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in the Georgia Piedmont;
- A 12-Year Report -

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Management of Small Woodland Holdings
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- A 12-Year Report -

by
R. M. Romancier, and E. V. Brender

Trees can be a crop, just as cotton, corn, and pecans are a crop. Trees, however, differ from annual crops in that all along they reach maturity for one product or another, and some trees can always be left to grow and increase in value. For example, the trees on a 38-acre woodlot on the Hitchiti Experimental Forest were worth \$2,315 in 1948. During a 12-year period \$1,920 worth of trees were harvested, and those left standing are now worth \$7,065.

No special tools were used, no fertilizer, no irrigation; just a reasonable outlay of energy, a small amount of money, and above all a little planning ahead and deciding which trees to harvest and which to keep. This same thing could be done by any small woodland owner on most 30-, 40-, and 100-acre tracts of timberland.

Over 90 percent of the commercial forest land in central Georgia is in private ownership, mostly in small farm holdings.^{1/} The greatest portion of this forest acreage is not under planned management and contributes only a fractional share of its potential to the owner and to the economy of the region.

To show that these small holdings could be profitably managed, three farm woodlots were taken under management on the Hitchiti Experimental Forest in 1948. This forest, located in the lower Piedmont of middle Georgia, is typical of many of the woodlands of the region. In the three woodlots, the mixed loblolly-shortleaf pine stands were put under management to produce continuous crops of sawtimber and pulpwood. This paper is the story of how hitherto unmanaged, relatively young stands of pine trees were changed into valuable woodland holdings.

^{1/} Anonymous. Preliminary Forest Survey statistics for central Georgia, 1961. U. S. Forest Serv. Southeast. Forest Expt. Sta. 1961.

A mature, good-quality sawtimber tree in Farm Woodlot 1. At 49 years of age, this tree is 24 inches d. b. h. and contains 600 board feet, worth at least \$18 on the stump.

THE HITCHITI FARM WOODLOTS

A large portion of the lower Piedmont of Georgia was originally in oak-hickory forests. Following settlement of this region by the white man, the land was repeatedly cleared and abandoned. Pines generally became established on the abandoned land and the principal upland forest type is now a mixture of loblolly and shortleaf pine, often with a moderate to dense understory of hardwood species.

As a first step in planned management of the three woodlots, a survey was made to determine the acreage in each woodlot, the age classes of the stands (table 1), numbers and sizes of trees, and sawtimber and pulpwood volumes (table 2). The most valuable woodlot, Farm Woodlot 1, had a higher proportion of older pine stands than the other woodlots. Stands over 50 years old made up 12.4 percent of the area in Farm Woodlot 1, compared to 5.9 percent in Farm Woodlot 2, and none in Farm Woodlot 3.

Table 1. --Stand age distribution by woodlots, 1948

Age class	Farm Woodlot 1 39.5 acres	Farm Woodlot 2 49.0 acres	Farm Woodlot 3 38.2 acres	All woodlots 126.7 acres
- - - - - Percent of area - - - - -				
Open land	5.6	5.1	--	3.7
Trees less than 25 years old	44.8	48.6	67.0	52.9
Trees 25 to 50 years old	37.2	40.4	33.0	37.2
Trees 50 years old or older	12.4	5.9	--	6.2
Total	100.0	100.0	100.0	100.0

Table 2. --Initial stand, 1948
(per acre)

Woodlot	Area	Average site index	Trees	Average d. b. h.	Volume		
					Sawtimber	Pulpwood	Total
	<u>Acre</u>	<u>Feet</u>	<u>Number</u>	<u>Inches</u>	<u>Board feet</u>	<u>- - Cubic feet - -</u>	
Farm Woodlot 1	39.5	80	88.9	11.2	7,416	368	1,957
Farm Woodlot 2	49.0	86	64.2	10.9	4,569	289	1,282
Farm Woodlot 3	38.2	89	75.1	9.8	3,001	348	1,015

Farm Woodlot 1 has the most favorable topography for pine of the three areas; it consists of gentle to moderate upper slopes and only a small area of lower slopes. Hardwoods are less of a problem here than on the other two woodlots. In Woodlot 1 the age classes and stocking were not in balance for sustained yield, but the area contained a large volume of pine, with 7,416 board feet^{2/} plus 4.6 cords^{3/} of pulpwood, or a total of 1,957 cubic feet of pine per acre.

Farm Woodlot 2 was less heavily stocked with pine than Farm Woodlot 1, but was still considerably above the level of an average middle Georgia woodlot. At the start of the study, this woodlot had 4,569 board feet and 3.6 cords of pulpwood for a total of 1,282 cubic feet per acre.

^{2/} International $\frac{1}{4}$ -inch rule.

^{3/} A cord is a volume of stacked wood 4' x 4' x 8'.

A young stand in Farm Woodlot 2, typical of many of the stand conditions when the study was started.

Farm Woodlot 3 had the lowest sawtimber volume of the three areas, and was more typical of an average small forest tract. It contained a large number of young trees with good future potential, with an average site index^{4/} 10 feet higher than that of Woodlot 1. The pine sawtimber volume in Farm Woodlot 3 was 3,001 board feet and 4.4 cords of pulpwood to the acre, for a total of 1,015 cubic feet per acre.

Like other 40-acre forest tracts in middle Georgia, the Hitchiti farm woodlots are not all pine stands; hardwood stands are also present (fig. 1). In Farm Woodlot 1 the hardwoods occur principally as an understory, but in Farm Woodlots 2 and 3 hardwood stands occupy 39 and 45 percent of the area, respectively. However, one-fourth of the hardwood area is capable of growing fine hardwood timber. The other areas support a mixture of pine and mostly cull hardwoods.

^{4/} Height of the larger, taller trees in each stand at a certain age, usually 50 years.

Figure 1.--The Hitchiti farm woodlots.

MANAGEMENT METHOD

Harvesting of the tree crop on the three woodlots has been under a system of partial cuts, removing surplus and mature trees, and leaving others to increase in size and value. The system as carried out provides a steady supply of wood for as many years as the woodlot manager wishes. Harvests may be made annually or periodically. In this study, all the early cuts were improvement cuts, removing the large, rough trees, defective trees, and trees that stood too crowded. Some trees were harvested each year in each woodlot. Later some groups of mature, sawtimber-size trees were cut, and some sawtimber stands were cut rather heavily, leaving about 25 well-formed and well-spaced seed trees per acre to regenerate a new stand. A few stands were thinned for pulpwood and one open-grown stand of loblolly pine was clear cut and planted. Farm Woodlot 2 was converted in 1953 to a periodic harvest schedule, so that the growth of several years could be cut at one time. In 1948, Woodlots 2 and 3 were understocked and quite out of balance in age and size classes for systematic harvesting of forest products. To get a sustained annual or short periodic yield you must cut less than the annual growth until the stand or forest is properly stocked with trees of the right sizes. Since growth data for the woodlots were not available, the allowable cut was based upon assumed board-foot growth rates as follows:

Farm Woodlot 1 - 300 board feet per acre per year

Farm Woodlot 2 - 150 board feet per acre per year

Farm Woodlot 3 - 75 board feet per acre per year

The allowable harvest cut for each woodlot was the assumed per-acre growth multiplied by the entire area in the woodlot. This volume was harvested annually from a portion of the area in each woodlot, rather than spreading the harvest over the entire woodlot. After the first repeat inventory in 1953, the allowable cut was adjusted on the basis of growth that the woods made during the first 5 years. However, not all of the growth was scheduled for cutting in Woodlots 2 and 3; some was left to build up the stocking.

To regulate and control management of these woodlots, total inventories were taken of the initial stands, and again of the entire woodlot at the end of 5 years of management, and 7 years later in 1960. Records have been kept by stands and summarized for each woodlot. All trees 6 inches d. b. h. and larger were measured and merchantable heights estimated to a 4-inch top for pulpwood and to an 8-inch top for sawtimber which included trees 9.6 inches d. b. h. and larger.

HARVESTS

Over the 12-year period, 330,667 board feet and 120.4 standard cords of pulpwood have been cut from the three woodlots, with a cash stumpage value of about \$10,000.

Local markets for sawtimber and pulpwood were readily available. Stumpage prices have fluctuated widely, but have generally increased with time (table 3). These are prices that a small-scale timber grower would also have expected from the sale of marked pine sawtimber and pulpwood. The amount, quality, and location of the wood will affect the price, as will market conditions.

Table 3. --Pine stumpage prices

Year	Sawtimber	Pulpwood
	<u>Dollars per M</u>	<u>Dollars per cord</u>
1949	18.13	1.50
1950	21.93	1.88
1951	29.02	2.25
1952	30.32	2.70
1953	31.69	3.00
1954	23.80	3.40
1955	23.40	3.70
1956	25.60	4.20
1957	28.20	4.80
1958	28.60	4.94
1959	29.20	5.25
1960	35.20	5.60

A record of the amount of wood removed from each woodlot was kept (table 4). The annual per-acre harvest from Farm Woodlot 1 amounted to 300 board feet and 0.1 cord of pine; in Farm Woodlot 2 it amounted to 194 board feet and less than 0.1 cord, and in Farm Woodlot 3, 131 board feet and 1.4 cords of pine were cut annually. The average yearly harvest of Woodlots 2 and 3 exceeded the originally planned annual harvest because the reinventory made in 1953 showed that the growth in these two woodlots was considerably better than had been expected.

In each woodlot, the sawtimber trees cut averaged 16 inches d.b.h. In some of the stands, no sawtimber was cut; in others, no pulpwood was cut. Four upland hardwoods areas, totaling 10.6 acres, were not cut at all.

Table 4. --Harvests made over a 12-year period
(per acre)

Woodlot	Operations	Trees	Average d. b. h.	Volume		
				Sawtimber	Pulpwood	Total
	<u>Number</u>	<u>Number</u>	<u>Inches</u>	<u>Board feet</u>	<u>- - Cubic feet - -</u>	
Farm Woodlot 1	10	25.0	13.6	3,595	103	903
Farm Woodlot 2	6	10.0	15.8	2,325	35	528
Farm Woodlot 3	10	23.0	12.0	1,568	139	482

The truck holds about 3 cords of pulpwood, worth about \$16.80 on the stump, \$28.80 at roadside, and \$45.90 delivered at a woodyard.

About 1,500 board feet of sawtimber, worth \$45 on the stump.

PRESENT CONDITION OF THE WOODLOTS

A great deal has happened to the farm woodlots in 12 years (table 5). The large, rough sawtimber trees have been cut, surplus trees in certain size classes have been removed, slow growers and defective trees have been harvested, some cull hardwoods deadened, and the growing space for trees has been improved; some trees have been allowed to grow into larger, more valuable size classes, for one large sawtimber tree is typically worth several small ones. To illustrate, a 10-inch (d. b. h.) loblolly pine with one 16-foot log contains about 33 board feet, worth about 99¢ on the stump. A 14-inch (d. b. h.) tree with three 16-foot logs contains 180 board feet and is worth about \$5.40 stumpage.

The changes that took place are illustrated in figures 2a and 2b. In all three woodlots the number of pulpwood size trees increased. In Woodlot 1 there was a slight decrease in sawtimber trees, but in Woodlots 2 and 3 sawtimber size trees increased in number. In terms of cubic feet, the changes are parallel to changes in tree numbers, except that in Woodlot 1, the total volume has not changed during the 12 years. The other two woodlots gained in volumes in all product size classes, with the largest gains in the small to medium sawtimber size class in Woodlot 3. These gains reflect primarily the high proportion of young pine stands that have grown into merchantable size during the 12-year period. Board-foot volume changes followed the same pattern, as shown in the following tabulation:

<u>Per acre board-foot volume</u>		
(Woodlot)	(1948)	(1960)
1	7,416	6,572
2	4,569	5,681
3	3,001	5,206

The decrease in Woodlot 1 resulted from cutting large overmature trees.

Table 5. --Present stand, 1960
(per acre)

Woodlot	Trees	Average d. b. h.	Volume		
			Sawtimber	Pulpwood	Total
	<u>Number</u>	<u>Inches</u>	<u>Board feet</u>	<u>- - Cubic feet - -</u>	
Farm Woodlot 1	110.9	10.1	6,572	515	1,935
Farm Woodlot 2	79.0	10.9	5,681	389	1,619
Farm Woodlot 3	88.8	10.4	5,206	425	1,570

Figure 2a.--Number of pulpwood, small sawtimber, and large sawtimber trees (per acre).

Figure 2b.--Cubic-foot volume in pulpwood, small sawtimber, and large sawtimber trees (per acre).

Just as an agricultural crop must compete with many weeds for its water, nutrients, and living space, so pines compete with hardwoods for these same essentials. In the pine stands where harvests were made, hardwood control measures were undertaken to eliminate large cull hardwoods and some understory hardwoods that interfered with pine regeneration. But by and large no efforts were expended toward converting the hardwood areas to pine. Hardwood trees of cordwood size increased in all three woodlots. However, one-fourth of the hardwood area supports commercial species of good quality and will contribute to the revenue from the woods. The remainder should be converted to pine. Now that prospects for selling pulpwood from hardwoods are in sight, conversion to pine may be accomplished, if not at a profit, at least at reasonable costs.

PRODUCTION

The amount of wood present in 1960, less the wood present when the study began in 1948, plus the wood harvested between 1948 and 1960 is the production of the woodlots. Table 6 gives the production of each woodlot in terms of total cubic feet and in board feet of sawtimber and standard cords of pulpwood. Dollar values are also given for the initial amount of wood, wood harvested, wood remaining, and wood produced. The average annual production for the three woodlots has amounted to \$15.49 per acre.

The forest owner has been able to build substantially on his investment over the past 12 years. At the same time he has received a sizeable annual income. The woodlots in their initial condition in 1948 were worth about \$97 per acre; \$77 worth of wood has been harvested per acre, based on the rates actually paid. The present value of the woodlots is about \$205 per acre.

While these are returns only, and do not include the cost of items such as taxes, fire protection, equipment, or labor for marking trees or deadening hardwoods, these dollar values do indicate reasonable returns that a landowner might expect under similar conditions.

Table 6a. --12-year production of wood on the farm woodlots (per acre)

Woodlot	Initial	Harvested	Residual	Production
----- Cubic feet -----				
Farm Woodlot 1	1,957	903	1,935	881
Farm Woodlot 2	1,282	528	1,619	865
Farm Woodlot 3	1,015	482	1,570	1,037

Table 6b. --12-year production of forest products on the farm woodlots (per acre)

Farm Woodlot	Initial		Harvested		Residual		Production	
	Board feet	Cord-wood	Board feet	Cord-wood	Board feet	Cord-wood	Board feet	Cord-wood
Farm Woodlot 1	7,416	4.60	3,595	1.29	6,572	6.44	2,751	3.13
Farm Woodlot 2	4,569	3.61	2,325	.44	5,681	4.86	3,437	1.69
Farm Woodlot 3	3,001	4.35	1,568	1.74	5,206	5.31	3,773	2.70

Table 6c. --12-year production of the farm woodlots in dollars per acre

Woodlot	Initial		Harvested		Residual		Production		
	Board feet ^{1/}	Cord-wood ^{1/}	Board feet ^{2/}	Cord-wood ^{2/}	Board feet ^{3/}	Cord-wood ^{3/}	Board feet	Cord-wood	Total production
Farm Woodlot 1	134.45	6.90	100.03	4.64	197.16	36.06	162.74	33.78	196.52
Farm Woodlot 2	82.84	5.42	74.01	1.94	170.43	27.22	161.60	23.74	185.34
Farm Woodlot 3	54.41	6.52	44.18	6.28	156.18	29.74	145.95	29.50	175.45

^{1/} \$18.13 per MBM and \$1.50 per cord.^{2/} Value prorated on basis of prices paid from 1949 to 1960.^{3/} \$30.00 per MBM and \$5.60 per cord.

SUMMARY

Three woodlots representing many of the stand and site conditions found in small woodland holdings in middle Georgia have been under sustained-yield management for a period of 12 years. They have been managed much as a small woodland owner might do, applying good forestry practices and working to promote proper stocking and good growth.

The objectives have been a continuous yield of saw logs and pulpwood on an annual cutting cycle. The annual cut was set below the estimated annual growth to build up the initial stocking.

Harvesting operations were at first strictly improvement cuts and began early in 1949. Harvests were made annually in each woodlot through 1956, except in Farm Woodlot 2, which was converted in 1953 to a periodic harvest schedule.

Over the 12-year management period, an amount of wood equal to about half the 1948 cubic-foot volume was harvested from each woodlot. In other words, a large amount of wood was removed, but the residual stocking remained the same or was improved over the initial stocking.

The actual financial returns from the woodlots have been considerable, averaging \$77 per acre. There has also been a significant increase in the value of each woodlot. Comparing the initial and production values of the three woodlots, the compound interest rates earned are:

Farm Woodlot 1	2.6 percent
Farm Woodlot 2	6.4 percent
Farm Woodlot 3	9.2 percent

A portion of the increase in valuation is the result of the general business inflation, but much of the increase is directly related to the forest management practices used.

A great many of the small woodland holdings in middle Georgia can be profitably managed for wood production. Initial investments are small while the potential returns are great.

The sustained yield of saw logs and pulpwood, as described for this study, is only one of the ways in which farm woodlots in middle Georgia can be handled. For help in selecting and applying the most suitable management plan, a Consulting Forester, Farm Forester, or a State Extension Forester can provide guidance and advice.

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