

Changing Markets for Hardwood Roundwood

by

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ABSTRACT

Traditionally, hardwood roundwood has been used to produce lumber, cabinet plywood, and veneer. Hardwoods also have been a major part of the pulpwood consumption in the northern tier of the eastern United States since the early 1960's, while southern pines have been the predominant species used in southern tier states. However, since the 1960's there has been a steady increase in the consumption of hardwood pulpwood in the East. During the mid 1980's, hardwood roundwood also started to be used for the production of engineered wood. By the early 1990's, the volume of hardwood roundwood consumed by the pulp and EWPs industries exceeded the volume of roundwood consumed by the hardwood lumber industry. The consumption of eastern hardwood roundwood has increased dramatically in part because there are substantial hardwood resources to support this increase. Other factors that have influenced the increase include declining volumes of southern softwood growing stock, reduction in the sale of softwood timber from National Forests, and rising demand for homes and paper. These factors caused the price of softwood roundwood to escalate and provided the impetus needed to develop new technologies to manufacture products from less expensive hardwood roundwood. Still, changes in hardwood roundwood consumption have varied by region. In this paper we analyze changes in hardwood roundwood consumption on a regional level and how they were influenced by increasing demand for wood-based materials, increased volumes of hardwood inventories, and changes in technology.

INTRODUCTION

For most of this century, sawtimber was the most commonly consumed hardwood roundwood product. It was converted mostly into lumber with smaller amounts used for architectural plywood and veneer. Hardwood roundwood also has been used for pulping but traditionally softwoods have been preferred because they have longer and stronger fibers. The higher strength to weight ratio of softwoods also is the major reason why hardwoods have not been used in the production of construction products such as dimension lumber and plywood. However, in recent years the separation of markets for softwood and hardwood has become less distinct as hardwood roundwood has been used increasingly in the manufacture of paper and construction products such as oriented strand board (OSB). This increase is occurring at a time when hardwood lumber production also has increased.

The three major factors influencing the increased use of hardwood roundwood are increased demand for wood-based materials, increased volumes of hardwood growing stock and sawtimber, and changes in technology that allow hardwood material to substitute for softwood material. In this paper we analyze changes in hardwood roundwood consumption on a regional level with respect to these three factors. Since any increase in roundwood consumption must be supplied from an existing timber resource base, changes in the hardwood and softwood resource are examined first; followed by an analysis of pulpwood consumption, roundwood usage by the engineered wood-products industry (EWPs), and regional changes in hardwood pulpwood and sawtimber consumption.

DATA USED

Historical inventory data reported in this paper are from Smith et al. (2001), pulpwood consumption (mill receipts) data were developed from USDA Forest Service pulpwood production studies, and sawtimber consumption data are

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Table 1 – Changes in eastern hardwood and softwood growing-stock volume (and sawtimber volume in parentheses)

Year	South Central	Southeast	North Central	Northeast
-----million cubic feet-----				
Hardwood				
1963	51,987 (22,716)	46,998 (21,587)	41,792 (16,679)	52,835 (15,785)
1977	61,474 (27,228)	60,691 (27,830)	51,838 (21,783)	67,320 (19,818)
1987	70,874 (32,907)	68,154 (33,916)	61,896 (27,512)	80,524 (28,999)
1997	80,392 (42,097)	71,124 (36,889)	74,640 (34,913)	90,234 (39,015)
Softwood				
1963	34,913 (22,639)	40,174 (21,010)	9,627 (3,776)	24,034 (7,813)
1977	50,200 (33,011)	51,008 (27,155)	12,859 (5,843)	30,991 (10,352)
1987	52,994 (35,879)	52,619 (30,136)	16,009 (7,693)	31,609 (13,786)
1997	52,985 (37,114)	51,861 (29,727)	18,431 (9,361)	30,945 (15,566)

based on estimates of hardwood lumber production developed by the senior author.² Because estimates of southern pulpwood production were unavailable before 1993, we assumed that pulpwood receipts in the southern regions were equal to production (harvest). We did not examine residue consumption because of the difficulty of identifying the sources of this residue. This paper focuses on the 32-year period from 1965 to 1997, though relative pulpwood consumption for the earliest years available are presented for discussion purposes. An initial examination of pulpwood and sawtimber consumption data revealed considerable yearly variability, making it difficult to visualize trends. As a result, all historical data are examined as 5-year averages.

REGIONAL CHANGES IN THE TIMBER INVENTORY

Estimates of hardwood and softwood growing-stock volumes for 1963, 1977, 1987, and 1997 are presented in Table 1. Since 1963, hardwood growing-stock volumes increased by 54 and 51 percent (annual rates of 1.30 and 1.25 percent) in the South Central and Southeast regions, and 79 and 71 percent (annual rates of 1.72 and 1.61 percent) in the North Central and Northeast

regions, respectively. Softwood growing-stock volumes also increased in all four regions but these increases follow a much different trend. While hardwood growing-stock volumes increased continually in the South Central, Southeast, and Northeast, softwood volumes have remained relatively constant since 1977. By contrast, North Central softwood growing-stock volume has increased by more than 90 percent but on a small initial base.

Sawtimber inventories have increased more rapidly than growing-stock inventories in all regions and species groups (Table 1). This higher rate of growth for sawtimber is the result of ingrowth as forests that began to regenerate 50 to 80 years ago. The greatest increases in hardwood and softwood sawtimber volume were in the northern regions. As with growing stock, hardwood sawtimber inventories have increased steadily in all regions. Southern softwood sawtimber inventories also increased between the 1963 and 1987 estimates but have remained stagnant or have decreased since then. Northeastern softwood inventories have increased as increases in white pine and hemlock inventories have more than offset the recent decline of spruce fir inventories.

² Hardwood lumber production data was estimated using methodology outlined in Luppold and Dempsey (1989, 1994). Hardwood roundwood consumption for lumber production was based on .17 cubic feet of roundwood per board foot of lumber.

CHANGES IN PULPWOOD ROUNDWOOD CONSUMPTION

The South Central region is the largest eastern consumer of pulpwood roundwood, accounting for 43 percent of eastern consumption in 1997 (Johnson and Stepleton 1999, Piva 1999, Widmann and Griffith 1999). The primary softwood species consumed in the South Central and Southeast regions are plantation-grown southern yellow pines while hardwoods consumed include virtually every species other than hickory and walnut. In the late 1960's, hardwood accounted for less than 30 percent of pulpwood consumption in the South Central region (Johnson 1996). The proportion of hardwood pulpwood consumed remained at around 30 percent through the 1970's but increased to nearly 40 percent by the late 1980's. Since 1995, the proportion of hardwood roundwood pulpwood has remained around 42 percent.

The Southeast region accounted for 34 percent of eastern pulpwood consumption in 1997. In the late 1960's, hardwoods accounted for 19 percent of the roundwood pulpwood consumed. Since then, the proportion of hardwood pulpwood has increased steadily reaching 31 percent by the late 1990's (Johnson and Stepleton 1999).

The first pulpwood consumption study for the North Central region indicated that softwoods accounted for nearly 90 percent of the pulpwood produced in the late 1930's (Demmon 1946). By the late 1960's, aspens accounted for 49 percent of the pulpwood consumption compared to 38 percent softwoods and 13 percent other hardwoods (Blyth 1969). The proportion of hardwood used exceeded 75 percent in the late 1980's and remained at that level into the late 1990's.

The high proportion of hardwood pulpwood consumed in the North Central region is partly the result of an accounting procedure. In the late 1970's, a small amount of aspen roundwood was diverted from the pulpwood market for EWP's. Over time, greater quantities of aspen were used for EWP's but this roundwood continued to be termed pulpwood. It is estimated that in the late 1990's about 180 million cubic feet of hardwood roundwood was used to produce OSB in the North Central region. If the volume used in OSB production is

subtracted from pulpwood consumption, actual roundwood consumption by pulp mills is less than roundwood consumption by sawmills in the North Central region.

The Northeast accounted for only 10 percent of eastern pulpwood consumption in 1997 with the bulk of production in Maine, Pennsylvania, and New York. The major softwood species consumed by pulpmills are spruce and fir while hardwoods used are seldom identified by species. In 1955, hardwoods accounted for 27 percent of Northeast production (Kingsley 1966). By the late 1960's hardwoods accounted for more than 40 percent of Northeast pulpwood consumption (Kingsley 1968). During the 1970's and 1980's, Northeast pulpwood consumption increased but the proportion of hardwoods remained relatively constant at around 50 percent. In the 1990's, Northeast softwood pulpwood consumption declined while hardwood consumption increased. Most of this shift from softwoods to hardwoods occurred in Maine.

The increased consumption of hardwood pulpwood has been spurred by increasing demand for paper, changes in the types of papers produced, changes in papermaking technology, and rising softwood pulpwood prices. Since 1965, U.S. paper and paperboard production increased by 135 percent (Howard 1999). Much of the increase in paper consumption has been in the types of papers that do not require a high proportion of softwood pulp (magazines, catalogs, and office papers).

In addition to increased production of office and magazine papers, changes in container specifications and production technologies have allowed increased hardwood use in kraft production. Hardwood fibers have lower tensile strength but higher compression strength. In situations where boxes are piled on top of one another, containers made from a greater proportion of hardwoods may be superior.

Rising demand for hardwood roundwood might be best explained by its sustained lower price relative to softwood. In most areas of the East, hardwood pulpwood historically has been considerably less expensive than softwood pulpwood. Since the 1970's, the gap between hardwood and softwood pulpwood prices has

declined though hardwood prices remain lower than softwood prices.

ENGINEERED WOOD-PRODUCTS

Engineered wood-products are an emerging industry for which roundwood usage is counted as pulpwood in the North Central region and sawlog production in the Northeast. For this paper, these products are defined as a family of materials formed by press gluing small, thin sections of wood that have been formed by flaking or veneering. The advantage of these materials is that they can be manufactured from low-value species or small-diameter roundwood.

Originally aspen was used to manufacture OSB in the North Central region. In the late 1980's, three OSB plants were constructed in Maine and initially used aspen. Today, OSB is manufactured in all eastern regions. Aspen is the most common species used in the North Central region while yellow-poplar and other soft hardwoods are used in the Northeast. Increasing volumes of hardwoods are used in the southern regions, but southern yellow pine remains the most common material.

Although housing starts were higher in the 1970's than the 1990's, the average floor area of a single family residence increased from 1,720 square feet in 1977 to 2,150 square feet in 1997 (Howard 1999). On a square foot basis, housing starts have increased by 17 percent between the 1970's and the 1990's. Construction activity has increased at a time when softwood harvests in

western National Forests have fallen, Canadian imports have been restricted by treaty, spruce fir inventories in the northeast have declined, and southern sawtimber consumption has reached new highs.

It can be argued that the robust housing market of the 1990's plus declining western softwood plywood production led to investments in eastern OSB and other EWPs plants. As OSB replaced softwood plywood, logs that were earmarked for plywood were used for lumber production. As a result, U.S. softwood lumber consumption has remained relatively constant since 1987, while softwood plywood production has dropped by nearly one-third.

HARDWOOD SAWTIMBER AND PULPWOOD CONSUMPTION

The South Central region also is the largest producer of hardwood sawtimber, accounting for 32 percent of eastern consumption in 1997. Although this region has consistently been the largest producer of hardwood lumber, sawtimber consumption decreased from the late 1960's to the early 1980's (Table 2). However, consumption has increased by nearly 50 percent since the early 1980's. By contrast, hardwood pulpwood consumption has increased continually since the late 1960's, surpassing sawtimber consumption in the early 1980's. By the late 1990's, pulpwood accounted for 58 percent of the hardwood roundwood consumed in the South Central region compared to 34 percent three decades earlier.

Table 2 – Hardwood sawtimber and pulpwood consumption in the eastern regions of the Eastern United States.

Time period	South Central		Southeast		North Central		Northeast	
	Saw ¹	Pulp ²	Saw ¹	Pulp ²	Saw ¹	Pulp ³	Saw ¹	Pulp ⁴
	-----million of cubic feet-----							
1965 to 1969	572	301	343	218	266	210	353	183
1970 to 1974	497	393	315	256	264	231	344	229
1975 to 1979	464	394	293	262	282	234	357	211
1980 to 1984	435	482	298	326	294	322	404	275
1985 to 1989	561	617	348	395	393	439	532	298
1990 to 1994	620	701	340	462	421	524	578	326
1995 to 1997	656	903	331	540	460	553	601	359

¹ Assumes 0.17 cubic foot per board foot. ² Assumes 75 cubic feet per cord. ³ Assumes 79 cubic feet per cord.

⁴ Assumes 85 cubic feet per cord.

Southeastern hardwood sawtimber consumption also decreased between the late 1960's and early 1980's. Since the early 1980's, sawtimber consumption has remained near or below the levels recorded in the late 1960's. As in the South Central region, hardwood pulpwood consumption has increased steadily, surpassing sawtimber consumption in the early 1980's. By 1997, pulpwood accounted for 62 percent of the hardwood roundwood consumed in this region. In the late 1960's, the North Central region produced only 17 percent of the eastern hardwood sawtimber. After a slight decline in the early 1970's, sawtimber consumption increased and accounted for 22 percent of eastern consumption by the late 1990's. However, even with the increase in lumber production in this region, hardwood pulpwood consumption surpassed sawtimber consumption in the early 1980's.

Similar to the North Central, Northeast hardwood sawtimber consumption decreased in the early 1970's but has increased at an annual rate of 2.8 percent since then (Table 2). As in the other regions, Northeast pulpwood consumption has increased steadily over the last 35 years at an annual rate of 2.3 percent. However, unlike the other regions, the proportion of other roundwood material has not exceeded hardwood sawtimber consumption even with the addition of the 100 million cubic feet of hardwood roundwood consumed by the EWPs industry.

Although hardwoods usually are associated with high-grade lumber, much of the hardwood timber in the east is unsuitable for lumber and veneer production. While sawtimber suitable for lumber is escalating in real prices, the price of low-quality sawlogs is declining. In addition to the abundant low-value hardwood inventory, there are vast amounts of hardwood fiber not considered growing stock. By contrast, the proportion of cull softwood trees is lower than the proportion of cull hardwood trees, and a higher proportion of the total fiber in softwood species is in the section measured for growing stock.

As mentioned earlier, the availability and low price of low-value hardwoods have resulted in greater use of hardwoods in paper production. This trend contributed to the swing from

sawtimber as the predominant roundwood product consumed in the 1960's to pulpwood being predominant in the 1980's. However, an increase in consumption requires mills that can process the increase. Because of the difficulty in acquiring water-pollution permits for new pulpmills, most of the increased pulp production over the last 4 decades has resulted from increasing capacity at existing or idled mills. In 1965, the southern regions had 5 times more pulping capacity than the northern regions, and therefore, had a much larger base to expand on.

Today lumber production is dependent on the proportion of species such as select red and white oaks, sugar maple, the ashes, black walnut, and black cherry. In 1997, these species accounted for more than 40 percent of the sawtimber base in the northern regions versus 24 and 19 percent of the South Central and Southeastern timber base, respectively. It should be noted that since 1965, Northeastern and North Central hardwood sawtimber consumption increased by 70 percent compared to a 15-percent increase for the South Central region and a 3-percent decrease for the Southeast region. An additional reason for the decrease in the Southeast region is that much of the mountain timber is in national forests or is adjacent to Blue Ridge Parkway and Skyline Drive.

An additional factor that may be facilitating increased sawtimber consumption is an increase in acreages can be harvested economically because of the increased price of hardwood pulpwood. Although this interaction between the pulpwood and sawtimber markets has not yet been demonstrated, its potential has been recognized by researchers. Also, there is increased interest in investigating whether markets for lower value hardwoods may increase thinning activity that would improve timber quality.

CONCLUSIONS

While increased hardwood inventories have facilitated increases in hardwood sawtimber and pulpwood consumption, the market forces driving these increases differ. Increased hardwood sawtimber consumption was a response to higher lumber prices resulting from increased domestic and international demands. The increase in hardwood pulpwood

consumption has been influenced by declining volumes of southern softwood growing stock, a reduction in the sale of softwood timber from national forests, and increased demand for products traditionally manufactured from softwood roundwood.

Will the increase in hardwood roundwood consumption continue? It is always difficult to predict the future, still, some educated guesses can be made. As the northern hardwood resource grows, there will be increased amounts of low-value roundwood available. Because of environmental regulations, it is doubtful that pulping capacity will increase in this region. Another factor that may hinder increased pulping capacity is the increasing supply of South American eucalyptus pulp. However, if demand for EWP's continues to increase, the Northeast may be an ideal area to site plants. Such plants may start to use red maple if technology is developed to use this species and if consumers can accept EWP's in darker color.

As lumber production increases, the demand and price for higher quality sawtimber will increase in all regions. Eventually, these price increases may facilitate the development of production technologies that can transform low-value roundwood into high-value hardwood dimension. Additional markets for lower grade hardwood roundwood also could increase the long term supply of high-quality sawtimber if satisfaction of these demands can be matched with increased forest management. It remains to be seen whether the potential for increased forest management is put into practice.

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