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Thirty Years of Management On a Small Longleaf Pine Forest

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ABSTRACT. A management demonstration in an understocked 40-acre tract of second-growth longleaf pine (Pinus palustris Mill.) forest in south Alabama was begun in 1948. The management goal for this "farm forty" is to produce high-quality poles and logs on a 60-year rotation. Initial sawlog volume averaged 3,559 board feet per acre. Although periodic harvests removed 3,833 board feet per acre, standing volume after 30 years of management had increased to 5,408 board feet per acre. Over half the forty has been harvested and naturally regenerated to longleaf, with the shelterwood system, and now supports stands ranging in size from grass-stage seedlings to small poles. Management costs have been minor. Continued management will lead to optimum stocking and a balanced distribution of age classes.

Escambia Experimental Forest¹ in southwest Alabama, was established in 1948 as a demonstration of small woodlot management. The forty was selected as typical of the 35- to 45-year-old understocked, second-growth longleaf pine forests common to the coastal plains of the Gulf South.

The tract comprised 31 acres of longleaf pine upland and 9 acres of slash pine-hardwood in branch bottoms and on flats. Site-index for longleaf is average-TO feet at 50 years. When first inventoried late in 1947, the pine stands averaged 39 square feet of basal area and 83 trees per acre

The "Escambia Farm Forty," located on the

¹ Maintained by the Southern Forest Experiment Station, USDA Forest Service, in cooperation with the T. R. Miller Mill Company.

in merchantable size classes (trees 3.6 inches d.b.h. and larger). About 81 percent was longleaf and the rest largely slash pines. Sixty percent of the merchantable pine volume was in sawtimber-size material (trees 9.6 inches d.b.h. and larger). All cubic-foot and board-foot volumes are from local experimental firestand volume tables, compiled in 1958, for longleaf and slash pines. Cubic-foot volumes are inside bark and board-foot values are for International 1/4-inch rule unless otherwise stated.

MANAGEMENT

The long-term goal of management for the forest is to grow high-quality poles and logs on a 60-year rotation. This goal will be accomplished entirely through management of the existing natural forest. With little or no capital investment the forest will provide a regular income to the landowner through intermediate and regeneration cuts. Periodic removals will be kept below growth until the objective of full stocking, with a balanced distribution of age classes, is reached.

Management began in 1948 with annual harvests, confined largely to thinnings and improvement cuts that removed the poorest trees first. Keeping annual cut below growth promoted a gradual increase in high-quality growing stock. After the 1962 harvest and completion of 15 years of management, annual cuts were discontinued. Harvests had removed 85 percent of the total growth.

Intermittent harvests during the second 15 years of management removed about half the pine volume growth, mostly in regeneration cuts. Beginning in 1954, selected areas in the Forty were naturally regenerated with the shelterwood system. Age of the regenerated stand is dated from the year of overstory removal.

To date, 22 acres (71 percent) of the longleaf pine upland have been naturally regenerated. Nine of these acres are in stands of seedlings or saplings. The remaining 13 acres are occupied by 15- to 25-year-old stands ranging up to small poles in size (Figure 1).

Except for some deadening of cull hardwoods, cultural treatments on the Forty, excluding planned logging, have consisted only of recurrent prescribed fires. The entire Forty has been prescribed burned seven times in the 30 years for brush control, hazard reduction, and seedbed preparation.

Management costs have been small, confined mostly to prescribed burning, marking trees for cut, and some controlling of cull hardwoods. Total annual costs over the first 19 years averaged about six dollars cash plus 12 man-hours of time.

GROWTH AND CUT

Thirty-year growth and removals of merchantable pine timber on the Forty, by 15-year periods, are summarized in Table 1. The initial inventory taken when management began, revealed a pine stand with a merchantable volume averaging 846 cubic feet per acre. About 60 percent of this volume was in sawlogs and amounted to 3,559 board feet per acre.

From 1948 through 1962, pine volume on the Forty increased to 933 cubic feet per acre while sawtimber-size material increased from 508 to 722 cubic feet, or 4,449 board feet. Sub-sawlog-size material showed a net decrease of 127 cubic feet. Only 113 cubic feet per acre of this material was removed in cutting. Much of the decline is due to growth of trees into sawlog size during the first 15 years and lack of recruitment from below, as no regeneration efforts were made before 10.54. The first 15 years also gave harvests totaling 515 cubic feet per acre, of which 402 cubic feet were sawlogs. More net growth (incutting cut) occurred in the sawtimber stand than in the total stand.

From 1963 through 1977, standing merchantable pine volume increased to 1,194 cubic feet per acre, while removals totaled 275 cubic feet per acre. Sixty-six percent of the merchantable volume increase (including cut) during the second 15 years was in sawtimber. Naturally regenerated stands

Table 1. Growth and cut of pine per average acre on the Escambia Farm Forty, 1948-1977.

		Total stand/acre 03.5" d.b.h.)		Sawtimber stand/acre (>9.5" d.b.h.)	
		Cubic feet	Cubic feet	ht. 1/4" Doyle	Doyle
Inventory	1947	846	508	3,559	1,841
Inventory	1962	933	722	4,449	2,474
Increase	1947-1962	87	214	890	633
Cut	1947-1962	515	402	2,482	1,409
Growth	1947-1962	602	616	3,372	2,042
Inventory	1977	1,194	855	5,408	3,268
Increase	1962-1977	261	133	959	794
cut	1963-1977	275	219	1,351	768
Growth	1963-1977	536	352	2,310	1,562
increase	1947-1977	348	347	1,849	1,427
cut	1947-1977	790	621	3,833	2,177
Growth	1947-1977	1,138	968	5,682	3,604

¹ Excludes tops (which are included in total cubic feet).



Figure 1. Natural longleaf regeneration on the Escambia Farm Forty: sapling stand foreground, small pole stand right background, sawtimber stand left background.

were growing into merchantable sizes, so net growth (including cut) was 184 cubic feet per acre in sub-sawlog-size material.

During the 30 years, standing volume of pine timber increased 41 percent to 1,194 cubic feet per acre and sawtimber volume 52 percent to 5,408 board feet per acre. The entire 30-year increase in standing volume was in the **sawlog-size** classes. The volume in trees in the 4-inch through **9-inch** diameter classes declined from 263 cubic feet per acre in 1947 to 126 cubic feet per acre in 1962 and increased to 250 cubic feet per acre in 1977. Small trees present in 1947 were either cut or grew into **sawlog** size, to be replaced by small **third-growth** trees in the 4-, 5-, and **6-inch** diameter classes. By 1977, trees per acre had increased to 119, and basal area had increased to 5.1 square feet. **Sawlogs** represented 72 percent of the total standing volume in 1977, compared to 60 percent in 1947. The sawtimber volume of 5,408 board

feet per acre was all located on the 18 acres not yet regenerated, so the average acre carrying **sawtimber** trees was supporting 12 thousand board feet.

In all, 31.6 thousand cubic feet of pine **has been** harvested from the Forty (Figure 2), of which 79 percent was **sawlogs**. The 153 thousand board feet removed exceeded the initial stand of 142 thousand board feet. About half the sawtimber volume went into high-value poles and piling. Increment of merchantable timber, growth plus cut, was 45.6 thousand cubic feet. 85 percent (227 thousand board feet) in **sawlogs**.

The **diameter-class** distribution of merchantable pine per acre on the Forty, both 1947 and 1977, is shown in Figure 3. The main changes are the appearance of many **small-diameter** third-growth trees and the shift of **residual** second-growth timber into larger size classes.

Hardwoods were also present on the Forty in

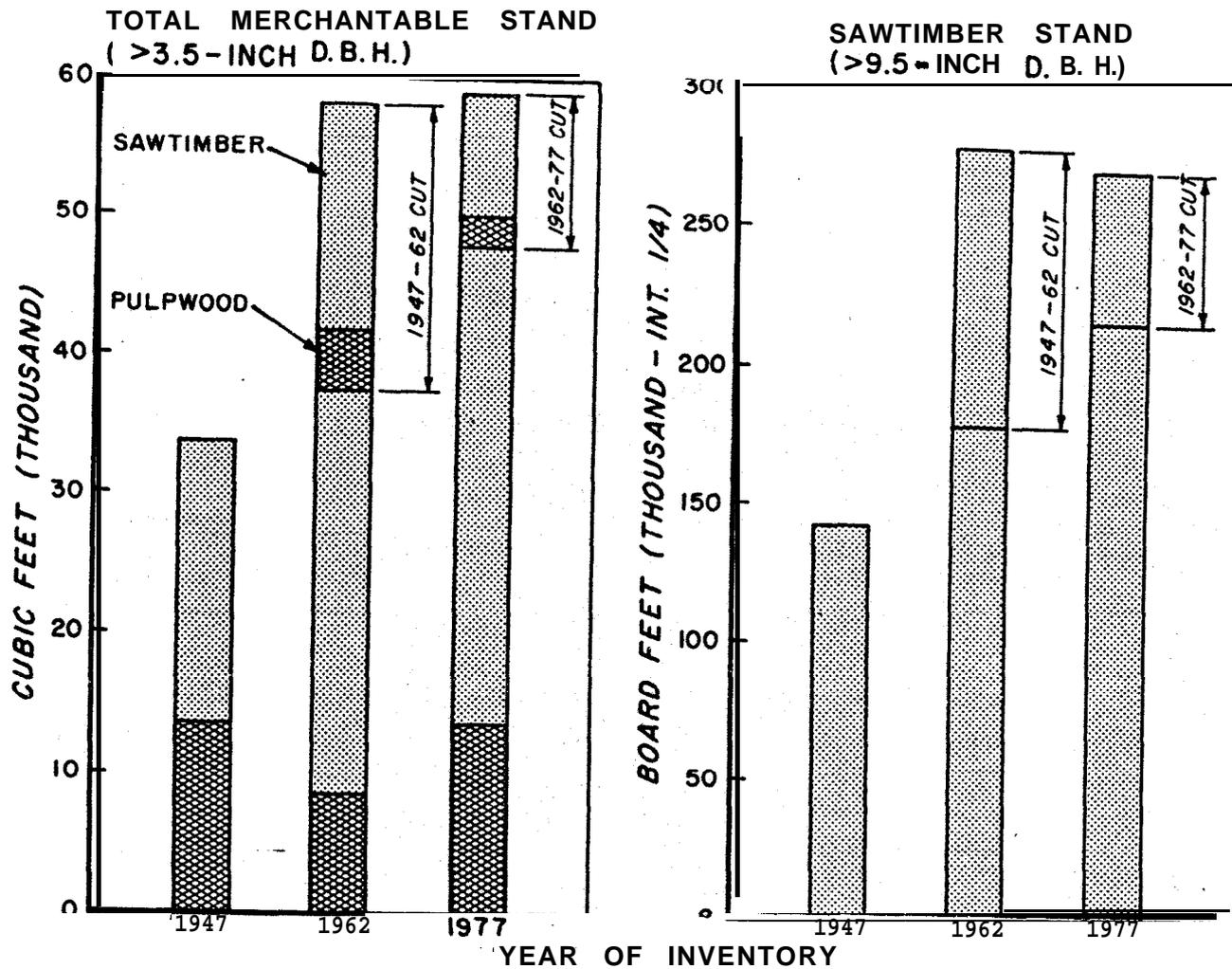


Figure 2. Standing volume of merchantable pine timber at each inventory plus volumes cut between inventories on the Escambia Farm Forty.

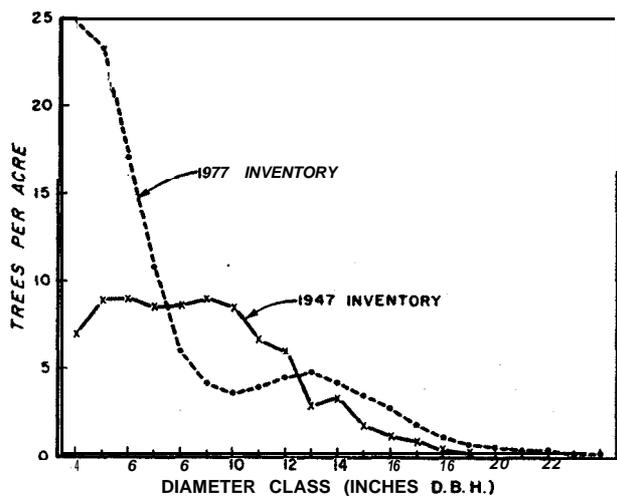


Figure 3. Diameter class distribution of pines per acre on the Escambia Farm Forty in 1947 and 1977.

1977, mainly in the slash pine-hardwood bottoms. The amount of change in this component is not known, because hardwoods were not inventoried earlier. Hardwood volume in the 4-inch d.b.h. class and larger was 256 cubic feet per acre, of which over half (146 cubic feet per acre) was composed of trees in the 10-inch d.b.h. class and up. Overall, hardwoods averaged 58 stems and 16 square feet of basal area per acre.

DISCUSSION

So far, all harvests on this farm forestry forty have been derived from the poorly stocked stand present in 1947. Old timber stands will continue to be thinned, naturally regenerated, and harvested under the shelterwood system. Cuts will be less than growth until the desired stocking and age-class distribution is reached. Ideally the Forty

will be stocked eventually with 12 five-year age classes, each occupying a total of 3.3 acres. Basal area of merchantable stands not being regenerated should then average from 60 to 90 square feet per acre, with older stands having the higher densities. Meanwhile, assuming future growth is similar to past, periodic five-year removals over the near term can average about 5 to 6 thousand cubic feet, including 25 to 30 thousand board feet of sawtimber. Once stocking goals are met, cubic-foot volume removals should nearly triple as fast-growing young stands are thinned. Sawtimber removals will probably increase more moderately, as less than half the stands will be old enough to support operable sawtimber cuts. Most sawtimber removed in each cutting cycle will come from stands scheduled for regeneration cuts and final harvest, with cut volume estimated to average about 40 to 45 thousand board feet each five-year cutting cycle.

CONCLUSIONS

Results from 30 years of management of this demonstration farm forty should interest any lan-

downer with a small tract of longleaf pine forest. In this case, the starting point for management was a poorly-stocked stand of second-growth longleaf pine on an average Coastal Plain site. Despite no capital outlays and relatively small expenses, principally for prescribed burning and timber marking, the forest's condition had greatly improved while providing an income from regular harvests of timber, mostly high-value sawlogs, poles, and piling.

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