Maine Forest Products Council

2024 STATEWIDE ECONOMIC CONTRIBUTION OF MAINE'S FOREST PRODUCTS SECTOR

Acknowledgments

This project is commissioned by the Office of Business Development and is funded by the Maine Jobs & Recovery Plan.

UNIVERSITY OF MAINE

The Economic Impact Analysis was produced by researchers in the School of Economics at the University of Maine.

Dr. Andrew Crawley, Associate Professor
School of Economics, University of Maine
andrew.crawley@maine.edu

Elinor Hunt, Research Associate
School of Economics, University of Maine
elinor.hunt@maine.edu

CAMOIN ASSOCIATES

Jim Damicis, Senior Vice President
Tori Conroy, Senior Project Manager
Angela Hallowell, Senior Analyst
Dawn Hammond, Analyst

ARTICLE CONTRIBUTORS

Shane O'Neil
Forestry Industry Business Development Manager
University of Maine

Joel Slate
Chair, MFPC Manufacturing Committee
Vice President, ND Paper

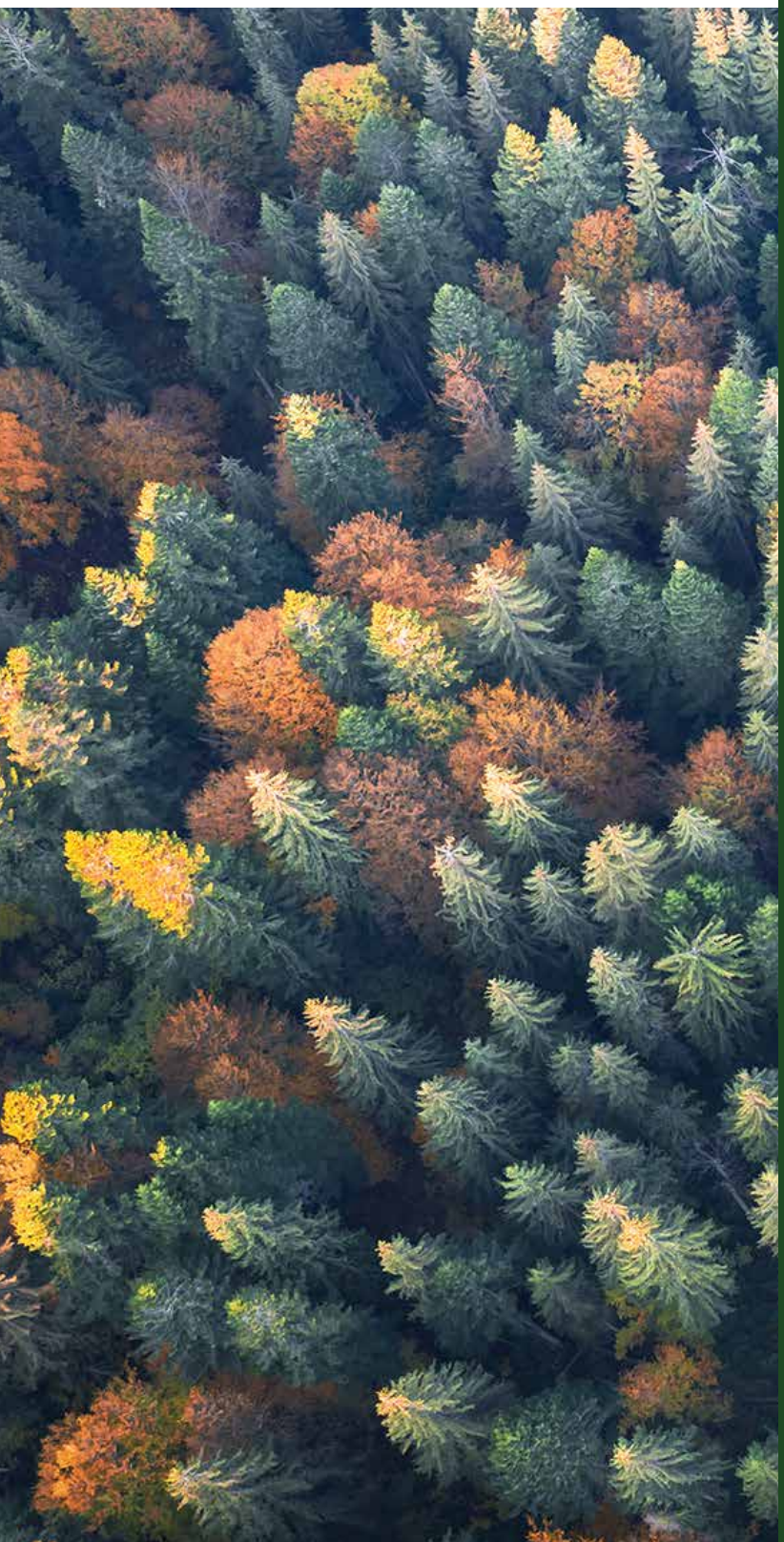
Matt Stedman
Maine Snowmobile Association
Forester, Irving Woodlands

James Brooks
Chair, MFPC Pulp and Paper Committee
SAPPI North America

Dr. Adam Daigneault
Director, University of Maine School of Forest Resources

Chris Fife
Chair of the MFPC Landowner Committee, Weyerhaeuser Public Affairs Manager

Table of Contents



1 Letter from the Forest Products Council

3 Executive Summary

4 Background

5 Assumptions and Methodology

7 Total Annual Statewide Economic Contribution

9 Composition of the Forest Products Sector

12 Industry Perspectives

28 Appendix A

Letter from the Maine Forest Products Council

Like our industry, the Maine Forest Products Council (MPFC) is in a transition period, so it is only fitting, as I assume the role of Executive Director, that we benchmark where Maine's Forest Economy has landed since our last report in 2019.

This report provides the third snapshot of Maine's forest economy. As before, it represents a collaborative effort between MFPC and economists at the University of Maine, and its analysis goes back at least a quarter century. Dr. Andrew Crowley has managed to present us with an accurate and independent analysis of Maine's forest economy, and we appreciate his services. Dr. Daignault has helped provide perspective on the state of our abundant forest resource. These connections to the University of Maine are important to the forest economy, and their assistance is greatly appreciated.

From 2019 to 2024, Maine's forest economy has been tumultuous. With a global pandemic, unpredictable weather, the unexpected loss of a century-old paper mill in Jay, and global markets suffering from artificially high inflation and interest rates, every sector has been depressed, and harvests are down accordingly. More recently, back-and-forth discussions on duties and tariffs levied against some of our traditionally strongest trading partners (including our neighbors) have introduced even more unpredictability, making it exceedingly difficult to predict market trends. There are also policies well beyond our borders, such as the European Union Deforestation Regulation (EUDR), that will greatly impact global markets for forest products.

But even with all these factors at play—many of which are out of our control—we remain optimistic about the direction our industry is headed for several reasons.

An incredible pent-up demand for new housing starts and rebuilds is expected to be unleashed once borrowing becomes more affordable. There is also a lot of potential to introduce more domestically produced renewable wood-based construction products, such as insulation, siding, flooring, and CLT—all value-added products that diversify and add resilience to our industry.

On the pulp and paper side, tremendous opportunities still exist, especially for companies making the necessary investments to produce products that are projected to remain in high demand, such as tissue and packaging. With the help of public-private partnerships and investments, Maine remains on the cutting edge of innovation for this sector, and demand is only expected to increase.

As you will read in Shane O'Neill's piece, Maine companies and institutions are also working hard to position Maine as a global leader in wood-based biofuels and biochar. UMaine is even working on a wood fiber-based replacement for traditional firefighting foam that contains PFAS and has become an environmental hazard.

The uses and need for wood-based products are expanding. Fortunately, Maine has plenty of trees—more than 22 billion according to Dr. Daignault's analysis—and we are well-positioned to serve as the wood basket for the northeastern United States. While our numbers have slid since 2019, **we remain an $8.3 billion economic powerhouse in Maine**, and our contributions will continue to be vital to the very fabric of our state.

All signs point to this being a time of transition—a temporary decline.

Maine's wood manufacturers agree and are riding out this transition in anticipation of recovering and increasing demand. As shown in Joel Slate's article, a number of significant investments have occurred since our 2019 report, and more investments are anticipated in the future. Strategies to keep our logging workforce whole are vital as we prepare for increasing demand for wood products.

The essays in this report were written by professionals in the various sectors of our industry. These insights help to show our vision for the future and some perspectives on how to reach these goals.

As with all Maine heritage industries, we represent the opportunities and livelihoods of rural Maine people. Through encouraging capital investments, continuing to practice sustainable forest management, and recognizing our role in the greater northeast regional economy, Maine's Forest economy will recover and continue to provide the resources that society needs long into the future.

Krysta West, Executive Director
Maine Forest Products Council

Executive Summary

Maine's Forest Products sector includes (but is not limited to) businesses, organizations, and individuals involved with logging and forestry, paper-related product manufacturing, sawmills and wood product manufacturing, wood furniture manufacturing, and biomass electricity generation.

The forest products sector contributes directly to the Maine economy through its day-to-day operations (e.g., direct sales, wages, and employment of workers). In addition to these direct impacts, every dollar spent on local purchases by any business, organization, or individual involved in the Forest Products sector circulates throughout Maine's economy. It is used by other businesses and organizations to pay their employees and taxes, and to purchase more goods and services. This "multiplier effect" is a crucial component to consider when studying the total economic contribution of the Forest Products sector to the state of Maine.

When you take these multiplier effects into consideration, Maine's Forest Products sector contributed an estimated $8.3 billion in total output and over 29,000 full and part-time jobs to the state economy in 2024.

HIGHLIGHTS OF MAIN FINDINGS

Estimated **overall economic contribution** of Maine's Forest Products sector in 2024, including multiplier effects:

$8.3B
in output

29,000+
jobs

$2.1B
in labor income
(see Table 2)

Total estimated **value-added impact** of Maine's Forest Products sector:

$3.4B
including multiplier effects, which equals

3.45%
of the state's gross domestic product (GDP),[1]
or

$1 out of every $29
in Maine's total GDP

Since 2019, employment in Maine's Forest Products sector has fallen

-7%

Paper manufacturing sales have declined

-41%

Wood product manufacturing sales have increased

+45%

[1] This assumes the 2024 GDP was $98,606,000,000, as reported by the Bureau of Economic Analysis (BEA), https://www.bea.gov/sites/default/files/2025-03/stgdppi4q24-a2024.pdf

Background

The Forest Products sector in Maine consists of businesses, organizations, and individuals involved in one of seven primary areas:

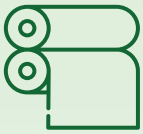
1. HARVESTING

2. BIOMASS ELECTRICITY GENERATION

3. SAWMILLS

4. PLYWOOD AND VENEER

5. PULP AND PAPER MANUFACTURING



6. WOOD FURNITURE

7. WOOD PRODUCTS MANUFACTURING

Table 1 shows the breakdown of industries that make up the Forest Products sector.

Table 1. List of Industries Included in the Model

Forestry and Logging
Support Activities for Forestry
Biomass Electric Power Generation
Sawmill and Woodworking Machinery Manufacturing
Wood Product Manufacturing
Paper Manufacturing
Wood Kitchen Cabinet and Countertop Manufacturing
Manufacturing
Wood Office Furniture Manufacturing
Custom Architectural Woodwork and Millwork

Source: IMPLAN, University of Maine

Assumptions and Methodology

Over the last 10 years, the University of Maine (UMaine) has conducted an economic impact study of the Forest Products sector for the State of Maine. The last study, which was conducted in 2019, relied on federal data produced within the Annual Survey of Manufacturers (ASM) to determine the direct activity of the Forest Products sector and, therefore, served as the primary data input into the 2019 economic impact model.

However, this data source was discontinued from federal statistics programs in the years following the 2019 report.[2] In its absence, the 2025 update relies on a different data approach to determine the direct data inputs to the impact model.

Schematic 1 below compares the approach used in previous UMaine studies analyzing the economic impact of Maine's Forest Products sector, which sourced data from the ASM before integrating it into IMPLAN, an economic modeling tool.

In contrast, the new approach replaces ASM with Lightcast, a data provider that aggregates labor market and economic data. Lightcast utilizes multiple sources, including the Bureau of Economic Analysis (BEA) and the Bureau of Labor Statistics (BLS), to identify industry-level output on a detailed level. The data collected from Lightcast was then used as the direct input into the IMPLAN model.

Schematic 1

	PREVIOUS APPROACH	THIS REPORT'S APPROACH
Underlying Data Source	United States Census Bureau	bea Bureau of Economic Analysis; U.S. Bureau of Labor Statistics
Direct Input Data Source	Annual Survey of Manufacturers (ASM)	Lightcast
Input-Output Software	IMPLAN	IMPLAN

[2] The ASM was transitioned into the Annual Integrated Economic Survey (AIES), which will replace seven prior annual business surveys with one single streamlined survey. However, data collection for the 2024 AIES did not begin until March 2025 and was therefore not available to be used for this analysis.

Economic variables used in this analysis were sourced from multiple reputable datasets to ensure accuracy and consistency across the impact models. Output, employment, and labor income estimates were primarily derived from Lightcast, which integrates data from the BEA, BLS, and the Maine Department of Labor.

These estimates include both employer and non-employer activity, providing a comprehensive view of industry performance. Establishment-level data were obtained from the Quarterly Census of Employment and Wages (QCEW). Labor income figures were calculated using Lightcast earnings data cross-validated against QCEW-reported average annual pay to ensure alignment with observed wage patterns.

All figures, presented in 2024 dollars, were calibrated using the latest available 2023 Maine IMPLAN model, which was also used to estimate multiplier effects. Due to inter-industry linkages, the Forest Products sector is included in both direct and multiplier contributions. For instance, manufacturers of paper products (direct effects) purchase goods and services from logging companies (captured in multiplier effects).

ECONOMIC CONTRIBUTIONS MODELING

The analysis measures the annual (one-year) impact of Maine's Forest Products sector on the state's economy. To determine this annual impact, we assume industry outputs are equal to the "direct" economic impacts ("direct effects").

Therefore, these total output figures are used as the direct inputs in the model to calculate the "indirect and induced impacts." These are also referred to as ripple effects and are generated by supply chain and employee spending.

The total economic impact of Maine's Forest Products sector is the sum of the direct, indirect, and induced effects.

DIRECT: The most immediate impacts are the annual output, employment, and labor income supported directly by the Forest Products sector. This is considered the direct impact.

INDIRECT: Indirect effects occur through business-to-business spending, as the Forest Products sector re-spends a portion of revenue on suppliers within the state, and again as money continues through vendor businesses' supply chains. In other words, for every dollar spent at a local supplier, a portion of that dollar will again be spent on goods and services at other businesses in the state. This is considered the indirect impact.

INDUCED: Another way that forest products dollars have a multiplier effect is through workers in both the Forest Products sector and indirectly impacted businesses spending a portion of their wages on goods and services within Maine. The portion of spending paid to workers re-spent in the state economy is the induced impact.

MODELING SOFTWARE

This analysis uses the input-output model designed by IMPLAN. The IMPLAN model allows the analyst to input the amount of direct economic activity (employment, labor income, value added, or output) occurring within the region and, using the direct inputs, estimates the ripple effects that the output, labor income, or jobs generate as these dollars circulate throughout the economy. This is captured in the indirect and induced impacts and is commonly referred to as the "multiplier effect."

The modeling software (IMPLAN) and the overall sector definition used in this report mirror the state's past analyses. However, the methodology used to determine the sector's direct output differs due to changes in the availability of federal data. This change is explained above.

Total Annual Statewide Economic Contribution

Output and labor income figures for 2019 were adjusted from the previous report to reflect 2024 dollars. Growth rates in direct output, employment, and labor income between 2019 and 2024 were then calculated to identify how Maine's Forest Products sector has changed since the last impact analysis was conducted. Therefore, Table 3 reflects real growth rates after accounting for inflation.

Since the 2019 impact report, the total output supported by Maine's Forest Products sector has declined by 14%, as employment has declined by 7%.

During this study period, the Forest Products sector saw reductions in production capacity stemming from economic headwinds and other challenges. For example, the Androscoggin Paper Mill in Jay closed in 2023 as profits were no longer feasible following the 2020 explosion that destroyed two pulp digesters.

Job losses in Pulp and Paper Mills account for the greatest share of the direct employment decline since 2019, although other industries, such as logging, have also seen reductions.

Meanwhile, other paper mills have made significant capital investments to increase capacity, the impacts of which are likely to be captured in the years following 2024. Additionally, there was growth in Wood Product Manufacturing, further indicating that declining output and employment are largely concentrated within the Paper Manufacturing segment of the Forest Products sector.

Table 2. Total Annual Statewide Economic Contribution of Maine's Forest Products Sector, 2024

	Direct	Indirect	Induced	Total
Output	$4,891,447,032	$2,007,008,642	$1,420,183,946	**$8,318,639,620**
Employment	11,888	9,865	7,884	**29,637**
Labor Income	$1,041,849,467	$587,722,722	$445,430,347	**$2,075,002,535**

Source: IMPLAN, University of Maine

Table 3. Growth Rate of Total Annual Statewide Economic Contribution of Maine's Forest Products Sector (2019-2024)

	Direct	Indirect	Induced	Total
Output	-14%	-22%	1%	**-14%**
Employment	-3%	-14%	-3%	**-7%**
Labor Income	27%	-22%	-1%	**3%**

Source: IMPLAN, University of Maine

At the same time, labor income in the sector saw rapid growth, even after accounting for inflation. This is in line with broader macroeconomic trends. From 2019 to 2024, the average weekly wage across all industries in Maine grew by an inflation-adjusted 9%, based on data from the Bureau of Labor Statistics.[3] Therefore, despite contraction in employment and output, labor income still saw inflation-adjusted growth within the Forest Products sector during this study period.

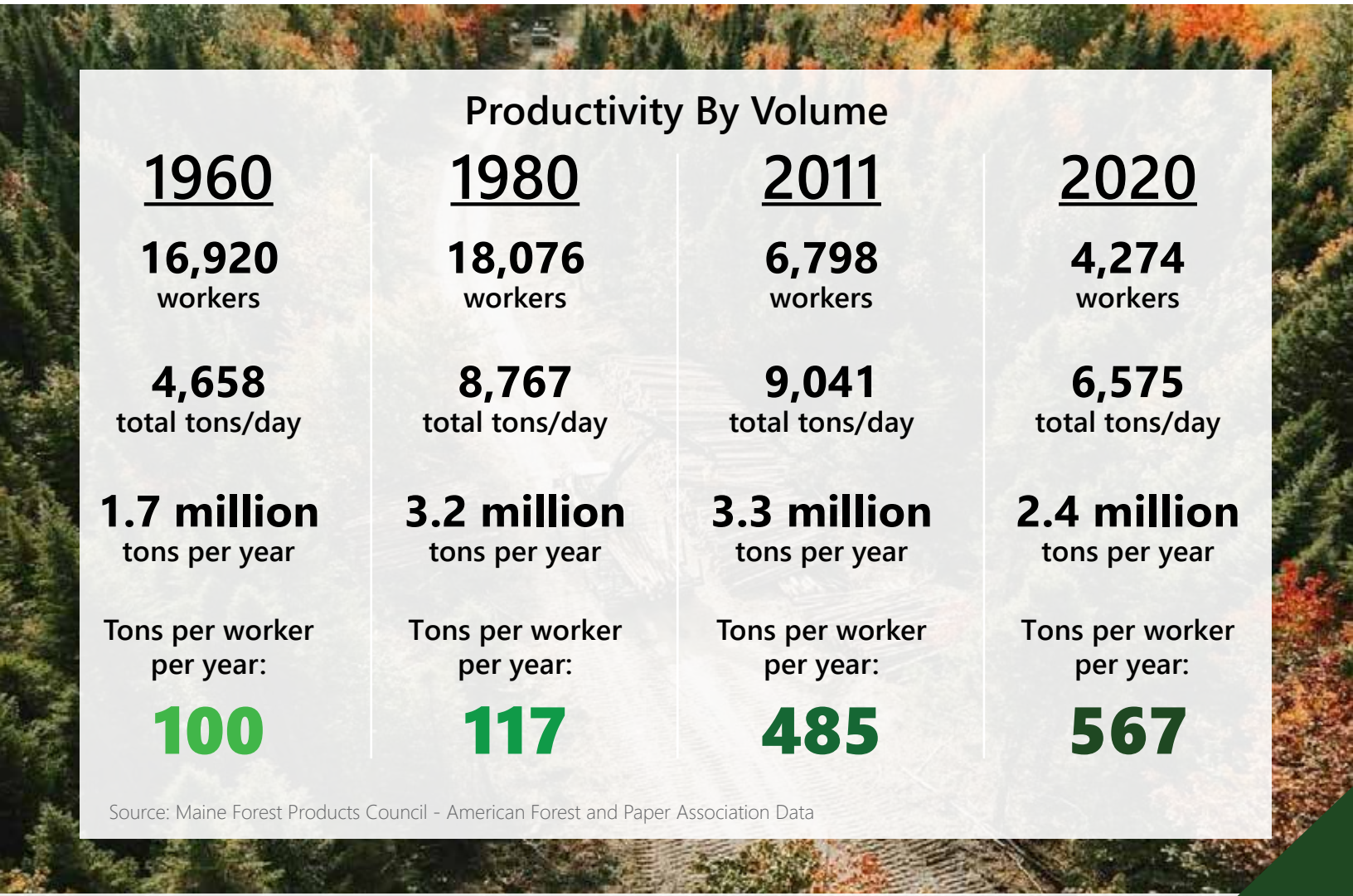
Another way of evaluating the sector's performance is by studying its productivity, measured by the average annual employee contribution to Gross Domestic Product (GDP). The average annual employee contribution was calculated by dividing total direct output, adjusted for inflation, by the total number of employees. Performing this calculation across multiple years allows for the examination of average output per worker, a standard approach for assessing changes in productivity.

Although different data sets were used across the 2019 and 2024 studies, adjusting for inflation reveals that economic productivity per worker has decreased.

Table 4. Average Annual Direct GDP Contribution per Employee

	2016	2019	2024
Average Employee Contribution	$463,741	$467,767	$411,461

Source: IMPLAN



[3] Source: Quarterly Census of Employment and Wages (QCEW) for Maine, all industries, ownership, and establishment sizes. Average Weekly Wage from QCEW was adjusted for inflation using the Consumer Price Index for All Urban Consumers.

Composition of the Forest Products Sector

Table 5 and Map 1 depict the distribution of employment in Maine's Forest Products sector by county.

Northern and rural counties, particularly Aroostook and Somerset, have the highest employment shares, indicating a strong dependence on forestry.

Map 1. Distribution of Maine Forest Products Industry Employment by County, 2024

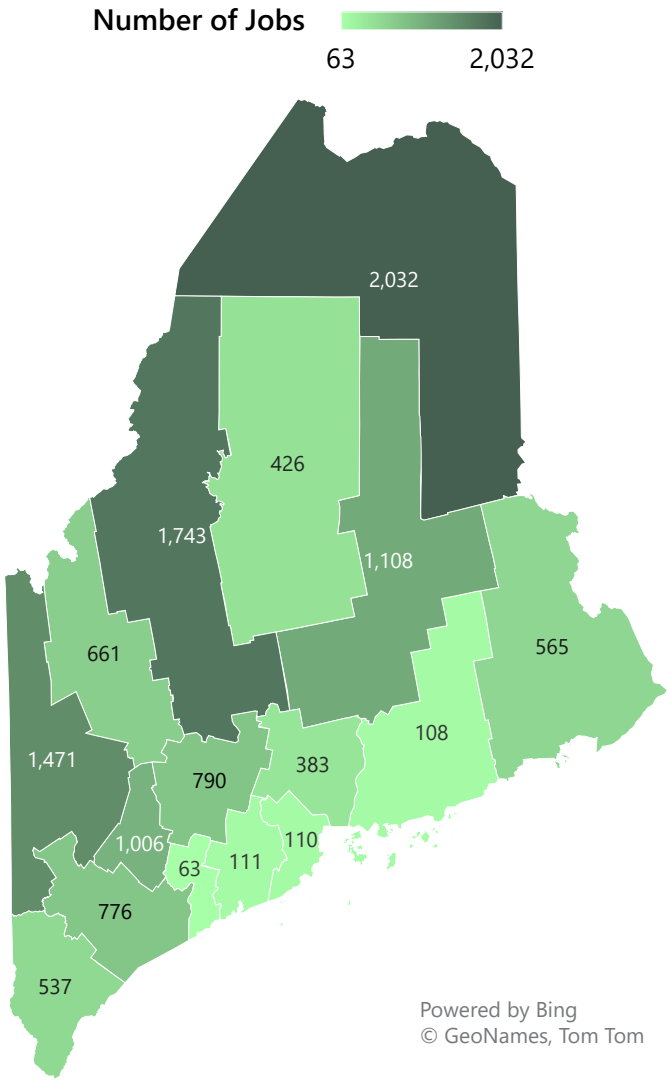


Table 5. Maine Forest Products Industry Employment Distribution by County, 2024

County	Employment	Employment Share
Androscoggin	1,006	8.5%
Aroostook	2,032	17.1%
Cumberland	776	6.5%
Franklin	661	5.6%
Hancock	108	0.91%
Kennebec	790	6.6%
Knox	110	0.92%
Lincoln	111	0.93%
Oxford	1,471	12.4%
Penobscot	1,108	9.3%
Piscataquis	426	3.6%
Sagadahoc	63	0.53%
Somerset	1,743	14.7%
Waldo	383	3.2%
Washington	565	4.8%
York	537	4.5%

Notes: Lightcast industry data sources vary by worker type: (1) QCEW Employees: Mainly from the Bureau of Labor Statistics Quarterly Census of Employment and Wages (QCEW), with support from County Business Patterns. (2) Non-QCEW Employees: Draw from multiple sources, including QCEW, Current Employment Statistics (CES), County Business Patterns, Bureau of Economic Analysis (BEA) income reports, National Industry-Occupation Employment Matrix (NIOEM), American Community Survey (ACS), and Railroad Retirement Board data. (3) Self-Employed/Extended Proprietors: Based on ACS, Non-employer Statistics, and BEA income reports. Projections for QCEW and Non-QCEW Employees use NIOEM and state-published long-term industry forecasts.

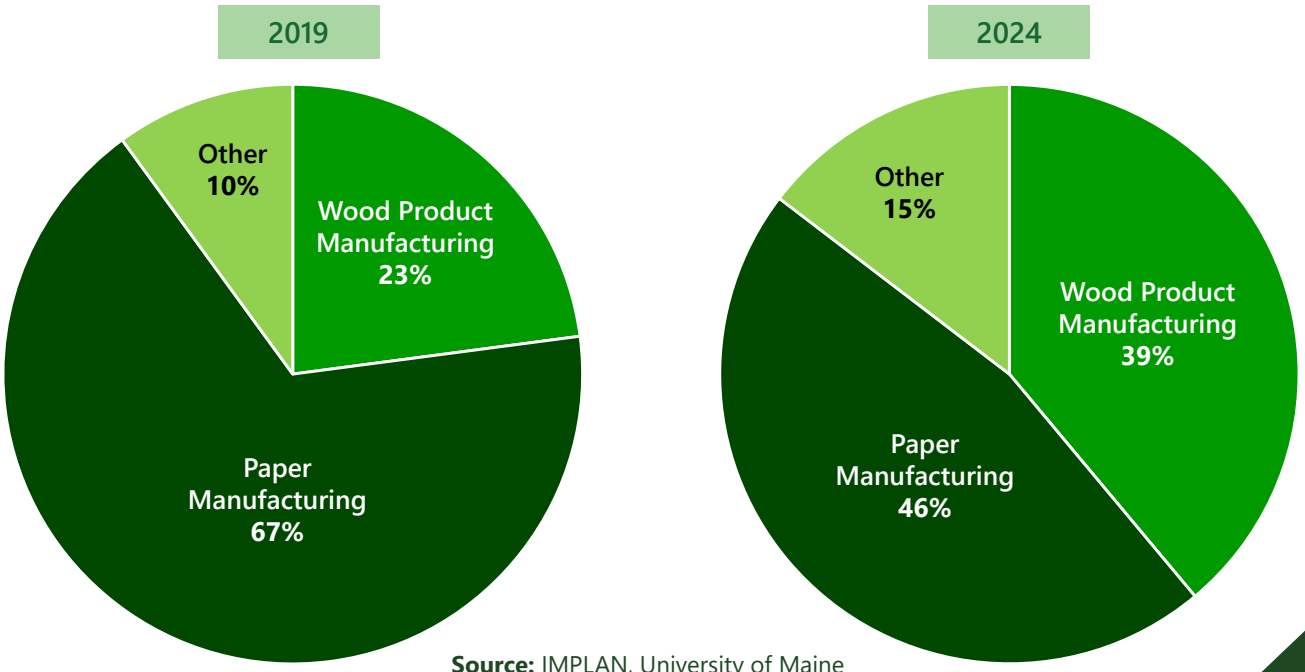
Source: Lightcast

Central and western regions, such as Oxford and Androscoggin, also show moderate involvement, while southern and coastal counties like Cumberland and York have much lower employment in the sector. This highlights the continued importance of forest-based industries in northern Maine, in contrast to the more diversified economies of the south.

Figure 1 illustrates a shift in the direct output contribution of the Forest Products sector from 2019 to 2024, with a notable decline in the share of Paper Manufacturing. In 2019, Paper Manufacturing dominated the sector, accounting for the majority of output (67%). By 2024, its share had decreased significantly, indicating a diversification in the industry (46%).

This change suggests a movement away from traditional paper products toward increased output from Wood Product Manufacturing and other forest-related industries, likely reflecting broader market and demand shifts.

Figure 1. The Changing Composition of the Forest Products Sector's Direct Output



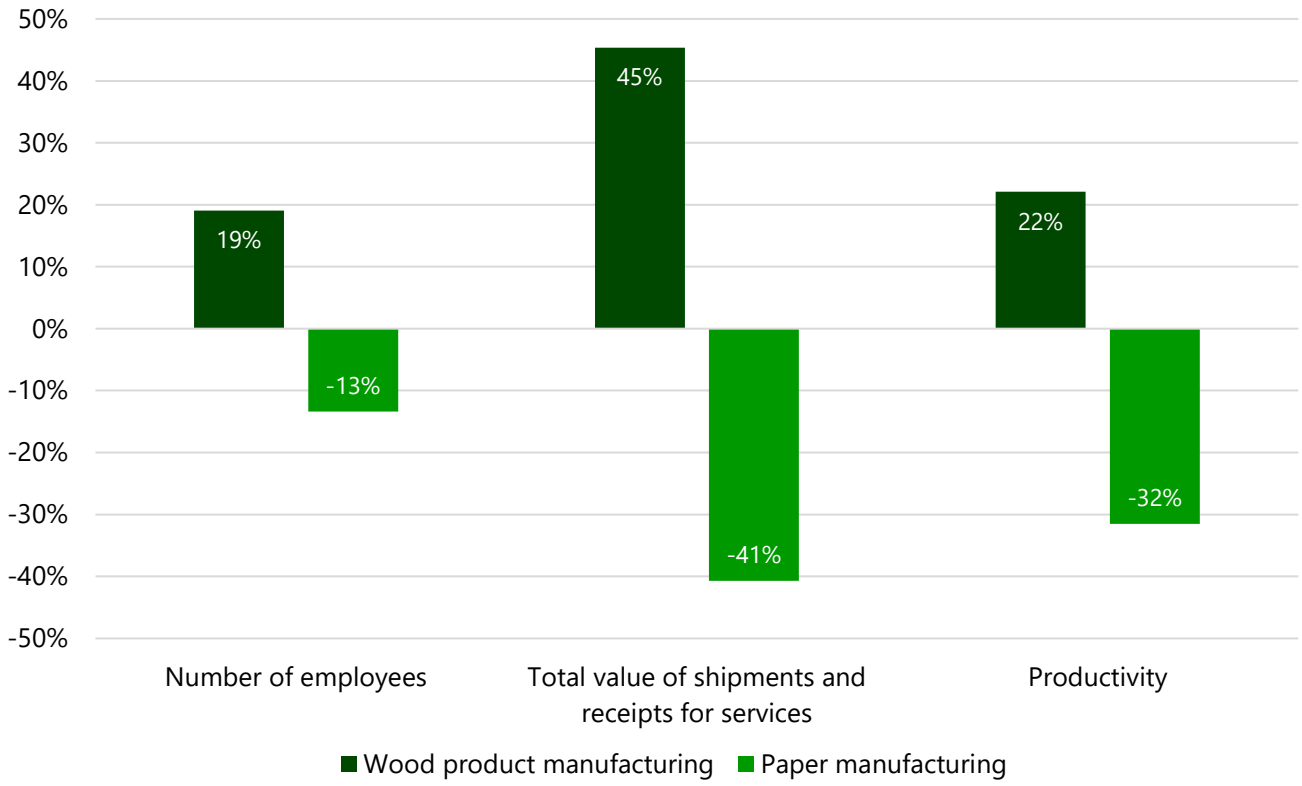
Source: IMPLAN, University of Maine

Figure 2 highlights contrasting trends between Maine's two primary Forest Product industries.

Wood Product Manufacturing experienced growth across all three indicators—employment, output, and productivity—most notably with a 45% increase in total shipments and receipts.

In contrast, Paper Manufacturing showed declines in all categories, including a 41% drop in output and a notable contraction in productivity.

Figure 2. Growth and Contraction of Forest Products Sectors: 2019 to 2024



Source: IMPLAN, University of Maine

Industry Perspectives

Maine's forest economy is undergoing a bold transformation from traditional timber and paper-based industries to becoming a globally recognized leader in forest-based innovation, biomanufacturing, and sustainable materials.

The following section of the report provides various perspectives from people within the Forest Products sector, highlighting the voices of industry leaders, researchers, and land managers shaping this evolution.

Together, these insights illustrate how public-private collaboration, capital investment, and innovation are redefining the value of Maine's forest resources and positioning the state for long-term economic and environmental leadership.

Maine's Forest Resources

Balancing Growth, Harvest, and Carbon for a Sustainable Future

By Dr. Adam Daigneault
Director, University of Maine School of Forest Resources

Maine's 17.4 million acres of forestland represent one of our state's greatest assets. Covering 88% of the state, these working forests support thousands of jobs and myriad recreational opportunities while serving as a key asset to mitigating climate change.

With more targeted management, Maine's forests can do even more—growing more timber while storing significantly more carbon, all while preserving habitat for a range of important wildlife species.

Our Forests Are Growing Like Never Before

The numbers tell an impressive story. Maine's forests currently contain more than 22 billion live trees, and they're growing faster than we are harvesting them. Annual forest growth in Maine currently exceeds harvest by more than 50%. We're sustainably growing an estimated 1 billion cubic feet of wood annually, but only harvesting about 521 million cubic feet. That's a lot of untapped potential sitting in our forests.

Today's timber volume is nearly double what it was in 1953, resulting from decades of sustainable forestry work. But this surplus growth also presents an opportunity. With so much wood accumulating in our forests, we can increase both harvests and carbon storage through modern forest management.

Maine's Forest Landscape: A Climate Success Story

Trees' ability to sequester and store carbon provides a huge benefit to Maine. Our forests and wood products remove more than 90% of the state's annual greenhouse gas emissions. Our harvested wood products alone store 1.6 million metric tons of carbon dioxide equivalent each year. That's like permanently taking 350,000 cars off the road.

Here's what many people don't realize: Actively managed forests can store more carbon over time than forests left alone. Young, fast-growing trees capture carbon quickly, while older forests eventually slow down and become vulnerable to insects, disease, and storms that release stored carbon back to the atmosphere.

About 75% of our forest carbon goes into tree growth, while 25% gets stored in wood products—everything from the framing in your house to the paper in your office. Both matter for climate benefits.

The Sweet Spot: More Wood and More Carbon

University of Maine research reveals something remarkable: We can increase Maine's forest carbon storage by 15-25% while maintaining

current harvest levels. We can even increase our harvests by 20% or more without reducing our current rate of carbon uptake. The key is using a diverse mix of forest management practices across the landscape.

For example, collectively we could:

- **Go intensive where it makes sense.** We can use practices like planting and commercial thinning on our most productive sites to grow more wood faster. These high-productivity stands can supply most of our timber needs while sequestering carbon rapidly.
- **Preserve the special places.** Sites with exceptional carbon storage or conservation value can be managed less intensively or set aside entirely. This "land-sparing" approach maximizes benefits across the landscape.
- **Diversify our management.** Moving beyond our current focus on partial harvests and shelterwood cuts to include more varied approaches—from intensive plantations to extended rotations—gives us more options to meet multiple objectives.
- **Plant more trees.** Shifting from natural regeneration to planting on appropriate sites increases long-term productivity. Planted stands typically grow faster and reach higher volumes than naturally seeded ones.

Keeping Our Forests Healthy

Active management isn't just about growing more wood—it's about keeping our forests healthy and resilient. Maine faces serious challenges from invasive pests and diseases. We have some of the highest densities of non-native forest pests in the country, and climate change is making these problems worse.

Without active management, our forests become sitting ducks. Overcrowded stands are stressed and vulnerable. Dead and dying trees release their stored carbon back to the atmosphere.

Strategic harvesting and regeneration create healthier, more resilient forests that can better withstand these challenges. Managing for diversity—different species, ages, and forest conditions—also helps our forests adapt to changing conditions while maintaining their ability to provide wood, store carbon, and support wildlife.

Markets Matter

Here's the reality: Landowners need markets for all types of wood to make forest management work. Recent mill closures have reduced demand for lower-grade material, making comprehensive management harder. But new opportunities are emerging. For example, mass timber construction, advanced wood products, and renewable energy markets are creating demand for different types of wood.

Carbon markets and other ecosystem service markets may eventually provide additional revenue for landowners who implement climate-smart practices. The key is maintaining diverse, robust markets that reward good forestry and provide incentives for landowners to actively manage their forests.

The Path Forward

Maine already leads the nation in sustainable forestry with 8.5 million certified acres. Our forests prove that working landscapes can provide economic benefits while storing carbon and supporting wildlife.

The science is clear: We don't have to choose between timber and carbon. With strategic management, Maine's forests can grow more wood, store more carbon, and provide more benefits to our communities. We have the knowledge, the resources, and the track record to make it happen.

The opportunity is enormous. Our forests are primed for increased productivity and carbon storage. With the right approach, Maine can continue to lead the way in showing how working forests address climate change while supporting rural economies.

That's the Maine way—practical, science-based solutions that work for our forests, our economy, and our future.

Maine's Forest Economy

From Traditional Timber to Revolutionary Bioproducts

By Shane O'Neil
University of Maine

Maine's forest economy stands at a pivotal moment in its centuries-long history. It is transforming from traditional logging and paper manufacturing into a sophisticated bioeconomy that positions the state as a global leader in sustainable forest innovation.

With forests covering over 88% of the state (the highest percentage in the nation) and nearly 92% of that in private ownership, Maine's 17.5 million forested acres represent both a cherished natural heritage and an economic powerhouse that continues to evolve with changing market demands and environmental imperatives.

The Foundation: Traditional Forest Economy and Wood Inventory

Maine's forest economy has deep roots extending back to 1634, when the state's first official sawmill was established in South Berwick. By the early 1700s, the region had become critical to England's naval supremacy. After the Revolutionary War, it served as the wood basket to the newly formed nation for centuries. This legacy of forest utilization has evolved into a modern industry that is deeply rooted in Maine's identity, rural communities, and trade.

The state's 742 billion green tons of timber inventory also demonstrates our sustainability, with over 18 billion green tons of net growth in a diverse forest landscape of a nearly even mix between softwood and hardwood species.

As of 2024, the forestry and Forest Products sector generates $5.3 billion in total sales (78% of which are from out of state), making it a significant driver of Maine's economy.[4]

[4] "Updated Sector Summary: Forestry and Forest Products Industry Profile," Maine Department of Economic and Community Development, February 28, 2025, https://www.maine.gov/decd/sites/maine.gov.decd/files/2025-05/Summary%20-%20Forestry%20and%20Forest%20Products%20-%20DECD.pdf

Market Opportunities and Economic Evolution

The transformation of Maine's forest economy reflects broader shifts in global markets and environmental consciousness. With the global transition from print to digital media, demand within the traditional pulp and paper market has shifted dramatically.

Photo Source: Tanbark

In response, forest sector businesses, governmental and nonprofit agencies, and institutes of higher learning in the state established the Forest Opportunity Roadmap initiative in 2018 to collaboratively strengthen and grow Maine's forest economy through this transition.

The initiative targets both the support of established products in the state and the diversification of the state's forest products portfolio into innovative products, including forest-based chemicals, biodegradable materials, and new product segments for wood as a sustainable feedstock.

University of Maine's Forest Economy Impact

As a FOR/Maine partner, the University of Maine has invested in and emerged as the cornerstone of Maine's forest innovation ecosystem, positioning itself as a global leader in forest bioproducts research and development. Through its comprehensive pilot and pre-commercial research infrastructure, the university has created a range of technology categories in development both internally and through collaboration with industry and institutes on a global scale.

Molded pulp product, University of Maine

The university's Process Development Center (PDC) operates the only facility in the United States capable of producing cellulose nanofibrils (CNF) at industrial scale and making it available to researchers, educators, and businesses globally. This global distribution network has established Maine as a critical hub for nanocellulose innovation and created an ecosystem with the highest concentration of nanocellulose researchers in the world.

Building from a long history in pulp, paper, and nanocellulose, the PDC is developing new capabilities in sustainable packaging, forest-based sustainable coatings and treatments to replace PFAS, and molded pulp products to replace plastics in single-use containers and other packaging applications.

Currently, the PDC is in the early stages of establishing a new Forest Biomaterials Innovation Center focused on leveraging these technologies into advancing renewable packaging research and commercialization, while providing hands-on training to scientists and engineers in this field.

UMaine's Advanced Structures and Composites Center (ASCC) has made international headlines with BioHome3D, the world's first 3D-printed house constructed entirely from bio-based materials on the world's largest thermoplastic 3D printer. The ASCC continues to advance this large-scale additive manufacturing technology, while innovating and supporting businesses in traditional solid wood and wood-based composites such as mass timber, wood fiber insulation, and other wood composite building materials.

The ASCC is currently expanding its capabilities with the Green Engineering and Materials project, a 50,000-square-foot facility to house the Factory of the Future, which will advance forest products technologies while training the future workforce for these careers.

The Forest Bioproducts Research Institute (FBRI) at UMaine operates a Biomass to Bioproducts Pilot Plant (B2P2) capable of processing up to one ton of woody biomass daily into chemicals for manufacturing biofuels, biochemicals, and advanced materials. Combined with UMaine's patented synthetic crude oil production process, FBRI is developing technologies for converting low-value wood into a variety of biofuels and bioproducts, ranging from home heating oil to jet fuel and even fish feed.

Biofuels, University of Maine

This research addresses critical needs in aviation sustainability and aquaculture while creating new revenue streams for Maine's forest landowners. Additionally, FBRI is in the process of expanding its capabilities to advance biochar and other wood pyrolysis technologies with new equipment to support new and established businesses in the state.

UMaine's Advanced Manufacturing Center (AMC) has recently launched the B.O.T. Loft: a dedicated training facility focused on hands-on training in robotics, automation, and advanced manufacturing to K-12, college, and industry. The facility provides the state's current and future workforce with the technical skills needed to implement highly automated manufacturing operations. This allows Maine to be globally competitive not only in Forest Products Manufacturing but in all production sectors.

Corporate Value-Added Investments: Industry Leaders Drive Innovation

In conjunction with the investments in forest innovation at UMaine, industry has responded in kind with similar investments. Some examples of these investments include:

- **LP Building Solutions** represents one of the significant recent investments in diversifying Maine's forest economy, with the company completing a $150 million conversion of its New Limerick facility to produce LP SmartSide trim and siding products. This transformation converted the facility from oriented strand board (OSB) and laminated strand lumber to producing LP's flagship engineered wood siding products.

- **TimberHP** represents one of Maine's most innovative forest industry start-up companies, establishing North America's first wood fiber insulation manufacturing facility in Madison. The company invested $150 million in renovating the former Madison Paper Industries mill, which closed in 2016, creating a new manufacturing operation that produces wood fiber insulation products from low-grade softwoods that offer a sustainable alternative to fiberglass, foams, and mineral wool insulations.

- **Tanbark Molded Fiber Products** has emerged as a leader in sustainable packaging solutions, establishing operations in Saco. The company manufactures molded fiber packaging using wood pulp largely sourced from Maine woods, creating products with smooth finishes and complex architectures. Tanbark's innovation lies in producing PFAS-free packaging products that can substitute for single-use plastic materials, addressing both environmental concerns and regulatory requirements. The company's products are designed for high-end applications and serve clients, including restaurants like Luke's Lobster.

- **Standard Biocarbon (SBC)** in Enfield represents the cutting edge of Maine's

forest bioeconomy, producing high-quality biochar from woody biomass at an industrial scale. Co-located in Enfield at a Pleasant River Lumber sawmill, the company utilizes state-of-the-art pyrolyzing technologies to convert locally sourced mill residuals into biochar. SBC processes 500 tons of locally sourced mill residuals monthly, producing 18,000 cubic yards of biochar annually. This biochar serves multiple markets, including agriculture, environmental remediation, composite materials, and carbon removal credits.

The Future Forest Economy

The transformation of Maine's forest economy represents a comprehensive shift from traditional extraction-based industries to sophisticated biomanufacturing that maximizes value while minimizing environmental impact. Several federally supported multi-member initiatives, including Maine-FOREST, Maine Forest Bioproducts Advanced Manufacturing Tech Hub, and the Coalition of Northern Forest Innovation & Research (CONFIR), are currently in place or in development to support this transition.

In summary, the members of Maine's forest economy are working diligently through this economic transition, leveraging centuries of forest management expertise, world-class research capabilities, and strategic corporate investments to create a sustainable bioeconomy that will serve as a model of collaboration for forest-dependent regions worldwide.

The combination of traditional forest stewardship, cutting-edge research, and innovative manufacturing positions Maine to capture significant value from the global shift toward sustainable materials while maintaining the ecological integrity of its forest resources.

Attracting Manufacturing Capital Investments

By Joel Slate
Corporate Director of Fiber Supply for ND Paper and Chair of MFPC's Manufacturing Committee

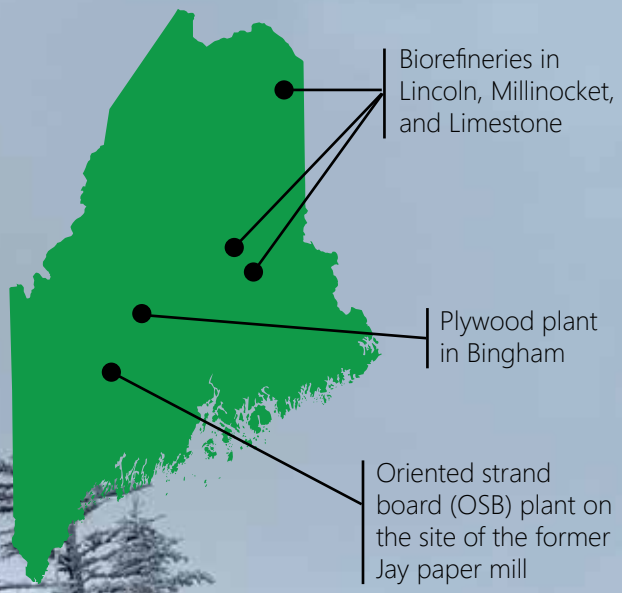
Since the last publication of Maine's Forest Economy, companies across the state have invested well over $1 billion into their facilities. Because some firms wanted to maintain confidentiality, investments have been grouped by market segment.

Pulp and Paper	Sawmills	Engineered Wood	Biomass Energy and Other Wood-Based Products	Logging and Trucking
$750M+	**$140M+**	**$400M+**	**$150M+**	**$100M+**

These investments covered a wide range of items, but every investment was designed to do at least one of the following:

- Update aged equipment
- Increase production
- Increase the value of products produced, allowing higher sales pricing
- Reduce production costs (e.g., fiber consumption, waste reduction, quality improvements, labor requirements, energy consumption)
- Increase energy production and reduce reliance on external energy suppliers

In addition to the completed capital projects, numerous additional capital investments have been announced, including:



Deciding to invest capital in Maine is not without challenges, particularly when evaluating projects with long lifespans.

Maine's aging demographics force companies to ask who will be operating the equipment in the years to come.

Energy is expensive in Maine, and the grid's reliability has caused problems in recent years. The regulatory environment has proven to be inconsistent and challenging for natural resource and manufacturing firms.

On the other hand, Maine has some of the highest quality fiber in the world, excellent universities and trade schools, and a long history of high-quality manufacturing. In addition, Maine has offered incentives such as loan guarantees, matching funds, and tax incentives.

Mills, landowners, and loggers have proven resilient in Maine through years of economic cycles. No doubt, those cycles will continue in the future, but the companies that weather the tough years and produce strong profits in the good years will be those that continue to invest in their facilities and be on the cutting edge of new technologies and processes.

Public Use of Private Lands

Managing Expectations for Increasing and Diversifying Public Use

By Matt Stedman
Executive Vice President of Maine Snowmobile Association and forester for Irving Woodlands

In Maine, there is a unique and long-standing tradition of allowing public access on private property. Within the Forest Products sector, large and small landowners continue to carry on this tradition with land access policies that are often more permissive than those on publicly owned land.

However, the ever-changing landscape of recreation types and user demographics creates a challenge for landowners that one would have never imagined 20 years ago.

Most of the early recreational activities occurring in these forests through the 20th century were what one might call traditional: hunting, fishing, trapping, primitive camping, gathering of fiddleheads or mushrooms, and maybe some hiking.

Motorized access began in the late 1970s, including snowmobiling, and evolved in the mid- to late 1990s to include ATVs. While recreation has evolved in some ways through the decades, it still remains true that the growing outdoor recreation

industry is heavily reliant on open access to the privately-owned working forest.

A lot of this recreation would not have been possible without the forest industry, which has preserved our forests. This includes construction of access roads, a diverse forest from harvesting history, variable landowner objectives across the forest landscape, and forestry workers who then introduce new recreational users to an area they have learned while making a living.

Fast-forward to today, and the list of activities the public would like to participate in on these lands has grown. Most landowners want to be good neighbors and community members; however, the never-ending demands can become overwhelming. For most, there is little to no benefit to allowing this access, and often, problems arise.

When written or oral permissions exist, the landowners have someone to contact and resolve issues. Many of these permissions through the years have relied on one-on-one relationships and handshake deals with local volunteers or organizations. Many of today's recreationalists do not understand what a blessing it is to be able to enjoy endless miles of roads and millions of acres of forest land, and the delicate balance required to maintain this unprecedented level of access. It has become somewhat expected that landowners allow every type of use.

Landowners and land managers struggle to find ways to connect with and ensure that a multitude of different user groups are informed that they are in a working forest where companies and contractors have the right of way and are there to make a living.

The recreational users, whether organized groups or individuals, should take it upon themselves to understand how fortunate they are to have access to these private properties. I believe there is nowhere in the world like Maine in this regard.

Users must understand that 95% of the recreation land they enjoy in Maine is owned by someone, in the same way they may own their home/property. These landowners have the right to allow public access to this land and to take it away. Landowners may need to close their property to recreation for certain periods of time to maintain safety while work activities occur. These are the same private property rights that each of us want on the land we purchased, maintain and pay taxes on.

Public use of private property is a huge driver of Maine's $3.4 billion outdoor economy. No one can ignore this delicate balance, and we must continue to work together to ensure a thriving rural economy for both the Forest Products sector and the outdoor economy without negatively impacting landowner rights or our working forests.

Maine's Paper Industry

Innovation, Capital Investments, and Diversification are Keys to the Future

By James Brooks
SAPPI North America

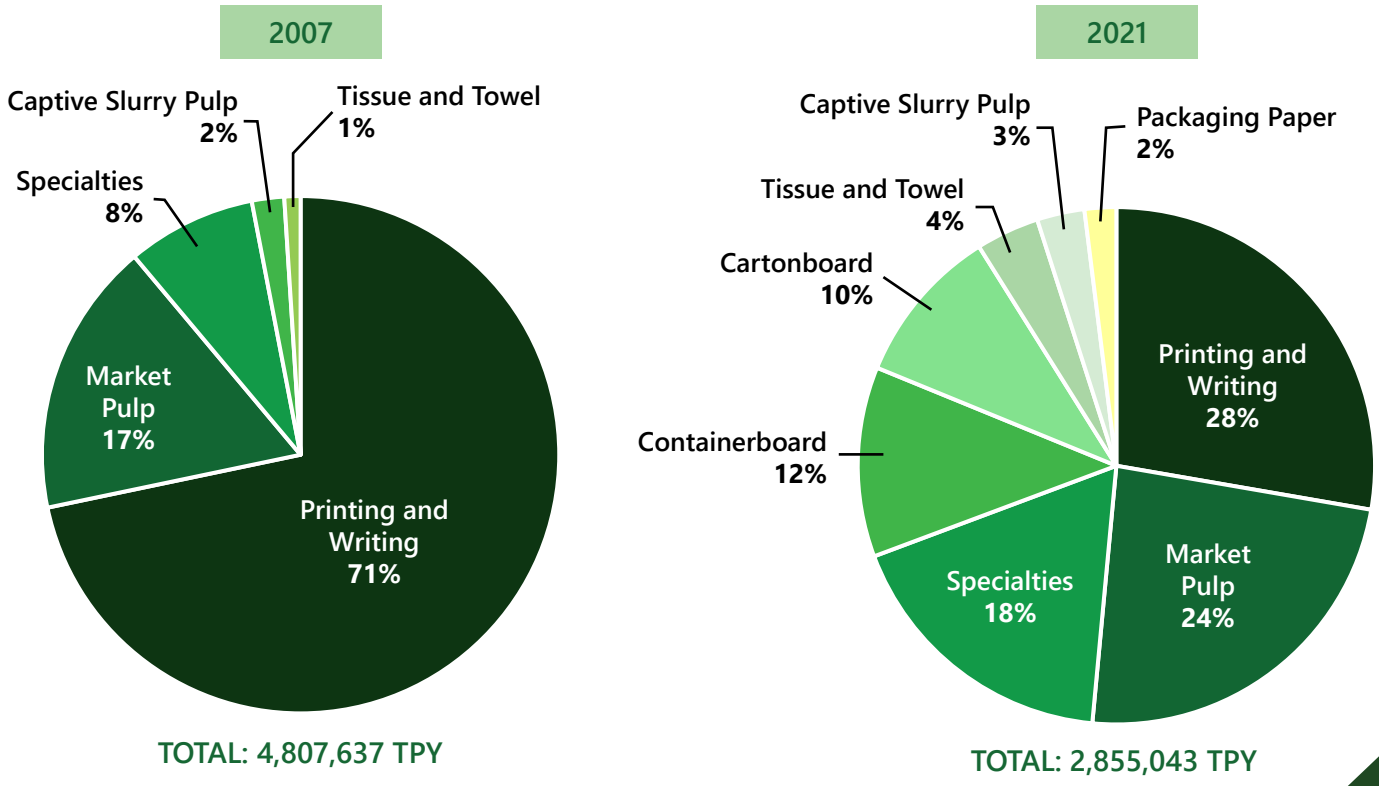
Worldwide demand for printing papers has declined significantly over the past 20 years, as advertisers shifted from magazines and catalogs to digital marketing. This market disruption led to the closure of many mills in Maine and a reduction in the amount of paper produced. However, Maine's paper industry still generates more than $2 billion per year in sales.

According to a 2022 market profile by the Maine Department of Economic Development, the industry directly employs nearly 3,000 people and supports many more indirect jobs.

In 2007, printing and writing papers made up 71% of Maine's pulp and paper capacity. According to data compiled by Fisher International, this had dropped to 28% by 2021 and is certainly even lower today with the new packaging paper capacity recently introduced.

Meanwhile, packaging papers, specialty paper, market pulp, and tissue have expanded their share of Maine's pulp and paper market.

Maine's Capacity Evolution in the 2000s: Moving Away from Printing and Writing



Source: Fisher International

Digital transformation has reduced the demand for printing papers that were once the backbone of Maine's paper industry. Yet, the shift to online advertising and sales has also opened new opportunities, especially in packaging and specialty papers. Markets for other paper grades, such as tissue, have remained strong. The mills that continue to operate in Maine have shifted their production to meet the demands of stable or growing markets, diversified their product lines, and introduced innovative new products.

For example, in 2016, St. Croix Tissue added two new tissue machines, with a capacity of 132,000 tons per year. ND Paper made significant investments at its Rumford Mill, which allows it to produce 300,000 tons of packing paper per year. Other mills have expanded their specialty paper production.

While all companies still operating in Maine have invested in their mills to remain competitive, Sappi has made the most significant investments to set the company up for the future. They recently completed Project Elevate, a $500 million investment to convert PM2 at the Somerset Mill to increase its capacity and produce more sustainable solid-bleached-sulfate (SBS) paperboard for packaging products.

The project will increase production of premium packaging and food-service products that are more environmentally sustainable alternatives to single-use plastic. PM2 will make folding cartons, food service boards, and eventually, cup and liquid packaging products.

This project comes on the heels of Project Balance, a $200 million rebuild of PM1 and the woodyard completed in 2018, which allows the production of both coated paper and packaging grades. With the completion of these two projects, the mill is now able to produce 1.25 million tons of paper per year, including 920,000 tons/year of SBS paperboard.

According to Mike Haws, CEO of Sappi North America, these strategic projects will ensure the future of the state-of-the-art mill for generations to come. "We are really setting up our company for the next generation in North America," he said. "And I couldn't be prouder of the Sappi North America team."

This type of capital investment, along with the introduction of innovative new products and diversification, is the key to a sustainable future for Maine's pulp and paper industry. The industry will continue to develop new technologies and products to extract greater value from every tree, creating sustainable biomaterials that serve as renewable alternatives to fossil-based solutions.

The State of Maine can help by supporting research and development into the manufacturing of new products derived from our forests, offering initiatives to increase economic opportunities for residents and attract skilled workers to relocate to Maine, and providing tax incentives for investments that position pulp and paper mills for the future.

With continued innovation, diversification, workforce development, and capital investment, the pulp and paper industry in Maine will remain very competitive in a difficult market environment, providing rewarding jobs and economic security for generations to come.

Understanding Ownership of Maine's Private Forest Land

By Chris Fife
Weyerhaeuser Public Affairs Manager and Chair of the MFPC Landowner Committee

In 1993, I headed Downeast as a freshly minted University of Maine forestry graduate to begin my first full-time job working for Georgia-Pacific. Georgia-Pacific owned three mills in Woodland: a pulp and paper mill, an OSB mill, and a sawmill.

The logs and pulpwood for the mills were furnished, in part, from Georgia-Pacific's 450,000 acres of timberland in Maine and 350,000 acres of Crown timberland just across the river in New Brunswick. I couldn't have been more excited; I had become part of the history of the Maine woods!

Despite the recent sale of Diamond-Occidental, most of Maine's vast 10-million-acre commercial forests were still considered paper company land. But paper markets were shrinking, and Georgia-Pacific understood that their timberland had value that could not be realized if the mills and woodlands didn't stand on their own. So, in late 1997, Georgia-Pacific spun off the timberland assets into a separate publicly traded company, The Timber Company.

As a young, inexperienced forester, I was nervous about the change, but many of the seasoned foresters I worked with were excited about the opportunity. Twenty-eight years later, Wagner Forest Management, a Timber Investment Management Organization (TIMO), is sustainably managing much of the forest land.

Of that land, 312,000 acres are designated as a working forest, featuring no development, conservation easements designed to balance public access, development restrictions, and sustainable land management. Additionally, the Downeast Lakes Land Trust owns and manages over 50,000 acres, contributing to the long-term economic and environmental well-being of the region.

Despite my enchantment with the forests of Washington County, my career followed a different path, and I moved from Georgia-Pacific and The Timber Company to Plum Creek and then Weyerhaeuser, a Real Estate Investment Trust (REIT) and nationwide building products manufacturer.

Our 830,000 acres of timberland in Maine are still often referred to by locals as Scott Paper land, and some even remember Scott Paper's predecessor, the Hollingsworth-Whitney Company.

Much has been made of changing ownership patterns in Maine's commercial woodlands over the past three decades. However, despite changing ownership, the land has continuously provided not only a steady supply of timber to support Maine's forest product manufacturers but also abundant recreation opportunities, extensive wildlife habitat, and a healthy environment.

Additionally, many large landowners have offered up land with special ecological and recreational value for conservation, working with conservation partners, including the State and local land trusts, to protect these special places through land sales or conservation easements.

The ownership of forests in Maine looks much different today than 30 years ago. Now, stewardship of Maine's forests rests in the hands of a diverse group of landowners, each contributing to the state's economic and ecological vitality. These private landowners include:

- **Timber Investment Management Organizations (TIMOs):** A TIMO is a company that manages timberland investments on behalf of institutional investors such as pension funds, endowments, insurance companies, and wealthy individuals. TIMOs do not usually own the land themselves. Instead, they manage it for clients who are the actual investors.

- **Real Estate Investment Trust (REIT):** A timber REIT is a publicly traded company that owns and manages income-producing forestland. These publicly traded companies generate revenue from timber harvesting, land sales, conservation easements, and sometimes real estate development. They are structured to provide investors with access to timberland as an asset class.

- **Long-Term Family Ownerships:** Generational landowners prioritize legacy and stewardship, maintaining forests for future use. Families like the Pingrees (7 Islands Land Company) and the Millikens (Baskahegan) have managed forest land in Maine for generations. John Malone and the Buck family are newer forest landowners who are just now passing the legacy on to the next generation.

- **Integrated Forest Products Companies:** These companies own and manage forest land to provide timber for their manufacturing operations, driving economic activity. Almost all these ownerships are integrated with sawmills.

- **Environmental Non-Profit Organizations:** Over the past decade, organizations like the Appalachian Mountain Club and The Nature Conservancy have become major forest landowners. While their primary focus is conservation, these organizations also provide recreational opportunities and harvest timber, supporting the forest economy.

- **Land Trusts:** Local trusts protect land for ecological and recreational purposes, preserving Maine's natural heritage.

- **Small Family Ownerships:** Small non-industrial private forest landowners in Maine own more than 6.2 million acres of timberland, adding to the diverse tapestry of forest management.

As ownership of private forestland in Maine continues to change, I believe a few factors will help to maintain the legacy of stewardship and access.

Since 1975, forester licensing has been a requirement for writing plans and managing timber in Maine. This means that forest landowners of all sizes and classes will continue to hire professionals, educated and bound by ethical standards, to plan and manage their timberland.

Maine's private landowners are leading the nation in third-party certified sustainable forestry with 8.5 million acres of forestland certified by nationally recognized programs, the Sustainable Forestry Initiative (SFI) and the Forest Stewardship Council (FSC).

To achieve certification, landowners must adhere to forest practices that are environmentally sound, economically viable, and socially responsible. Third-party certification has increased dramatically over the past decade from around 2 million acres in 2015. Despite changes in ownership of forest land, most new large forest landowners have maintained 3rd party forest certification, protecting the long-term values of the forest.

Additionally, Maine's forests are now recognized for their vital role in combating climate change. Trees and wood products sequester carbon, storing it in long-lasting solid wood products like lumber for housing, solid wood flooring, cabinets, and furniture. Wood-based materials are also replacing petroleum-based products through recycled wood options.

Landowners can now participate in forest carbon offset markets, utilizing changes in forest management strategies to store additional carbon while continuing to grow high-value timber. This dual role as an economic and environmental asset underscores the forests' importance to Maine's economy and global sustainability.

Over 2.37 million acres of land in Maine are under a conservation easement that protects forest land from development. These easements often include considerations for public access, sustainable forest management, and protection of sensitive sites. These easements run with the land, ensuring that the conservation objectives are transferred to new landowners in the future.

Finally, forest landowners in Maine have shown a continued willingness to work with local clubs and State agencies to allow public recreation. Through public outreach and education, both the State and user groups have highlighted the importance of respecting private landowners' investment in forest roads and minimizing environmental impacts from litter, fire, and motorized use.

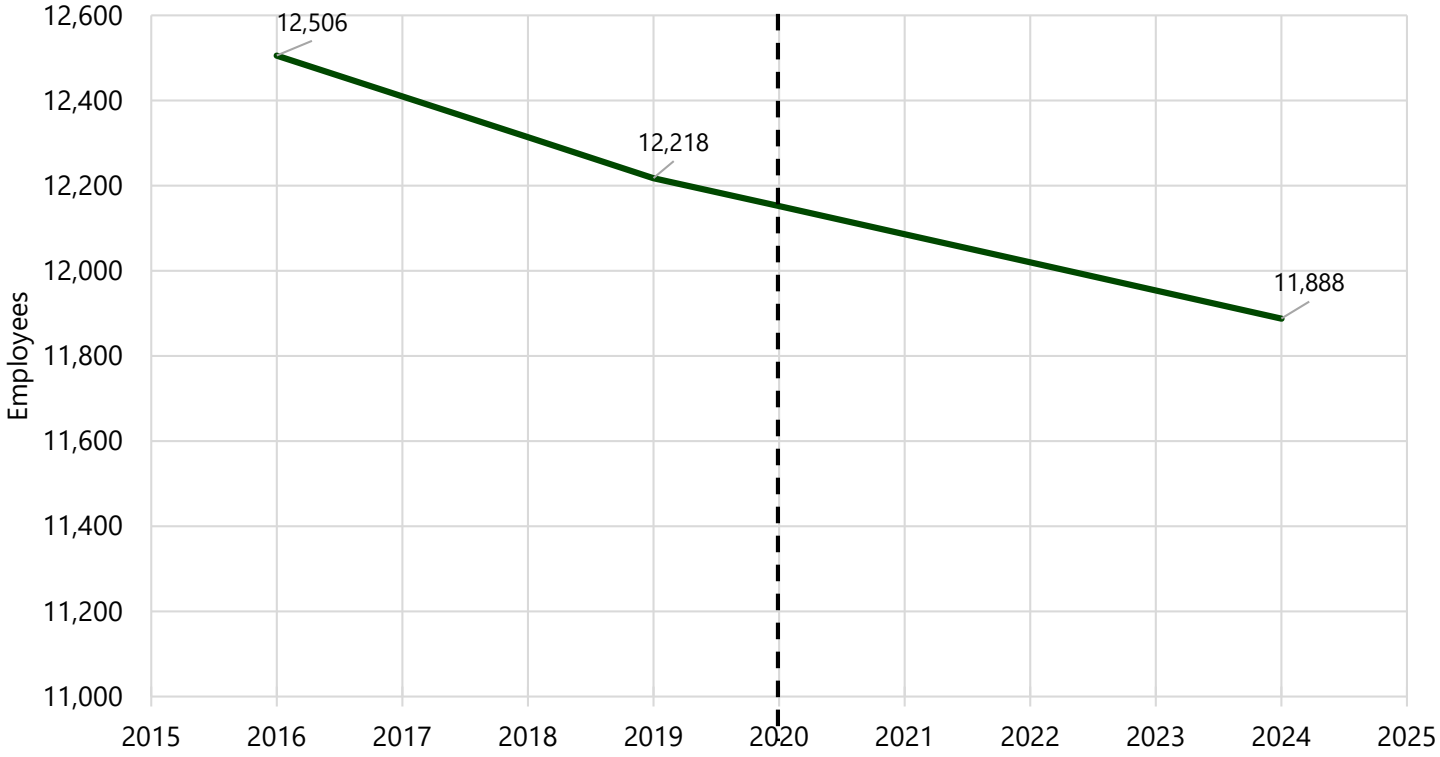
Maine's forests are a testament to the power of collaboration. From supporting a thriving $3.4 billion outdoor recreation economy to fostering biodiversity, carbon sequestration, and sustainable land management, the contributions of these lands extend far beyond timber.

The diverse landowners—ranging from investment groups to small families—work together to ensure Maine's forests remain a vital economic and ecological resource. By continuing to balance public access, conservation, and sustainable practices, Maine's forests will thrive for generations to come.

Appendix A

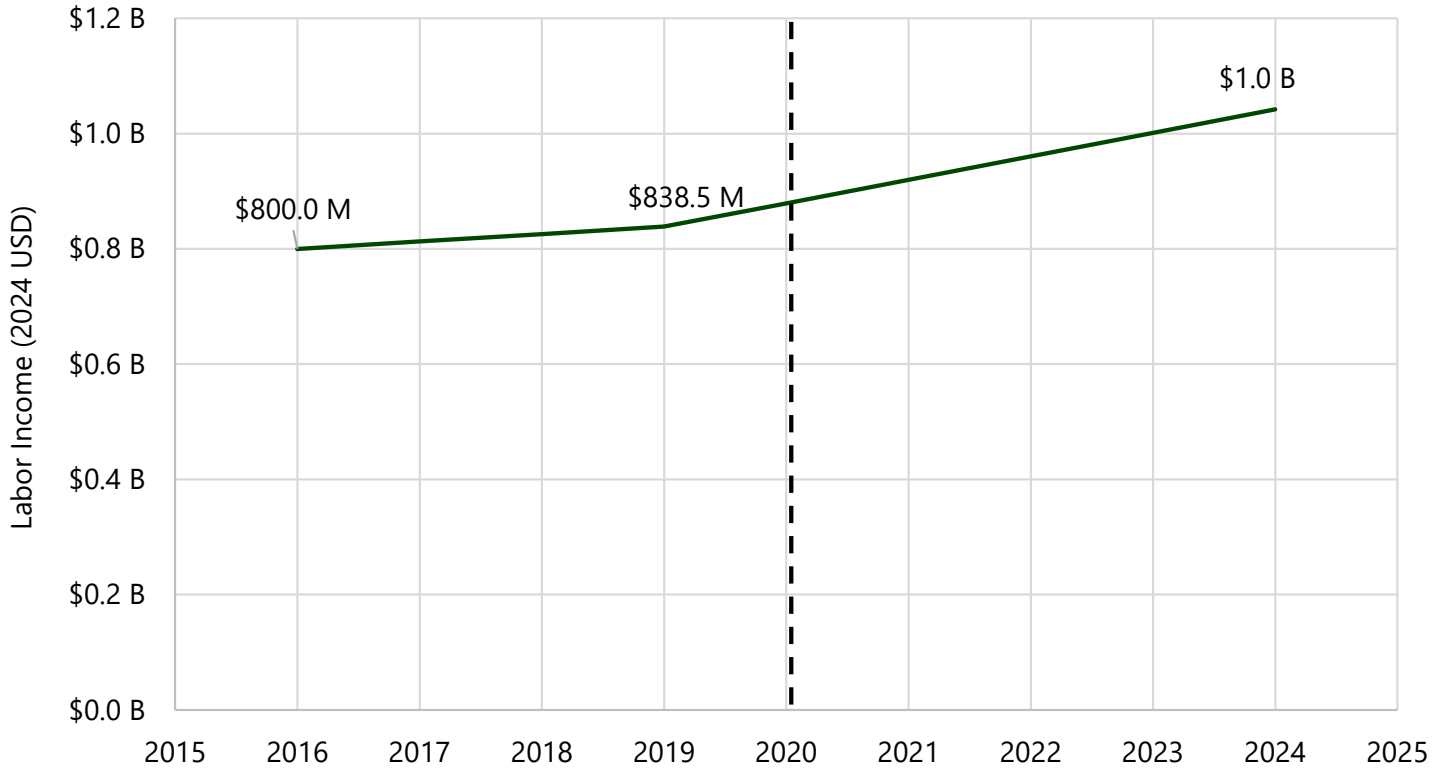
Given the change in methodology, we provide the following figures to compare estimates and trends from the last two studies conducted by UMaine to the estimated values for 2024. Please note that all dollar values are shown in 2024 dollars.

Number of Direct Employees in the Forest Products Sector



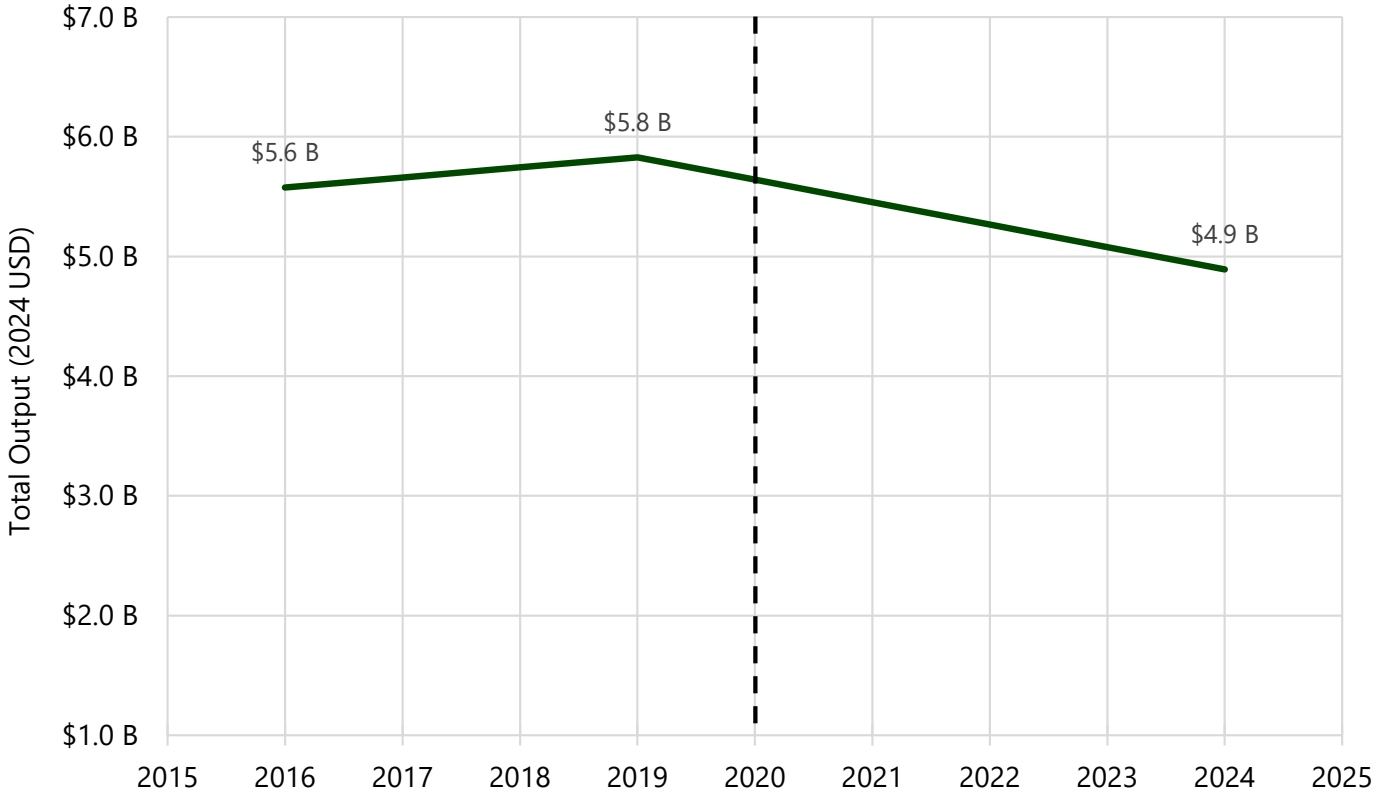
Source: 2016 and 2019 Statewide Economic Contribution of Maine's Forest Products Sector, University of Maine

Direct Labor Income in the Forest Products Sector



Source: 2016 and 2019 Statewide Economic Contribution of Maine's Forest Products Sector, University of Maine

Direct Output in the Forest Products Sector



Source: 2016 and 2019 Statewide Economic Contribution of Maine's Forest Products Sector, University of Maine

The Maine Forest Products Council is proud to have the following companies represented on the Board of Directors:

Acadian Timber
American Forest Management
Bar Harbor Bank and Trust
BBC Lands LLC
Cross Insurance
Family Forestry
Farm Credit East
H.C. Haynes
Hanington Bros., Inc.
Innovative Natural Resource
JD Irving
Kennebec Lumber Company
Key Bank
LandVest
LP Corp
Maibec Logging Inc.
ND Paper
Nicols Brothers Logging
Pingree Associates/Seven Islands Pleasant River Lumber/A&A Brochu Logging
Prentiss & Carlisle
ReGenerate Energy Holdings
Robbins Lumber
Sappi
Southern Maine Forestry
Stratton Lumber
Timber Resource Group
Timberstate G. Inc.
Wadsworth Woodlands
Wagner Forest Management Ltd.
Weyerhaeuser
Woodland Pulp, St. Croix Tissue, St. Croix Chipping

MAINE FOREST PRODUCTS COUNCIL

Since 1961, the Maine Forest Products Council has been the voice of Maine's forest economy. MFPC's members are landowners, loggers, truckers, paper mills, tree farmers, foresters, lumber processors and the owners of more than 8 million acres of commercial forestland, but they are also bankers, lawyers and insurance executives. The Council represents members at the Maine Legislature throughout the state, in Washington D.C. and the U.S.

Krysta West, Executive Director
Ellen Parent, Deputy Director
Patrick Strauch, Director Emeritus
Annabelle Kidson, Office Manager

207-622-9288
www.maineforest.org

535 Civic Center Drive, Augusta, Maine 04330

MAINE
FOREST PRODUCTS COUNCIL