THE WAVE OF WOOD

Forestry's Economic Contribution to South Carolina's Economy in 2018

ABOUT THE AUTHORS

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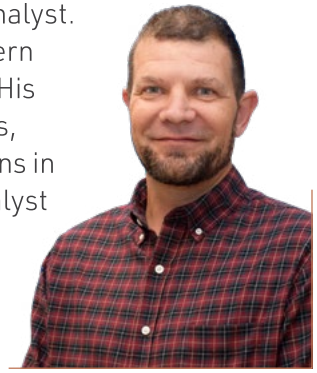

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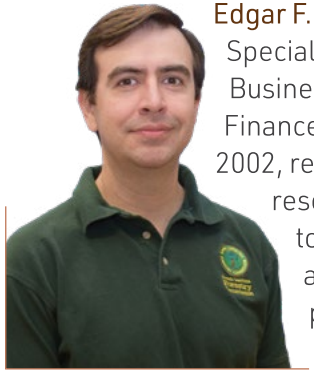

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The Wave Of Wood: Forestry's Economic Contribution to South Carolina's Economy in 2018

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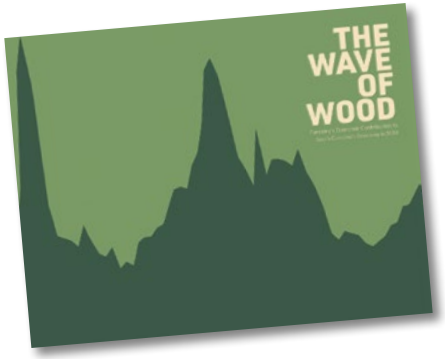

STATE FORESTER'S MESSAGE

Scott Phillips
South Carolina State Forester

It is an honor to present the South Carolina Forestry Commission's latest study of the economic contribution of our forests to the state's economy. While the purpose of this publication is to accurately quantify the economic activity generated by our forest industry and highlight the importance of forestry to our state's economy, this is very much a transitional study.

This year's report has several important differences as compared to the previous reports published in 2008, 2015 and 2017. The most significant is the use of "Industry Contribution Analysis," which is a new recommended approach for multi-sector analyses of industries like ours. The effect of using this new approach is a more conservative, but more accurate, estimate of the economic impact of our industry. Another key difference is the level of details that this report provides. For example, we provide a more detailed look at the economic contributions of our six primary forestry sectors along with three-year trends to illustrate sector momentum.

Historically, we have used these studies to validate economic high points for our industry or to document the achievement of growth goals. Going forward we plan to perform these analyses on routine intervals that will allow us to better track changes in our forestry sectors.

While components of the report have changed, the role that forestry plays in South Carolina's economy has not. Forestry continues to be a pillar of our state's economy, contributing $21.2 billion annually while providing more than 98,000 jobs and $4.9 billion in annual labor income. Compared to other leading industries in the Palmetto State, forestry ranks #1 in jobs, #2 in labor income, and #3 in direct economic output.

Overall, forestry continues to be a vibrant part of our state's economy with impacts visible in every county. Recent announcements and new investments in our industry along with our strong timberland base will ensure that forestry will continue to be an important part of South Carolina's growing economy. And while producing all these positive economic impacts, the active management of our forests also produces clean air, clean water, recreational opportunities, wildlife habitat and the beautiful aesthetics that draw people to our state.

It's great to be part of South Carolina's forestry community!

South Carolina is home to three commercial forest tree nurseries. Here, Tim Adams with the SC Forestry Commission looks at germination of seedlings grown at Taylor Nursery, which is managed by ArborGen. The forest tree nursery industry is a part of the Timber Aggregate Sector.

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STUDY HIGHLIGHTS

The purpose of this study is to update the economic contribution of forestry to South Carolina's economy for 2018 and to show the relative magnitude of forestry's major sectors. Forestry is a complex industry with a long supply chain from the forest to value-added forest products, and it can also include non-timber forest products and ecosystem services. This study includes business sectors that have a direct and logical connection to the state's forest resource.

IMPLAN software was used in this study to be consistent with previous economic contribution studies of forestry in South Carolina. Fifty-one IMPLAN sectors were grouped into six aggregate forestry sectors for analysis. The aggregate sectors were identified as: timber, logging, solid wood products, pulp & paper, wood furniture, and forest-based recreation. "Industry Contribution Analysis" was completed on each aggregate sector to minimize buy-back purchasing within the aggregate sectors.

A suite of four metrics, employment, labor income, value-added, and output, were used to describe each aggregate sector. Each metric is made up of three components, the direct effect of the forestry sector plus the indirect and induced effect of suppliers and households, respectively.

This analysis reveals that in 2018, the total economic contribution of forestry to South Carolina's economy was $21.2 billion. The pulp & paper aggregate sector accounts for 60% of forestry's total contribution, even though it declined 8.7% since 2017. The decline in contribution by pulp & paper was more than made up by the growth in forest-based recreation.

In summary, forestry makes a significant contribution to South Carolina's economy through $21.2 billion in sales, 98,306 jobs and significant social and environmental benefits.

Forestry's economic contribution translates to $4,218 in sales per South Carolina resident.

Every $1,000 spent on forest products made in the Palmetto State generates an additional $520 in sales in rural communities.

Our forest industry creates 98,306 jobs statewide, contributing $4.95 billion in labor income.

Four out of every 100 employed residents in South Carolina support their families with forestry salaries.

Forestry businesses in South Carolina paid $232.4 million in direct taxes on production and imports at the federal, state and local levels.

SOUTH CAROLINA FORESTRY IN THE 21ST CENTURY

The Wave of Wood

A single main factor has driven South Carolina's forestry sector since the turn of the 21st century. It has been called a wall of wood, but it more accurately reflects a wave of wood as it slowly diminishes in size with each passing decade. But wood supply has affected every aspect of forestry in the state, including timber prices, timberland ownership patterns, thinning versus final harvesting levels, tree planting rates, wood procurement specifications, industry expansion and ultimately the economic impact of forestry to the state's economy.

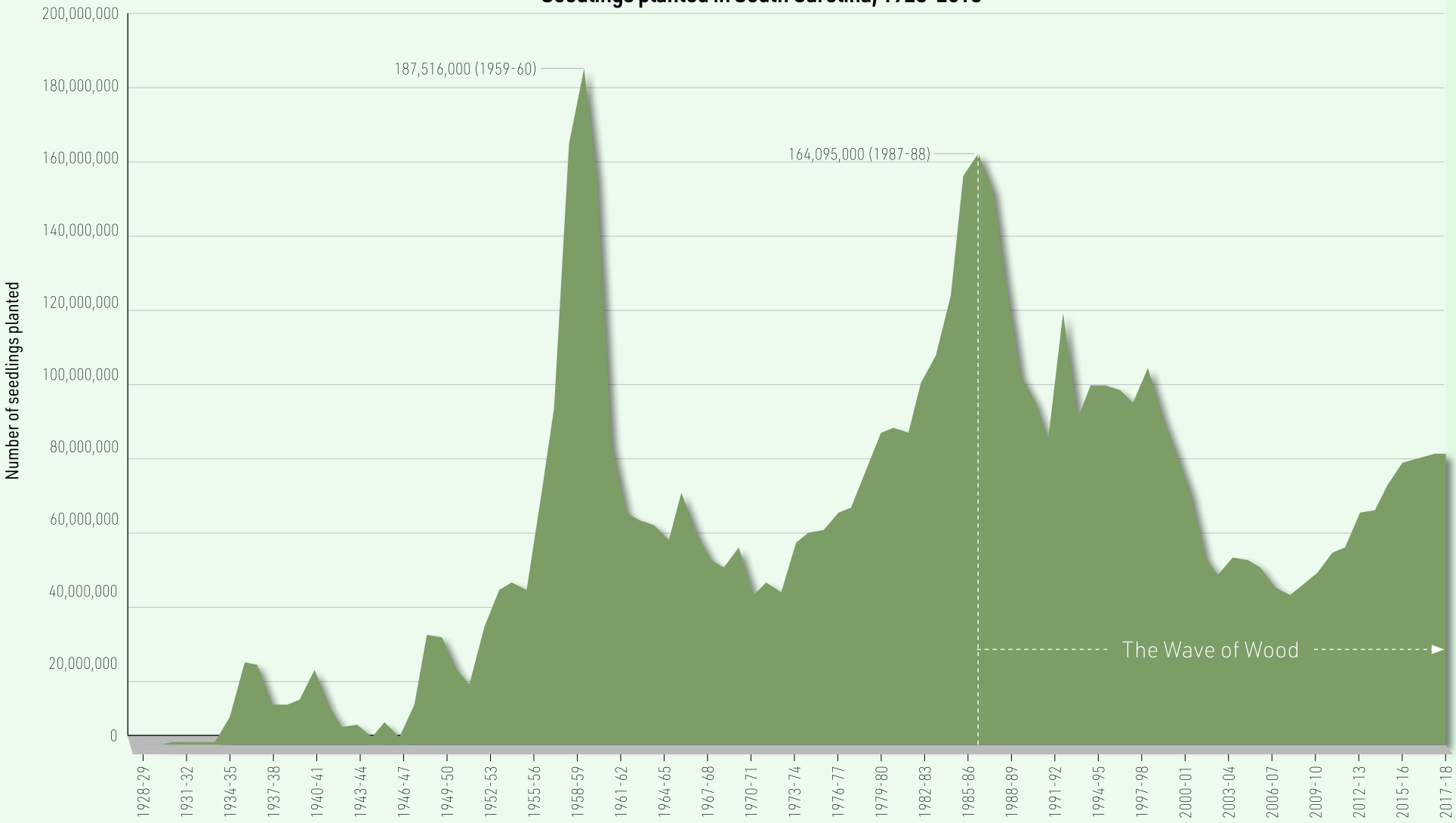
The wave of wood was born out of three historical events that covered the last half of the previous century. The first event that formed the wave of wood, the Soil Bank Program, was a federal tree planting program in the 1950s to take farmland out of production in order to reduce crop surpluses. In South Carolina alone, an all-time high of 187.5 million seedlings were planted in the 1959-1960 planting season during the peak of the Soil Bank Program. After a 30-year rotation, the earliest Soil Bank plantings reached financial maturity and final harvest by 1986. Forest Inventory and Analysis (FIA) data show the first signs of the current wave of wood forming with the 1986 FIA report. As landowners harvested the Soil Bank plantings, they reinvested a portion of their profits into replanting the harvested stands creating an echo of the original wave of wood.

The Conservation Reserve Program, or CRP, as it is commonly known, was the second factor in forming the wave of wood. Originally intending to take erodible cropland out of production, the CRP Program resulted in the conversion of significant acreage of cropland to timberland beginning in the mid-1980s.

Tree planting in South Carolina reached a peak of 164 million seedlings in the 1987-1988 season. The Soil Bank Program had a higher peak, but CRP has extended over more years, as its focus shifted from stabilizing erodible soils to protecting environmentally sensitive lands. Between 1987 and 1993, CRP brought over 200,000 acres of farmland into productive timberland alone.

The third factor forming the wave of wood was a natural disaster named Hurricane Hugo. Hugo caused widespread timber damage in 23 of South Carolina's 46 counties overnight September 21-22, 1989. Over 10.3 billion board feet of South Carolina's sawtimber was damaged, equal to 4.6 years' worth of timber harvest. Still, basically all of the 4.5 million acres of damaged forestland returned to productivity either by tree planting or through natural regeneration. Mills that depended on the lost timber resource were closed following Hugo, but within 15 years the new wave of wood created a period of economic expansion in forestry that grew from biomass to pulpwood to chip-and-saw to sawtimber.

Seedlings planted in South Carolina, 1928-2018



SOUTH CAROLINA FORESTRY IN THE 21ST CENTURY

More Wood Than Ever Recorded

The establishment of new forests on productive sites and the intensive management of planted stands resulted in a significant increase in standing timber volume in the decade following Hurricane Hugo's destruction.

The South Carolina Forestry Commission took over FIA plot measurement in 1998 from the USDA Forest Service in order to document the forest's recovery from Hurricane Hugo. By 2001, FIA data show that the total standing timber inventory in South Carolina had not only surpassed pre-Hugo levels, but that South Carolina's forests contained more wood than ever recorded.

Of course, the age and size distribution of the state's forests had changed radically, but the total volume of wood was at record highs. By 2001, the peak of the wave of wood was 11 years old and just approaching merchantability. Biomass became a common term that, at that time, referred to pre-merchantable material that could be harvested for energy while thinning natural stands to improve tree health and vigor. The first announcement of a biomass power plant in South Carolina was Loblolly Green Power in Newberry. Later biomass projects were constructed and operated by EDF – Renewable Energy in Dorchester and Allendale counties and by Ameresco on the Savannah River Plant in Aiken County.

As the wave of wood entered its teenage years, it reached merchantability as pulpwood which was used primarily by the seven pulp and paper factories in the state. The sheer volume of available pulpwood exceeded the demand by South Carolina's existing industry. As pulpwood prices fell to new lows, oriented strand board (OSB) and wood pellet industries began analyzing statewide FIA data for potential greenfield sites. Over the next decade, two OSB and two wood pellet mills were constructed in South Carolina. Even expansion of the existing P&P industry and increased wood chip export didn't fully utilize the available pulpwood supply.

The Great Recession, which officially lasted from December 2007 to June 2009, slowed the domestic economy, and it had significant impact on the forest resource and timber products output. As the economy entered into the recession, our standing forest inventory was larger than ever documented by FIA. The recession significantly slowed timber harvest levels for a number of years, which allowed the wave of wood to strengthen as it moved from primarily pulpwood to chip-and-saw and small sawtimber product classes.

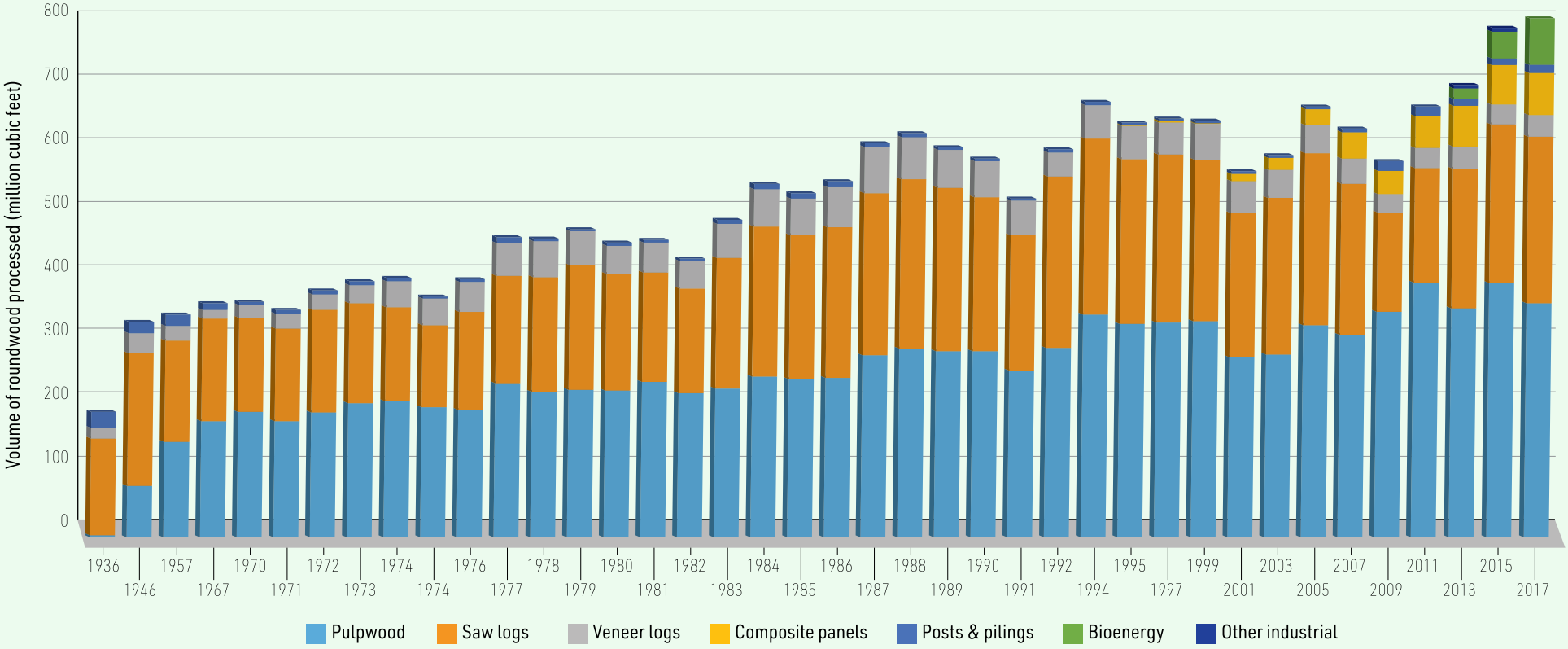
More Forest Products Than Ever Recorded

Economic expansion in the forestry sector began again, especially in the solid wood products sector, as the pent-up demand worked through the existing surplus of housing units in the years following the recession. By 2011, the Timber Products Output (TPO) Program documented that South Carolina's primary forest product mills were producing at pre-recession levels. Each successive TPO survey, in 2013, 2015, and 2017, showed that South Carolina mills were producing more forest products than ever recorded. By 2017, the wave of wood was 27 years old and solidly in the large-diameter size class. In addition to supporting an expanding sawmill capacity, the wave of wood supplemented the existing pulpwood supply. In fact, the fastest growing sector in the state was the export of surplus sawtimber logs to overseas markets. A total of 18 new log export yards operated in South Carolina between 2013 and 2018, annually exporting a volume of wood roughly equivalent to one of the largest sawmills in the state. The secondary forest products industry

also grew following the recession with the additions of First Quality in the sanitary paper sector and Roseburg Forest Products in the mass timber products sector. As of 2018, the wave of wood is still clearly visible in the FIA data. Sawtimber availability is still having a moderating influence on stumpage prices, which have historically delayed final harvests.

Pulpwood pricing has seen some seasonal fluctuations though as wood supply tightens. Future wood supply and continued growth of the forest industry in South Carolina will largely depend on timberland owners' willingness to harvest mature stands and their confidence in future markets to reinvest in establishing new plantations.

Production of primary timber products in South Carolina, 1936-2017



ECONOMIC CONTRIBUTION ANALYSIS

Economic Model Used

The goal of this project was to accurately estimate the economic contribution that forestry has on South Carolina's economy. Previous economic contribution estimates were funded and published by the South Carolina Forestry Commission based on 2006, 2013 and 2015 data. Each of the previous estimates used the latest version of IMPLAN (IMpact Analysis for PLANning) Input-Output software at the time of the analyses. IMPLAN was originally developed by the USDA Forest Service as a means to describe the economic importance of forestry in rural communities.

By using IMPLAN for each successive economic study, long-term trends in forestry's contribution to South Carolina's economy can be more accurately followed.

IMPLAN is an Input-Output model that has been widely used in South Carolina to analyze the impact of various economic sectors. Following the Forestry Commission's initial 2006 study, follow-up studies that utilized forestry's results, in whole or in part, were completed for agribusiness and natural resources. IMPLAN has also been used to analyze the economic contribution of the Charleston Ports Authority as well as private sector businesses, such as BMW in the South Carolina Upstate.

The current analysis used a new version of IMPLAN that is simply referred to as the new IMPLAN, but it includes a more intuitive online package with additional features. One key feature that was used in this study was the option to use "Industry Contribution Analysis" instead of "Industry Output" in the "Event Type." IMPLAN offers a thorough discussion of "Industry Contribution Analysis" online at their Help & Support website (Lucas, 2019). "Industry Contribution Analysis" is the recommended approach for multi-sector industry studies in that it puts constraints on buyback purchases in order to minimize double counting within a supply chain. The results of an "Industry Contribution Analysis" will typically be lower than an "Industry Output" analysis unless the buyback purchases are eliminated manually.

Sectors Included

With the goal of accurately estimating forestry's contribution to South Carolina's economy, we must define what is meant by the term forestry. Forestry is a multi-faceted industry with a long supply chain from the forest tree nursery to the forest landowner, to the logger, primary forest

product mill and finally a secondary forest product mill where a value-added product is made. Forestry contributes to the state's economy through the manufacture of timber products, non-timber products and even ecosystem services, forest-based recreation a prime example thereof. Pine straw production is an example of a non-timber forest product, but the majority of forestry's economic contribution in this study comes from the manufacture of timber products, such as lumber, pulp and paper, or furniture.

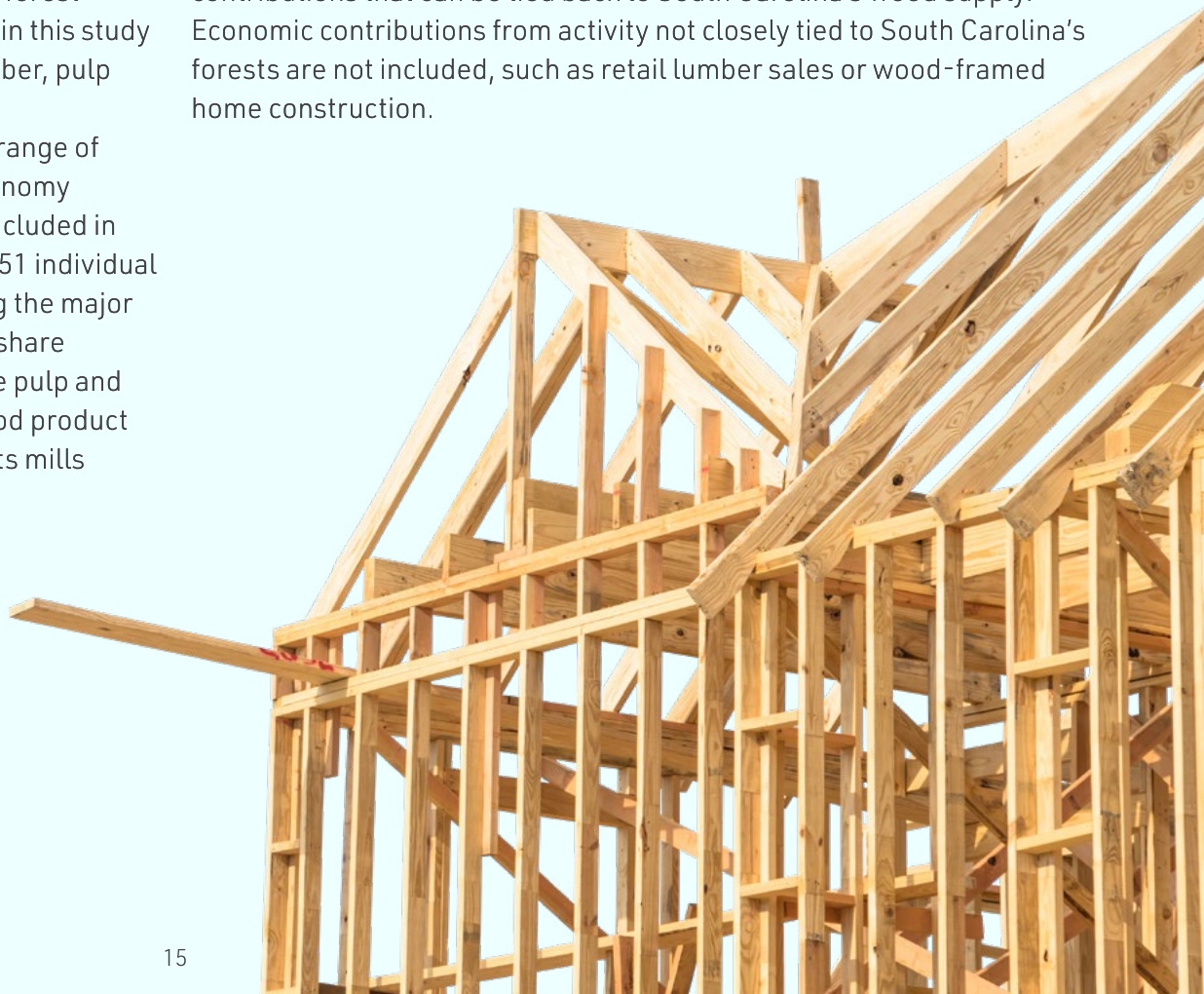
IMPLAN has a total of 536 individual sectors that cover the range of manufacturing, retail and service industries in the state's economy (Cheney, 2019). Fifty-one of the 536 IMPLAN sectors were included in this analysis as part of forestry's economic contribution. The 51 individual sectors were grouped into six aggregate sectors representing the major forestry categories. Industries within each aggregate sector share commonalities, such as the use of small-diameter trees in the pulp and paper aggregate sector or the type of product in the solid wood product aggregate sector. Both primary and secondary forest products mills could be combined in an aggregate sector.

List of Aggregate Forestry Sectors

(# of individual sectors included)

- Timber (6)
- Logging (1)
- Pulp and Paper (11)
- Solid Wood Products (12)
- Wood Furniture (11)
- Forest-Based Recreation (10)

Each aggregate sector will be described in more detail in the Results section of this publication. Descriptions of the companies included in each aggregate sector come from NAICS code descriptions assigned to each IMPLAN sector. An effort was made to include all economic contributions that can be tied back to South Carolina's wood supply. Economic contributions from activity not closely tied to South Carolina's forests are not included, such as retail lumber sales or wood-framed home construction.

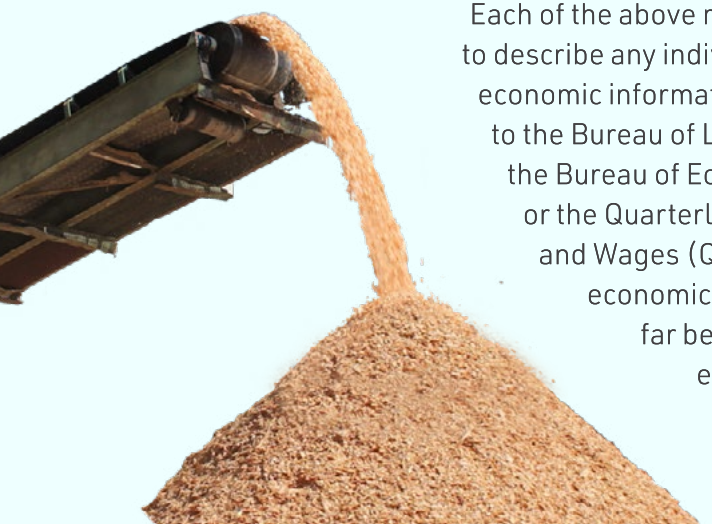


ECONOMIC CONTRIBUTION ANALYSIS

Measures of Impact

IMPLAN produces a suite of metrics that together paint a picture of the importance of forestry to the state's economy. The suite of metrics are: employment, labor income, value-added, and economic output. Definitions for each metric are listed below.

- Employment: The annual average of monthly jobs in an industry including full-time and part-time jobs.
- Labor Income: All forms of employment income, including wages, benefits and proprietor income.
- Value-Added: The difference between an industry's total output and the cost of its intermediate inputs. It is a measure of an industry's contribution to the Gross State Product.
- Economic Output: The value of industry production. For manufacturers, this would equate to gross sales after accounting for any change in inventory. For the service sector, it equates to sales. For the retail and wholesale trade, output equates to gross margin.



Each of the above metrics can be used to describe any individual mill through economic information such as that reported to the Bureau of Labor Statistics (BLS), the Bureau of Economic Analysis (BEA), or the Quarterly Census of Employment and Wages (QCEW). However, the economic impact of a mill goes far beyond the number of employees who punch their timecard or cash their paycheck at their local bank. Those direct expenditures by a mill are magnified in the local economy as employees spend their paycheck in the community and suppliers to the mill expand to meet the additional demand.

Each metric has three economic components: Direct effects, indirect effects and induced effects.

- Direct Effects: Economic impacts generated within a specific industry sector.
- Indirect Effects: Economic impacts generated within associated industry sectors.
- Induced Effects: Economic impacts in the region as a result of employees spending their wages.

The indirect and induced effects essentially magnify the direct effects as money circulates within a community. A sawmill might hire 100 people, but suppliers might have to add additional employees to meet orders, and jobs might be created in the community depending on how employees spend their wages.

So for every 10 jobs created by the industry, there might be four or five jobs created in the community. The direct effect can be viewed as a pebble creating a splash as it falls into a pond. The indirect and induced effects of that pebble are the widening ripples that result from the splash. The multipliers that expand direct effect to total effects will be calculated for each metric.

Please note that there is an excellent discussion of input-output models and contribution analysis in the last SC Forestry Commission IMPLAN study, "Economic Contribution Analysis of SC's Forestry Sector, 2017" (Khanal et al., 2017).

ECONOMIC CONTRIBUTION RESULTS

Introduction to Results

This study is based on IMPLAN data for 2017; however, the results are adjusted forward within the IMPLAN program to 2018 dollars. Fifty-one IMPLAN sectors were grouped into six aggregate sectors of related industries. An industry contribution analysis was done for each aggregate sector. The results will be presented in order based on the magnitude of economic impact. More detailed information will be presented for individual sectors as they will be prioritized by impact, and three years of data (2015-2017) will be presented to illustrate sector momentum. An attempt was made to offer explanations for some of the results that came out of these analyses. Interviews with industry leaders gave credence to IMPLAN results and possible explanations for unexpected results.

PULP AND PAPER

The pulp and paper aggregate sector is the foremost forestry sector in terms of its contribution to South Carolina's economy. It surpasses every other aggregate sector in each IMPLAN metric for total contribution. Pulp & paper's total output contribution for 2018 is $12.79 billion, which amounts to 60.3% of forestry's total economic contribution in South Carolina. 40,838 people are employed either directly or indirectly by forestry businesses within this sector. While still the predominant forestry sector, pulp and paper experienced an 8.7% decline in total output from 2017 to 2018.

Annual Economic Contribution of South Carolina's Pulp & Paper Aggregate Sector, 2018

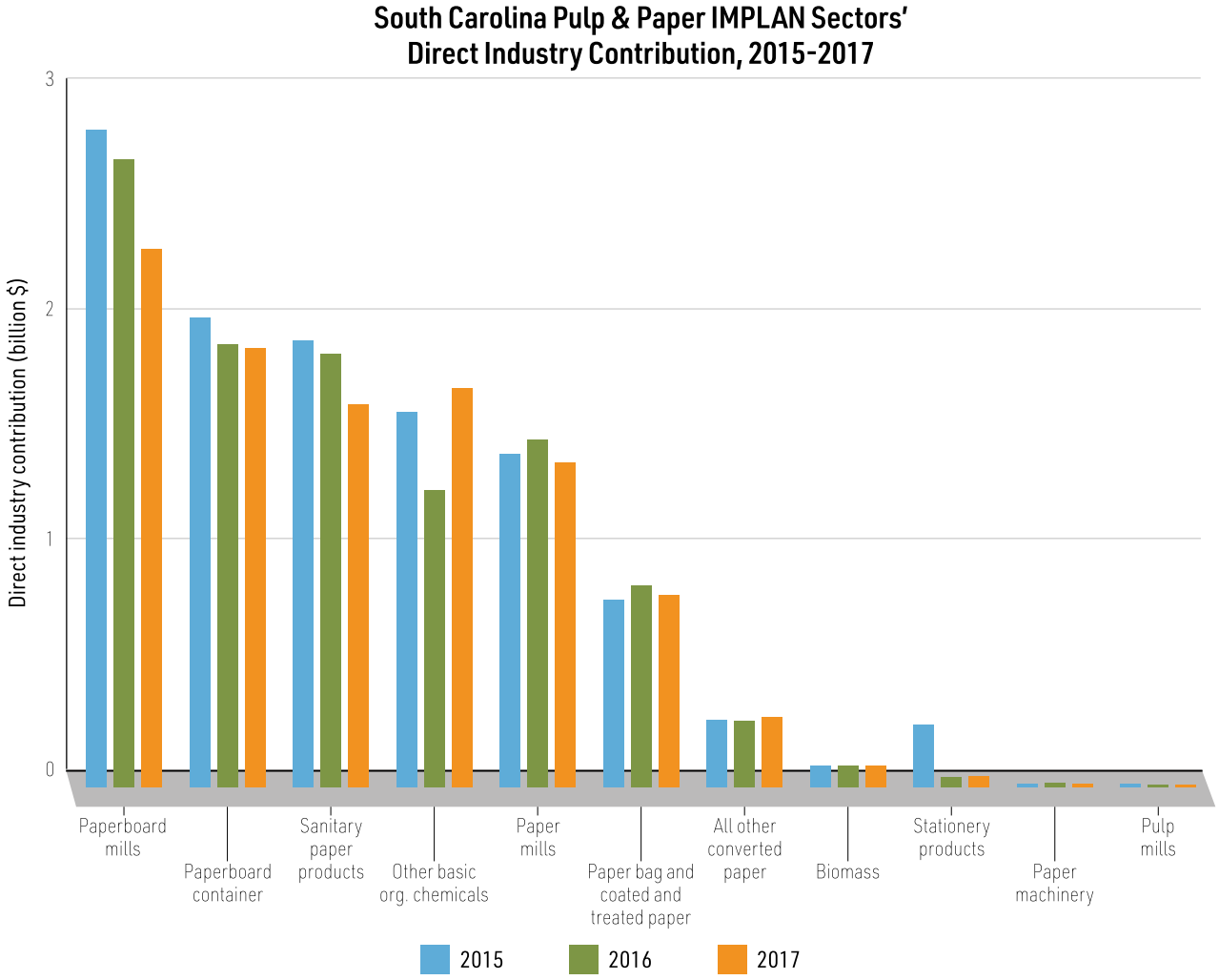
	Contribution					
Metric	**Direct**	**Indirect**	**Induced**	**Total**	**% Change From 2017**	**Multiplier (Total / Direct)**
Employment (No. of Jobs)	12,891	15,963	11,983	40,838	-2.0%	3.17
Labor Income (Million USD)	$1,227.7	$870.9	$475.5	$2,574.2	-1.1%	2.10
Value Added (Million USD)	$2,624.8	$1,366.6	$873.4	$4,864.7	-11.7%	1.85
Output (Million USD)	$8,628.8	$2,611.4	$1,550.3	$12,790.4	-8.7%	1.48

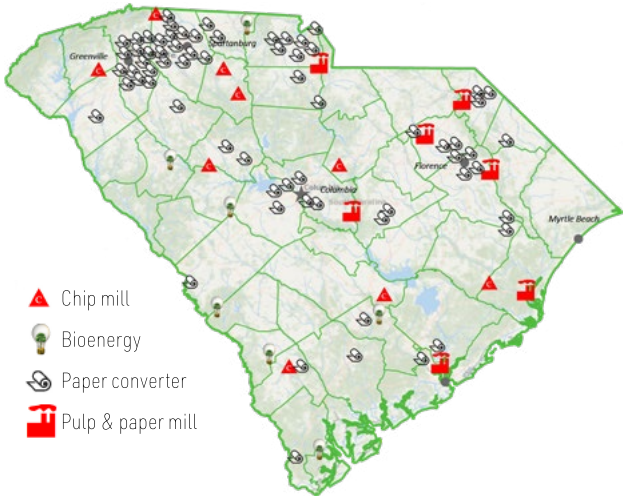
The pulp and paper aggregate sector is made up of 11 individual IMPLAN sectors that include companies that produce either primary or secondary forest products. IMPLAN sectors 146 through 153 are included in this analysis in addition to portions of the closely aligned sectors biomass power generation (#47), organic chemical manufacturing (#165) and paper machinery manufacturing (#269). The seven pulp and paper mills in the state create a business cluster that attracts closely related industries to the state.

Paperboard manufacturing leads the 11 sectors with $2.3 billion in direct industry output. However, this sector experienced a decline of $500 million from 2015 to 2017. Paperboard manufacturing accounted for over 40% of the decline in the pulp and paper aggregate sector. The only individual sector that experienced a significant increase in economic output was the basic organic chemical industry. While a diverse industry, its largest component uses the by-products of pulp and paper mills to make myriad secondary products. The overall decline in pulp and paper can be attributed to the shutdown of one paper machine at Resolute Forest Products in 2017, temporary shutdowns at other mills for repairs and maintenance, soft markets for some products as mills shifted among product mixes, and foreign trade issues.

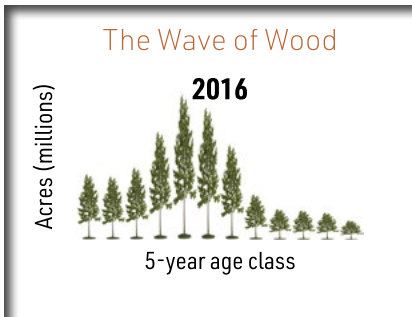
The pulp and paper aggregate sector has statewide reach in terms of capital investment, resource procurement and local employment. A network of chip mills spreads the timber demand over the whole state instead of concentrating the demand closer to the mill. South Carolina has a strong secondary industry that produces value-added fiber products. In particular, the sanitary paper products sector has expanded appreciably in recent years. Also, paper converting operations appear to be clustered in the Upstate of South Carolina.

Pulp and paper has a mutually beneficial relationship with the other aggregate sectors. For example, they provide a market for chips that are produced as a by-product by sawmills. When sawmill production increases, pulp and paper mills can reduce their pulpwood harvest to offset the increase in sawmill chip production. We'll turn our attention to the Solid Wood Products aggregate sector next.

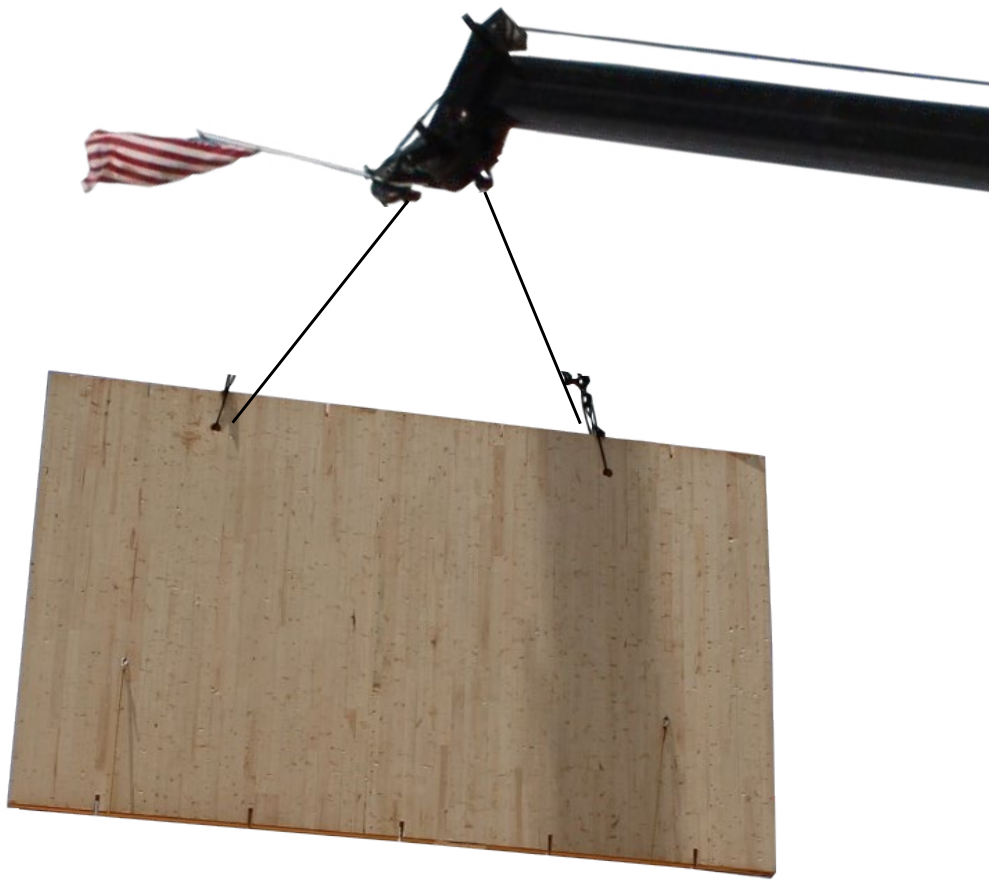




The pulp and paper aggregate sector includes 16 primary and 68 secondary forest product mills.



SOLID WOOD PRODUCTS



The solid wood products aggregate sector is the second largest forestry sector in terms of its contribution to South Carolina's economy. It is second in economic impact only to the pulp and paper aggregate sector. Solid wood products' total output contribution for 2018 is $4.5 billion, which amounts to 21.4% of forestry's total economic contribution in South Carolina.

21,945 people are employed either directly or indirectly by forestry operations within this sector. This sector was stable to slightly positive from 2017 to 2018 with 2-4% growth in wages, value added, and output.

The solid wood products aggregate sector is a diverse group of 12 individual sectors that include companies that produce either primary or secondary forest products. IMPLAN sectors 134-145 are included in this analysis in addition to a portion of sector 269 (sawmill machinery manufacturing). This industrial group is heavily tied to growth in home construction and remodeling.

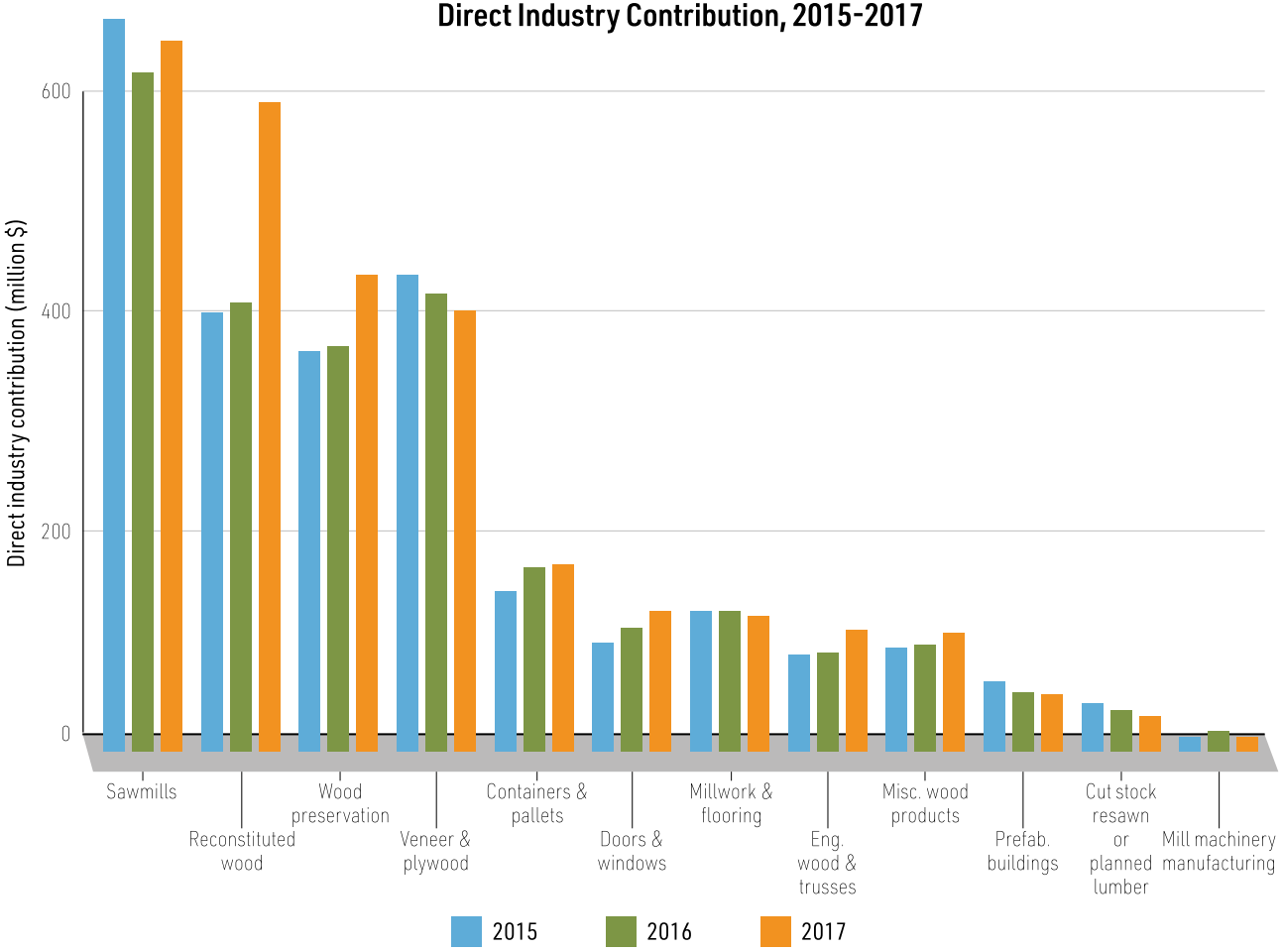
Annual Economic Contribution of South Carolina's Solid Wood Products Aggregate Sector, 2018

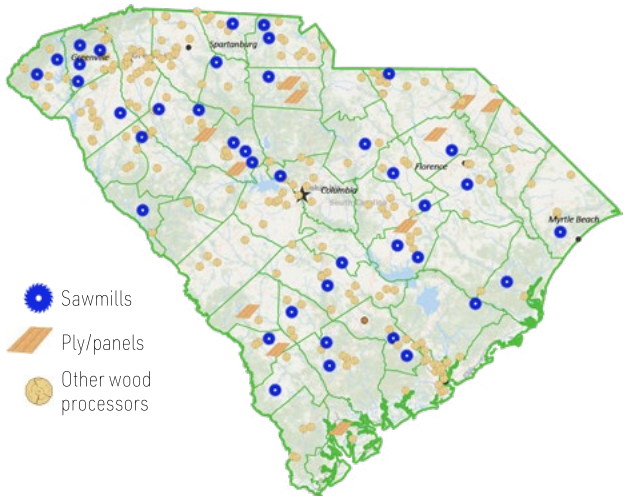
Metric	Contribution				% Change From 2017	Multiplier (Total / Direct)
	Direct	Indirect	Induced	Total		
Employment (No. of Jobs)	8,994	7,806	5,145	21,945	-0.3%	2.44
Labor Income (Million USD)	$518.4	$392.7	$203.8	$1,114.9	2.9%	2.15
Value Added (Million USD)	$836.5	$582.7	$374.4	$1,793.6	3.8%	2.14
Output (Million USD)	$2,832.8	$1,049.6	$665.0	$4,547.5	2.3%	1.61

The 40 sawmills have the largest contribution to the state's economy within this sector. The top four industry sectors, sawmills, reconstituted wood, wood preservation and veneer/plywood make up 73.3% of the total aggregate sector's direct output. The largest growth in 2017 was seen in the reconstituted wood industry which includes the manufacture of oriented strand board (OSB), medium- and high-density fiberboard, and particleboard. Construction of a new HDF plant in the Lowcountry likely accounted for the significant increase.

Every county in South Carolina is home to at least one business in the solid wood products aggregate sector. These business can range from large Fortune 500 companies to small, entrepreneurial woodworking enterprises. Future growth in this area is anticipated as the state's forests continue to mature overall. The abundance of softwood sawtimber has resulted in the emergence of a significant log export industry to the benefit of private forest landowners and others.

South Carolina Solid Wood Products IMPLAN Sectors' Direct Industry Contribution, 2015-2017





The Solid Wood Products aggregate sector includes 71 primary and 200 selected secondary operations.

FOREST-BASED RECREATION

In addition to providing the raw materials for manufacturing forest products, our forests serve as the landscape for many forms of outdoor recreation. The U.S. Fish & Wildlife Service (USFWS) published the 2016 National Survey of Fishing, Hunting and Wildlife-Associated Recreation, which provides the key information necessary for calculating the value of forest-based recreation in 2018. This USFWS report is updated every five years, and recent South Carolina IMPLAN studies were based on the 2011 USFWS report.

In 2016, South Carolina's population was 4,958,000. Based on regional statistics, 16.2% of South Carolina's population (~800,000) were considered outdoor sportsmen. Hiking and wildlife watching were the most popular outdoor activities, enjoyed by 35% of South Carolinians. 9.4% and 3.4% of state residents participated in fishing and hunting, respectively.

The cost of outdoor recreation varies primarily based on the type of activity and whether it is close to home or not. Typical expenditures included sporting goods, such as rifles, fishing gear, binoculars, etc., hotel stays, both full- and limited-service meals, transportation costs, recreational vehicles, access fees, land leases, etc. Hunting had the highest annual cost at $2,287 per hunter. Freshwater fishing costs were $933 per angler and wildlife watching cost $882 per year.

Based on southern region participation rates and national trip and equipment expenditure breakdowns, over $2.3 billion was spent on forest-based recreation in total in 2016. However, only the marginal value of retail purchases were included in this analysis, resulting in a direct contribution of $1,007.9 million for 2018. The total contribution of forest-based recreation was $1,650.8 million, which made this aggregate sector the 3rd largest sector in the study.

Estimates of economic contribution for South Carolina's forest-based recreation have varied considerably in past studies. The approach taken in this study most closely follows the methodology in a 2016 report titled, "The Economic Contribution of Natural Resources to South Carolina's Economy" by Dr. David Willis and Dr. Thomas Straka, both of Clemson University (Willis and Straka, 2016). The Clemson report found that fishing, hunting and wildlife viewing created 31,958 jobs in South Carolina and contributed $2.7 billion to the state's economy. However, that study included some forms of recreation not forest-based, such as off-shore fishing. It was also based on an earlier 2011 USFWS report.

Annual Economic Contribution of South Carolina's Forest-based Recreation Aggregate Sector, 2018

	Contribution					
Metric	Direct	Indirect	Induced	Total	% Change From 2017	Multiplier (Total / Direct)
Employment (No. of Jobs)	12,952	2,247	2,547	17,746	N/A *	1.37
Labor Income (Million USD)	$338.1	$97.1	$98.6	$533.8	N/A*	1.58
Value Added (Million USD)	$641.7	$174.0	$184.3	$1,000.0	N/A*	1.56
Output (Million USD)	$1,007.9	$315.8	$327.1	$1,650.8	N/A*	1.64

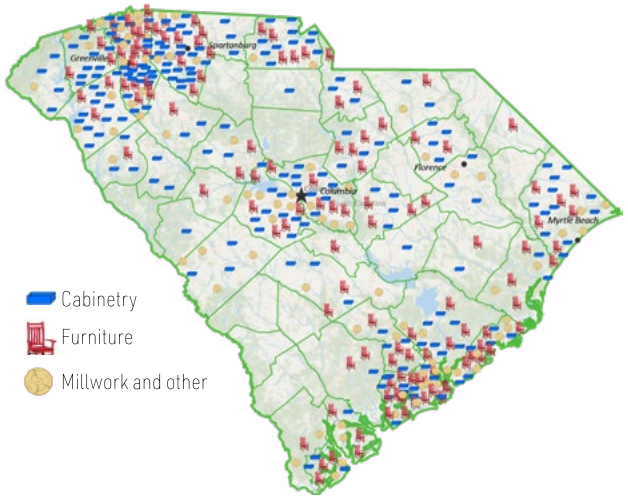
* Not comparable due to a change in protocol.

WOOD FURNITURE

Although South Carolina's wood furniture aggregate sector appears small in comparison to our larger, neighboring states, it still consists of over 400 companies that manufacture household and office furniture, including kitchen cabinets, upholstered and non-upholstered wood furniture, architectural woodwork, shelving, box springs, blinds and even burial urns and caskets. These companies fit within 11 individual IMPLAN sectors: 368-370, 372-374, 376-378, and 392-393.

Essentially all of the companies in this sector manufacture secondary forest products. They are value-added products that often are used over decades of their owners' lives. They can be treasured items that are handcrafted by local woodworkers. As such, they typically are among the most highly-valued wood items manufactured in the state.

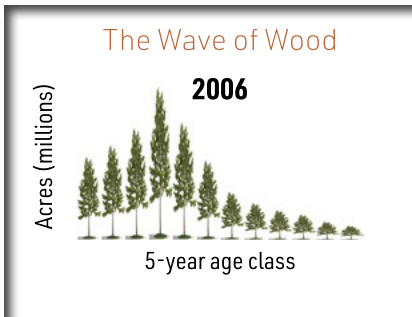
The wood furniture sector grew significantly from the 2017 IMPLAN study to the current 2018 study. The total number of jobs and associated labor income jumped 30.6% and 41.4%, respectively. The total output, or gross sales, for this sector was $1.24 billion, 34.6% above the last study. Kitchen cabinets and countertops are the largest component of this sector, accounting for $238 million of the $839 million in direct output. The Wood Furniture aggregate sector is closely aligned with homebuilding and it has continued strengthening with increasing investment in housing starts and renovations.



427 companies within the wood furniture sector occur statewide.

Annual Economic Contribution of South Carolina's Wood Furniture Aggregate Sector, 2018

Metric	Contribution				% Change From 2017	Multiplier (Total / Direct)
	Direct	Indirect	Induced	Total		
Employment (No. of Jobs)	3,440	1,407	1,317	6,164	30.6%	1.79
Labor Income (Million USD)	$157.0	$75.4	$52.2	$284.6	41.4%	1.81
Value Added (Million USD)	$394.8	$115.4	$95.8	$606.1	41.2%	1.54
Output (Million USD)	$839.4	$232.9	$170.3	$1,242.6	34.6%	1.48



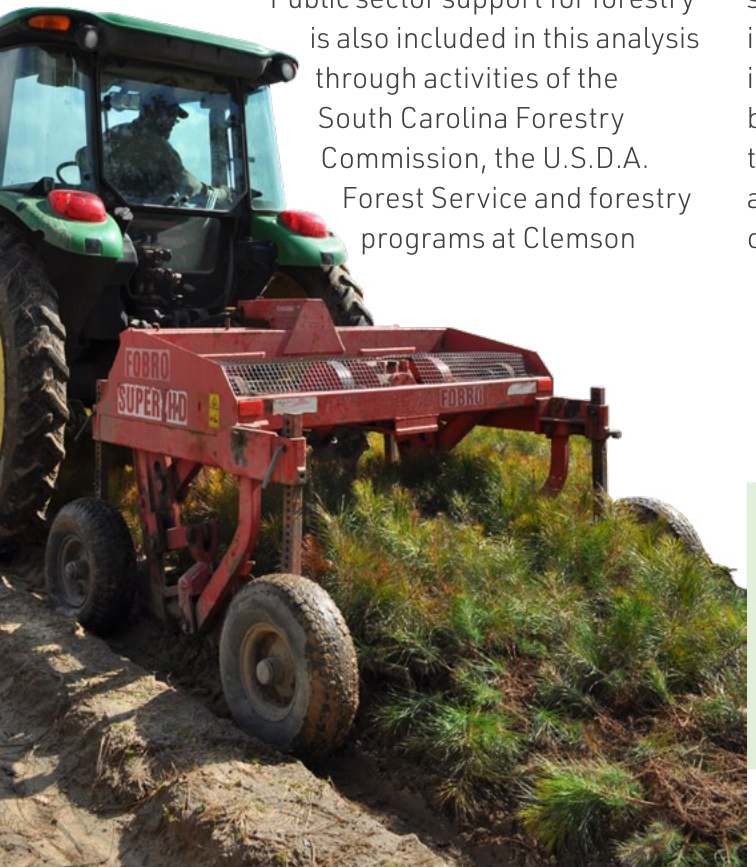
TIMBER

The timber growing aggregate sector is focused on the establishment and management of forestland in South Carolina. Activities in this sector include nursery and tree improvement operations, site preparation, forest fertilization, short rotation woody crops, pine straw production, TIMO and REIT operations, and consulting services.

Public sector support for forestry is also included in this analysis through activities of the South Carolina Forestry Commission, the U.S.D.A. Forest Service and forestry programs at Clemson University and Horry-Georgetown Technical Institute.

The Timber aggregate sector grew slightly in employment, labor income and economic contribution from 2017 to 2018. 4,431 employees were employed directly by companies included in this analysis. The total economic contribution by companies in this sector was $496.3 million in 2018. The largest individual component of this aggregate sector included short rotation crops (under 10 years by definition) such as tree nurseries, Christmas tree operations, and woody biomass which amounted to 39.5% of the total economic contribution for the sector. Six IMPLAN sectors contributed to the Timber aggregate sector (6, 15, 19, 473, 531, & 535).

The timber growing sector is a huge success story for South Carolina. It reflects the active management of forest landowners, whether family forest owners or large investment corporations. Fifty-one percent of the timber harvested annually comes from actively managed timberlands. With a 20-25 year investment horizon, forest landowners are an optimistic group. Their initial investments in establishing new forest stands have historically resulted in healthy returns on investment. South Carolina has more standing timber inventory currently than at any point in recorded history.



Annual Economic Contribution of South Carolina's Timber Aggregate Sector, 2018

Metric	Contribution				% Change From 2017	Multiplier (Total / Direct)
	Direct	Indirect	Induced	Total		
Employment (No. of Jobs)	4,431	226	1,004	5,661	8.0%	1.28
Labor Income (Million USD)	$169.1	$11.4	$39.8	$220.3	5.5%	1.30
Value Added (Million USD)	$215.2	$20.2	$73.4	$308.8	1.2%	1.43
Output (Million USD)	$327.4	$38.5	$130.4	$496.3	2.9%	1.52

LOGGING

Logging uniquely stands out as the only IMPLAN sector on which the other aggregate sectors depend. Without loggers, timberland owners could not harvest and transport their timber to market. In fact, without loggers, there would not be commercial wood products markets.

The logging sector is the smallest of the six major categories analyzed in this study. The six categories, pulp & paper, solid wood products, forest-based recreation, wood furniture, timber and logging, include a total of 51 individual IMPLAN sectors. All are aggregated sectors made up of six to 12 individual IMPLAN sectors except for logging which stands alone.

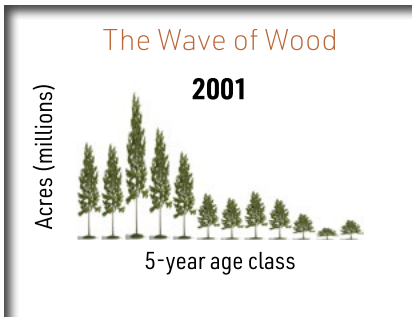
In this study, logging showed a decline in each of the IMPLAN metrics. Direct employment dropped 1.6%, from 4,409 in 2015 to 4,339 in 2018, while total employment declined 10.1% overall. Labor income, value-added and output all declined 23-27% during this same time period.

Increased logging efficiencies as equipment was modernized can help explain a gradual decline in employment. However, the decline in labor income, value-added and output are harder to explain. Timber Products Output (TPO) data show South Carolina mills trending upwards in production from 2015-2017.

Forest Inventory & Analysis (FIA) data show a similar upward trend in growing stock harvest removals. Temporary mill shutdowns for maintenance, declining timber prices and declining cut and haul rates could explain the downward IMPLAN trends in labor income, value-added and output.

Annual Economic Contribution of South Carolina's Logging Aggregate Sector, 2018

	Contribution					
Metric	**Direct**	**Indirect**	**Induced**	**Total**	**% Change From 2017**	**Multiplier (Total / Direct)**
Employment (No. of Jobs)	4,339	549	1,064	5,952	-10.1%	1.37
Labor Income (Million USD)	$167.3	$20.1	$42.1	$229.6	-25.6%	1.37
Value Added (Million USD)	$185.5	$29.1	$77.4	$292.0	-23.0%	1.57
Output (Million USD)	$281.0	$47.9	$137.6	$466.5	-27.2%	1.66



TOTAL FORESTRY CONTRIBUTION

The six aggregate forestry sectors are analyzed separately in order to quantify their individual contribution to South Carolina's economy. Each of the aggregate sectors are clusters of related businesses. Both primary and secondary mills are included in most aggregate sectors. These IMPLAN analyses were based on "industry contribution analyses" in order to eliminate product sales among business within each aggregate sector.

As the figure below clearly illustrates, the "pulp and paper" (P&P) aggregate sector dominates the overall forestry contribution to South Carolina's economy. With $8.6 billion in direct output and 12,891 jobs, P&P has three times the economic impact of the next largest forestry aggregate sector, "solid wood products." Only "forest-based recreation" competes with P&P on the number of employees. The remaining three aggregate sectors, furniture, timber and logging, together contribute $1.4 billion directly to the state's economy.

Forestry's economic contribution to South Carolina's economy was $21.2 billion in 2018 when the six aggregate sector results were combined. This is a slight increase from the 2017 results as reported by Khanal, Straka, and Willis (2017). In fact, each IMPLAN metric increased from 2017 to 2018 with the largest increases coming in employment and labor income.

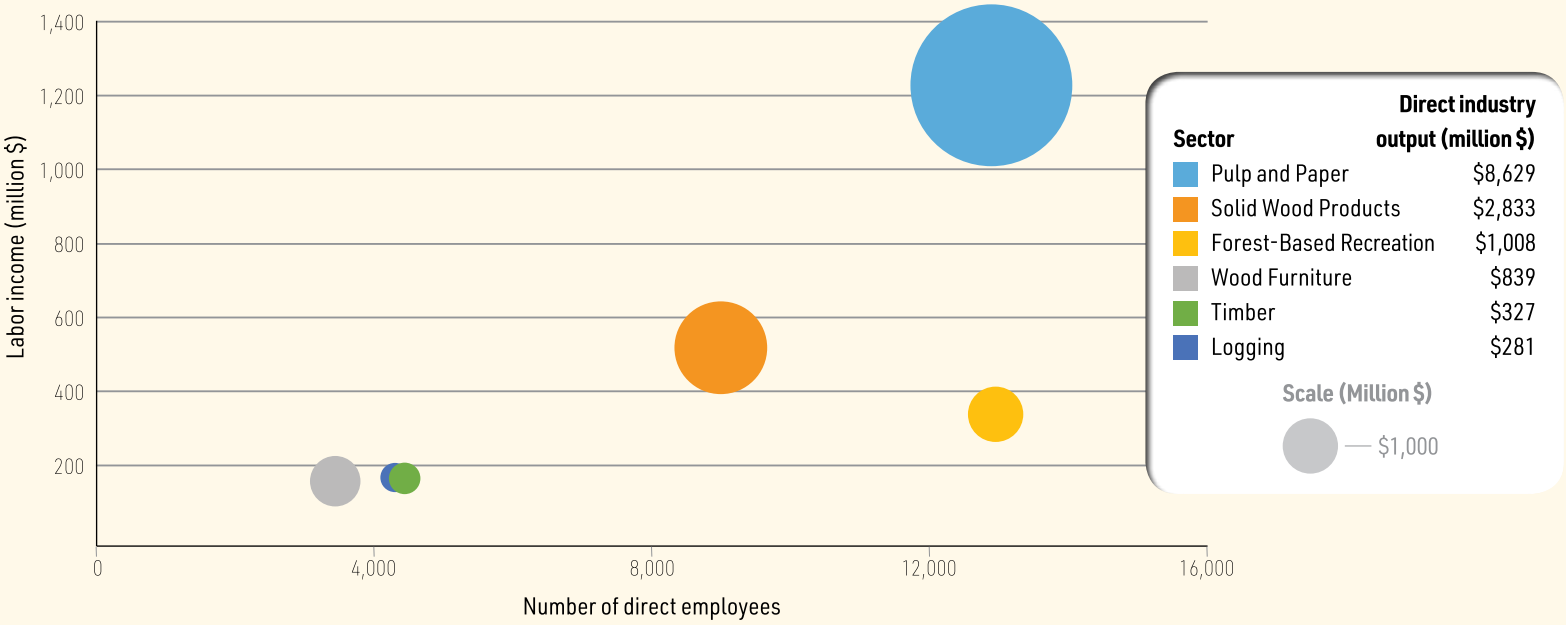
Annual Economic Contribution of Forestry to South Carolina's Economy, 2018

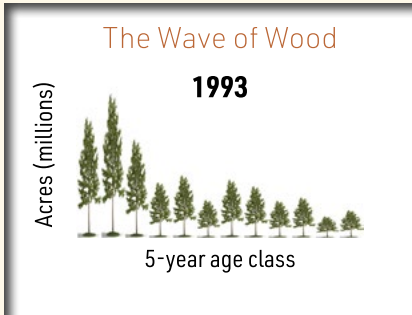
Metric	Contribution				% Change From 2017	Multiplier (Total / Direct)
	Direct	Indirect	Induced	Total		
Employment (No. of Jobs)	47,047	28,198	23,060	98,306	16.4%	2.09
Labor Income (Million USD)	$2,577.6	$1,467.6	$912.0	$4,957.4	9.9%	1.92
Value Added (Million USD)	$4,898.5	$2,288.0	$1,678.7	$8,865.2	1.0%	1.81
Output (Million USD)	$13,917.3	$4,296.1	$2,980.7	$21,194.1	0.7%	1.52

Total forestry-related employment jumped from 84,425 in 2017 to 98,306 in 2018. This 16.4% increase was primarily due to the increase in jobs attributed to forest-based recreation. Analyses of recreation-related jobs were based on an updated 2016 US Fish and Wildlife Service report. When recreation jobs were subtracted from the 2018 and 2017 IMPLAN analyses, the remaining forestry-based jobs were almost identical, 80,560 and 80,269, respectively.

While forestry's contribution to the state's economy was fairly stable overall, there were several sectors that saw significant change in output. Two aggregate sectors, P&P and Logging, saw significant declines in output; both were likely due to a paper machine closure in 2017 and temporary shutdowns due to mill maintenance and weather events. However, these declines were more than offset by the increased output in wood furniture and forest-based recreation. Housing construction and renovation continue to fuel the solid-wood products and furniture sectors. While not the major focus of this report, IMPLAN provides estimates of tax payments at the federal, state and local levels. Forestry's direct payment for "Taxes on Production and Imports (TOPI) in 2017 was $232,435,661. Sales and property taxes were the largest components of TOPI. Forest-based recreation and pulp and paper aggregate sectors led all forestry aggregate sectors in direct TOPI taxes at $98.2 million and $88.7 million, respectively.

Direct economic effects of forestry sectors in South Carolina, 2017





DISCUSSION

From its initial exploration and eventual settlement, forestry has played a critical role in South Carolina's history. Finding an abundant resource, early settlers utilized the forest for everything from housing to transportation to fuel. Noted historian, Walter Edgar, said that "forestry can make a strong case for being South Carolina's first industry." (personal communication w/ Tim Adams).

The use of the state's forests has changed throughout history. Besides using logs and lumber for construction materials, a "naval stores" industry was developed to turn pine resin into diverse products ranging from surface finishes to fragrances and medicines.

Westward extension of railroad lines, required increasing harvests for railroad ties. Upstate hardwood forests were purchased and managed for oak lumber for cabinets by companies such as Singer Sewing Machine. Of course, as populations grew, more wood was needed for heating and cooking.

The use of our forests continue to change in order to meet today's needs. Pulp and paper capacity is transitioning away from newsprint with the rapid growth of digital media and into packaging, sanitary tissue, and organic chemical products. The manufacture of panel products, like oriented-strand board, high-density and medium-density fiberboard makes more efficient use of small-diameter trees. Also, the need for renewable energy has created a new global market for wood as fuel in the form of pellets.

The future use of our forest will continue to adapt to efficiently match the timber resource with society's needs and desires. With a maturing forest resource, mass timber building products have the potential to create a paradigm shift in commercial construction. Maturing baby boom generations and market growth in developing countries will likely continue the surge in sanitary paper products for decades to follow.

The shift in forest products manufacturing over time will keep forest industry relevant in people's lives and the state's economy. New products and technological advances help to modernize the industry. However, maintaining our timberland base is critical to the long-term health and vigor of forest industry.

RECOMMENDATIONS FOR FUTURE IMPLAN ANALYSES

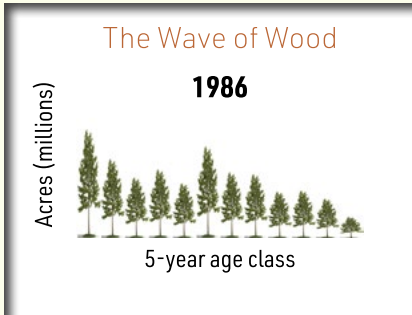
Early IMPLAN studies focused solely on the value of forest products manufacturing in providing employment for South Carolina citizens and economic opportunity in rural neighborhoods. Although still a rural state, South Carolina's population is growing at approximately 1.3% annually. The population went from 4 million at the turn of the century to 5 million in 2017. The growth was concentrated in South Carolina's three largest urban areas of Greenville, Columbia, and Charleston.

As population grows, urban sprawl puts more pressure on the remaining forestland. While our forests continue to have more standing wood volume than ever recorded, there is additional pressure on existing forestland for recreation and ecosystem values associated with forests, such as water quality, air quality, and non-timber forest products.

Future IMPLAN analyses should continue evaluating the forest industry's contribution to the state's economy using standardized approaches, while developing the methodology for including ecosystem services. Some attributes, such as the value of forested watersheds in reducing the cost of water treatment downstream, can be quantified more easily than others.

Past IMPLAN studies have been implemented periodically in South Carolina to validate anticipated economic high points for forestry or to document success in meeting program goals, such as the SC Forestry Commission's $20x15 Program ($20 billion in output by 2015). An alternative approach used by some state forestry programs is to update IMPLAN metrics annually to monitor forestry's overall trends in response to economic conditions. Annual updates work best when following standardized approaches. Finally, IMPLAN results have traditionally been published as snapshots describing the industry at one moment in time. The logical extension of IMPLAN, though, is to describe trends over time.

Factoring in inflation, South Carolina forestry's 2006 IMPLAN contribution of $17.4 billion would equate to $21.7 billion in 2018.The current $21.2 billion contribution would be approximately $1 billion higher if identical methodologies were used between the 2006 and 2018 studies. In any case, even accounting for inflation, forestry's contribution to South Carolina's economy has been stable to slightly growing.



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