

Examination of regional hardwood roundwood markets in West Virginia

Delton Alderman*
William Luppold*

Abstract

West Virginia's large and diverse hardwood resource ranges from oak-hickory forests in the southern and northwestern regions of the state to northern hardwood stands in the northeastern region. West Virginia is home to a diverse group of primary hardwood processing industries including hardwood grade mills, industrial hardwood sawmills, engineered wood-product manufacturers, rustic-fence plants, face-veneer manufacturers, a hardwood plywood mill, and several roundwood and pulpwood concentration yards that supply mills in Ohio and Virginia. Each of these primary hardwood-processing industries has specific roundwood requirements with respect to species and quality resulting in a diverse set of roundwood markets. The diversity of West Virginia's roundwood markets were examined based on a detailed survey of 30 logging and associated roundwood merchandising operations. The harvesting operations surveyed merchandise roundwood to an average of four markets each. The production of sawlogs or peeler logs, however, appears to be driving these operations. Other roundwood markets appear less important or secondary but still influence the profitability of logging operations. Of the species harvested in West Virginia, yellow-poplar is the most versatile because of its use for sawlogs, peeler logs, and rustic fencing. Yellow-poplar also is utilized most often in the production of oriented strandboard.

West Virginia's large and diverse hardwood resource ranges from oak-hickory forests (that also contain larger quantities of yellow-poplar) to northern hardwood stands with significant amounts of hard maple and black cherry (DiGiovanni 1990). In the Central Appalachian region, there have been significant increases in both the demand for timber and the types of roundwood products used by the forest industry. Annual removal of growing stock in West Virginia's sawtimber increased by 90 percent between the 1976 to 1989 and 1989 to 2000 forest surveys (DiGiovanni 1990, USDA 2004). During the 1990s, large-capacity mills were located in West Virginia to manufacture oriented strandboard (OSB), engineered wood products (EWP), and laminated veneer lumber (LVL). Because of these mills, timber consumption in the state has increased, with a significant increase in the volume of smaller diameter and/or low-quality roundwood harvested to supply both existing pulp-mills and new EWP facilities. Pallet mills also are processing smaller diameter roundwood in addition to low-grade lumber and cants purchased from grade sawmills. Before the development of these new markets, most logging was conducted to supply sawmills that produced factory-grade lumber, while timber

harvesting generally concentrated on trees in the diameter classes of 15 inches or larger. Collectively, these expanding and new markets allow economically feasible harvesting of smaller diameter and/or low-grade timber (Hassler et al. 1999).

West Virginia also is home to a diverse group of primary hardwood-processing industries, including hardwood grade mills, industrial hardwood sawmills, EWP facilities, rustic-fence plants, face-veneer plants, a hardwood plywood veneer mill, veneer log yards that provide bolts to surrounding states, and several roundwood and pulpwood concentration yards that serve mills in Maryland, Ohio, and Virginia. Each of these industries has specific roundwood requirements with respect to

The authors are, respectively, Research Forest Products Technologist and Economist Project Leader, USDA Forest Service, Northeastern Research Station, Princeton, WV (dalderman@fs.fed.us and wluppold@fs.fed.us). This paper was received for publication in October 2004. Article No. 9953.

*Forest Products Society Member.

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species and quality¹. This large number of markets also creates opportunities for more efficient utilization of hardwood roundwood. However, the form and degree of roundwood product segmentation that is occurring in West Virginia or other hardwood-producing regions has been poorly documented.

Because there are few data linking regional roundwood markets to the types and intensity of timber harvests, it is not known how the ongoing changes will affect timber harvesting practices that in turn affect future utilization opportunities for forest products. In this study, the number and types of roundwood markets in West Virginia are examined and distances that roundwood are hauled to end users is reported. Data were obtained from a survey of 30 logging jobs that were active during 2001. The study objectives were to investigate regional roundwood markets in conjunction with broad market indicators and to discern the effects of regional roundwood markets on the type and intensity of timber harvests. The survey revealed information on the number and types of hardwood roundwood products merchandized at each site as well as the distance to market(s). Information on the factors that influence merchandising decisions also was obtained. To place this information in context, the composition of West Virginia's forests and primary forest products industry are discussed and data-collection procedures are described.

West Virginia's sawtimber resource

West Virginia contains three survey units or regions (**Fig. 1**) as defined by the USDA Forest Service's Forest Survey and Analysis (FIA) unit (DiGiovanni 1990). The northeastern region contains 40 percent of the state's sawtimber inventory followed by the southern and northwestern regions with 34 and 26 percent, respectively (**Table 1**). While yellow-poplar is the most common species in all three regions, the northeastern region has a higher proportion of currently high-value species: select red oak (primarily northern red oak), hard maple, and black cherry. Twenty-two percent of the sawtimber volume in the southern region is yellow-poplar, though this region also contains a high percentage of oak species. The northwestern region has higher proportions of select white oaks (primarily white) and other red oaks (primarily black, pin, and scarlet).

Another way to examine the forest resource is to discriminate sawtimber into hard (higher density) and soft (lower density) hardwood species (**Table 1**). Hard hardwood species include the oaks, hard maple, ashes, hickories, and elms. Soft hardwood species include yellow-poplar, soft maple, birch, basswood, the gums, and aspen. Pulp and paper manufacturers

Table 1. — Board foot and proportional volumes of sawtimber for the northwestern, southern, and northeastern survey units of West Virginia, 2000.^a

Species	Northeastern		Southern		Northwestern	
	MMBF ^b	%	MMBF	%	MMBF	%
Yellow-poplar	4,113	14.3	5,395	22.5	3,480	18.5
Select red oak	3,418	11.9	2,453	10.3	1,541	8.2
Other red oaks	1,392	4.9	2,168	9.1	2,012	10.7
Select white oak	2,051	7.2	2,025	8.5	2,862	15.2
Other white oaks	2,136	7.4	2,165	9.0	1,383	7.4
Hard maple	2,103	7.4	1,008	4.2	786	4.2
Soft maple	2,732	9.5	1,335	5.6	842	4.5
Hickory	1,236	4.3	1,425	6.0	1,318	7.0
Black cherry	1,827	6.4	310	1.3	559	3.0
Soft hardwood ^c	9,690	33.8	9,783	39.6	6,223	30.2
Hard hardwood ^d	13,007	45.4	11,735	49.0	10,743	57.2
Softwoods	2,333	8.1	994	4.2	751	4.0
All species	28,600		23,930		18,782	

^a Source: USDA Forest Serv. (2004).

^b MMBF is million board feet.

^c Includes yellow-poplar, soft maple, birch, beech, basswood, gums, and aspen.

^d Includes all oaks, hard maple, ash, hickories, and elms.

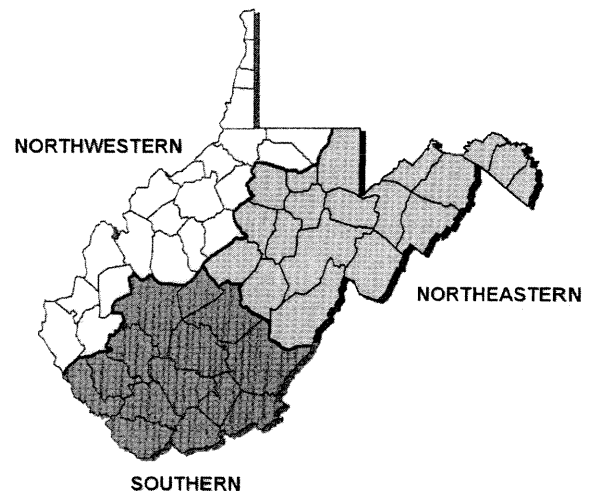


Figure 1. — FIA survey regions in West Virginia.

in the states that border West Virginia prefer hard hardwood species, while soft hardwood species are preferred by EWP and hardwood plywood manufacturers. In fact, the high volume of yellow-poplar in West Virginia is what attracted firms to build three EWP and one hardwood plywood peeling operation in the state during the 1990s.

Forest industry in West Virginia

Historically, hardwood sawmills have been the most important hardwood roundwood-consuming industries in West Virginia (**Table 2**); this remains true today, as evidenced by historical data and the trend toward larger (in production) sawmills and a decrease in the number of and production from smaller mills. In 1964, West Virginia tallied 505 sawmills, with 94 producing more than 1 million board feet (MMBF) per year (Kingsley and Dickson 1965). By 1976 this number was down to 365 sawmills, with 90 producing more than 1 MMBF per

¹ Luppold, W.G. and M.S. Bumgardner. Regional changes in the timber resource and sawmilling industry in Pennsylvania. In preparation.

year (Bones and Glover 1977). Widmann and Murriner (1987) reported 164 sawmills in 1986, 111 of these produced more than 1 MMBF/year. Today, the state has more than 160 sawmills, nearly half of which are in the northeastern region. In 2000, these mills produced a total of about 750 MMBF (West VA. Div. of For. 2001). Mills in the northeastern region are more numerous, southern region mills on average are larger with an average annual capacity exceeding 7 MMBF. The northwestern region has nearly the same number of mills as the southern region, but the average capacity of these mills is only 2.3 MMBF and total production in this region is only a third of that in the southern region. Hardwood mills also can be divided into larger mills that produce mostly lumber graded under the National Hardwood Lumber Association (2003) rules and smaller mills that produce mostly ungraded lumber and cants (Table 2).

Grade sawmills consume high-quality logs, but the highest quality logs are consumed by the face-veneer industry. In 2001, one slicing operation was located in the southern region and a second operation was located in the northwestern region. The logs consumed by this industry are usually sorted in log yards where buyers of veneer logs periodically assess them for veneer production².

There are two OSB mills, respectively, in the northeastern and southern regions (Table 2). These mills primarily consume lower quality soft hardwood and softwood roundwood, including tops and limbs. The northeastern region also has a LVL mill while the southern region has a rotary veneer mill (RVM) that produces poplar veneer core that serves a North Carolina hardwood plywood manufacturer. Both of these operations consume similar volumes of yellow-poplar peeler logs, which are relatively clear upper logs that can be used down to a small-end diameter of 8 inches. These mills are located in four contiguous counties: Upshur (LVL), Braxton (OSB), Nicholas (RVM), and Fayette (OSB). Our findings indicate that the procurement ranges of these mills extend 160 miles; at this distance, discrete mills can pull material from northwestern North Carolina, southwestern and central Virginia, northeastern Kentucky, eastern Ohio, western Maryland, and southwestern Pennsylvania. The OSB mills consume more than 900 tons/day, the RVM peeler plant uses 40 MMBF/year, and the LVL facility utilizes 43 MMBF/year. The hardwood face-veneer facility in the southern region uses rotary lathes to slice oak and basswood.

Most of the rustic-fence manufacturers in West Virginia are in the northeastern region. In addition to black locust, a hard hardwood, these businesses use smaller diameter yellow-poplar logs and other soft hardwood and softwood species for rails and posts. Although there are no pulpwood mills in the state, 10 pulpwood yards provide raw materials to mills in adjoining states. The northern regions have four yards each and the southern region has only two yards.

Data-collection procedures

Thirty harvesting sites were selected by a representative sample of primary wood-using mills in West Virginia. Since West Virginia is divided into three FIA regions, the decision to stratify the sample using these regional examples was made. To ensure that all of the products were represented accurately, the mill pop-

Table 2. — Number and approximate capacity of hardwood sawmills and other major consumers of hardwood roundwood, by region, 2000.^a

	Northeastern	Southern	Northwest
Sawmills (no.)	95	40	44
Sawmill capacity (MMBF)	352	294	102
OSB mills (no.)	1	1	0
SB mills capacity (MTons)	1,000	500	0
Peeler mills (no.) ^b	1	1	0
Peeler mill capacity (MMBF)	40	40	0
Face veneer mills (no.) ^c	0	1	1
Pulpwood yards (no.)	4	2	4
Rustic fence plants (no.)	15	1	2

^a Source: West Virginia Division of Forestry (2001).

^b LVL and plywood.

^c Neither face veneer operation was listed as a market for the harvest sites surveyed. In West Virginia, high-grade veneer logs tend to be mechanized by sawmills or log yards.

ulation was stratified by product and mill size. For each strata, mills were selected randomly by the probability proportional to size with replacement. This ensured that the largest mills were selected to obtain a viable list of suppliers (small and part-time mills may not have been operating and such mills do not purchase stumpage but obtain roundwood through gate wood purchases). Thus, of the 30 sites, 12 would be in the northeastern region, 10 in the southern region, and 8 in the northwestern region. The final sample differed slightly in that there were 13 observations in the northeastern region, 9 in the southern region, and 8 in the northwestern region. One segment of the survey pertained to the types of roundwood products, the markets for these products, and distance(s) to markets. Logging company characteristics included type of logging operation (contract, independent, or company), type of harvest, number of loads per day, and if a forester was involved in the harvest layout.

Logger profile

The logging crews participating in this study were primarily contract loggers (21), eight were independent, and one was a company logging crew. The average logging crew comprised 4.5 employees (range: three to eight). Seven of the 30 crews used manual bucking and the remainder used buck saws. The average number of loads hauled per day was 3.5 (range: two to eight) and 11 crews contracted material hauling.

Ninety-three percent of the study sites were on privately held land, of which 40 percent was owned by the forest industry, 17 percent by other types of private corporations, and 36 percent private individuals. Only 7 percent was publicly owned timberland. The average tract was 98 acres (range: 15 to 440) and the elevation ranged from 650 to 3,500 feet. Eleven of the survey plots were selection cuts that were marked by professional foresters; nine sites were diameter limit cuts. Clearcuts and logger's choice harvests accounted for three sites and seven sites were disparate harvest types.

Generally one would assume that contract loggers would abide by the objectives of their employer (timber purchaser or land owner) while independent contractors would have greater latitude in selling roundwood. Therefore, the average number of markets for independent loggers should be greater than the average number of markets for contract loggers. These expect-

² Wagner J.E., B. Smalley, and W.G. Luppold. Factors affecting the merchandising of hardwood logs in the Southern Tier of New York. In preparation.

tations were not apparent in the current study as each logger group averaged 3.9 roundwood markets. However, the current study focused on broad categories of roundwood and not the separation of sawlogs or other products into sub categories. Furthermore, the steep terrain in West Virginia limits the size of the log landing and effectively limits the number of log sorts that can take place. Much of the log sorting in West Virginia occurs at sawmills or log yards.

Roundwood merchandising in West Virginia

Hardwood sawlogs were the most common roundwood product merchandised by the surveyed operations (Table 3). In addition to the six markets listed, four additional minor markets were identified: alloy chips, softwood pulpwood, firewood, and logs for log houses. On average, the harvesting operations surveyed merchandized roundwood to about four markets (Table 3). All but two operations listed three or more roundwood markets and one operation listed six markets. Only one operation did not produce hardwood sawlogs as a primary product and at least one additional hardwood product. The lone sample site that produced a single product was a softwood pulpwood harvest.

Peeler logs were the second most common roundwood product merchandised. Nearly half of the operations that merchandised these logs also considered peelers as primary products. The high proportion of operations merchandising peeler logs reflects the relatively high price for this material, \$350 to \$400 per thousand board feet (MBF) (Doyle scale). A greater percentage of logging operations in the southern region merchandised peeler logs and two-thirds of the operations in this region considered peeler logs as a primary product. The LVL plant purchased peeler logs down to a 7-inch small-end diameter, while the hardwood plywood mill purchased logs down to a 10-inch small-end diameter. The northeastern region had the lowest percentage of peeler log merchandising, possibly because rustic fence manufacturers purchased yellow-poplar logs down to a 6-inch small-end diameter.

OSB was the third most common market for hardwood roundwood. This product requires a greater volume of roundwood material than peeler mills, but the relative value of OSB material is considerably lower. OSB appeared to be more important in the southern and northwestern regions than in the northeastern region.

Rustic fence material appeared important only in the northeastern region (Table 3). The fact that rustic fence manufacturers can use a portion of the logs that otherwise would be shipped to an OSB mill might account for the lower percentage of OSB roundwood merchandising in the northeastern region.

Pulpwood was merchandised by more than half of the operations but appeared more important in the northern regions than in the south. The lack of pulp markets in the southern region is partly the result of the rough terrain and lack of major highways in the western portion of this region.

Table 3. — Number and percentage of surveyed logging operations that merchandize logs to major roundwood markets, by region, 2000.

Item	Northeastern		Southern		Northwestern	
	Number	%	Number	%	Number	%
Sawlogs	13	100	9	100	7	88
Peeler logs for LVL and plywood	9	69	8	89	6	75
Reports that peelers also were a primary product	2	15	6	66	3	38
OSB	8	62	7	78	7	88
Pulpwood	7	54	4	44	5	63
Low-grade sawlogs	7	54	2	22	4	50
Rustic fence material	5	39	1	11	1	13
Average number of roundwood markets ^a	4.2		4.1		3.8	
Range in number of roundwood markets	2 to 5		3 to 5		1 to 6	

^a Includes additional markets for metallurgical chips, logs for log houses, and firewood.

Impact of market haul distance

Transportation economic theory normally stipulates that the greater the value of a commodity per unit weight, the greater the distance the commodity can travel to the end consumer (Bressler and King 1970). However, there are underlying aspects of the hardwood roundwood market that counter this assumption. Large sawmills are the primary users of higher value hardwood³. These mills are widely distributed in West Virginia and appear competitive in both input and output markets. Still, grade mills obtain sawlogs through a variety of channels, which includes ownership of standing timber, stumpage purchases on the open market, logs purchased from independent loggers, and logs procured from concentration yards. Mid- and low-grade sawlogs are usually processed by numerous smaller sawmills or rustic-fence manufacturers. By contrast, peeler mills, OSB plants, and pulp mills are less numerous (Table 2) and consume greater quantities of roundwood. Therefore, even though these larger users may consume lower value roundwood, their requirements (species, size, etc.) and locations imply that, on average, roundwood must be hauled a greater distance from harvest site to the mill.

Average haul distances to various roundwood markets are listed in Table 4. Since all but one of the logging operations sampled was associated with the production of sawlogs, the haul distance to the mill or distribution yard for sawlogs is a critical factor. In the three regions examined, the average distance to the primary sawlog delivery point ranged from 33 to 35 miles. This narrow range would be expected given the relatively even distribution of large and small sawmills throughout the state. However, there was considerable variation in the haul distances to other roundwood consumers.

Peeler logs were hauled 49 and 86 miles from the logging site to the mill. Roundwood directed to OSB manufacturers were hauled an average of 95 miles from the northwestern region as there are no OSB facilities in this region. The haul distance for pulpwood varied considerably by region possibly due to differences in topography and access to highways. The northwestern region is the least mountainous area of the state

³ Face veneer logs are the highest value form of hardwood roundwood. However, these logs are usually transported to a sawmill or mill yard before they are remerchandized to a log buyer.

Table 4. — Average haul distance to market, by region, 2000.

Product	Northeastern	Southern	Northwest
	----- (miles) -----		
Sawlogs	35	34	33
Peeler logs	48	86	77
OSB	43	56	95
Pulpwood	44	20 ^a	81
Rustic fencing	25	s ^b	s ^b

^a Excludes one logging site that sold pulpwood directly to trucker.

while the western portion of the southern region contains some of the steepest slopes in the eastern United States.

The greater distance that lower grade hardwood roundwood is shipped in West Virginia seems contradictory to the expectation of transportation economics in that the lowest value per unit weight products are being shipped the longest distance. Because of economies of scale in production, OSB and pulp mills must be large and therefore require a large procurement area. Furthermore, because these operations are the only markets for low-grade roundwood, they have limited influence on the price of roundwood. This pricing influencing behavior is demonstrated by OSB and pulp mills in West Virginia when loggers are provided premiums for long hauls if market conditions merit these premiums. These large users also may reduce or eliminate suppliers from distant areas when demand for OSB or pulp declines.

Concluding comments

This examination of how roundwood is merchandized in West Virginia demonstrates the complexity of hardwood roundwood markets in this state. Ten discrete markets were identified by examining logging harvesting operations: sawlogs, peeler logs, OSB roundwood, hardwood pulpwood, low-grade sawlogs, and rustic fencing material were cited most frequently as end-use destinations. On average, there were about four roundwood markets for each logging operation surveyed; the number of markets ranged from one to six.

Other than the average distance that sawlogs were hauled and the average number of roundwood markets per logging job, there were variations in procurement characteristics

among the three regions. However, because of the small sample size, it is impossible to determine if these variations were the result of regional variations in timber supplies, topography, and hardwood-consuming industries or can be attributed to statistical variation. Although 29 harvesting operations indicated that “higher grade” sawlogs were a primary product, most low-quality roundwood markets appeared secondary in nature. However, as time has progressed, revenues from these secondary markets have probably become integral in the long-term viability of logging operations in West Virginia.

One of the most interesting findings of this examination was the importance of yellow-poplar to a variety of industries in West Virginia. Total consumption of small-diameter yellow-poplar logs by LVL, hardwood plywood, and rustic fence industries exceeds 80 MMBF/year. OSB manufacturers also use lower grade yellow-poplar roundwood while sawmills process yellow-poplar butt logs. The multiple uses of yellow-poplar are unique because segments of an individual tree could be merchandized for three to five discrete roundwood users.

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