Historic, archived document

Do not assume content reflects current scientific knowledge, policies, or practices.

Ten Years of Experimental Farm Woodland Management in the Southern Appalachians

by *Robert A. Campbell*

7a
SOUTHEASTERN FOREST
EXPERIMENT STATION.
Asheville, North Carolina

7b above

Joseph F. Pechanec,
Director

Revised.
1.9622
S 4572

Southeastern Forest Experiment Station
Asheville, North Carolina

ERRATUM

In Station Paper 83, "Ten Years of Experimental Farm Woodland Management in the Southern Appalachians," issued September 1957, the second paragraph, page 10, first sentence under Summary should read, "This 10-year summary shows that the woodlands contain less basal area, board-foot volume, and cordwood than they did in the beginning some 10 years ago."

✓ TEN YEARS OF EXPERIMENTAL FARM WOODLAND MANAGEMENT
IN THE SOUTHERN APPALACHIANS ✓

by

Robert A. Campbell
Southern Appalachian Research Center

Farm woodlands account for about 40 percent of the total woodland area of the Southern Appalachians. With proper care they could supply an important part of the forest product needs of the region and at the same time provide a sizeable supplement to the cash farm income. Few such properties are now operating at top capacity in either respect.

To determine the actual returns possible from planned farm woodland management, and to provide demonstration woodlands, four separate areas on the Bent Creek Experimental Forest, near Asheville, North Carolina, were set aside in 1945. These areas are representative of many farm holdings in acreage as well as in character of the timber stand. The cutting plan for each tract called for the removal of some products annually, and the use of such labor and equipment as a farmer would have available. Cutting during the past 10 years has gradually removed defective and poorly formed trees in addition to species of low value. Future cutting will be scheduled to allow the desired amount of growing stock to build up, after which it will be sustained at about the same level as annual growth.

Two of the tracts, Woodlands 1 and 2, are being managed for small products such as small saw logs, pulpwood, and fuelwood; the other two, Woodlands 3 and 4, for large, high-quality products such as large saw logs and veneer logs. Pulpwood and fuelwood are removed in thinnings from appropriate areas and from topwood left in the sawtimber operation. Other products such as locust posts and dogwood bolts are cut and sold when markets and supply of products permit.

Stand Description and Treatment

These stands are typical of the region, in that they were repeatedly culled and burned prior to the late 1920's. Since then they have been protected from fire and trespass but have had no other management until recently. Starting in 1946 and continuing every year since, some cutting has taken place in each woodland through 1955 (fig. 1). All cutting during the first 8 years was solely in the nature of an improvement to remove defective, over-mature trees and thin overdense stands. During 1954 and 1955, some sound and thrifty trees in Woodlands 1 and 2 were cut to increase the difference in average tree size between large-product areas and small-product areas, so that the management comparison would be more meaningful. During the

Figure 1. -- Above, cove site immediately after formative cut. Below, cove site 10 years later, showing the new crop in early stages.

first 10 years, comparisons between the large- and small-product woodlands have not had much meaning because most of the harvested sawtimber came from large trees already present on both types of tract when they were first established.

As a result of this formative cut, both saw-log and cordwood stocking have been reduced below their starting level. Most of the reduction took place in Woodlands 1 and 2, as shown in table 1 and figures 2, 3, 4, and 5.

Table 1. --Original stand in 1946, as compared to stand in 1951 and 1956,
on a per-acre basis

Year	Trees	Basal area	Volume		Annual net ^{1/} growth		
			Diameter class		Diameter class		All size classes
			5 to 10	10+	5 to 10	10+	
			inches	inches	inches	inches	
	<u>Number</u>	<u>Square feet</u>	<u>Cords</u>	<u>Board- feet</u>	<u>Cords</u>	<u>Board- feet</u>	<u>Cubic feet</u>
WOODLAND 1							
1946	247	105	18.2	4900	--	--	--
1951	208	93	14.0	5200	-0.14	140	17
1955	141	65	10.0	3800	-0.20	205	24
WOODLAND 2							
1946	89	63	7.2	5400	--	--	--
1951	101	65	7.5	^{2/} 4700	0.17	260	67
1955	88	52	7.0	3300	-0.04	205	37
WOODLAND 3							
1946	148	75	10.7	5000	--	--	--
1951	146	75	11.4	4700	0.27	210	65
1955	121	63	8.0	4300	-0.21	180	18
WOODLAND 4							
1946	114	72	9.1	5900	--	--	--
1951	109	72	8.7	^{2/} 6100	0.04	300	63
1955	99	68	8.0	5900	0.07	180	42
COMBINED							
1946	149	79	11.3	^{2/} 5400	--	--	--
1951	140	76	10.4	5300	0.09	230	54
1955	110	63	8.0	4600	-0.07	190	32

^{1/} The growth figures include the volumes cut during each 5-year period.

^{2/} Varies from previous reports because of exclusion of cull tree volume and/or different volume tables.

The need for rebuilding growing stock on these two areas will require a "stretch-out" between harvests in order to make an economic cut. While there will still be an annual harvest from one or more of the woodlands, the bulk of the cut from each will be removed in one year.

During the second 5 years, cubic foot growth on all woodlands combined was considerably less than it was for the first 5 years. However, the growth for the second period was reasonably good considering the drought conditions that existed from 1952 through 1954. The average annual growth of pole-timber-sized trees decreased materially, from plus 0.09 cord to minus 0.07 cord per acre. Insect damage in 1953 accounts for part of this decrease; movement of pole timber trees into sawtimber sizes accounts for the rest. The board-foot growth of sawtimber trees also declined on all areas except Woodland 1. The net result was a 17-percent decline in board-foot growth from 230 to 190 board-feet per acre per year (table 1). Oddly enough, the board-foot growth on the two small-product areas is the same (205 board-feet per acre), and on the two large-product areas it is identical (180 board-feet per acre). Within the range of residual stockings carried, the growth-volume relationship did not form any regular pattern. The growth (table 1) is the growth of the stands after cutting, with no allowance made for defect in merchantable trees. The volume harvested (table 2) is based on net log scale, not upon tree estimates.

All trees were graded on a butt-log tree-grade system, starting with the first inventory in 1946 and at each successive inventory. Desirable as a quality comparison might be, it would not have much meaning at present because of changes in grading standards introduced in the early 1950's. Furthermore, changes in quality between the first and second inventories (a 5-year period) would represent largely the harvest of old-growth material and a reduction of cull trees. Much of the better old-growth timber was of high quality, but it was mature and earning only a low rate of interest.

Harvest Returns

During the second 5-year period, the total stumpage value of the harvests was greater by about one-half than during the first 5-year period (table 2). This increase was caused mainly by a general rise in stumpage prices, and a larger volume of cordwood cut during the second 5-year period because of a growing demand for pulpwood. Also contributing to the increase were a higher proportion of good logs and better appraisals. In comparison with prices bid for national forest stumpage of the same species, grade, and accessibility, the stumpage prices obtained for the sawtimber from these woodlands were low. Nevertheless, they more than doubled during the 10-year period. The volume of sawtimber harvested was only slightly larger during the second 5-year period than during the first. The cordwood volume, however, was 50 percent greater, and this increase resulted in $2\frac{1}{2}$ times more cordwood stumpage return than during the first 5-year period. Much of the increase in value was due to the fact that all hardwood cordwood was sold as fuelwood during the first 3 years, whereas pulpwood markets paying a higher rate were available thereafter.

Table 2. -- Volume and value of forest products harvested per acre, 1946-1955

Period	Timber products				Other		Value of all products		
	Saw	Fuel and	Posts	Total	Xmas	Tan-	On	At	F.o.b.
	logs	pulpwood			trees	bark	stump	roadside	market
	Board- feet	Cords	Number	Cubic feet ^{1/}	Number	Tons	- - - -	Dollars	- - - -
WOODLAND 1									
1946-1950	520	1.51	--	232	--	--	5.00	19.00	32.00
1951-1955	1600	7.86	--	985	--	--	35.00	111.00	168.00
Total	2120	9.37	--	1217	--	--	40.00	130.00	200.00
Yearly average	210	.94	--	122	--	--	4.00	12.96	19.95
WOODLAND 2									
1946-1950	1620	4.92	--	743	--	0.45	18.00	75.00	113.00
1951-1955	1900	1.95	--	545	--	--	36.00	76.00	109.00
Total	3520	6.87	--	1288	--	.45	54.00	151.00	222.00
Yearly average	350	.69	--	129	--	.04	5.36	15.15	22.25
WOODLAND 3									
1946-1950	970	0.67	0.9	252	--	--	11.00	25.00	38.00
1951-1955	900	2.60	--	400	0.7	--	16.00	47.00	72.00
Total	1870	3.27	.9	652	.7	--	27.00	72.00	110.00
Yearly average	190	.33	.1	65	.1	--	2.72	7.27	11.08
WOODLAND 4									
1946-1950	1230	1.13	7.7	342	--	--	19.00	42.00	59.00
1951-1955	710	1.11	3.0	237	--	--	11.00	27.00	38.00
Total	1940	2.24	10.7	579	--	--	30.00	69.00	97.00
Yearly average	190	.22	1.1	58	--	--	3.00	6.91	9.75
ALL WOODLANDS									
1946-1950	1120	1.82	3.0	377	--	0.1	14.00	40.00	59.00
1951-1955	1150	2.87	1.1	473	0.2	--	21.00	57.00	84.00
Total	2270	4.69	4.1	850	.2	.1	35.00	97.00	143.00
Yearly average	230	.47	.4	85	--	--	3.55	9.69	14.34

^{1/} Based on 85 cubic feet per cord and 5 board-feet per cubic foot, 1 cubic foot per post.

It is expected that returns will decrease during the coming 5-year period, especially on Woodlands 1 and 2 while the growing stock is being re-built. The high returns per acre per year of \$4.00 and \$5.24 shown in table 2 for Woodlands 1 and 2, respectively, will drop sharply because much of the large and high-quality sawtimber was harvested in 1954 and 1955. On the other hand, cutting on Woodlands 3 and 4 will probably continue at about the 10-year average of 200 board-feet and $\frac{1}{4}$ cord per acre per year until the stand volumes are built up to the desired levels, when the cut can be increased. Stumpage returns per acre per year for each woodlot are shown in figure 6. The 10-year average for all woodlots combined was \$3.55. On a basis of current prices, the average annual stumpage return for the 10-year period would be about \$5.00 per acre. Figure 7 shows how the market dollar was divided among stumpage, logging, and hauling during the past 10 years.

Figure 6. --Stumpage returns per acre per year from farm woods, 1946-1956.

Figure 7.--Division of the market dollar, 1946-1956.

Miscellaneous products such as fence posts, tanbark, and Christmas trees have contributed only a small fraction (2 percent) to the total stumpage returns (fig. 8).

Figure 8.--Christmas trees produced little income during the first 10 years of management but promise to be a very profitable venture in the future as the trees reach desirable size. These are Norway spruces 8 years after planting. Trial plantings of southern balsam have also been set out.

Harvest Time

The average annual harvest input was $5\frac{1}{2}$ man-hours per acre, as shown in table 3. If timber marking and cruising time were added, the total would approximate 1 man-day per acre per year. Cordwood products required most of the time, 60 percent, while the harvest of sawtimber required 36 percent of the listed total, and other products the remaining 4 percent. The high figure for sawtimber from Woodland 2 appears out of line, but no satisfactory explanation for it is known at present.

Table 3.--Harvest time^{1/} per acre for various forest products

Woodland	Sawtimber	Cordwood	Other products ^{2/}	All
<u>Hours</u>				
1	1.67	6.14	--	7.81
2	3.13	4.72	0.89	8.74
3	1.68	2.37	.09	4.14
4	1.66	1.67	.13	3.46
Average	1.97	3.26	.24	5.47

^{1/} Labor shown is time from stump to roadside only, and is a 10-year average.

^{2/} Includes posts on Woodlands 3 and 4, tanbark on Woodland 2, and Christmas trees on Woodland 3.

Hourly Returns

The difference between roadside value and stumpage value is called conversion return. These returns are shown in table 4 for each of the major products by woodland, based on a 10-year average. The hourly returns are higher for sawtimber than for other products except in Woodland 1, where a large volume of insect-infested pine was harvested as cordwood. The conversion returns divided by the hours required to produce each type of product are known as gross hourly wages, and these too are shown in table 4. Note that they are highest for sawtimber and are about equal for cordwood and other products. Net hourly returns can be approximated by deductions from the gross hourly wages shown in table 4. These deductions, to cover equipment and depreciation costs, are 25 cents per hour for sawtimber and 15 cents per hour for cordwood.

Summary

This 10th year summary shows that the woodlands in general contain about the same basal area, board-foot volume, or cordwood volume as they did in the beginning some 10 years ago. However, the 10 years of management have greatly improved the quality of growing stock. They have also increased the earning power of the stand through the removal of old growth which was mature and earning interest at only a fraction of 1 percent per annum.

The results of 10 years of management show that if a farmer owned timber of similar average size and stocking, he would have obtained a return from the sale of stumpage alone of \$3.55 per acre per year, even during the initial management period. And if, in addition, he had done the woods work, he would have tripled his forest income, to about \$10 per acre per year.

Furthermore, if he had a truck and could load and haul his forest products to market, he would increase his return another 50 percent--to nearly \$15 per acre per year. In this case, he would be selling his labor as he does in marketing wheat or tobacco.

Table 4. -- Annual conversion returns^{1/} per acre and gross hourly wages^{2/}

Woodland	: Sawtimber :	Cordwood :	Other : products :	All
----- Dollars -----				
Woodland 1				
Conversion returns	2.47	6.50	--	8.97
Gross hourly wages	1.48	1.06	--	1.15
Woodland 2				
Conversion returns	4.66	4.26	0.79	9.70
Gross hourly wages	1.49	.90	.89	1.11
Woodland 3				
Conversion returns	2.23	2.36	.06	4.55
Gross hourly wages	1.33	1.00	.67	1.10
Woodland 4				
Conversion returns	2.16	1.60	.16	3.92
Gross hourly wages	1.30	.96	1.23	1.13
Average				
Conversion returns	2.73	3.18	.23	6.14
Gross hourly wages	1.39	.97	.96	1.12

^{1/} Conversion returns shown are roadside values less stumpage values.

^{2/} Net wages can be computed by deducting 25 cents and 15 cents from gross hourly wages for sawtimber and cordwood, respectively; these deductions are to allow for equipment operation and depreciation.

* NATIONAL AGRICULTURAL LIBRARY

1022590076