


Kentucky Forest Sector Economic Contribution Report



 College of Agriculture,
Food and Environment
Forestry and Natural Resources Extension



2019 - 2020

Annual Forest Sector Economic Contribution Estimates

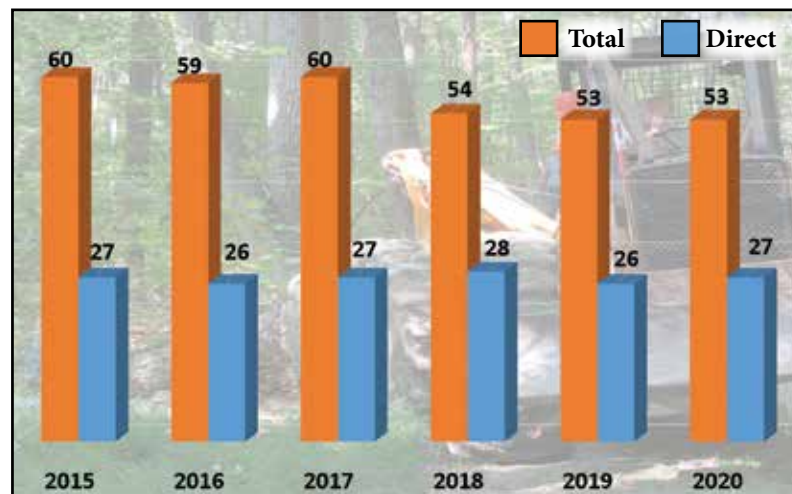
The Kentucky forest industry was designated as essential during the COVID-19 pandemic permitting continued, albeit modified, operations. This report estimates the economic contribution of the overall forest sector in both rural and urban areas. The overall Kentucky forest sector contribution has remained fairly stable over the last few years with the sector providing an estimated \$9.55 billion in direct contributions in 2020

and a total economic contribution of \$13.97 billion (Figure 1). The Kentucky forest sector also directly employed nearly 27,000 people in 2020 with indirect and induced employment resulting in a total of more than 53,000 Kentucky jobs (Figure 2). The direct labor wages for the Kentucky forest sector were \$1.8 billion in 2020 with total labor wages reaching \$3.1 billion.

Figure 1. Kentucky Forest Sector Direct & Total Economic Contribution (2015-2020) in Billions



Figure 2. Kentucky Forest Sector Direct and Total Jobs (2015-2020) in Thousands



Figures 1 and 2 source: IMPLAN Data for Kentucky and the Kentucky Forest Products Industry Directory

Wood Industry and Master Loggers in Kentucky

Kentucky's forests, which are mostly privately owned, provide the majority of the timber for the Kentucky forest sector which processes it into many useful products used throughout the state and around the world. The economic contribution comes from timber resources in all 120 counties. Over 2,600 Kentucky Master Loggers were responsible for this harvest. The wood was processed at 671 wood, paper, and paper converting manufacturing facilities located in 112 counties (Figure 3). The distribution of these facilities indicates the importance of the forest sector to both rural and urban communities.

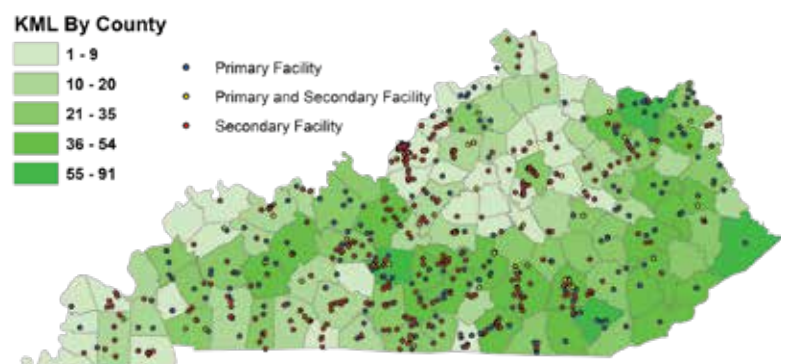


Figure 3. Kentucky Wood Industries and Master Loggers

Source: Kentucky Master Logger Database and Kentucky Forest Products Industry Directory

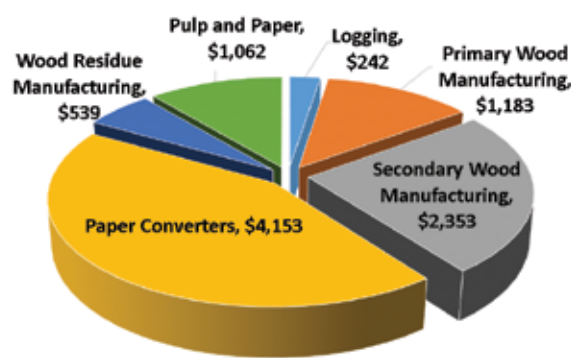
2019 - 2020 Forest Sector Economic Contribution Estimates

The Kentucky Forest Sector is made up of six sub-sectors: logging, primary wood manufacturing, secondary wood manufacturing, pulp and paper, paper converters, and wood residue manufacturing. Employment and economic contributions for each of the sub-sectors in 2019 are displayed in Figures 4 and 5.

Figure 4. Direct Employment by Kentucky Forest Sub-Sectors



Figure 5. Direct Economic Contribution by KY Forest Sub-Sectors in Millions



By the Numbers...

2019

Direct Employment: **26,807**

Total Employment: **53,141**

Direct Contribution: **\$9.53 Billion**

Total Contribution: **\$13.94 Billion**

2020 Forest Sector Economic Contribution Estimates

2020 estimates vary by sub-sector. Logging and primary wood manufacturing were down 1.435% and pulp and paper were down 1.68% in comparison to 2019. Secondary wood manufacturing was up 2.4% while paper converters and wood residue remained flat in 2020 (Table 1). Logging and primary wood manufacturing were negatively impacted by temporary mill closures in response to slow grade lumber markets and decreased export markets, as well as a slowing Chinese economy that resulted in an overall drag on demand and harvesting.

Table 1. 2020 Kentucky Forest Sector Direct Economic Contribution Estimates

Forest Sub-sector	Millions	% Change from 2019
Logging	\$238	-1.435%
Primary Wood Manufacturing	\$1,166	-1.435%
Secondary Wood Manufacturing	\$2,410	2.400%
Paper Converters	\$4,153	0.000%
Wood Residue Manufacturing	\$539	0.000%
Pulp and Paper	\$1,044	-1.680%

2020

Direct Employment: **26,981**

Total Employment: **53,380**

Direct Contribution: **\$9.55 Billion**

Total Contribution: **\$13.97 Billion**

Figures 4, 5 and Table 1 sources: IMPLAN Data for Kentucky and the Kentucky Forest Products Industry Directory

Timber Output and Prices

It is estimated that in 2020 over 779 million board feet of hardwood logs were harvested in Kentucky. This is a slight decline of 11 million board feet compared to 2019 and harvesting remains less than half the total timber volume growth in Kentucky. Slow markets, COVID issues, and uncertainty made 2020 another tough year for many logging operations and sawmills. Overall, statewide delivered log prices increased by approximately 2.5% for all grades and species combined.

The main drivers for this overall trend was a slow stabilization of domestic and Asian export markets for many species. If markets continue to stabilize there are indicators of improving conditions and pricing trends into 2021. Table 2 shows the delivered prices for factory lumber logs of several commercially important species across Kentucky during 2020 and how those prices changed from the first half to the last half of the year.

ASH – Prices for medium quality sawlogs decreased 13% in 2020 due to decreased export demand. Further, secondary degrade caused by ambrosia beetles in trees killed by the emerald ash borer has reduced the abundance of lumber quality in standing timber which has reduced stumpage values.

CHERRY – Cherry logs increased in value across all log grades in 2020, with a 26% increase in high quality logs and 11% for medium quality.

HICKORY – 2020 showed improvement for hickory, as prices increased 38% and 12% for high and medium quality logs, respectively.

MAPLES – High quality hard maple (typically sugar maple) increased 32% and high quality soft maple (typically red maple) remained stable in 2020. However, both experienced a decrease in low quality log pricing, 18% for hard maple and 20% for soft maple in 2020 compared to 2019.

RED OAK – Red oak finally experienced price increases with an uptick of 4% for high and medium quality logs and indications are that this trend will continue in 2020. However, this increase was not seen in low quality logs that decreased 20% in 2020 and expectations for lower quality logs in 2021 is unclear.

WHITE OAK – Log price continues to remain strong due to the multiple uses and demands in high and medium quality lumber logs. The demand for high quality stave logs for bourbon whiskey production has remained stable. Regional periods of dry weather coupled with relatively high prices

Species	Quality	2020 1&2 Quarters	2020 3&4 Quarters	% Change
Ash	High	\$544	\$622	14%
	Medium	\$420	\$364	-13%
	Low	\$310	\$240	-23%
Cherry	High	\$1,085	\$1,369	26%
	Medium	\$618	\$689	11%
	Low	\$324	\$332	2%
Hickory	High	\$761	\$1,046	38%
	Medium	\$492	\$552	12%
	Low	\$307	\$291	-5%
Sugar Maple	High	\$490	\$646	32%
	Medium	\$376	\$344	-9%
	Low	\$279	\$229	-18%
Red Oak	High	\$483	\$502	4%
	Medium	\$357	\$370	4%
	Low	\$276	\$222	-20%
Red Maple	High	\$494	\$474	-4%
	Medium	\$334	\$354	6%
	Low	\$271	\$217	-20%
Black Walnut	High	\$1,944	\$1,698	-13%
	Medium	\$1,045	\$955	-9%
	Low	\$437	\$374	-14%
White Oak	High	\$464	\$766	65%
	Medium	\$362	\$521	44%
	Low	\$261	\$235	-10%
Yellow-poplar	High	\$532	\$508	-5%
	Medium	\$403	\$351	-13%
	Low	\$253	\$211	-17%

es resulted in ample supplies of white oak in 2019 and 2020. The importance of white oak in grade lumber markets increased pricing for high quality logs by 65%, and medium grade logs by 44%. However, similar to red oak, low quality white oak log pricing decreased by 10%.

BLACK WALNUT – While high quality logs were off by 13% from the start of 2020, the species is still commanding historically high prices continuing a sellers' market for high quality walnut logs. As with many other species, low grade walnut logs decreased in value by 14% in 2020.

YELLOW-POPLAR – Logs of all grades decreased in 2020 with high quality logs losing 5%, medium quality 13%, and low quality 17%.

Stave Log Prices

Stave logs are generally high quality white oak logs that are used to make barrels for the distilling and wine industry. Competition for these logs remains high, as do prices. Some softening of prices has occurred due to prolonged dry spells allowing for increased harvesting and log inventories and European tariffs decreasing export of American bourbon, but generally the pricing trend is upward and is projected to remain so. The strong stave log market has also increased the overall value of all high and medium quality white oak logs. Statewide stave logs are averaging over \$1.40/bdft (Figure 6). The market for white oak logs is expected to remain strong in 2021 indicating continued opportunities for landowners and loggers.

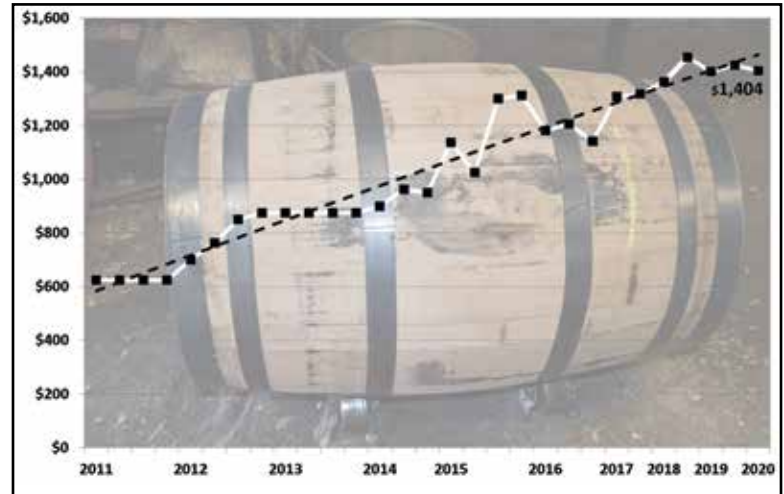


Figure 6. Delivered Stave Logs Prices in Kentucky 2011-2020 by Quarter (\$/MBF)



Railroad Tie Log Prices

Railroad tie logs remain another important timber product in Kentucky, helping many sawmills through fluctuating grade lumber markets in 2019 to 2020. Hardwood railroad tie log pricing softened slightly, but overall remained a healthy market over the last year and a half with statewide tie log prices remaining relatively stable with oak averaging a 3% decrease in value in 2020, and non-oak hardwood tie logs experiencing an 8% decrease (Figure 7). The statewide average for oak tie logs is \$404/MBF, and for non-oak tie logs it is \$347/MBF. However, a high degree of variability in pricing has been seen across regions and month to month. Purchasing has remained stable due to low inventories at tie treatment facilities and should continue into 2021 as normal maintenance and replacement of railway ties continues.

Figure 7. Delivered Tie Logs Prices in Kentucky 2008-2020 by Quarter (\$/MBF)

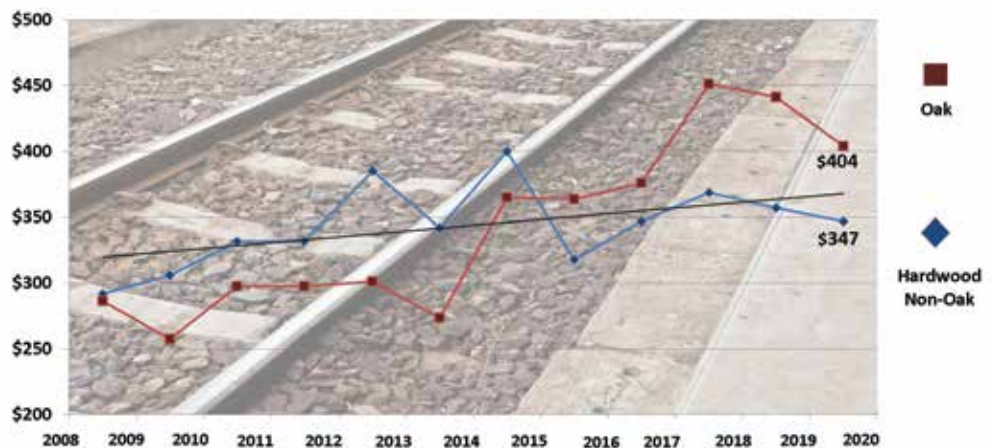


Figure 6, 7 and Table 2 sources: Kentucky Division of Forestry's Delivered Log Price Data (MBF = 1,000 board feet)

Kentucky Forest Sector Economic Contributions

The map shows the Kentucky Congressional Districts and the accompanying tables highlight the economic contributions of the forest sector in each district.

Did you know?

The total taxes paid by the Kentucky Forest Sector was...

\$309,102,925

See below for the taxes paid in each Congressional District (CD).

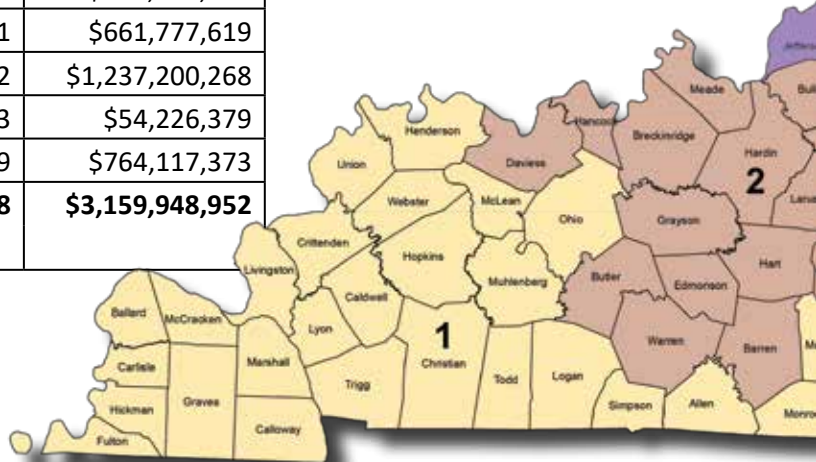
CD 1	\$63,159,847	CD 4	\$70,745,815
CD 2	\$73,418,302	CD 5	\$33,858,820
CD 3	\$32,740,612	CD 6	\$35,179,529

Congressional District #3. 2020 Kentucky Forest Sector Economic Contributions

Forest Sub-sector	Jobs		Total Labor Income
	Direct	Total	
Logging	45	56	\$359,475,747
Primary Wood Mfg.	122	260	
Secondary Wood Mfg.	1,373	2,118	
Paper Converters	1,194	2,218	
Wood Residue Mfg.	95	192	
Pulp and Paper	0	0	
Totals	2,829	4,844	

Congressional District #2. 2020 Kentucky Forest Sector Economic Contributions

Forest Sub-sector	Jobs		Contributions	
	Direct	Total	Direct	Total
Logging	564	937	\$63,494,385	\$106,637,323
Primary Wood Mfg.	741	1,331	\$234,883,888	\$335,989,990
Secondary Wood Mfg.	2,441	3,661	\$461,505,651	\$661,777,619
Paper Converters	1,373	3,136	\$909,486,472	\$1,237,200,268
Wood Residue Mfg.	90	191	\$36,782,713	\$54,226,379
Pulp and Paper	631	1,687	\$559,310,699	\$764,117,373
Totals	5,840	10,943	\$2,265,463,808	\$3,159,948,952
Total Labor Income	\$632,711,456			



Congressional District #1. 2020 Kentucky Forest Sector Economic Contributions

Forest Sub-sector	Jobs		Contributions	
	Direct	Total	Direct	Total
Logging	362	603	\$51,542,565	\$80,834,594
Primary Wood Mfg.	1,178	1,857	\$329,728,975	\$443,916,738
Secondary Wood Mfg.	3,445	4,926	\$676,450,937	\$916,555,786
Paper Converters	991	1,920	\$563,757,481	\$744,533,174
Wood Residue Mfg.	175	525	\$164,858,701	\$229,049,458
Pulp and Paper	463	1,060	\$381,139,725	\$505,218,345
Totals	6,613	10,891	\$2,167,478,383	\$2,920,108,095
Total Labor Income	\$603,266,840			

Congressional District #6. 2020 Kentucky Forest Sector Economic Contributions

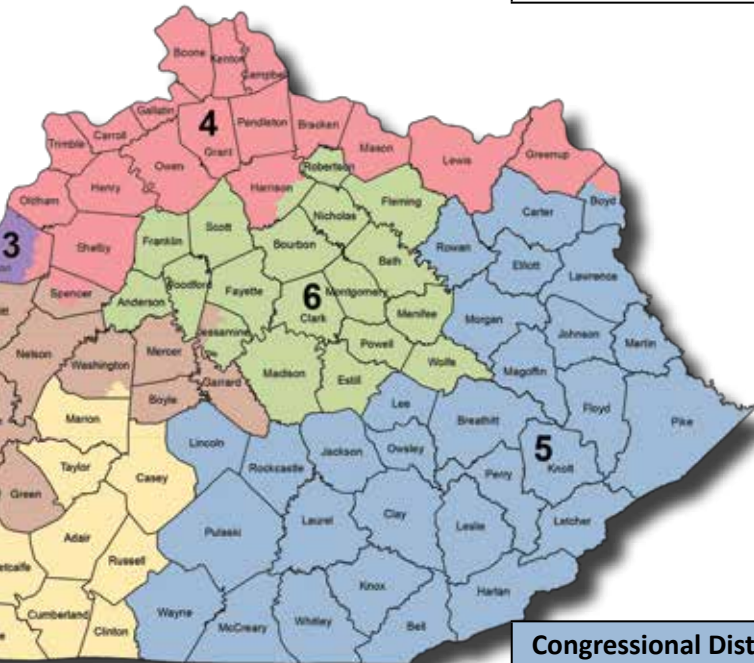
Forest Sub-sector	Jobs		Total Labor Income
	Direct	Total	
Logging	236	440	\$304,392,927
Primary Wood Mfg.	406	717	
Secondary Wood Mfg.	1,068	1,625	
Paper Converters	1,058	2,228	
Wood Residue Mfg.	65	93	
Pulp and Paper	0	0	
Totals	2,833	5,103	

Contributions by Congressional Districts

Direct and total contributions that the Kentucky forest sector contributes to each of those districts.

Sector Economic Contributions	
Contributions	
Direct	Total
\$4,098,775	\$5,680,918
\$63,267,936	\$91,151,684
\$343,726,787	\$476,101,428
\$623,733,607	\$824,843,223
\$61,085,716	\$81,590,493
\$0	\$0
\$1,095,912,821	\$1,479,367,746

Congressional District #4. 2020 Kentucky Forest Sector Economic Contributions				
Forest Sub-sector	Jobs		Contributions	
	Direct	Total	Direct	Total
Logging	427	603	\$31,595,781	\$51,095,728
Primary Wood Mfg.	229	402	\$64,975,656	\$98,128,114
Secondary Wood Mfg.	878	1,354	\$179,359,960	\$265,938,989
Paper Converters	2,776	5,747	\$1,527,150,322	\$2,125,213,077
Wood Residue Mfg.	213	735	\$236,698,562	\$348,781,416
Pulp and Paper	0	0	\$0	\$0
Totals	4,523	8,841	\$2,039,780,280	\$2,889,157,324
Total Labor Income	\$533,795,856			



Did you know?
 Value added represents sales (receipts, operating income, plus inventory change) minus inputs (consumption of goods and services purchased or imported) and is a measure of an industry's contribution to the GDP. The total value added by the Kentucky Forest Sector was...

\$5,247,513,158

Sector Economic Contributions	
Contributions	
Direct	Total
\$32,099,550	\$55,109,957
\$132,601,775	\$191,646,709
\$202,884,464	\$295,709,080
\$606,504,508	\$822,881,235
\$7,314,011	\$11,368,517
\$0	\$0
\$981,404,308	\$1,376,715,497

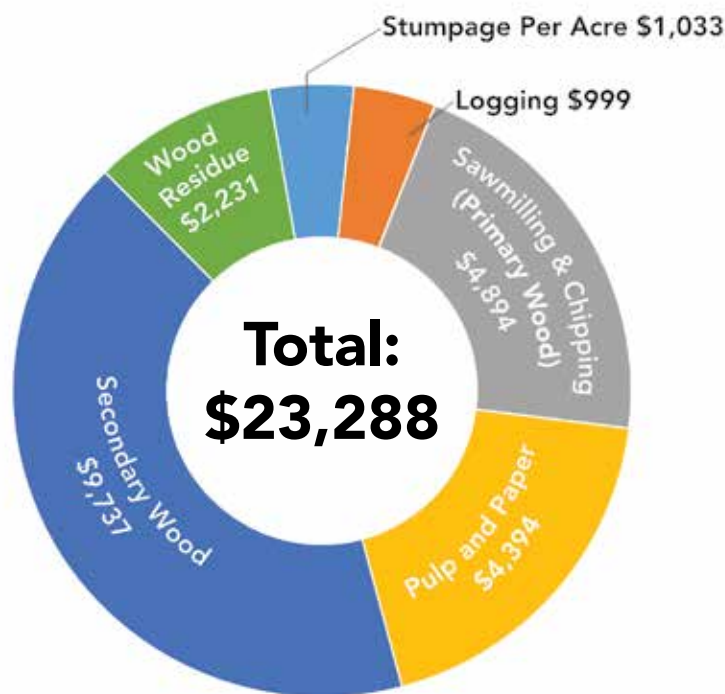
Congressional District #5. 2020 Kentucky Forest Sector Economic Contributions				
Forest Sub-sector	Jobs		Contributions	
	Direct	Total	Direct	Total
Logging	346	691	\$55,249,973	\$90,997,370
Primary Wood Mfg.	1,156	1,931	\$340,690,200	\$471,766,460
Secondary Wood Mfg.	2,715	3,974	\$546,557,716	\$744,517,940
Paper Converters	56	105	\$27,883,976	\$36,715,225
Wood Residue Mfg.	72	161	\$32,682,884	\$50,146,572
Pulp and Paper	0	0	\$0	\$0
Totals	4,345	6,862	\$1,003,064,750	\$1,394,143,566
Total Labor Income	\$345,180,460			

Economic Contribution of One Harvested Acre to Kentucky

The wood resources that support Kentucky's forest sector come primarily from Kentucky's forests. Each acre of harvested timber is estimated to contribute \$23,288 to Kentucky's economy (Figure 8). This contribution starts with the woodland owner who receives, on average, \$1,033 per acre for timber sold based on the statewide average of 3,563 board feet of timber harvested per acre at \$0.29 per board foot. Remaining economic contributions are calculated by dividing the direct cash output of each forest sub-sector by the estimated number of acres harvested in 2020.

The wood flow diagram on the next page shows how most of the harvested timber moves through the supply chain. Loggers harvest the timber and transport it to a mill for processing into primary products like lumber, crossies, or paper. Secondary industries then convert the primary products into a final product. Virtually no wood is wasted in the supply chain as products such as sawdust, chips, and bark are sold or used in other industries. Each step along the way, from the woodlands to the final wood-using industry, contributes to the economy. The most value is added by the secondary industry. This indicates the importance of ensuring a good business climate for secondary wood products industries in Kentucky. Woodland owners and logging are individually the smallest direct contributors; however, without woodlands and logging the Kentucky forest sector would be severely and negatively impacted.

Figure 8. The VALUE of a Harvested Woodland Acre to Kentucky



Source: IMPLAN Data for Kentucky and the Kentucky Forest Products Industry Directory

Housing Starts and Kentucky's Forests

Housing starts are typically used as a major economic indicator (Figure 9) because they provide an important snapshot of the U.S. economy and because of their impact on the Kentucky forest sector. Wood products from Kentucky can be found throughout homes including a significant use for floors, cabinets, moldings, furniture and much more. The U.S. housing market reached 16.75 million in 2020 which is more than double the amount of housing starts in 2010 but remains below the high of 24.875 million in 2005.



Figure 9. Housing Starts 2001 - 2020 (in thousands)

Wood Flow Through Kentucky's Forest Industry

One Harvested Acre



The majority of Kentucky's woodlands are privately owned by families. The US Forest Service estimates there are 136,000 woodland ownerships in Kentucky with over 80,000 owned jointly by spouses; there are an estimated 31,000 individual owners and more than 21 thousand other joint ownerships.



Logging



Logging firms are typically family operated small businesses and are a critical link in harvesting and transporting wood to sawmills. Without loggers, most family woodland owners would have no means of getting their timber to market.



Sawmill & Chipping



Kentucky's sawmills, also mostly family operated, process harvested wood into useful products such as lumber and crossties. In addition to lumber, wood chips are also manufactured to be used in the paper industry.



Pulp & Paper



Kentucky's paper industry uses wood chips to create high quality paper products. These wood chips are typically derived from trees lacking lumber potential or the small branches of lumber producing trees.



Residue



Wood that is not otherwise used in sawmills is utilized in the wood residue industry. This wood residue industry not only creates useful products such as mulch and charcoal but it ensures no harvested wood is wasted.

Secondary



Kentucky's secondary wood industries add significant value to processed wood by creating cabinets, flooring, staves, and much more. Many of these high value wood products are utilized in homes and offices across the state and nation.



This conceptual model traces the flow of harvested wood through numerous forest industries in Kentucky. Woodland owners grow, manage, and protect their woodlands and are the foundation of the Kentucky forest sector. Logging firms harvest and transport the logs to sawmills where they are converted into products utilized by other wood industries, such as: cabinet and flooring manufacturers, paper makers, and residue users. Nearly all of the wood harvested in Kentucky is transformed into useful products and energy and less than half the volume of wood grown each year is harvested.

Kentucky Forest Sector Exports

In 2020, Kentucky exported an estimated \$276 million in wood-related exports which is a \$61 million decrease from 2019. Decreases of \$22 million in wood barrels, \$18 million in railway ties, \$8 million in oak lumber, and \$6 million in hardwood lumber account for most of the decreases in Kentucky wood-related exports in 2020 (Figure 10).

Figure 10. Kentucky Wood-Related Exports in Millions (2020)



Sources for all graphs: USDA Foreign Agricultural Service

Despite the reduction in exports, oak trees continue to supply over half of the wood exported from the state (Figure 11). The demand for oak barrels softened in 2020 with more than \$112 million in exports. Oak lumber was the second highest export at \$53 million which further highlights the overall importance of oak timber supplies to forest sector exports. Figure 12 shows the top five importers of Kentucky barrels, the United Kingdom imported more than \$55 million followed by Ireland importing over \$21 million while Japan and Canada imported more than \$9 million each. Oak in its various forms remains an important export as well as an important species in domestic consumption and its sustainability is important to Kentucky and surrounding states. Unfortunately, there are challenges to oak sustainability. To address these challenges the White Oak Initiative (www.whiteoakinitiative.org) is working to support better forest management to ensure availability of oak supply to the forest sector as well as the many ecological benefits oaks provide.

Europe remains the leading destination for Kentucky wood-related exports in 2020 at more than \$117 million (Figure 13). Asia was the second leading destination for Kentucky wood-related exports at \$84 million in 2020. North America (Canada and Mexico) represented the third largest importer of Kentucky wood products at \$62 million. The rest of the world imported more than \$13 million in wood-related products.

Figure 11. Top 5 Kentucky Wood-Related Exports in Millions (2020)

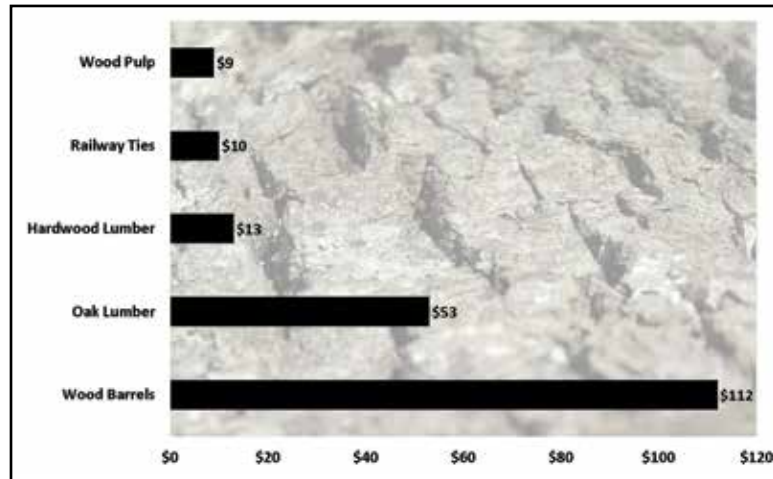


Figure 12. Top 5 Importers of Kentucky Barrels by Country in (2020)

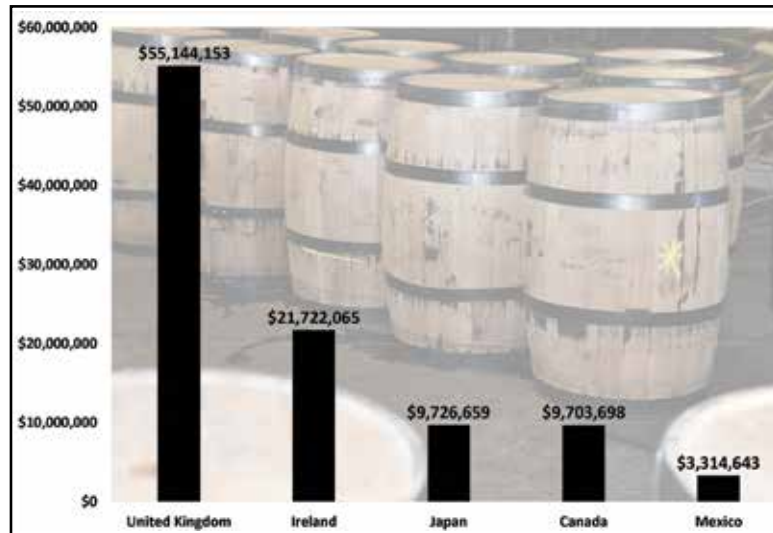
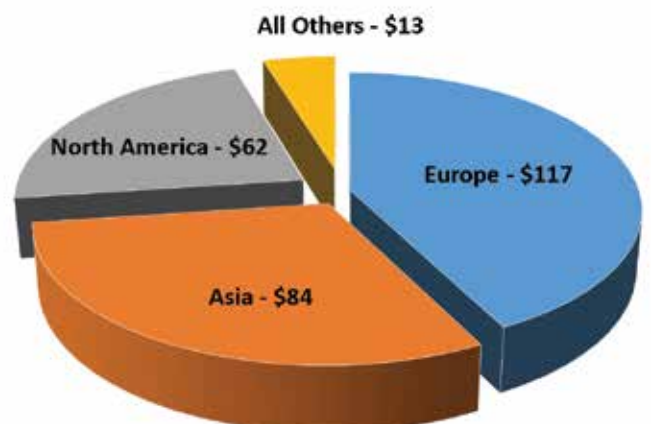


Figure 13. Kentucky Wood-Related Export Destinations in Millions (2020)



Data and Methodology

The estimates of the annual economic contribution of Kentucky's forest sector in this report come from a variety of data sources. Economic contribution estimates were assessed using IMPLAN database (2015-2019) and software. IMPLAN is an input-output economic modeling database and software widely used to assess economic contributions and impacts. Direct economic contribution refers to the economic activity directly associated with an industry or sector. Total economic contribution sums up industry's direct, indirect, and induced effects. The 2015-2017 estimates were assessed using matrix-inversion approach (Henderson and Evans 2017), while the 2019 contributions were assessed using input-output model customization approach within IMPLAN (Parajuli et al. 2018). While the Congressional Districts analysis uses 'econometric' approach, the state level analysis uses 'trade flow' approach options in IMPLAN. Broadly, the trade flow model used in the state level analysis accounts for trade between counties or regions, hence capturing more indirect and induced effects. On the other hand, the Econometric Regional Purchase Coefficient (E-RPC) model does not estimate trade flows with other regions. The E-RPC method only estimates the proportion of local demand that is met by local producers, thus the reduction in indirect and induced estimates when compared to trade flow models. Therefore, the sum of all Congressional Districts contributions are less than the state level one. IMPLAN recommends the use of the trade flows model but E-RPC is the only option available for the Congressional Districts since they are not trading economic units like counties that constitute the state level database. More details about the analytical method can be found at: <https://bit.ly/2LajYIL>. The 2019 IMPLAN data was adjusted to provide 2020 estimates based on annual employment from the Kentucky Forest Products Industry Directory maintained by the University of Kentucky, Department of Forestry and Natural Resources Extension and the Kentucky Division of Forestry (KDF). The availability of current employment data in the directory also allowed adjustments of other sources of information. Data from KDF through its Delivered Log and Product Prices is also essential for this report as is the Forest Inventory Analysis provided jointly by KDF and the USDA Forest Service. USDA Foreign Agricultural Service, Kentucky Master Logger Program, and Kentucky Forest Industries Association members also provided data used in this report.

For more information, please visit <http://forestry.ca.uky.edu/economic-report>.

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