

The forest products economy of Tennessee

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Tennessee is dominated by forests. More than 14 million acres—or a little more than half the state—are classified as forests. Tennessee forests provided 225 million ft³ of hardwood roundwood production and 99 million ft³ of softwood roundwood production in 2001. Forest products are an essential component of the Tennessee economy and are part of the rich economic heritage of the state. In 2000, forests and forest products accounted for 6.6 percent of the state's economy and generated \$21.7 billion in economic output (English et al. 2003). The state is the number one producer of hardwood flooring and is ranked second in the United States in hardwood lumber production (U.S. Dept. of Commerce 2005a, 2005b, 2006). More than 180,000 Tennesseans are directly and indirectly employed by the forest products industry (English et al. 2003). Tennessee is known by many as “The Hardwood Capital of the World” (Tennessee Forestry Association 2005).

The intent of this manuscript is to provide a “state-level” template for documenting contributions of the forest products economy. This template may be noteworthy in the process of allocating public and private fiscal resources in times of constrained budgets, strong international competition, and unprecedented economic change.

A brief overview and historical perspective

The acres of Tennessee land classified as forest have grown from approximately 9.4 million in the early 20th century to exceed 14.4 million acres by the end of the 20th century. Eighty-nine percent of the forests in the state are classified as hardwood, with more than 52 percent of the forestland in upland hardwoods (an increase of more than 400% in this type since the early 1950's). Nonindustrial private landowners own more than 80 percent of Tennessee's forests (Schweitzer 2000, Vissage and Duncan 1990, Birdsey 1983, Murphy 1972, Strenitzke 1962, Hedlund and Earles 1971, Wheeler 1952).¹

Population growth, urbanization, and land fragmentation may have the greatest impact on Tennessee forests. The trend in the private ownership of the forests has shifted from farmers to absentee landowners with the number of landowners increasing sharply while the average acreage of ownership has decreased; e.g., 91 percent of all private forestland owners, who account for 37 percent of the total private forestland acreage, own less than 50 acres. Alig et al. (2002) project this trend in forest ownership to continue as Tennessee's population is expected to increase by almost 1.4 million people by 2030 (U.S. Bureau of Census 2005).

British and Scotch-Irish pioneers migrated south to Tennessee from Virginia in the early 1700's and established some of the state's first permanent settlements, e.g., Joneborough (Holt, 1923). Tennessee was admitted to statehood in the United States of America on June 1, 1796. As Tennessee was settled in the 18th and 19th centuries, millions of board feet (BF) of red cedar (*Juniperus virginia*) were harvested for railroad ties, while other extensive timber harvesting of yellow-poplar (*Liriodendron tulipifera*), oak (*Quercus* sp.) and hickory (*Carya* sp.) occurred (White 1947). In 1869, Tennessee produced 205 million BF of mostly hardwood lumber (Tennessee Forest Industries Committee

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1964). By 1900, forest products were the second largest contributor to the state's economy, and in 1909 annual production of lumber in Tennessee exceeded 1.2 billion BF (Freeman 1965, May 1991). In the early 1900's the world's largest wood distillation plant in upper East Tennessee produced millions of tons of acetate of lime, millions of bushels of charcoal, and thousands of gallons of wood alcohol (Rothrock 1936).

In 1954, three-fifths of all industrial establishments in Tennessee were forest-dependent plants (Tennessee Forest Industries Committee 1957). These forest-dependent plants provided employment for 14 percent of all industrial workers, contributed 10 percent to the state's industrial payroll, and accounted for 10 percent of the value of all manufactured products (Tennessee Forest Industries Committee 1957). As quoted by White (1957) in the mid-twentieth century, "Tennessee is still ranked in comparison with the States of the Union as a timber state."

Data sources

Primary data sources for economic value were the Tennessee Agri-Industry Model (TN-AIM) based on the Impact Analysis for Planning (IMPLAN) model (Olson and Lindall 1999, English et al. 2001, 2003). Data sources for population and manufacturing statistics came from the U.S. Census Bureau Annual Survey of Manufacturers, U.S. Department of Commerce, Bureau of Economic Analysis, and U.S. Department of Labor, Bureau of Labor Statistics, see Literature Cited. Other data sources included the Univ. of Tennessee, College of Business, Tennessee Statistical Abstract. A range of U.S. Forest Service, Forest Experiment Station resource and general bulletins were also used in the analysis (see Literature cited).

One of the challenges of compiling a summary document from a wide range of sources of economic statistics at the state level is the inconsistency of classification types, time frames and statistical information reported in the literature. The ending time frame for most of the analyses used in this manuscript is the year 2000. In some instances, if the data sources allowed for consistent compilation, data were compiled up to the year 2004.

The USDA Forest Service in the mid-70's developed IMPLAN for community impact analysis. The current IMPLAN input-output database and model are maintained and sold by MIG, Inc. (Minnesota IMPLAN Group), <http://www.implan.com/index.html>. The National Technical Support Centers are supporting usage of IMPLAN throughout the USDA Natural Resources Conservation Service (NRCS). They have provided IMPLAN training and models to each NRCS state and have available all 50 state and 3,000 county datasets. The IMPLAN software can combine any combination of counties and states into one study area. (More information can be found at the link: <http://www.economics.nrcs.usda.gov/technical/implan/index.html>.) A template for any state can be developed by using the summary that follows and

the IMPLAN database with the aforementioned other public data sources.

Economic value of forest products in Tennessee

The contribution of forest products to the Tennessee economy increased from \$18.2 billion in 1997 to \$21.7 billion in 2000, (Table 1) (see <http://aimag.ag.utk.edu/pubimpact.html> for complete report) (English et al. 2001, 2003). During the same period, the economic contribution of forest products as a percent of all economic value in the state declined from 9.8 percent to 6.6 percent. Among the state's agricultural sectors in 2000, forest products manufacturing was exceeded only by food manufacturing in economic contribution to the state.

Of the \$21.7 billion of economic value added by this sector in 2000, \$11.9 billion was from direct industrial output, and \$2.5 billion was from the direct effect of salaries and wages. Secondary forest products manufacturing contributed \$13.8 billion in economic value, and primary forest products manufacturing contributed \$7.6 billion in economic value. The top sectors contributing to total economic value for both 2000 and 1997 were: (1) paper and allied products (secondary); (2) pulp, paper and paperboard mills (primary); (3) furniture; and (4) sawmills, planing and flooring mills.²

The forest products industry employed 184,297 Tennesseans in 2000 (Table 1). From 1997 to 2000 employment increased by 10,371 jobs. Economic contributions from wages and salaries increased from \$4.8 billion in 1997 to \$5.7 billion in 2000. The pulp, paper, and paperboard mills (primary) and paper and allied products (secondary) employed 71,989 Tennesseans in 2000. The furniture sector was the second largest employer in 2000 employing 43,657

Table 1. — Direct and total economic contribution of the forest products industry in Tennessee.^a

	Direct effects		Total effects	
	1997	2000	1997	2000
Effects of all forest products on the Tennessee economy ^b				
Total industrial output	\$10.4	\$11.9	\$18.2	\$21.7
Employment	68,156	77,394	173,926	184,297
Wages and salaries	\$2.3	\$2.5	\$4.8	\$5.7
Value-added	\$3.7	\$4.1	\$8.1	\$9.5
Effects of secondary forest products on the Tennessee economy ^b				
Total industrial output	\$6.9	\$7.8	\$11.9	\$13.8
Employment	53,094	54,453	116,211	120,951
Wages and salaries	\$1.6	\$1.7	\$3.2	\$3.6
Value-added	\$2.4	\$2.6	\$5.3	\$6.0
Effects of primary forest products on the Tennessee economy ^b				
Total industrial output	\$3.5	\$3.9	\$6.3	\$7.6
Employment	15,062	21,676	57,715	60,833
Wages and salaries	\$0.7	\$0.8	\$1.6	\$2.0
Value-added	\$1.3	\$1.4	\$2.8	\$3.4

^a English et al. (2001, 2003); USDA, The Natural Resources Inventory and Analysis Institute. 2003. NRCS IMPLAN Analysis.

^b <http://waterhome.brc.tamus.edu/NRCSdata/implan/>.

^c Dollar amounts in billions.

Table 2. — Primary manufacturing contributions to economic value by sector and region.^a

Primary manufacturing and economic sector	1997	2000	Value change	Percent change
	-----(\$million)-----			(%)
Pulp, paper & paperboard mills	3683	5049	1366	37
Chattanooga	2277	954	-1323	-58
Knoxville	170	54	-116	-68
Memphis	677	3367	2690	397
Nashville	43	98	55	128
Tri-Cities	306	276	-30	-10
Intrastate trade	210	300	90	43
Sawmills, planing & flooring mills	1926	2260	334	17
Chattanooga	552	60	-492	-89
Knoxville	837	413	-424	-51
Memphis	49	552	503	1027
Nashville	309	1005	696	225
Tri-Cities	110	139	29	26
Intrastate trade	69	91	22	32
Logging	433	271	-162	-37
Chattanooga	87	27	-60	-69
Knoxville	124	46	-78	-63
Memphis	62	64	2	3
Nashville	80	114	34	43
Tri-Cities	51	14	-37	-73
Intrastate trade	29	6	-23	-79
Forest & forestry products	262	294	32	12
Chattanooga	68	33	-35	-51
Knoxville	114	46	-68	-60
Memphis	23	73	50	217
Nashville	40	104	64	160
Tri-Cities	12	24	12	100
Intrastate trade	5	14	9	180
Total primary	6304	7874	1570	25

^a English et al. (2001, 2003); USDA, The Natural Resources Inventory and Analysis Institute. 2003. NRCS IMPLAN Analysis Site. <http://waterhome.brc.tamus.edu/NRCSdata/implan/>.

Tennesseans. The only sector to lose employment between 1997 and 2000 was the forest and forestry products sector.

The pulp, paper, and paperboard mills (primary), and paper and allied products (secondary) contributed \$10.5 billion (49%), the largest proportion of the \$21.7 billion of total economic value in 2000 (Tables 2 and 3). These two sectors contributed 46 percent, or \$8.4 billion, of the \$18.2 billion of the total economic value in 1997. Furniture contributed 20 percent, or \$4.4 billion, of the total economic value in 2000 and 22 percent, or \$4.0 billion, in 1997. Sawmills, planing and flooring mills contributed 10 percent, or \$2.3 billion, of the total economic value in 2000 and 11 percent, or \$1.9 billion, in 1997.

Other sectors that increased in total economic value from 1997 to 2000 were: other wood products (\$0.9 billion increase); and millwork, veneer, plywood and structural wood (\$0.9 billion increase). Sectors that decreased in total economic value from 1997 to 2000 were: forest and forestry products (-\$1.0 billion); mobile homes and wood buildings (-\$0.3 billion); and logging (-\$0.2 billion).

The study by Sun and Zhang (2006) may partially explain the decline in the logging sector in Tennessee. Sun and Zhang (2006) estimated harvesting margins for the

Table 3. — Secondary manufacturing contributions to economic value by sector and region.^a

Secondary manufacturing and economic sector	1997	2000	Value change	Percent change
	-----(\$million)-----			(%)
Paper & allied products	4754	5539	785	17
Chattanooga	2051	566	-1485	-72
Knoxville	1188	469	-719	-61
Memphis	504	2439	1935	384
Nashville	490	1471	981	200
Tri-Cities	343	402	59	17
Intrastate trade	178	192	14	8
Furniture	4017	4369	352	9
Chattanooga	452	1429	977	216
Knoxville	684	1268	584	85
Memphis	1167	376	-791	-68
Nashville	1310	849	-461	-35
Tri-Cities	141	153	12	9
Intrastate trade	263	294	31	12
Other wood products	1227	1645	418	34
Chattanooga	335	111	-224	-67
Knoxville	284	614	330	116
Memphis	99	360	261	264
Nashville	358	388	30	8
Tri-Cities	104	112	8	8
Intrastate trade	47	60	13	28
Mobile home & wood buildings	1076	1227	151	14
Chattanooga	209	7	-202	-97
Knoxville	333	665	332	100
Memphis	8	161	153	1913
Nashville	484	353	-131	-27
Tri-Cities	0	3	3	300
Intrastate trade	42	38	-4	-10
Millwork, veneer, plywood & structural wood	831	1094	263	32
Chattanooga	296	61	-235	-7
Knoxville	200	267	67	34
Memphis	58	370	312	538
Nashville	206	313	107	52
Tri-Cities	36	43	7	19
Intrastate trade	35	40	5	14
Total secondary	11905	13874	1969	17

^a English et al. (2001, 2003); USDA, The Natural Resources Inventory and Analysis Institute. 2003. NRCS IMPLAN Analysis Site.

logging sector by state and found that the Tennessee logging sector had the second lowest mean and second highest coefficient of variation (CV) harvesting margins for hardwood sawtimber among 11 southern states. The harvesting margins for pine pulpwood and pine sawtimber products are close to the median values of the other 11 states. A low mean harvesting margin indicates less income for loggers, and a high CV indicates income volatility. This may imply that in the presence of an increase in primary and secondary sectors net imports of hardwoods are occurring in the Tennessee logging sector.

Contribution to economic value

In 2000, the Memphis region contributed the most forest products-related economic value, with \$7.7 billion (Tables 1 and 2). The \$7.7 billion represented an increase of 293 percent from the \$2.6 billion contributed by this region in 1997 (Fig. 1). The significant improvement in forest products economic value in the Memphis region was

the strength of improved economic value for the entire state between 1997 and 2000. The Nashville region was the second largest forest products contributor with \$4.7 billion in economic value in 2000, a 41 percent increase from the \$3.3 billion contributed by this region in 1997.

The Memphis region had improvements in economic value from every forest products sector between 1997 and 2000, with the exception of furniture. A significant increase of \$2.7 billion in economic value occurred between 1997 and 2000 in the primary pulp, paper and paperboard sector, in conjunction with an increase of \$1.9 billion from the secondary paper and allied products sector. All other sectors in the Memphis region, with the exception of furniture had combined economic improvements of \$1.3 billion between 1997 and 2000. Furniture in the Memphis region had a loss of \$0.8 billion in economic value between 1997 and 2000.

Chattanooga and Knoxville had reductions in forest products economic value between 1997 and 2000. Chattanooga contributed \$3.3 billion in economic value from forest products in 2000, a reduction of 47 percent from the \$6.3 billion contributed by this region in 1997. Knoxville contributed \$3.8 billion in economic value from forest products in 2000, a reduction of 2 percent from the \$3.9 billion contributed by this region in 1997.

The Chattanooga region had decreases in economic value from every forest products sector between 1997 and 2000, with the exception of furniture. The weakness in Chattanooga between 1997 and 2000 came from a loss of \$1.3 billion in economic value from the primary pulp, paper and paperboard sector combined with a loss of \$1.4 billion from the secondary paper and allied products sector. All other sectors in Chattanooga, with the exception of furniture had combined economic losses of \$1.4 billion between 1997 and 2000. Furniture in the Chattanooga region had a growth of almost \$1.0 billion in economic value between 1997 and 2000.

The intrastate relocation in primary and some secondary forest products industries from eastern Tennessee towards western Tennessee, primarily the Memphis region, may be explained by a study by Tilley and Munn (2006). Tilley and Munn (2006) used IMPLAN to compare state-level economic contributions and changes in the South. The results revealed that from 1992 to 2001, forest-based industries and economic contributions were declining in North Carolina and Virginia, and increasing in Mississippi and Louisiana. This interstate economic relocation may partially explain why the forest-based industries in the Memphis region increased (close proximity to Mississippi and Louisiana), while the eastern Tennessee, Chattanooga and Knoxville, regions declined. Another factor in the relocation may be changes in land use and population density. Land use changed from forest to developed and population density increased most significantly between 1990 and 1999 in the eastern half of the state (Wear and Greis 2002). As a result, less land is available for timber production in the eastern portion of Tennessee, relative to historical availability, than in the West. Moreover, these regional trends are projected to continue through 2020 (Hardie et al. 2000).

Figure 1. — Proportion of economic value by intrastate region in Tennessee, 1997 and 2000.

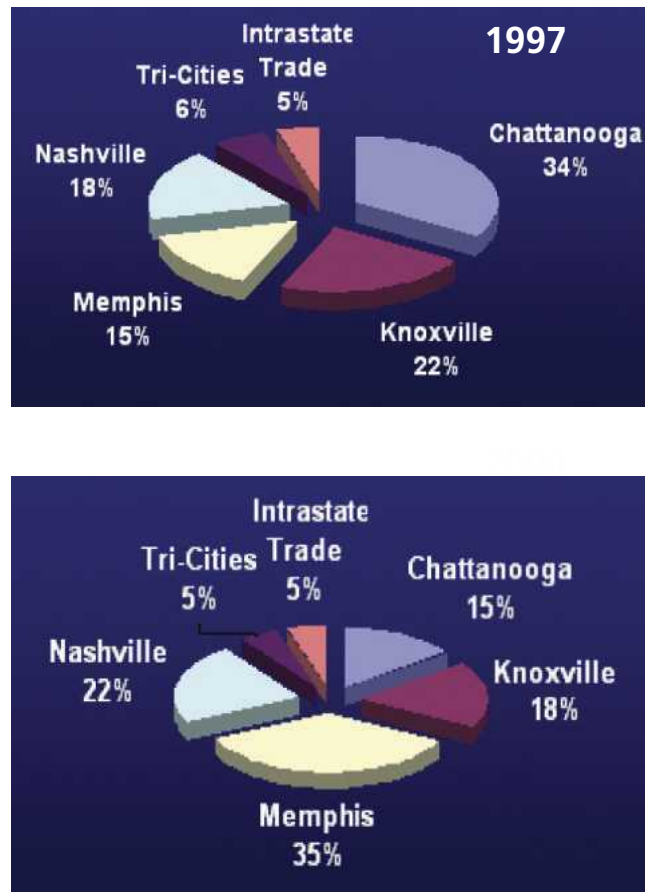


Figure 2. — Per capita income for the United States, South and Tennessee (1954 to 2004).

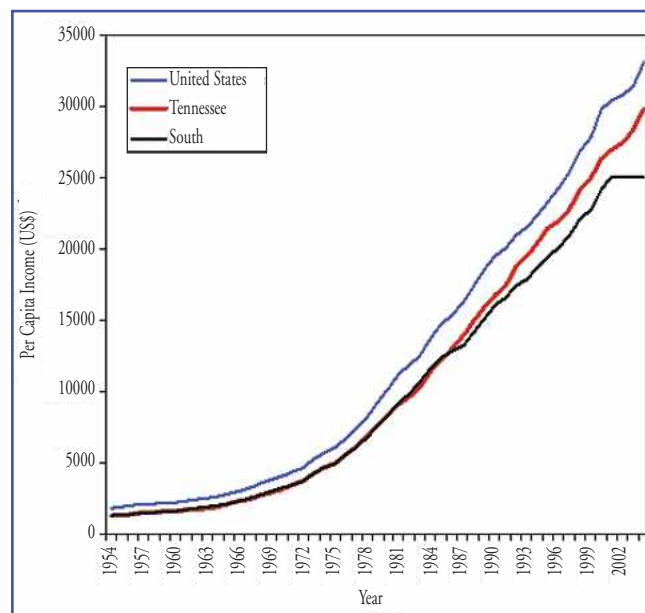


Figure 3. — Tennessee per capita income for the manufacturing sector and wood related industries (1958 to 2000).

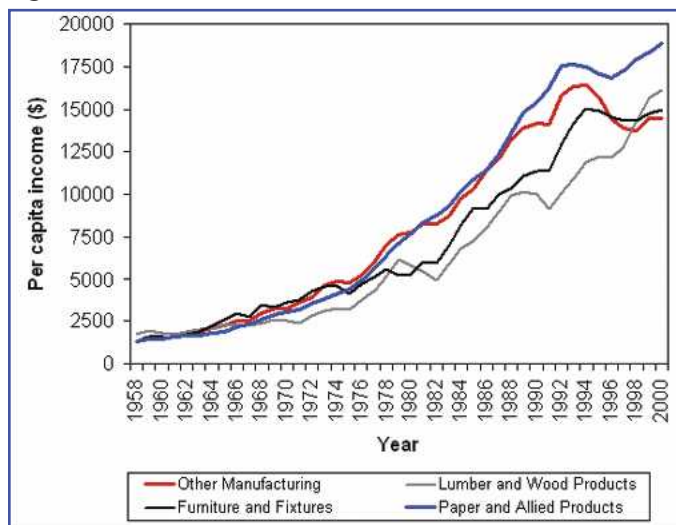
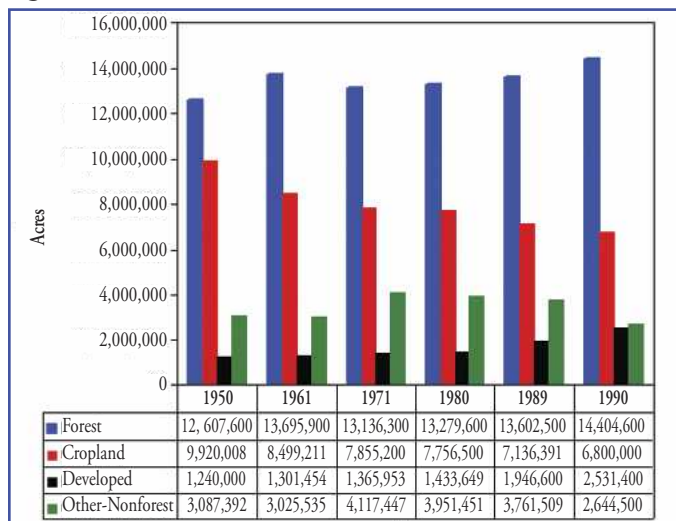


Figure 4. — Trends in land use in Tennessee, 1950-1999.



Economic and demographic trends

The U.S. population is approaching 300 million people, of which more than 85 million people live in the South and more than 5.9 million live in Tennessee (U.S. Bureau of the Census 2005).³ The Tennessee population is projected to exceed 7.3 million people by 2030 (U.S. Bureau of the Census 2005). Tennessee is the 16th most populous state in the United States and 6th most populous state among the southern states. Twenty percent of Tennessee's population by 2030 is projected to be classified as elderly, i.e., 65 and over (U.S. Bureau of the Census 2005). Population growth in Tennessee will come largely from high rates of migration of childbearing age people (Bloom et al. 2002).

Population growth and urbanization in Tennessee will likely have unprecedented effects on forestland use and the forest products economy in the state by 2030 (Alig et al. 2002). The pattern of land fragmentation and forest ownership will likely continue as Tennessee's population is projected to increase by almost 1.5 million people by 2030 (U.S.

Bureau of the Census 2005). Gobster and Rickenbach (2004), Kline et al. (2004), and Wear et al. (1999) have all documented that timber production and active forest management decline when population densities increase. Stein et al. (2005) project that many private forests in the eastern United States are likely to see dramatic increases in housing development in the next three decades, with consequent impacts on ecological, economic, and social services. Significant housing density increases in more than 15 Tennessee counties are projected to shift 20 to 40 percent of the forestland base to exurban use by 2030, e.g., Memphis, Nashville and Knoxville metropolitan areas (Stein et al. 2005).⁴

Per capita income

Per capita income in Tennessee was lower than the U.S. per capita from 1954 to 2004 (Fig. 2).⁵ The gap in per capita income between the United States and Tennessee widened after the early 1980's but has remained relatively constant over the last decade. Tennessee has maintained a higher per capita income relative to the South since the early 1980's. The gap between Tennessee and the South per capita income has widened since 2000 (Fig. 2).

Per capita income from forest products manufacturing employment is higher for paper and allied products (Standard Industrial Classification Code (SIC) 465) relative to other manufacturing sectors (Fig. 3). The gap in per capita income for paper and allied products when compared with other forest products manufacturing sectors has widened since 1995, i.e., per capita income has declined in the manufacturing category labeled "Other."⁶

Per capita income in the lumber and wood products (SIC 413) category surpassed per capita income in furniture and fixtures (SIC 417) and other manufacturing for the first time in 1999 (Fig. 3). The gap in per capita income between paper and allied products, and lumber and wood products (SIC 413) has continued to narrow since 1999 (U.S. Department of Commerce, Bureau of Economic Analysis 2005; U.S. Department of Labor, Bureau of Labor Statistics 2005). Time trends of per capita income by SIC industry group were not performed after 2000 given the change in 2001 from the Standard Industrial Classification Code (SIC) to the North American Industry Classification System (NAICS) by the U.S. Department of Commerce.

Trends in employment

More than 3.5 million people were employed in Tennessee in 2004. Total employment in Tennessee grew from 1969 to 2000 at an average rate of 2.1 percent per year, which equated to approximately 55,000 jobs per year. Wage and salary employment grew at the same annual rate of 2.1 percent and comprised 82 percent of total employment.

Employment in the wood products related industries experienced a smaller rate of growth in Tennessee from 1969 to 2000. The paper and allied products sector of the wood-related industries in Tennessee added employment at a rate of 3.1 percent per year from 1969 to 1979, but grew at a slower rate of only 1.1 percent from 1980 to 2000. Lumber and wood products employment grew at a more

consistent rate of 0.9 percent per year from 1969 to 2000.

The furniture and fixtures sector continues to employ the second largest number of workers in the forest products industry in Tennessee, but employment is declining. The furniture and fixtures sector added employment at a rate of 1.2 percent per year from 1969 to 1994 but declined dramatically after 1995. The rate of job loss in this sector has averaged 1.6 percent per year since 1995, an average loss of almost 1,000 workers per year.

Number of forest products manufacturers

The number of firms classified as paper and allied products has remained almost constant from 1990 to 1996. There was a slight reduction in the number of firms, from 181 to 172, between 1996 and 2000 (Univ. of Tennessee 1964, 1968, 1973, 1978, 1982 to 1988, 1992 to 1994, 1999 and 2003). Even though paper and allied products firms are greatly outnumbered by other forest products firms in Tennessee, this sector has the highest per capita income and highest employment per firm relative to other forest products firms.

The number of manufacturing establishments classified as lumber and wood products in Tennessee declined between 1996 and 2000 (from 1087 firms to 608) (Univ. of Tennessee 1999, 2003). This significant reduction was the result of a large decrease in the number of firms with 1 to 4 employees, which declined from 507 firms in 1996 to 182 firms in 2000. The number of firms with 5 to 9 employees within lumber and wood products also declined from 225 to 112 firms (Univ. of Tennessee 1999, 2003).

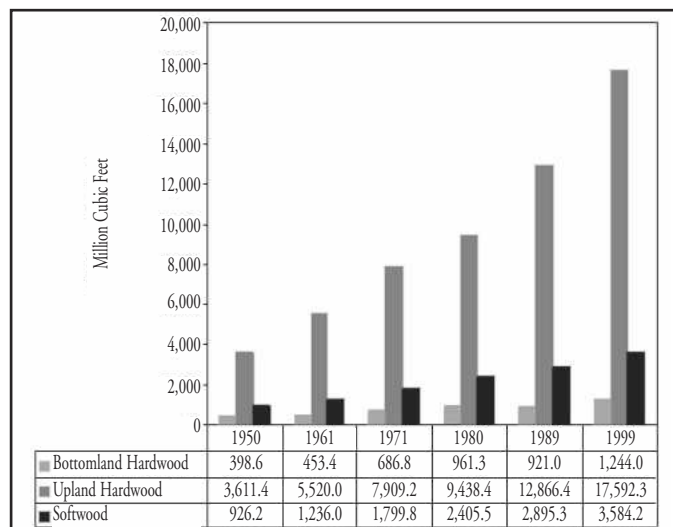
The number of firms in the furniture and related products category significantly increased between 1996 and 2000 from 313 to 473 firms (Univ. of Tennessee 1999, 2003). It was not feasible from the data source to determine if some of the decrease in the lumber and wood products sector and increase in the furniture and related products category was a re-classification of manufacturing category due to technology change within an existing sawmill that may have added some type of furniture or flooring capabilities. However, when these sectors were combined there was a net loss of 319 firms between 1996 and 2000. The decline in the smaller-sized firms within the lumber and wood products category appears to be inconsequential in loss of economic value to Tennessee.

Trends in Tennessee's forests

Lands classified as forest have increased by 14 percent from 1950 to 1999 in Tennessee (Fig. 4). Nonindustrial private landowners owned more than 80 percent of the forestland in Tennessee. The percentage of lands owned by nonindustrial private landowners increased by more than 7 percent since the early 1950's. All other ownership types of forestland in Tennessee increased since the early 1950's with the exception of forestland maintained by the National Forest, which decreased by approximately 7 percent from a peak in 1967 (Wheeler 1952, Strenitzke 1962, Hedlund and Earles 1971, Murphy 1972, Birdsey, 1983, Vissage and Duncan 1990, Schweitzer 2000).

Lands classified as "cropland" and "other non-forest"

Figure 5. — Trends in growing stock volume in Tennessee, 1950-1999.



have declined from 1950 to 1999 by 31 percent and 14 percent respectively (Fig. 4). It was not possible from the data to determine the exact amount of land that was converted from either "cropland" or "other non-forest" to forestland. Even though land classified as "developed" made up the smallest proportion of land in Tennessee, "developed" land increased by 104 percent from 1950 to 1999. As discussed earlier, the relationship between the increase in land classified as "developed" combined with population growth and urbanization, should not be ignored as to its potential impact on amount of forestland available for commercial timber use.

Approximately 52 percent of the forestland in Tennessee consists of the upland hardwood forest type (Fig. 5). The upland hardwood forest type has increased by 487 percent since the early 1950's. Forestlands classified as softwood comprise 11 percent of total forestland and have increased by 387 percent since the early 1950's. The bottomland hardwood forest type makes up the smallest proportion of forestland in Tennessee and is located primarily in the west Tennessee (Wheeler 1952, Strenitzke 1962, Hedlund and Earles 1971, Murphy 1972, Birdsey, 1983, Vissage and Duncan 1990, Schweitzer 2000).

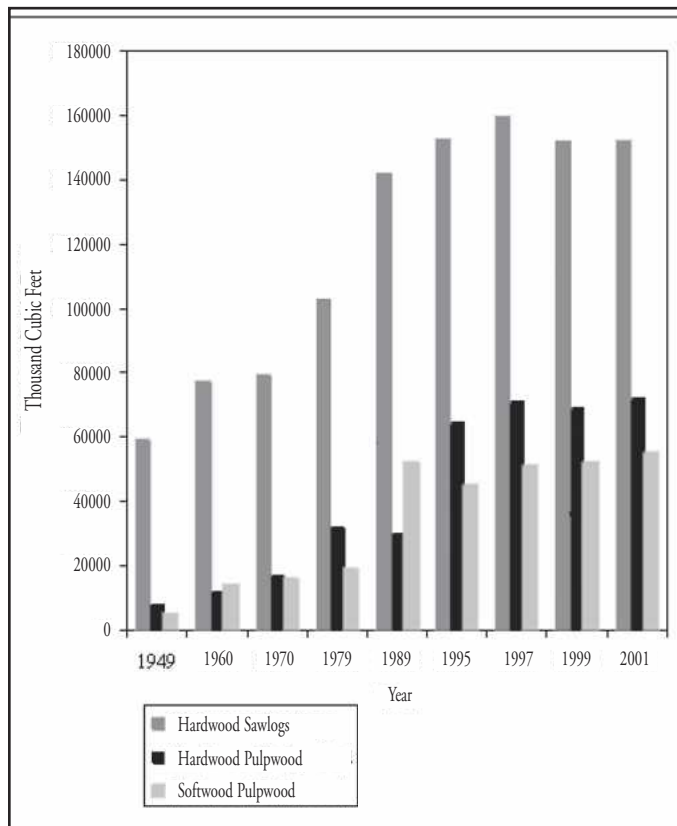
Trends in timber products output

Total growth of Tennessee's commercial timber exceeded total removals by a factor of 1.95 in 1999. Prior to 1999 the ratio of total growth to total removals had consecutively increased, i.e., 1950 = 1.16, 1961 = 1.55, 1971 = 2.35, 1980 = 2.39, 1989 = 2.91 (Stratton and Wright 1999, Stratton and Wright 1997, Howell and Wright 2002).

Given the predominant hardwood forest types of Tennessee, most roundwood production came from hardwoods.⁷ However, hardwood roundwood production declined after a peak production of 236 million ft³ in 1997 to a relatively stable 225 million ft³ in 1999 and 2001. Softwood roundwood production had a peak production of 100 million ft³ in 1999 and was 99 million ft³ in 2001.

Hardwood sawlogs make up the largest proportion of total roundwood production in Tennessee and declined

Figure 6. — Industrial roundwood production in Tennessee, 1949-2001.



from a peak production of 159 million ft³ in 1997 to 151 million ft³ in 2001 (Fig. 6). Hardwood pulpwood comprises the second largest proportion of total roundwood production in Tennessee and had stable production of near 70 million ft³ since 1997. Softwood pulpwood production has increased steadily since the early 1950's and was at a peak level of 55 million ft³ in 2001 (Johnson 1996, Johnson and Steppleton 1996, Johnson and Howell 1996, Stratton and Wright 1997, Stratton and Wright 1999, Bentley and Wright 2001, Howell and Wright 2002).

Summary

Forest products are an important economic sector in

Tennessee. Forest products in 2000 accounted for 6.6 percent of the state's economy and generated \$21.7 billion in economic value. Economic value grew by \$3.5 billion after 1997. Among forest industries contributing economic value to the state, the pulp, paper, paperboard and allied products industries contributed the largest proportion (49%) of forest products economic value in 2000. Furniture contributed \$4.4 billion of the total economic value (20% of the total from the forest industries sector). Sawmills, planing and flooring mills contributed 10 percent of the total economic value of the forest industries sector. The pulp, paper, paperboard and allied products industries are the largest forest products industry employers in the state, employing almost 72,000 Tennesseans. The furniture sector is the second largest employer of more than 43,000 Tennesseans. Employment in the pulp, paper, paperboard and allied products industries has been stable for the last two decades, while employment in the furniture sector has declined.

In 2000, the Memphis region was the leading forest products contributor to economic value, contributing more than \$7.7 billion, an increase of 293 percent from 1997. The pulp, paper, paperboard and allied products industries had the largest growth in the Memphis region contributing \$4.6 billion in economic value in 2000. The Nashville region was the second largest forest products contributor with \$4.7 billion in economic value in 2000, a 41 percent increase from 1997. The Chattanooga region had decreases in economic value from every forest products sector between 1997 and 2000, with the exception of furniture.

The acreage of Tennessee's is increasing. Almost 52 percent of the forestland in the state consists of upland hardwood forests, and the acreage in this forest type has increased by almost 500 percent since the early 1950's. Nonindustrial private landowners own more than 80 percent of the forestland in Tennessee. Total growth of Tennessee's commercial timber exceeded total removals by a factor of 1.95 in 1999. Hardwood sawlogs make up the largest proportion of total roundwood production in the state.

Tennessee's population exceeded 5.9 million people in 2004 and is projected to exceed 7.3 million people by 2030. It is the 16th most populous state in the U.S. and 6th most

¹ Nonindustrial private forest (NIPF) land ownership is defined by the USDA Forest Service as "privately owned land excluding forest industry or farmer ownership" (Bentley and Wright 2001).

² The economic sectors for primary and secondary manufacturers reported in IMPLAN are: Primary ("Pulp, Paper and Paperboard Mills," "Sawmills, Planing and Flooring Mills," "Logging" and "Forest and Forestry Products"); and Secondary ("Paper and Allied Products," "Furniture," "Other Wood Products," "Mobile Homes and Wood Buildings," "Millwork, Veneer, Plywood and Structural Wood"), see English et al. (1997, 2000).

³ The "south" is defined in this manuscript to be consistent with the U.S. Census Bureau (2005), i.e., Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas and Virginia.

⁴ Exurban is defined as private forestland with 16 to 64 housing units per square mile. Lands with these higher housing densities can still support many wildlife species and other ecological functions, although at perhaps a reduced level. However, management for commercial timber may be less likely (Stein et al. 2005).

⁵ Per capita personal income is total personal income divided by total midyear population. All State and local area dollar estimates are in current dollars (not adjusted for inflation). Source: U.S. Dept. of Commerce, Bureau of Economic Analysis. 2005. Regional accounts data, annual state personal income. www.bea.gov/bea/regional/spi/drill.cfm.

⁶ The per capita income for the other manufacturing sector were estimated from the median value for the following industries: Stone, clay, and glass products; Primary metal industries; Fabricated metal products; Industrial machinery and equipment; Electronic and other electric equipment; Motor vehicles and equipment; Other transportation equipment; Instruments and related products; Miscellaneous manufacturing industries; Ordnance 10/; Food and kindred products; Tobacco products; Textile mill products; Apparel and other textile products; Printing and publishing; Chemicals and allied products; Petroleum and coal products; Rubber and misc. plastics products; Leather and leather products.

⁷ Roundwood is defined as logs, bolts, or other round sections cut from trees for industrial manufacture or consumer use (Bentley and Wright 2001).

populous state in the south. Twenty percent of the state's population will be classified as elderly by 2030.

Population growth, urbanization and land fragmentation may have the greatest impact on Tennessee forests. The trend in private ownership of forests has shifted from farmers to absentee landowners. Forestland ownership is increasing while the average acreage size of ownership is decreasing. Ninety-one percent of private forestland owners which comprise 37 percent of the total private forestland acreage own less than 50 acres. The loss of commercial timber use on fragmented lands in proximity to urban metropolitan areas may be a significant phenomenon for forestry.

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