

# Changes in Tennessee's Secondary Hardwood Processing and Sawmill Industries from 2005 to 2009

William G. Luppold  
Delton Alderman  
Doug Schnabel

---

## Abstract

Tennessee is in the center of the Eastern hardwood region and has experienced large declines in employment by primary and secondary hardwood processors since 2005 in a pattern similar to the one these processors have experienced nationally. The objective of this article is to examine changes in national hardwood processing industries between 2005 and 2009 and compare these changes with changes in secondary manufacturing employment and hardwood lumber production in Tennessee. The decline in employment in Tennessee's furniture industry was caused by increased imports of wooden furniture from Asia and reduced domestic furniture demand as the result of the 2009 recession. Reduced employment in Tennessee's flooring and kitchen cabinet industry was a function of the decline in home construction, large firms shifting production to other states, and the 2009 recession. Employment in the millwork industry was less affected perhaps because of shifts in production by larger firms from northern and western states to Tennessee. Declines in hardwood lumber consumption caused most large and very large sawmills in Tennessee to downsize and several medium and small mills to go out of business. The short-term outlook for Tennessee's secondary and primary hardwood manufacturers continues to be bleak except for pallets, crossties, and exports.

---

Wood product production declined between 2005 and 2009 as a result of a drop in housing starts after 2005 followed by the recession that began in 2008. The most indicative statistic showing this decline is the 40 percent reduction in employment by wood product manufacturing (North American Industry Classification System [NAICS] 321) during this period (US Department of Labor, Bureau of Labor Statistics [USDL-BLS] 2012). In addition, household furniture manufacturers who had already been losing employees because of international competition continued to lay off employees while employment in the kitchen cabinet industry declined after the drop in home construction (USDL-BLS 2012). The continued loss of employment in wood product production affected both hardwood and softwood lumber markets, while the decline in household furniture and kitchen cabinet production has especially affected hardwoods. However, it is difficult to examine the impact of declining markets on the hardwood lumber use and production industries on a national basis because of lack of data.

Tennessee is in the center of the Eastern hardwood region and has a diverse forest product industry (Young et al. 2007). This state has traditionally been the largest producer of wood flooring (US Department of Commerce [USDC]

2005), one of the largest producers of hardwood lumber (USDC 2007 to 2010), and home to numerous furniture, millwork, cabinet, and pallet manufacturers. The only major secondary hardwood product not manufactured in Tennessee is treated crossties, but several treating plants are located in adjacent states.

The size and diversity of Tennessee's forest products industry and the availability of detailed employment and production data for 2005 and 2009 (Tennessee Department of Agriculture 2006, 2010) make it ideal for examining the reduction in employment in secondary hardwood processing industries resulting from reduced hardwood lumber consumption and the decline in hardwood lumber production during this period. The objective of this article is to examine changes in national hardwood processing industries between

---

The authors are, respectively, Economist and Research Forest Products Technologist, USDA Forest Serv., Northern Research Sta., Princeton, West Virginia (wluppold@fs.fed.us [corresponding author], dalderman@fs.fed.us); and Retired Forest Business Program Specialist, Tennessee Div. of Forestry, Nashville. This paper was received for publication in October 2011. Article no. 11-00118.

©Forest Products Society 2012.

Forest Prod. J. 62(1):4-9.

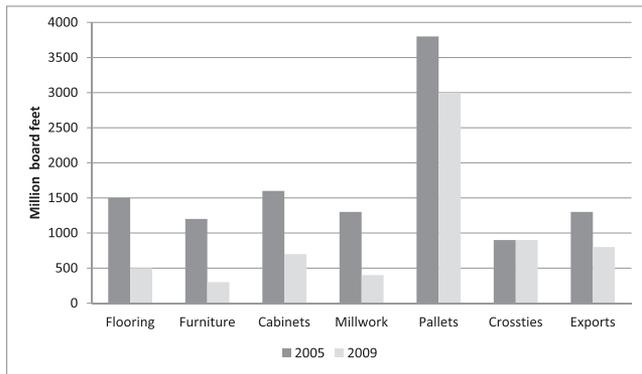


Figure 1.—National hardwood lumber consumption by major users of appearance grade lumber versus lumber consumption by pallet and crosstie producers in 2005 and 2009. Sources: *Hardwood Market Report (2009)* and *Johnson (2011a)*.

2005 and 2009 and compare these changes with changes in secondary manufacturing employment and hardwood lumber production in Tennessee. We will analyze changes in secondary hardwood manufacturing nationally by examining changes in hardwood lumber consumption and changes in employment. For Tennessee we will only examine employment data for secondary processors. Changes in the hardwood lumber industry will be analyzed in terms of lumber production nationally and lumber production and mill characteristics for the state of Tennessee.

The *Hardwood Market Report (2009)* and *Johnson (2011a)* are the only sources of recent hardwood lumber consumption data. These estimates are based on internal databases and input by manufacturing associations and individuals associated with the hardwood industry.

National estimates of long-term hardwood lumber production were derived from the revised data developed by Luppold and Bumgardner (2008). Estimates after 2006 are based on Current Industrial Reports Lumber production and mill stocks (USDC 2007 to 2010). Employment in major secondary hardwood processing industries was developed from USDL-BLS (2011). The NAICS defines these industries differently from most researchers who study these markets. For instance, NAICS includes flooring under the caption of “cut stock, resawing lumber, planing, and other millwork, including flooring.”

Every 4 years Tennessee collects information from all primary and secondary wood processors through a census conducted by County Service Foresters. Each firm is visited or called to obtain information on employment, volume of logs consumed and lumber produced, and primary products

and species produced. Although a few firms declined to participate in the census, more than 99 percent of the firms provided at least employment numbers and, in the case of primary manufacturers, lumber production data. Each firm is assigned a unique sequence number, which allows for the tracking of these operations over time. Because secondary processors do not report lumber consumption, the measurement for this sector is employment-stratified by the type of facility. Changes in the sawmill industry will be based on hardwood lumber production stratified by size class.

## Results

### Changes in national consumption, production, and employment 2005 to 2009

After historic high levels of hardwood lumber consumption in the 1990s, demand plummeted between 2005 and 2009 (*Hardwood Market Report 2009*, *Johnson 2011a*). As previously mentioned, the primary causes of this decline appear to be the decline in home construction between 2005 and 2009, the 2008 to 2009 recession, and the continuation of wood furniture imports from Asia causing a further decline in domestic furniture production. This series of events caused demand for lumber to decline dramatically (Fig. 1). National hardwood consumption plus exports declined from 11.6 billion board feet (BBF) in 2005 to 6.6 BBF in 2009 (*Hardwood Market Report 2009*, *Johnson 2011a*).

A review of NAICS definitions found six classifications that include our target industries (Table 1). Nationally, the decline in hardwood lumber demand has been greater in the more profitable appearance-based applications (furniture, cabinets, flooring, millwork, and most exports) than in the less profitable major industrial applications (pallets and crossties; Fig. 1). The only sawn hardwood lumber product that continued to be consumed at 2005 levels in 2009 was railroad crossties. The changes in end use have caused the proportion of lumber consumed in industrial applications to increase from 41 percent in 2005 to 60 percent in 2009 (*Hardwood Market Report 2009*, *Johnson 2011a*). This shift in hardwood lumber use caused the price of the most commonly traded appearance lumber (Mid-Grade, No. 1 Common) to decrease (Fig. 2) and hardwood lumber production (Fig. 3) to drop sharply. In contrast, the price of pallet cants and crossties continues to be at levels slightly higher than in 2005. As a result of these market conditions, most hardwood sawmills either reduced production, became idle, or went out of business between 2005 and 2009.

We examined changes in national employment for major hardwood using industries from December 2005 to December 2009 because most firms questioned for the Tennessee

Table 1.—Change in national employment in major hardwood lumber using industries between December 2005 and December 2009.<sup>a</sup>

Industry	% change Dec 2005–Dec 2009
NAICS 31321911: Wood windows and doors	–39.4
NAICS 31321918: Cut stock, resawing lumber, planing, and other millwork, including flooring	–40.2
NAICS 31321920: Wood containers and pallets	–17.8
NAICS 31337110: Wood kitchen cabinets and countertops	–40.6
NAICS 31337121: Upholstered household furniture	–39.3
NAICS 31337122: Nonupholstered wood household furniture	–47.8

<sup>a</sup> Source: US Department of Labor, Bureau of Labor Statistics (2011). NAICS = North American Industry Classification System.

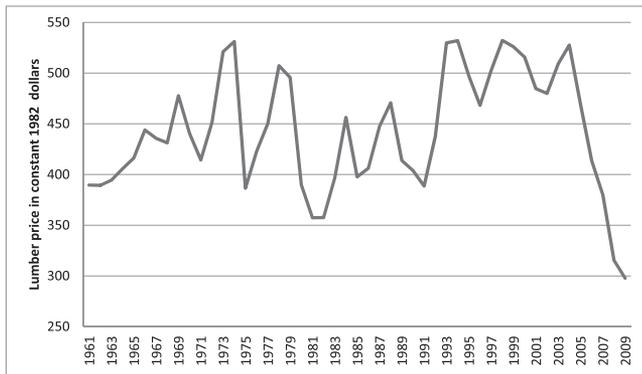


Figure 2.—No. 1 Common price for Appalachian hardwood species weighted by sawtimber volume in constant 1982 dollars per thousand board feet, 1960 to 2009. Source: Luppold and Bumgardner (2010).

census would likely provide year-end employment data. In general, the change in employment shown in Table 1 is less than the decline in hardwood lumber demand. One possible explanation for this inconsistency is that hardwood lumber is expensive and has continually been replaced by less expensive substitutes (Luppold and Bumgardner 2008). Even the pallet industry has been substituting recycled pallet lumber for new lumber (Bejune et al. 2002).

### Changes in employment in Tennessee's secondary hardwood industries 2005 to 2009

Oak strip flooring is the primary flooring product manufactured nationally and in Tennessee. In addition, one large laminated truck flooring manufacturer uses oak. The flooring industry employed 2,433 workers in 2005, and eight large mills employed 2,410 of these workers. Between 2005 and 2009, three of these large plants closed, the other five large plants reduced employment, one small plant became idle, two small plants opened, and employment in this sector declined by 69 percent (Table 2). The corporation that operated two of the large flooring plants that closed also reduced employment by nearly 50 percent at its remaining Tennessee plant but continued high rates of production at its newest facility in West Virginia (Johnson 2011b). As a result of plant closures and shifting production to operations outside of Tennessee, the decline in employment in Tennessee's flooring industry between 2005 and 2009 was 72 percent, which was greater than the 40 percent decline in national employment for the NAICS code that includes this industry.

The furniture industry in Tennessee in 2005 included a diverse set of manufacturers who produced chairs, wooden case goods, upholstered furniture, and furniture parts. In 2005, nearly 8,000 workers were employed by the Tennessee furniture manufacturing sectors in 58 plants, ranging in size from one person to more than 1,000 (Table 2). Nineteen furniture operations went out of business or became idle between 2005 and 2009, eight of which were small (fewer than 25 employees), five were medium-sized (25 to 99 employees), and three were large (100 or more employees). Although we were unable to determine the products manufactured by the idled and closed operations, manufacturers of wood household furniture were disproportionately affected. Overall, employment in Tennessee's

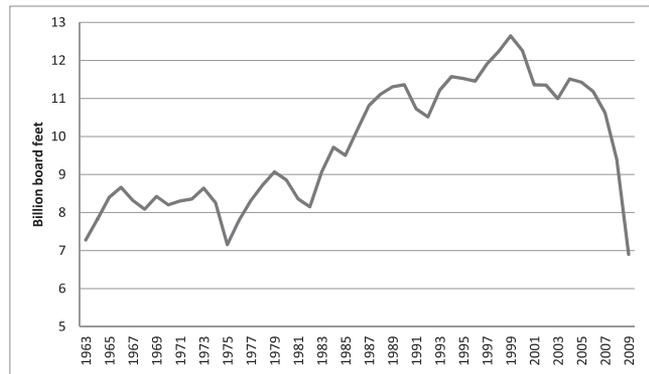


Figure 3.—Eastern US hardwood lumber production in billions of board feet (BBF), 1963 to 2009. The official estimate developed by the US Department of Commerce (USDC), Bureau of Census excluded the production in smaller mills starting in 2009, pushing this estimate down to 4.8 BBF. In past years, these excluded mills were estimated to produce around 40 percent of the hardwood lumber manufactured in the eastern United States. Using this information, we estimated production to be 6.7 BBF. Sources: Luppold and Bumgardner (2008) and USDC (2007 to 2010).

furniture industry declined by 50 percent between 2005 and 2009. This decline is greater than the 39 percent decline in upholstered furniture employment nationally but close to the 48 percent decline in nonupholstered furniture employment.

As in the case of flooring and furniture, the 50 percent decline in employment in Tennessee's cabinet industry was greater than the 40 percent decline in employment in this industry nationally. In 2005, Tennessee had 52 cabinet plants employing 1,411 workers (Table 2). The three largest operations employed 64 percent of the workers, the nine medium-sized operations employed an additional 30 percent, and the 40 small operations employed 6 percent. The decline in this industry between 2005 and 2009 disproportionately affected larger operations; only one of the three large and four of the nine medium-sized operations were still operating by 2009. The two large operations that closed were associated with a holding company that has larger plants in Indiana and Iowa. All of the 14 new operations were small, and most employed 10 or fewer workers. This shift in industrial demographics resulted in the small operations employing 45 percent of the workforce in 2009.

Millwork products include moulding, doors, windows, stair parts, and custom wood fixtures. In 2005, Tennessee had 21 millwork manufacturers; 11 of these operations were small, 8 were medium-sized, and 2 were large manufacturers. Both large operations are associated with national corporations that have multiple plants, most of which are located in northern and western states. Between 2005 and 2009 Tennessee's millwork industry lost two medium-sized firms and 12 percent of its workforce. The two large plants lost only 4 percent of their workforce, while medium-sized firms lost 39 percent. The 12 percent decline in Tennessee's millwork manufacturers' employment between 2005 and 2009 is considerably less than the 40 percent decline in national employment in this industry during this period. One possible explanation for the small decline in employment in the two larger operations is that the cost of labor is lower in

Table 2.—Change in the number of secondary forest manufacturers in Tennessee and number of employees in these facilities in 2005 and 2009 by facility type.<sup>a</sup>

Facility type	2005		2009		% change	
	No. of mills	No. of employees	No. of mills	No. of employees	No. of mills	No. of employees
Flooring	12 <sup>b</sup>	2,433	10	750	-17	-69
Furniture	58	7,977	40	3,925	-31	-51
Kitchen cabinets	52	1,411	58	575	12	-50
Millwork	21	1,498	23	1,312	10	-12
Pallets	58	1,215	58	966	0	-20
Total	201	14,534	189	7,528	-6	-50

<sup>a</sup> Sources: Tennessee Department of Agriculture (2006, 2010).

<sup>b</sup> Two of these mills had gone out of production before being surveyed in 2006. It was estimated that these mills employed 500 workers in 2005 (Johnson 2011b).

Tennessee than in northern and western states, resulting in the corporations shifting production to Tennessee.

The number of pallet plants in Tennessee showed little net change because the number of new plants equaled the number of plants that went idle or out of business. The 12 new plants employed more workers than the 12 plants that were closed or idled, which indicates the 20 percent decline in employment between 2005 and 2009 was caused by reduced employment in the remaining plants. The 20 percent decline in employment in Tennessee's pallet industry between 2005 and 2009 is close to the 18 percent decline in national employment for this industry.

### Changes in Tennessee's sawmilling industry 2005 to 2009

The primary product manufactured by hardwood sawmills can range from pallet cants to high-quality kiln-dried (KD) lumber. For this article, we segmented the primary lumber into six hardwood lumber product groups: green lumber, KD lumber, crossties, pallets, other, and not specified (Table 3). It should be noted that most mills produce more than one of these products. The "other" category includes manufacturers who listed staves, handles, softwood products, and other miscellaneous items as their primary product. These products are usually manufactured in small sawmills (producing 1 to 2.9 million board feet [MMBF] annually) and micromills (producing less than 1 MMBF annually). The "not specified" primary products were manufactured by micromills that did not provide primary product information.

Random length, random width green or air-dried lumber (green lumber) is the most common hardwood lumber product manufactured in Tennessee. Green lumber can be marketed by any size mill but tends to be sold in higher proportions by medium-sized sawmills (producing 3 to 4.9 MMBF annually), small-sized mills, and micromills. In 2005 and 2009 the average green sawmill produced 2.6 and 2.1 MMBF, respectively.

KD lumber can be sold random length, random width, or sorted by length and width. Before the decline in the market, KD lumber tended to be produced by large mills (producing 5 to 9.9 MMBF annually) and very large mills (producing 10 MMBF or more annually). The decline in demand for appearance lumber coincides with the decline in the average size of KD mills in Tennessee, which decreased from 6.7 MMBF in 2005 to 3.7 MMBF in 2009.

Crossties have traditionally been manufactured by smaller sawmills or large mills that specialize in industrial products. In 2005 and 2009, the average tie mill produced 2.1 and 2.0 MMBF, respectively. Pallet lumber can be manufactured by mills of all sizes because it is normally produced from the low-grade centers of logs or cants. In 2005 and 2009, the average pallet mill produced 3.8 and 2.6 MMBF, respectively.

In 2005, mills that listed green lumber as their primary product accounted for 60 percent of the lumber produced in Tennessee, and mills that produced KD lumber accounted for an additional 11 percent (Table 3). Green and KD lumber are normally graded using National Hardwood Lumber Association rules, and these products are primarily used for appearance lumber, but some low-grade green

Table 3.—Changes in the number of hardwood sawmills in Tennessee and volume of lumber produced by these mills for 2005 and 2009 by hardwood lumber product group.<sup>a</sup>

Hardwood lumber product group <sup>b</sup>	2005		2009		% change	
	No. of mills	Volume (MMBF)	No. of mills	Volume (MMBF)	No. of mills	Volume (MMBF)
Green lumber	196	507	123	269	-37	-47
KD lumber	14	94	11	41	-21	-56
Crossties	49	104	44	90	-10	-13
Pallet/cants	4	128	34	87	0	-32
Other <sup>c</sup>	23	15	19	11	-17	-27
Not specified	2	3	8	5	300	167
Total	318	851	239	503	-25	-41

<sup>a</sup> Sources: Tennessee Department of Agriculture (2006, 2010). MMBF = million board feet; KD = kiln dried.

<sup>b</sup> The first product listed in product category of the survey. Most mills produce more than one hardwood lumber product.

<sup>c</sup> Other includes staves, handle blanks, cedar products, and other miscellaneous wood products.

Table 4.—Changes in the number of hardwood sawmills in Tennessee and volume of lumber produced by these mills for 2005 and 2009 by size class.<sup>a</sup>

Size class by MMBF	2005		2009		% change	
	No. of mills	Volume (MMBF)	No. of mills	Volume (MMBF)	No. of mills	Volume (MMBF)
Very large, ≥10	26	363	12	160	-54	-56
Large, 5–9.9	29	192	17	117	-41	-39
Medium, 3–4.9	40	145	22	86	-45	-41
Small, 1–2.9	62	105	58	103	-6	-2
Micro, <1	161	46	130	37	-19	-20
Total	318	851	239	503	-25	-41

<sup>a</sup> Sources: Tennessee Department of Agriculture (2006, 2010). MMBF = million board feet.

lumber can end up in pallets. In 2009, the volume of lumber produced by mills whose primary product was green or KD lumber declined by 47 and 56 percent, respectively (Table 3).

In contrast, the volume of lumber produced by mills whose primary product was crossties and pallets declined by 13 and 32 percent, respectively. This movement away from lumber used for appearance purposes noted in national markets (Fig. 1) is consistent with primary product trends shown in Table 3. Since 2005, the shift to less profitable industrial products was primarily caused by the decline in the housing market. Therefore, the large shift to the production of industrial products versus appearance production in all likelihood is temporary, contingent on an improving economy.

The 41 percent decline in hardwood lumber products manufactured in Tennessee between 2005 and 2009 is similar to the 40 percent decline in Eastern production during this period. This indicates that changes in Tennessee's sawmill industry during this market contraction may mirror changes in the industry at large. At first glance the most affected mills by size class were very large mills (Table 4). The number of mills and volume produced declined by 54 and 56 percent, respectively, between 2005 and 2009. Although three very large mills went out of business, most of the decline in the number of very large mills was the result of 14 mills reducing production by the equivalent of one or more size classes. Three mills increased production to the point where they jumped up one size class to become very large mills, and two of those mills listed crossties or pallet cants as their primary product.

Although large mills appear to have fared better than very large mills, the percent change in numbers and volume produced can be deceiving. Of the 29 large mills operating in 2005, 8 went out of business, 1 was idled, and 11 reduced production by one or more size classes by 2009. The decline in the large mill was partially offset by the construction of a green mill and a crosstie mill. Of the 40 medium-sized mills operating in 2005, 7 went out of business in 2009, 7 were idled, and 15 reduced production by the equivalent of one or more size classes. One new medium-sized mill that primarily produces crossties was added between 2005 and 2009.

The proportion of Tennessee's hardwood lumber manufactured in small mills increased from 12 percent in 2005 to 20 percent in 2009. Most of this increase was the result of larger mills downsizing or micromills upsizing. Of the 62 small mills operating in 2005, 11 went out of business in 2009, 17 were idled, and 15 reduced production, thus downsizing them to the micromill classification. This

decline was partially offset by the addition of three crosstie mills, one pallet cant mill, one stave mill, and one green mill. The greatest decline in active mills, in absolute numbers, occurred in micromills. Of the 161 micromills in operation in 2005, 11 were out of business in 2009 and 34 were idle. The decline in micromills was partially offset by the restarting of six micromills that were idled in 2005 and the addition of 18 new mills. Of the 24 restarted or new mills that provided product information, 6 listed green lumber as the primary product, 5 listed crossties, 2 listed pallet material, and 5 listed "other" items (framing lumber, cedar, and other miscellaneous items) as their primary product.

## Conclusions

The objective of this article was to examine changes in national hardwood processing industries between 2005 and 2009 and compare these changes to change in secondary manufacturing employment and hardwood lumber production in Tennessee. Of the secondary processing plants operating in Tennessee, wood flooring had the greatest relative loss in employment, which was caused by reduced demand for this product, and one company's production shifted away from Tennessee to a newer mill in West Virginia. Tennessee's furniture industry employed nearly 8,000 workers in 2005 but downsized to a little under 4,000 workers in 2009. It appears that goods and other wood household products were disproportionately affected. With the exception of millwork, the recession seems to have disproportionately affected larger operations over smaller operations.

The 50 percent decline in employment in Tennessee's kitchen cabinet industry was largely the result of the closing of two large operations whose parent company shifted production to plants in other states. In contrast, employment in Tennessee's millwork sector declined by only 12 percent between 2005 and 2009. It appears that the decline in employment in the two larger operations was due to shifting employment from higher labor cost states to Tennessee.

Nationally, employment in the pallet industry declined by 18 percent between 2005 and 2009, while Tennessee's pallet workforce declined by 20 percent. Since 2005, the decline in hardwood lumber consumption by this industry sector was caused by the reduced use of pallets and increased use of recycled pallet and pallet parts. This relatively small decline in pallet production, combined with nearly constant demand for crossties, is the primary reason that demand for industrial products increased from 40 percent in 2005 to 60 percent in 2009.

In 2005, Tennessee mills that listed green or KD lumber as their primary product accounted for 71 percent of lumber production. This declined to 59 percent in 2009, reflecting the decline in the consumption of appearance grade lumber. Both the number and average size of Tennessee's sawmills declined from 2005 to 2009. The decline in the proportion of lumber produced by very large and large operations is a function of reduced production. The decreased production by medium-sized mills is a result of firms going out of business or idling their operations.

Since 2009, the markets for hardwood lumber have improved but have continued to be anemic compared with 2005. Pallet and crossties continue to be consumed at levels slightly lower than in 2005, while the consumption of all other secondary products remains at or below recession levels. The price of pallet cants and untreated crossties continues to be at levels slightly higher than in 2005; the prices of No. 1 Common lumber for most species have declined since mid-2010. The short-term outlook for Tennessee's and the overall US secondary and primary hardwood manufacturers continues to be bleak with the exception of pallets, crossties, and exports. It appears now that the only thing that can improve hardwood markets is an increase in housing starts or a dramatic increase in exports.

### Literature Cited

- Bejune, J., R. Bush, P. Araman, B. Hansen, and D. Cumbo. 2002. Pallet industry relying more on recovered wood material. *Pallet Enterp.* October:20–27.
- Hardwood Market Report. 2009. 2008: The year at a glance, 12th annual statistical analysis of the North American hardwood marketplace. Hardwood Market Report, Memphis, Tennessee.
- Johnson, J. (Editor, Hardwood Market Report). 2011a. Estimates of hardwood lumber consumption 2009. Personal communication.
- Johnson, J. (Editor, Hardwood Market Report). 2011b. Personal communication.
- Luppold, W. and M. Bumgardner. 2008. Regional analysis of hardwood lumber production: 1963–2005. *North. J. Appl. Forestry* 25(3): 146–150.
- Luppold, W. and M. Bumgardner. 2010. An analysis of declines in hardwood lumber price of the past 40 years. *HMR Executive* 4(4):1–7.
- Tennessee Department of Agriculture. 2006. Spread sheet of mill capacities for calendar year 2005. Provided by the Tennessee Department of Agriculture, Division of Forestry, Nashville.
- Tennessee Department of Agriculture. 2010. Spread sheet of mill capacities for calendar year 2009. Provided by the Tennessee Department of Agriculture, Division of Forestry, Nashville.
- US Department of Commerce (USDC). 2005. 2002 Census of manufacturers. USDC, Washington, D.C. <http://www.census.gov/prod/ec02/ec0231i321918t.pdf>. Accessed June 28, 2011.
- US Department of Commerce (USDC). 2007 to 2010. Current industrial report, lumber production and mill stocks. MA24T. USDC, Washington, D.C.
- US Department of Labor, Bureau of Labor Statistics (USDL-BLS). 2011. Employment, hours, from the current employment statistics survey (national). USDL, Washington, D.C. <http://data.bls.gov/pdq/querytool.jsp?survey=ce>. Accessed March 4, 2011.
- US Department of Labor, Bureau of Labor Statistics (USDL-BLS). 2012. Employment, hours, from the current employment statistics survey (national). USDL, Washington, D.C. <http://data.bls.gov/pdq/querytool.jsp?survey=ce>. Accessed February 27, 2012.
- Young, T. M., D. G. Hodges, and T. Rials. 2007. The forest products economy of Tennessee. *Forest Prod. J.* 57(4):12–19.