

New York State Forest Sector

An Economic Overview – 2020

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Executive Summary

New York State has 20,201,249 residents and generates approximately \$1.7 trillion in gross regional product [1]. Over 43% (8,804,190) of the state’s population resides in New York City, leaving the majority of New York’s 30.2 million acres to the remaining 11.4 million residents. 61% of the state’s land area is classified as forested (18.6 million acres) and provides numerous tangible and intangible benefits for both the residents of New York and its many annual visitors [2]. The farmland only covers 7.8 million acres or about 25% of the state land area [3]. This study employs 2020 IMPLAN data [4] to do a contribution analysis using the methods described by Watson et al. (2015) [5] to establish the economic contribution of the forest sector to the New York State economy.

The forest sector contributes to New York State’s economy in two ways: 1) **Base output**, which measures a sector’s ability to bring forth goods and services from other sectors – or its supply-chain contribution; and 2) **Gross output**, which measures a sector’s ability to keep money in the region by producing goods and services to sell to other local industries and households. This document focuses on the supply-chain (base) contribution that the forest sector made to New York State in the year 2020.

For the purposes of this report, the state was grouped into five regions. The five regions are defined as Western/Central New York, Southern Tier, North Country, Capital Region and Downstate. Each region’s supply-chain is not proportional to the State supply-chain. Each region supply-chain is unique to that region, so that the base output, value added, employment and labor income of the regions together do not add to the base output, value added, employment and labor income found for the State of New York as a whole.

New York State received significant benefits from the forest sector in 2020. The sector is made up of four industries: Forestry and Logging; Solid Wood Products, Pulp and Paper, and Wood Furniture. The forest sector in New York generated a supply-chain output contribution of \$14.3 billion, with about 70% attributable to the production activities of the pulp and paper industry (Exhibits 1, 2 and 3). For comparison, we also have included the results for the agricultural sector, which is the primary other rural economic sector.

Base Economic Activity of New York State

Description	Output	Employment	Labor Income	Value Added
Forestry and Logging	\$210.1	1,988	\$108.0	\$135.5
Wood Products	\$1,813.8	8,465	\$586.7	\$794.3
Pulp and Paper	\$10,212.0	28,807	\$2,902.1	\$4,008.3
Wood Furniture	\$2,083.0	10,968	\$737.3	\$1,017.1
Forest Sector Total	\$14,319.0	50,229	\$4,334.1	\$5,955.1
NYS Agriculture Total	\$15,064.4	70,902	\$3,667.0	\$5,829.8

Exhibit 1: The base economic activity for the NYS forest sector. The pulp and paper industry generated more than two thirds of the economic activity in the sector. The forest sector in the New York State was behind the agriculture sector only in employment and output, but it was above it in labor income and value added. Output, Labor Income, and Value Added are measured in millions of \$ and Employment is measured in jobs.

New York State’s Forest sector base output and employment was less than Agriculture, but had higher results for labor income and value added. The forest sector supported 50,229 jobs of base employment (22,464 direct base and 27,765 indirect plus induced base) and \$4.3 billion in base labor income (\$2.1 billion in direct base and \$2.2 billion in indirect plus induced base). While Agriculture had approximately 20,673 more employees, the base labor income per employee was greater in the Forest Sector. The state-wide average labor per worker was \$86,286 compared to only \$51,719 per worker for Agriculture (Exhibits 1 and 3).

Among the State’s four forest industries, the pulp and paper industry made the largest contributions in terms of output, employment, value added and labor income, and the Forestry and Logging Industry was the smallest contributor (Exhibit 1).

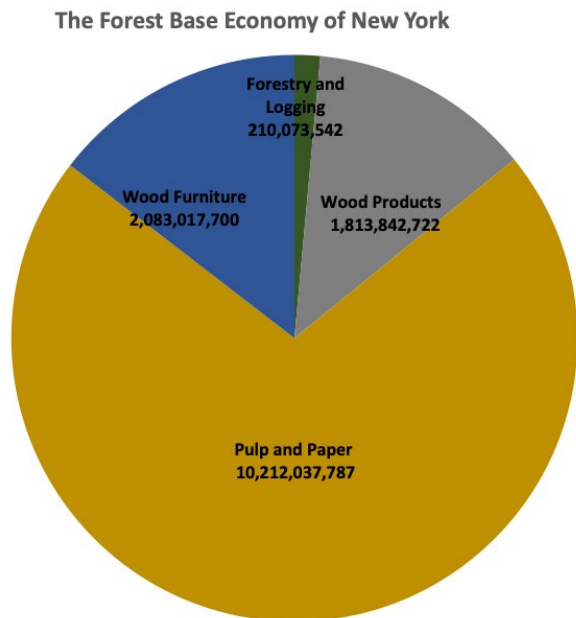


Exhibit 2: The base economic activity for the NYS forest sector

The region that generated the largest employment was the Downstate region with 18,777 jobs. This region also generated the highest base output (\$5.1 billion), base labor income (\$1.8 billion) and the highest base value added (\$2.4 billion).

New York State’s forestry and logging industry produced \$210 million in base output (Exhibit 2). Also, 1,988 jobs were created by this industry state-wide. The forestry and logging industry also contributed to employment within each region, but its largest employment contribution was within the Downstate Region (1,905 jobs).

Base Output, Value Added, Employment and Labor Income of the New York State Forest Sector

Description	Output	Value Added	Employment	Labor Income
Regional Forest Sector Total Base	14,319.0	5,955.1	50,229	4,334.1
Regional Forest Sector Direct Base	8,520.5	2,435.7	22,464	2,142.3
Regional Forest Sector Indirect plus Induced Base	5,798.5	3,519.5	27,765	2,191.8

Exhibit 3: Base, Direct Base and Indirect Base Output, Value Added, Employment and Labor Income of the NYS forest sector in 2020. Output, Value Added and Labor Income are measure in million USD and Employment is measure in jobs.

The pulp and paper industry generated the greatest base valued added statewide (\$4.0 billion). At a regional level, this industry was the largest contributor to base output, employment, labor income and value added in most of the five regions except for the Southern Tier Region. There, the wood products industry was the largest contributor to base employment (2,364), as well as the largest contributor to base output (\$475.2), base labor income (\$117.8 million), and base value added (\$150.6). The pulp and paper industry generated the second largest base value added (\$121.8 million), and it was the second largest contributor to employment (1,283) in this region. The region that generated most of the value added by the pulp and paper industry was the Downstate Region (\$1.4 billion).

The three regions where most of the jobs were created, by the Pulp and Paper industry, were Western/Central New York (8,800), Downstate (8,734), and North Country (8,415).

The contribution of wood furniture industry to bring money into the state, through its supply-chain, was \$2.1 billion. The base labor income contribution for this industry was \$737.3 million. This industry had its strongest presence in the Downstate Region where \$1.2 billion were generated, through its supply-chain expenditures.

Introduction

New York State has 20,201,249 residents and generates approximately \$1.7 trillion in gross regional product [1]. Over 43% (8,804,190) of the state’s population resides in New York City, leaving the majority of New York’s 30.2 million acres to the remaining 11.4 million residents. 61% of the state’s land area is classified as forested (18.6 million acres) and provides numerous tangible and intangible benefits for both the residents of New York and its many annual visitors [2]. The farmland covers only 7.8 million acres or about 25% of the state land area [3] This study employs 2020 IMPLAN data [4] to do a contribution analysis using the methods described by Watson et al. (2015) [5] to establish the economic contribution of the forest sector to the New York State economy.

New York State received significant benefits from the forest sector in 2020. The sector is made up of four industries: Forestry and Logging; Solid Wood Products, Pulp and Paper, and Wood Furniture (Table 1).

New York State Forest Sector’s Industries

Industry	Individual Industries
Forestry and Logging	Forestry, forest products, and timber tract production; Commercial logging
Wood Products	Sawmills and wood preservation; Veneer and plywood manufacturing; Engineered wood member and truss manufacturing; Reconstituted wood product manufacturing; Wood windows and doors manufacturing, cut stock, re-sawing lumber and planning, other millwork including flooring, wood container and pallet manufacturing; Manufactured home manufacturing; Prefabricated wood building manufacturing; All other miscellaneous wood product manufacturing and electric power generation-biomass
Pulp and Paper	Pulp mills; Paper mills; Paperboard mills; Paperboard container manufacturing; Paper bags and coated and treated paper manufacturing; Stationery product manufacturing; Sanitary paper product manufacturing; All other converted paper product manufacturing
Wood Furniture	Wood kitchen cabinet and countertop manufacturing; Upholstered household furniture manufacturing; Non- upholstered wood household furniture manufacturing; Institutional furniture manufacturing; Wood office furniture manufacturing; Custom architectural woodwork and millwork.
Agriculture	Crop production; Vegetable and melon farming; Fruit and tree nut farming; Greenhouse, nursery, and floriculture production; Animal production and aquaculture; Fishing, hunting, and trapping; Fluid milk manufacturing; Creamery butter manufacturing; Cheese manufacturing; Animal, except poultry; slaughtering; Meat processed from carcasses; Poultry processing; Wineries. Excludes the Forestry and Logging Industry.

Table 1: The forest sector is comprised of four industries, following the main body of literature [1,6 and 7]. The respective industries contained within each industry are listed, following IMPLAN industrial descriptions.

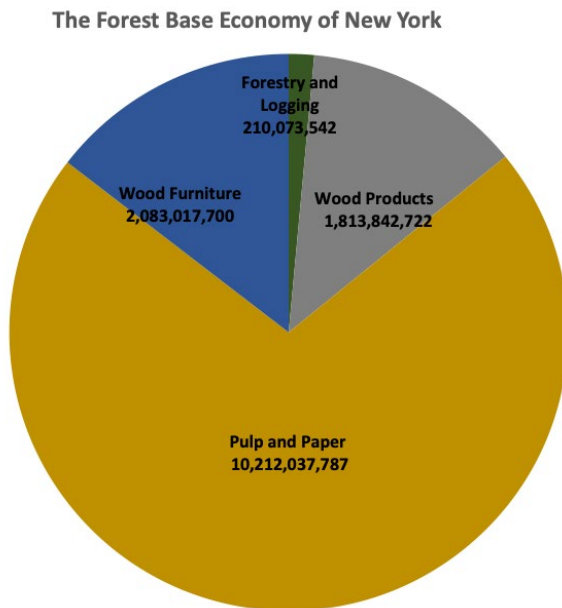


Figure 1: The direct employment of the NYS forest sector

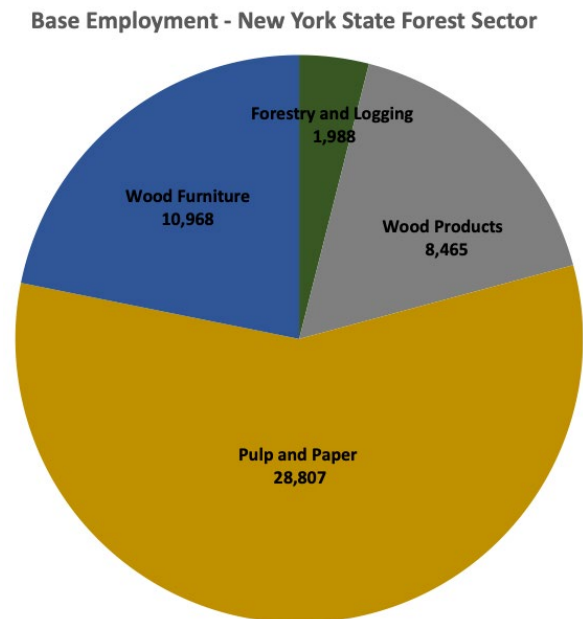


Figure 2: The base employment of the NYS forest sector

The forest sector contributes to New York State’s economy in two ways: 1) **Base output**, which measures a sector’s ability to bring forth goods and services from other sectors – or its supply-chain contribution; and 2) **Gross output**, which measures a sector’s ability to keep money in the region by producing goods and services to sell to other local industries and households. The contribution analysis done, showed that the forest sector makes both, base and gross output contribution to New York State in the year 2020. This document focuses on the supply-chain (base) contribution that the forest sector made to the State.

The forest sector in New York generated a supply-chain output contribution of \$14.3 billion, with about 70% attributable to the production activities of the pulp and paper industry (Figure 1 and Tables 2 and 3).

New York States Forest Sector base output and employment was less than Agriculture, but had higher results for labor income and value added. The forest sector supported 50,229 jobs of base employment (22,464 direct base and 27,765 indirect plus induced base) and \$4.3 billion in base labor income (\$2.1 billion in direct base and \$2.2 billion in indirect plus induced base). While Agriculture had approximately 20,673 more employees, the base labor income per employee was greater in the Forest Sector. The state-wide average labor per worker was \$86,286 compared to only \$51,719 per worker for Agriculture (Figures 2 and 3 and Tables 2 and 3).

Among the State’s four forest industries, the pulp and paper industry made the largest contributions in terms of base output, employment, value added and labor income, and the Forestry and Logging Industry was the smallest contributor (Tables 2 and 4 and Figure 4).

The Base Economic Activity for the New York State Forest Sector

Description	Output	Employment	Labor Income	Value Added
Forestry and Logging	\$210.1	1,988	\$108.0	\$135.5
Wood Products	\$1,813.8	8,465	\$586.7	\$794.3
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Table 3: Base, Direct Base and Indirect Base Output, Value Added, Employment and Labor Income of the NYS forest sector in 2020. Output, Value Added and Labor Income are measured in million USD and Employment is measure in jobs.

Direct and Indirect plus Induced Base Output of the Industries within New York State Forest Sector

Description	Total Base	Direct Base	Indirect plus Induced Base
Forestry and Logging	\$210.1	\$121.8	\$88.3
Wood Products	\$1,813.8	\$1,008.0	\$805.9
Wood Furniture	\$2,083.0	\$1,223.2	\$859.9
Pulp and Paper	\$10,212.0	\$6,167.5	\$4,044.5
TOTAL	\$14,319.0	\$8,520.5	\$5,798.5

Table 4: Base, Direct Base and Indirect plus Induced Base Output of the industries within NYS forest sector in 2020. Output is measured in million USD.

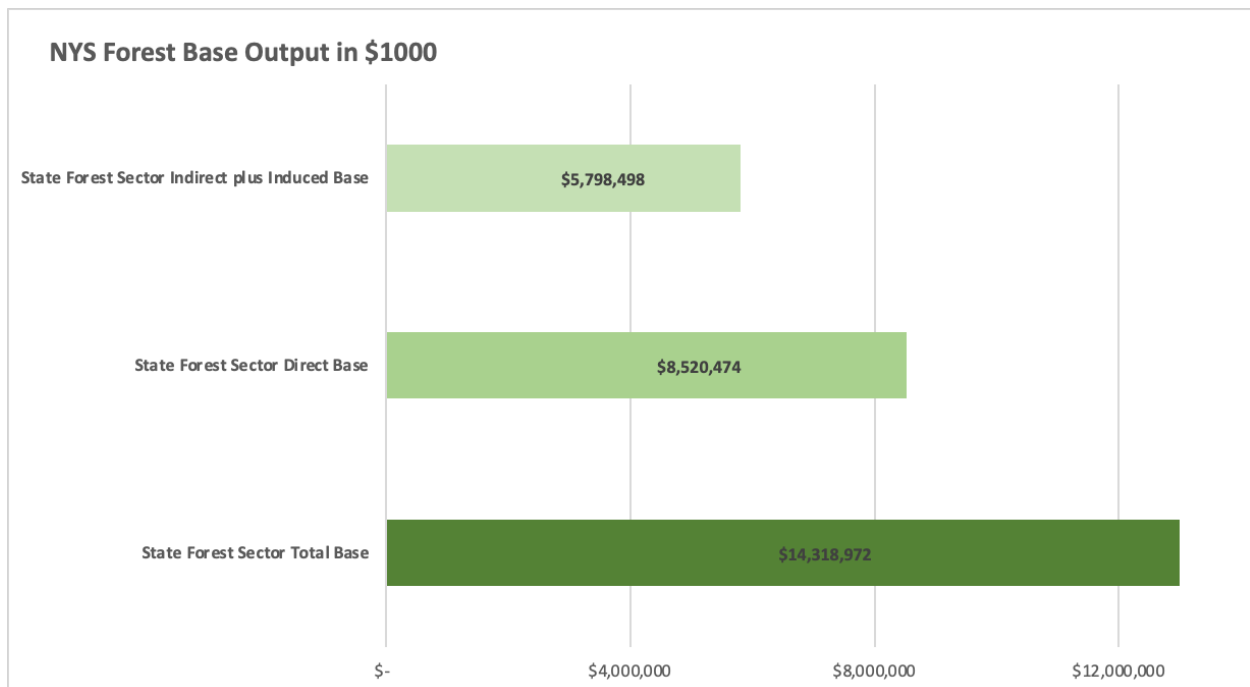


Figure 3: Total Base, Direct Base and Indirect plus induced Base Output of the NYS forest sector in 2020

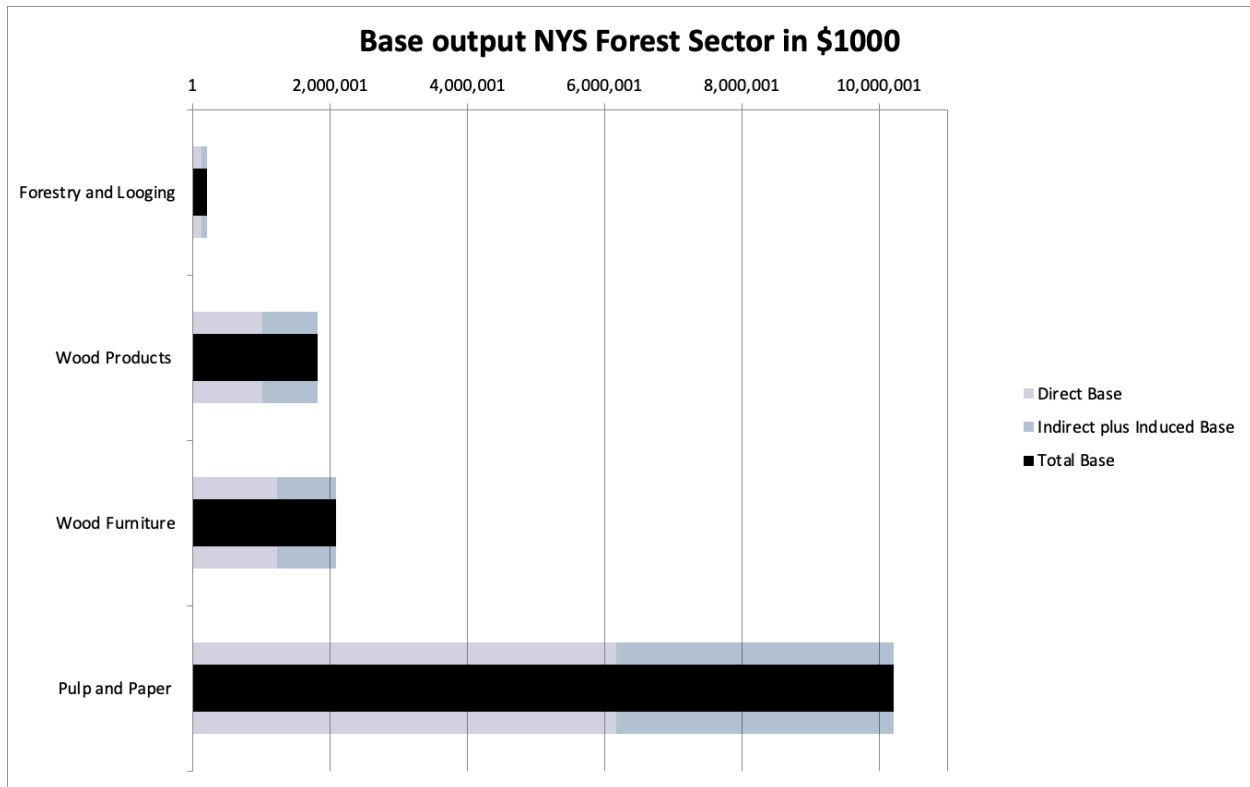


Figure 4: Total Base, Direct Base Output and Indirect plus Induced Base Output of the industries within NYS forest sector in 2020

Contribution Analysis vs. Multiplier Analysis

The effects of an industry on a regional economy can be classified as direct, indirect, or induced. Direct effects simply measure the initial impacts of the industry’s activity given an exogenous change in demand for its output, such as its output or compensation paid to its employees as a result of a change in production. Indirect effects, such as output, employee compensation, etc., result from the direct effect. These are the generated by the other industries within the regional economy producing the inputs demanded by the initial industry’s changed production. When households are included in the analysis, the model is defined as “closed”. Under a closed model, induced effects are the additional economic activity created by households spending of labor income generated by the direct and indirect effects [4,5,6,7,8].

Contribution analysis is derived from economic base theory and is an *ex-post* analysis based on the existing economy as described by a social accounting matrix (SAM) which can be derived from IMPLAN. Economic base theory describes contributions in terms of gross – an industry selling its output to local industries and households keeping money in a region and base – an industry’s supply-chain expenditures bringing money into the region. A multiplier analysis is used to estimate *ex-ante* or forecasted economic impacts of the forest industries in each state or region examined given a change in the exogenous sales for its output [5].

The mathematics of contribution analysis and impact analysis are very similar such that same multipliers can be derived from both analyses. Multipliers are a measure of the predicted total production requirements for every unit of production sold to an exogenous change in final demand [4,5,6,7,8]. Therefore, a direct, indirect, or induced multiplier captures the expected “ripple effects” of an industry’s production throughout the economy. Larger multipliers indicate more economic linkages, or “ripples”. For example, the construction industry requires dimensional lumber, which comes from the Wood Products industry, which buys its inputs, logs, from the Forestry & Logging industry. Therefore, every house built indirectly creates a demand for outputs from the Forestry and Logging industry. More regional economic activity is created, per unit of output, by industries with larger multipliers. A multiplier that measures the direct and indirect effects is defined as a Type I multiplier; a multiplier that measures the direct, indirect, and induced effects is defined as a SAM multiplier [4,6,7,8].

Furthermore, multipliers and contribution analysis effects may be constructed for output as well as all the components of value added such as labor income, and employment [4,6,7,8]. Multipliers are commonly calculated with respect to output to measure the impacts of a change in final demand for the output of an initial industry on i) regional output (output/output multipliers), ii) value added (value added/output multipliers), iii) employment (employment/output multipliers), or iv) labor income (labor income/output multipliers). Multipliers can also be calculated with respect to economic factors other than output. For example, the effects of an increase in employment by a given industry on the demand for employment within the regional economy (employment/employment multipliers) [6,7].

The New York State regional economic multipliers for the forest industries are given in Table 5. The multipliers from Table 5 are used to answer what if questions. For example, what is the *ex-ante* or forecasted economic impact if there was an exogenous change final demand for a sector’s outputs. The sector with the largest forecasted economic output impact would be the wood products industry; namely, for every \$1.00 change exogenous change in final demand, the predicted regional economic impact on would be \$1.80. In terms of *ex-ante* regional economic impacts, the top forest industry within the state economy would be the wood products industry in terms of output, value added and labor income, but in terms of employment, the pulp and paper industry would be the most important.

New York State Business Multipliers (SAM)

Description	Output	Value Added	Employment	Labor Income
Forestry and Logging	1.72	1.71	1.37	1.49
Wood Products	1.80	2.68	1.99	2.16
Wood Furniture	1.70	2.15	1.62	1.81
Pulp and Paper	1.66	2.52	2.89	2.09

Table 5. Business Multiplier output/output, value added/value added, employment/employment, labor income/labor income for the four industries of the New York forest sector.

Multiplier and contribution analysis effects illustrate the economic linkages within a given region and are used along with the direct effects of the industry to expound each industry’s role within the regional economy. However, if a multiplier or impact analysis is used to estimate the contribution of a given industry, this creates a problem of ‘double-counting’ by making its direct, indirect, or induced effects appear responsible for a larger share of the economy than the observed data can support [5]. That is the sum of gross and base output across all industries would be greater than what is actually observed. Contribution analysis eliminates this double-counting problem by requiring the sum of gross and base output, employment, income, and value added to add to those actually observed in the region [5]. While the multipliers from Table 5 help answer the “what if” question, Table 2 of the contribution analysis answers the “what is” question. Tables 2 describes the *ex-post* or current situation in the New York State economy regarding the forest sector. Contrary to the multiplier analysis, this table shows that in 2020 the most important forest industry was the pulp and paper, which generated the greatest output, value added, employment and labor income.

Contribution and impact analysis results should be interpreted with caution. Normally, industries are defined according to the North American Industrial Classification Scheme (NAICS). For this study the relevant industries of the forest sector have been aggregated as described in Table 1, while all other industries are aggregated using a 2-digit NAICS aggregation scheme. For example, the manufacturing industry, comprises over 200 industry classifications. Aggregating industries into broader categories may skew the analyses and is termed “aggregation bias”. The aggregated industry is a weighted average of all the aggregated industry’s production activity; those industries with the greatest output levels have the greatest influence. Thus, the analysis may not truly represent an individual industry within the aggregated industry [4,6,7].

Regional Contribution Analysis

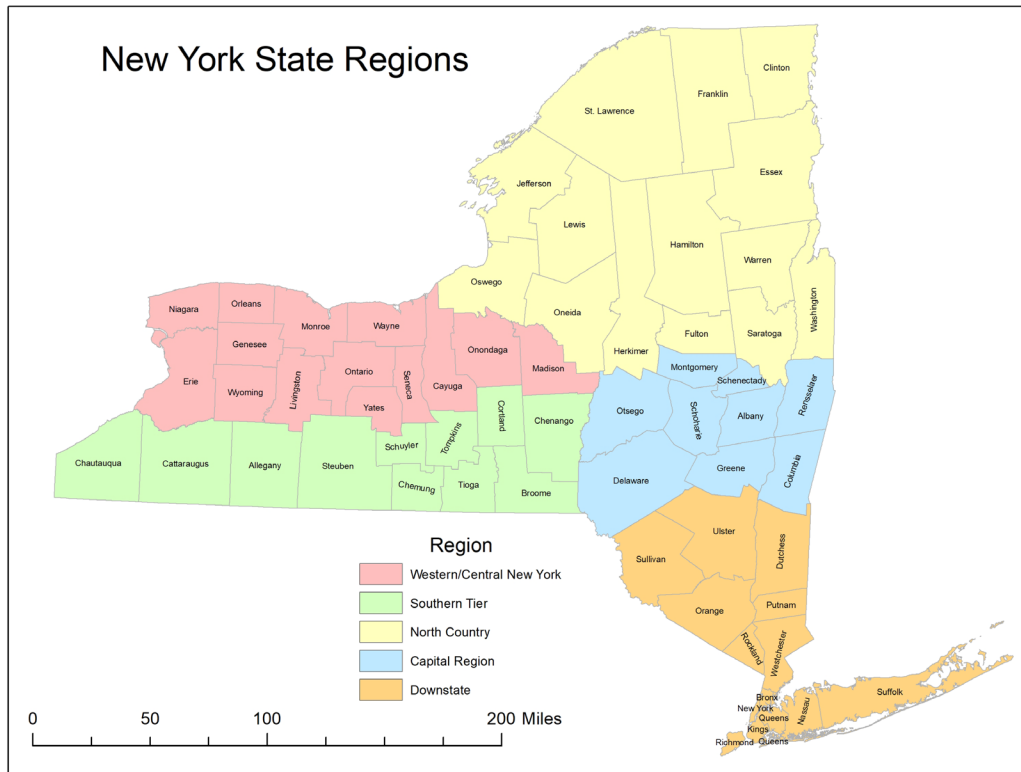
The forest sectors play an important role in each region of New York State. For the purposes of this report, the State was organized into five different regions. The regions are defined as (a) Western / Central New York, (b) Southern Tier, (c) The North Country, (d) Capital Region and (e) Downstate. Given the nature of the IMPLAN data used to generate this report, the aggregation scheme described in Table 6 and shown on Map 1 will provide more accurate results.

Each region’s supply-chain is not proportional to the State supply-chain. Each region supply-chain is unique to that region, so that the base output, value added, employment and labor income of the regions together do not add to the base output, value added, employment and labor income found for the State of New York as a whole.

Forest Regions of New York State

	Counties
REGION 1 Western/Central New York	Erie, Niagara, Genesee, Livingston, Monroe, Ontario, Orleans, Seneca, Wayne, Wyoming, Yates, Cayuga, Madison, Onondaga
REGION 2 Southern Tier	Allegany, Cattaraugus, Chautauqua, Broome, Chemung, Chenango, Schuyler, Steuben, Tioga, Tompkins, Cortland
REGION 3 North Country	Oswego, Fulton, Herkimer, Oneida, Clinton, Essex, Franklin, Hamilton, Jefferson, Lewis, Saint Lawrence, Saratoga, Warren, Washington
REGION 4 Capital Region	Delaware, Montgomery, Otsego, Schoharie, Albany, Columbia, Greene, Rensselaer, Schenectady
REGION 5 Downstate	Dutchess, Orange, Putnam, Rockland, Sullivan, Ulster, Westchester, Bronx, Kings, New York, Queens, Richmond, Nassau, Suffolk

Table 6. Forest Regions of New York State used in this report



Map 1. Forest Regions of New York State used in this report

The Downstate Region brought the highest amount of money into the state from the forest sector in 2020: Its contribution was \$5.1 billion of base output, or 33% of the total forest sector output. The smallest of the forest sector contributor to bring money into the state was the Southern Tier Region at \$1.1 billion in base output (Figures 5).

The Downstate region is also the biggest employer of the forest sector in the state, which from an economic base perspective is responsible for generating 34% (18,777) of the total jobs. The smallest contributors were the Capital Region, with 6,068 base employment, and the Southern Tier Region with 5,126 base employment (Figures 6).

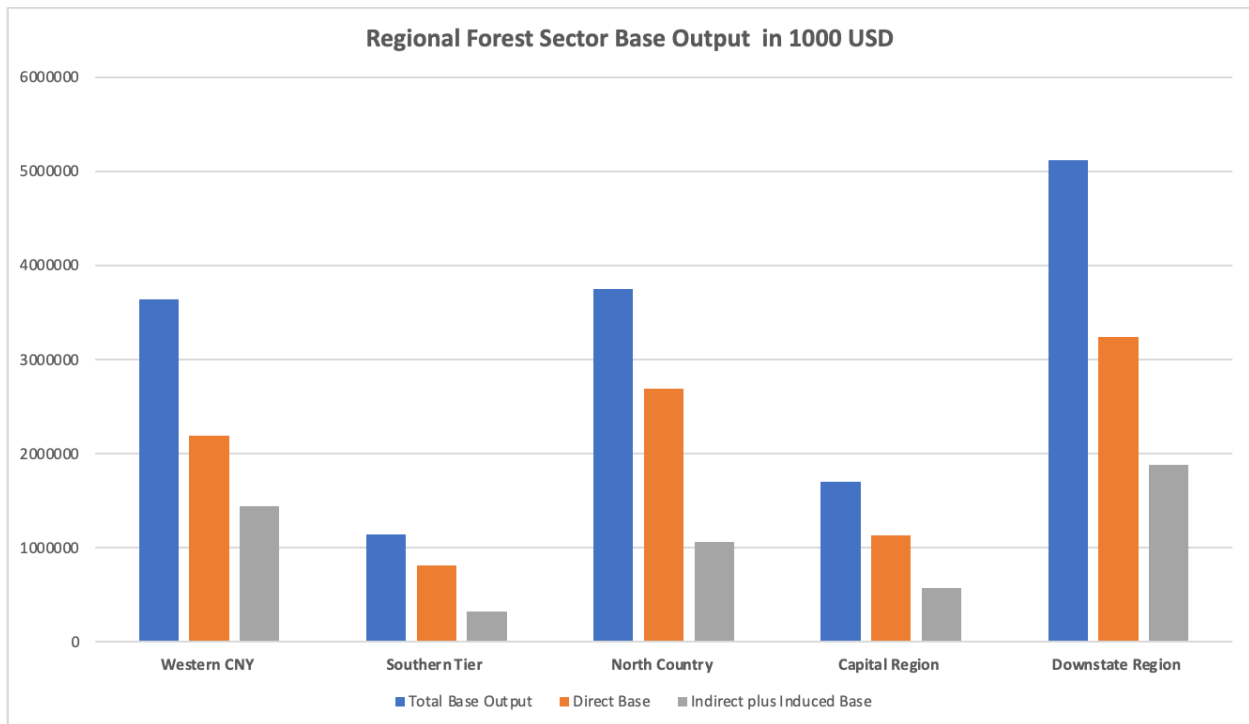


Figure 5: Total Base, Direct Base Output and Indirect plus Induced Base Output of the forest sector of the five regions of NYS in 2020

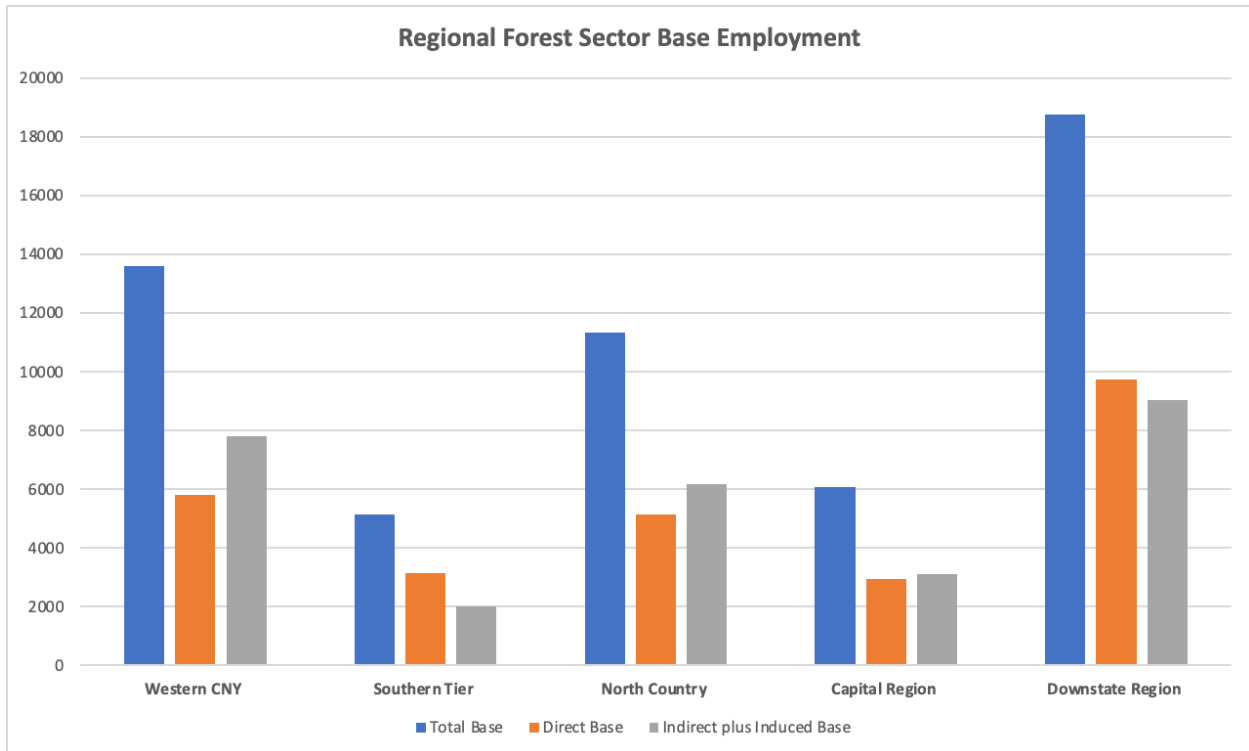


Figure 6: Total Base, Direct Base and Indirect plus Induced Base Employment of the forest sector of the five regions of NYS in 2020

Regional Total Base Output of the Forest Sector

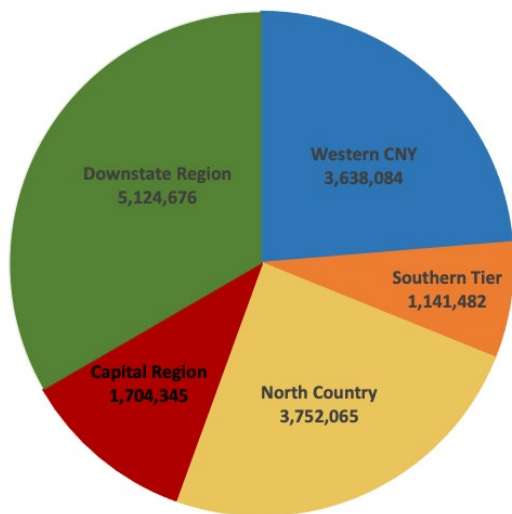


Figure 7: Total base output of the forest Sector per region

According to Figure 7, the region with the highest total base output for the NYS forest sector was Downstate, followed by North Country and Western/Central New York. The region with the smallest total base output was Southern Tier Region.

Examining Table 7, the forest sector's base production levels were higher than the agriculture sector's within three regions: Downstate, North Country and the Capital Region. These three regions were also bigger contributors to the state economy than the agriculture industries in base value added and labor income. The Downstate region was the only region that generated a higher level of base employment than the agriculture industries.

Base Economic Activity of the Forest and Agriculture Sectors per New York State Region				
Western-CNY Region Base Economic Activity (Forest and Agriculture)				
Description	Output	Value Added	Employment	Labor Income
Regional Forest Sector Total	\$3,638,084,227	\$1,434,624,476	13,618	\$1,055,000,830
Regional Agriculture Total	\$6,648,664,507	\$2,489,576,137	30,079	\$1,473,121,795
Southern Tier Region Base Economic Activity (Forest and Agriculture)				
Description	Output	Value Added	Employment	Labor Income
Regional Forest Sector Total	\$1,141,481,702	\$390,291,573	5,126	\$297,949,219
Regional Agriculture Total	\$3,680,698,848	\$1,125,049,596	17,320	\$672,196,886
North Country Region Base Economic Activity (Forest and Agriculture)				
Description	Output	Value Added	Employment	Labor Income
Regional Forest Sector Total	\$3,752,065,409	\$1,098,372,871	11,325	\$752,090,216
Regional Agriculture Total	\$2,982,057,162	\$932,716,002	16,876	\$608,474,088
Capital Region Base Economic Activity (Forest and Agriculture)				
Description	Output	Value Added	Employment	Labor Income
Regional Forest Sector Total	\$1,704,344,909	\$627,326,219	6,068	\$455,270,283
Regional Agriculture Total	\$1,387,431,524	\$504,790,527	8,324	\$303,872,977
Downstate Region Base Economic Activity (Forest and Agriculture)				
Description	Output	Value Added	Employment	Labor Income
Regional Forest Sector Total	\$5,124,675,784	\$2,366,168,739	18,777	\$1,780,621,451
Regional Agriculture Total	\$2,706,608,266	\$1,112,471,385	12,764	\$759,370,333

Table 7: The base economic activity of the forest and agriculture sector per region. Output, Labor Income, and Value Added are measured in USD and Employment is measured in Jobs

In 2020, the region that generated the largest base employment was the Downstate region at 18,777 jobs (Table 7 and Figure 8). This region also generated the highest base output (\$5.1 billion), labor income (\$1.8 billion) and value added (\$2.4 billion) (Table 7).

New York State's forestry and logging industry produced \$210 million in base output, in other words, the forestry and logging industry was responsible for \$210 million of supply-chain expenditures. Also, 1,988 jobs were generated by this industry in the state. The forestry and logging industry also contributed employment within each region, but its largest employment contribution was within the Downstate Region (1,905 jobs) (Figure 8).

Among the State's four forest industries, the pulp and paper industry generated the greatest base valued added state-wide (\$4.0 billion). At a regional level this industry was the largest contributor to base output, employment, labor income and value added in most of the five regions except for the Southern Tier Region where the wood products industry was the largest contributor to base employment (2,364) (Figure 8), as well as the largest contributor to base output (\$475.2), base labor income (\$117.8 million), and base value added (\$150.6). The pulp and paper generated the second largest base value added (\$121.8 million), and it was the second largest contributor to base employment (1,283) in this region. The region that generated most of the base value added by the pulp and paper industry was the Downstate Region (\$1.4 billion).

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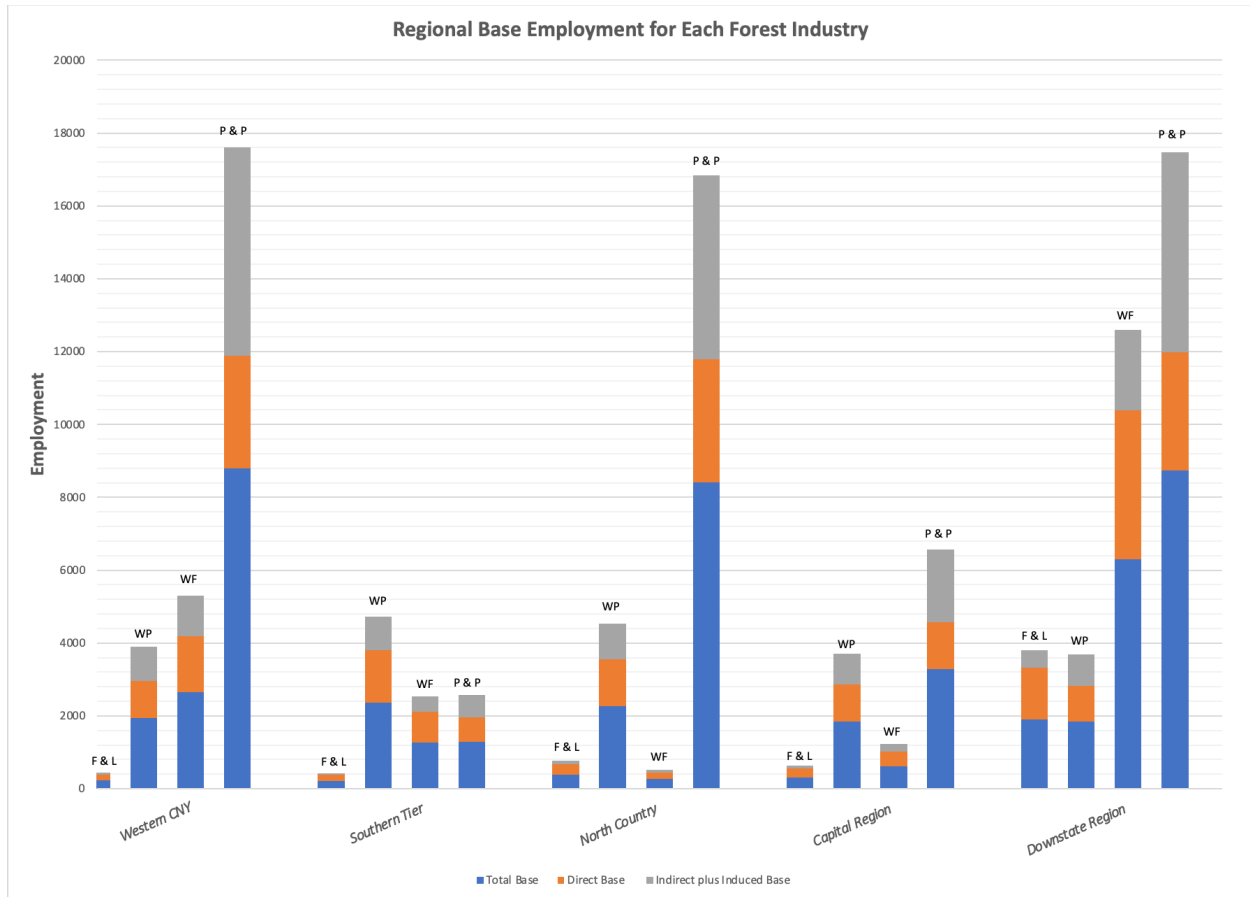


Figure 8: Total Base, Direct Base and Indirect plus Induced Employment per Region per forest Industry of New York State

Summary

New York States Forest Sector base output was less than Agriculture; however, its base labor income and value added were larger. While Agriculture had approximately 20,673 more employees, the labor income per employee was greater in the Forest Sector; namely, \$86,000 per employee compared to \$52,000 per employee. Agricultural dominates base output, value added, and labor income in two of the five regions, but only one with respect to base employment.

Pulp and Paper continues to dominate base output, employment and value added across four of the five regions. The Downstate Region had the greatest total base output followed by the North Country and then Western Central New York. In terms of total base labor income, value added and employment, Downstate was first followed by Western Central New York and then the North Country.

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