

U.S. HARDWOOD LUMBER PRODUCTION: 1963 TO 2003

William Luppold and Matthew Bumgardner¹

Abstract.—Between 1963 and 2003 northern hardwood lumber production more than doubled while production in the southern regions increased by less than 25 percent. In 1963 the major users of hardwood lumber were the furniture manufacturers located in the southeast region, and hardwood flooring producers located in the south central region. By contrast more than 60 percent of the kitchen cabinet and pallet industries were located in the northern region. Decreased production of flooring, increased concentration of the furniture industry in the southeast region, and increased production of pallets resulted in production plummeting in the south central region, while increasing in the northeast, north central, and southeast regions. Between 1982 and 2002 lumber consumption by the furniture industry had declined as imported furniture caused the domestic industry to contract. By contrast, production of kitchen cabinets, flooring, pallets, and exports surged, causing production in the northeast, north central, and south central regions to increase. As a result of shifting domestic and international demand and an adequate sawtimber resource, southern and northern production became nearly equal by 1992 and has remained relatively equal since then.

INTRODUCTION

Between 1963 and 1999 eastern hardwood lumber production increased by 73 percent, or more than 5 billion board feet (Fig. 1). Beginning in 1999, the hardwood lumber industry suffered through 4 years of declining production before experiencing small increases in 2004 and 2005. While decreases in eastern hardwood lumber production between 1999 and 2003 were similar across regions, most of the increases in production prior to 1999 were in the northeast and north central regions (Fig. 2, Table 1).

It is important to understand shifts in hardwood lumber production because sawlog harvesting is a major source of timber removal and forest disturbance. Therefore, understanding how changes in hardwood lumber use and sawtimber availability have influenced hardwood lumber production is crucial in assessing

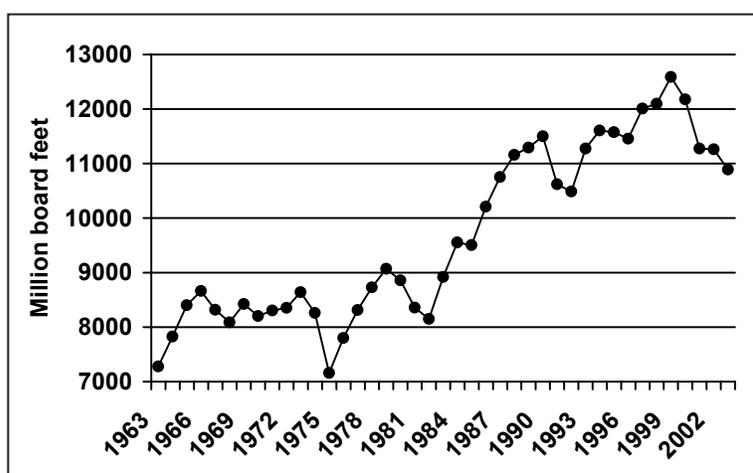


Figure 1.—Estimated eastern hardwood lumber production 1963 to 2003.

¹Economist (WL) and Forest Products Technologist (MB), Northern Research Station, USDA Forest Service, 241 Mercer Springs Road, Princeton, WV 24740. WL is corresponding author: to contact, call (304)431-2770 or email at wluppold@fs.fed.us.

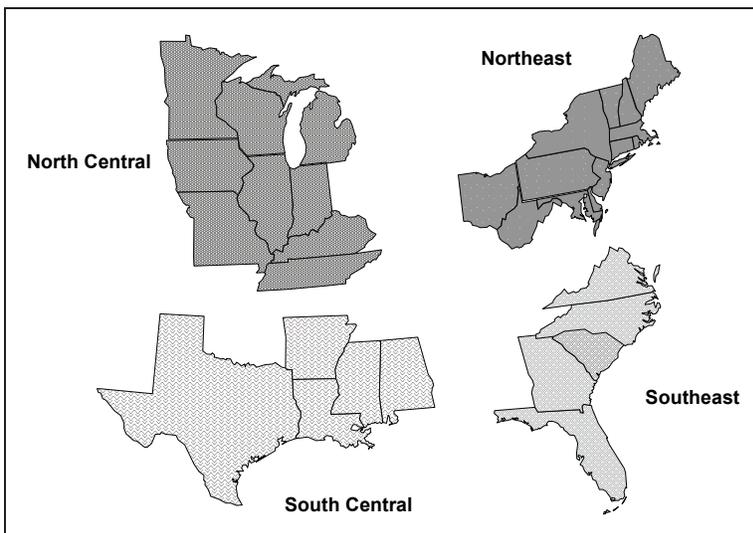


Figure 2.—Delineation of eastern forest survey regions.

Table 1.—Regional lumber production in million board feet (MMbf) and percentage basis for peak production years in the eastern United States

Year	Northeast		North central		Southeast		South central		Total (MMbf)
	(MMbf)	(%)	(MMbf)	(%)	(MMbf)	(%)	(MMbf)	(%)	
1963	1,509	21	1,225	17	1,585	22	2,958	41	7,277
1972	2,073	25	1,530	18	1,832	22	2,921	35	8,356
1982	2,304	28	1,582	19	1,963	24	2,302	28	8,151
1992	3,013	29	2,346	22	1,889	18	3,240	31	10,488
1999	3,672	29	2,817	22	2,295	18	3,804	30	12,588
2003	3,112	29	2,424	22	1,992	18	3,361	30	10,889

the impacts of markets on forests. Other studies linking lumber production to sawtimber availability and demand have been conducted at the state level (Luppold and Bumgardner 2006).

METHODS

In this paper, we examine regional (Fig. 2) hardwood lumber production from 1963 to 2005 and link these changes in production to regional species composition and lumber demand. The biggest factors that affect hardwood lumber production, at least in the short run, are where specific industry sectors have chosen to locate and what species are currently fashionable in both domestic and international markets. Regional analysis is critical to understanding the influence of sector-level demands (e.g., furniture, flooring), which tend to be concentrated regionally, on hardwood lumber production.

Since the early 1960s, the hardwood lumber market has been dynamic with respect to production and consumption. The continual change in the market makes it difficult to identify at what points to examine these changes. For this paper we have chosen six periods: 1963 to 1972, 1972 to 1982, 1982 to 1992, 1992 to 1999, 1999 to 2003, and 2003 forward. The first period was defined by the availability of data (Census of Manufacturing), the second and third periods were selected because they began and ended with economic recessions, and the 1992 to 1999 period was selected because production rose to an all-time high in 1999. Similarly, the 1999 to 2003 period was selected because of the 4 continual years of declining production. Since 2003 we have seen market realignment, but it is still too early to confirm if these trends will continue.

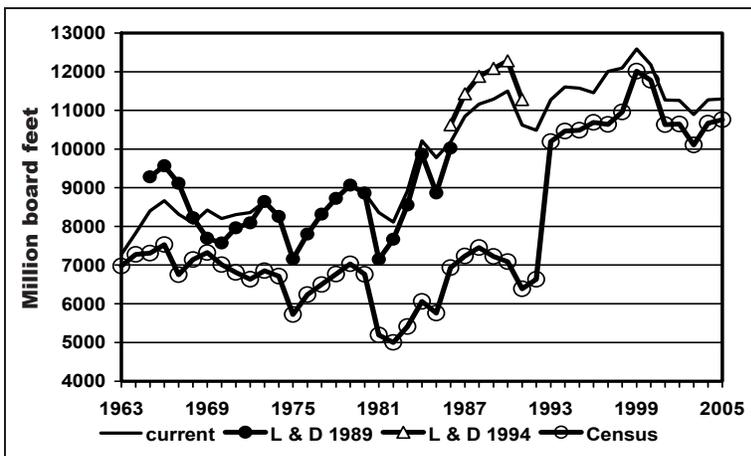


Figure 3.—Comparison of current estimates of hardwood lumber production with those of Luppold and Dempsey (1989, 1994) and USDC Census revised estimates 1963 to 2005.

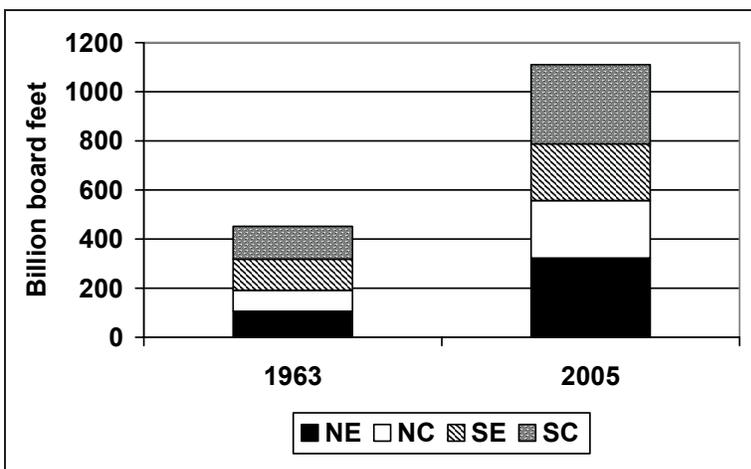


Figure 4.—Eastern hardwood sawtimber inventory in 1963 and 2005.

Data Considerations

Between 1960 and 1994 the U.S. Department Commerce (USDC) Bureau of the Census underestimated hardwood lumber production (Fig. 3). Identification of this problem led to the development of alternative estimates (Luppold and Dempsey 1989, 1994). For this analysis, the incorporation of additional information supplied by the U.S. Forest Service and state forestry agencies and redefinitions of regions required new estimates based on the procedures described in Luppold and Dempsey (1989, 1994).

Changes in Sawtimber Inventory

Hardwood lumber production is inherently linked to sawtimber inventory. In 1963 the eastern regions of the United States contained more than 450 billion board feet (bbf) of hardwood sawtimber (Fig. 4). However, the southern regions contained 58 percent of the eastern sawtimber resource. By 2005 inventories of eastern hardwood sawtimber exceeded 1.2 trillion board feet with 56 percent of this increase occurring in the northern regions (Table 1). This shift in inventory resulted in near parity between the northern and southern hardwood sawtimber inventories in 2005 (Fig. 4).

It should be noted that much of the increase in inventory over the last 40 years was a result of the transition of small-diameter growing stock into sawtimber-size material (termed in-growth). These trees regenerated during three distinct periods. Many of the red oak species regenerated after a virtual clear cut of both

Table 2.—Hardwood lumber consumption in the United States by major industries for selective Census years

Industry	1963	1972	1982	1992	1997	2002
	-----Million board feet-----					
Wood furniture	1,594	1,926	1,613	1,546	1,592	1,248
Upholstered furniture	671	865	545	663	492	442
Office furniture	173	213	322	484	573	371
Kitchen cabinets	221	293	312	898	1,266	1,367
Millwork	256	614	436	644	726	923
Other building products	48	212	307	342	539	684
Pallets and containers	1,201	1,486	2,508	3,127	4,109	3,666
Crossties	500	850	834	578	884	928
Flooring	1,622	706	386	755	1,162	1,191
Miscellaneous	492	1251	873	956	740	567
Total domestic	6,778	8,416	8,136	9,993	12,083	11,388
Exports	131	237	321	919	1,213	1,162
Total domestic plus exports	6,909	8,653	8,457	10,912	13,296	12,550

hardwood and softwood forests between the late 19th century and the early 20th century and associated widespread slash fires. As marginal farmland was abandoned during and after the Great Depression, shade intolerant/pioneer species (e.g., yellow-poplar) regenerated on these lands (Clarkson 1964, Carvell 1986). After World War II, shade-tolerant species such as red and sugar maple started to regenerate, apparently because increased selective harvesting patterns resulting in incomplete canopy removal.

States in the northern regions contain significant quantities of softwood timber, but more than three-quarters of the sawtimber inventory are hardwood species (USDA Forest Service 2006). The northeast region contains relatively large quantities of soft maple (primarily red), select red oak (mainly northern red oak), and hard maple. The north central region also contains relatively high quantities of select white oak, other red oak (primarily black oak), select red oak, and hard maple. The apparent increase in proportional sawtimber volume in the south central regions is largely the result of increased sawtimber inventories in Kentucky and Tennessee. By 2005 nearly 40 percent of the south central sawtimber inventory was within these states.

The composition of forest in the southern regions is evenly distributed between hardwoods and softwood species (USDA Forest Service 2006). The predominant hardwood species in the southeast region include yellow-poplar, sweet and black gums, other red oaks (including laurel, southern water, scarlet, and black oak) and select white oaks. Other red oaks (including water, southern red, black, and scarlet oak), gums, other white oak (including chestnut, post, and overcup oak), and select white oak are the predominant species.

RESULTS

1963 to 1972

In 1963 more than 40 percent of hardwood lumber was produced in the south central region (Table 1) even though this region contained only 30 percent of the hardwood sawtimber (Fig. 4). This apparent imbalance was the result of the large market for flooring (Table 2) and the high concentration of flooring and dimension manufacturers in this region as measured by regional proportion of total value of shipments

Table 3.—Changes in regional relative value of shipments for major hardwood lumber consuming using industries 1963, 1982, 2002 in the United States

Industry	Year	Northeast	North central	Southeast	South central
		-----percent-----			
Wood household furniture	1963 ¹	21	19	44	16
	1982 ²	18	13	54	15
	2002 ³	26	19	42	13
Flooring	1963	3	12	18	67
	1982	NA	NA	NA	NA
	2002	NA	NA	NA	NA
Dimension	1963	23	17	18	42
	1982	24	16	21	39
	2002	NA	NA	NA	NA
Kitchen cabinets	1963	40	31	17	12
	1982	31	29	19	21
	2002 ⁴	30	38	17	16
Pallets	1963	38	29	14	19
	1982	29	31	17	23
	2002 ⁵	24	31	20	25

¹ USDC Bureau of the Census 1966

² USDC Bureau of the Census 1985

³ USDC Census Bureau 2004a

⁴ USDC Census Bureau 2004b

⁵ USDC Census Bureau 2005

(Table 3). In 1963 the northeast region produced nearly as much lumber as the southeast but contained a lower volume of hardwood sawtimber. The north central region produced only 17 percent of eastern lumber in 1963, which seems to be consistent with the relatively low level of sawtimber inventory.

Between 1963 and 1972 hardwood lumber production increased by more than 15 percent as lumber use increased for nearly every lumber-consuming industry other than flooring. While production in the south central region decreased by 1 percent, production in the northeast, north central, and southeast regions increased 37, 25, and 16 percent, respectively. The decrease in lumber production in the south central region and a relatively small increase in the southeast region were largely the result of reduced flooring production. As flooring production dropped by more than 50 percent, south central flooring plants shifted to dimension production as nearly all the increase in lumber consumption during this period was in the form of dimension purchases (USDC Bureau of the Census 1966, 1976). Because of these shifts, combined northern production increased from 38 percent to 43 percent of total eastern production.

1972 to 1982

During this 11-year period hardwood markets experienced variations in price and production as the U.S. economy endured two recessions. Demand changed significantly as furniture fashion shifted from closed grained species (maple) to open grained species (oak), and pallet production increased (Table 2). These changes caused major shifts in hardwood lumber production from the south to the northeast.

The most significant shifts were the 600-mmbf decline in the south central region as hardwood flooring production hit a post-World War II low. The increased preference for red oak in furniture, a growing export market, and increased pallet demand caused production in the northeast to increase by 250 mmbf.

Even though furniture production declined between 1972 and 1982 (Table 2), the furniture and dimension industries became more concentrated in the southeast region (Table 3). While production in the north central region increased with increased export and pallet demand, the decline in hard maple prices during this period seemed to have a disproportionate influence on hardwood lumber production in the Lake States. As a result of these changes, the northern region accounted for more than 47 percent of eastern hardwood lumber production in 1982.

It should be noted that hardwood production declines during periods of recession because of not only reduced production of secondary products, but also the tendency of secondary manufactures to reduce lumber inventory. This drawdown in inventory also explains the surge in price and production after these periods as secondary processors increase lumber consumption and inventories simultaneously.

1982 to 1992

After 1982 hardwood lumber production surged to 11.5 bbf in 1990 before declining in 1991 and 1992. Still, the mid-1980s was the first time that hardwood lumber production exceeded 10 bbf since 1913. However, this increase in production was inconsistent across regions. Between the 1982 and 1992 recessions, hardwood lumber production in the north central and northeast regions increased by nearly 50 and 30 percent, respectively. This increase was influenced by increased production by pallet and kitchen cabinet firms that were more heavily concentrated in these regions (Table 3), increased exports, and an increase in demand for hard maple.

Between 1982 and 1992 hardwood lumber production increased 40 percent in the south central region as a result of increased flooring production and an expansion of the pallet and kitchen cabinet industries. By contrast, hardwood lumber production declined in the southeast as demand by the furniture industry remained flat. The decline in hardwood lumber consumption by the furniture industry also was related to the increased volume of furniture imports during the 1990s. By 1999, hardwood lumber production in the combined northern and southern regions would be virtually equal.

1992 to 1999

Between 1992 and 1999 production increased in all regions at similar rates as consumption by all industries increased. Even the furniture industry increased production although imports continued to climb. The most significant change during this period was the continual increase in industrial product consumption and consumption by construction-related industries, including kitchen cabinets, millwork, flooring, and other building products. While lumber consumption by these industries had been steadily growing since 1982, it reached parity with combined consumption by the furniture industries only in 1992 (Table 3). Between 1992 and 1999 hardwood lumber consumption by the furniture industries increased slightly, but lumber use by construction and remodeling manufacturers surged.

1999 to 2003

After reaching an all-time high in hardwood lumber production in 1999, the hardwood lumber industry declined by 1.7 bbf over 4 years (Fig. 1). This was the first time that hardwood consumption had declined for 4 consecutive years in the recorded history of annual hardwood lumber production starting in 1904 (Steer 1948). Although most of this decrease was the result of a decline in consumption, the liquidation of inventories at furniture plants also contributed. While furniture production decreased in all regions, the southeast had the greatest relative decline in terms of value of shipments due to the high proportion of furniture manufacturing located there (USDC Census Bureau 2004a).

The unusual aspect of this period was that as the pallet and furniture industries' consumption of hardwood lumber declined, consumption by manufacturers of construction and remodeling products increased. By 2002, combined consumption by construction and remodeling industries was twice the combined consumption by the furniture industry. Hardwood lumber consumption by the pallet industry declined as pallet and pallet part recycling increased. This recycling effort was in part triggered by increased prices of low-grade oak lumber resulting from continual use of these species by the flooring industry. Export demand also was changing during this period as China became an important market for U.S. hardwoods. These shifts in markets resulted in a uniform decline in lumber production across all regions.

Another example of markets expanding in this period was the Amish furniture manufacturing clusters located in portions of Ohio, Pennsylvania, and Indiana. These clusters are characterized by high concentrations of small firms collectively generating significant regional lumber use.

DISCUSSION

This analysis demonstrates that regional shifts in hardwood lumber production result from an interaction of changing demands for hardwood lumber, location of lumber-using industries, and attributes of the sawtimber inventory. Many of the changes in demand over the past 40 years would have been difficult to project. However, there are several known aspects about the hardwood resource and market that can provide insight on how production may change in the future.

One factor that influences long-term regional production trends is sawtimber supply because secondary industries seeking to expand production want to locate close to supplies. Species diversity also may influence regional production because style trends cycle and different species move in and out of vogue. Therefore, states or regions that have relative high volumes of timber and a broad composition of species may experience more consistent harvests of hardwood sawtimber.

For years the demand for higher grades of hardwood lumber came from large furniture, wood flooring, and kitchen cabinet manufacturers. Today much of the commodity products portion of these industries is facing international competition. By contrast, a driver of growth in hardwood lumber demand seems to be smaller manufacturers producing custom and semi-custom products; these manufactures are difficult to track. As time progresses, it may become increasingly difficult to examine how demand influences supply, particularly at regional levels, without developing more information on the smaller consumers of hardwood lumber.

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