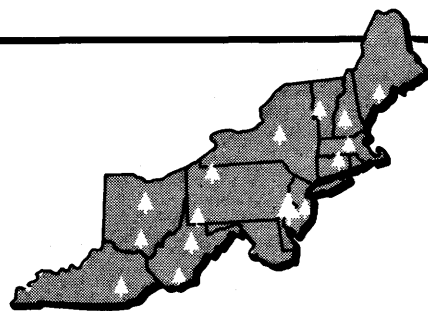


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A FIRST LOOK AT LOGGING RESIDUE CHARACTERISTICS IN WEST VIRGINIA

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Abstract.—In 1973 and 1974, the Forest Products Marketing Laboratory obtained some preliminary information about characteristics of logging residues in West Virginia. Sixteen 1-acre plots were measured in conjunction with a test of the line-intersect sampling method. Findings from the 16 plots showed that hardwood residue volumes ranged from 100 to 1,300 cubic feet per acre, with an average of 467.

KEY WORDS: logging residue, Appalachian hardwoods.

In 1973 and 1974, a study was conducted by the Forest Products Marketing Laboratory in West Virginia to test the feasibility of estimating hardwood logging residues with the line-intersect method. As a part of this study, all residue material 4.0 inches and larger, d.o.b. (diameter outside bark) at the small end, and 4.0 feet long or longer was measured on 16 one-acre plots.

The plots were located mainly in the southern half of the State on both private and public lands. They represented a variety of harvesting conditions. Clearcut and partial-cut units were sampled in both young and old hardwood stands, and utilization ranged from sawtimber only to pulpwood and mine-props. Although the plots were not located according to any planned stratification (since testing the meth-

od was our primary goal), the data obtained give some idea of the magnitude of the logging-residue situation in Appalachia.

Residue volumes were determined with Smalian's formula, using length and both end diameters, outside bark (o.b.). Since the line-intersect method was being tested, no attempt was made to estimate defect. I was concerned only with gross volume figures.

Species were also recorded, and of the 2,048 pieces of residue measured, 31 percent were red oak, 25 percent white oak or chestnut oak, 15 percent maple, 7 percent poplar, 7 percent pine, and 4 percent hickory. The remaining 11 percent were made up of 12 other species.

The average gross volume (including bark) on the 16 plots was 467 cubic feet per acre, or approximately 15 green tons. The volumes

Table 1.—Summary of residue characteristics for the 16 one-acre plots for all pieces > 4.0 inches d.o.b. at the small end and > 4.0 feet in length

Plot No.	Average diameter (o.b.)		Average length	Volume/acre
	Small end	Large end		
	Inches	Inches	Feet	Cubic feet
1	4.8	5.9	6.9	290
2	5.2	7.7	12.5	655
3	4.6	6.8	8.0	204
4	5.1	8.5	14.7	805
5	5.3	8.7	18.6	672
6	4.6	8.1	15.9	761
7	4.4	7.0	12.3	264
8	4.5	7.4	17.2	169
9	5.3	8.4	16.5	1297
10	5.1	8.3	13.7	354
11	5.4	8.3	18.2	925
12	4.5	6.2	10.4	397
13	4.4	5.7	8.8	222
14	4.7	6.1	6.4	150
15	4.2	5.5	8.2	199
16	4.2	5.6	6.4	102
Weighted average	4.8	7.1	11.8	467

ranged from about 100 cubic feet to nearly 1,300 cubic feet per acre (table 1). Probably one of the most significant findings was that 57 percent of this volume was in pieces 20 feet long or longer.

Appalachian hardwood residues are generally not large in diameter. Sixteen percent of the volume was in pieces 8 inches (o.b.) and larger at the small end (table 2). Fifty-six percent of the volume was in pieces 10 inches (o.b.) or more at the large end. And 42 percent of the residue volume was in pieces 10 inches (o.b.) or more at the large end and 20 feet or more in length.

Average diameter (o.b.) of the residue material was 4.8 inches at the small end and 7.1 inches at the large end (table 1). Average length was 12 feet.

When the residue was measured, a six-way classification scheme was used to describe the type of material. First, it was determined whether the piece was bolewood or limbwood, then whether it was straight (if a straight line between the centers of the ends lay within the piece) or crooked (having sweep or crook greater than the definition for a straight piece). If the piece was crooked, it was determined whether there was one or more than one point of crook.

Table 2.—Average cubic-foot volume/acre by length and diameter class (small end) for all 16 plots

Lower limit of diameter class - small end (inches)	Lower limit of length class (feet)																	Total
	4	8	12	16	20	24	28	32	36	40	44	48	52	56	60	64	68	
4	27.7	24.6	20.9	25.5	26.4	26.0	30.0	23.5	16.9	17.2	11.4	2.5	3.3	—	—	3.5	3.7	263.1
5	9.0	4.6	4.9	5.5	7.8	9.4	6.2	6.7	2.8	3.2	1.9	2.7	—	1.3	—	—	—	66.0
6	5.1	3.9	2.3	2.0	3.8	3.4	2.4	4.6	—	2.4	—	—	—	2.7	5.9	—	—	38.5
7	2.1	4.7	2.1	4.4	1.4	2.1	—	1.1	4.3	—	—	—	—	—	—	—	—	22.2
8	1.8	2.6	3.8	1.2	—	1.1	—	1.8	—	—	—	2.7	—	3.4	—	—	—	18.4
9	1.0	1.1	1.4	4.7	—	—	—	—	—	—	—	—	—	—	—	—	—	8.2
10	.4	1.6	.6	4.3	—	1.5	—	—	—	—	—	—	4.3	—	—	—	—	12.7
11	.3	.4	—	2.0	—	—	2.0	2.0	—	—	—	—	—	—	—	—	—	6.7
12	—	—	.7	1.9	3.3	—	—	—	—	—	—	—	—	—	—	—	—	5.9
13	—	1.1	1.4	—	—	—	2.5	—	—	—	—	—	—	—	—	—	—	5.0
14	3.4	1.1	—	1.3	—	—	—	—	—	—	—	—	—	—	—	—	—	5.8
15	.7	1.0	—	—	2.0	—	—	—	—	—	—	—	—	—	—	—	—	3.7
16	.6	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	.6
17	1.3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1.3
18	2.1	1.2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3.3
19	—	1.3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1.3
20	.6	1.9	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2.5
21	—	1.4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1.4
Total	56.1	52.5	38.1	52.8	44.7	43.5	43.1	39.7	24.0	22.8	13.3	7.9	7.6	7.4	5.9	3.5	3.7	466.6

Summarizing the data by residue class, I found that 48 percent of the pieces and 76 percent of the volume came from bolewood (table 3). Forty-five percent of the pieces qualified as straight material, and this represented 47 percent of the volume on an average acre. Another 29 percent of the pieces (22 percent of the volume) had only one point of crook. In many cases, at least two straight 4-foot pieces could be obtained from such material. Although defect was not recorded, losses that would reduce the amount of chip-pable material probably averaged less than 5 percent.

Table 3.—Distribution of residue, by type of material, in percent

Class	Pieces	Volume
Bolewood:		
Straight	31	42
1 crook	9	15
> 1 crook	8	19
	48	76
Limbwood:		
Straight	14	5
1 crook	20	7
> 1 crook	18	12
	52	24
Total	100	100

To estimate the extent of logging residue in West Virginia, figures from the most recent forest-survey report (*Ferguson 1964*) may be used. In 1961 there were 28.8 billion board feet of sawtimber growing on 11.4 million acres of commercial forest land in West Virginia. This is an average of 2,526 board feet per acre. Dividing this into the annual sawtimber cut of 433.3 million board feet shows that about 171,500 acres were harvested. When the average of 467 cubic feet per acre is applied to this, I get an estimate of 80 million cubic feet of residues left in the woods. This is more than three times the average annual pulpwood production from roundwood in West Virginia (1963-72) of 280 thousand rough cords.

Logging residues constitute a large source of potential raw material for the wood-using industries in Appalachia. Whether or not the material can be removed and processed at a profit is presently unknown.

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