UNIVERSITY OF KENTUCKY

FORESTRY AND NATURAL RESOURCES

KENTUCKY FOREST SECTOR ECONOMIC CONTRIBUTION REPORT

2022-2023

Cooperative Extension Service

FORESTRY AND NATURAL RESOURCES - EXTENSION

Annual Forest Sector Economic Contribution Estimates

The total Kentucky forest sector contribution was $18.6 billion in 2022 with an estimated $12.6 billion in direct contributions (**Figure 1**). This increase is largely a result of increased wages throughout all sub-sectors, strength of the stave and cooperage industry, and some changes to industries included within the report—see the methodology section for more information. Inflation, shortage of labor and workforce issues continue to be limiting factors for industries. [ForestryWorks Kentucky,](ForestryWorks Kentucky) is a new initiative underway to address workforce needs in logging, forestry and wood industry careers in the state. The downtrend in hardwood lumber and railway tie markets within the forest sector are significant, as it is one of the largest sectors in Kentucky. The economic contributions of this sector are important across the state to both rural and urban communities.

Forest industries employed 28,004 people in 2022 with indirect and induced employment resulting in a total of 57,275 Kentucky jobs (**Figure 2)**. The direct labor wages for the Kentucky forest sector were $2.1 billion in 2022 with total labor wages reaching $3.9 billion. Multiple facilities have permanently closed in Kentucky and the surrounding region. Kentucky's forest industries continue to grapple with weak hardwood lumber and railway tie markets for several key species. Rising inflation, rising wages for labor, finding new export markets to take the place of China, and the retirement of key leadership in the Kentucky forest industry further complicate matters.

Figure 1. Kentucky Forest Sector Direct & Total Economic Contribution (2021 - 2023) in Billions

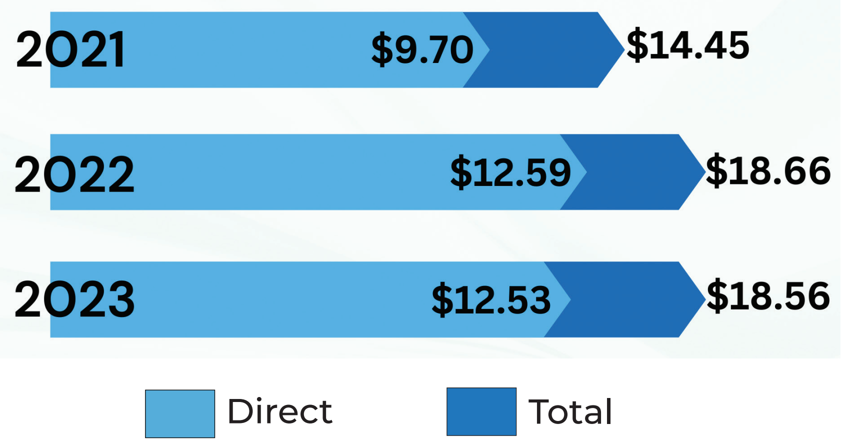
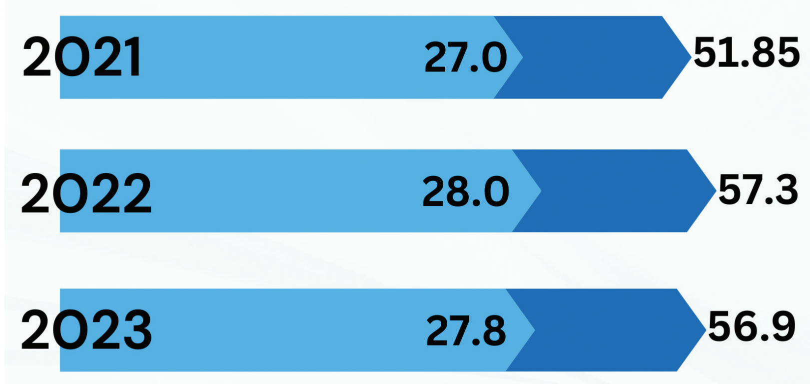


Figure 2. Kentucky Forest Sector Direct and Total Jobs (2021 - 2023) in Thousands

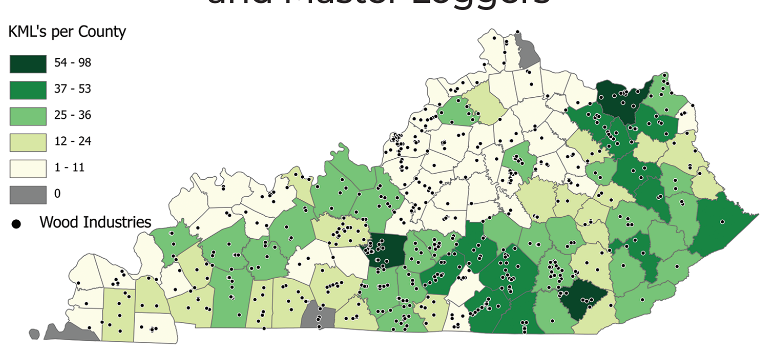


Source: IMPLAN Data for Kentucky and the Kentucky Forest Products Industry Directory

Wood Industry and Master Loggers in Kentucky

There are 2,532 Kentucky Master Loggers, located in 117 counties, who work to harvest timber and deliver it to the 673 wood, paper, and paper-converting industries located in 114 counties throughout Kentucky. Family owned woodlands generate the majority of timber harvested in Kentucky, which drives a significant percentage of economic contribution of the forest sector. Loggers link woodland owners to the many industries that produce forest products. One example of this connection is that loggers provide all of the white oak required to make the barrels for the $9 billion bourbon industry. For these reasons the health and future workforce of the logging sector is vital to maintaining a robust forest industry in Kentucky. **Figure 3** shows the concentration of Kentucky Master Loggers (required on commercial logging operations) by county and the distribution of wood using industries across the state.

Figure 3. Kentucky Wood Industries and Master Loggers

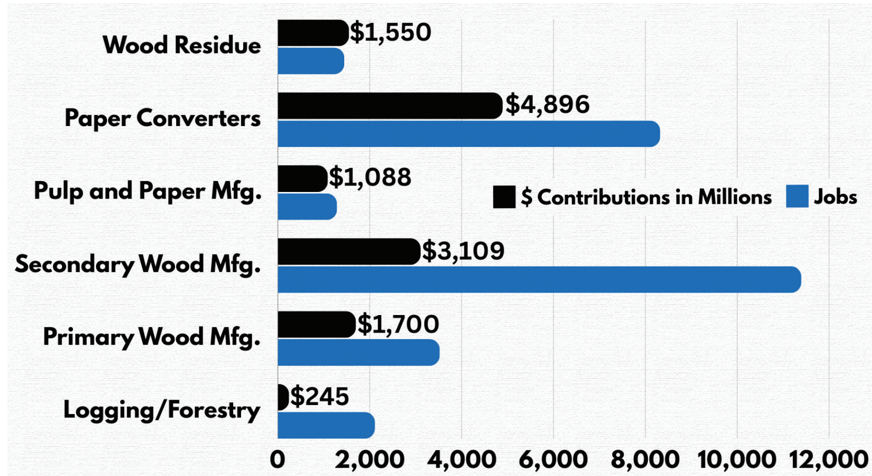


Source: Kentucky Master Logger Database and Kentucky Forest Products Industry Directory

2022 Forest Sub-Sectors Economic Contribution Estimates

Kentucky's forest sector is comprised of six sub-sectors: logging and forestry, primary wood manufacturing, secondary wood manufacturing, pulp and paper manufacturing, paper converters, and wood residue manufacturing. The secondary wood manufacturing sub-sector remains the largest sub-sector employer followed by paper converters (**Figure 4**). Logging and forestry, primary wood manufacturing, and secondary wood manufacturing are key forestry sub-sectors as they comprise the beginning of the supply chain that converts wood into many useful products.

Figure 4. Direct Employment and Economic Contributions of Kentucky Forest Sub-Sectors



2023 Forest Sub-Sectors Economic Contribution Estimates

Table 1. 2023 Kentucky Forest Sub-Sectors Direct Economic Contributions & Change from 2022

Forest Sub-Sector	Millions	% Change from 2022
Logging and Forestry	$221	-9.7%
Primary Wood Mfg.	$1,618	-4.8%
Secondary Wood Mfg.	$3,147	1.2%
Pulp and Paper Mfg.	$1,171	7.6%
Paper Converters	$4,920	0.5%
Wood Residue	$1,451	-6.4%

The 2023 Kentucky forest sector output estimates varied by sub-sector. Some sub sectors, including logging and forestry, primary wood manufacturing and wood residue were down by 9.7%, 4.8%, and 6.4% compared to 2022. Secondary wood manufacturing was slightly up by 1.2%, pulp and paper was up 7.6%, and paper converters were up .5% in 2023 (**Table 1**). Volatile markets for logs and lumber continue to negatively affect the logging and forestry and primary wood manufacturing sub-sectors, which are also struggling with rising inflation. Widespread generational retirement is occurring in all sectors and is resulting in labor shortages that will remain a significant issue for the forest sector; logging and forestry along with primary wood manufacturing are having the most difficulty in recruiting and retaining skilled labor.

Figure 4 and Table 1 sources: IMPLAN Data for Kentucky and the Kentucky Forest Products Industry Directory

Timber Output and Prices

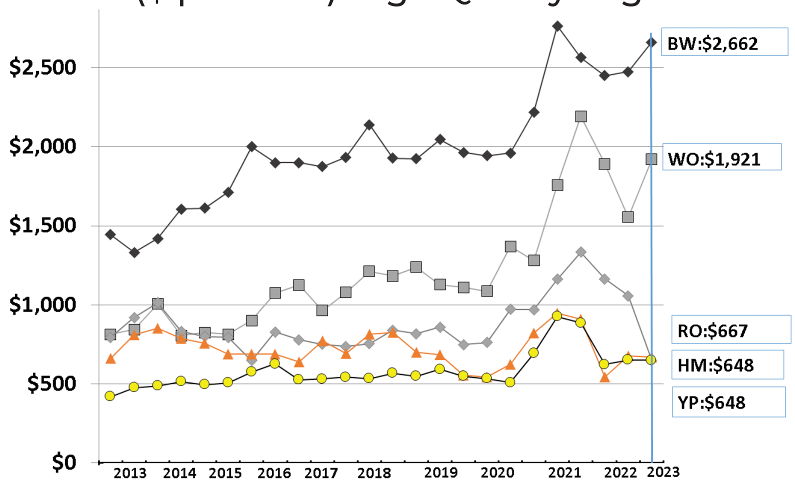
Hardwood markets recovered marginally for high quality logs of all species except maple in 2023; however, pricing is nowhere near the records set in 2021. Statewide averages for delivered log prices decreased by 16.6% from the 2nd half of 2022 to the end of 2023, when combining all grades and species (**Table 2**). Log and lumber pricing and demand are tied to numerous factors including: cooling housing starts, rising interest rates, business concern over the potential for a global economic recession, rising inflation, ongoing global conflict, and continued supply chain issues. From a broad perspective the S&P forecast is anticipating economic growth to decrease from 2.4% to 1.5%. Along with these broader market concerns, short falls in labor recruitment and retention continue. The latter issue is particularly troubling given that logging and primary wood manufacturing industries currently employ an aging workforce—the average age of loggers in Kentucky is 57.

Table 2. Kentucky Delivered Log Prices from 2nd Half 2022 - 2nd Half 2023

Species	Quality	2022 3&4 Quarters	2023 3&4 Quarters	% Change
Hard Maple	High	$1,164	$648	-44.3%
	Medium	$725	$392	-45.9%
	Low	$327	$262	-20.0%
Red Oak	High	$543	$710	30.8%
	Medium	$418	$466	11.5%
	Low	$289	$273	-5.4%
Soft Maple	High	$610	$408	-33.1%
	Medium	$433	$257	-40.6%
	Low	$261	$217	-17.0%
Black Walnut	High	$2,452	$2,662	8.5%
	Medium	$1,463	$945	-35.4%
	Low	$600	$393	-34.6%
White Oak	High	$1,893	$1,921	1.5%
	Medium	$1,077	$737	-31.6%
	Low	$373	$305	-18.4%
Yellow-poplar	High	$621	$648	4.4%
	Medium	$437	$395	-9.5%
	Low	$248	$199	-19.7%

Delivered Log Summary:
With the exception of maple, high quality hardwood log values increased slightly in 2023. The downtrend for medium and low quality logs was consistent across all species in Kentucky. Data from the top six species shows this decrease with the exception of marginal increases for medium quality red oak logs (**Table 2**). **White oak** high-quality grade lumber log pricing increased compared to 2022. In contrast, medium- and low-quality logs decreased an average of approximately 31.6% and 18.4% respectively. While high quality lumber log prices are increasing they remain lower than prices paid for white oak stave logs (**Figure 6**). High-quality white oak lumber logs have not returned to the record high prices experienced in 2021, but are still elevated considerably compared to pricing in 2020 and prior (**Figure 5**). The demand of white oak for many uses in products including veneer, stave, and grade lumber will keep competition and pricing strong for this species. **Black walnut** followed a similar trend as white oak, with high-quality lumber logs increasing slightly in value, and low and medium-quality logs decreasing by 35% from 2022 to 2023. Black walnut is our most valuable species and average prices are still elevated compared to prices paid in 2020 and prior. **Hard maple** experienced reductions in pricing ranging from 20-46% across all log qualities from 2022 through the end of 2023. **Yellow-poplar** values for high quality logs marginally increased. Medium and low quality logs continue to track lower in 2023, decreasing between 9.5-19.7% respectively, for Kentucky's most abundant tree species. **Red oak** domestic and export market demand is slowly improving from record lows in 2022. Lackluster markets for flooring, cabinets, and millwork associated with housing starts and home remodeling due to the slowing housing market are partially to blame. Consumer preferences for species other than red oak and alternative materials also contribute to weakened lumber demand. The railroad tie market is partly cloudy, but still provided a consistent market for red oak logs at this time.

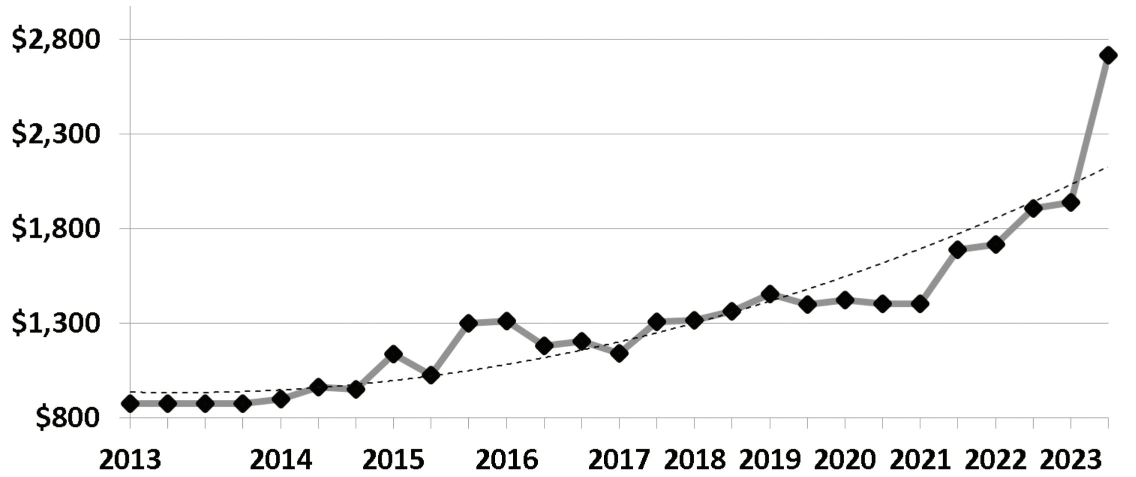
Figure 5: Delivered Log Prices ($ per MBF) High Quality Logs



Stave Log Prices

Strong competition for stave logs continues in response to the ever-increasing demand driven by the "bourbon boom." New log yards, stave drying yards, and equipment and technology upgrades to increase production of barrels have all been important investments to help meet the growing demand for bourbon. Daily barrel production ranges from 8-12,000 statewide, amongst all cooperages combined. Markets are averaging $2.72 per board foot (**Figure 6**) statewide with logs ranging from $1 to $3 /bdft. Unlike most other commodities, stave logs experienced a 42.3% increase throughout 2023. The market for stave logs is expected to remain strong in 2024 due to intense competition for high-quality white oak logs for a variety of products and uses. Despite white oak growing stock concerns (see White Oak Initiative for more information), the strong white oak market continues to be an opportunity for both loggers and landowners.

Figure 6: Delivered Stave Log Prices in Kentucky 2013-2023 by Quarter ($MBF) Doyle



Railroad Tie Log Prices

Railroad tie logs remain an important timber product in Kentucky. The market for hardwood railroad tie logs has softened in terms of pricing and purchasing (**Figure 7**). Predictions from the tie demand forecast show a decrease in tie purchases of 2% for 2024. We have seen statewide price decreases in 2023 compared to 2022. Oak railway ties experienced a 17.9% decrease in 2023, while non-oak tie logs decreased by 15.4% statewide during the last year. The statewide average for non-oak railroad tie logs is $358/MBF while oak tie log average $375/MBF. Air drying yards are at full capacity, but maintenance and replacement of railway ties are ongoing, which should provide some stability into 2024.

Figure 7: Delivered Tie Log Prices in Kentucky 2009-2023 ($/MBF) Doyle

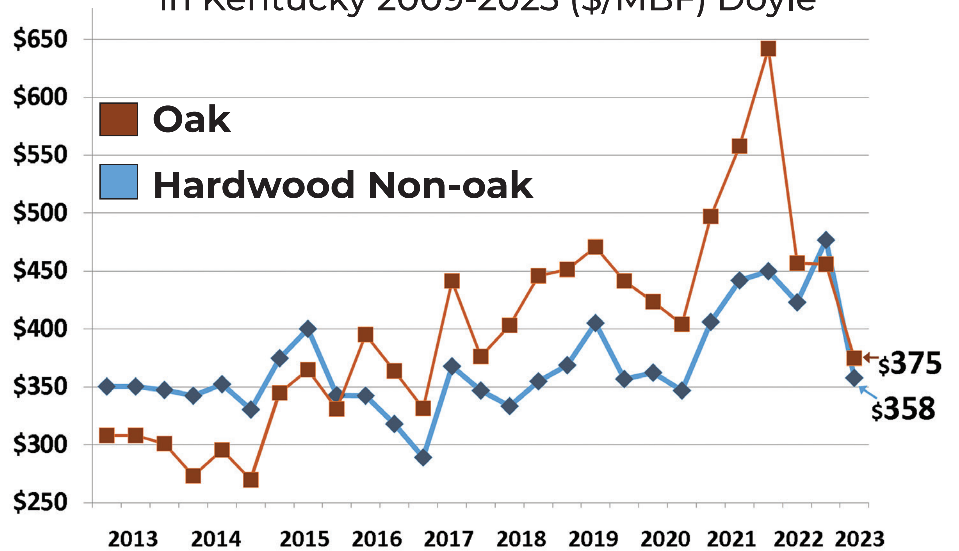


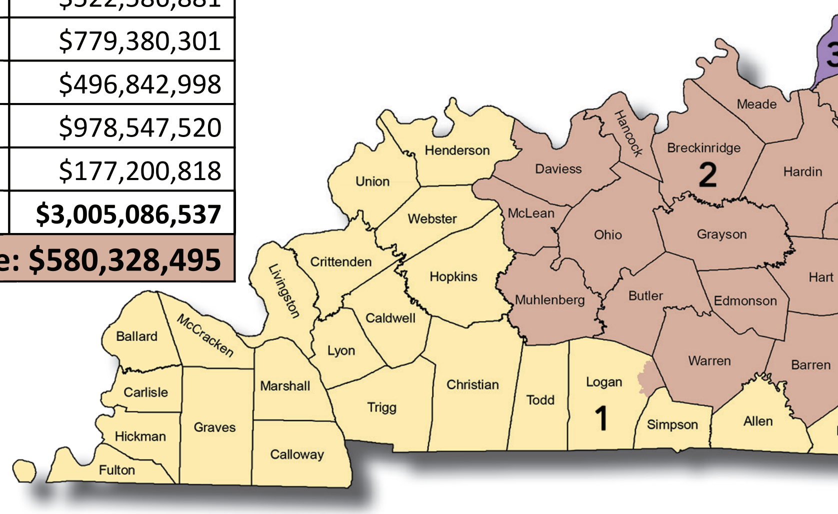
Figure 5, 6, 7 and Table 2 sources: Kentucky Division of Forestry's Delivered Log Price Data (MBF = 1,000 board feet)

Kentucky Forest Sector Economic Contri

The map shows the new Kentucky Congressional Districts. The accompanying tables for the 2023 year highlight the direct and total contributions that the Kentucky forest sector contributes to each of those districts. Note that the sum of districts does not equal the state aggregate because the Congressional Districts (CDs) are not true economic units that levy taxes and trade with other regions.

Congressional District #3. 2023 Kentucky Forest		
	Jobs	
Forest Sub-sector	**Direct**	**Total**
Logging and Forestry	43	53
Primary Wood Mfg.	186	440
Secondary Wood Mfg.	1,418	2,255
Pulp and Paper Mfg.	0	0
Paper Converters	1,367	2,805
Wood Residue Mfg.	200	441
Totals	**3,215**	**5,994**
Total La		

Congressional District #2. 2023 Kentucky Forest Sector Economic Contributions				
	Jobs		Contributions	
Forest Sub-sector	**Direct**	**Total**	**Direct**	**Total**
Logging and Forestry	348	470	$37,888,718	$50,528,019
Primary Wood Mfg.	849	1,295	$425,744,872	$522,586,881
Secondary Wood Mfg.	2,583	3,269	$642,429,223	$779,380,301
Pulp and Paper Mfg.	459	831	$408,929,262	$496,842,998
Paper Converters	1,343	2,134	$813,283,957	$978,547,520
Wood Residue Mfg.	181	403	$139,388,322	$177,200,818
Totals	**5,764**	**8,402**	**$2,467,664,353**	**$3,005,086,537**
Total Labor Income: $580,328,495				



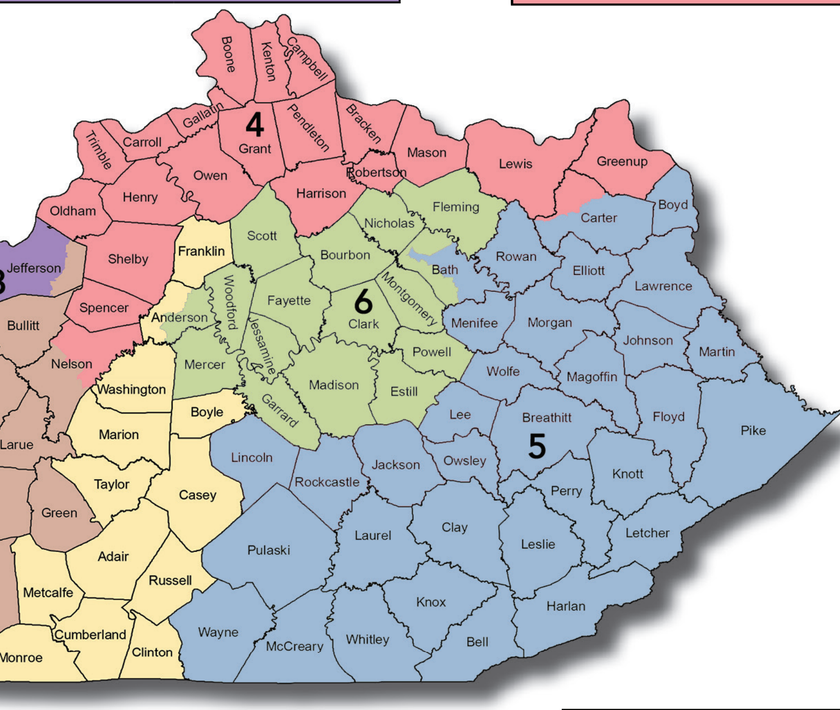
Congressional District #1. 2023 Kentucky Forest Sector Economic Contributions				
	Jobs		Contributions	
Forest Sub-sector	**Direct**	**Total**	**Direct**	**Total**
Logging and Forestry	470	629	$54,734,717	$74,663,183
Primary Wood Mfg.	646	1,019	$308,350,431	$389,878,220
Secondary Wood Mfg.	2,677	3,549	$759,009,305	$934,200,555
Pulp and Paper Mfg.	599	1,077	$497,046,319	$609,956,205
Paper Converters	1,112	1,787	$676,130,453	$818,177,936
Wood Residue Mfg.	392	1,180	$537,647,698	$686,900,893
Totals	**5,896**	**9,241**	**$2,832,918,923**	**$3,513,776,992**
Total Labor Income: $632,878,455				

Congressional District #6. 2023 Kentucky Fore		
	Jobs	
Forest Sub-sector	**Direct**	**Total**
Logging and Forestry	220	354
Primary Wood Mfg.	296	594
Secondary Wood Mfg.	1,244	1,997
Pulp and Paper Mfg.	96	240
Paper Converters	1,558	3,241
Wood Residue Mfg.	129	212
Totals	**3,543**	**6,637**
Total		

butions by Congressional Districts

Sector Economic Contributions	
Contributions	
Direct	Total
$4,812,941	$6,581,735
$123,228,809	$184,455,952
$429,241,104	$612,616,789
$0	$0
$822,698,941	$1,149,785,520
$199,380,133	$255,831,192
,579,361,928	**$2,209,271,189**
abor Income: $476,542,954	

Congressional District #4. 2023 Kentucky Forest Sector Economic Contributions				
	Jobs		Contributions	
Forest Sub-sector	**Direct**	**Total**	**Direct**	**Total**
Logging and Forestry	375	447	$28,603,496	$38,471,235
Primary Wood Mfg.	279	474	$124,993,523	$169,166,255
Secondary Wood Mfg.	728	1,000	$177,978,832	$234,393,825
Pulp and Paper Mfg.	151	303	$120,318,864	$157,127,146
Paper Converters	2,858	4,925	$1,633,695,257	$2,089,081,967
Wood Residue Mfg.	348	924	$497,421,750	$611,643,896
Totals	**4,740**	**8,073**	**$2,583,011,722**	**$3,299,884,324**
Total Labor Income: $600,067,937				



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 in 2022 was...

$6,463,363,701.73

Congressional District #5. 2023 Kentucky Forest Sector Economic Contributions				
	Jobs		Contributions	
Forest Sub-sector	**Direct**	**Total**	**Direct**	**Total**
Logging and Forestry	453	672	$62,922,141	$90,200,131
Primary Wood Mfg.	1,101	1,746	$495,394,596	$630,999,190
Secondary Wood Mfg.	2,882	3,944	$813,774,733	$1,014,836,437
Pulp and Paper Mfg.	80	153	$62,172,906	$79,574,600
Paper Converters	36	58	$18,627,539	$22,930,833
Wood Residue Mfg.	105	176	$43,539,353	$55,267,619
Totals	**4,656**	**6,748**	**$1,496,431,268**	**$1,893,808,811**
Total Labor Income: $378,006,276				

est Sector Economic Contributions	
Contributions	
Direct	Total
$32,326,959	$50,791,779
$140,715,434	$204,750,990
$324,339,515	$470,905,986
$82,431,018	$113,279,896
$955,750,758	$1,291,978,212
$33,753,698	$48,115,645
$1,569,317,381	**$2,179,822,508**
Labor Income: $454,470,892	

Forest Sector Taxes Paid in 2022

The Kentucky forest sector pays taxes at the county, state, and federal levels. **Table 3** highlights the amount of taxes paid by each of Kentucky's forest sub-sectors. Examples of the taxes paid include: sales tax, property tax, motor vehicle license, social insurance taxes (such as Social Security) and custom duty taxes. Estimates for the 2022 tax year are not yet available.

Table 3: Forest Sector Taxes Paid in 2022 (**Millions**)

	Logging	Primary Wood Mfg.	Secondary Wood Mfg.	Pulp and Paper	Paper Converters	Wood Residue Mfg.	Total Taxes Paid
Total Taxes Paid (Total Taxes Paid: Combined Sectors)	$56.34	$169.63	$377.13	$115.37	$511.25	$141.29	$1,371.02
County Taxes Paid:	$6.09	$20.14	$38.31	$13.46	$59.06	$20.26	$157.31
State Taxes Paid:	$14.10	$45.68	$89.38	$31.37	$135.60	$45.14	$361.28
Federal Taxes Paid:	$36.15	$103.81	$249.44	$70.55	$316.59	$75.89	$852.43

Source: IMPLAN Data for Kentucky

Housing Starts and Kentucky's Forests

Because of the amount of wood found in U.S. homes, housing starts are a major economic indicator for wood products. Floors, cabinets, moldings, furniture are just some of the many wood products found throughout our homes. Housing starts are down from 2022; however, they began picking up toward the end of 2023 (**Figure 8**). Cuts to the interest rates are expected to spur an increase in housing starts. The 17+ million housing starts in 2023 is much higher than the 6.6 million in 2009 (**Figure 9**).

Source: U.S. Census Bureau and U.S. Department of Housing and Urban Development

Figure 8: US Housing Starts In Thousands (2023)

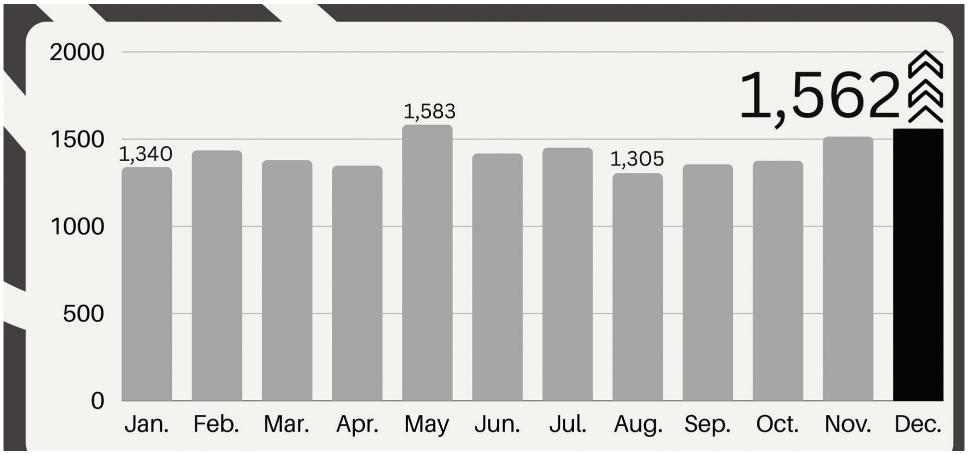
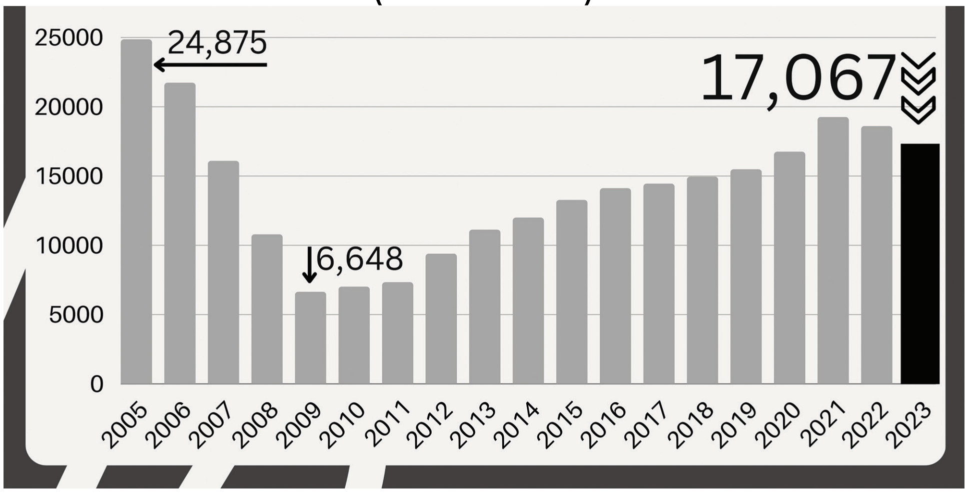


Figure 9: US Housing Starts In Thousands (2005 - 2023)



Impact of One Harvested Acre in Kentucky: $20,021

The wood harvested in Kentucky is transformed into many useful products and energy while less than half the volume of wood grown each year is harvested. The diagram shows how wood flows from a landowner's woodlands through the forest industry supply chain and each economic contribution along the way. Each step, from the woodlands to the final wood-using industry adds value and contributes to the economy.

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

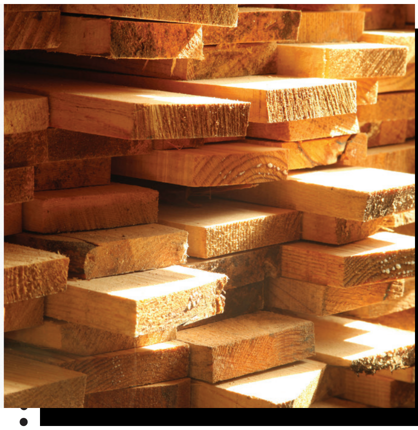
On average, each harvested woodland acre in Kentucky generates $1,354 for the owner. The majority of Kentucky's woodlands are privately owned by families. The U.S. Forest Service estimates there are 136,000 woodland ownerships in Kentucky with over 80,000 owned jointly by spouses; there are an estimated 31,000 individual owners and more than 21,000 other joint ownerships.

One Harvested Acre
$1,354

Logging
$543

Logging firms are typically family operated small businesses and are the 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.

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.



Sawmilling & Chipping
$3,971

Secondary Wood
$7,721

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

Wood Residue
$3,560

Wood not used in sawmills is utilized in the wood residue industry to create useful products such as mulch and charcoal, ensuring no harvested wood is wasted.

Pulp and Paper
$2,873

Kentucky's paper industry uses wood chips from trees lacking lumber potential to create high quality paper products.

Kentucky Forest Sector Exports

Kentucky wood related exports climbed to $396 million in 2023, an increase of $44 million from 2022 export levels (**Figure 10**). Wood barrel exports are responsible for much of that increase as their export level climbed more than $63 million in 2023 to a total of $211.9 million. Wood-related exports surpassed the recent high of $382 million in 2018. Oaks remain very important for the wood export market as the top two wood-related exports from Kentucky come from oak trees: oak barrels and oak lumber ($41.9 million).

Exports of railroad ties saw a large increase to $34 million in 2023. Non-oak hardwood lumber exports were $17.6 million in 2023. Adhesive paper, rough oak and paper made up the remaining top seven wood-related exports at $12 million, $11.9 million, and $7.8 respectively (**Figure 11**). The demand for Kentucky's barrels continues to grow domestically and internationally. The United Kingdom led the way in barrel imports at $102.8 million, followed by Ireland at $36.2 million, and Canada at $19.1 million (**Figure 12**). Requirements implemented by the EUDR are of concern to wood manufacturing companies exporting to EU nations.

Europe remains the leading destination for Kentucky wood-related exports in 2023 at more than $186 million. North America (Canada and Mexico) represented the second largest importer of Kentucky wood products at $98 million. Asia was the third leading destination for Kentucky wood-related exports at $96 million in 2023. The rest of the world imported more than $16 million in Kentucky wood-related products.

Figure 10: Kentucky Wood-Related Exports 2018 - 2023

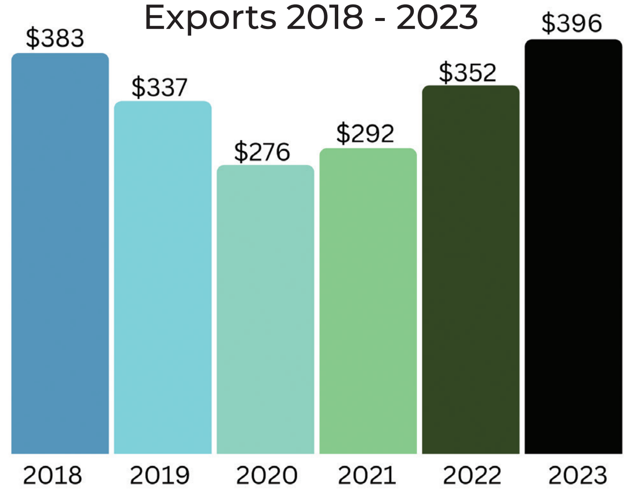
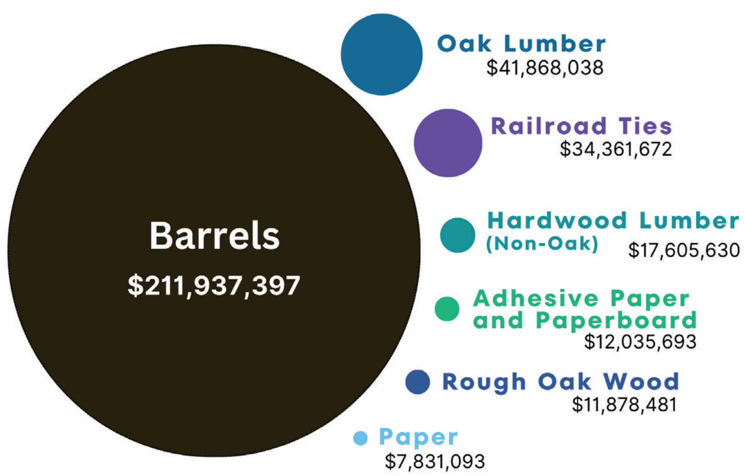
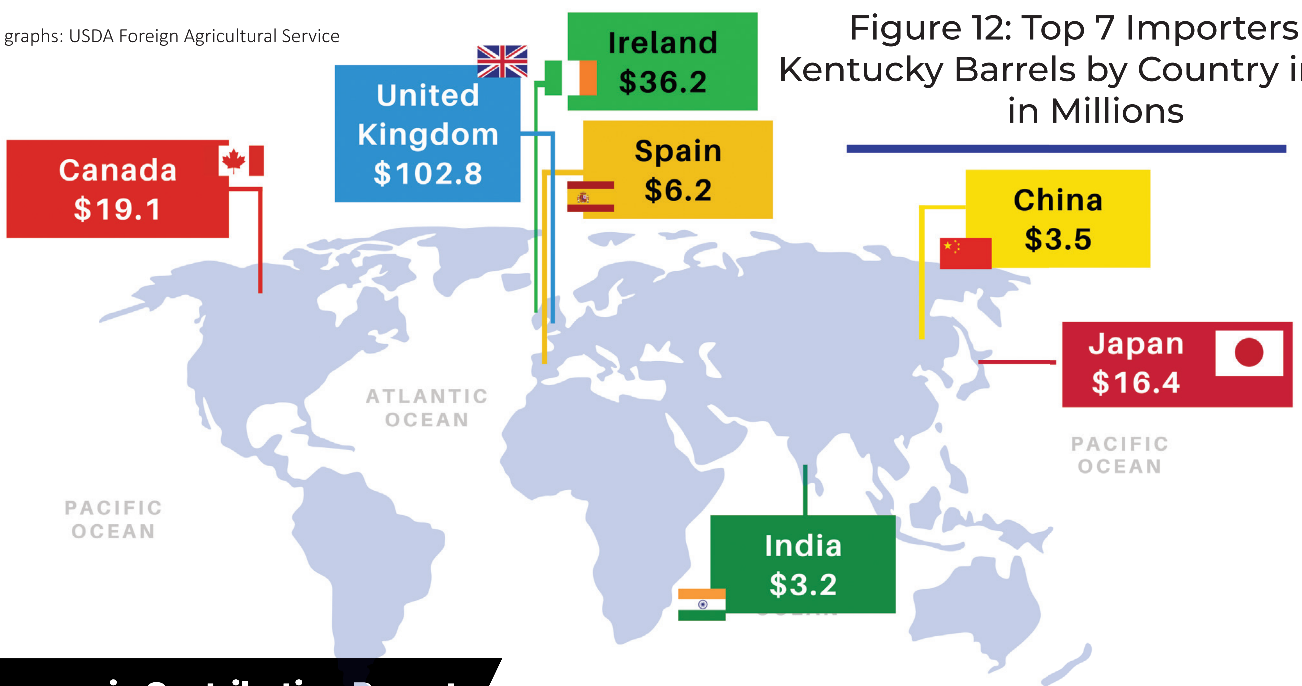


Figure 11: Top 7 Kentucky Wood-Related Exports in Millions (2022)



Sources for all graphs: USDA Foreign Agricultural Service

Figure 12: Top 7 Importers of Kentucky Barrels by Country in 2023 in Millions



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 (2022) and software (IMPLAN Cloud). All contributions estimates are in 2022 dollar-year values. IMPLAN is an input-output economic modeling database and software widely used to assess economic contributions and impacts. The direct contributions are economic activities (e.g., output, employment, labor income, and value-added) associated with an industry or sector in the study area; the indirect contributions are those of local industries purchasing goods and services from other industries, leading to others' outputs, employment, and labor income; while the induced contributions are those of labor income (employee compensation and proprietor income) via goods and services purchased due to the direct and indirect spending by industries. Total economic contribution sums up industry's direct, indirect, and induced effects. The 2022 economic contributions were assessed using the latest IMPLAN Cloud. While the economic contribution for the forest sector was conducted for all the forest-related industries, forest sub-sectors' contributions were estimated by aggregation of related forest sub-sector industries following IMPLAN Industry aggregation procedure. For example, the logging sub-sector is comprised of forestry, forest products, and timber tract production (IMPLAN industry code 15), commercial logging (IMPLAN industry code 16), and a partial claim of the support activities for agriculture and forestry (IMPLAN industry code 19). This report differs from previous reports as it incorporates a new industry (19), dropped an industry, and adjusted (updated) the partial claim percentage in others based on more recently available information.

Congressional districts are composed of combined zip codes (and partial zip codes), and they are not distinct economic units that levy taxes and trade with other regions like counties or states do. IMPLAN Cloud uses very different methods for calculating trade flows for zip codes and those at county or state-level analyses. Therefore, the sum of all congressional districts' contributions may not be equal to the state-level (aggregate).

The 2022 IMPLAN data was adjusted to provide 2023 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 are the Timber Product Output and 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.

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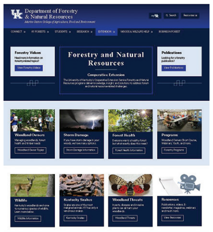

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