

Economic Impact of the Texas Forest Sector, 2015



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HIGHLIGHTS 2015

- The Texas forest sector directly contributed \$18.3 billion of industry output to the Texas economy, employing over 66,000 people with a payroll of \$3.7 billion.
- Including direct, indirect, and induced effects, the Texas forest sector had a total economic contribution of \$32.5 billion in industry output, supporting more than 144,500 jobs with \$8.4 billion in labor income.
- On average, every dollar generated in the Texas forest sector contributed an additional 77 cents to the rest of the Texas economy.
- Every job created in the forest sector resulted in another 1.19 jobs in the state.
- Texas forest landowners received estimated stumpage revenue totaling \$316.4 million.
- Secondary forest products manufacturing industries contributed over two-thirds of the Texas forest sector's total industry output and employed 72 percent of the forest sector workforce.
- The forest sector in East Texas directly produced \$5.7 billion worth of goods and services, supporting more than 18,900 jobs with \$1.4 billion in labor income.
- Seventy-six percent of the industry output from forestry, logging, and the primary solid wood products industries was from East Texas.
- Texas forest products firms exported \$1.11 billion worth of forest products to foreign countries in 2015.
- The recent recession had a profound adverse impact on the Texas forest sector. Compared to 2007, the 2015 Texas forest sector total industry output and employment decreased 18 percent and 13 percent, respectively. Compared to a recent low point in 2011, however, total industry output and employment generated by the Texas forest sector increased 10 percent and 13 percent, respectively.

INTRODUCTION

Texas has more than 63.4 million acres of forestland — 12.3 million acres in East Texas and 51.0 million acres across the rest of the state (Miles, 2017). Of the 63.4 million acres, timberland accounts for 23 percent, or about 14.3 million acres, and the majority of it — around 85 percent — is located in East Texas. Figure 1 shows forest coverage across the state.

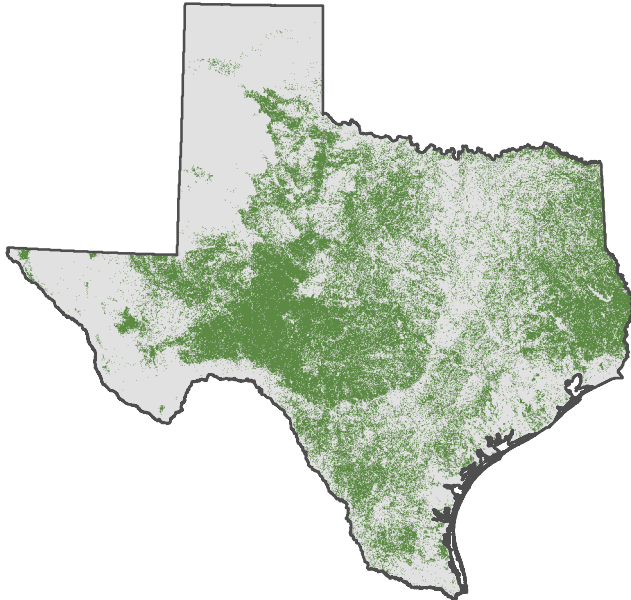


Figure 1. Forestland in Texas

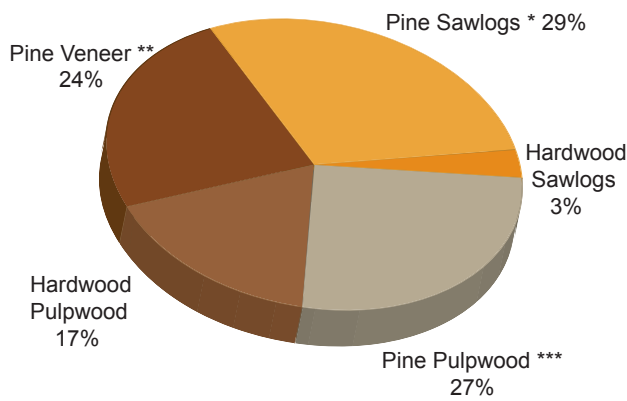
In East Texas about 92 percent of the timberland is privately owned. Family forest landowners are by far the largest group of private owners, accounting for about 53 percent of all timberland. In the past decade most timberland held by corporations that own wood processing facilities have transferred to entities that do not own wood processing facilities such as TIMOs (Timberland Investment Management Organizations) and REITs (Real Estate Investment Trusts). They currently account for about 24 percent of timberland in East Texas. Other private ownership classes (i.e. non-industrial corporate excluding TIMOs and REITs, unincorporated, Native American, and nongovernmental organizations) account for slightly more than 15 percent of all timberland. About eight percent of timberland is publicly owned. There is an estimated 17.4 billion cubic feet of volume on timberland in East Texas. Softwood species account for 58 percent and hardwoods account for 42 percent of the total (East Texas Forestlands, 2015).

Only 2.2 million (4 percent) of the 51 million acres of forestland outside of East Texas is considered productive timberland, having capacity of producing at least 20 cubic feet per acre per year. Mesquite is the most abundant forest type in Central and West Texas. Forest types juniper-pine, oak, and other hardwood are also abundant. Oak is a common type in the West Central and North Central regions (see Figure 4 for regions; Central and West Texas Forestlands, 2013). Timber growing stock outside of East Texas was estimated to be 954 million cubic feet in 2013 (Miles, 2017). Hardwoods made up 85 percent of the total, while softwoods accounted for only 15 percent.

In 2015, total removals of growing stock in East Texas decreased 1.7 percent from the previous year (Edgar et al. 2017). The total volume of growing stock removed was 504.7 million cubic feet in 2015, compared to 513.7 million cubic feet a year earlier. Industrial roundwood harvest in Texas, the portion of total removals that was subsequently utilized in the manufacture of wood products, totaled 418.2 and 105.2 million cubic feet for softwood and hardwood, respectively. Softwood industrial roundwood harvest was down 4.9 percent, and hardwood roundwood harvest was up 15.0 percent from a year earlier. The combined harvest decreased 1.5 percent to 523.4 million cubic feet in 2015.

In 2015, Texas mills produced 1.5 billion board feet of lumber, a 2.0 percent decrease from a year earlier. Production of softwood lumber declined 2.3 percent to 1.4 billion board feet and hardwood lumber production increased 2.8 percent to 107 million board feet. Production of structural panels, including plywood and OSB, was up 4.1 percent to 2.4 billion square feet (3/8-inch basis). Production of paperboard, fiberboard, and market pulp was down 4.8 percent to 2.1 million tons compared to 2014.

The forest sector makes considerable contributions to local and regional economies. In 2015, the wood-based industry continued to be one of the top 10 manufacturing sectors in the state. Texas was the largest of the 13 southern states in terms of total employment, economic output, and labor income in the forest sector between 2004 and 2009 (Brandeis et al. 2012). The value of harvested timber ranked ninth among Texas top agricultural commodities in 2015, behind cattle and calves, broilers, milk, miscellaneous crops, cotton



* includes chip-n-saw

** includes panel roundwood

*** includes posts, poles and pilings

Figure 2. Industrial roundwood harvest by product, 2015

lint, corn, chicken eggs, and sorghum grain. This study evaluates the Texas forest sector's economic contributions to local economies in 2015, foreign exports, and the impacts of the 2008 financial crisis on the sector. The impacts are further divided to capture variations across sub-industries and regions. The multipliers published in this study can be used to assess the economic contributions individual sub-industries may make to the local economy.

DATA AND METHODS

The IMPLAN input-output modeling system and associated 2015 databases from the Minnesota IMPLAN Group (MIG) were used in this study to estimate direct and total economic contributions of the Texas forest sector in 2015. The input-output analysis examines how direct effects (e.g. operation expenditures and employment) generate additional indirect effects (e.g. purchases by supporting industries and their employment) and induced effects (e.g. household spending by direct and indirect employees) that result in the total impact on the local economy. The multipliers used in this study are Type SAM (Social Accounting Matrix) multipliers, which capture expenditure linkages between industries and other economic agents, such as households and government. The databases used by the IMPLAN system were compiled by MIG based on data from various U.S. federal agencies such as Bureau of Economic Analysis, Bureau of Labor Statistics, Census Bureau, Department of Agriculture, and Geological Survey (MIG, Inc. 2000). All values estimated here are

in 2017 constant dollars unless stated otherwise.

The economic contribution analysis is used to estimate the contribution that Texas forestry-based sectors have on the state's overall economy. Specifically, the contribution analysis estimates the reduction in economic activity that would occur in a particular region if the forestry sectors ceased to exist. The Texas forest sector is divided into six sub-industries: forestry, logging, primary solid wood products, secondary solid wood products, primary paper and paperboard products, and secondary paper and paperboard products. Each sub-industry includes several IMPLAN sectors as defined by MIG (see Appendix). Consistent with previous studies, IMPLAN sector 143 "Manufactured home (mobile home)" is excluded from the secondary solid wood products sub-industry. All results are based on multi-industry contribution analysis.

RESULTS

STATEWIDE CONTRIBUTIONS

The Texas forest sector directly produced \$18.3 billion of industry output in 2015 (Table 1). Value-added accounted for 27 percent (\$4.9 billion) of the industry output. Note that value-added is the contribution of industries to the state's output, also known as Gross State Product (GSP). It equals industrial output minus intermediate inputs.

Direct employment of the Texas forest sector was more than 66,000 workers with \$3.7 billion of wages, salaries, and benefits in 2015. The sector's average annual labor income (including wages, benefits, taxes paid to the governments on behalf of employees, and proprietor income) was \$56,421 in 2015, about eight percent lower than the state average across all sectors.

The impacts of the forest sector are transferred to other sectors of the economy through purchasing inputs from other sectors in the state as well as household spending with subsequent rounds of additional spending. Including direct, indirect, and induced effects, the Texas forest sector contributed \$32.5 billion in industry output to the state economy in 2015. Value-added was \$12.7 billion, 39 percent of the total industry output. The Texas forest sector generated 144,583 jobs and created \$8.4 billion in labor income. These impacts were estimated based on Type SAM multipliers for

output, value-added, employment, and labor income in Table 1. On average, every dollar generated in the Texas forest sector contributed an additional 77 cents to the rest of the Texas economy. Furthermore, every job created in the Texas forest sector resulted in 1.19 additional jobs in the state economy.

CONTRIBUTIONS BY SUB-INDUSTRY

Economic contribution varied across sub-industries in the Texas forest sector. Secondary solid wood and secondary paper and paperboard products were the largest two sub-industries in the Texas forest sector (Table 1). The secondary paper and paper-

board products sub-industry produced the largest industry output while secondary solid wood products produced the largest value-added, employed the most labor force, and generated the highest labor income in the forest sector. The majority (54%) of the forest sector workforce — 35,516 workers — was employed in the secondary solid wood products sub-industry. The secondary paper and paperboard products sub-industry employed 14,210 workers, accounting for 22 percent of the total direct employment of the forest sector.

Primary wood products sub-industries (solid wood and paper and paperboard products) produced about 27 percent of the direct industry output, supporting 9,881 full and part-time jobs in Texas. The forest-

Table 1. Direct and total economic contributions of the Texas forest sector, 2015

Sub-industry	Industry Output (\$ million)	Value-Added (\$ million)	Employment (jobs)	Labor Income (\$ million)
Direct Contribution				
Forestry	259.28	228.88	2,256	142.49
Logging	356.75	216.21	4,231	211.54
Primary Solid Wood Products	2,370.80	528.90	6,959	378.38
Secondary Solid Wood Products	5,842.01	1,866.82	35,516	1,621.24
Primary Paper & Paperboard Products	2,513.78	513.97	2,922	318.49
Secondary Paper & Paperboard Products	6,997.98	1,572.70	14,210	1,056.89
Total	18,340.60	4,927.48	66,093	3,729.04
Total Contribution				
Forestry	434.39	326.87	3,382	200.51
Logging	615.56	364.78	5,872	297.51
Primary Solid Wood Products	4,341.70	1,610.68	17,282	1,015.74
Secondary Solid Wood Products	10,756.93	4,595.96	64,259	3,273.54
Primary Paper & Paperboard Products	4,858.50	1,792.99	14,580	1,070.18
Secondary Paper & Paperboard Products	11,537.27	4,060.45	39,209	2,549.07
Total	32,544.36	12,751.71	144,583	8,406.54
SAM Multiplier				
Forestry	1.68	1.43	1.50	1.41
Logging	1.73	1.69	1.39	1.41
Primary Solid Wood Products	1.83	3.05	2.48	2.68
Secondary Solid Wood Products	1.84	2.46	1.81	2.02
Primary Paper & Paperboard Products	1.93	3.49	4.99	3.36
Secondary Paper & Paperboard Products	1.65	2.58	2.76	2.41
Total	1.77	2.59	2.19	2.25

Numbers in columns may not sum to totals due to rounding.

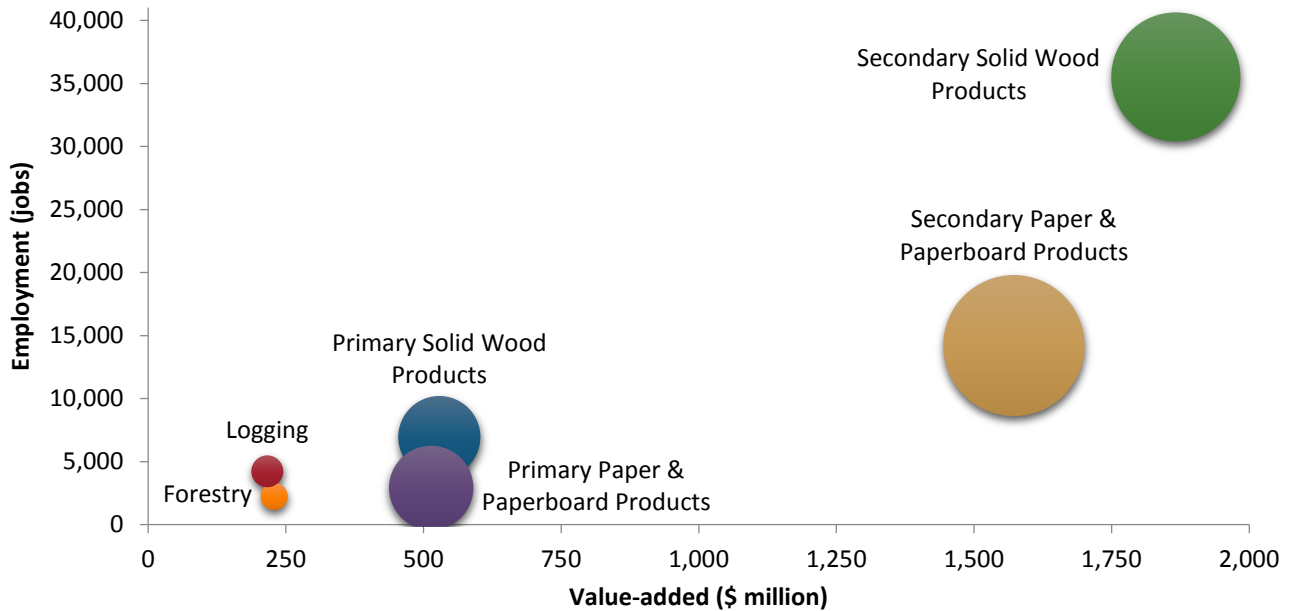


Figure 3. Direct economic contributions of the Texas forest sector by sub-industry, 2015

ry and logging sub-industries together accounted for about three percent of the total industry output. Figure 3 shows the direct economic contributions of the forest sector by sub-industry. The size of the bubbles represents the magnitude of industry output. Overall, the primary paper and paperboard products sub-industry has the highest SAM multipliers in industry output, value-added, employment, and labor income indicating local economies benefited more from this sub-industry than other sub-industries in the forest sector. Every dollar generated in the primary paper and paperboard products sub-industry created an additional 93 cents in the state economy. Every job in the primary paper and paperboard sub-industry created an additional 3.99 jobs in Texas.

CONTRIBUTIONS BY REGION

The economic contributions of the forest sector varied substantially across the state's seven regions: Northeast, Southeast, North Central, Northwest, South, West, and West Central (Figure 4). Table 2 shows the direct and total economic contributions of the Texas forest sector by region. In absolute terms, North Central Texas had the greatest direct economic contribution in 2015. The forest sector in North Central Texas contributed 41 percent — \$7.4 billion — of industry output and employed about 41 percent of total workers — 29,936 people — in the Texas forest sector. This

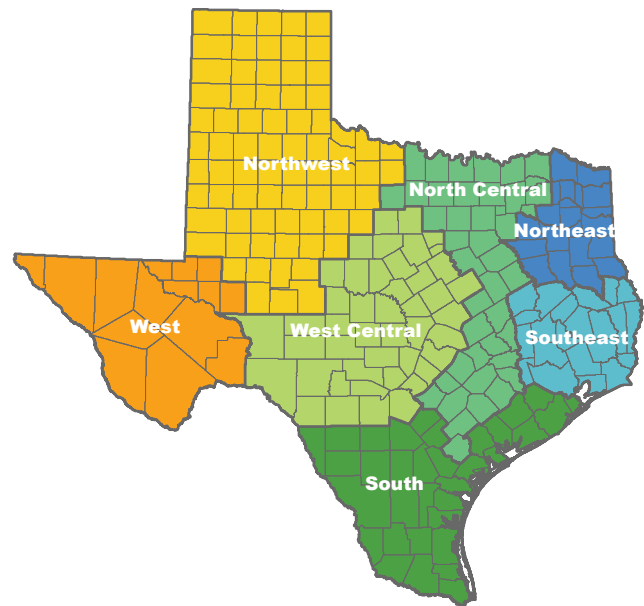


Figure 4. Regions in Texas

is mainly due to the concentration of secondary forest products and paperboard industries in this region. Including direct, indirect, and induced contributions, the forest sector in this region had a total contribution of approximately \$13.9 billion in industry output and \$5.6 billion in value-added, employing 61,742 people.

East Texas had about 35 percent of direct industrial output (\$6.3 billion) and employed 33 percent (21,892) of total workers in the sector, mainly from the solid wood and paper and paperboard products sub-industries in the region. Nearly three-quarters of all for-

stry and logging industries and the great majority of the primary forest products industries in Texas reside in East Texas. The output from primary solid wood products in East Texas accounted for 79 percent of all primary solid wood products manufacturing in Texas. The forest sector in East Texas had a total economic contribution of \$11.2 billion in total industry output, \$4.5 billion in value-added, and 47,545 jobs to the state economy.

West Central Texas produced \$2.4 billion worth

of goods and services from the forest sector in 2015. The region's share of the total Texas forest sector's industry output, employment, and value-added was around 13 percent. Most of the outputs in this region were from the secondary forest products industries. The other three regions (Northwest, South, and West) had minor contributions to the Texas forest sector.

The forest sector plays an important role in local economies of some East Texas counties. For example, in 28 of 43 East Texas counties, the wood-based sector

Table 2. Direct and total contributions of the Texas forest sector by region, 2015

Region	Industry Output (\$ million)	Value-Added (\$ million)	Employment (jobs)	Labor Income (\$ million)
Direct Contribution				
Northeast	2,300.84	606.75	8,335	464.97
Southeast	4,036.40	1,158.71	13,557	858.96
North Central	7,461.52	1,984.47	26,936	1,536.56
Northwest	850.72	253.16	2,560	151.60
South	825.12	210.10	4,151	177.95
West	460.72	85.53	1,506	65.82
West Central	2,406.73	605.17	9,073	479.93
Total	18,340.60	4,927.48	66,093	3,729.04
Total Contribution				
Northeast	3,867.54	1,387.05	17,812	908.73
Southeast	7,320.30	3,079.47	29,734	2,014.98
North Central	13,880.24	5,592.74	61,742	3,703.16
Northwest	1,313.99	490.35	5,191	284.88
South	1,240.99	412.99	7,059	297.07
West	720.59	210.52	3,111	136.54
West Central	4,200.69	1,578.60	19,935	1,061.19
Total	32,544.36	12,751.71	144,583	8,406.54
SAM Multiplier				
Northeast	1.68	2.29	2.14	1.95
Southeast	1.81	2.66	2.19	2.35
North Central	1.86	2.82	2.29	2.41
Northwest	1.54	1.94	2.03	1.88
South	1.50	1.97	1.70	1.67
West	1.56	2.46	2.07	2.07
West Central	1.75	2.61	2.20	2.21
Total	1.70	2.27	2.20	2.08

Numbers in columns may not sum to totals due to rounding.

was in the top five among manufacturing sector employers in 2015. The forest sector ranked first among manufacturing industries in Cass, Cherokee, Hardin, Jasper, Marion, Newton, Red River, Rusk, Sabine, San Augustine, Tyler, and Walker Counties. The forest sector contributed about 10 percent of total employment generated in Cass, Nacogdoches, Polk, and Sabine Counties. Similarly, the forest sector contributed more than 25 percent of direct economic output and more than 15 percent of total value added in Cass and Jasper Counties.

Harris, Cass, Jasper, Polk, and Orange were the top five East Texas counties in terms of direct output value of the forest sector in 2015. Similarly, the top five counties with direct forest-related employment were Harris, Polk, Cass, Jasper, and Angelina. Harris, Cass, Jasper, Polk and Angelina Counties provided the five largest direct labor-income opportunities and also ranked the top five among East Texas counties in terms of direct value-added impacts.

FOREIGN EXPORTS OF THE TEXAS FOREST SECTOR

Texas forest products firms exported \$1.1 billion worth of forest products to foreign countries in 2015, about six percent of the forest sector’s value of direct industry output. Secondary paper and paperboard products was the largest forest products export sub-industry, shipping \$395.7 million worth of products to foreign countries (Figure 5). The value of foreign exports by the secondary solid wood products sub-industry totaled \$292.2 million in 2015. Primary paper and paperboard and primary solid wood products exported \$237.7 million and \$146.9 million, respectively.

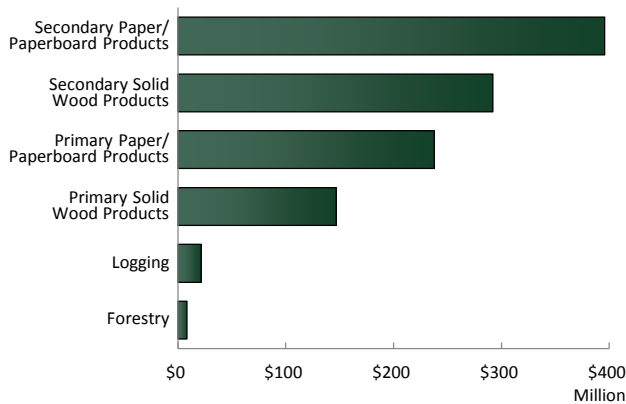


Figure 5. Value of Texas forest products foreign exports by sub-industry, 2015

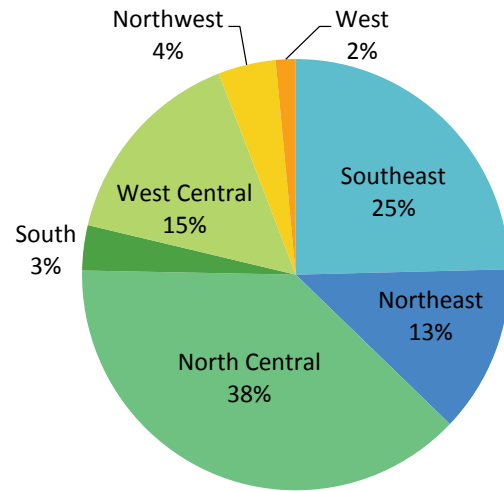


Figure 6. Value of Texas forest products foreign exports by region, 2015

Of the regions, North Central Texas was the largest contributor to exports, accounting for about 38 percent of the total value of forest products foreign exports in 2015 (Figure 6). East Texas, combining the Northeast and Southeast regions, was the second largest contributor, exporting \$409.9 million of forest products internationally. These top two regions accounted for about 76 percent of the total forest products exports in the state in 2015, while West Central Texas accounted for only 15 percent and the remaining three regions together contributed nine percent of the total forest products exports, or \$102 million.

RECESSION EFFECTS ON THE FOREST SECTOR IN TEXAS: A RETROSPECTIVE ANALYSIS

The 2008 great financial crisis began in December 2007 and ended in June 2009. During this time goods-producing industries experienced large declines in employment and economic output. The housing market collapse resulted in significant job losses in the forest sector across the South. From a peak of 2.1 million units of U.S. housing starts in 2005, new residential construction dropped to 554,000 units in 2009, the lowest level since 1945. The housing market has been rebounding slowly to about 1.1 million units in 2015. Similar to the rest of the region, wood-related business dipped in Texas during the recession. Given the importance of the forest sector in the state economy, it is imperative to understand how the recession impacted the state’s forest sector and whether it has recovered.

With the help of trend analysis, this section evaluates the forest sector's total economic contributions in recent years (2007–2015) and the recession's impacts on the Texas forest industry. Constant 2011 dollars were used for the comparison analysis.

Texas forest industry felt the deleterious effects of recession in 2010 and 2011, and had yet to recover as of 2015. Compared to the 2007 value, the 2015 total economic output value was still down 18 percent. The magnitude of recession effects, however, varied across sub-industries. In terms of percentage change, the forestry sub-industry was the hardest hit, as its total economic output was down 67 percent in 2015 compared to the pre-recession year of 2007 (Figure 7). Secondary solid wood products, a major contributor among forest sub-industries, experienced the largest number of job losses in Texas. Compared to 2007, the secondary solid wood products sub-industry contributed 23 percent less in terms of total economic output and generated 19 percent fewer jobs in 2015. Total payroll of secondary solid wood products decreased by 17 percent during this period. In contrast, the primary solid wood products sub-industry, which consists of sawmills and veneer and plywood manufacturing, performed better than pre-recession year 2007 in terms of total employ-

ment opportunities and labor income. The primary solid wood products sub-industry was also least affected in terms of total output and value-added.

The paper and paperboard products sub-sector, which consists of the primary and secondary paper and paperboard products sub-industries, also had not fully recovered from the 2008 economic recession as of 2015. Compared to 2007 levels, there was still about a 10 percent decline in total economic output and an 11 percent decline in employment in the paper and paperboard products-related sub-industries. Due to lower economic activity, total volumes of timber harvests declined from 619.3 million cubic feet in 2007 to 523.4 million cubic feet in 2015 (Edgar et al. 2017), but the trend of timber harvest has been upward since 2011.

The average weighted price of large pine sawtimber was still down 29 percent during the period from 2007 to 2015 (Texas Timber Price Trends). Lower demand for timber stagnated production in the entire supply chain network of the forest sector. Along with economic recession, structural changes in traditional forest sub-industries and lack of product demand due to availability of inexpensive substitutes may have contributed to the decrease of overall forest product output. For example, primary paper and paperboard

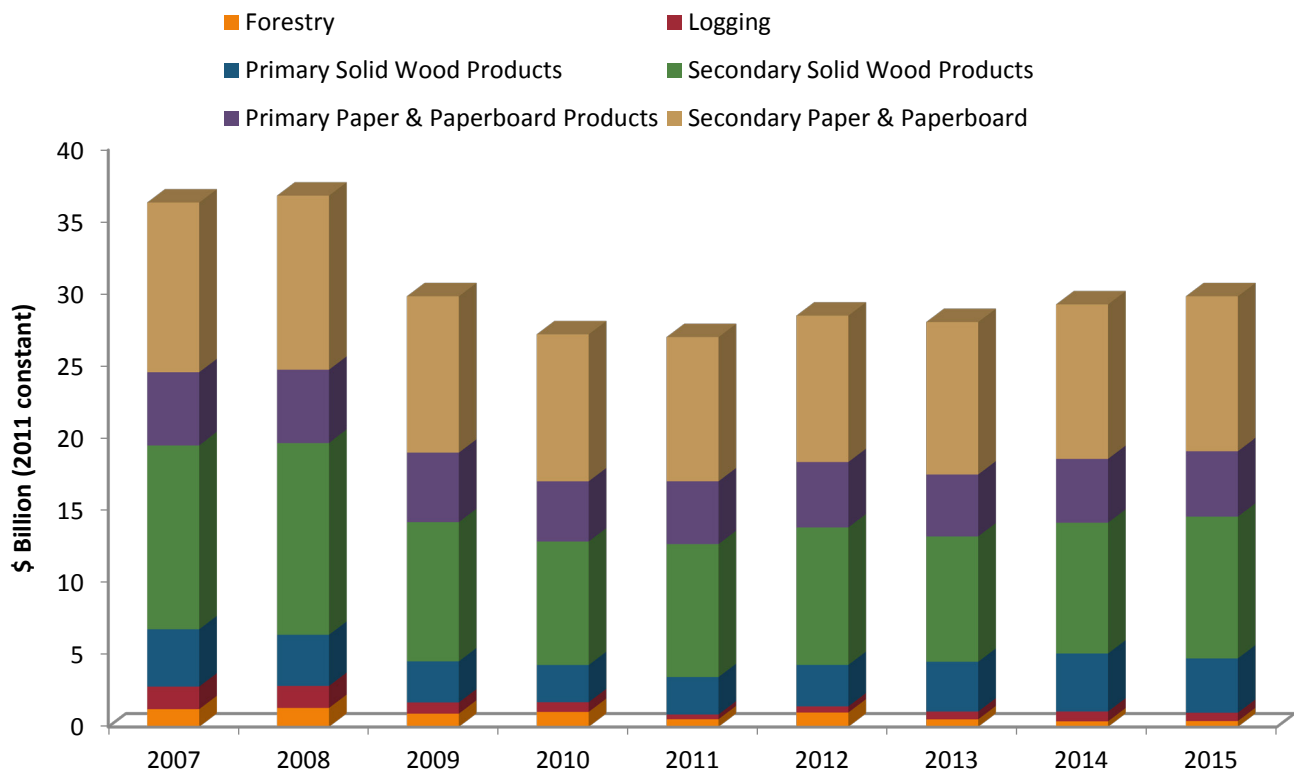


Figure 7. Total economic output of Texas forest sector by sub-industry, 2007–2015

outputs have declined as a result of significant adjustments prior to the recession. The furniture sub-industry is facing increased competition from imported products. Employment opportunities in logging declined during this period. Overall, trend analysis of the Texas forest sector suggests that the economic downturn largely impacted the forest sector in Texas and it had not fully recovered as of 2015.

CONCLUSION

The forest sector plays an important role in the Texas economy. During the past decade, the wood-based industry has remained one of the top 10 manufacturing sectors in the state. In 2015, the Texas forest sector (forestry, logging, primary and secondary solid wood products manufacturing, and primary and secondary paper and paperboard products manufacturing) directly contributed \$18.3 billion in industry output and \$4.9 billion in value-added to the state economy and supported more than 66,000 jobs with a payroll of \$3.7 billion.

Impacts of the forest sector are transferred to other sectors of the economy through input purchases and spending. Including direct, indirect, and induced effects, the total economic contributions of the Texas forest sector in 2015 were \$32.5 billion in industry output, \$12.7 billion in value-added, \$8.4 billion in labor income, and about 144,600 jobs. On average, every dollar generated in the Texas forest sector contributed an additional 77 cents to other sectors, and every job in the Texas forest sector created another 1.19 jobs in the state economy.

The largest industry outputs were from secondary forest products (wood windows/doors and mill work, wood containers, wood buildings, other wood products, furniture, paperboard containers, coated and treated paper and packaging materials, etc.). Most of the secondary forest products manufacturing facilities are located in North Central Texas. Nearly three-quarters of all forestry and logging industries and the majority of the primary forest products industries reside in East Texas.

The forest sector in East Texas directly produced \$6.3 billion worth of goods and services in 2015. It generated \$1.7 billion in value-added, about 21,900

jobs, and \$1.3 billion in labor income.

Texas forest products firms exported about six percent of their total industry output, or \$1.1 billion worth of forest products to foreign countries in 2015, with secondary paper and paperboard being the largest. North Central Texas was the largest contributor among all regions to the forest products foreign exports in 2015.

The 2008 economic recession had a profound adverse impact on the Texas forest sector. Compared to pre-recession levels, the 2015 total economic output value of the forest sector was still down 18 percent. The secondary solid wood products sub-industry contributed 23 percent less in terms of total economic output and generated 19 percent fewer jobs during this period. In contrast, the primary solid wood products sub-industry, which consists of sawmills and veneer and plywood manufacturing, performed better than pre-recession year 2007 in terms of total employment opportunities and labor income.

Note that the scope of this study is focused only on the economic contributions of the forest sector. The environmental benefits of forests were not included. A study conducted by Texas A&M Forest Service in 2013 estimated that the more than 60 million acres of forestland in Texas provide \$93 billion worth of environmental goods and services such as regulating local climate, protecting water resources, improving wildlife habitats, species diversity, and other intangible cultural benefits. There are some emerging, non-traditional markets for forestry and forest products such as electricity or biofuel production using woody biomass, carbon credits, and other ecosystem benefits trading from sustainable forest management. These markets also provide economic opportunities for the Texas forest sector.

Additional information on economic impacts of Texas forest industries, statewide trend analysis, directory of forest products industry, timber supply analysis, county- or region-specific distribution of forest products, economic values of the ecological goods and services provided by Texas forests, and more web-based applications are available in the Texas Forest Information Portal (texasforestinfo.com) developed by Texas A&M Forest Service.

REFERENCES

- Brandeis, T.J., A.J. Hartsell, J.W. Bentley, and C. Brandeis. 2012. Economic dynamics of forests and forest industries in the southern United States. USDA Forest Service, General Technical Report. SRS-152, 86 p.
- Central and West Texas Forestlands, 2013. Texas A&M Forest Service, College Station, TX.
- East Texas Forestlands, 2015. Texas A&M Forest Service, College Station, TX.
- Edgar, C., R. Parajuli, R. Zehnder, B. Carraway, and E. Taylor. 2017. Harvest Trends 2015. Texas A&M Forest Service, College Station, TX.
- MIG, Inc. 2000. IMPLAN professional version 2.0: User's guide, analysis guide, and data guide (2nd edition). Minnesota IMPLAN Group, Stillwater, MN.
- Miles, P.D. 2017. Forest Inventory EVALIDator web-application version 1.6.0.00. St. Paul, MN: U.S. Department of Agriculture, Forest Service, Northern Research Station. [Available only on internet: <http://apps.fs.fed.us/Evalidator/evalidator.jsp>].
- Texas Timber Price Trends. <http://tfsweb.tamu.edu/timberpricetrends>.
- Watson, P., J. Wislon, D. Thilmany, and S. Winter. 2007. Determining economic contributions and impacts: What is the difference and why do we care? *Pedagogy in Regional Studies*, JRAP 37(2): 140-146.

GLOSSARY

- Industry output** is the total value of production or service by industry for a given time period.
- Value-added** is the difference between an industry's total output and the cost of its intermediate inputs. It consists of four components: employee compensation, proprietor income, other property income, and indirect business tax.
- Employment** includes full-time and part-time employees and self-employed individuals.
- Labor income** includes wages, salary, and benefits of employees, taxes paid to the government on behalf of employees, and income for self-employed individuals.
- Direct effects** refer to the sector's own production, value-added, employment, and labor income.
- Indirect effects** refer to the economic activities in other sectors impacted by the forest sector's purchase of goods and services.
- Induced effects** are economic activities from consumption of goods and services using income generated from the direct and indirect effects.
- SAM** is the acronym for Social Accounting Matrices, a macro accounting system widely used by many countries for analyzing relationships of economic activities such as production, consumption, and trade between various economic entities.
- Direct economic impact** of a sector includes only direct effects.
- Total economic impact** of a sector includes all three types of effects generated by the sector: direct, indirect, and induced.
- Economic impact** is the net change in new economic activity associated with an industry, event, or policy in an existing regional economy (Watson et al. 2007).
- Economic contribution** is the gross change in economic activity associated with an industry, event, or policy in an existing regional economy.

APPENDIX

Sub-Industry/IMPLAN Sector	IMPLAN Sector ID	IMPLAN BEA Code	NAICS 2012
Forestry			
Forestry, forest products, and timber tract production	15	113A00	1131-2
Commercial hunting and trapping	18 (partial)	114200 (partial)	1142 (partial)
Support activities for agriculture and forestry	19 (partial)	115000 (partial)	115 (partial)
Logging			
Commercial logging	16	113310	1133
Primary solid wood products			
Sawmills	134	321113	321113
Wood preservation	135	321114	321114
Veneer and plywood manufacturing	136	32121A	321211-2
Reconstituted wood product manufacturing	138	321219	321219
Secondary solid wood products			
Engineered wood member and truss manufacturing	137	32121B	321213-4
Wood windows and door manufacturing	139	321911	321911
Cut stock, resawing lumber, and planing	140	321912	321912
Other millwork, including flooring	141	321918	321918
Wood container and pallet manufacturing	142	321920	32192
Prefabricated wood building manufacturing	144	321992	321992
All other miscellaneous wood product manufacturing	145	321999	321999
Wood kitchen cabinet and countertop manufacturing	368	337110	33711
Upholstered household furniture manufacturing	369	337121	337121
Nonupholstered wood household furniture manufacturing	370	337122	337122
Institutional furniture manufacturing	372	337127	337127
Wood office furniture manufacturing	373	337211	337211
Custom architectural woodwork and millwork	374	337212	337212
Showcase, partition, shelving, and locker manufacturing	376	337215	337215
Primary Paper and Paperboard Products			
Pulp mills	146	322110	32211
Paper mills	147	322120	32212
Paperboard mills	148	322130	32213
Secondary Paper and Paperboard Products			
Paperboard container manufacturing	149	322210	32221
Paper bag and coated and treated paper manufacturing	150	322220	32222
Stationery product manufacturing	151	322230	32223
Sanitary paper product manufacturing	152	322291	322291
All other converted paper product manufacturing	153	322299	322299

Source: IMPLAN Group, 2015

