FORESTS & THE WEST VIRGINIA ECONOMY

Volume 3: The Commercial Timber Harvest in West Virginia

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F O R E S T S

THE WEST VIRGINIA ECONOMY

Volume 3: The Commercial Timber Harvest in West Virginia

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Bulletin 691, *Forests and the West Virginia Economy*—Volume 1:
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Authors

Kenneth D. Jones is research technologist and Gary W. Zinn is
associate forest scientist in the Division of Forestry, West
Virginia Agricultural and Forestry Experiment Station, West
Virginia University.

West Virginia University
Agricultural and Forestry Experiment Station
College of Agriculture and Forestry
Robert H. Maxwell, Director
Morgantown

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FOREWORD

This is the third in a series of reports on West Virginia's forest resources. The series examines the forest resources, their current levels of utilization, their present role in the state's economy, the outlook for the future, and the prospects for increasing the economic contribution of forests and forest-based activity for the benefit of the citizens of West Virginia.

These reports focus mainly on timber resources and the timber-based economy. Observations are included on other forest resources and their uses including outdoor recreation, fish and wildlife, water, and wilderness; but these will not be covered in depth. Detailed research on the state's nontimber resources and their use is in progress and will be reported separately.

The research reported here was conducted under the auspices of the West Virginia Agricultural and Forestry Experiment Station at West Virginia University. Major financial support was provided by the West Virginia Governor's Office of Community and Industrial Development and by the Experiment Station. Other principal cooperators include the West Virginia Department of Natural Resources, the USDA Forest Service, and the West Virginia Forestry Association. The investigators gratefully acknowledge the support and cooperation of these agencies and organizations.

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HIGHLIGHTS

1. In 1979, West Virginia's timber producers harvested 89.27 million cubic feet of roundwood from the state's forests. Ninety-two percent of this (81.8 million ft³) was hardwoods and 8 percent (7.4 million ft³) was softwoods.
2. Of the state's total harvest, approximately 73 percent (65.1 million ft³) was processed as sawlogs and 12 percent (10.7 million ft³) was utilized as pulpwood. The production of mine timbers and fencing accounted for an additional 13 percent (11.7 million ft³).
3. The 1979 timber harvest in West Virginia was down 16 percent from 1974 harvest levels. Furthermore, the 1979 timber harvest represented a decline in harvest activity of 32 percent since 1965. From 1965-79, hardwood removals decreased 31 percent, while softwood harvests declined 44 percent.
4. In 1979, the sawlog harvest from West Virginia timberlands was 417.3 million board feet—down 9.8 percent from 1974. Ninety-six percent of all sawlogs came from hardwoods, with red oaks accounting for 35 percent of all sawlog volume. West Virginia was also a net exporter of sawlogs in 1979, shipping 53.5 million board feet of sawtimber to other states.
5. In 1982, West Virginia's total pulpwood production amounted to a record volume of 457,600 standard cords (38.89 million ft³). In 1983, total pulpwood production from all sources in West Virginia declined 15 percent to 389,400 cords. Pulpwood production from roundwood amounted to 246,600 standard cords, while chip production from manufacturing residues contributed 142,800 standard-cord equivalents. All of West Virginia's pulpwood production was exported to other states.
6. The veneer log harvest attained a record level of 8.5 million board feet in 1979. The 1980 harvest was down slightly to 7.5 million board feet, but veneer receipts increased to 23.4 million board feet, setting a record for the second consecutive year.
7. In 1979, mine timber production rose 13 percent over 1974 levels to 7.6 million ft³.
8. Rustic fence production in West Virginia has grown by more than four times since 1965—producing more than 3 million pieces in 1979.
9. The state's Christmas tree growers harvested 115,873 trees in 1984, generating \$1,733,000 in sales.
10. West Virginia's total fuelwood consumption in 1981 was estimated at 874,000 cords—over twice as much as the state's total 1983 pulpwood production.

11. The timber harvest ranked as the state's third largest cash crop in 1979 with an estimated stumpage value of \$39,688,000. Sawmills and other buyers of sawlog stumpage paid an estimated \$30.9 million to forest land owners—78 percent of timber harvest's total estimated value. The sale of timber for veneer logs and mine timbers also brought woodland owners considerable revenue but represented a much smaller percentage of the timber harvest's total value.

FORESTS AND THE WEST VIRGINIA ECONOMY

3. The Commercial Timber Harvest in West Virginia

Kenneth D. Jones and Gary W. Zinn

INTRODUCTION

It may be that civilization would not have occurred if primitive man had not had an abundant, readily available supply of wood, for almost all of man's early needs were met by this versatile material. From fuel for fire to structural materials for shipbuilding and home construction, wood has been one of the most utilized natural resources of all time.

In West Virginia, as in much of the world, there was no shortage of trees prior to the arrival of modern man. Trees covered the entire landscape except for a few natural openings or where Indians had cleared a small patch of land for agriculture. Trees were often a nuisance to the early settlers who would cut and burn large areas of virgin forest to clear land for farms or buildings.

The first sawmill west of the Allegheny mountains was operated by John Minear in 1776 near the town of St. George in Tucker County [4]. This water-powered mill employed a device known as a sash saw, which allowed two men to cut up to 500 linear feet of lumber a day, not much wood by modern standards, but it marked the beginning of lumber production in West Virginia.

Timber production peaked in West Virginia in 1909 when nearly 1.5 billion board feet of lumber was cut [4]. With the virgin forests now gone, it is doubtful that production will ever again reach such a high level. For the past 35 years timber production in West Virginia has averaged only about 400 million board feet annually, barely rivaling the volumes sawed in the early 1890s.

This volume of the West Virginia Forest Development Series examines the latest timber production information available for the state of West Virginia. It defines the status of timber production in the state and provides insight into the dynamics of West Virginia's timber-based industry.

HIGHLIGHTS OF THE 1979 TIMBER HARVEST

In 1979, the latest year for which complete harvest information is available, West Virginia's timber producers harvested about 89.27 million cubic feet of roundwood from the state's forests. About 92 percent (81.8 million ft³) of the harvested timber was hardwoods and 8 percent (7.4 million ft³) was softwoods. Seventy-three percent of the total harvest statewide was processed as sawlogs which were then manufactured into lumber. Approximately 10.72 million cubic feet of roundwood, or 12 percent of the state's timber harvest, was cut for

pulpwood and exported to paper mills in neighboring states; 11.69 million cubic feet, or 13 percent of the roundwood harvest, went into the production of mine timbers and fencing. The remaining portion of the harvest was used in the veneer and cooperage industries or was manufactured into cabin logs, dimension bolts, handle stock, wedges, and other miscellaneous wood products [11]. (See Table 1 and Appendix Table A1.)

Most of the 1979 timber harvest came from the northeastern and southern geographic units of the state (Figure 1). The northeastern unit accounted for 46 percent of the state's total harvest, 45 percent of all sawlog production, and 56 percent of the state's pulpwood harvest.

The southern unit produced 39 percent of the total harvest, including 40 percent of the sawlog harvest and 34 percent of the state's pulpwood. The northwestern unit had a relatively low timber output—only 15 percent of the 1979 timber harvest and sawlog harvest and only 10 percent of the state's pulpwood production [11]. (See Appendix Table A2.)

Figure 1. West Virginia forest survey geographic units, 1975.

Source [2].

Table 1
The timber harvest in West Virginia, by product, 1979

Product	Volume*	Percent
Sawlogs	65.1	73
Pulpwood	10.7	12
Veneer Logs	1.3	1
Mine Timbers	7.6	8
Fencing	4.1	5
Misc. Products**	.5	1
Total	89.3	100

Source: [11].

*Million cubic feet.

**Miscellaneous products include cooperage, cabin logs, dimension bolts, handle stock, poles, and wedges.

RECENT TRENDS IN WEST VIRGINIA'S TIMBER HARVEST

Prior to 1979, two surveys of the timber industry had been conducted in West Virginia, in 1965 and in 1974. The latest survey was conducted in 1979 by the U.S. Forest Service and the West Virginia Department of Natural Resources.¹ Although the years in which the surveys took place may not be representative of the long-term production trends in West Virginia's timber industries, they do provide some comparative data over a 14-year period.

In addition to the comprehensive statewide survey of the timber industry which occurs about every ten years, the U.S. Forest Service also conducts periodic surveys on special segments of the wood industry. In the northeastern region of the United States, which includes West Virginia, pulpwood production is surveyed annually and the veneer industry is canvassed about every four years. Updated information is available on these industries as late as 1982 and 1980 respectively. With the addition of these supplementary surveys, trends in these industries can be more easily distinguished.

From 1974 to 1979, the total industrial roundwood harvest in West Virginia dropped 17.5 million cubic feet, a 16 percent drop in the state's total timber output. Furthermore, the timber harvest in West Virginia decreased 32 percent

¹All 1979 harvest volumes and statistics were reported in Nevel, Robert L., Jr., and Edward Murriner, 1981. *West Virginia Timber Industries—A Periodic Assessment of Timber Output*. Unpublished File Report, USDA Forest Service, Northeast Forest Experiment Station, Forest Inventory and Analysis Unit, Broomall, Pa. Special acknowledgment is hereby given to the authors. Reference is to Nevel & Murriner unless otherwise noted.

between 1965 and 1979, despite a 16 percent increase in the state's timber supplies during the same period.

The declines in harvest volumes occurred in both the hardwood and softwood timber types. From 1965 to 1979, hardwood removals decreased 31 percent, while softwood harvests declined 44 percent (Table 2).

The drop in roundwood harvests in West Virginia is reflected in production levels of the state's two major timber products—sawlogs and pulpwood. In 1979, sawlog production was down 9.8 percent from the 1974 harvest and since 1965 it has dropped a total of 23 percent. Similarly, the 1979 pulpwood harvest was 41 percent lower than 1974 levels and 60 percent less than the 1965 harvest (Table 3).

Annual assessments of pulpwood production after 1979 indicate that the downward trend has reversed. A 150 percent increase occurred in 1980; and by 1982 pulpwood production had risen to an all-time high of 457 thousand standard cords² [16].

In addition to the declines in the sawlog and pulpwood harvests during the late 1970s, the volume of timber cut for miscellaneous products such as cooperage, cabin logs, handles, wedges, and dimension bolts also declined substantially in 1979. More timber was cut in 1979 as compared to 1974 for only three minor products—veneer logs, mine timbers, and fencing. The harvest of veneer logs increased nearly 300 percent over 1974 volumes, while 13 percent more timber was cut for use as mine timbers. The production of fence materials increased about 42 percent over the same period.

The declining timber harvests in West Virginia have not been limited to any one geographic unit. All three geographic units in the state registered declines in timber removals in 1979 (Table 4).

Table 2

Harvest volumes from West Virginia by timber type
for selected years, 1965, 1974, 1979

	1965	1974	1979	% Change	% Change	% Change
	(million cubic feet)			'65-74	'74-79	'65-79
Hardwoods	118.8	95.0	81.8	-20.0	-13.8	-31.1
Softwoods	13.2	11.6	7.4	-12.1	-36.2	-43.9
All Species	132.0	106.6	89.2	-19.2	-16.3	-32.4

Source: [11].

²Standard cord—see definition of terms.

Table 3

Trends in sawlog and pulpwood production in West Virginia,
1965-1979

	1965 (million cubic feet)	1974	1979	% Change '65-74	% Change '74-79	% Change '65-79
Sawlogs	84.5	72.2	65.1	-14.5	-9.8	-22.9
Pulpwood	27.1	18.2	10.7	-32.8	-41.2	-60.5
Total Harvest	132.0	106.6	89.2	-19.2	-16.4	-32.5

Source: [11].

Table 4

Timber harvest in West Virginia by geographic unit,
1974 and 1979

Geographic Unit	1974 (million cubic feet)	1979	% Change
Northeastern	47.1	40.9	-13
Southern	41.7	35.2	-16
Northwestern	17.8	13.1	-26
Totals	106.6	89.2	-16

Source: [11].

THE SAWLOG HARVEST IN WEST VIRGINIA, 1979

The sawlog harvest from West Virginia timberlands in 1979 was 417.3 million board feet (MMBF). Hardwoods made up 399.3 MMBF (96 percent) of the harvest, while softwoods accounted for only 4 percent. The 1979 sawlog harvest was 9.8 percent less than the 1974 harvest and 22.9 percent less than in 1965.

Oaks were the predominant species cut for sawlogs in 1979, comprising 56 percent of the hardwood sawlogs and 54 percent of the total roundwood removals that year. Red oaks accounted for 35 percent of all sawlog volume and white oaks for 19 percent. Yellow-poplar accounted for 16 percent of all sawlog

volume in 1979. Other important species removed for sawlogs that year were hickory, sugar maple, red maple, and black cherry. Hemlock and white pine were the most important softwoods harvested. (See Appendix Table A3 and Figure 2.)

In 1979, the northeastern unit led the state in sawlog production with 187.6 million board feet. This was in contrast to the 1965 and 1974 surveys which showed that the southern unit had been the state's leading sawlog producer. In 1979, the southern unit harvested only 168.7 MMBF of sawlogs, about 11 percent less than the northeast's output. The southern unit's loss of status was a reflection of a 26 percent drop in its sawlog output since 1965.

Percentage-wise, the northwestern unit's sawlog harvest was no better than the southern unit's output—dropping 22 percent from 1974 levels and falling below its 1965 harvest level. In 1979, the northwestern unit produced only 61 million board feet of sawlogs.

When combined, the northeastern and the southern units accounted for 85 percent of the 1979 sawlog harvest and helped to minimize the effect of declining sawlog production in the northwestern unit. The substantial decrease in the southern unit's sawlog output accounted for most of the drop in the state's sawlog harvest in recent years.

West Virginia was a net exporter of sawlogs in 1979, shipping 53.5 million board feet of sawtimber to other states. More than 50 percent of the exported logs went to Pennsylvania and 25 percent to Virginia, with Maryland and Ohio the other major importers.

West Virginia imported 5.2 million board feet of sawlogs in 1979—mostly oaks and yellow-poplar from Virginia and Pennsylvania. After deducting

Figure 2. Sawlog production by species in percent, West Virginia, 1979.

Source: [11].

imports, the adjusted balance of sawlog exports totaled 48.3 million board feet, giving West Virginia net sawlog receipts³ amounting to 369 million board feet in 1979. (See Appendix Tables A3 and A4.) Net sawlog receipts in 1979 were down 18 percent from 1974.

THE PULPWOOD HARVEST

Although no pulp mills have operated in West Virginia since the 1930s, large mills in neighboring states rely heavily on West Virginia pulpwood in their manufacturing processes. Thus the production of pulpwood remains an important aspect of the state's timber industry. In 1979, pulpwood production made up 12 percent of the state's timber harvest. All of the state's production is exported.

Most of West Virginia's pulpwood is shipped to Westvaco Corporation's pulp and paper mills at Luke, Maryland and Covington, Virginia. Much of the remaining pulpwood goes to mills in Ohio, Pennsylvania, and elsewhere in Virginia. At Westvaco's Luke mill, pulpwood is chipped at the firm's log yard in Piedmont, West Virginia, and blown through a large tube across the Potomac River to the pulp mill in Maryland. With major paper operations located so close to its borders, West Virginia has been, for quite some time, the leading exporter of pulpwood in the northeastern United States.⁴

Pulpwood comes from two sources: (1) harvesting roundwood, and (2) woodchips made from manufacturing residue. In 1982, West Virginia's total pulpwood production amounted to a record volume of 457,600 standard cords (38.89 million cubic feet). Of that total, 271.5 thousand cords came from roundwood harvests, accounting for 59 percent of total pulpwood production. The production of chipped manufacturing residues, meanwhile, reached a near record level of 186.1 thousand cord equivalents and contributed 41 percent of the state's total pulpwood production in 1982 (Figure 3) [16].

In 1983, total pulpwood production from all sources in West Virginia declined 15 percent to 389,400 cords. Pulpwood production from roundwood amounted to 246,600 standard cords, while chip production from manufacturing residues contributed 142,800 standard-cord equivalents.

Little change has occurred in the pulpwood species mix over the last 15 years. Hardwoods were still the major source of pulpwood in 1982, accounting for 88 percent of total pulpwood production. Oaks and hickories were the major hardwood species harvested for pulpwood in 1982 and accounted for 52 percent of the round pulpwood harvest. In addition, 98 percent of the chipped manufacturing residues were also hardwoods. Softwoods comprised 12 percent

³Receipts—see definition of terms.

⁴Northeastern U.S.—see definition of terms.

of the pulpwood production in 1982, with pine accounting for almost all of the softwood harvested for pulp. Some hemlock was also harvested, but was of little significance (Figure 4) [16].

Figure 3. Pulpwood production in West Virginia by source, 1965–1983.

Figure 4. West Virginia pulpwood production by source and species, 1982.

Greenbrier County, with 97.1 thousand cords of pulpwood harvested in 1982, has led the state in pulpwood production since the mid-1970s. Other major pulpwood-producing counties in 1982 were Hampshire and Hardy, where 30.2 thousand cords and 21.2 thousand cords were harvested, respectively [16]. (See Figure 5.)

In 1981, Greenbrier County also had the highest cubic-foot pulpwood harvest per acre of commercial forest land. Grant, Morgan, and Wood counties also had a high degree of pulpwood harvest intensity⁵ [18].

Figure 5. Geographic pattern of pulpwood production from roundwood, by county, West Virginia, 1981.

Source: [11].

⁵It is important to note that the harvest intensity map (Figure 5a) on page 10 shows only the volume of roundwood cut per acre of commercial forest land and does not indicate whether or not a county is being cut too intensively. The degree of intensity or level of pulpwood harvests in a county is generally closely related to the location of pulp mills in the area.

Figure 5a. Intensity of the pulpwood harvest from roundwood, by county, West Virginia, 1981.

Source: [11].

OTHER TIMBER PRODUCTS AND INDUSTRIES

In 1979 about 15 percent of the state's timber harvest was used in the manufacture of veneer logs, mine timbers, and fencing. Lesser volumes were cut into cooperage and cabin logs, poles, dimension bolts, and stock for handles and wedges. The periodic surveys of West Virginia's timber industries do not, however, always canvass the use of other timber resources which have been emerging as small, but nonetheless, important aspects of the state's timber harvest. Among these new enterprises are Christmas tree production and the firewood industry.

THE VENEER HARVEST

In 1979, prior to the nationwide recession of 1981-82, the production and receipts of veneer logs in West Virginia were at or near record levels, three to five times greater than in 1974. That same year, production of veneer logs in the state reached an all-time high—over 8.5 million board feet. Receipts also hit record volumes in 1979 with West Virginia's three veneer mills receiving and manufacturing 23 million board feet of high quality logs.

Figures from 1980 almost duplicated the records of 1979, but production was down slightly to 7.5 million board feet. Veneer receipts, however, increased to 23.4 million board feet, setting a record for the second consecutive year [8]. Receipts in 1979 and 1980 were 539 percent greater than 1974 levels and 266 percent greater than the previous record year of 1968, when six veneer mills operated in the state. (See Table 5.)

Even though West Virginia exports some veneer logs, the state has historically been a net importer of veneer material. In 1980, West Virginia's veneer harvest accounted for only 21 percent of its receipts, while 79 percent was imported [8]. In 1979, loggers in Pennsylvania supplied 40 percent of all veneer logs imported by West Virginia. Virginia and Maryland each supplied about 20 percent and 10 percent came from New York. Nearly 90 percent of the imported veneer logs in 1979 were oaks; the remainder consisted mostly of ash, black cherry and elm [11].

Veneer log exports in 1980 were up 37 percent from the previous year, but with the demand for these logs so high in West Virginia, exports amounted to only 2.6 million board feet or 35 percent of the 1980 harvest [8]. This was quite

Table 5
Veneer log production and receipts, and number of
operating plants in West Virginia,
1963-1980

Year	No. of Plants	Production —MMBF—	Receipts
1963	5	7.0	6.3
1965	6	4.6	6.4
1968	6	7.9	8.7
1972	4	4.3	6.1
1974	4	3.2	4.3
1976	3	3.6	3.9
1979	3	8.5	23.0
1980	3	7.5	23.4

MMBF: millions of board feet.

Source: adapted from [11].

in contrast to the late 1960s and early 1970s when a much higher percentage of annual production was exported (Appendix Table A5), mostly to Virginia and Pennsylvania.

The species mix comprising the veneer harvest has changed considerably in the past 15 years (Figure 6). Changing consumer preferences, decline of the container veneer industry which used large volumes of yellow-poplar, and the availability of suitable high quality logs are the major causes behind the changes in this species composition.

In 1963, 69 percent of West Virginia’s veneer logs came from yellow-poplar, 10 percent from red oaks, and 9 percent from black walnut. By 1979, red oak accounted for 57 percent of the total veneer harvest and white oak comprised 26 percent. Together, oaks accounted for 83 percent of the 1979 veneer harvest. Hickory, yellow-poplar, and ash each totaled about 4 percent.

Although the 1979 and 1980 veneer harvests were impressive, it will not be clear how the nationwide recession of 1981–82 has affected the state’s veneer industry until production figures are collected from the post-recession period.

Figure 6. Percent of total veneer log harvest by species, West Virginia, 1963, 1974, 1979.

Source: [11].

MINE TIMBERS

Production of mine timbers in West Virginia closely parallels the economic cycles of the underground coal mining industry in the state. In 1969, when coal production was high, approximately 11 million cubic feet of wood was manufactured into mine timbers. But in 1974 only 6.7 million cubic feet of mine timbers were produced. In 1979, following an increase in coal production and an increased concern for mine safety, the production of mine timbers rose 13 percent over 1974 levels to 7.6 million cubic feet (Table 6). Hardwoods are most commonly used in mine timber production because of their strength and durability; softwoods accounted for less than 8 percent of mine timber production in 1979.

Table 6
Mine timber production in West Virginia,
1965, 1974, 1979

Year	1965	1974	1979
	—million cubic feet—		
Softwoods	.9	.5	.6
Hardwoods	10.1	6.2	7.0
Total Output	11.0	6.7	7.6

Source: [11].

COOPERAGE LOGS

Cooperage logs and bolts are used to make two types of wooden barrels; tight cooperage and slack cooperage. Tight cooperage is used to hold liquids; slack cooperage holds dry materials. Large, high quality white oak sawtimber is required to produce the clear, defect-free staves that are needed for tight cooperage. In West Virginia, tight cooperage for bourbon barrels was an important use of white oak for many years but has declined recently due to a drop in the demand for barrels. With changes in both product demand and the availability of high quality white oak, cooperage production in West Virginia fell from a high of 6.7 million board feet in 1949 to a low of 1.0 million board feet in 1979 (Table 7).

There were only three cooperage mills in West Virginia in 1979 and they utilized less than 2/10 of 1 percent of the state's total harvest that year. By 1984, there was only one cooperage stove mill operating in the state.

Table 7
Cooperage production in West Virginia
for selected years, 1949-1979

Year	Production —million board feet—
1949	6.7
1952	3.2
1960	1.5
1965	4.4
1974	3.2
1979	1.0

Source: [11].

RUSTIC FENCING

Rustic two- and three-rail fences have become popular with suburban home and estate owners during the last two decades, and West Virginia has capitalized on this increased demand. Between 1965 and 1979 the number of fence posts and rails produced in the state has risen more than four times and in 1979 more than 3 million pieces of rustic fence material were produced in West Virginia (Table 8).

While farmers and other rural residents still cut many rustic fence posts during slack periods and sawmills produce many of the rails, the industry has progressed to include several modern high-production mills which market a complete line of fencing materials.

Table 8
Production of rustic fence material in West Virginia,
1965, 1974, 1979

Year	Softwoods		Hardwoods		Total	% Change
	Posts	Rails	Posts	Rails		
	—thousand pieces—					
1965	8	0	238	477	723	
1974	89	912	582	577	2160	+199
1979	23	1167	874	1012	3076	+42

Source: adapted from [11].

Traditionally, most of the rustic fencing produced in West Virginia has been from hardwoods. In 1979, most posts were still made from hardwoods, while slightly more than half of the rails came from softwoods. Because of their form and durability, black locust, yellow-poplar, and sassafras were the most widely used hardwood species, while red spruce and hemlock were the most commonly used softwoods.

Rustic fencing has become the second most important minor timber product manufactured in West Virginia, accounting for 30 percent of all timber volume harvested for use in miscellaneous timber products in 1979. In addition, most of this comes from trees less than 12 inches dbh, and therefore subtracts little from the state's growing stock inventory.

MANUFACTURING RESIDUE

In 1979, more than 35 million cubic feet of wood residues were generated by primary wood manufacturers throughout the state. The residues consisted of mill waste such as slabs and edging, veneer cores, bark, sawdust, and shavings. Over the last few decades, manufacturing residues⁶ have become a major source of inexpensive material for wood pulp mills, charcoal producers, fuelwood consumers, and other industrial facilities. Such usage has replaced traditional disposal methods, such as dumping and open burning.

In 1979, nearly 27 million cubic feet, or 75 percent of all residues were recovered and utilized in various industries. Fifty-two percent of the wood manufacturing residue produced in West Virginia was bought and converted into fiber by the pulp and paper industry.

Fuel was the second greatest use of residues, accounting for 16 percent of all residues produced. Charcoal manufacturing used 9 percent of the residues, while 1 percent was used as livestock bedding and mulch. Twenty-two percent

⁶Manufacturing residues—see definition of terms.

of wood residues had to be disposed of by other means in 1979 (Figure 7). Ninety percent of the coarse residues, such as veneer cores, slabs, and edgings, was utilized, mostly by the pulp and paper industry. In addition, nearly 60 percent of the fine residue, such as sawdust and shavings, was recovered and used for pulp, fuelwood, or in charcoal production.

A comparison of 1979 manufacturing residue utilization levels and the levels of residue use in 1965 and 1974 shows:

- A greater percentage of the wood residues were used in 1979 (78%) than in 1974 (76%) and 1965 (51%).
- More wood residue was used for fuel in 1979 (16%) than in 1974 (12%), but less than in 1965 (23%).
- A substantially greater percentage of wood residues were utilized as pulpwood in 1979 (52%) and 1974 (47%) than in 1965 (21%)

These statistics show that primary wood manufacturing residues have increased in value and utility over time, and that West Virginia's primary manufacturers have become more efficient in utilizing surplus wood residue.

Figure 7. Trends in wood manufacturing-residue use in West Virginia, 1965, 1974, 1979.

Source: [11].

CHRISTMAS TREE PRODUCTION

Most Christmas tree production in West Virginia comes from established plantations which are not considered as commercial forest land and therefore are not included in the state's forest inventory. However, the Christmas tree industry has become an important economic segment among the state's small forest industries, generating \$1,733,000 in sales in 1984 [6].

In 1984, approximately 171 Christmas tree growers in West Virginia harvested and sold an estimated 115,873 trees, down 17 percent from the record year of 1983, when 139,611 trees were sold for \$1,967,066 [6]. (See Table 9.)

White pine was West Virginia's most popular species of Christmas tree in 1984, representing 34.3 percent of all trees sold. Scotch pine was nearly as important, accounting for 34.2 percent of tree sales. Douglas-fir and Fraser fir were next, with 19.0 percent of the market, while Norway spruce and miscellaneous species comprised the remaining Christmas tree sales in 1984 (Figure 8) [6].

Of the 1983 harvest, approximately 70 percent was marketed in-state and 30 percent sold out-of state. In 1985, West Virginia growers expected to market 122,000 trees and to plant an additional 400,000 trees [6].

Estimates of Christmas tree production through 1988 can be projected from the number of trees planted in recent years. Growers expect to increase Christmas tree production more than 100 percent by 1988 [6].

Figure 8. Christmas tree species marketed by West Virginia growers, in percent, 1984.

Source: [6].

Table 9
Christmas tree sales and number of growers in West Virginia,
1973-1984

Year	No. of Trees	No. of Growers
	—thousands—	
1973	126.2	238
1974	88.8	191
1975	86.8	164
1976	103.2	168
1977	95.6	175
1978	126.9	153
1979	110.1	162
1980	119.9	164
1981	119.0	180
1982	128.8	163
1983	139.6	171
1984	115.9	171

Source: [6].

Figure 9. Total fuelwood consumption estimates, West Virginia 1961-1981.

Source: [13].

FUELWOOD PRODUCTION

Over the past decade, fuelwood has been gaining in importance as a source of energy. This has been largely due to the increasing cost of alternative heating fuels since the Arab oil embargo of 1973. Since West Virginia is more than 80 percent forested and has ample supplies of fuelwood readily available and accessible, West Virginians have been increasing their consumption of woodfuel in both the industrial and residential sectors.

Fuelwood production figures for West Virginia are not available because the production of most round fuelwood is done on a part-time basis by many individuals and firms and is impossible to canvass. Total removals in terms of growing stock are equally difficult to document since most round fuelwood is cut from cull or otherwise unmerchantable trees or from trees that are less than 5 inches dbh. Therefore, consumption data is used as an estimate for total fuelwood production (Figure 9).

It can be assumed that West Virginia's production of fuelwood closely parallels its consumption, since timber suitable for fuelwood is so readily available in the state. Between 1975 and 1981, fuelwood consumption in the state increased by approximately 109 percent. Wood for fuel is a significant use of timber—the 1981 estimated consumption level, 874,000 cords, was almost twice as much as West Virginia's total 1982 pulpwood production from both roundwood and mill residues. It is estimated that by 1988 residential fuelwood consumption alone will reach 974,980 cords and top 1.1 million cords by 1992 [1].

THE ECONOMIC IMPORTANCE OF THE TIMBER HARVEST IN WEST VIRGINIA

Annual timber harvests in West Virginia represent a substantial financial return to forest land owners who decide to sell their timber. In 1979, West Virginia woodland owners received an estimated \$39.68 million from the sale of timber stumpage.⁷ Compared with other agricultural crops, the timber harvest in West Virginia ranked as the state's third largest cash crop in 1979, generating almost as much income to landowners as dairy products brought to farmers, which was surpassed in value only by the beef cattle industry (Table 10). In comparison, cash receipts from all other agricultural crops, excluding livestock and animal products, totaled only \$61.7 million in 1979 [15].

The largest and most valuable component of the 1979 timber harvest was the sawtimber segment. Sawmills and other buyers of sawtimber stumpage paid an estimated \$30.9 million to forest land owners. The income from sawtimber sales accounted for 78 percent of the 1979 timber harvest's total estimated value

⁷Timber stumpage—see definition of terms.

(Table 11). The sale of timber for veneer logs and mine timbers also brought woodland owners considerable revenue but represented a much smaller percentage of the timber harvest's total value. Estimates of stumpage value were made for all segments of the timber harvest except miscellaneous wood products because of the relatively small volume of timber harvested for that purpose. Additionally, the estimated stumpage value for fuelwood was not included in the total harvest value because the woodfuel from manufacturing residue was already represented by some other harvest segment. Also, much of the fuelwood was consumed domestically without being sold and therefore did not generate cash receipts.⁸

The manufacture of primary and secondary wood products in West Virginia also generates jobs, income, and added value in the state. In 1977, 7,450 employees, or about 6.4 percent of the state's manufacturing labor force, was employed in wood-using industries (Appendix Table A6). They were paid more than \$58.5 million in wages and salaries—3.6 percent of all manufacturing wages paid in the state that year. West Virginia's wood industries also accounted for roughly \$130 million in value added by manufacture [12].

Primary wood products manufacture is the largest segment of the state's current forest industry. It includes logging contractors, sawmills, planing mills, and establishments which manufacture millwork, veneer, and structural wood members. These industries cut, transport, saw, slice, or otherwise prepare roundwood products for further manufacture or use. In 1977, this segment of the wood products industry employed 54 percent of all wood industry employees and 3.4 percent of all manufacturing employees statewide. These primary industries paid \$30.6 million in wages and salaries and added \$67.3 million in product value through the manufacture of raw wood material, converting it mostly into lumber [12].

The secondary wood products sector includes wood container manufacturers, wood preserving plants, wood furniture makers, paper product manufacturers, and other miscellaneous wood product firms. In 1977, this segment employed 46 percent of wood-using industry employees and paid \$27.9 million in wages. Despite the relatively small number of establishments in this segment, it is almost as important as the primary wood products segment in terms of value—adding 66.2 million to the value of the wood products through manufacture [12].

Included in the secondary wood products industry is paper and allied products. Although West Virginia has no paper mills, the state does manufacture secondary paper products such as paperboard, bags, and cardboard boxes. The manufacture of paper and allied products accounted for \$35.5 million in value added in 1977 while employing 1,600 people and paying \$15.6 million in wages and salaries [12].

While the relatively small secondary wood products segment contributes

⁸The value for fuelwood consumed in 1979 is \$2,531,620—based on the estimated stumpage price for pulpwood.

much to the state's wood industry, it could be larger and contribute more to the economy of the state. Most of the lumber and wood products are shipped out-of-state after primary conversion to be manufactured into finished products elsewhere. Many millions of dollars in value added, and hundreds of jobs are lost in West Virginia by not manufacturing more finished wood products in the state. The lack of a larger and more diversified secondary lumber and wood products sector continues to keep West Virginia from realizing a greater return from its timber harvesting activities.

Table 10
Relative ranking of West Virginia's cash crops, 1979

Product	Estimated Value
Cattle and Calves	\$68,218,000
Dairy Products	\$40,489,000
Timber Harvest	\$39,688,000
Apples	\$36,163,000
Eggs	\$ 9,949,000
Peaches	\$ 3,998,000
Hay	\$ 3,245,000
Tobacco	\$ 2,774,000
Corn	\$ 2,033,000

Source: adapted from [15].

Table 11
Estimated stumpage value of the timber harvest
in West Virginia, 1979

Product	Volume Harvested (millions of cu.ft.)	% of Harvest	Estimated Value (1979 dollars)
Sawlogs	65.1	73	30,893,019
Pulp wood	10.7	12	583,214
Veneer Logs	1.3	1	4,670,750
Mine Timbers	7.6	8	1,993,965
Fencing	4.1	5	276,000
Cooperage	*	*	200,000
Micellaneous	.5	1	*
Christmas Trees	*	*	1,071,200
Total	89.2	100	39,688,149

*Data not available or represents an insignificant volume.

TIMBER HARVEST SUMMARY

West Virginia's timber producers harvested and sold more than 89.3 million cubic feet of roundwood from the state's forest lands in 1979 for \$39.7 million. The sawlog segment, which accounted for 73 percent of the total harvest, also accounted for 78 percent of the timber-related landowner income. However, the 1979 sawtimber harvest was almost 10 percent less than the harvest in 1974 and 23 percent less than 1965.

The pulpwood harvest, which accounted for 12 percent of the 1979 harvest, also declined throughout the 1970s, dropping more than 60 percent between 1965 and 1979. However, it had a dramatic turnaround beginning in 1980, and by 1982, a record pulpwood production level of 457 thousand cords was achieved.

West Virginia's veneer and rustic fencing industries also have shown substantial gains. In 1979, the veneer harvest reached a record 8.5 million board feet and veneer mill receipts were more than five times greater than in 1974. Rustic fencing production in West Virginia has been growing since 1965, and by 1979 showed an increase in fence posts and rail production of more than four times.

But these gains have come in relatively small segments of West Virginia's timber industries and account for only a small percentage of the state's total harvest. Overall, West Virginia's timber harvest activity has declined over most of the last two decades. The 1979 timber harvest was 16 percent lower than in 1974 and 32 percent less than in 1965, despite substantial growth in West Virginia's forest inventory.

DISCUSSION

Why has West Virginia's expanding timber resource not been more fully utilized? The basic explanation is that the state's wood products industry is dominated by the primary manufacture of lumber, and that hardwood lumber producers have faced tough economic and market conditions in the past two decades. During the late 1960s and through the 1970s, falling timber harvest and utilization levels in the state have been partly due to changes in relative production costs and consumer preferences which have hurt hardwood lumber products in general. Non-wood materials, most notably metals and plastics, are cheaper, consumer-accepted substitutes for traditional hardwood materials in such products as furniture, doors, windows and frames, casings, etc. With the increased popularity of wall-to-wall carpeting, the hardwood flooring market has almost disappeared. Even other wood products were outcompeting hardwood lumber; for instance, low-cost furniture made with wood veneer or woodgrain-printed paperboard, or plastic over plywood or particleboard core material, has been accepted by consumers as a substitute for solid wood furniture. Similar substitutes for solid hardwood paneling have also been accepted.

As a result of these market factors, total U.S. hardwood lumber production declined almost 3 percent (from 7.5 to 7.3 billion board feet) between 1965 and 1979. In the same period, U.S. hardwood lumber consumption dropped from 7.7 to 7.3 billion board feet, or about 5 percent [14]. But these figures are small when compared with the declines experienced in West Virginia's hardwood sawlog harvest and sawmill receipts. The state's sawlog harvest declined 23 percent between 1965 and 1979 (Table 3), while net sawlog receipts dropped 18 percent between 1974 and 1979 (net receipts figures for 1965 are not available). Clearly, the state's lumber industry fared worse than the total hardwood lumber market during this period. Apparently, factors beyond general market trends were hurting the performance of West Virginia's hardwood-based industries.

In addition to the general market factors just discussed, the recent decline in the state's lumber industry was probably made more severe by (1) the lack of a strong marketing program designed to promote the state's wood products, and (2) a weak secondary wood-using industry within the state.

Traditionally, several agencies including the West Virginia Department of Agriculture's Division of Forestry,⁹ the West Virginia University Cooperative Extension Service, and the U.S. Forest Service's Forestry Science Laboratory at Princeton, W. Va. have engaged in wood products marketing efforts, but these efforts have generally been low-key. More recently, the Governor's Office of Community and Industrial Development has shown an interest in forest products marketing, but its efforts have not yet had time to yield significant results. Private wood industry firms, of course, promoted their individual product lines, but have not organized an industry-wide marketing effort of any kind. Because of this weak and uncoordinated marketing situation, West Virginia has lost opportunities to expand its wood product sales to existing markets, to develop new markets, and to attract new wood product enterprises [19].

According to the 1984 directory of West Virginia's Forest Industry, there are 140 secondary wood manufacturing establishments operating within the state, the majority of which are relatively small enterprises. This illustrates the low level of secondary wood products manufacturing activity in the state, which further limits the opportunity to market primary wood products. A larger, more diversified secondary wood-using industry would stimulate primary wood processing activity by offering an in-state market, low transportation costs, quick deliveries, etc.

Finally, higher levels of wood products production are hindered by the structure of West Virginia's wood industry. The industry is structured primarily to use large, high quality hardwoods—not the relatively abundant, small size, low quality timber which comprises a large part of the state's forest inventory. The large-scale utilization of small size, low quality timber would require the establishment of mills specifically designed to use such timber to

⁹Formerly in the West Virginia Department of Natural Resources.

make profitably marketable products. The production technologies do exist and active effort to attract such enterprises would promise several benefits, such as new employment opportunities, larger incomes to timberland owners, growth in the state's economy, and long-run improvement in the quality and utility of the state's timber inventory [19].

Further insight into the state's forest economy and its growth potential can be gained through a comprehensive analysis of the composition and structure of the state's wood-based industry, and by analyzing market trends and prospects for hardwood timber products. These analyses will be forthcoming in future volumes of the West Virginia Forest Development Series.

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APPENDIX A

Tables

- A-1 West Virginia timber harvest by product, 1979.
- A-2 Industrial timber harvest by product and geographic unit, West Virginia, 1979.
- A-3 Sawlog production and receipts by species and shipments, West Virginia, 1979.
- A-4 Sawlog production by type, unit, and destination of shipments, West Virginia, 1979.
- A-5 Veneer log exports and imports in West Virginia for selected years, 1963-1980.
- A-6 Economic statistics for West Virginia's wood products industries, 1977.

Table A-1

West Virginia Timber Harvest by Product, 1979

Product	Total Harvest	Hardwood Volume (in million cubic feet)	Softwood Volume	Percent of Total Harvest	Percent of Hardwoods	Percent of Softwoods
Sawlogs	65.1	62.0	3.0	72.9	95.4	4.6
Pulpwood	10.7	8.2	2.5	12.0	76.3	23.7
Veneer Logs	1.3	1.3	0.0	1.5	100.0	0.0
Cooperage Logs	0.2	0.2	0.0	0.2	100.0	0.0
Mine Timbers	7.6	7.0	0.6	8.5	92.0	8.0
Fencing *	4.1	2.8	1.3	4.6	68.5	31.5
Misc. products**	0.3	0.3	0.0	0.4	98.8	1.3
Total	89.3	81.8	7.5	100.0	91.6	8.4

Source [11].

*includes posts and rails.

**includes cabin logs, dimension bolts, poles, and handle stock.

Table A-2

Industrial timber harvest by product and geographic unit, West Virginia, 1979

Geographic Unit and Species Group	Sawlogs	Pulpwood in thousands of cubic feet	Other Products	All Products
Northeastern				
Softwoods	1,701	1,980	978	4,659
Hardwoods	27,571	3,978	4,703	36,252
Total	29,272	5,958	5,681	40,911
Southern				
Softwoods	1,002	187	703	1,892
Hardwoods	25,286	3,460	4,595	33,341
Total	26,288	3,647	5,298	35,233
Northwestern				
Softwoods	317	374	232	923
Hardwoods	9,185	748	2,273	12,206
Total	9,502	1,122	2,505	13,129
All Units				
Softwoods	3,020	2,541	1,913	7,474
Hardwoods	62,042	8,186	11,571	81,799
Total	65,062	10,727	13,484	89,273

Source: [11].

Table A-3

Sawlog production and receipts by species and shipments, West Virginia,
1979*

Species	Total Production	Retained in State	Exported	Imported	Total Receipts
Hemlock	4.3	4.3	0.0	**	4.3
White Pine	4.3	4.3	0.0	**	4.3
Yellow Pine	2.0	1.5	0.5	0.1	1.6
Other Pines	0.1	0.1	0.0	0.0	0.1
Spruce	2.5	2.5	0.0	0.1	2.6
Other Softwoods	4.9	1.6	3.3	0.0	1.6
Total Softwoods	18.1	14.3	3.8	0.2	14.5
Ash	5.7	4.7	1.0	0.3	5.0
Basswood	8.5	7.9	0.6	0.2	8.1
Birch	3.4	3.4	**	**	3.4
Black Cherry	9.3	8.9	0.4	0.1	9.0
Cucumber	1.8	1.8		**	1.8
Black Gum	3.9	3.6	0.3	**	3.6
Hickory	19.4	14.7	4.7	0.2	14.9
Red Maple	13.5	11.5	2.0	0.3	11.8
Sugar Maple	17.1	14.7	2.4	0.1	14.8
White Oak	39.7	35.3	4.4	0.8	36.1
Chestnut Oak	38.2	32.4	5.8	0.8	33.2
Red Oak	77.3	65.2	12.1	0.9	66.1
Other Oaks	69.4	62.3	7.1	0.2	62.5
Black Walnut	2.1	1.6	0.5	0.0	1.6
Yellow-Poplar	64.9	58.9	6.0	0.8	59.7
Other Hardwoods	10.9	10.1	0.8	0.2	10.3
Total Hardwoods	399.2	349.5	49.7	5.0	354.5
All Species	417.3	363.8	53.5	5.2	369.0

Source: [11].

*In millions of board feet,
International 1/4-inch log rule.

**Less than 50 Mbf.

Table A-4

Sawlog production by type, unit, and destination of shipments, West Virginia, 1979.

Species Group and Geographic Unit	Retained in Unit	Shipped to Other Unit	Shipped to Other State in million board feet	Total Production	Percent of Total
Softwoods					
Northwestern	8.2	**	2.0	10.2	56.4
Southern	4.2	**	1.8	6.0	33.2
Nothwestern	1.7	0.2	**	1.9	10.5
Total Softwoods	14.1	0.2	3.8	18.1	4.3
Hardwoods					
Northeastern	156.2	5.9	15.3	177.4	44.4
Southern	144.4	2.4	15.9	162.7	40.8
Northwestern	36.2	4.4	18.5	59.1	14.8
Total Hardwoods	336.8	12.7	49.7	399.2	95.7
All Species	350.9	12.9	53.5	417.3	100.0

Source: [11].

*International 1/4-inch log rule.

**Less than 50 MBf.

Table A-5

Veneer log exports and imports in West Virginia for selected years, 1953–1980

Year	Production (million board feet)*	Exports (million board feet)*	Percent of Production	Receipts** (million board feet*)	Imports (million board feet*)	Percent of Receipts
1963	7.0	4.5	64	6.3	3.8	60
1965	4.6	2.1	46	6.4	3.9	61
1968	7.9	5.1	65	8.7	5.9	68
1972	4.3	2.6	60	6.1	4.4	72
1974	3.2	2.6	81	4.3	3.7	86
1976	3.6	3.1	86	3.9	2.9	74
1979	8.5	1.9	22	23.0	16.4	71
1980	7.5	2.6	35	23.4	18.5	79

Source [11].

*International 1/4-inch rule.

**Total veneer logs received at West Virginia veneer mills—includes logs that remained within the state plus logs imported from out of the state.

Table A-6

Economic statistics for West Virginia's wood products industries, 1977.

S.I.C. Code	Industry	Number of Firms	Number of employees	Annual payroll (million of dollars)	Value added
241	Logging camps & contractors	177	700	5.7	10.3
242	Sawmills & planing mills	218	2600	19.2	42.2
243	Millwork, veneer, plywood & structural wood members	17	700	5.7	14.6
Total	primary industries	412	4000	30.6	67.3
244	Wood containers	20	500	3.5	6.4
249	Misc. wood products	30	750	NA	NA
2491	Wood preserving	10	500	4.6	12.1
251	Wood furniture	17	600	4.2	8.6
26	Paper & allied products	28	1600	15.6	35.5
Total	secondary industries	95 *	3450 *	27.9	62.6
Total,	wood products industries	507	7450	58.5	129.9

Source: [12].

NA—Not available.

*Does not include SIC code 2491.

APPENDIX B:

Definition of Terms

Coarse Residues—Manufacturing residues suitable for chipping, such as slabs, edgings, and veneer cores [11].

Fine Residues—Manufacturing residues not suitable for chipping, such as sawdust and shavings [11].

Hardwoods—Dicotyledonous trees, usually broad-leaved and deciduous; oaks, maples, and hickories, for example [2].

Manufacturing Plant Residues—Wood materials that are generated when round timber (roundwood) is converted into wood products; includes slabs, edgings, trimmings, miscuts, sawdust, bark, shavings, veneer cores and clippings, and screenings [11].

Miscellaneous Wood Products—Those products, which when combined, comprise only a small percentage of the total volume of wood products manufactured in a given year. These generally include cooperage, cabin logs, dimension bolts, handle stock, and wedges.

Northeastern U.S.—Includes Connecticut, Delaware, Kentucky, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, Rhode Island, Vermont, and West Virginia.

Pulpwood—Roundwood or plant by-products cut, chipped, and prepared for manufacture into woodpulp [11].

Receipts—Cut timber such as sawlogs, veneer bolts, or pulpwood, which is received by mills for conversion into timber products.

Roundwood Products—Logs, bolts, and other timber generated from harvesting trees for industrial or consumer uses [11].

Sawlog—A log that meets minimum standards of diameter, length, and defect, including logs at least 8 feet long, and with a minimum diameter inside bark of 6 inches for softwoods and 8 inches for hardwoods [2].

Softwoods—Coniferous trees, usually evergreens, having needles or scalelike leaves; spruce, pine, and hemlock for example [2].

Standard Cord—A unit of measure for stacked wood encompassing 128 cubic feet of wood, bark, and air space. Cord estimates can be derived from cubic-foot estimates by applying a factor of 85 cubic feet of solid wood per rough cord [9].

Timber Harvest—Total production of round timber for conversion into wood products [11].

Timber Stumpage—The value of marketable timber as it stands uncut in the woods; in a general sense, the standing timber itself.

Veneer—A thin layer of wood sliced from a veneer log, that is bonded to and used to cover a usually lower value material, such as plywood.

Veneer Log—A roundwood product from which veneer is sliced or sawn, that meets standards of diameter, length, and defect [8].

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