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Tennessee's Forest and Forest Products Industry and Associated Economic Impacts for 2000

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Executive Summary

In 2000, the forest and forest products industrial complex contributed $21.7 billion to the Tennessee economy, accounting for 6.6 percent of the economic activity conducted within the state, and employed over 184,000 individuals, or 5.2 percent of the total number of workers. The forest and forest products industrial complex includes the primary industries typically associated with forest operations such as the management and logging of trees, plus the input supplying industries and the value-added sub-sectors, which includes forest products manufacturing. In addition,

- Tennessee is one of the top hardwood lumber producing states (ranked 2nd) and is the number one producer of hardwood flooring and pencils.

- Leading forest products manufacturing included paper manufacturing, furniture and related products manufacturing, and wood products manufacturing. For these industries, in 2000, close to $10.0 billion of goods were shipped and close to 63,000 Tennesseans were employed with a payroll close to $1.8 billion.

- From 1997 to 2000, paper manufacturing increased close to 20 percent, furniture and related products manufacturing increased 18.3 percent, and wood products manufacturing increased 11.6 percent.

- In 2000, approximately 934.2 million board feet of hardwood products (lumber, crossties, handle blanks, etc.) were manufactured. For softwood lumber, approximately 194.4 million board feet was produced.

- In 2000, Tennessee's forest product (paper products, wood products, plus furniture and related products) exports outside the United States, including forestry and logging (forest nurseries and gathering of forest products, etc.), totaled $613.6 million.

- Sawlogs accounted for the largest share of the states industrial roundwood products at 185.0 million cubic feet for both hardwoods and softwoods combined, followed by pulpwood at 121.1 million cubic feet, other industrial uses at 13.2 million cubic feet, and veneer logs at close to 5.8 million cubic feet.

- In 2001, outdoor sports enthusiasts spent close to $1.3 billion on fishing and hunting activities generating additional total impacts of $2.5 billion in the state's economy.

This analysis was conducted using the Tennessee Forest Industry Model (TNFIM) and the Impact Analysis for Planning (IMPLAN) model and databases. TNFIM, an input-output model for the five Forest Inventory and Analysis Regions (FIA) within the state, traces transactions conducted within the economy and attempts to quantify the economic interdependencies within each region's economy for a given point in time. Through these interdependencies, one can evaluate the indirect and induced impacts that economic activity in one region might have on the entire state economy.

Table of Contents

List of Tables

List of Figures

Introduction

This analysis expands a previous report entitled, "*Economic Impacts of Agriculture and Forestry in Tennessee, 2000*," (English *et al.*, 2003) in which the economic importance and impacts of both the agriculture and forestry industries in Tennessee's economy were examined using 2000 data. Likewise, for this study, an input-output model was used to determine direct impacts on related input industries, and impacts through resulting expenditures by households and institutions at both the state and at a five-region level as defined by the USDA's Forest Service's Forest Inventory and Analysis Regions (FIA) (for FIA regional map, see page 9; for county listings, see Appendix A.1) (U.S. Department of Agriculture, Forest Service, 2004). Impacts were provided for four major indicators: total industry output, employment, wages, and value-added.

The objectives of this analysis were to: 1) provide an overview of Tennessee's forest resource base, 2) assess Tennessee's output of timber products, and 3) evaluate the economic importance and impacts of the forestry industrial complex for the state and by FIA consumptions regions within the state.

Tennessee Forestry Overview

Tennessee has an abundant forest resource base. Approximately 55 percent of the state is forested (14.4 million acres). The largest percentage of the total forest area, 69.4 percent, is owned by individuals, followed by government ownership at 13.9 percent, forest industry at 9.7 percent, and other corporations at 7.0 percent. The state contains 15 state forests that encompass 159,700 acres, 53 state parks (total acreage greater than 121,000), the Big South Fork National River and Recreation Area (125,000 acres), Land Between the Lakes National Recreation Area (170,000 acres), the Cherokee National Forest (633,000 acres), and the Great Smoky Mountains

National Park (approximately 245,500 acres in Tennessee) (Tennessee Statistical Abstract, 2003; Tennessee Division of Forestry, Tennessee Forest Facts, 2004).

Tennessee's forests are predominately hardwoods (89 percent). The state's forest area has increased over the past decades. There has been a 10 percent increase in farm lands reverting to hardwood forests from early 1970's to 2000. Over 170 tree species are native. Mixed hardwoods are the predominant forest types, followed by oak and oak/hickory, bottomland oak type, and other bottomland type species. More specifically, white oak, red oak, yellow poplar, hickories, sugar maple, red maple, sweetgum, and ashes are the predominant hardwood species. For softwoods, virginia pine, shortleaf pine, loblolly pine and eastern redcedar are the major softwood species (Schweitzer, 2000; Tennessee Division of Forestry, Forest Facts, 2004).

Tennessee is ranked as one of the top hardwood lumber producing states (2^{nd}) and is ranked the number one producer of hardwood flooring and pencils. In 2000, approximately 934.2 million board feet of hardwood products (lumber, crossties, handle blanks, etc.) were manufactured. Likewise, for softwood lumber, approximately 194.4 million board feet was produced. The top five counties with the largest timber volume were Cumberland (587.8 cubic feet (cu. ft.)), Wayne (573.9 cu. ft.), Morgan (544.5 cu. ft.), Monroe (528.3 cu. ft.), and Hickman (527.1 cu. ft.). For lumber production, the top five leading counties were Hardeman (75.2 million board feet (mbf)), Macon (45.0 mbf), McNairy (39.9 mbf), Johnson (37.2 mbf), and Henry (36.2 mbf) (Schweitzer, 2000; Tennessee Division of Forestry, Tennessee Forest Facts, 2004; Tennessee Agricultural Statistics Service, 2001; Tennessee Agricultural Statistics Service, 2002).

Forest products manufacturing industries for the state included wood product manufacturing, paper manufacturing, and furniture and related products. In 2000, close to $10.0 billion of goods were shipped and close to 63,000 Tennesseans were employed with a payroll

close to $1.8 billion (Table 1). Paper manufacturing shipped the largest value at $4.7 billion, followed by furniture and related products at $2.6 billion, and wood product manufacturing at $2.5 billion. Tennessee's market share of the United States for value of shipments for wood product manufacturing were 2.7 percent, paper manufacturing at 2.8 percent, and furniture and related products at 3.5 percent.

Table 1. Forestry Manufacturing Statistics for Tennessee, 2000

Manufacturing Industry	Employees	Payroll	Establishments	Value of Shipments
	(number)	(million $)	(number)	(million $)
Wood Product Manufacturing	19,026	478	608	2,544
Paper Manufacturing	18,160	692	172	4,703
Furniture & Related Products	25,756	627	473	2,660
Total	62,942	1,797	1,253	9,907

Source: U.S. Census Bureau, Manufacturing, Mining, and Construction Statistics, Annual Survey of Manufacturers, 2000 Geographic Area Statistics; U.S Census Bureau, State and County *Quickfacts*, Tennessee *QuickLinks*, County Business Patterns Economic Profile, 2000.

In 2000, Tennessee's forest products (paper products, wood products, plus furniture and related products) exports outside the United States, including forestry and logging (forest nursery seedlings and gathering of forest products (gums, barks, balsam needles, etc.)), totaled $613.6 million. Paper products had the highest export value at $463.6 million, followed by wood products ($71.4 million), furniture and related products ($69.8 million), and forestry and logging ($8.6 million) (U.S. Department of Commerce, 2000). For the forest products industries listed in Table 1, the maps in Figures 1 through 3 show the predominant areas where these manufacturing and processing establishments were located throughout the state.

Timber Product Output

In 1999, Tennessee's timber products output[1] totaled 437.5 million cubic feet. Of that value, 325.2 million cubic feet was from roundwood[2], up 1.4 percent from 1997's total of 320.7 million cubic feet, with the remaining 112.3 million cubic feet comprising of plant byproducts[3].

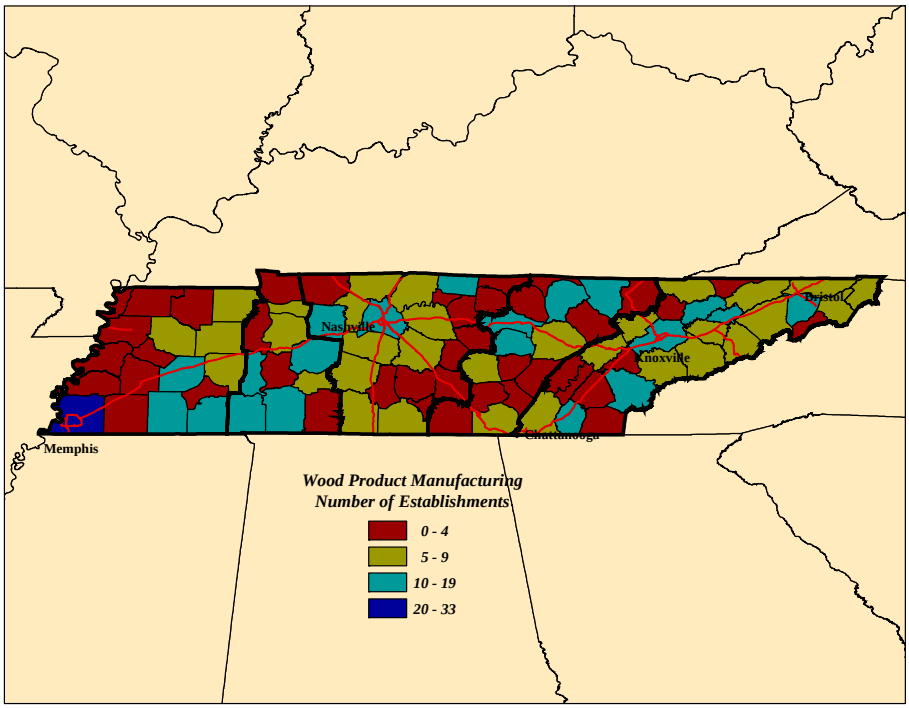

Figure 1. Number of Wood Product Manufacturing Establishments in Tennessee, 2000.

[1]Defined as total volume of roundwood products from all sources plus the volume of byproducts recovered from mill residues (Howell, M., and R. Wright, U.S. Department of Agriculture, Forest Service, "Tennessee's Timber Industry—An Assessment of Timber Product Output and Use, 1999, Southern Research Station, Resource Bulletin SRS—76, July 2002).

[2] Defined as logs, bolts, or other round sections cut from trees for industrial manufacture or consumer uses (Howell, M., and R. Wright, U.S. Department of Agriculture, Forest Service, "Tennessee's Timber Industry—An Assessment of Timber Product Output and Use, 1999, Southern Research Station, Resource Bulletin SRS—76, July 2002).

[3] Defined as primary wood products such as pulp chips, animal bedding, fuelwood, recycled from mill residues (Howell, M., and R. Wright, U.S. Department of Agriculture, Forest Service, "Tennessee's Timber Industry—An Assessment of Timber Product Output and Use, 1999, Southern Research Station, Resource Bulletin SRS—76, July 2002).

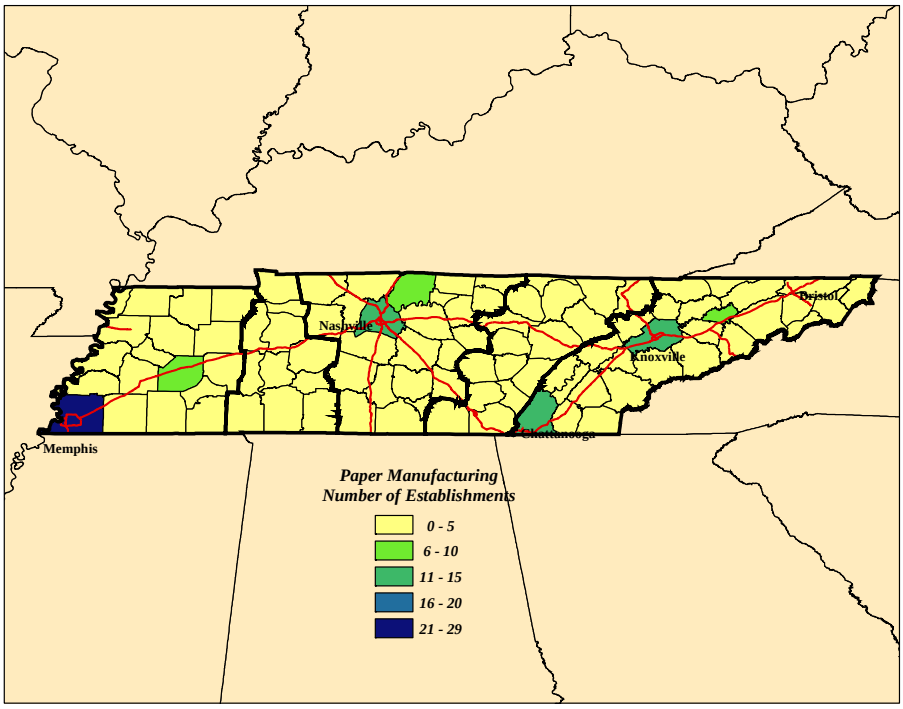

Figure 2. Number of Paper Manufacturing Establishments in Tennessee, 2000.

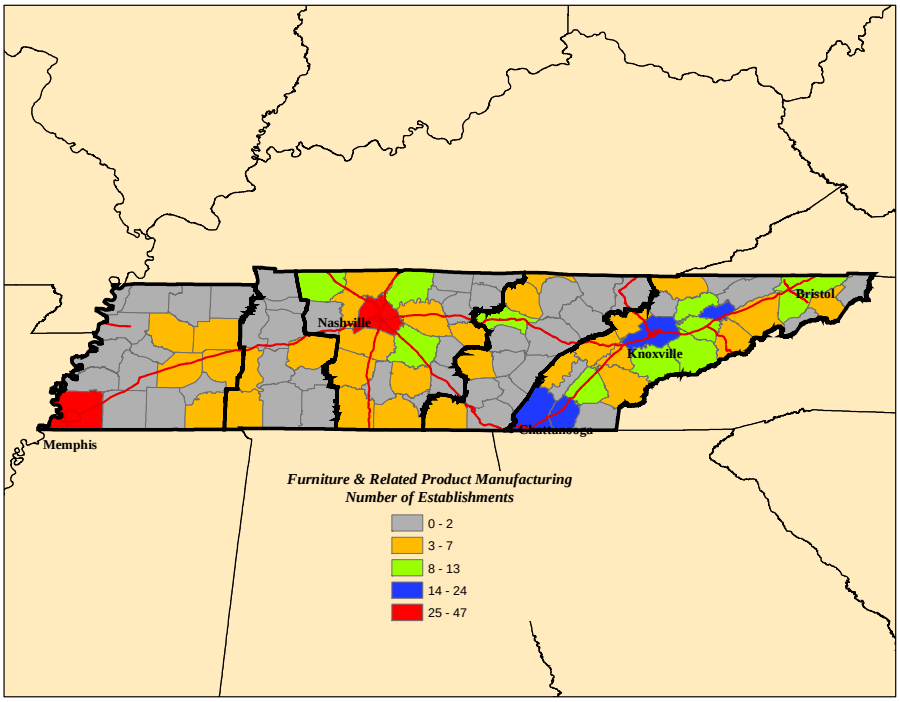

Figure 3. Number of Furniture & Related Products Establishments in Tennessee, 2000.

Hardwood roundwood products comprised 225.0 million cubic feet with softwood roundwood products totaling 100.2 million cubic feet. Roundwood timber products output by FIA regions are presented in Table 2. Sawlogs accounted for the largest share of the state's industrial roundwood products at 185.0 million cubic feet (56.9 percent) for both hardwoods and softwoods combined, followed by pulpwood at 121.1 million cubic feet (37.2 percent), other industrial[4] uses at 13.2 million cubic feet (4.1 percent), and veneer logs at close to 5.8 million cubic feet (1.8 percent) (Howell and Wright, 2002).

Table 2. Selected Roundwood Timber Products Output by Forest Inventory & Analysis Region and Species Group for Tennessee, 1999

	Sawlogs		Veneer logs		Pulpwood		Other Industrial	
Region	Soft-wood	Hard-wood	Soft-wood	Hard-wood	Soft-wood	Hard-wood	Soft-wood	Hard-wood
	(thousand cubic feet)							
East	13,617	24,327	3,959	1,141	14,963	7,985	4,528	1,382
Plateau	11,386	31,586	319	53	21,168	21,851	6,139	997
Central	4,743	33,047	0	253	855	2,587	150	52
W. Central	955	27,671	0	0	7,751	27,022	0	0
West	2,227	35,478	0	116	7,448	9,487	0	0
Total	32,928	152,109	4,278	1,563	52,185	68,932	10,817	2,431

Source: Howell, M. and R. Wright, U.S. Department of Agriculture, Forest Service, "Tennessee's Timber Industry—An Assessment of Timber Product Output and Use, 1999, Southern Research Station, Resource Bulletin SRS—76, July 2002.

Softwood pulpwood (52.1 percent) and sawlogs (32.8 percent) were the largest softwood product outputs, followed by other industrial uses (10.8 percent) and veneer logs (4.3 percent). Likewise, hardwood sawlogs (67.6 percent) and pulpwood (30.6 percent) were the largest hardwood product outputs, followed by other industrial uses (1.1 percent) and veneer logs (0.7 percent) (Howell and Wright, 2002).

[4] Defined as composite panels, poles, posts, mulch, firewood, logs for log homes, etc. (Howell, M., and R. Wright, U.S. Department of Agriculture, Forest Service, "Tennessee's Timber Industry—An Assessment of Timber Product Output and Use, 1999, Southern Research Station, Resource Bulletin SRS—76, July 2002).

Sawlog output from industrial roundwood for both hardwoods and softwoods combined was highest for the Plateau region – close to 43.0 million cubic feet. Sawlog output for the East, Central, and West Regions ranged from 37.7 to 37.9 million cubic feet. Output for the West Central Region was 28.6 million cubic feet. Pulpwood output was the largest for the Plateau and West Central Regions at 43.0 and 34.7 million cubic feet, respectively. The East Region had the largest veneer logs output at 5.1 million cubic feet, while the Plateau Region had the largest other industrial uses output at 7.1 million cubic feet.

In 1999, roughly 124.5 million cubic feet of plant byproducts (i.e., coarse, bark, sawdust, and shaving residues) were generated in Tennessee (112.3 million cubic feet used plus 12.2 million cubic feet not used). Coarse residues had the largest volume of total residues at 57.2 million cubic feet, followed by bark at 32.6 million cubic feet, sawdust at 33.5 million cubic feet, and shavings at 1.2 million cubic feet. Most of the residues were used for industrial fuel and for the manufacturing of fiber products (Howell and Wright, 2002).

Approximately 274.8 million cubic feet, or 78.8 percent, of the total roundwood output for both hardwoods and softwoods combined came from privately owned lands (nonindustrial private), followed by forest industry ownership at 47.6 million cubic feet, other public at 16.1 million cubic feet, and national forests at 9.8 million cubic feet (Table 3). Roundwood output for both hardwoods and softwoods species groups combined was relatively uniform for privately owned lands with the Plateau Region having the largest roundwood output at close to 69.0 million cubic feet, followed by the West Central Region at 58.1 million cubic feet, the East Region at 54.0 million cubic feet, the West Region at 49.6 million cubic feet, and the Central Region at 44.1 million cubic feet (Howell and Wright, 2002).

Table 3. Total Roundwood Output by Forest Inventory & Analysis Region, Ownership Class, and Species Group for Tennessee, 1999

Region	National Forest		Other Public		Forest Industry		Nonindustrial private	
	SW	HW	SW	HW	SW	HW	SW	HW
	(thousand cubic feet)							
East	7,343	2,481	1,899	558	6,141	3,583	22,566	31,437
Plateau	0	0	1,569	9,613	11,906	7,445	26,468	42,466
Central	0	0	4	515	0	441	5,879	38,319
W. Central	0	0	0	97	0	10,486	8,914	49,167
West	0	0	1,400	472	2,697	4,973	5,808	43,807
Total	7,343	2,481	4,872	11,255	20,744	26,928	69,635	205,196

SW – Softwood; HW – Hardwood

Source: Howell, M. and R. Wright, U.S. Department of Agriculture, Forest Service, "Tennessee's Timber Industry—An Assessment of Timber Product Output and Use, 1999, Southern Research Station, Resource Bulletin SRS—76, July 2002.

In 1999, approximately 91.0 million cubic feet of industrial hardwood and softwood roundwood was exported to neighboring states (Table 4). This was an increase of 11.4 percent from 1997's export level of 81.7 million cubic feet. Pulpwood exports were the largest at 53.4 million cubic feet, with hardwood pulpwood comprising 89.1 percent of the total export volume. Sawlogs had the next largest export volume species. Most exports and imports of all industrial roundwood were from surrounding states (Howell and Wright, 2002).

Table 4. Movement of Industrial Roundwood by Product and Species for Tennessee, 1999

Region	Exported to other States		Harvested/Processed within State		Imported from other States		Received from both In- and Out-of-State	
	SW	HW	SW	HW	SW	HW	SW	HW
	(thousand cubic feet)							
Sawlogs	16,399	14,595	16,529	137,514	1,557	13,033	18,086	150,547
Veneer logs	4,278	1,413	0	150	0	2	0	152
Pulpwood	5,810	47,626	46,375	21,306	43,436	10,226	89,811	31,532
Other Industrial	380	550	10,437	1,881	2,624	490	13,061	2,371
Total	26,867	64,184	73,341	160,851	47,617	23,751	120,958	184,602

SW – Softwood; HW – Hardwood

Source: Howell, M. and R. Wright, U.S. Department of Agriculture, Forest Service, "Tennessee's Timber Industry—An Assessment of Timber Product Output and Use, 1999, Southern Research Station, Resource Bulletin SRS—76, July 2002.

Of the total roundwood volume (234.1 million cubic feet) harvested from and processed by mills within Tennessee, 154.0 million cubic feet, or 65.7 percent, was for both hardwoods and softwoods sawlogs. Hardwood sawlogs comprised the greatest proportion of the total at 137.5 million cubic feet (89.3 percent). Pulpwood was the next largest roundwood volume retained[5] at 67.6 million cubic feet for both softwoods and hardwoods combined. Softwood pulpwood was the largest volume retained at 46.3 million cubic feet (Howell and Wright, 2002).

Data and Methods Used

The Tennessee Forest Industry Model (TNFIM) was used to model industry and institutional interrelationships in five regions within Tennessee and was based on the Impact Analysis for Planning (IMPLAN) model and databases (Olson and Lindall, 1999). The five regions were based on those used by the Forest Inventory & Analysis Regions to represent areas of economic consumption (consumption regions), as displayed in Figure 4 (for county listings, see Appendix A.1). Regional values were then aggregated to the state level.

IMPLAN employs a regional social accounting system and can be used to generate a set of balanced economic/social accounts and multipliers. The social accounting system is an extension of input-output analysis[6]. The model uses regional purchase coefficients generated by econometric equations that predict local purchases based on a region's characteristics. Output from the model includes descriptive measures of the economy including total industry output, employment, and value-added for over 500 industries in the Tennessee economy. Total industry output is defined as the value of production by industry per year. Employment represents total

[5] Defined as roundwood volume harvested from and processed by mills within the same State (Howell, M., and R. Wright, U.S. Department of Agriculture, Forest Service, "Tennessee's Timber Industry—An Assessment of Timber Product Output and Use, 1999, Southern Research Station, Resource Bulletin SRS—76, July 2002).

[6] Input-output (I-O) analysis, also know as inter-industry analysis, is the name given to an analytical work conducted by Wassily Leontief (1936) in the late 1930's. The fundamental purpose of the I-O framework is to analyze the interdependence of industries in an economy through market-based transactions.

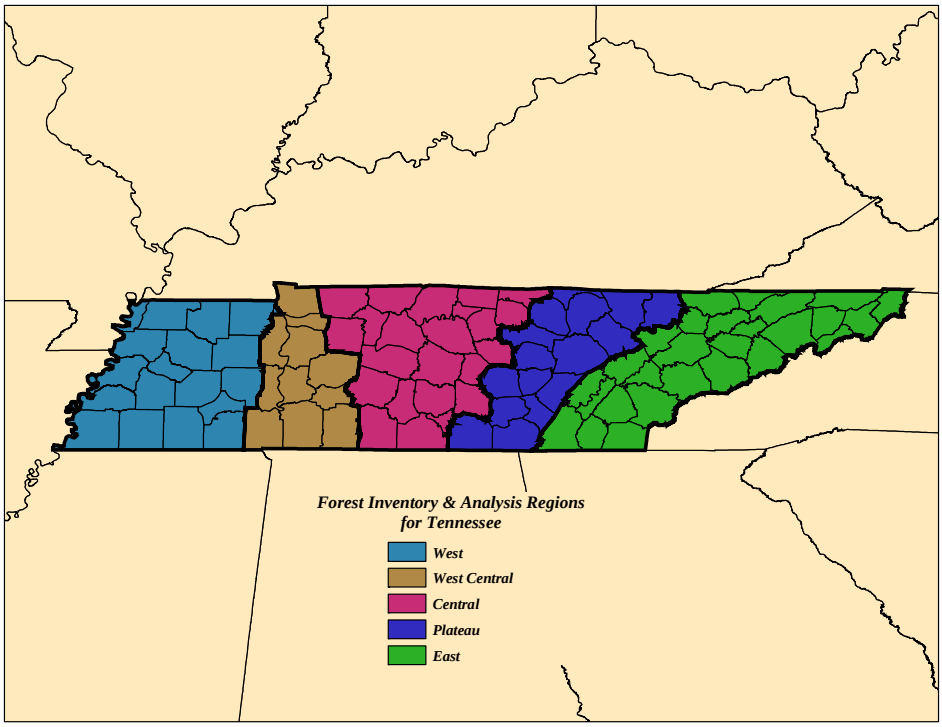

Figure 4. Tennessee Forest Industry Model Analysis Regions.

wage and salary employees, as well as self-employed jobs in a region, for both full-time and part-time workers. Total value added is defined as all income to workers paid by employers; self-employed income; interests, rents, royalties, dividends, and profit payments; and excise and sales taxes paid by individuals to businesses.

The model also can be used for predictive purposes, by providing estimates of multipliers. Multipliers measure the response of the economy to a change in demand or production. Multiplier analysis generally focuses on the impacts of exogenous changes on: a) output of the sectors in the economy, b) income earned by households because of new outputs, and c) jobs that are expected to be generated because of the new outputs. The notion of multipliers rests upon the difference between the initial impact of an exogenous change in final demand (final use and purchases of goods and services produced by industries) and the total impacts of the change. Direct impacts measure the response of a given industry to a change in

final demand for the industry. Indirect impacts represent the response by all industries in the economy to a change in final demand for a specific industry. Induced impacts represent the response by all industries in the economy to increased expenditures of new household income and inter-institutional transfers generated from the direct and indirect impacts of the change in final demand for a specific industry.

This study uses Type I and Type SAM (Social Accounting Matrix) multipliers. Type I multipliers are calculated by dividing direct plus indirect impacts by the direct impacts. Type SAM multipliers are calculated by adding direct, indirect, and induced impacts and then dividing by the direct impacts. The Type SAM multipliers take into account the expenditures resulting from increased incomes of households as well as inter-institutional transfers resulting from the economic activity. Therefore, Type SAM multipliers assume that, as final demand changes, incomes increase along with inter-institutional transfers. Increased expenditures by these people and institutions leads to increased demands from local industries.

Results

Economic Impacts at the State & In-State Forest Inventory & Analysis Region Levels

Direct economic activity for total industry output (TIO), employment, wages and salaries, and total value added (TVA) for forestry for the state and by FIA analysis regions within the state are presented in Table 5. In 2000, forestry related industries contributed a total of $11.9 billion in direct economic activity to Tennessee or close to 3.6 percent of the state's economy. Employment was over 77,000 persons or close to 2.2 percent of the workforce. Total value added was over $4 billion with $2.5 billion in wages. Approximately 70.3 percent of the forestry workforce was employed in secondary industries and 29.6 percent in primary. The East Region,

Table 5. Direct Economic Activity in Forestry

Sector	TIO[a]		Employment		Wages		TVA[b]	
	(Million $)	%	(Number)	%	(Million $)	%	(Million $)	%
All Sectors (Including Non-Forestry):								
State[c]	330,218		3,519,471		101,489		175,945	
East	106,863	32.4	1,177,048	33.4	32,487	32.0	55,644	31.6
Plateau	15,225	4.6	185,574	5.3	4,047	4.0	7,442	4.2
Central	110,890	33.6	1,142,132	32.5	34,159	33.7	59,504	33.8
West Central	7,530	2.3	82,734	2.4	1,798	1.8	3,455	2.0
West	89,710	27.2	931,983	26.5	28,998	28.6	49,900	28.4
Primary & Secondary Forestry								
State[c]	11,964		77,394		2,571		4,142	
East	4,769	39.9	35,139	45.4	1,062	41.3	1,612	38.9
Plateau	587	4.9	5,737	7.4	129	5.0	216	5.2
Central	1,961	16.4	13,535	17.5	438	17.0	666	16.1
West Central	818	6.8	4,400	5.7	138	5.4	253	6.1
West	3,828	32.0	18,583	24.0	802	31.2	1,395	33.7
Primary Forestry								
State[c]	4,118		22,941		832		1,497	
East	1,095	26.6	6,101	26.6	210	25.2	392	26.2
Plateau	360	8.7	3,793	16.5	79	9.5	142	9.5
Central	295	7.2	2,583	11.3	60	7.2	107	7.1
West Central	565	13.7	2,660	11.6	89	10.7	178	11.9
West	1,803	43.8	7,803	34.0	395	47.5	680	45.4
Secondary Forestry								
State[c]	7,846		54,453		1,739		2,645	
East	3,675	46.8	29,037	53.3	853	49.1	1,221	46.2
Plateau	227	2.9	1,944	3.6	50	2.9	74	2.8
Central	1,666	21.2	10,952	20.1	379	21.8	559	21.1
West Central	253	3.2	1,740	3.2	50	2.9	75	2.8
West	2,024	25.8	10,780	19.8	407	23.4	715	27.0

[a] Total Industry Output – annual value of production by industry.
[b] Total Value Added – income to workers paid by employers; self-employed income; interests, rents, royalties, dividends, and profit payments; and excise and sales taxes paid by individuals to businesses.
[c] State totals may not add due to rounding.

followed by the West Region had the largest total industry output values at $4.7 billion and $3.8 billion, respectively. This scenario held true for employment, wages, and total value added. The Central Region had the next largest values for all the categories analyzed. A more detailed presentation of the total industry output from processing by sub-sector is shown in Appendixes B and C.

For primary forestry, the West Region had the largest output value at $1.8 billion, or 43.8 percent of the total, followed by the East Region at $1.1 billion (26.6 percent). For secondary forestry the reverse was true. The largest value of output was from the East Region, followed by the West Region at $3.6 billion and $2.0 billion, respectively. Employment for primary forestry was the largest in the West and East Regions, followed by the Plateau Region. However, the West Central Region had the next largest values after the West and East Regions for the remaining categories analyzed. For secondary forestry, the Central Region had the next largest values after the East and West regions for all categories evaluated.

Primary Forest Products:

The largest output value for primary forest products was from pulp, paper, and paperboard mills, followed by sawmills, planing and flooring mills; logging; and forest and forestry products (Table 6). The West Region had not only the largest output value for pulp, paper and paperboard mills, at 56.4 percent of the state's value, but also for the remaining categories analyzed. For IMPLAN analysis, forest products were defined as the production from the forest including stumpage, pulpwood, fuel wood, Christmas trees, and fence posts. Forestry products, on the other hand, were establishments that manage and operate timber tracts, tree farms, and forest nurseries as well as conduct reforestation activities. For forest and forestry products, the East Region had the largest direct economic impact employing over 1,400 workers with an output value estimated at $53 million.

For sawmills, planing, and flooring mills, the Plateau Region, followed by the West Region, had the largest values for total industry output, employment, wages, and total value added. Next, and with very similar economic value levels, were the East and Central Regions. In 1949, Tennessee had an estimated 2,789 sawmills. In 1999, the number of sawmills was estimated at 440. The number of sawmills in the state has been relatively stable for the ten

Table 6. Direct Economic Activity in Primary Forest Products

Sector	TIO[a]		Employment		Wages		TVA[b]	
	(Million $)	%	(Number)	%	(Million $)	%	(Million $)	%
Pulp, Paper & Paperboard Mills:								
State[c]	2,620		7,555		526		919	
East	766	29.2	2,149	28.4	142	27.0	250	27.2
Plateau	1	0.0	3	0.0	0[b]	0.0	0[b]	0.0
Central	1	0.0	6	0.1	0[b]	0.0	0[b]	0.0
West Central	373	14.2	757	10.0	57	10.8	114	12.4
West	1,478	56.4	4,639	61.4	327	62.2	553	60.2
Sawmills, Planing & Flooring Mills:								
State[c]	1,180		9,928		268		427	
East	234	19.8	2,161	21.8	56	20.9	89	20.8
Plateau	285	24.2	2,728	27.5	70	26.1	111	26.0
Central	250	21.2	1,666	16.8	55	20.5	87	20.4
West Central	142	12.0	1,087	10.9	25	9.3	41	9.6
West	269	22.8	2,286	23.0	62	23.1	99	23.2
Logging:								
State[c]	165		1,265		28		64	
East	41	24.8	308	24.3	7	25.0	16	25.0
Plateau	48	29.1	380	30.0	8	28.6	18	28.1
Central	17	10.3	126	10.0	3	10.7	7	10.9
West Central	33	20.0	243	19.2	6	21.4	13	20.3
West	26	15.8	208	16.4	4	14.3	10	15.6
Forest & Forestry Products:								
State[c]	153		4,193		9		87	
East	53	34.6	1,483	35.4	4	44.4	36	41.4
Plateau	26	17.0	681	16.2	1	11.1	13	14.9
Central	26	17.0	785	18.7	2	22.2	12	13.8
West Central	18	11.8	574	13.7	1	11.1	10	11.5
West	30	19.6	669	16.0	2	22.2	17	19.5

[a] Total Industry Output – annual value of production by industry.
[b] Total Value Added – income to workers paid by employers; self-employed income; interests, rents, royalties, dividends, and profit payments; and excise and sales taxes paid by individuals to businesses.
[c] State totals may not add due to rounding.
[d] Values of 0 are nonzero values that are less than 1.

year period from 1989 to 1999, declining 10.2 percent from 1989's level of 490. Although the number of sawmills has decreased since 1949, sawmill output has increased since that timeframe. For 1999, Tennessee sawmills received 1.0 billion board feet of roundwood. Figure 5 shows the number of sawmill establishments by FIA for the state in 2000. Yellow and Eastern white pine were the primary softwood species received at Tennessee sawmills in 2000.

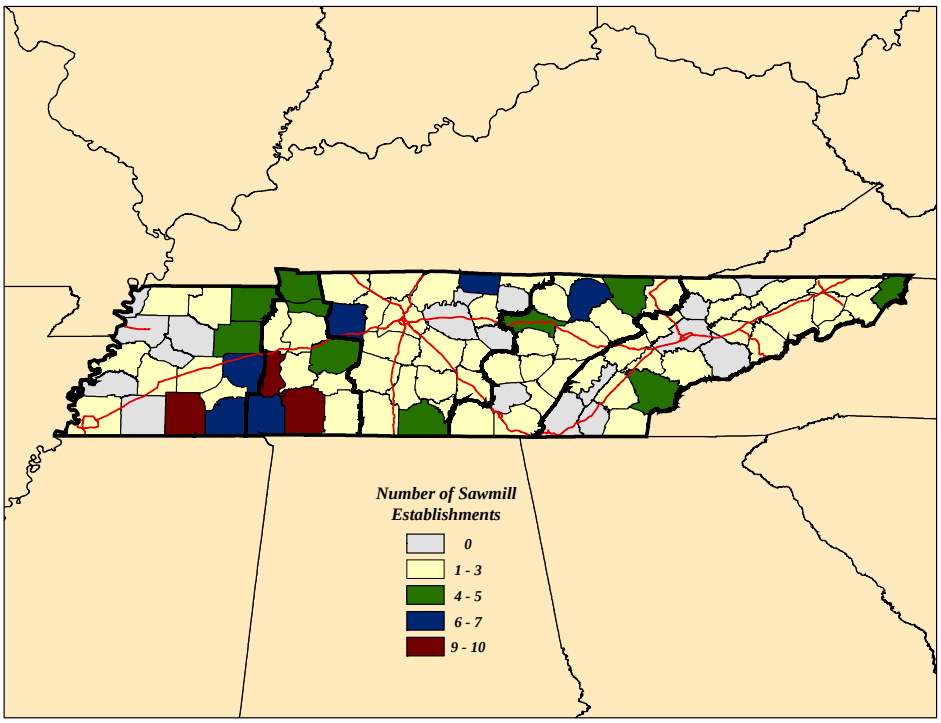

Figure 5. Number of Sawmill Establishment in Tennessee, 2000.

Approximately 15.9 million cubic feet of these two species combined were received, or 88 percent of the total volume (18.0 million cubic feet) of all softwoods received. Red oak, white oak, and yellow poplar were the primary hardwood species sawmills received. These three species combined represented approximately 116.2 million cubic feet, or 77.2 percent of the total volume (150.5 million cubic feet) of hardwoods received (Howell and Wright, 2002; U.S. Census Bureau, CenStats Databases, 2000 County Business Patterns (NAICS)).

Total industry output for logging was $165 million. The Plateau Region had the largest value for all the categories analyzed, followed by the East and West Central Regions. Figure 6 shows the number of logging establishments by FIA for the state in 2000. The Tennessee Division of Forestry has been very active in promoting educational efforts for individual loggers and forest landowners to adopt best management practices to enhance water quality. One

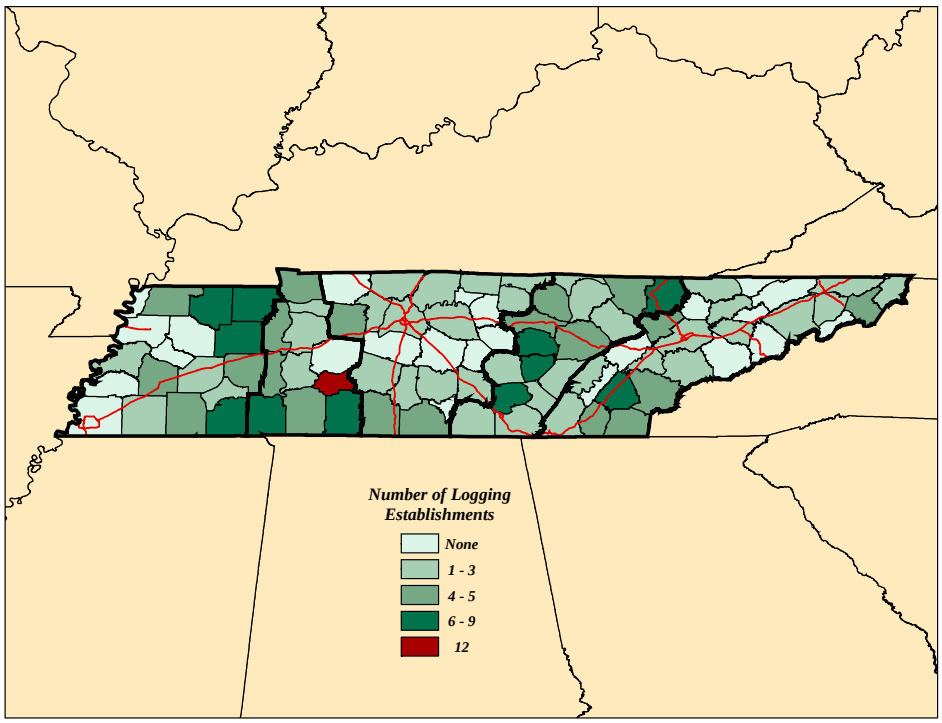

Figure 6. Number of Logging Establishments in Tennessee, 2000.

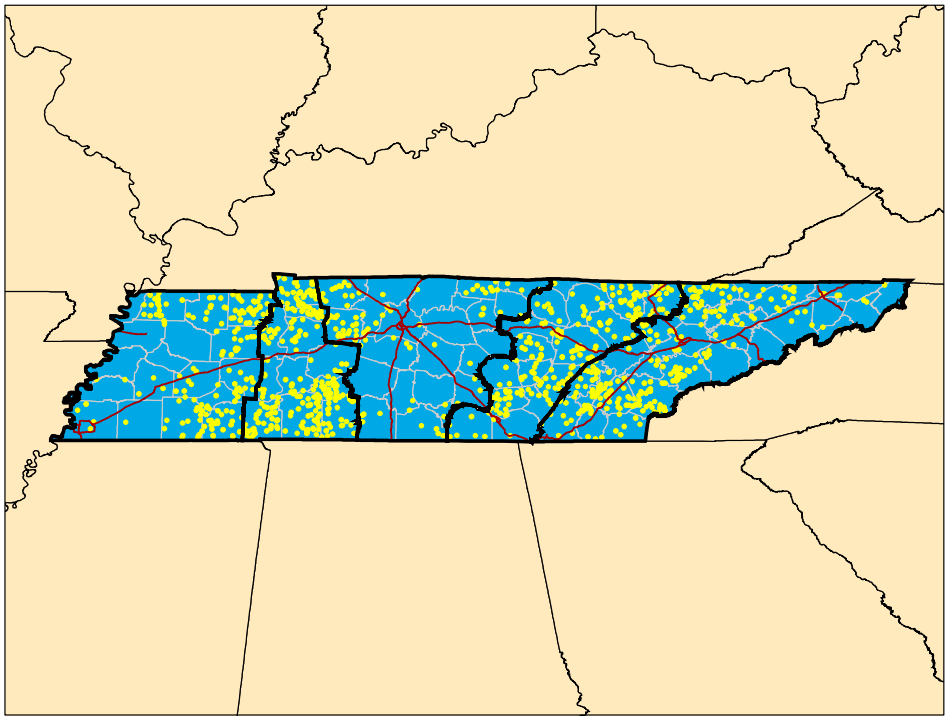

Figure 7. Location of Individuals Who Participated in the Tennessee Master Logger Program, 1991-99.
(Note: Each Dot Represents the Zip Code Address for a Master Logger Attendee)

training program available to loggers in the state is the Master Logger Program. The program encourages loggers to adopt environmentally sound logging practices for harvesting timber. Figure 7 shows the locations of where individuals have participated in the program from 1991-1999 (Tennessee Division of Forestry, Water Quality, 2004; Tennessee Division of Forestry, Master Logger, 2004; U.S. Census Bureau, CenStats Databases, 2000 County Business Patterns (NAICS)).

Secondary Forest Products:

The largest output values for secondary forest products were paper and allied products, followed by furniture; other wood products; mobile homes and wood buildings; and millwork, veneer, plywood and structural wood (Table 7). The furniture industry for this analysis was comprised of household, office, and public building furniture. The other wood products category was comprised of wood containers, wood partitions and fixtures, and miscellaneous wood products. The West Region had the largest values for output, employment, wages, and value added for paper and allied products. The East Region had the largest output values for the remaining secondary forest products sectors – furniture, other wood products, mobile homes and wood buildings, and millwork, veneer, plywood, and structural wood. However, for the latter secondary forest products category mentioned, the West Region had similar levels of economic activity.

Estimated Total Economic Impacts of Forestry

The estimated total economic impacts of forestry included not only the direct impacts from the industry, but also the impacts the industry had on input supplying industries (indirect impacts) and on expenditures by households and other institutions (induced impacts). The total economic impacts from forestry included direct, indirect, and induced impacts. The total

Table 7. Direct Economic Activity in Secondary Forest Products

Sector	TIO[a]		Employment		Wages		TVA[b]	
	(Million $)	%	(Number)	%	(Million $)	%	(Million $)	%
Paper & Allied Products:								
State[c]	3,223		13,917		589		982	
East	898	27.9	4,260	30.6	163	27.7	246	25.1
Plateau	47	1.5	241	1.7	7	1.2	9	0.9
Central	746	23.1	3,640	26.2	145	24.6	210	21.4
West Central	108	3.4	527	3.8	20	3.4	26	2.6
West	1,425	44.2	5,249	37.7	254	43.1	491	50.0
Furniture:								
State[c]	2,377		21,308		622		832	
East	1,683	70.8	16,435	77.1	452	72.7	593	71.3
Plateau	35	1.5	399	1.9	10	1.6	13	1.6
Central	424	17.8	2,757	12.9	106	17.0	150	18.0
West Central	26	1.1	153	0.7	5	0.8	7	0.8
West	208	8.8	1,564	7.3	50	8.0	69	8.3
Other Wood Products:								
State[c]	981		7,507		193		312	
East	526	53.6	3,294	43.9	88	45.6	146	46.8
Plateau	73	7.4	607	8.1	15	7.8	25	8.0
Central	169	17.2	1,482	19.7	38	19.7	61	19.6
West Central	60	6.1	513	6.8	12	6.2	18	5.8
West	153	15.6	1,610	21.4	41	21.2	62	19.9
Mobile Homes & Wood Buildings:								
State[c]	678		5,632		172		279	
East	364	53.7	2,986	53.0	94	54.7	151	54.1
Plateau	26	3.8	212	3.8	6	3.5	9	3.2
Central	195	28.8	1,620	28.8	51	29.7	82	29.4
West Central	55	8.1	488	8.7	13	7.6	22	7.9
West	38	5.6	325	5.8	9	5.2	15	5.4
Millwork, Veneer, Plywood, & Structural Wood:								
State[c]	587		6,089		163		240	
East	204	34.8	2,059	33.8	57	35.0	84	35.0
Plateau	46	7.8	486	8.0	12	7.4	18	7.5
Central	133	22.7	1,453	23.9	39	23.9	58	24.2
West Central	4	0.7	59	1.0	1	0.6	2	0.8
West	200	34.1	2,031	33.4	54	33.1	79	32.9

[a] Total Industry Output – annual value of production by industry.
[b] Total Value Added – income to workers paid by employers; self-employed income; interests, rents, royalties, dividends, and profit payments; and excise and sales taxes paid by individuals to businesses.
[c] State totals may not add due to rounding.

industry output, employment, wages, and value added resulting from forestry including each of these impacts are shown in Table 8. Forestry contributed an estimated output value of over

$21.7 billion to Tennessee's economy annually. An estimated 63.8 percent of the total impacts came from secondary forestry, while primary forestry contributed about 36.2 percent. Employment from forestry totaled over 184,000 workers. Of that value, 65.6 percent was contributed by impacts from secondary forestry, with 34.4 percent being contributed from primary forest products. Intrastate trade represented values purchased or imported from outside the regions. The West Region had the largest values for all categories for primary forestry, while the East Region had the largest values for secondary forestry. A more detailed total impact presentation of output, employment, wages, and value added by sub-sector is shown in Appendix C.

Table 8. Estimated Total Economic Impacts from Forestry

Sector	TIO[a]		Employment		Wages		TVA[b]	
	(Million $)	%	(Number)	%	(Million $)	%	(Million $)	%
Primary & Secondary Forestry								
State	21,750		184,297		5,624		9,597	
East	8,163	37.5	74,794	40.6	2,116	37.6	3,509	36.6
Plateau	908	4.2	9,926	5.4	218	3.9	389	4.1
Central	3,449	15.9	29,437	16.0	920	16.4	1,519	15.8
West Central	1,203	5.5	8,805	4.8	235	4.2	443	4.6
West	6,890	31.7	50,815	27.6	1,761	31.3	3,099	32.3
Intrastate Trade	1,137	5.2	10,520	5.7	374	6.7	638	6.6
Primary Forestry								
State	7,874		63,346		1,980		3,557	
East	1,953	24.8	15,992	25.2	473	23.9	867	24.4
Plateau	575	7.3	6,548	10.3	137	6.9	255	7.2
Central	539	6.8	5,223	8.2	137	6.9	246	6.9
West Central	858	10.9	5,918	9.3	161	8.1	320	9.0
West	3,366	42.7	24,141	38.1	877	44.3	1,540	43.3
Intrastate Trade	583	7.4	5,524	8.7	195	9.8	329	9.2
Secondary Forestry								
State	13,875		120,951		3,644		6,040	
East	6,210	44.8	58,802	48.6	1,643	45.1	2,642	43.7
Plateau	333	2.4	3,378	2.8	81	2.2	134	2.2
Central	2,910	21.0	24,214	20.0	783	21.5	1,274	21.1
West Central	345	2.5	2,887	2.4	74	2.0	122	2.0
West	3,524	25.4	26,674	22.1	883	24.2	1,559	25.8

Table 8. Estimated Total Economic Impacts from Forestry (Cont.)

Sector	TIO[a]		Employment		Wages		TVA[b]	
	(Million $)	%	(Number)	%	(Million $)	%	(Million $)	%
Intrastate Trade	553	4.0	4,996	4.1	180	4.9	309	5.1

[a] Total Industry Output – annual value of production by industry.
[b] Total Value Added – income to workers paid by employers; self-employed income; interests, rents, royalties, dividends, and profit payments; and excise and sales taxes paid by individuals to businesses.

Primary Forest Products Total Impacts:

Pulp, paper and paperboard mills contributed the largest values for all the categories analyzed compared to the other three primary forest products sectors combined (Table 9). The West Region dominated all value categories for this sector, with the East Region having the largest values next. The West, Central, Plateau, and East Regions had similar values across all categories for sawmills, planing, and flooring mills. For logging, the East and Plateau Regions led the other regions for all categories analyzed. The East Region had the largest values across all categories for forest and forestry products.

Secondary Forest Products Total Impacts:

Secondary forest products estimated total impacts are shown in Table 10. Paper and allied products and furniture were the largest contributors for all categories. Although paper and allied products had the largest value for output, wages, and value added, the furniture sector had the largest number of employed individuals. The West Region, followed by the East and Central Regions, had the largest values for the paper and allied products sector. For furniture, the East Region was the leader. Again, the East Region had the largest values for other wood products and mobile homes and wood buildings sectors. For the millwork, veneer, plywood, and structural wood sector, the East and West Regions were the largest contributors and had very similar levels of economic activity for all categories.

Table 9. Estimated Total Economic Impacts from Primary Forest Products

Sector	TIO[a]		Employment		Wages		TVA[b]	
	(Million $)	%	(Number)	%	(Million $)	%	(Million $)	%
Pulp, Paper & Paperboard Mills:								
State	5,049		33,035		1,264		2,241	
East	1,379	27.3	8,991	27.2	329	26.0	586	26.1
Plateau	1	0.0	8	0.0	0[c]	0.0	0[c]	0.0
Central	3	0.1	19	0.1	1	0.1	1	0.0
West Central	580	11.5	2,942	8.9	108	8.5	214	9.5
West	2,762	54.7	17,946	54.3	722	57.1	1,259	56.2
Intrastate Trade	324	6.4	3,129	9.5	104	8.2	181	8.1
Sawmills, Planing & Flooring Mills:								
State	2,261		21,794		601		1,025	
East	413	18.3	4,303	19.7	112	18.6	190	18.5
Plateau	466	20.6	4,978	22.8	118	19.6	205	20.0
Central	460	20.3	3,891	17.9	122	20.3	206	20.1
West Central	208	9.2	1,885	8.6	41	6.8	73	7.1
West	505	22.3	4,815	22.1	136	22.6	230	22.4
Intrastate Trade	209	9.2	1,922	8.8	72	12.0	121	11.8
Forest & Forestry Products:								
State	294		6,004		53		168	
East	96	32.7	2,090	34.8	17	32.1	61	36.3
Plateau	41	13.9	921	15.3	6	11.3	22	13.1
Central	49	16.7	1,060	17.7	9	17.0	25	14.9
West Central	27	9.2	717	11.9	3	5.7	14	8.3
West	57	19.4	996	16.6	10	18.9	32	19.0
Intrastate Trade	24	8.2	220	3.7	8	15.1	14	8.3
Logging:								
State	270		2,513		61		123	
East	65	24.1	608	24.2	15	24.6	30	24.4
Plateau	67	24.8	642	25.5	13	21.3	28	22.8
Central	28	10.4	253	10.1	7	11.5	13	10.6
West Central	43	15.9	374	14.9	8	13.1	18	14.6
West	42	15.6	384	15.3	9	14.8	19	15.4
Intrastate Trade	25	9.3	252	10.0	9	14.8	15	12.2

[a] Total Industry Output – annual value of production by industry.
[b] Total Value Added – income to workers paid by employers; self-employed income; interests, rents, royalties, dividends, and profit payments; and excise and sales taxes paid by individuals to businesses.
[c] Values of 0 are nonzero values that are less than 1.

For 2000, the output and employment multipliers by FIA regions and for the state for selected primary and secondary forestry sectors are presented in Table 11. For the state, multipliers ranged from 1.63 (Logging Camps & Logging Contractors) to 2.23 (Household

Table 10. Estimated Total Economic Impacts from Secondary Forest Products

Sector	TIO[a]		Employment		Wages		TVA[b]	
	(Million $)	%	(Number)	%	(Million $)	%	(Million $)	%
Paper & Allied Products:								
State	5,539		38,954		1,317		2,275	
East	1,465	26.4	10,843	27.8	341	25.9	566	24.9
Plateau	64	1.2	469	1.2	12	0.9	19	0.8
Central	1,275	23.0	9,146	23.5	315	23.9	509	22.4
West Central	144	2.6	983	2.5	30	2.3	45	2.0
West	2,493	45.0	15,804	40.6	572	43.4	1,053	46.3
Intrastate Trade	98	1.8	1,709	4.4	47	3.6	83	3.6
Furniture:								
State	4,368		43,657		1,258		1,963	
East	2,953	67.6	31,565	72.3	851	67.6	1,312	66.8
Plateau	52	1.2	635	1.5	15	1.2	23	1.2
Central	750	17.2	6,305	14.4	214	17.0	340	17.3
West Central	37	0.8	295	0.7	8	0.6	13	0.7
West	372	8.5	3,357	7.7	103	8.2	161	8.2
Intrastate Trade	204	4.7	1,500	3.4	67	5.3	114	5.8
Other Wood Products:								
State	1,646		14,641		394		674	
East	804	48.8	6,292	43.0	167	42.4	290	43.0
Plateau	109	6.6	1,089	7.4	26	6.6	46	6.8
Central	293	17.8	2,811	19.2	77	19.5	131	19.4
West Central	81	4.9	754	5.1	16	4.1	28	4.2
West	279	17.0	2,986	20.4	81	20.6	135	20.0
Intrastate Trade	80	4.9	709	4.8	27	6.9	44	6.5
Mobile Homes & Wood Buildings:								
State	1,226		11,834		347		590	
East	631	51.5	6,180	52.2	178	51.3	301	51.0
Plateau	39	3.2	384	3.2	9	2.6	16	2.7
Central	347	28.3	3,271	27.6	100	28.8	170	28.8
West Central	78	6.4	771	6.5	19	5.5	34	5.8
West	66	5.4	640	5.4	18	5.2	31	5.3
Intrastate Trade	65	5.3	588	5.0	23	6.6	38	6.4
Millwork, Veneer, Plywood, & Structural Wood:								
State	1,095		11,865		327		538	
East	357	32.6	3,922	33.1	106	32.4	174	32.3
Plateau	69	6.3	801	6.8	18	5.5	31	5.8
Central	245	22.4	2,681	22.6	76	23.2	124	23.0
West Central	6	0.5	85	0.7	2	0.6	3	0.6
West	368	33.6	3,887	32.8	109	33.3	178	33.1
Intrastate Trade	50	4.6	489	4.1	16	4.9	28	5.2

[a] Total Industry Output – annual value of production by industry.

[b] Total Value Added – income to workers paid by employers; self-employed income; interests, rents, royalties, dividends, and profit payments; and excise and sales taxes paid by individuals to businesses.

Table 11. Selected Primary and Secondary Forestry Total Industry Output and Employment Total Multipliers (Indirect & Induced) by FIA Region and State

Sectors	East	Plateau	Central	West Central	West	State
Total Industry Output						
Primary Forestry						
Logging Camps/Logging Contractors	1.57	1.40	1.63	1.31	1.57	1.63
Sawmills & Planing Mills, General	1.63	1.48	1.77	1.42	1.74	1.77
Hardwood Dimension/Flooring Mills	1.87	1.74	2.09	1.64	2.04	2.10
Special Products Sawmills, NEC	--	--	--	--	1.75	1.80
Pulp Mills	1.80	--	--	--	1.88	1.95
Paper Mills, Except Building Paper	1.80	1.55	1.92	1.55	1.87	1.92
Paperboard Mills	1.80	--	--	1.56	1.92	1.93
Secondary Forestry						
Millwork	1.79	1.52	1.86	--	1.84	1.89
Wood Kitchen Cabinets	1.79	1.50	1.84	1.44	1.87	1.88
Veneer and Plywood	--	--	--	--	1.80	1.75
Mobile Homes	1.74	--	1.78	1.41	1.76	1.81
Prefabricated Wood Buildings	1.71	1.48	1.79	1.40	1.80	1.81
Wood Household Furniture	1.83	1.52	1.87	--	1.88	1.92
Upholstered Household Furniture	1.72	1.46	1.74	1.39	1.77	1.82
Household Furniture, N.E.C.	2.12	--	2.14	--	--	2.23
Wood Office Furniture	2.01	--	1.93	--	2.04	2.01
Public Building Furniture	1.72	1.48	1.73	1.44	1.75	1.79
Wood Partitions and Fixtures	1.78	1.51	1.83	--	1.86	1.87
Paperboard Containers and Boxes	1.59	1.36	1.66	1.32	1.65	1.67
Employment						
Primary Forestry						
Logging Camps/Logging Contractors	1.98	1.69	2.00	1.54	1.85	1.99
Sawmills & Planing Mills, General	2.22	2.02	2.48	1.80	2.31	2.43
Hardwood Dimension/Flooring Mills	1.90	1.76	2.05	1.63	2.01	2.05
Special Products Sawmills, NEC	--	--	--	--	1.49	1.53
Pulp Mills	3.30	--	--	--	3.88	4.12
Paper Mills, Except Building Paper	3.93	2.54	3.07	2.91	3.87	4.13
Paperboard Mills	5.09	--	--	4.13	4.52	5.84
Secondary Forestry						
Millwork	2.00	1.71	1.99	--	1.96	2.04
Wood Kitchen Cabinets	1.73	1.51	1.76	1.44	1.74	1.79
Veneer and Plywood	--	--	--	--	2.06	2.05
Mobile Homes	2.06	--	2.00	1.58	1.93	2.08
Prefabricated Wood Buildings	2.11	1.81	2.22	1.72	2.17	2.19
Wood Household Furniture	1.86	1.66	1.99	--	1.97	1.94
Upholstered Household Furniture	1.80	1.52	1.72	1.47	1.92	1.86
Household Furniture, N.E.C.	1.82	--	1.88	--	--	1.87
Wood Office Furniture	2.16	--	2.40	--	2.21	2.19
Public Building Furniture	2.58	2.22	2.57	2.04	2.44	2.66
Wood Partitions and Fixtures	1.89	1.97	2.16	--	2.09	2.08
Paperboard Containers and Boxes	2.50	1.95	2.49	1.86	2.51	2.58

Furniture, NEC) for total industrial output and 1.53 (Special Products Sawmills, NEC) to 5.84 (Paperboard Mills) for employment. As an example on how to use the multiplier information, an increase of $1 million in economic activity for the sawmills and planing mills industry would result in an estimated total increase of $1.77 million – the $1 million increase in sawmills and planing mills, plus $0.77 million in additional economic activity generated by this increase. Further, for each job created in this same industry as a result of this $1 million increase, an estimated 1.43 additional jobs would be added.

Fishing and Hunting Expenditures

For 2001, recreational activities expenditures by sportsmen were important contributors to the state's economy. From March through August 2001, the University of Tennessee's Human Dimensions Research Lab conducted a telephone survey of anglers in Tennessee. Based on the survey, there were an estimated 916,241 anglers in the state. Anglers were asked about their expenditures for their most recent fishing trip. Trout, warm-water streams, reservoirs, and pond/small lake fishing were the different modes of fishing analyzed (Stephens *et al*., 2001).

Results from the survey indicate that total aggregate capital expenditures (reels, rods, rod-making equipment; lines, hooks, sinkers; artificial lures, flies; creel, fish bags, nets; and other equipment) were $129.5 million. The largest capital expenditure category was for reels, rods, and rod-making equipment at $58.5 million, followed by other equipment at $29.4 million, artificial lures and flies at $22.2 million, lines, hooks, and sinkers at $15.9 million, and creel, fish bags, and nets at $3.5 million. Trip related expenditure information (food, lodging, gas, boat rental/launch, and bait/ice) was also gathered. Reservoir fishing had the largest expenditure total per trip at $47.77, followed by warm-water fishing at $45.73, trout fishing at $41.74, and pond fishing at $24.56 (Stephens *et al*., 2001).

Direct fishing-related expenditures were $698.8 million. This expenditure financed close to 16,000 jobs. Total value added expenditures were estimated at $532.0 million. Total impacts for the state's economy were estimated at $1.38 billion in total industry output from recreational fishing and fishing related expenditures. Estimated total number of jobs exceeded 24,000, with total value added estimated at $943.1 million (Stephens *et al*., 2001).

According to the U.S. Fish and Wildlife Service for 2001 there were 359,000 hunters (state residents and nonresidents 16 years old and older) in Tennessee. Direct hunting-related expenditures totaled $588.7 million. Hunting expenditures generated over 11,500 jobs and contributed over $441.5 million in total value added. Equipment purchases were the largest hunting expenditure category totaling $384.3 million, or 65.3 percent of the total direct expenditures for hunting. Of this value, $222.1 million were spent on boats, campers, 4x4 vehicles, cabins, etc., followed by hunting equipment and auxiliary equipment (tents, special clothing, etc.) at $137.9 million and $24.3 million, respectively (U.S. Department of the Interior, Fish and Wildlife Service and U.S. Department of Commerce, U.S. Census Bureau, 2001).

Using IMPLAN, total impacts for the state's economy were estimated at $1.17 billion in total industry output from hunting and hunting related expenditures. Estimated total number of jobs exceeded 18,600, with total value added estimated at $789.2 million.

Summary and Conclusion

In 2000, Tennessee's forest and forest products industrial complex contributed $21.7 billion to the state's economy and employed over 184,000 individuals. Compared to 1997's value of $19.8 billion (value in 2000 dollars), this was an increase of 9.6 percent. The forestry industry for this study included the management and logging of trees, sawmills (primary forestry

products), including pulp and paper mills, plus forestry products manufacturing (secondary forestry products).

From a regional perspective, the forest industry was more important in the West Central, West, and East Regions relative to other two regions in the state (Table 12). Although the East Region contributed the largest amount of economic activity, close to $8.2 billion, this value represented only 7.6 percent of the total economic activity occurring in the region. The West Central Region relies heavily on the forest and forest products industry as reflected by the industry's 16.0 percent share of this regions economy.

Table 12. Regional Importance of Forestry to that Regions Economy, 2000

Location	Total Economic Activity	Estimated Forest Industry Contributions to the State's Economy	Percentage
	(million $)	(million $)	
State	330,218	21,750	6.6
East	106,863	8,163	7.6
Plateau	15,225	908	6.0
Central	110,890	3,449	3.1
West Central	7,530	1,203	16.0
West	89,710	6,890	7.7

Source: Minnesota IMPLAN Group, Inc.

Tennessee's forests are predominately hardwoods (89 percent). The state is one of the top hardwood lumber producing states and is the number one producer of hardwood flooring and pencils. In 2000, approximately 1.1 billion board feet of both hardwood products (lumber, crossties, handle blanks, etc.) and softwood lumber were produced. Forest products manufacturing for the state includes wood product manufacturing, paper manufacturing, and furniture and related products.

In 1999, timber products output for the state totaled 437.5 million cubic feet. Approximately 325.2 million cubic feet, or 74.3 percent, was from roundwood. Sawlogs accounted for the largest share of the state's industrial roundwood products for both hardwoods

and softwoods combined, followed by pulpwood, other industrial uses, and veneer logs. Most of the total roundwood output for both hardwoods and softwoods combined came from privately owned lands (non-industrial private), followed by forest industry ownership, other public, and national forests. Most exports and imports of all industrial roundwood were to and from surrounding states.

For primary forest products, the sectors with the largest output values were pulp, paper, and paperboard mills, followed by sawmills, planning, and flooring mills; forestry and forestry products; and logging. Likewise, for secondary forest products, the ranking was paper and allied products, followed by furniture; other wood products; mobile homes and wood buildings; and millwork, veneer, plywood, and structural wood.

In 2001, the number of anglers and hunters in the state were estimated at 916,000 and 359,000, respectively. For fishing expenditures, estimated total impacts were $1.38 billion for total industry output and $943.1 million for total value added. The number of jobs generated exceeded 24,000. Likewise, for hunting expenditures, total impacts were estimated at $1.17 billion for total industry output and $789.2 million for total value added. The number of jobs generated exceeded 18,600.

Literature Cited

English, B., K. Jensen, and J. Menard. (2003). "Economic Impacts of Agriculture and Forestry in Tennessee, 2000", Research Series 02-03.

Howell, M. and R. Wright. (2002). U.S. Department of Agriculture, Forest Service, "Tennessee's Timber Industry—An Assessment of Timber Product Output and Use, 1999". Southern Research Station, Resource Bulletin SRS-76.

Leontief, Wassily. (1936). "Quantitative Input and Output Relations in the Economic System of the United States", *Review of Economics and Statistics*, 18:105-125.

Minnesota IMPLAN Group, Inc., IMPLAN System (data and software), 1725 Tower Drive West, Suite 140, Stillwater, MN 55082, www.implan.com.

Olson, D. and S. Lindall. (1999). "IMPLAN Professional Software, Analysis, and Data Guide", Minnesota IMPLAN Group, Inc., 1725 Tower Drive West, Suite 140, Stillwater, MN 55082, www.implan.com.

Schweitzer, C. J. (2000). U.S. Department of Agriculture, Forest Service. "Forest Statistics for Tennessee, 1999". Southern Research Station, Resource Bulletin SRS-52.

Stephens, B., M. Fly, B. English, and J. Menard. (2001). Fishing Expenditures for Fall 2001 TWRA Survey. University of Tennessee, Institute of Agriculture.

Tennessee Agricultural Statistics Service, "Tennessee Agriculture 2001", Bulletin No. 36.

Tennessee Agricultural Statistics Service, "Tennessee Agriculture 2002", Bulletin No. 37.

Tennessee Division of Forestry, Master Logger. Accessed on 2/16/04 at http://www.state.tn.us/agriculture/forestry/tdfml.

Tennessee Division of Forestry, Tennessee Forest Facts. Accessed on 2/9/04 at http://www.state.tn.us/agriculture/forestry/tdfff.thml.

Tennessee Division of Forestry, Tennessee State Forests. Accessed on 2/9/04 at http://www.state.tn.us/agriculture/forestry/stateforests/index.html.

Tennessee Division of Forestry, Water Quality. Accessed on 2/16/04 at http://www.state.tn.us/agriculture/forestry/tdfbp.html.

Tennessee Statistical Abstract 2003, Center for Business and Economic Research, The University of Tennessee, Knoxville. Accessed on 3/23/04 at http://cber.bus.utk.edu/tsa/tsa03/tsa03.htm

U.S. Census Bureau, CenStats Databases, 2000 County Business Patterns (NAICS). Accessed on 2/16/04 at http://censtats.census.gov/.

U.S. Census Bureau, Manufacturing, Mining, and Construction Statistics, Annual Survey of Manufacturers, 2000 Geographic Area Statistics. Accessed on 5/21/03 at http://www.census.gov/prod/2002pubs/m00as-3.pdf.

U.S. Census Bureau, State and County *QuickFacts*, Tennessee *QuickLinks*, County Business Patterns Economic Profile, 2000. Accessed on 5/21/03 at http://quickfacts.census.gov/qfd/states/ 47000lk.htmlCenStats Database.

U.S. Department of Agriculture, Forest Service, Forest Inventory and Analysis, National Program Office, Southern Region. Accessed on 2/9/04 at http://srsfia2.fs.fed.us/.

U.S. Department of Commerce, TradeStats Express™-State Export Data, Office of Trade and Economic Analysis, 2000. Accessed on 12/10/03 at http://tse.export.gov/ITA2003_STATES/ESEIntro.htm.

U.S. Department of the Interior, Fish and Wildlife Service and U.S. Department of Commerce, U.S. Census Bureau. *2001 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation*. Accessed on 4/13/04 at http://www.census.gov/prod/2003pubs/01fhw/fhw01-tn.pdf.

Appendix A: Forest Inventory & Analysis Region County Identification Table

Table A.1. County Assignments by Forest Inventory & Analysis Regions and to Tennessee Forest Industry Model

East	Plateau	Central	West Central	West
Anderson	Bledsoe	Bedford	Benton	Carroll
Blount	Campbell	Cannon	Decatur	Chester
Bradley	Cumberland	Cheatham	Hardin	Crockett
Carter	Fentress	Clay	Hickman	Dyer
Claiborne	Franklin	Coffee	Houston	Fayette
Cocke	Grundy	Davidson	Humphreys	Gibson
Grainger	Marion	DeKalb	Lawrence	Hardeman
Greene	Morgan	Dickson	Lewis	Haywood
Hamblen	Overton	Giles	Perry	Henderson
Hamilton	Pickett	Jackson	Stewart	Henry
Hancock	Putnam	Lincoln	Wayne	Lake
Hawkins	Scott	Macon		Lauderdale
Jefferson	Sequatchie	Marshall		McNairy
Johnson	Van Buren	Maury		Madison
Knox	Warren	Montgomery		Obion
Loudon	White	Moore		Shelby
McMinn		Robertson		Tipton
Meigs		Rutherford		Weakley
Monroe		Smith		
Polk		Sumner		
Rhea		Trousdale		
Roane		Williamson		
Sevier		Wilson		
Sullivan				
Unicoi				
Union				
Washington				