

Regional Analysis of Hardwood Lumber Production: 1963–2005

William Luppold and Matthew Bumgardner

ABSTRACT

Between 1963 and 2005 hardwood lumber production in the eastern United States increased by more than 50%. Production more than doubled in the northeastern and north central regions while increasing by less than 25% in the southeastern and south central regions. Increased lumber production in the northern regions was facilitated by an expanding sawtimber inventory, relative high volumes of select oak species and hard maple, an expanding kitchen cabinet industry, increased exports, and increased lumber demand by the pallet industry. Hardwood lumber production in the south central region was correlated with hardwood flooring production. When flooring production declined between 1963 and 1982, south central lumber production declined. After 1982 flooring production increased and hardwood lumber production in the south central region followed. By contrast, lumber production in the southeastern region has been tied to the fortunes of the wood and upholstered furniture industries. As furniture imports increased, the demand for lumber by these industries first stagnated and then declined. As a result, lumber production in this region declined between 1982 and 2005. Today, much of the commodity product portions of hardwood-demanding industries are facing international competition. By contrast, a driver of growth in hardwood lumber demand seems to be smaller manufacturers producing custom and semicustom products. These new industries tend to purchase higher-quality lumber but can use a variety of species. Therefore, states or regions with high volumes of timber and a broad composition of species have the greatest potential for future growth in hardwood lumber production.

Keywords: hardwood, lumber, supply

Between 1963 and 1999 production of eastern hardwood lumber increased by 73% or more than 5 bbf (Table 1). Between 1999 and 2003 the hardwood lumber industry suffered through 4 years of declining production before experiencing small increases in 2004 and 2005. However, although recent declines in the production of eastern hardwood lumber were similar across regions, most of the increases in production before 1999 were in the northeastern and north central regions (Figure 1; Table 1).

It is important to understand regional 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 the impacts of markets on forests. Studies linking lumber production to sawtimber availability and demand have been conducted at the state level (e.g., Luppold and Bumgardner 2006). In this article we examine regional (i.e., multiple state) hardwood lumber production from 1963 to 2005 and link these changes in production to species composition and changes in lumber demand by major users of hardwood lumber. The primary factors that affect hardwood lumber production, at least in the short run, are the location of specific, major users of hardwood lumber and what species are currently fashionable in domestic and international markets. Regional analysis is critical to understanding the influence of demands by major users, e.g., furniture, flooring, pallets, and more, which tend to be concentrated regionally, on hardwood lumber production.

Table 1. Regional lumber production in million board feet and percentage basis for selected production years.

Year	Northeastern	North central	Southeastern	South central	Total east (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
2005	3,321 (29)	2,417 (21)	1,933 (17)	3,670 (33)	11,341

Data Considerations

Between 1960 and 1994, estimates of hardwood lumber production by the US Department of Commerce (USDC) Bureau of the Census increasingly underestimated actual production. Identifying this problem led to the development of alternative estimates (Luppold and Dempsey 1989, 1994). The series used in this analysis incorporated new information supplied by the US Forest Service and state forestry agencies and was developed using procedures described by Luppold and Dempsey (1989, 1994). This process reestimated lumber production between 1963 and 1991 and extends the series from 1991 to 2005. The current estimates of hardwood lumber production are compared with those of Luppold and Dempsey (1989, 1994) and Census estimates (USDC Bureau of the Census 1966 to 1999, USDC Census Bureau 2000 to 2007) in Figure 2.

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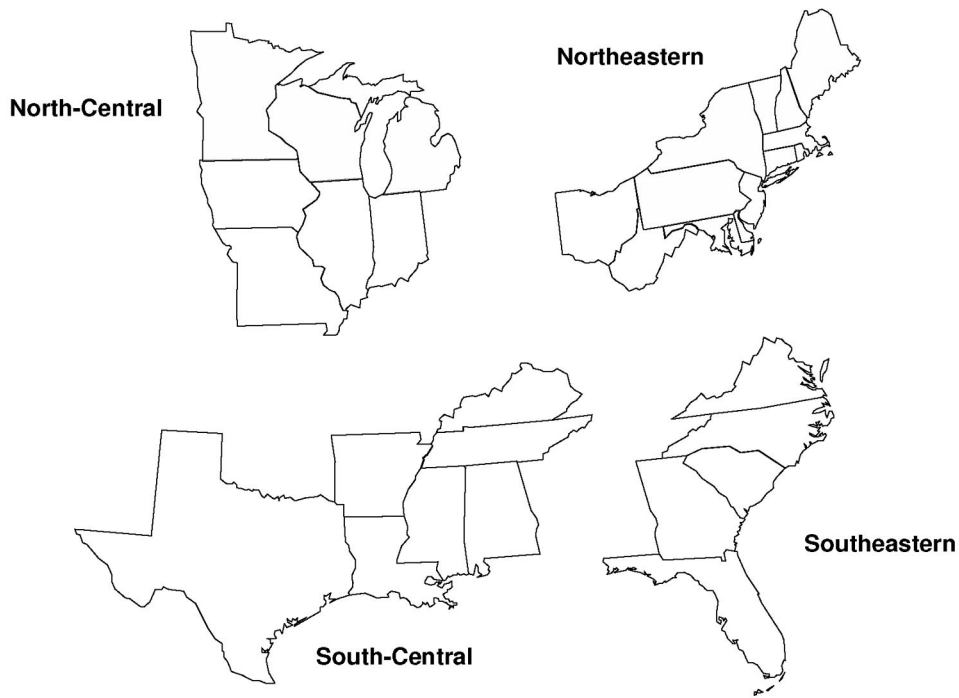


Figure 1. Delineation of eastern forest survey regions.

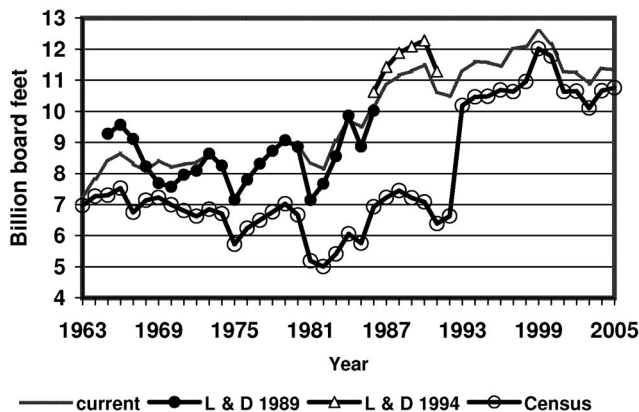


Figure 2. Comparison of current estimates with those of Luppold and Dempsey (L&D) (1989, 1994) and USDC Census revised estimates (USDC Bureau of the Census 1966 to 1999, USDC Census Bureau 2000 to 2007), 1963 to 2005¹.

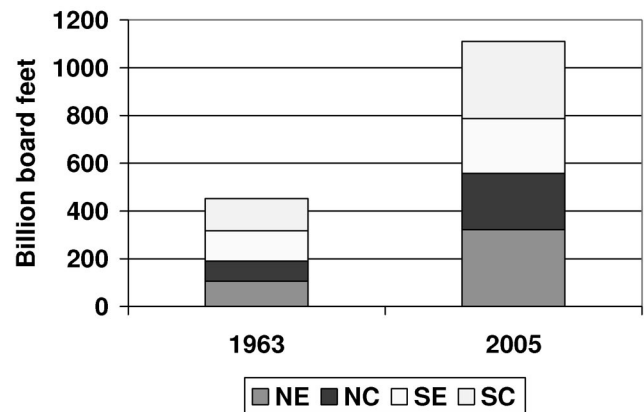


Figure 3. Eastern hardwood sawtimber inventory in 1963 (US Forest Service 1965) and 2005 (US Forest Service 2006).

Changes in Sawtimber Inventory

Hardwood lumber production is inherently linked to sawtimber inventory. In 1963, the eastern United States contained more than 450 bbf of hardwood sawtimber (Figure 3). However, the southern regions contained 58% of the eastern sawtimber resource. By 2005, inventories of eastern hardwood sawtimber exceeded 1.1 trillion bd ft with 56% of this increase in the northern regions (Figure 3). This shift in inventory resulted in near parity between the northern and southern hardwood sawtimber inventories in 2005 (Figure 3).

It should be noted that much of the increase in inventory over the last 40 years was a result of small-diameter growing stock transitioning to sawtimber size material (ingrowth). Many of the red oak species regenerated after a virtual clearcut of both 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 began to regenerate apparently because of increased selective harvesting that resulted in incomplete canopy removal.

Even though the states in the northern regions contain significant quantities of softwood timber, more than three-quarters of the sawtimber inventory are hardwood species (Table 2). The northeastern region contains relatively large quantities of soft maple (primarily red), yellow-poplar, 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 region is largely the

Table 2. Regional characteristics of hardwood sawtimber inventories, 2005.

Characteristic	Northeastern		North central		Southeastern		South central	
	1963 ^a	2005 ^b	1963	2005	1963	2005	1963	2005
(%).....							
Proportional hardwoods	74.5	75.7	81.4	76.1	47.0	54.0	49.6	57.9
Select white oak	8.0	6.9	13.5	13.9	10.0	11.0	9.6	12.0
Other white oak	5.5	4.1	2.2	2.3	7.9	7.5	11.1	13.3
Select red oak	12.3	11.4	10.2	9.8	5.2	5.5	4.5	7.0
Other red oak	7.3	6.2	8.7	11.2	17.0	17.2	18.5	22.6
Hard maple	12.4	11.2	9.8	9.0	0.3	0.6	0.8	2.0
Soft maple	7.2	14.7	8.9	5.0	4.3	5.3	1.3	2.1
Yellow-poplar	5.4	9.9	0.9	2.2	9.4	22.0	4.0	9.2
Sweet/blackgum	1.7	1.4	0.9	0.5	27.2	16.8	19.7	13.5
Black cherry	NA	6.0	NA	1.4	NA	0.4	NA	0.4

^a US Forest Service, 1965.^b US Forest Service, 2006.

NA, not applicable.

result of increased sawtimber inventories in Kentucky and Tennessee. By 2005, nearly 40% of the south central sawtimber inventory was within those states.

The composition of forest in the southern regions is distributed evenly between hardwood and softwood species (Table 2). Predominant hardwood species in the southeastern region are yellow-poplar, sweetgum and blackgum, other red oaks (including laurel, southern water, scarlet, and black oak), and select white oaks. Other red oaks (water, southern red, black, and scarlet), gums, other white oak (chestnut, post, and overcup), and select white oak are the predominant species in the south central region.

Shifts in Regional 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 the points at which these changes should be examined. We chose six periods: 1963–1972, 1972–1982, 1982–1992, 1992–1999, 1999–2003, and 2003 forward. The first period was defined by the availability of Census of Manufactures data, the second and third periods were selected because they began and ended with economic recession, the 1992–1999 period was selected because production rose to an all-time high in 1999, and the 1999–2003 period was selected because of the four continual years of declining production.

1963–1972

In 1963 more than 40% of the hardwood lumber was produced in the south central region (Table 1) even though it contained only 30% of the hardwood sawtimber (Figure 3). This apparent imbalance was the result of the large market for flooring (Table 3) and the high concentration of flooring and dimension manufacturers in this region as measured by regional proportion of total value of shipments (Table 4). In 1963, the northeastern region produced nearly as much lumber as the southeastern region but contained a lower volume of hardwood sawtimber. The north central region produced only 17% of eastern lumber in 1963. This seems consistent with the relatively low level of sawtimber inventory.

Between 1963 and 1972, hardwood lumber production increased by more than 15% as lumber use increased for nearly every industrial consuming industry except flooring. However, while production in the south central decreased by 1%, production in the northeast, north central, and southeastern regions increased by 37, 25, and 16%, respectively. The decrease in lumber production in

Table 3. Hardwood lumber consumption by major industries for selective Census years.^a

Industry	1963	1972	1982	1992	1997	2002
(mmbf).....					
Wood furniture	1,594	1,926	1,613	1,546	1,592	1,248
Upholstered furniture	671	865	545	663	492	442
Office and institutional 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	1,251	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

^a Luppold and Bumgardner, 2008.

the south central region and a relatively small increase in the southeastern region were largely the result of reduced flooring production. As flooring production dropped by more than 50%, south central flooring plants shifted to dimension production because 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 to 43% of total eastern production.

1972–1982

During this 11-year period, the hardwood lumber market experienced variations in price and production as the US economy endured two recessions. Although furniture production declined between 1972 and 1982 (Table 3), the furniture and dimension industries became more concentrated in the southeastern region (Table 4). There were also changes in species demand as furniture fashion shifted from closed-grained species (maple) to open-grained species (oak). The preferred open-grain species were select red and white oaks, which are found in greater abundance in the northern regions. Hardwood lumber use by the pallet industry increased by 1.1 bbf (Table 3) as this industry became the largest consumer of hardwood lumber. The expansion of the pallet industry provided an expanding market for hard to sell low-grade lumber in the northeastern region. By contrast, lumber consumption by the hardwood

Table 4. Changes in regional relative value of shipments for major hardwood lumber consuming using industries, 1963, 1982, and 2002.

	Year	Northeastern	North central	Southeastern	South central
Wood household furniture		(%)			
	1963 ^a	21	19	44	16
	1982 ^b	18	13	54	15
	2002 ^c	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 ^d	30	38	17	16
Pallets					
	1963	38	29	14	19
	1982	29	31	17	23
	2002 ^e	24	31	20	25

^a USDC Bureau of the Census 1966.

^b USDC Bureau of the Census. 1985.

^c USDC Census Bureau. 2004a.

^d USDC Census Bureau. 2004b.

flooring industry continued to decline. Production in the north central region increased with increased export and pallet demand, but the decline in hard maple prices during this period seemed to have a disproportionate influence on hardwood lumber production in the Lake States. The combination of all these changes resulted in major shifts in hardwood lumber production from the south central region to the northeastern region.

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

1982–1992

After 1982, hardwood lumber production surged to 11.5 bbf by 1990 before declining in 1991 and 1992. Still, the mid-1980s was the first period in which hardwood lumber production exceeded 10 bbf since 1913. However, this increase in production was inconsistent across regions. Between the 1982 and 1992 recession, hardwood lumber production in the north central and northeastern regions increased by nearly 50 and 30%, respectively. These increases were influenced by increased production by pallet and kitchen cabinet firms that were more heavily concentrated in these regions (Table 4), increased exports, and an increase in demand for hard maple.

Between 1982 and 1992 hardwood lumber production increased by 40% in the south central region because of increased flooring production and an expansion of the pallet and kitchen cabinet industries. However, hardwood lumber production declined in the southeastern region as demand by the furniture industry remained flat. The decline in hardwood lumber consumption by the furniture industry also was related to an increase in furniture imports during

the 1990s. By 1999, hardwood lumber production was virtually the same in the combined northern and southern regions.

1992–1999

Between 1992 and 1999, production increased in all regions at similar rates as consumption by all industries increased. The furniture industry increased production although imports continued to climb. However, the most significant change during this period was the continual increase in industrial product consumption and consumption by construction-related industries. The construction and remodeling industry includes kitchen cabinets, millwork, flooring, and other building products. Lumber consumption by these industries has been growing steadily since 1982, but it did not reach parity with combined consumption by the furniture industries until 1992 (Table 3). Also, during this period, consumption of hardwood lumber by the furniture industries increased slightly but lumber use by the manufacturers of construction and remodeling manufacturers surged.

1999–2003

After reaching an all-time high in hardwood lumber production in 1999, the hardwood lumber industry declined by 1.7 bbf over 4 years (Table 1). This was the first time that hardwood consumption had declined for 4 consecutive years in the recorded history of annual hardwood lumber production that began in 1904 (Steer 1948). Most of this decrease was the result of a decline in consumption by the furniture industry as a result of an increase in furniture imports (Schuler and Buehlmann 2003). Although furniture production decreased in all regions, the southeastern region had the greatest relative decline in value of shipments because of 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 these industries was twice the combined consumption by the furniture industry. Hardwood lumber consumption by the pallet industry declined as the recycling of pallet and pallet parts increased (Bush et al. 1997). This recycling effort was triggered by increased cost of pallet disposal at landfills and the apparent profit opportunities in the repair and recycling of pallets. Export demand also was changing during this period as China became an important market for US hardwoods. These shifts in markets resulted in a uniform decline in lumber production across all regions.

Beyond 2003

Hardwood lumber consumption has increased modestly since 2003, but some regional realignment is apparent. Most of the increase in hardwood lumber production occurred in the south central region, while production in the southeastern region continues to decrease as the furniture manufacturing industry outsources to China. Lumber production in the northern region remained nearly constant but there was a significant shift in the red oak and soft maple markets. Another shift since the turn of this century is the apparent emergence of small "boutique" markets for hardwood products. As home remodeling increases so does the demand for semicustom and custom cabinets, flooring, and millwork. Producers of these products tend to use greater quantities of hardwood lumber

per unit of product manufactured and appear to account for at least 10% of the current demand for graded lumber. An example of boutique markets is the Amish furniture manufacturing clusters in Holmes County, Ohio (Bumgardner et al. 2007). This cluster is characterized by high concentrations of small firms collectively consuming 44 mmbf of lumber in 2005.

Conclusion

This analysis shows that regional shifts in hardwood lumber production result from an interaction of changing demands for hardwood lumber, the location of these lumber-using industries, and the attributes of the sawtimber inventory. While the increase in production in the northern regions was facilitated by an expanding sawtimber inventory, the volume of select oaks and hard maple in these regions and the relatively high price of these species over the last 40 years made expanded production profitable. Increased production in these regions also was facilitated by expanding production and lumber demand by the kitchen cabinet industry, increased exports, and a large pallet industry that provided localized markets for low-grade lumber.

Hardwood lumber production in the south central region seems to be correlated with hardwood flooring production. When flooring production declined between 1963 and 1982, south central lumber production declined; however, the decline in lumber production was not as steep as the decline in flooring because of the presence of furniture dimension manufacturers in the region. When flooring production started to increase after 1982, hardwood lumber production in the south central region followed. By contrast, lumber production in the southeastern region has been tied to the fortunes of the wood and upholstered furniture industries. As furniture imports increased, the demand for lumber by these industries first stagnated and then declined. Consequently, lumber production in this region declined between 1982 and 2005, which is counter to the nearly 40% eastern hardwood lumber production over this period.

For years, the demand for higher grades of hardwood lumber was by large furniture, wood flooring, and kitchen cabinet manufacturers. Today, much of the commodity product portions of these industries are facing international competition. By contrast, a driver of growth in hardwood lumber demand seems to be smaller manufacturers producing custom and semicustom products; these manufacturers are difficult to track. In the future, it may be increasingly difficult to determine how demand influences supply, particularly at regional levels, unless additional data on boutique markets are developed.

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 that want to expand production

want to locate close to supplies. Species diversity also may influence regional production because style trends cycle and different species fall into and out of fashion. Therefore, states or regions with high volumes of timber and a broad composition of species have the greatest potential for future growth in hardwood lumber production.

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