,491
Other removals	287,978	7,711	280,267
Total removals	2,227,696	1,292,950	934,746

Table 27. Volume of plant residues by industrial source and type of residue and by softwoods and hardwoods, Arkansas, 1968

Species group and type	All industries	Lumber	Veneer and plywood	Other
— Thousand cubic feet —				
Softwood:				
Coarse ¹	10,050	7,482	1,839	729
Fine ²	10,357	8,984	104	1,269
Total	20,407	16,466	1,943	1,998
Hardwood:				
Coarse	11,188	8,607	346	2,235
Fine	14,581	12,283	33	2,265
Total	25,769	20,890	379	4,500
All species:				
Coarse	21,238	16,089	2,185	2,964
Fine	24,938	21,267	137	3,534
All types	46,176	37,356	2,322	6,498

¹Unused material suitable for chipping, such as slabs, edgings, and veneer cores.

²Unused material not suitable for chipping, such as sawdust and shavings.

Table 28. Projections of net annual growth, available cut, and inventory of growing stock and sawtimber on commercial forest land, Arkansas, 1968-1998¹

Species group	Growing stock				Sawtimber			
	1968	1978	1988	1998	1968	1978	1988	1998
	----- Thousand cubic feet -----				----- Thousand board feet -----			
Softwood:								
Cut	281,300	395,900	502,600	575,700	1,292,900	1,751,000	2,126,000	2,310,000
Growth	390,500	466,900	536,200	575,700	1,570,000	1,906,000	2,059,000	2,140,000
Inventory ²	6,422,400	7,302,500	7,806,400	7,938,200	24,814,100	27,904,000	28,105,000	26,806,000
Hardwood:								
Cut	289,300	339,200	392,100	440,600	934,700	978,000	1,054,000	1,092,000
Growth	368,100	394,200	423,700	440,600	893,300	904,000	945,000	977,000
Inventory ²	8,806,200	9,451,500	9,874,800	10,052,300	21,374,900	21,019,000	20,050,000	18,920,000
Total								
Cut	570,600	735,100	894,700	1,016,300	2,227,600	2,729,000	3,180,000	3,402,000
Growth	758,600	861,100	959,900	1,016,300	2,463,300	2,810,000	3,004,000	3,117,000
Inventory ²	15,228,600	16,754,000	17,681,200	17,990,500	46,189,000	48,923,000	48,155,000	45,726,000

¹ Based on the assumption that the cut of growing stock will be in balance with growth by the year 1998, and that forestry progress will continue at the rate indicated by recent trends.

² Inventory as of January 1 of the following year.