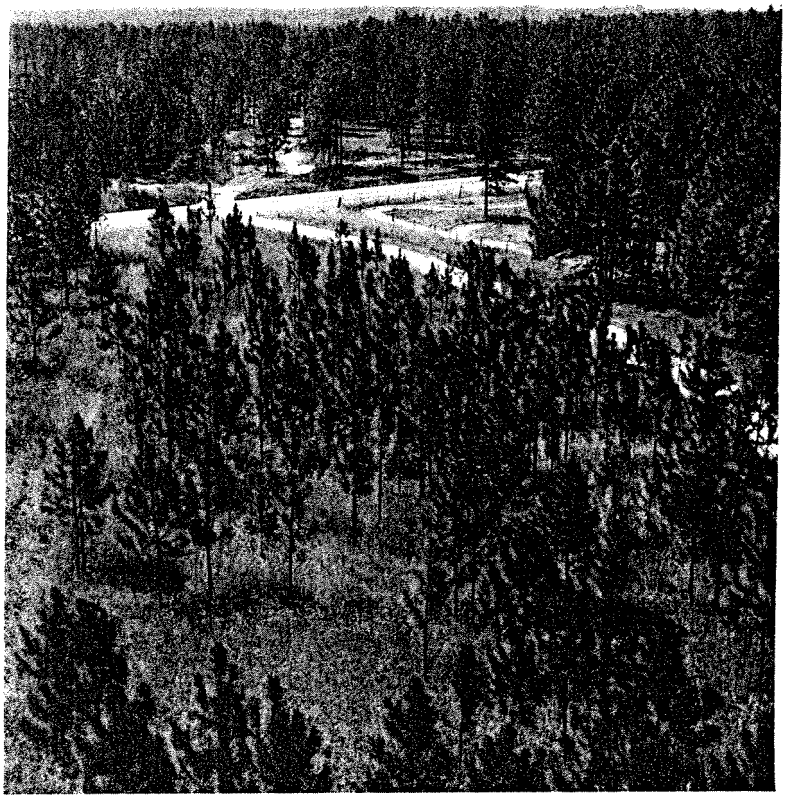
# TEN YEARS OF TIMBER MANAGEMENT IN THE MIDDLE COASTAL PLAIN OF GEORGIA

by

**E. P. Jones and F. A. Bennett**



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# FOREWORD

The George Walton Experimental Forest in Dooly County, Georgia, is operated by the U. S. Forest Service in cooperation with Mr. Holt E. Walton, of Cordele, Georgia, and St. Regis Paper Company. As originally established in 1947, the experimental forest contained 3,300 acres leased from Mr. Walton rent free for a 50-year period. As Mr. Walton purchased adjoining lands, they were incorporated with the forest until the total area in 1964 became 4,360 acres.

A pilot forest is one phase of a broad program of slash-longleaf pine management research being conducted on the experimental forest. This study was primarily planned and directed through the first lo-year period by Norman R. Hawley, and due acknowledgment is accorded him by the authors. Others who have contributed substantially to the study are Daniel E. Chappelle, William R. Harms, George P. Jarrett, and John D. Woodward.

## Contents

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## INTRODUCTION

The middle coastal plain stretching diagonally across the lower half of Georgia is more than half occupied by slash (*Pinus elliottii* Engelm.) and longleaf pine (*P. palustris* Mill.). Because of low market prices and wildfires, owners were rather apathetic toward such forest properties in the decade prior to World War II. Turpentining was about the only paying woods operation, and most management was toward that product. Large loblolly pines were sometimes girdled to make room for the gum producing species. With wood products of so little value, longleaf and slash pine of all sizes were destructively cupped for naval stores. Fire was used indiscriminately to aid movement through the woods, to provide grazing for open-range cattle, to kill boll weevils, and in some cases purely as a matter of habit.

Although the state was making progress in its fire protection effort, only a small portion of the counties in the area were under organized fire protection by the start of World War II. With the coming of the war, naval stores operations were intensified, and heavy cutting started to provide lumber and other wood products.

As a result of these conditions and woods practices, much of the longleaf-slash pine forest acreage was severely understocked and producing at a low level by the end of the war. Although lumber and gum prices were in balance with the over-all economy, stocking on the average woodland holding was so low that meaningful returns from intensified management efforts did not appear possible within reasonable time limits. Some 56 percent of the land area of the middle coastal plain was classed as forest land, but farming and allied interests were the major lines of activity, and received primary attention. There was a need for a graphic illustration of the feasibility and profitability of managing these understocked forest lands.

To meet this need. a pilot forest of 2.273 acres was set up on the George Walton Experimental Forest in 1949 (fig. 1). It represented a medium-size holding which might be operated as an independent business venture. Furthermore, it reflected the woodland conditions and influences affecting timber production in the middle coastal plain of Georgia.

## THE PILOT FOREST

The topography and soils of the pilot forest are typical of the middle coastal plain. The land is gently rolling, broken frequently by small streams, many of which are intermittent. Unlike the ridge sites, these narrow stream bottoms are poorly drained and constitute the best areas for pine growth, except where ponding occurs. The soils are good timber sites. On the upland soils, most of which were once cultivated, dominant trees in natural stands of slash pine at age 50 will measure from 60 to 85 feet in height, averaging around 75 feet. Bottomland sites will average 8 to 10 feet higher. Longleaf heights on the same soils and at the same age will be slightly shorter.

When management began in 1949, the forest was irregular in stocking and stand patterns, a natural result of past woodland practices. Stands were even-aged by groups, with the average area of uniformity quite limited, usually no more than a few acres.

An age class survey completed in 1955 outlines the development of the forest (fig. 2). The large acreage in the 0- to lo-year class indicates good regeneration during the period from 1945 to 1955, which was a direct result of fire protection; also, better than 133 acres of plantings during this period help boost the area in this age class. The small acreage in the 11- to 20-year class and the 21- to 30-year class represents poor reproduction establishment during the 19251945 period, when fires burned indiscriminately and livestock grazed freely.

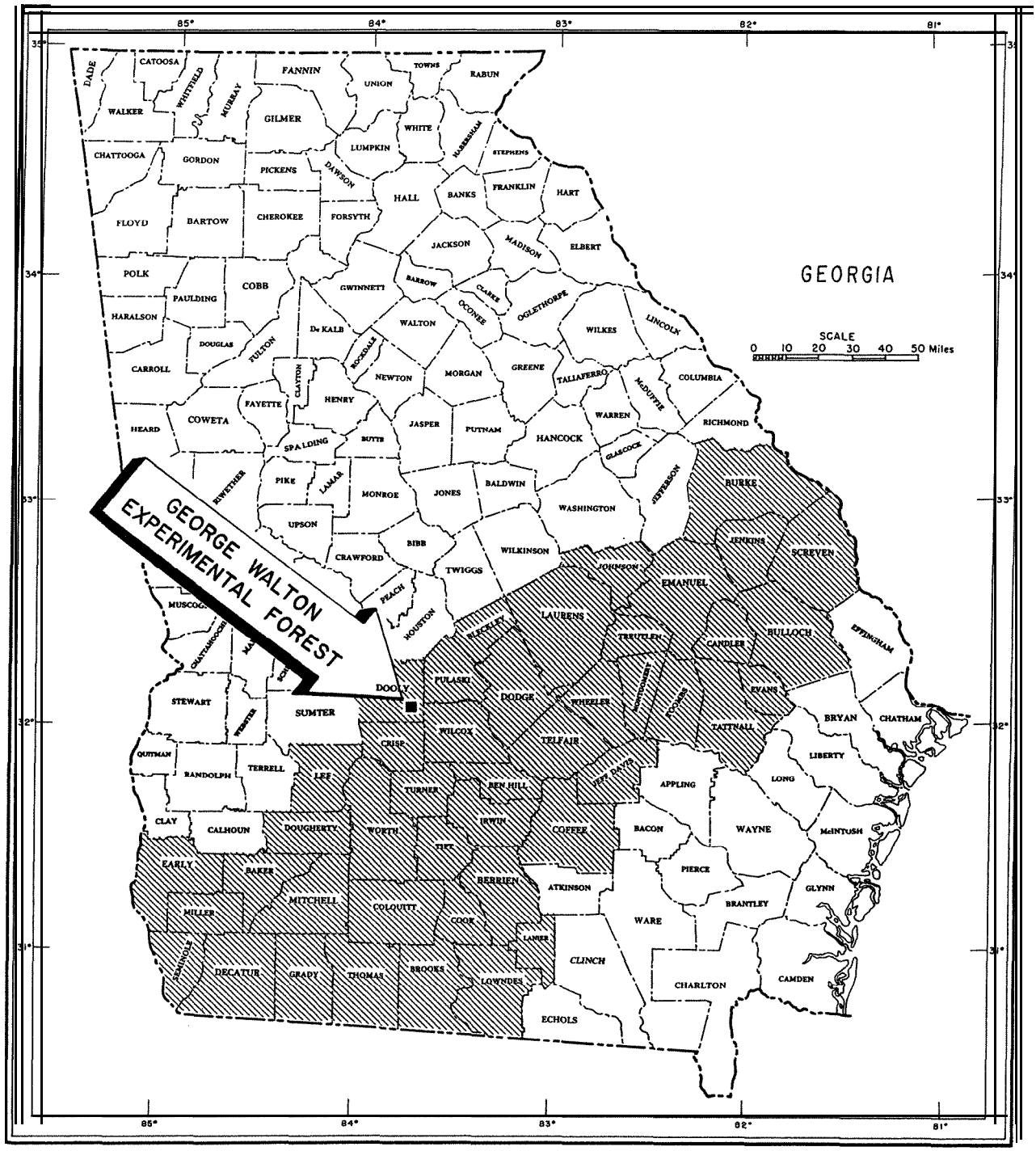



*Figure 1.—The middle coastal plain area of Georgia and location of the George Walton Experimental Forest.*

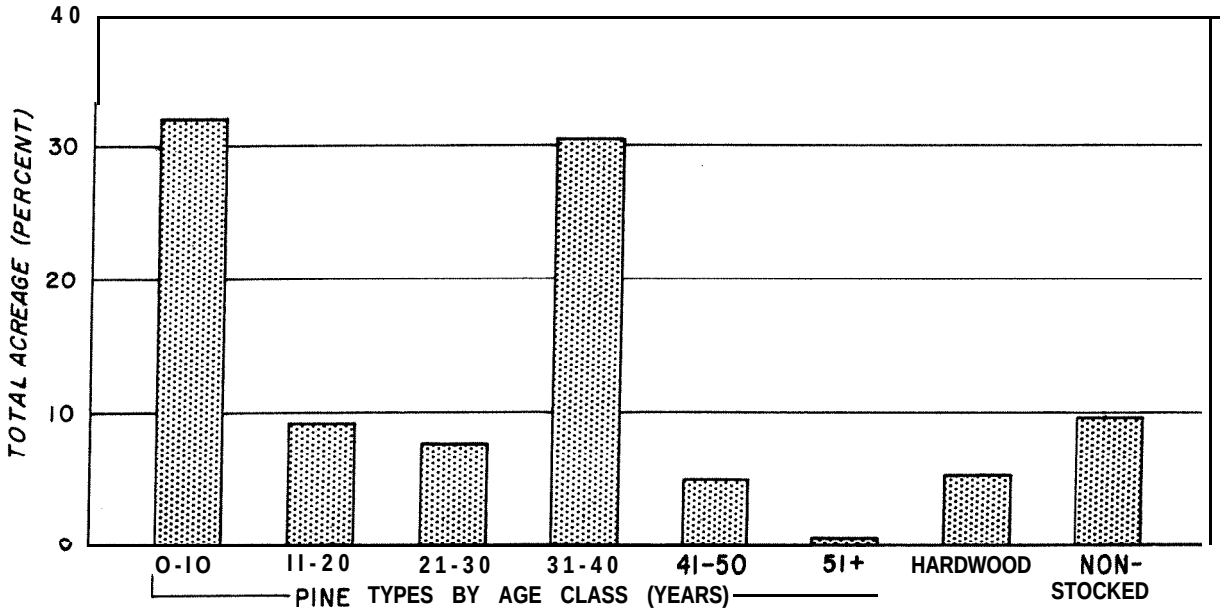



*Figure Z.-Percentage of pilot forest acreage by forest type, with pine type broken into IO-year age classes, as of 1955.*

Another large portion of the pilot forest is the 31- to 40-year age class, which is from reproduction of the period just after World War I. This time of economic depression and heavy boll weevil losses forced many acres of cropland into abandonment and these areas regenerated naturally to the pine types (fig. 3). In this connection, it is interesting to note that most of the former cropland on the experimental forest was classified in 1928 as Susquehanna sandy loam by Phillips et *al.*[1] In their discussion of the soil typos can be found the reasons for abandonment. They stated: "Crop yields are low, and in many cases the land is cleared and farmed for a few years and then allowed to revert to pasture or woodland . . . . Cotton yields on an average of about one-eighth or one-tenth bale per acre, and corn averages about 10 or 12 bushels." They also noted that boll weevil damage was heavy and the soils were ". . . bettor adapted to forestry and grazing."

## *Fire Protection*

The first consideration after establishment of the experimental forest was protection against the indiscriminate annual burning practiced widely. Although Mr. Walton made a strong effort to control fire on his acreage, approximately one-third of his holding burned annually, according

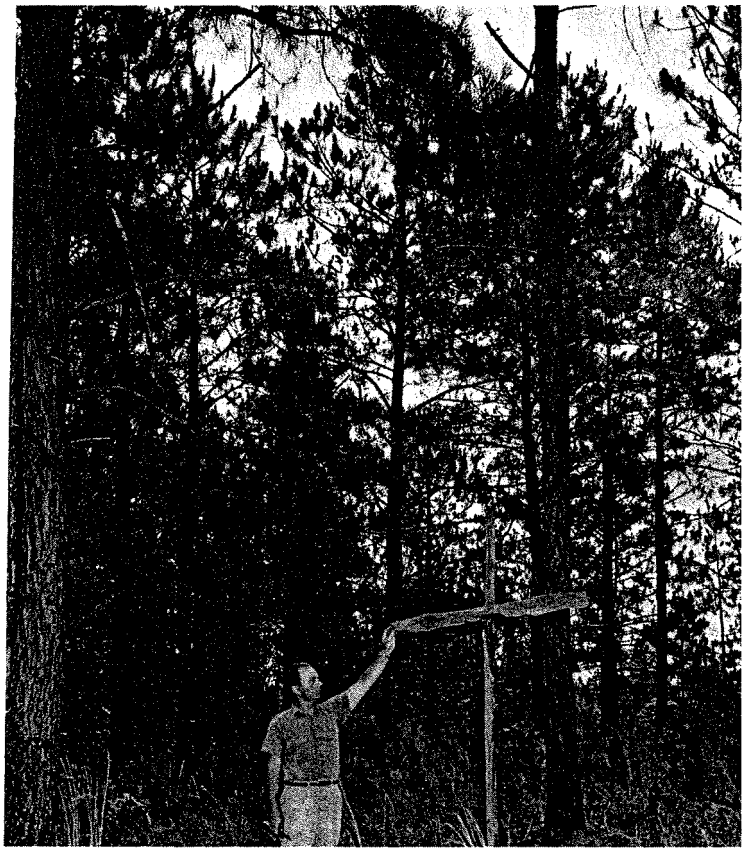


*Figure 3.-Many of the second-growth* slash *pine stands in the middle coastal plain of Georgia seeded in on abandoned farm lands. This peanut stack pole recalls the cropland past of the George Walton Experimental Forest.*

[1] Phillips, S. W., E. W. Knobel, G. L. Fuller, and J. W. Moon. Soil Survey Dooly County, Georgia. U. S. Dept. Agr. Soil Survey Rpt. 10, Series 1923, 305 pp., illus. 1928.

*Figure 4.—A burned firebreak around the perimeter of the forest protected tke investment from ravages of outside wildfires.*

to his estimate. Malicious or incendiary burning was not widespread, but with no county fire protection unit, fires spread rapidly from one ownership to another. Without some protection against the threat of fires from adjoining lands, effective management would be difficult.

To provide this protection, 8-foot parallel firelanes were plowed 60 to 70 feet apart around the perimeter of the forest. After sufficient frost in the fall or early winter, the area between these lanes was burned (fig. 4). From the start this proved to be an effective barrier, although the cost has been high. In the first 4 years alone, more than 50 ties were stopped by this break. Only 115 acres were lost to fires crossing from adjoining lands during the first 12 years. Of significance is the fact that adjoining landowners, when they realized the importance of protecting the experimental forest from wildfire, would delay their annual burning until after the protective firebreak was burned. Eventually Dooly County established a protection unit in cooperation with the state, and this added much to the effectiveness of fire prevention and suppression on the research tract.

## *Management Policy*

The principal objective in the management of the pilot forest was the test of a system of management aimed at maximum sustained income for the medium-size forest ownership. To reach this objective, it was felt an integrated operation producing wood, gum, and stock forage, in that order, would be most appropriate.

To formnlate management policy, it was first necessary to evaluate stand conditions and stocking. Detailed type maps were prepared for the forest, and a 100-percent inventory was completed. Local volume tables [2] in board feet and cords were constructed and applied to the inventory. A special study showed annual growth to be approximately 200 board feet on the gross acre. From these preparatory measurements, the following broad points of management policy were set forth:

1. The first, or formative, cut would be primarily a salvage measure removing decadent old growth and worked-out naval stores trees.
2. Each cut, after the first, would remove only a portion of the growth until stocking was raised to an acceptable level.
3. Nonstocked areas would be brought into production as quickly as possible, either by natural seeding or by planting.
4. Cull hardwoods would be controlled sufficiently to insure the dominance of pine.
5. Naval stores production would be integrated with timber production when stand conditions permitted.
6. Cattle would be grazed when and where practical.
7. A tentative 50-year rotation would be adopted.

The rotation length of 50 years was not recognized as necessarily an optimum, but merely one sufficiently long to permit determination of an optimum.

[2] On the basis of International X-inch kerf rule and standard cords.

A simple form of area control was imposed on the pilot forest. The area was divided into five segments' or blocks of approximately 450 acres each (fig. 5), with one block to be operated each year. This system provides an annual income to the owner, putting management in the proper perspective from this standpoint.

A loo-percent inventory of all timber over 4.5 inches d.b.h. is made in each block at the completion of its respective cyclic cut. This intensity and frequency was considered necessary to get an accurate measure of response to management.

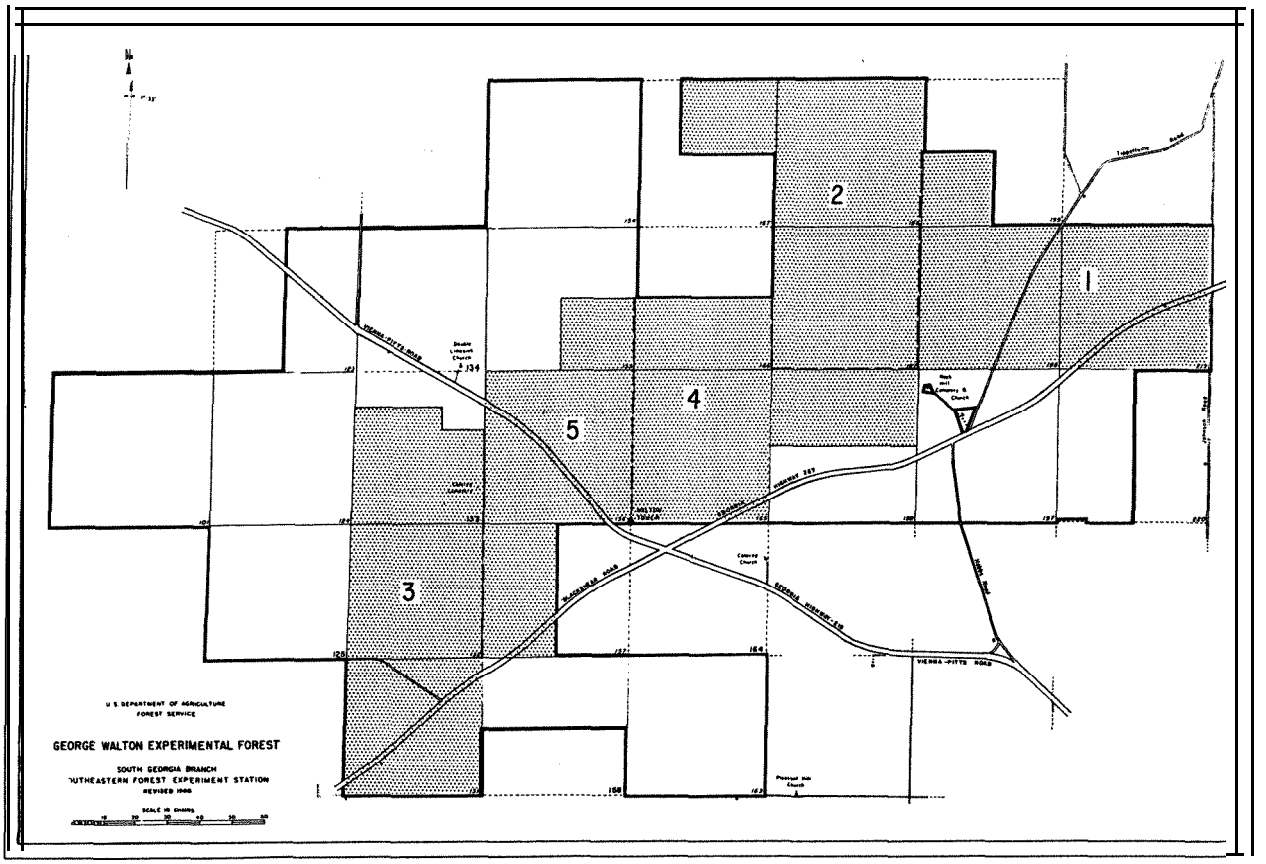



*Figure 5.—Map of tke George Walton Experimental Forest showing the pilot forest and the five blocks.*

Since the initial salvage-improvement cut, thinnings have been accomplished through a selective system in which the better quality trees are favored. As a density control for marking, the spacing rule-of-thumb 1.75 x diameter was adopted. If the average diameter of an area being thinned is 8.0 inches, for example, the average spacing in feet should be 8.0 x 1.75, or 14 feet. Application of this rule results in a residual basal area of 75 to 80 square feet per acre.

Although policy called for the integration of naval stores into management of the area, silvicultural considerations were to take precedence. Under this plan, cupping would be restricted to those areas that, from a silvicultural standpoint, required the removal of enough trees 9.0 inches and above to support a cupping operation. Since the forest as a whole was seriously understocked, opportunities for cupping operations were limited.

Cattle grazing was integrated with forest management on the pilot forest so far as practical. About 50 cows with calves were grazed on approximately 1,150 acres of woodland pasture. Forage consisted mainly of *wire* grass (*Aristida stricta* Michx.) and broom sedge (*Andropogon virginicus* L.), with some small areas of carpetgrass (*Axonopus affinis* Chase) and common lespedeza (*Lespedeza striata* [Thunb.] H. and A.) having been introduced. Supplemental feeding was required during the winter. Production records and costs of grazing have been kept separate from the forest operation and are not presented with this report. The pilot forest did benefit through some degree of hazard reduction as a result of the grazing (fig. 6).

To complete the management picture, species preferences were necessary. The order of priority was slash, longleaf, and loblolly. Slash and longleaf, being gum producers, were selected over loblolly pine, the only other pine species of any quantity on the forest. The more easily regenerated slash pine (fig. 7) was given priority over longleaf.

## RESULTS OF MANAGEMENT

The end of 1959 marked 10 years of intensive management on the pilot forest. Management followed the adopted plans and guidelines with few exceptions. The first cut was accomplished with a minimum of delay and removed only sawtimber, primarily old growth and worked out material. These trees, if left in the stand, would have invited insect and disease infestations. Nonsalvage material was removed only when necessary to relieve overcrowding. Following this, two cyclic pulpwood cuts *were* made, one block of the area being operated each year (figures 8 and 9). During the winter seasons, Mr. Walton's naval stores workers frilled and treated hardwood areas with 2,4,5-T. The entire forest was so treated by 1953, with excellent results on upland species and fair to good results on wet-land species (fig. 10). A naval stores operation, active in blocks 3 and 4 at time of the lease, was completed. These were the only trees cupped during the lo-year management period. Silvicultural markings on other areas did not remove enough trees 9 inches and above for a workable cupping unit.

*Figure 6.-Woods grazing, a long-standing practice in this region, was continued on the fenced-in portions of the pilot forest.*

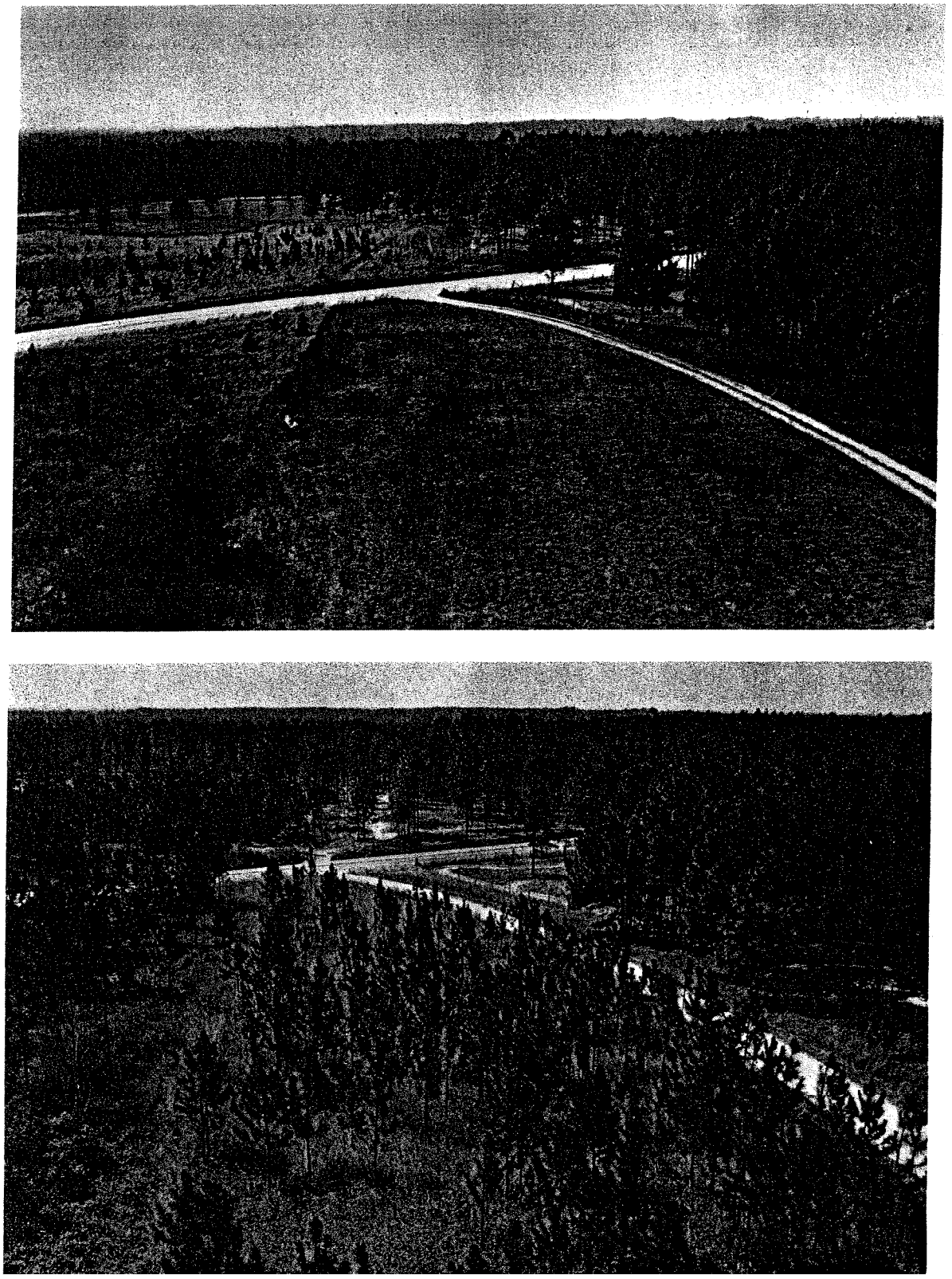
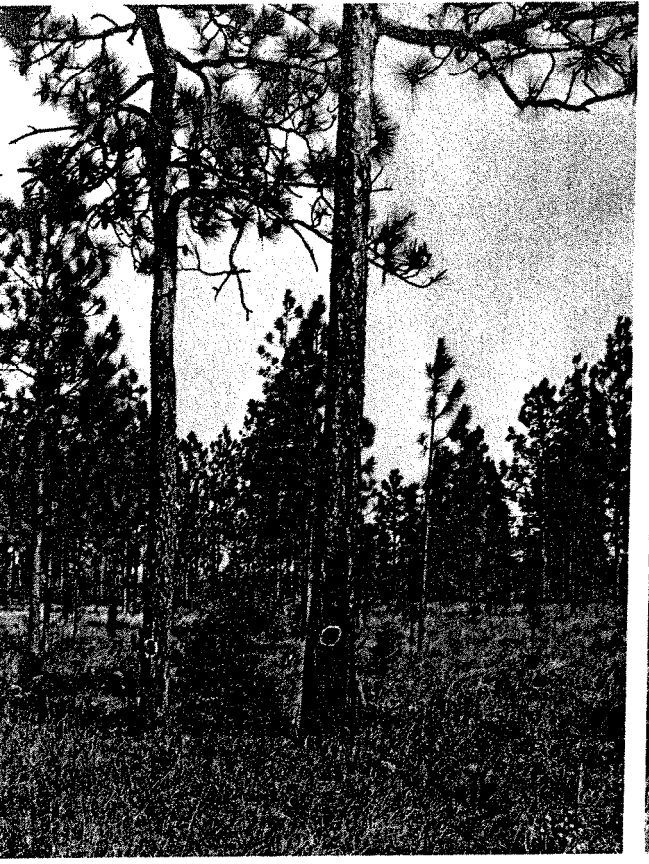


*Figure 7.-Given a seed source and fire protection, abandoned fields* **are** *regenerated quite easily to slash pine. This area was photographed in March of 1948* **(upper)** *and again in March of* **1954 (lower).**



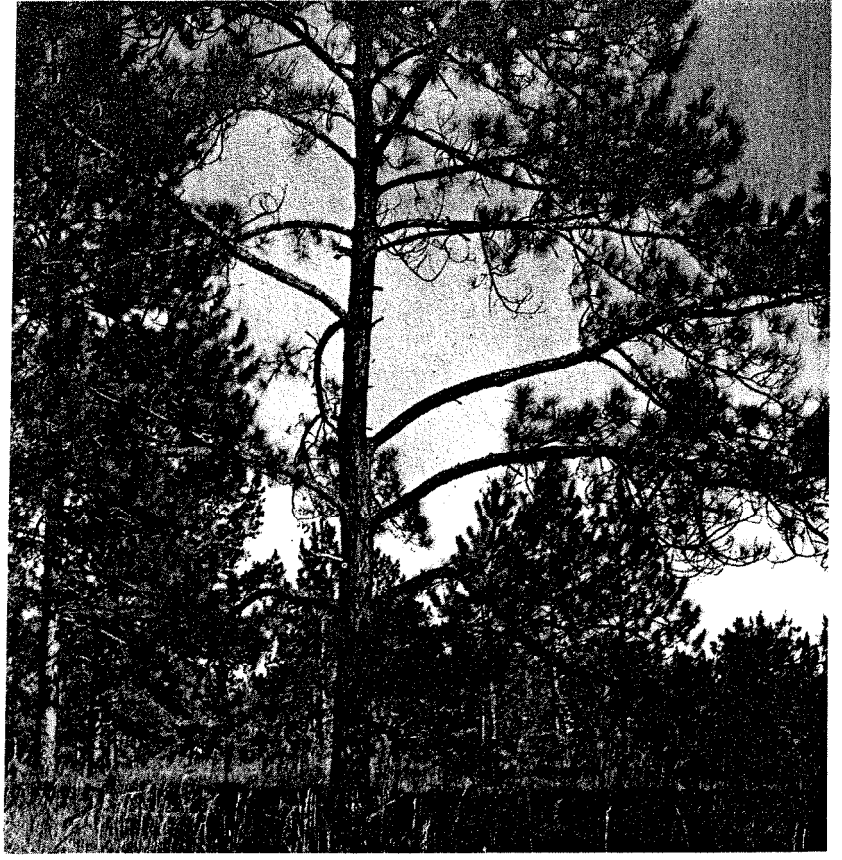


*Figure S.-Early cuttings on the pilot forest removed poor risk and low quality trees. This included destructively turpentined old growth* (left), *and second growth trees such as this 21-inch slash pine of extremely poor quality* (right).

*Figure 9.—Early cutting operations on the forest removed sawtimber and pulpwood. Saw logs were converted to lumber on a portable mill set on the forest* (left photo). *Standing in front of one of the first loads of pulpwood* [right photo] *is Fores&Norman R. Hawley (hand in pocket), and Cooperator Holt E. Walton.*

*Figure 10.—Slash pine reproduction quickly took over the areas formerly occupied by undesirable hardwoods.*

## Stand Composition

Slash pine is aggressively crowding out the less active longleaf (table 1). In 1948, about 33 percent of the total pilot forest acreage was occupied by merchantable longleaf, and only 17 percent was in merchantable slash. Some 11 years later at the last inventory, merchantable longleaf acreage had shrunk to 27 percent and slash acreage had increased to 25 percent. This trend is also evident in the number of commercial-size trees. As shown below, more than two-thirds of the trees were longleaf at the start, whereas at the last inventory a majority were slash:

| | *Longleaf* | *Slash* | *Other pine* | *Total* |
|---|---|---|---|---|
| | | *(percent)* | | |
| First inventory | 68.50 | 31.12 | 0.38 | 100 |
| Last inventory | 47.10 | 52.29 | 0.61 | 100 |

This big shift in acreage and number of trees between longleaf and slash pine can be attributed largely to fire protection. The more fire-resistant longleaf was able to dominate during the years before protection; but given protection from fire, slash pine demonstrated its fast growth and aggressiveness (fig. 11). Other factors, however, contributed to this change. A large portion of the 179 acres of slash pine plantations grew into merchantability between the first and last inventory, and secondly, almost 100 acres of merchantable longleaf had to be clear cut following a summer fire.

Merchantable acreage of all the pine species combined (longleaf, slash, and other) dropped from 56 to 56 percent of the total pilot forest area during the lo-year period. This was mostly

TABLE 1.—*Merchantable acreage on the pilot forest by species and size class at the first and last type mappings*

| Species | First mapping | | Last mapping | |
|---|---|---|---|---|
| | *Acres* | *Percent* | *Acres* | *Percent* |
| Longleaf | | | | |
| Sawtimber | 645.52 | 28.39 | 590.71 | 25.99 |
| Pulpwood | 98.93 | 4.35 | 21.29 | 0.94 |
| Slash | | | | |
| Sawtimber | 234.62 | 10.32 | 355.64 | 15.65 |
| Pulpwood | 160.87 | 7.08 | 212.30 | 9.34 |
| Loblolly | | | | |
| Sawtimber | 1.51 | 0.07 | 2.21 | 0.10 |
| Pulpwood | ------- | ------- | 0.39 | 0.02 |
| Pine mixture | | | | |
| Sawtimber | *146.97* | 6.47 | 84.36 | 3.71 |
| Pulpwood | 32.52 | 1.43 | 6.22 | 0.27 |
| Total pine | 1320.94 | 58.11 | 1273.12 | 56.02 |
| Hardwood | 71.51 | 3.15 | 12.34 | 0.54 |
| Total | 1392.45 | 61.26 | 1285.46 | 56.56 |

a result of the 100-acre clear-cut operation mentioned above. Although the aim is to increase merchantable acreage to as high a level as possible, there will usually be certain portions of the property that are not currently producing merchantable volumes. These areas may be newly regenerated or young stands that have not reached merchantable size, or areas that are temporarily or permanently out of production for some reason. Total pine acreage with adequate stocking, either merchantable or nonmerchantable, increased from 6'7 to 72 percent of the total area.

In the nonmerchantable acreage classes, the percentage of adequately stocked types moved from 9 percent at the first mapping to 17 percent at the last. The inadequately stocked types dropped from 16 to 11 percent (table 2). Acreage in undesirable nomnerchantable types increased from 13 to 16 percent of the total acreage in spite of intensive management. As a result of fire protection, hardwood reproduction acreage almost tripled, going from 52 to 137 acres. Grass area also increased, especially in the perimeter firebreak, where annual burning prevented restocking after the early sawtimber cut. In addition, very few of the many small grass areas interspersed among longleaf stands seeded during the management period. Wider rights-of-way were given to two state roads that pass through the area, and this also contributed to the increase of nonstocked acreage.

*Figure Il.-Rapid growth of slush pine contributed to its selection over longleaf in the order of species preference. This area was photogmphed in 1947* (left), *and again 2½ growing seasons later* (right).

TABLE 2.—*Nonmerchantable acreage on the pilot forest by desirable and undesirable types at the first and last type mappings*

| Type | First mapping | | Last mapping | |
|---|---|---|---|---|
| | *Acres* | *Percent* | *Acres* | *Percent* |
| Desirable types [1] | | | | |
| Adequate stocking | 205.88 | 9.06 | 375.77 | 16.53 |
| Inadequate stocking | 372.32 | 16.38 | 242.81 | 10.68 |
| Total | 578.20 | 25.44 | 618.58 | 27.21 |
| Undesirable types | | | | |
| Hardwood-pine | 73.77 | 3.25 | 53.20 | 2.34 |
| Hardwoods | 52.14 | 2.29 | 137.18 | 6.03 |
| Grass | 105.72 | 4.65 | 123.68 | 5.44 |
| Fields | 51.02 | 2.24 | 17.50 | 0.77 |
| Roads | 15.06 | 0.66 | 33.82 | 1.49 |
| Other | 4.77 | 0.21 | 3.71 | 0.16 |
| Total | 302.48 | 13.30 | 369.09 | 16.23 |
| Total all types | 880.68 | 38.74 | 987.67 | 43.44 |

[1] Pine or predominantly pine.

## *Stand Structure*

Management has sharply altered stand structure on the pilot forest. The most striking change is the decrease in number of trees in the diameter classes below 9 inches d.b.h. (fig. 12). Thinnings have been heavily concentrated in these sixes and, of course, growth on the residuals has moved many of them out of the class. Ingrowth from the precommercial sires has not been sufficient to offset the loss. This decrease in the number of smaller trees does not mean that pulpwood production will cease. When most of the 27 percent of the area now in desirable reproduction becomes merchantable, the number of pulpwood trees will be boosted considerably.

Through ingrowth from the lower diameters, there was a gain in the number of trees 9 inches and above. The percentage of trees classified as round, second-growth sawtimber more than doubled. This movement toward the larger diameter classes is not only a desirable result of management, but it is also a natural development in even-aged stands in which thinnings to relieve crowding are predominantly from below.

Total cubic-foot volume stocking has increased markedly (fig. 13). The increase is in sawtimber-size trees, the higher quality product. For example, volume in the ll-, 12-, and 13-inch diameter classes increased 88, 103, and 106 percent, respectively, despite the fact that almost 100 percent of the original volume in these diameter classes was harvested. Gains in the 14-, 15-, and 16-inch diameter classes have been almost as good. In the diameter classes above 8 inches, only the 22-inch class lost volume during the study period. With little volume in this class, the loss was of no significance.

## *Growth*

Growth on the gross acre has averaged 195 board feet plus 0.17 cord annually (table 3). Cordwood growth has been negligible due to the concentration of cutting in the pulpwood sires and lack of ingrowth. One notable exception is block 5, in which several plantations and reproduction areas grew into merchantability (fig. 14). Ingrowth accounts for about one-third of the annual board foot increment, an average of 2.6 trees per gross acre moving into sawtimber size annually.

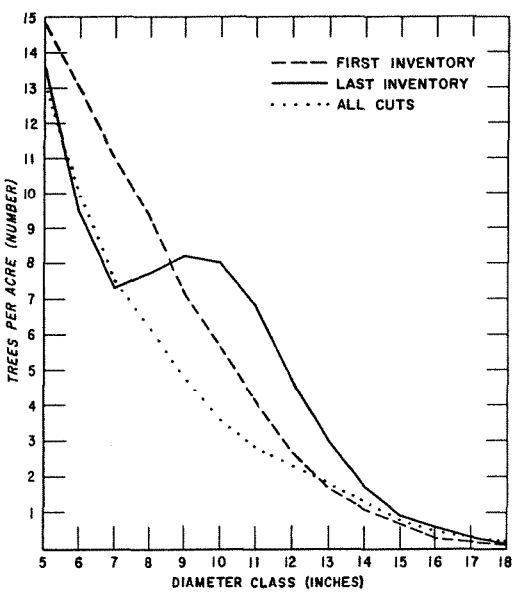



*Figure 12.—Number of trees per gross acre by diameter class for the first and last inventories and all intervening cuts.*

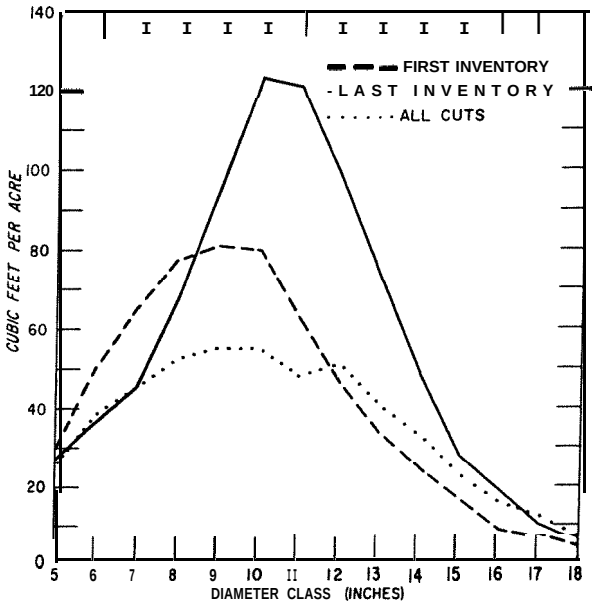



*Figure 13.—Cubic feet per gross acre by diameter class for the first and last inventories and all intervening cuts.*

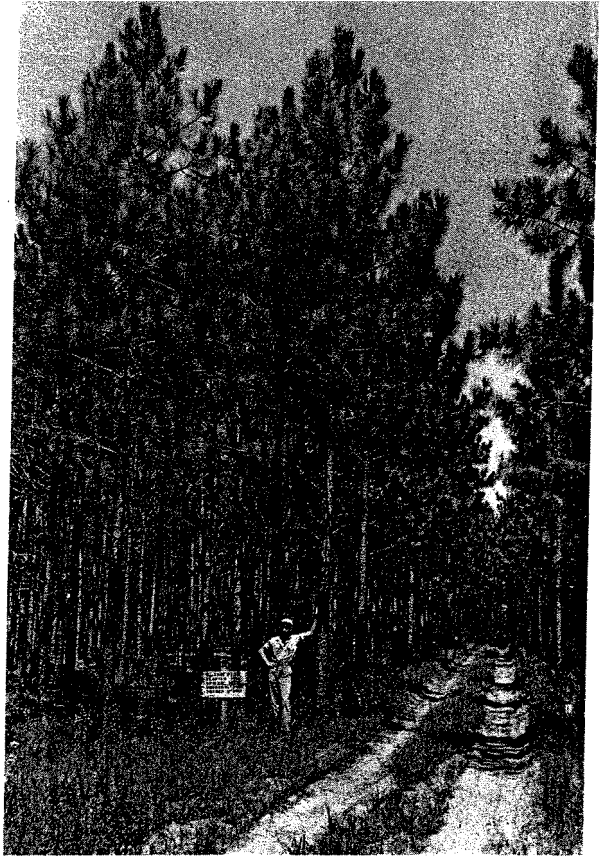


*Figure 14.—Old-field slash plantations, like this one at age 14, are adding to the number of trees and volume in the lower-diameter classes.*

At the end of the lo-year management period, board-foot stocking was 90 percent greater than the original volume, even though 100 percent of the initial volume had been harvested. Cordwood stocking was reduced to 89 percent of its initial volume, while 72 percent of the original was cut.

Growth is figured as the difference between initial stocking and residual stocking plus the amount cut during the management period. For an exact measure of growth, the first cut on the forest should be excluded from the calculation. This was not possible, since the first cut followed the initial inventory by as much as 3 years in some blocks. Even with inclusion of the volume of the initial cut, board-foot growth averaged better than 17 percent annually.

For the area actually stocked with merchantable pine timber, growth figures are considerably higher. Board&foot growth averaged about 335 feet per merchantable acre, plus cordwood growth of about 0.34 cord.

Expressing all merchantable volume in cubic measure, annual growth on the gross acre averaged 64 cubic feet or 0.7 cord. With a base stocking of 594 cubic feet, this represents an 11-percent increase annually (table 4). On the merchantable acre, annual growth averaged 114 cubic feat, or 1.2 cords. Basal area growth averaged 2.4 square feet ammally on the gross acre and 4.1 square feet on the merchantable acre.

TABLE *3.-Board foot and cordwood stocking and average annual growth, per gross acre*

| Block | Stocking | | | | | | Average annual growth | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | First inventory | | All cuts | | Last inventory | | Volume | | Percent | |
| | *Cords* | *Bd. ft.* | *Cords* | *Bd. ft.* | *Cords* | *Bd. ft.* | *Cords* | *Bd. ft.* | *Cords* | *Bd. ft.* |
| 1 | 2.77 | 1048 | 2.16 | 1141 | 1.33 | 2205 | 0.07 | 206 | 2.5 | 19.7 |
| 2 | 3.25 | 1102 | 2.15 | 1330 | 2.68 | 1926 | 0.16 | 214 | 4.9 | 19.4 |
| 3 | 3.59 | 1212 | 2.15 | 1213 | 3.24 | 2389 | 0.16 | 221 | 4.5 | 18.2 |
| 4 | 2.65 | 1401 | 1.67 | 1252 | 2.32 | 2373 | 0.12 | 200 | 4.5 | 14.3 |
| 5 | 2.62 | 853 | 2.85 | 666 | 3.92 | 1811 | 0.36 | 139 | 13.7 | 16.3 |
| Mean [1] | 3.01 | 1130 | 2.18 | 1136 | 2.69 | 2142 | 0.17 | 195 | 5.6 | 17.3 |

[1] Calculation of means included weighting by actual acreage in each block.

TABLE 4.—*Average cubic volume and basal area stocking and growth of all merchantable wood on the gross and merchantable acre*

| Area | Stocking | | | | | | Average annual growth | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | First inventory | | All cuts | | Last inventory | | | | | |
| | Volume | Basal area | Volume | Basal area | Volume | Basal area | Volume | Basal area | Volume | Basal area |
| | *cu. ft.* | *sq. ft.* | *cu. ft.* | *sq. ft.* | *cu. ft.* | *sq. ft.* | *cu. ft.* | *Sq. ft.* | *Percent* | |
| Gross acre | 594 | 26.54 | 510 | 21.92 | 720 | 28.53 | 63.6 | 2.39 | 10.7 | 9.0 |
| Merchantable acre | 970 | 45.67 | 833 | 37.72 | 1275 | 49.09 | 113.8 | 4.11 | 11.7 | 9.0 |

## COSTS

Wherever possible, actual expenditures have been used to establish total costs of management. In order to exclude research costs, some expenses are estimated. When estimated costs were necessary, a liberal figure was adopted.

Cost of the land has been left out because the aim is to determine what the *owner* can make by growing timber. This charge would presumably be the same whether the owner grew timber, farmed, or grazed cattle, and therefore is of no consideration unless the decision hinges on land investment versus some other business enterprise.

Divided into capital and current expenses, timber management costs for the lo-year period amounted to $1.15 per acre per year (table 5). Included under capital expenses are those items that occur only once or at unspecified times during the rotation period. They are investments required for proper management and are amortized over appropriate periods. Under current expenses are annual costs that can vary from year to year, such as expenditures for routine management activities and taxes. Set apart under current expenses are protection costs.

Fire protection has been expensive because it was necessary to try to provide complete protection for the experimental forest as a research installation. Protection costs for the pilot forest have been prorated on an acreage basis and are therefore similar to those a private landowner would have to pay for the same degree of protection. Even so, most owners would not require so high a degree of protection. They would depend more on suppression activities as needed.

## RETURNS

Sixty-two percent of the returns from the 10 years of management on the pilot forest came from sawtimber, 34 percent from pulpwood, and the remaining 4 percent from naval stores. Insufficient stocking soon precluded turpentining operations under a plan of management designed to increase stocking to an acceptable level.

The average annual harvest was 205 M board feet of sawtimber plus 632 cords of pulpwood (table 6). This indicates an annual cut per gross acre of 90 board feet plus 0.28 cord. Some of the trees sold as pulpwood were actually classed as sawtimber on the stump. These individuals or small groups of sawtimber trees were removed as thinning measures, but of necessity they were converted as pulpwood because their volume was not sufficient to warrant a mill or saw log operation.

Pulpwood stumpage prices more than doubled during the lo-year period, going from about $3.00 in 1949 to $6.50 in 1959. Sawtimber stumpage fluctuated very little, ranging from $27 to $29 per thousand. [3] Sawtimber sales were made only during the first 5 years of the management period.

As outlined below, the pilot forest has realized a net ammal return of $5.88 per gross acre for the 10 years of operation.

| | *Per gross acre, annually* | |
|---|---|---|
| Receipts from sales | $4.23 | |
| Cost of management | -1.15 | |
| Net cash return | | $3.08 |
| Value increase of growing stock: | | |
| Board feet | $3.01 | |
| Cords | -0.21 | |
| Net increase | | $2.80 |
| Total net return | | $5.88 |

This return was determined simply by using the costs and returns as previously tabulated, but without interest and carrying charges. Value increase of growing stock is based on 1959 prices, and the slight reduction in cordwood stocking is reflected by the negative charge for this item. Including the increased value of the growing stock, the total annual net return for the entire pilot forest was $13,365. Assuming $60 per acre as a fair estimate of the value of land and timber at time of establishment, returns from the forest have been at the simple interest rate of almost 10 percent per annum.

[3] Since sawtimber was sawn on Cooperator Walton's own portable mill, payment was based on green chain tally. Conversion has been made to stumpage price per M board feet by the local volume table (International ¼-inch kerf).

TABLE B.--*Timber management costs for the first IO-year management period on the pilot forest*

| Item | Amortization period | Annual cost per acre |
|---|---|---|
| | *Years* | Dollars |
| **Capital expenses:** | | |
| Hardwood control | 45 | 0.025 |
| planting | 40 | 0.024 |
| Pruning | 35 | 0.011 |
| Fireline construction | 50 | 0.002 |
| Land survey | 50 | 0.020 |
| Tower | 25 | 0.028 |
| Power wagon, radios | 15 | 0.018 |
| Vehicle depreciation | 5 | 0.024 |
| Cruise and management plan | 50 | 0.059 |
| | | 0.211 |
| **Current expenses:** | | |
| Taxes | | 0.209 |
| Timber marking | | 0.095 |
| Recurrent cruises | | 0.040 |
| Road and bridge maintenance | | 0.082 |
| Vehicle operation | | 0.022 |
| General supervision | | 0.200 |
| | | 0.648 |
| **Protection:** | | |
| Burning firebreaks | | 0.092 |
| Plowing firebreaks | | 0.062 |
| Presuppression | | 0.127 |
| Suppression | | 0.013 |
| | | 0.294 |
| Total | | 1.153 |

TABLE 6.-*Harvested products and receipts for the first IO-year management period on the pilot forest*

| Year | Product | | | | | Total income | Per acre income |
|---|---|---|---|---|---|---|---|
| | Pulpwood | | Sawtimber | | Gum [1] | | |
| | *Cords* | *Dollars* | *Mbf* [2] | *Dollars* | *Dollars* | *Dollars* | *Dollars* |
| 1950 | 48.20 | 144.60 | 638.20 | 18,745.30 | 1,239.67 | 20,129.57 | 8.86 |
| 1951 | | --- | 561.02 | 15,472.93 | 1,239.67 | 16,712.60 | 7.35 |
| 1952 | --- | | 479.67 | 14,159.86 | 1,239.67 | 15,399.53 | 6.77 |
| 1953 | --- | | 203.72 | 5,726.57 | --- | 5,726.57 | 2.52 |
| 1954 | 645.53 | 3,227.65 | 25.66 | 742.86 | --- | 3,970.51 | 1.75 |
| 1955 | 1826.99 | 9,134.95 | 125.11 | 4,618.11 | | 13,753.06 | 6.05 |
| 1956 | 886.80 | 4,434.00 | | --- | | 4,434.00 | 1.95 |
| 1957 | 1235.16 | 6,793.37 | | | --- | 6,793.37 | 2.99 |
| 1958 | 859.21 | 4,725.65 | --- | --- | --- | 4,725.65 | 2.08 |
| 1959 | 815.63 | 4,485.96 | | --- | --- | 4,485.96 | 1.97 |
| Totals | 6317.52 | 32,946.18 | 2,053.38 | 59,465.63 | 3,719.01 | 96,130.82 | 42.29 |

[1] On a lease basis of 15 cents per face. [2] International X-inch kerf.

## A NEW MANAGEMENT PLAN

Because work in the first 10 years has been toward improving the forest, the individual timber stand has been of primary concern. A principal objective has been to build stocking to an acceptable level. Having made a good start toward this, we adopted a new plan of management in 1959.

The new plan is aimed toward more intensive management through strict area control. It retains the idea of five blocks worked on a 5-year cutting cycle, but each block has been modified to include ten 50-acre cutting units. One of these units will be clear cut each year and provision made for its regeneration, either naturally or artificially (fig. 15). Concurrently with each clear cut, individual stands in the block being operated will be thinned as needed.

The several advantages of this system include the concentration of operations such as naval stores (fig. 16) and cuttings. This will allow maximum volumes to be obtained at a minimum of administrative costs. Site preparation and regeneration measures will be more efficient and of wider latitude. Also, there will be optimum opportunity for the use of compartment-wise cultural measures such as pruning, hardwood control, and prescribed burning. The long-range result of this system of management will be 50 even-aged compartments of 50 acres each.

## FUTURE PROSPECTS

It is impossible to predict what future costs and returns will be for the pilot forest, but past experience and current conditions do give some indications. Cost of fire protection should be lower than in the past. State-county protection units are highly reliable and effective in surveillance and attack, and public attitude is now such that burning the perimeter flrebreak is no longer imperative. Taxes will be higher during the next decade; they increased from 17 cents per acre in 1949 to 43 cents in 1960. Routine management costs should not change too much from what they have been in the past, and possibly might be cheaper with the new management plan. It is assumed that any rise in costs caused by an increase in the general economy will be offset by similar rises in the prices received for forest products.

Increased profits on the pilot forest will depend mainly on greater production of salable material. With stocking in 1959 almost double what it was in 1949, volume growth will be considerably better. During the first 10 years, the average sawtimber tree advanced from 56 to 74 board feet. A similar increase in the next 10 years will mean an average sawtimber tree of 100 board feet. Also, the quality of timber stands will continue to improve through selective thinnings. More volume and better quality timber concentrated in areas to be clear cut will be more attractive to prospective buyers.

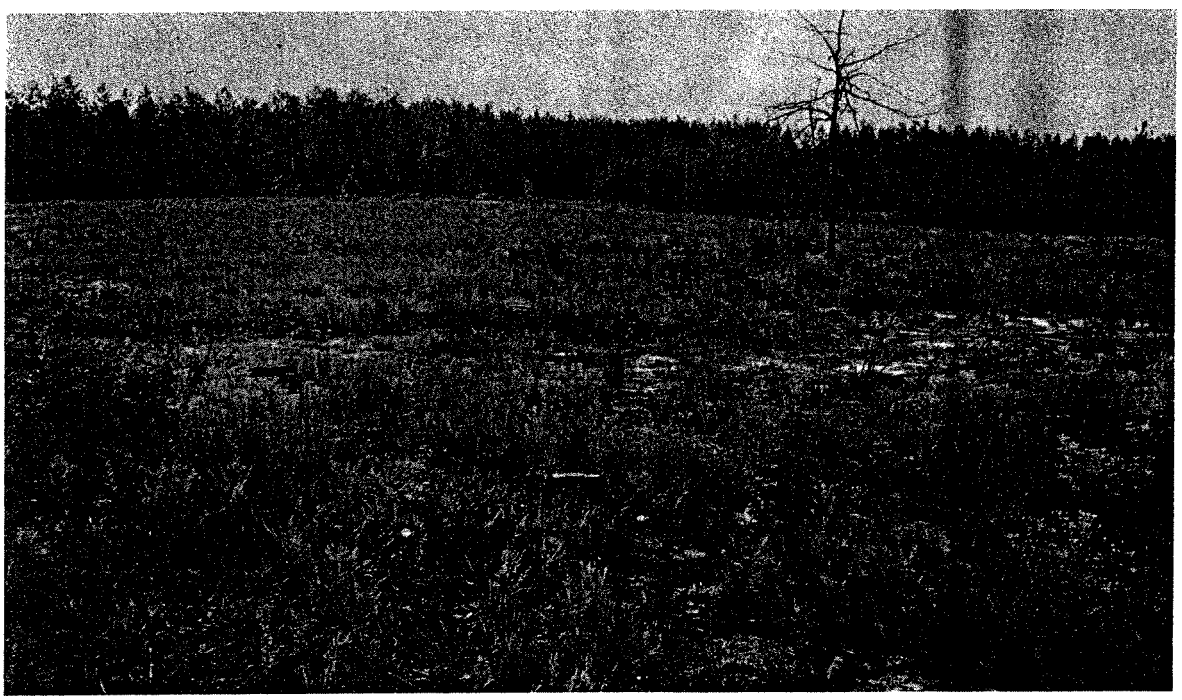


*Figure 15.—Under the management plan of 1959, a 50-acre unit of the pilot forest is clear cut each year, with artificial regeneration to follow where necessary within 2 years.*

*Figure 16.—Poor stand conditions* **required the** *exclusion of naval stores on most of the pilot forest during the first 10 years. These conditions have been remedied, and gum production is again scheduled annually.*

Future profits on the **pilot forest will** also be related **to** the forest economy of Georgia and the Southeast. Daily pulping capacity in Georgia increased from 5,340 tons in 1949 to better than 8,000 tons in 1960.[4] The outlook is for additional expansion of this industry, which means continued demands for wood supplies. Although the lumber industry did not have a comparable increase during this period, there are heartening reports concerning the southern pine lumber business. Size and quality of logs are increasing, offering lumber which is able to compete favorably with fir imported from the West. Also, a good, economical grade of pine plywood is now possible, which will mean an almost new market for southern pine. Income from naval stores under the new plan of management should show a big increase during the next decade.

For this pilot forest, and areas like it, future returns may not be as spectacular as they have been during the 1949-1959 period, but certainly a fair profit can be expected for the effort and investment of properly managing this **medium-size** holding.

[4] Christopher, Joe F., and Martha E. Nelson. Southern pulpwood production, 1960. U. S. Forest Serv. South. Forest Expt. Sta. Forest Survey Release 85, 29 pp. 1961.

## SUMMARY AND CONCLUSIONS

The pilot forest on the George Walton Experimental Forest represents the medium-size forest ownership in the middle coastal plain of Georgia. Tbis 2,200-acre forest of slash and longleaf pine has been under planned management for 10 years. Gross earnings have been $7.03 per acre per year, with an annual cost of $1.15 per acre.

Slash pine is aggressively crowding out the leas active longleaf in acreage and the commercial size classes. The progress of slash pine can be attributed largely to fire protection, which has also permitted a slight gain in the area occupied by undesirable hardwood reproduction types. In spite of intensive management, the total acreage in merchantable pine has failed to increase; in fact, it has dropped slightly.

Timber stands on the pilot forest are generally in a much better state of growth now. Board-foot stocking at the end of 10 years had been increased by 90 percent of the initial volume, while cutting had removed a volume equal to 100 percent of the original volume.

Most of the cuttings thus far on the forest have been toward improving the timber stands. Early sawtimber operations removed large volumes of over-mature and decadent longleaf and loblolly pine, and destructively turpentined slash and longleaf. Subsequent thinnings have been concentrated in the pulpwood-size classes and have been essentially thirmings from below. This has considerably reduced the number of pulpwood-size trees and concentrated residual volume in the sawtimber-size classes. However, reproduction of the first 10 years of management is just recently starting to grow into merchantability, reinforcing the number of pulpwood trees.

From this report of the first 10 years of management on the pilot forest, the following conclusions can be drawn:

1. The medium-size forest ownership of 2,000 to 2,500 acres can be operated as an independent and self-sustaining unit in the middle coastal plain of Georgia.

2. Given effective fire protection on understocked areas, slash pine stands will readily expand in area and density through the regenerative and fast growth habits of the species.

3. In spite of intensive management, acreage actually growing merchantable timber volumes on the average forest holding is not likely to increase beyond certain limits, even when cutting is restricted to improvement cuts and thinnings.

4. Average cordwood growth rates of 10 percent or better are possible on young, understocked longleaf-slash pine stands Sawtimber growth rates of 15 to 20 percent can be realized.

5. Sawtimber ingrowth in young, lightly stocked stands of longleaf-slash pine is such that the original stocking may be virtually doubled over a lo-year period while most of the original volume is harvested.

6. Excluding interest on the investment, a return of 10 percent is possible.