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Washington's Forest Products Industry and Timber Harvest, 2020

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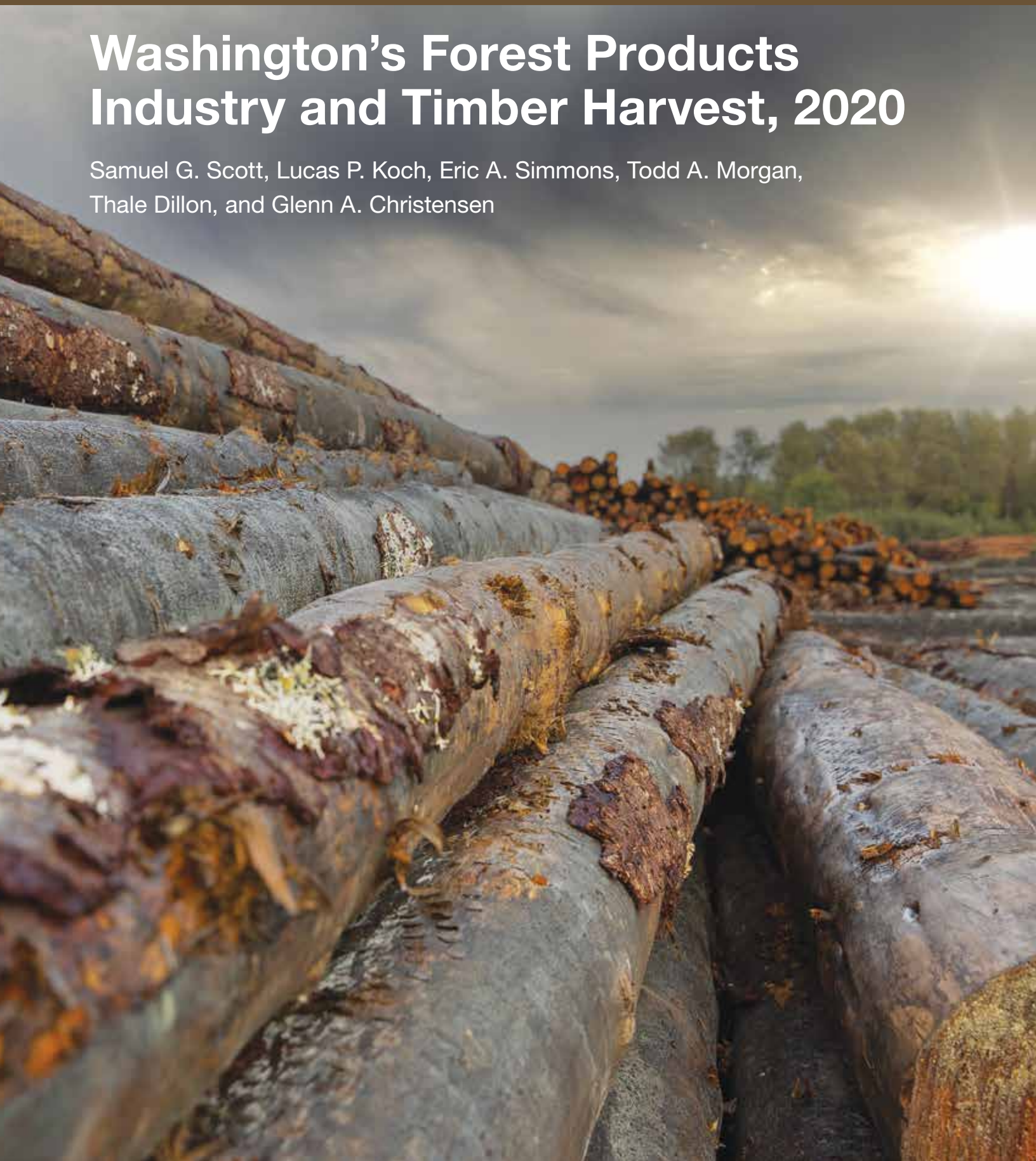

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Cover photo: A stack of cut trees lies wet in a pile at a lumber yard in Washinton state.
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Abstract

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We conducted a census of the 2020 Washington forest products industry. We asked any facility that purchased roundwood or purchased residuals from roundwood users about their mill characteristics, employment, inputs, outputs, residual production and disposition, and sales value. We also collected data from facilities in surrounding states that purchased roundwood from Washington. We identified 83 primary processing facilities, nearly 3 billion board feet Scribner of timber harvest, and more than 4 billion bone-dry units of generated residuals. We compared the census results to similar efforts in the past by the Washington State Department of Natural Resources within Washington, and the University of Montana, Bureau of Business and Economic Research in neighboring Western States.

KEYWORDS

Forest economics
Forest products
Lumber production
Timber harvest
Washington

Report Highlights

- More than 2.9 billion board feet (BBF) Scribner of timber was harvested in Washington in 2020, of which 73 percent came from private and American Indian tribal timberlands, 21 percent came from state lands, 5 percent came from national forests, and the remaining 1 percent came from other public lands.
- The five most productive counties by timber harvest in the state were Lewis County (432 million board feet [MMBF] Scribner), Cowlitz County (287 MMBF Scribner), Grays Harbor County (277 MMBF Scribner), Stevens County (205 MMBF Scribner), and Pacific County (182 MMBF Scribner).
- Primary wood products facilities consumed almost 3.2 BBF Scribner of timber, most of which came from Washington (2.4 BBF Scribner) alongside timber from Canada (15 MMBF Scribner) and other parts of the United States (324 MMBF Scribner).
- Combined, sawmills across the state produced more than 4.4 BBF of lumber.
- Washington producers reported a total sales value of just more than $5.6 billion, 53 percent of which was reported to be sold to customers within Washington.
- The forest products industry directly employed an estimated 28,154 people, of which 75 percent were in the wood products manufacturing sector, such as sawmills and pulp mills, while the remaining 25 percent were in the forestry, forestry support, and logging sectors.
- About $2.64 billion in labor income was generated by the Washington forest products industry. Seventy-four percent of that labor income was in the wood products manufacturing sector, while 26 percent was in the forestry, forestry support, and logging sectors.

Contents

Introduction

This report contains the findings from a census of Washington's primary forest products industry for 2020. Our principal goals are as follows: (1) determine the utilization of Washington's timber harvest, (2) identify the type and number of primary forest products facilities operating during 2020, and (3) determine their sources of raw materials and quantify outputs of finished products.

2020 Washington Forest Industries Data Collection System Census

The University of Montana's Bureau of Business and Economic Research, in cooperation with the Forest Inventory and Analysis (FIA) program at the U.S. Department of Agriculture, Forest Service's Rocky Mountain and Pacific Northwest Research Stations, has developed a system to collect, compile, and make available state and county information on the operations of the forest products industry. This system—the Forest Industries Data Collection System (FIDACS)—has been used to analyze 11 Western states in periodic censuses (e.g., Hayes et al. 2021b, Marcille et al. 2020, Simmons et al. 2021); however, this is the first application of the FIDACS in the state of Washington.

Prior to 2020, the Washington Department of Natural Resources (WADNR) collected and published similar information from across the state in a series of mill and harvest reports; however, starting in 2020, the Bureau of Business and Economic Research has taken on these tasks. Previous mill and harvest reports by the WADNR used a different methodology for data collection and analysis than what is presented in this report. Timber harvest reports such as Watts et al. (2018), as well as the Washington State Department of Revenue's harvest reports, used data from the Washington forest tax, whereas mill reports, including Smith et al. (2017), relied on mill surveys to collect data (WADOR 2024). An attempt has been made to provide valid comparisons between data years, but some variation due to these methodological differences is unavoidable.

We attempted to capture every primary forest products manufacturer in Washington in the census, as well as any out-of-state facilities that receive Washington timber. A primary forest products manufacturer is defined as any business that processes timber into an intermediate or final wood product, as well as any facility that processes wood fiber residuals from those timber processors.

Through a combination of mailed surveys, telephone calls, and in-person interviews, the following information was requested from every primary wood products manufacturer in Washington:

- Facility information
  - Location
  - Production capacity
  - Employment
  - Preferred and accepted log lengths and diameters
- Volume of raw material received by:
  - Material type
  - County of origin
  - Ownership
  - Species
  - Mortality status at time of harvest
- Volume and sales value of finished products by:
  - Product type
  - Market location
- Residuals information
  - Production
  - Utilization
  - Sales value

About 48 percent of facilities identified within Washington responded directly to the 2020 census. This is lower than response rates typically seen in other Western states for similar FIDACS efforts. Facilities that did not respond were estimated using a combination of additional survey efforts in 2019, 2021, 2022, 2023, 2024, and other external sources.

Washington's Timberland and Harvest

Timberland in Washington

Washington contains almost 17.7 million acres of nonreserved timberland across all ownerships (table 1), which is nearly 4 percent of the total land area in the state (USDA FS 2023). Of that timberland, 51 percent (9.1 million acres) is in private hands through a combination of industrial and nonindustrial owners, 33 percent (5.7 million acres) is managed by the federal government, and the remaining 2.9 million acres are owned by state and local governments.

Table 1—Washington timberland by ownership class, 2018

Ownership class	Area	Proportion of state timberlands
	THOUSAND ACRES	PERCENT
Private	9,057	51
Federal	5,702	32
State	2,394	14
Other public	519	3
Total	**17,672**	**100**

Source: USDA FS (2023).

Timber Harvest by Ownership

Thirty-three percent of timberland in Washington is under federal management (primarily through the Forest Service), but only 5 percent of timber harvested in 2020 was from the National Forest System (table 2; fig. 1). Most of the harvest (73 percent) occurred on private and American Indian tribal property. Washington state lands were also a large harvest source, contributing more than 600 million board feet (MMBF) Scribner, or 20 percent of total harvest, from 2.4 million acres (14 percent) of timberland.

The past two decades have seen a substantial drop in total timber harvest in the state. In 2005, the WADNR reported nearly 3.6 billion board feet (BBF) Scribner of harvest across all ownerships, while the 2020 data show only 3.0 BBF Scribner—a decrease of about 17 percent. The most significant decrease in harvest has been from private lands—from 2.9 to 2.2 BBF Scribner. The national forests within the state have nearly doubled their harvest over the same period, from 81 MMBF Scribner in 2005 to 155 MMBF Scribner in 2020. National forest harvest in Washington peaked in 1964 at 1.8 BBF Scribner and declined severely in the early 1990s. More historical harvest data can be found in WADNR (2003).

Table 2—Washington timber harvest by ownership class, select years

	2005	2008	2011	2014	2017	2020
Ownership class	THOUSAND BOARD FEET SCRIBNER					
Private and tribal timberland	**2,863,950**	**2,067,485**	**2,206,644**	**2,456,691**	**2,087,194**	**2,166,177**
Public timberland	**706,631**	**690,603**	**778,309**	**599,878**	**674,689**	**791,292**
National forest	81,142	104,373	108,661	116,088	103,815	155,057
State lands	593,881	515,107	636,863	436,146	529,214	605,403
Other public	31,608	71,123	32,785	47,644	41,660	30,832
All owners	**3,570,581**	**2,758,088**	**2,984,953**	**3,056,569**	**2,761,883**	**2,957,470**

Sources: Smith et al. (2012, 2015b); Stephenson et al. (2006, 2007, 2008, 2009); Watts et al. (2018).

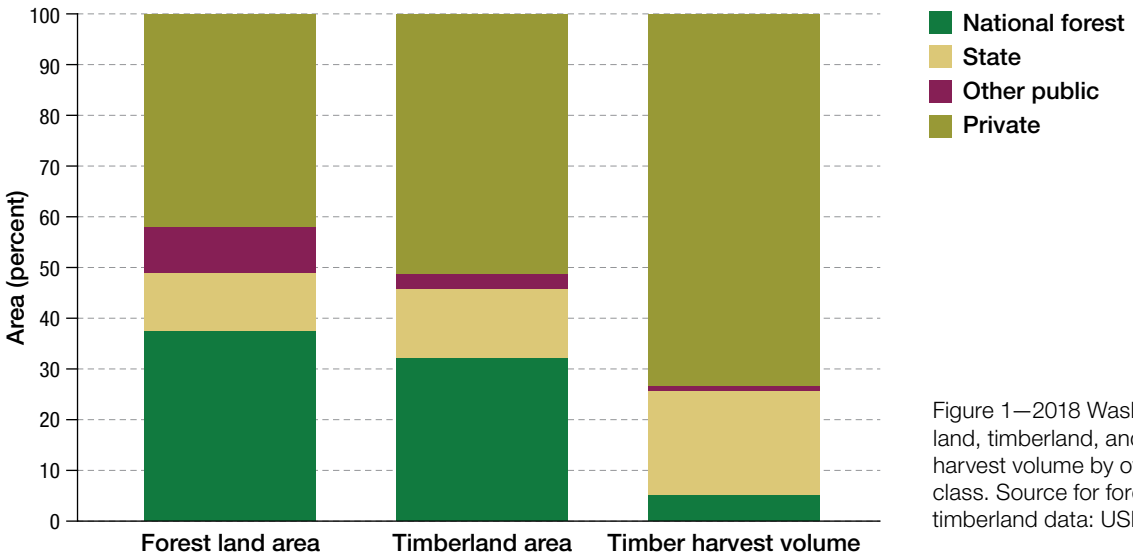

Figure 1—2018 Washington forest land, timberland, and 2020 timber harvest volume by ownership class. Source for forest land and timberland data: USDA FS (2023).

Timber Harvest by Geographic Source

The Washington forest products industry can be divided geographically along the Cascade Range into western and eastern regions (or west side and east side), which in turn can be split into three and two (for a state total of five) resource areas, respectively, according to Campbell et al. (2010), as shown in figure 2. Also notable is the distribution of ownership throughout the state. National forest land is concentrated down the center of the Cascades and in several pockets in the northwest, northeast, and southeast corners of the state. More information related to the distribution of forest-specific ownership can be found in Campbell et al. (2010).

About 2.3 BBF Scribner (79 percent of the state total) of timber was harvested from the west side of the Cascades across three resource areas (table 3):

- The Olympic Peninsula resource area includes Clallam, Jefferson, Grays Harbor, Mason, and Thurston Counties. Grays Harbor County accounted for the most timber harvested in the area, while Mason County accounted for the least.
- The Southwest resource area was the most productive timber region in the state, harvesting about 1.0 BBF Scribner of timber, and includes Pacific, Lewis, Skamania, Clark, Cowlitz, Wahkiakum, and Pacific Counties. The smallest county by timber harvest (and area) was Wahkiakum County. The most timber came from Lewis County.
- The Puget Sound resource area includes Whatcom, Skagit, Snohomish, King, Pierce, Kitsap, Island, and San Juan Counties. Island and San Juan Counties (both composed of multiple islands) accounted for the smallest timber harvest, whereas Pierce County accounted for the largest.

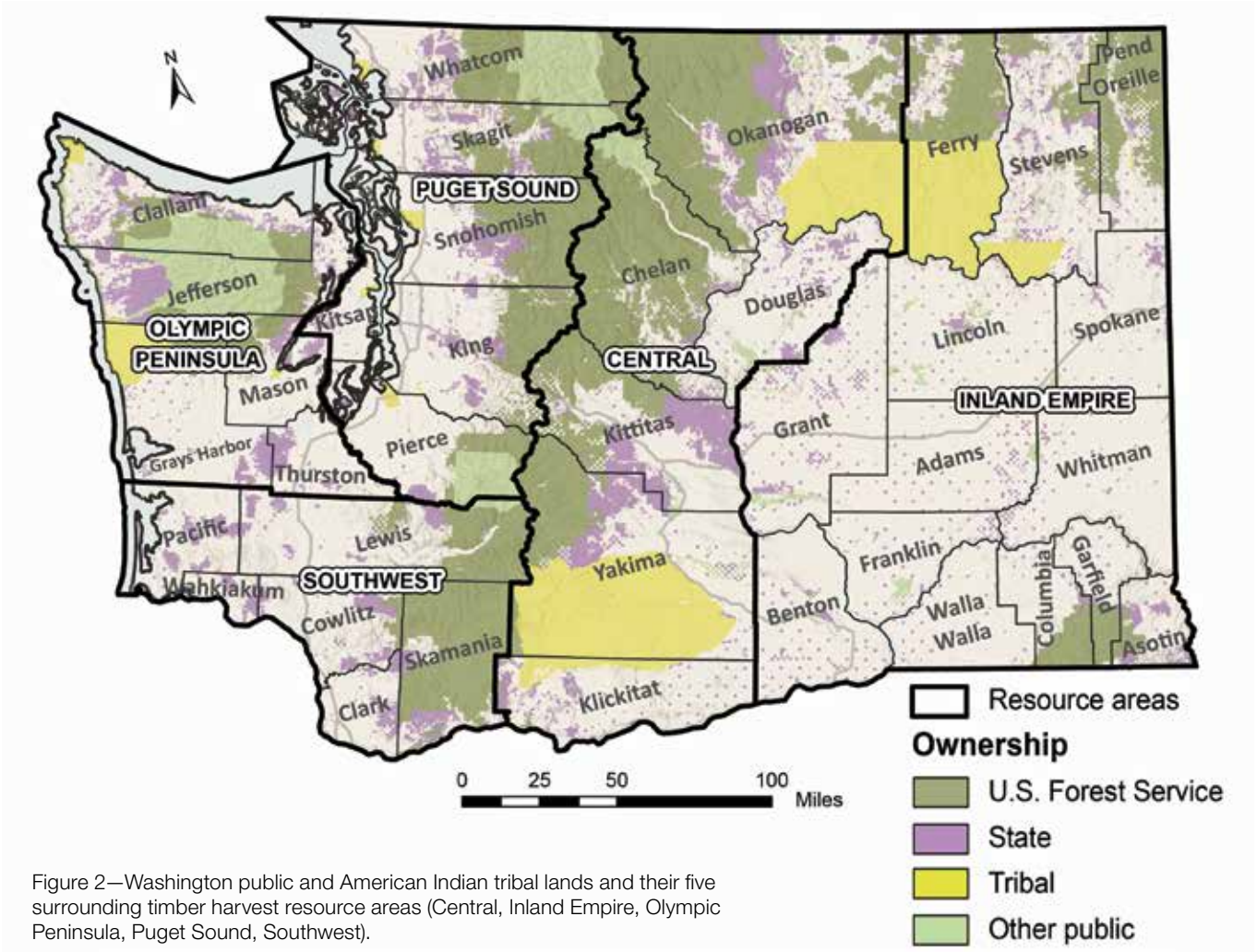

Figure 2—Washington public and American Indian tribal lands and their five surrounding timber harvest resource areas (Central, Inland Empire, Olympic Peninsula, Puget Sound, Southwest).

Table 3—Washington timber harvest by resource area, county, and ownership, 2020

Resource area/county	Private and tribal	National forest	State	Other public	Total
	THOUSAND BOARD FEET SCRIBNER				
Inland Empire	**310,098**	**99,728**	**50,035**	**12,384**	**472,246**
Asotin	809	—	380	—	1,189
Columbia	2,497	—	—	—	2,497
Ferry	77,746	30,693	22,390	—	130,829
Garfield	—	—	1,351	—	1,351
Lincoln	1,461	—	—	—	1,461
Pend Oreille	35,126	26,518	1,699	10,100	73,442
Spokane	45,584	—	8,957	2,020	56,561
Stevens	146,876	42,518	15,259	264	204,916
Central	**109,327**	**21,351**	**13,470**	**2,628**	**146,776**
Chelan	9,910	721	314	—	10,945
Kittitas	5,797	3,208	6,534	2,000	17,539
Klickitat	32,570	—	6,622	—	39,192
Okanogan	31,638	13,412	—	628	45,678
Yakima	29,412	4,010	—	—	33,422
Olympic Peninsula	**513,740**	**18,408**	**224,202**	**7,598**	**763,948**
Clallam	116,874	4,640	50,747	285	172,546
Grays Harbor	212,828	—	57,950	6,697	277,475
Jefferson	73,568	12,958	49,193	—	135,719
Mason	46,362	368	37,051	616	84,397
Thurston	64,108	442	29,262	—	93,812
Southwest	**869,991**	**11,777**	**158,257**	**2,350**	**1,042,375**
Clark	38,724	—	16,958	—	55,682
Cowlitz	244,117	722	40,161	1,930	286,930
Lewis	344,352	9,414	77,898	420	432,084
Pacific	172,280	—	10,150	—	182,430
Skamania	57,975	1,641	—	—	59,616
Wahkiakum	12,543	—	13,090	—	25,633
Puget Sound	**363,021**	**3,793**	**159,439**	**5,872**	**532,125**
Island	5,083	—	1,256	—	6,339
King	85,518	1,200	121	—	86,839
Kitsap	11,959	—	5,248	5,500	22,707
Pierce	112,143	—	30,031	250	142,424
San Juan	—	—	314	—	314
Skagit	63,416	20	26,561	—	89,997
Snohomish	51,887	2,573	50,323	—	104,783
Whatcom	33,015	—	45,585	122	78,722
Total	**2,166,177**	**155,057**	**605,403**	**30,832**	**2,957,470**

— = no harvest.

About 619 MMBF Scribner (21 percent of the state total) of timber was harvested from the east side of the Cascades across two resource areas:

- The Central resource area was the least productive timber region in the state (147 MMBF Scribner) and includes Okanogan, Douglas, Chelan, Kittitas, Yakima, and Klickitat Counties. Little harvest occurred in the southern scrubland of the area. Okanogan County is the northern-most county in the area and harvested the most timber in the resource area at 46 MMBF Scribner.
- The Inland Empire resource area represents eastern Washington. Much of the area is unforested, but Ferry, Stevens, Pend Oreille, and Spokane Counties are vital timber sources and processing areas, not only for Washington, but also for the nearby Idaho Panhandle and northwestern Montana. We estimated a total harvest of 472 MMBF Scribner for 2020 from this resource area.

Timber Harvest by Product

A diverse array of timber products is harvested in Washington, including sawlogs, veneer logs, pulp logs, nonpulp fiber logs, house logs, logs for utility poles, and cedar specialty product logs. About 2.4 BBF Scribner of sawlogs were harvested in the state, representing 83 percent of the 2020 total harvest (table 4). Of the remaining products, the largest product categories were veneer and pulpwood.

Timber Harvest by Species

Of the 20-plus tree species harvested in Washington in 2020, Douglas-fir (*Pseudotsuga menziesii*) was the most common (tables 5 and 6). (See the species list on p. 18 for scientific names of species referenced in this report.) The second most abundant species harvested was western hemlock. Douglas-fir and western hemlock accounted for 83 percent of the total harvest. Looking at trends, the WADNR reported Douglas-fir to consistently be between 40 and 50 percent of annual harvest between 2005 and 2017, whereas our analysis shows a jump to more than 60 percent. At the same time, the "other species" category fell 11 percentage points. It is possible that this change is due to the different data collection methods rather than actual changes in the industry over the period.

While the east side of the state accounted for 21 percent of the total harvest, nearly 96 percent of pine and 76 percent of true fir came from the region (table 7). This situation was much different on the west side, which accounted for 97 percent of the state's western hemlock harvest.

Hardwoods are an important part of the forest products industry in Washington. However, we cannot provide detailed census results regarding hardwood harvest and utilization without disclosing facility- or company-specific information. For more information about the hardwood sector of Washington in the past, see mill and harvest reports previously released by the WADNR (2018).

Table 4—Washington timber products harvested by ownership class, 2020

Ownership class	Sawlogs	Veneer	Pulpwood	Other [a]	All products
	THOUSAND BOARD FEET SCRIBNER				
Industry	1,139,851	41,147	124,016	8,490	1,313,504
Nonindustry private and tribal	686,254	103,516	55,555	7,347	852,673
National forest	122,652	23,329	8,987	89	155,057
State	17,251	7,441	390	5,750	30,832
Other public land	467,786	71,892	24,210	41,515	605,403
All owners	**2,433,795**	**247,325**	**213,158**	**63,191**	**2,957,470**

[a] Other includes house logs, specialty cedar logs, and post and pole logs.

Table 5—Washington timber harvest by species, select years

Species	2005	2008	2011	2014	2017	2020
	THOUSAND BOARD FEET SCRIBNER					
Douglas-fir (*Pseudotsuga menziesii*)	1,289,122	933,344	1,408,872	1,309,933	1,326,768	1,842,407
Western hemlock (*Tsuga heterophylla*)	1,002,888	817,015	734,370	765,472	654,954	619,735
Western redcedar (*Thuja plicata*)	66,190	54,892	59,650	57,643	61,802	117,796
Ponderosa pine (*Pinus ponderosa*)	—	197	46,670	51,134	40,352	109,233
Other species[a]	584,778	522,740	735,391	872,387	678,007	268,298
All species	**2,942,978**	**2,328,188**	**2,984,953**	**3,056,569**	**2,761,883**	**2,957,470**

— = no volume reported.

[a] Other species include Pacific silver fir (*Abies amabilis*), white fir (*Abies concolor*), grand fir (*Abies grandis*), subalpine fir (*Abies lasiocarpa*), Engelmann spruce (*Picea engelmannii*), Sitka spruce (*Picea sitchensis*), lodgepole pine (*Pinus contorta*), western white pine (*Pinus monticola*), western larch (*Larix occidentalis*), red alder (*Alnus rubra*), bigleaf maple (*Acer macrophyllum*), black cottonwood (*Populus trichocarpa*), walnut (*Juglans* spp.), and oak (*Quercus* spp.).

Sources: Smith et al. (2012, 2015b); Stephenson et al. (2006, 2007, 2008, 2009); Watts et al. (2018).

Table 6—Washington timber harvest by species and product, 2020

Species	Sawlogs	Veneer	Pulpwood	Other products[a]	All products
	THOUSAND BOARD FEET SCRIBNER				
Douglas-fir (*Pseudotsuga menziesii*)	1,484,963	193,312	107,671	56,461	1,842,407
Western redcedar (*Thuja plicata*)	108,823	—	2,905	6,068	117,796
Western hemlock (*Tsuga heterophylla*)	526,488	35,778	57,469	—	619,735
True fir[b]	70,054	2,552	17,264	15	89,886
Pine[c]	129,747	2,077	10,094	238	142,156
Other species[d]	113,720	13,605	17,755	409	145,489
All species	**2,433,795**	**247,325**	**213,158**	**63,191**	**2,957,470**

— = no volume reported.

[a] Other products include house logs, specialty cedar logs, and post and pole logs.

[b] True fir includes grand fir (*Abies grandis*), white fir (*Abies concolor*), Pacific silver fir (*Abies amabilis*), and subalpine fir (*Abies lasiocarpa*).

[c] Pine includes ponderosa pine (*Pinus ponderosa*), lodgepole pine (*Pinus contorta*), and western white pine (*Pinus monticola*).

[d] Other species include Engelmann spruce (*Picea engelmannii*), Sitka spruce (*Picea sitchensis*), western larch (*Larix occidentalis*), red alder (*Alnus rubra*), bigleaf maple (*Acer macrophyllum*), black cottonwood (*Populus trichocarpa*), walnut (*Juglans* spp.), and oak (*Quercus* spp.).

Table 7—Washington timber harvest by resource area, region (east and west side), and species, 2020

Resource area	Douglas-fir (*Pseudotsuga menziesii*)	Western hemlock (*Tsuga heterophylla*)	Pine[a]	Western redcedar (*Thuja plicata*)	True fir[b]	Other species[c]	All species
	THOUSAND BOARD FEET SCRIBNER						
East side[d]	**342,378**	**19,897**	**136,119**	**26,620**	**68,400**	**25,608**	**619,021**
West side	**1,500,029**	**599,839**	**6,037**	**91,176**	**21,486**	**119,881**	**2,338,448**
Olympic Peninsula	419,023	257,898	4,148	20,376	9,516	52,986	763,948
Southwest	730,202	205,690	880	41,903	7,231	56,469	1,042,375
Puget Sound	350,804	136,251	1,008	28,896	4,739	10,426	532,125
State total	**1,842,407**	**619,735**	**142,156**	**117,796**	**89,886**	**145,489**	**2,957,470**

[a] Pine includes ponderosa pine (*Pinus ponderosa*), lodgepole pine (*Pinus contorta*), and western white pine (*Pinus monticola*).

[b] True fir includes grand fir (*Abies grandis*), white fir (*Abies concolor*), Pacific silver fir (*Abies amabilis*), and subalpine fir (*Abies lasiocarpa*).

[c] Other species include red alder (*Alnus rubra*), western larch (*Larix occidentalis*), Sitka spruce (*Picea sitchensis*), bigleaf maple (*Acer macrophyllum*), Engelman spruce (*Picea engelmannii*), black cottonwood (*Populus trichocarpa*), walnut (*Juglans* spp.), and oak (*Quercus* spp.).

[d] East-side resource areas are combined to avoid mill data disclosure.

Timber Flow

There was a net positive flow of domestic timber (223 MMBF Scribner) into Washington from Oregon and Idaho in 2020 (table 8). Washington timber was sent to Idaho (69 MMBF Scribner) and Oregon (30 MMBF Scribner), as well as a small volume to Montana. About 445 MMBF Scribner (15 percent of the total harvest) was exported internationally, with the majority going to Asia (table 9). This decreased from close to 850 MMBF Scribner in 2016, continuing a downward trend that started in 2014 (Smith et al. 2015a, 2017).

Forest Products Sectors

Industry Overview

The forest products industry in Washington is diverse both in production and geography (fig. 3). Industry activity is mostly focused west of the Cascades and along the Puget Sound, along with the geographically isolated region in the northeast corner of the state. Figure 3 also shows primary wood processing facilities tend to be near areas of higher timber harvest. Notably, it also shows that facilities that rely on bulk-shipped mill residuals, such as pulp mills, can also be located along major transportation infrastructure, including the Columbia River, major interstates, and railroad rights-of-way.

Facilities were identified in the following timber-using sectors:

- Sawmills
- Veneer mills
- Post and pole mills, including utility pole mills
- Specialty cedar mills, including shake and shingle mills
- Roundwood chipping mills
- Export yards

We also identified facilities in several residual-using sectors:

- Pulp mills
- Woody biomass energy and cogeneration plants
- Fuel pellet plants

Table 8—Domestic timber product flow into and out of Washington, 2020

Timber product	Domestic log flow into Washington	Domestic log flow out of Washington	Domestic net inflow (net outflow)
	THOUSAND BOARD FEET SCRIBNER		
Sawlogs	300,943	78,573	222,370
Veneer logs	649	3,761	(3,112)
Pulpwood logs	22,191	15,231	6,960
Other products[a]	57	3,706	(2,749)
All products	**323,840**	**101,271**	**223,469**

[a] Other products include house logs, specialty cedar logs, and post and pole logs.

Table 9—Timber flow into and out of Washington, 2020

Log source	Log destination		
	Washington	Other U.S. states	Other countries[a]
	THOUSAND BOARD FEET SCRIBNER		
Washington	2,411,369	101,271	444,830
Other U.S. states	323,840	—	—
Canada	14,983	—	—
Total	**3,195,022**	**101,271**	**444,830**

— = no volume reported.

[a] All exported logs are assumed to be sawlogs.

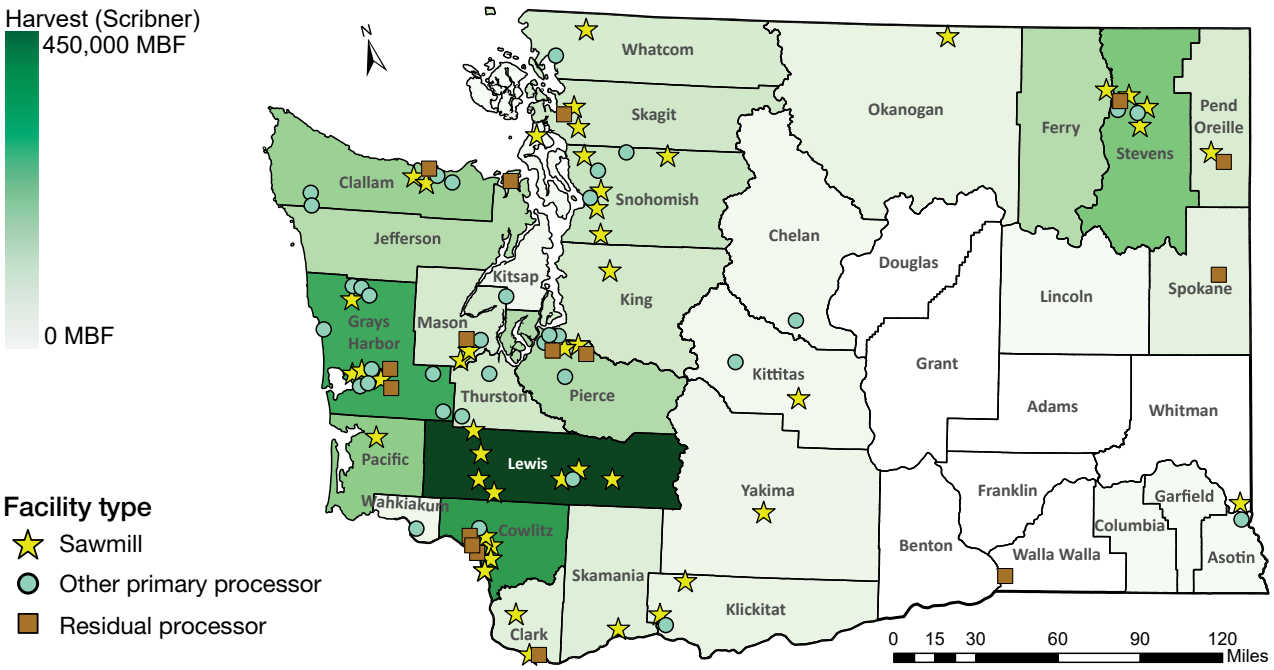

Figure 3—Washington primary and residual wood products facilities and 2020 timber harvest by county. MBF = thousand board feet.

Table 10 shows the number of facilties across several WADNR surveys and the 2020 census results by aggregated wood products sector, resource area, and county. One obvious trend is the severe decline in the total number of facilities since 2000. In 2000, the WADNR counted 228 active facilities across all sectors, while the Bureau of Business and Economic Research counted 97 facilites in 2020. This dramatic decrease is in line with patterns seen in other Western states over the same period, most likely related to the Great Recession that started in 2007 (Hayes et al. 2021b, Keegan et al. 2011, Simmons et al. 2021). The most drastic decrease is seen in the varied "other products" sector. This sector contains mostly smaller facilities that make niche products that have either been replaced by other materials or been consolidated into larger facilities over time.

The increase in wood products facilities between the 2016 WADNR survey and the 2020 FIDACS census may be due to our census methods; we included smaller facilities than did the WADNR survey. Several of the sawmills included in our census are very small, as discussed in the next section.

Sawmill Sector

The 2020 Washington census found that sawmills produced almost 4.5 BBF lumber tally, while the Western Wood Products Association reported 4.2 BBF lumber tally (WWPA 2021). Lumber production has stayed consistent across the state after a large decrease between 2006 and 2008 (table 11). The recent increase in production during 2020 may be due to increased demand for construction lumber during the COVID-19 pandemic (Morgan and Hayes 2021, van Kooten and Schmitz 2022).

Sawmills constitute a significant portion of the wood products industry in Washington. The number of sawmills in the state has been declining over the long term. In 1968, the WADNR reported 212 operating sawmills, compared to 77 in 2000 (Bergvall and Gedney 1970, Van Schoorl et al. 2006). In 2020, we identified 47 sawmills (table 12). However, average production per facility has been steadily rising. In 2000, the WADNR reported an average production of nearly 59 MMBF lumber tally per mill, whereas we found an average production of more than 95 MMBF lumber tally per mill in 2020, a 61-percent increase. This is indicative of the industry-wide trend toward large, modern,

Table 10—Active Washington primary wood products facilities by resource area, county, and product, select years

Resource area/county	Lumber	Veneer	Pulp	Specialty cedar	Other facilities[a]	Total
Inland Empire	**6**	**1**	**3**	**—**	**3**	**13**
Asotin	—	—	—	—	1	1
Ferry	1	—	—	—	—	1
Pend Oreille	1	—	1	—	—	2
Spokane	—	—	1	—	—	1
Stevens	3	1		—	2	6
Walla Walla	—	—	1	—	—	1
Whitman	1	—	—	—	—	1
Central	**5**	**1**	**—**	**—**	**1**	**7**
Kittitas	1	—	—	—	1	2
Klickitat	2	1	—	—	—	3
Okanogan	1	—	—	—	—	1
Yakima	1	—	—	—	—	1
Olympic Peninsula	**8**	**2**	**3**	**7**	**10**	**30**
Clallam	2	—	1	2	3	8
Grays Harbor	4	2	1	5	2	14
Jefferson	—	—	1	—	—	1
Mason	2	—	—	—	3	5
Thurston	—	—	—	—	2	2
Southwest	**14**	**—**	**4**	**1**	**3**	**22**
Clark	2	—	1	—	—	3
Cowlitz	4	—	3	—	2	9
Lewis	6	—	—	—	1	7
Pacific	1	—	—	—	—	1
Skamania	1	—	—	—	—	1
Wahkiakum	—	—	—	1	—	1
Puget Sound	**14**	**1**	**2**	**1**	**7**	**25**
Island	1	—	—	—	—	1
King	2	—	—	—	—	2
Pierce	3	1	2	—	3	9
Skagit	2	—	—	—	1	3
Snohomish	5	—	—	1	2	8
Whatcom	1	—	—	—	1	2
2020 Total	**47**	**5**	**12**	**9**	**24**	**97**
2016 Total	37	7	12	7	25	88
2012 Total	41	8	12	12	32	105
2008 Total	54	10	11	17	33	125
2004 Total	63	11	10	21	41	146
2000 Total	77	14	18	42	77	228

— = no mills.

[a] Other facilities include post and pole mills, pulp-chip conversion mills, biomass energy facilities, export yards, and fuel pellet facilities.

Sources: Largent et al. (2012); Smith et al. (2017); Stephenson et al. (2010); Van Schoorl et al. (2006, 2007).

Table 11—Estimates of Washington lumber production by data source and year, 2006–2010

	Production lumber tally		
Year	WWPA	WADNR	BBER
	THOUSAND BOARD FEET		
2020	**4,228,000**	**—**	**4,485,964**
2016	3,759,000	3,480,138	—
2014	4,035,000	3,932,961	—
2012	3,763,000	3,277,267	—
2010	3,637,000	3,361,919	—
2008	3,885,000	3,612,593	—
2006	5,130,000	4,947,434	—

— = no data available.

BBER = University of Montana, Bureau of Business and Economic Research; WADNR = Washington Department of Natural Resources; WWPA = Western Wood Products Association.

Sources: Largent et al. (2012); Smith et al. (2017); Stephenson et al. (2010); Van Schoorl et al. (2006, 2007); WWPA (2011, 2021).

Table 12—Number of Washington sawmills and combined average lumber production, select years

Year	Sawmills	Average lumber talley
	NUMBER	THOUSAND BOARD FEET
2020	**47**	**95,446**
2016	37	94,058
2012	41	79,933
2008	54	66,900
2004	63	76,777
2000	77	58,961

Sources: Smith et al. (2014, 2017); Stephenson et al. (2010); Van Schoorl et al. (2006, 2007).

relatively automated sawmills that take advantage of economies of scale (Simmons et al. 2021). During 2020, large sawmills—sawmills that produced more than 200 MMBF lumber tally—were responsible for 51 percent (2.3 BBF lumber tally) of all lumber production in the state, while representing only 17 percent of the total sawmill count (table 13).

Mill productivity and efficiency is measured using ratios that compare the volume of inputs to the volume of outputs within a sector. For the sawmill sector, lumber overrun is the volume of lumber recovered compared to the lumber volume predicted by the Scribner log scale. While lumber overrun is a common measure in the industry, it can be a misleading metric because it is partly a function of complexities within Scribner log scale. For example, milling small-diameter logs can arbitrarily increase lumber overrun because Scribner—the denominator—increasingly underestimates the volume of a log as log diameter decreases (Keegan et al. 2010). In 2020, Washington sawmills recovered an average 2.01 board feet lumber tally per board foot Scribner of log input (table 14), a 1.5-percent increase to the productivity ratio reported by the WADNR in 2016 (Smith et al. 2017). Compared to other west coast states, the Washington sawmill sector shows a lower lumber overrun than Oregon (2.14 board feet in 2017), but a higher lumber overrun than California (1.64 board feet in 2016) (Marcille et al. 2020, Simmons et al. 2021). Sawmills on the east side of Washington, which are typically smaller in capacity and milled log diameter, reported lower lumber overrun than did sawmills on the west side of the state (table 15).

An alternative metric of mill efficiency is lumber recovery factor. Like lumber overrun, lumber recovery factor compares the volume of mill inputs to volume of mill outputs, but it uses an estimate of cubic timber volume rather than the Scribner timber volume prediction as the denominator. Keegan et al. (2010) suggests that

Table 13—Lumber produced in Washington by mill production volume, 2020

Mill volume	Sawmills	Production lumber tally	Proportion of total	Average lumber tally per mill
	NUMBER	THOUSAND BOARD FEET	PERCENT	THOUSAND BOARD FEET
>200,000 MBF	8	2,306,101	51	288,263
100,000–200,000 MBF	8	1,248,063	28	156,008
10,000–99,999 MBF	23	929,777	21	40,425
<10,000 MBF	8	2,023	<1	253
Total	**47**	**4,485,964**	**100**	**95,446**

MBF = thousand board feet.

Table 14—Washington sawmill productivity, select years

Year	Sawmill production	Sawmill consumption	Lumber overrun
	THOUSAND BOARD FEET		MBF LUMBER TALLY/MBF SCRIBNER
2020	**4,485,964**	**2,226,318**	**2.01**
2016	3,759,000	1,636,891	1.98[a]
2012	3,763,000	1,764,452	1.57[a]
2008	3,885,000	1,913,037	1.89[a]
2004	4,836,948	3,080,259	1.57
2000	4,540,020	2,503,400	1.81

MBF = thousand board feet.
[a] Productivity ratio as reported by Smith et al. (2017). Other years are calculated using reported input and output volumes.
Sources: Smith et al. (2014, 2017); Stephenson et al. (2010); Van Schoorl et al. (2006, 2007).

Table 15—Washington sawmill productivity by region (east and west side), 2020

Region	Lumber tally	Sawmill consumption	Lumber overrun
	THOUSAND BOARD FEET		MBF LUMBER TALLY/MBF SCRIBNER
East side	657,201	413,766	1.59
West side	3,828,763	1,812,552	2.11
State total	**4,485,964**	**2,226,318**	**2.01**

MBF = thousand board feet.

lumber recovery factor may be a better metric of productivity in some cases, but it requires cubic volume data to calculate. Washington's lumber recovery factor in 2020 was lower but similar to other nearby states in recent years, which may be counter to expectations (table 16).

From a market perspective, we saw high national lumber prices in 2020. We might expect high lumber prices to drive recovery up as operators maximize fiber in primary products rather than byproducts, but lumber prices are not the only market factor that influences recovery. In addition, recovery is affected by log diameter, condition, species mix, and other feedstock variables. Washington recovery trends compared to other states may provide an interesting opportunity for further research.

Pulp and Paper Sector

Unlike many other Western states, Washington has an active pulp and paper sector. In the 2020 census, we identified 12 active facilities across the state that utilize virgin wood fiber originally sourced from the forest. In 2014, the WADNR reported 11 such facilities. The 12 facilities reported producing 1.57 million bone-dry tons (BDT) of shipped pulp totaling $1.15 billion in sales and 1.97 million BDT of shipped paper products totaling $1.09 billion in sales. Due to the large market share of a few companies within the state and industry, additional output information for the pulp and paper sector cannot be disclosed. WADNR (2018) provides information from past surveys.

Table 16—Sawmill and lumber recovery factors from the Forest Industries Data Collection System for Washington and nearby Western states (California, Idaho, Oregon)

	Washington 2020	California 2016	Idaho 2019	Oregon 2017
Lumber overrun	2.01	1.64	1.90	2.14
Lumber recovery factor	8.66	8.72	8.91	8.74

Lumber overrun is the volume of lumber recovered compared to the Scribner log scale prediction. Lumber recovery factor is the volume of lumber recovered compared to an estimate of cubic timber volume input.
Sources: Marcille et al. (2020); Simmons et al. (2021, 2022).

Washington pulp and paper mills reported taking in fiber for pulp from several sources:

Fiber originally intended for pulp production
- Pulpwood logs delivered directly to pulp facilities
- Chips from in-woods mobile chipping units
- Chips from roundwood chipping facilities

Wood products industry residuals
- Chips
- Sawdust
- Planer shavings

Putting all sources of fiber together, Washington pulp and paper mills brought in 3.8 million bone-dry units (BDU[1]) of coarse and fine materials (table 17). About 76 percent of that material came directly from within Washington, while 12 percent came from Oregon and the remainder came from Idaho, Montana, and Canada. The vast majority (93 percent) of the material was coarse, clean chips. As part of that, facilities brought in about 38 MMBF Scribner of roundwood timber, including timber chipped in the woods.

[1] One BDU is equal to 2,400 oven-dry pounds, whereas a bone-dry ton (BDT) is equal to 2,000 oven-dry pounds.

Mill Residuals

In the 2020 census, we requested that producers provide information about their generation, utilization, and sales of residuals. Using these data, we estimated the total residuals produced, as well as residual factors based on mill output. We split mill residuals into three categories:
- Bark—typically removed in the first part of the timber-processing chain
- Fine residuals—planer shavings, sawdust, and sander dust
- Coarse residuals—coarse chips and chippable material, such as slabs, log ends, and trim

According to the 2020 census, Washington mills generated about 3.7 million BDU (4.4 million BDT) of residuals (table 18). Washington, as noted in the previous

Table 17—Washington virgin forest wood-pulp inputs by type from in-state, Oregon, and other[a] sources, 2020

Origin	Roundwood	Coarse residuals and chips	Fine residuals
	MBF SCRIBNER	BONE-DRY UNITS	
Washington	33,487	2,785,557	70,468
Oregon	4,859	438,274	—
Other	—	457,991	98,503
Total	**38,346**	**3,681,822**	**168,971**

Bone-dry unit = 2,400 pounds of oven-dry wood; MBF = thousand board feet.
[a] Other includes Idaho, Montana, and Canada.

Table 18—Production and disposition of Washington mill residues, 2020

Type of residue	Total produced	Pulp and board	Energy	Mulch/bedding/ landscaping	Unspecified use	Unused
	BONE-DRY UNITS					
Coarse	1,964,119	1,561,380	362,272	0	40,467	[a]
Sawdust	596,298	221,626	294,641	80,031	0	[a]
Planer shavings	299,123	93,889	94,882	86,114	24,238	[a]
Bark	786,602	0	512,026	265,500	9,076	[a]
Total	**3,651,176**	**1,876,895**	**1,263,821**	**431,645**	**73,781**	**5,034**

Row and column totals do not sum because masked data is excluded.
Bone-dry unit = 2,400 pounds of oven-dry wood.
[a] Masked to avoid private mill data disclosure.

section, has an active pulp and paper industry, allowing the majority (51 percent) of those residuals to be utilized by the pulp, paper, and board sector. Nearly all—more than 99 percent—of mill residuals produced in Washington were utilized.

Residual factors are described as a function of mill output. For example, the coarse residual factor of 0.38 for 2020 indicates that for every 1,000-board feet lumber tally produced that year, 0.38 BDU of coarse residuals was generated. Comparing residual factors from past WADNR mill reports to census results can be difficult because different data collection methods were used, but they are displayed side-by-side in table 19. The trends in these results may be due to differing methodologies between the various reports. Recent FIDACS studies in Oregon, California, and Idaho show similar residual factors to the values reported here (table 20).

Product Flow and End Uses

Roundwood timber and various forest products are typically measured in a variety of units, including 1,000 board feet (MBF) Scribner, green tons, bone-dry tons, and others. By converting the raw timber, intermediate products, and final products into units of 1,000 cubic feet (MCF), we can track and illustrate the flow of wood fiber through the primary processing sector across all products (fig. 4). Using data collected by the 2020 census, the following timber conversion factors were developed from log size specifications, as well as product and residual recovery information:

- 4.33 board feet Scribner per cubic foot for sawlogs
- 4.46 board feet Scribner per cubic foot for veneer logs
- 2.26 board feet Scribner per cubic foot for pulp logs
- 4.94 board feet Scribner per cubic foot for all other products
- 4.15 board feet Scribner per cubic foot as a statewide weighted average

Table 19—Washington's sawmill residual factors for select years

Type of residue	2000	2004	2008	2012	2016	2020
	BDU/MBF LUMBER TALLY					
Coarse	0.44	0.35	0.38	0.40	0.25	0.38
Sawdust	0.18	0.18	0.18	0.18	0.09	0.13
Planer shavings	0.17	0.15	0.16	0.15	0.06	0.08
Bark	—	0.21	0.20	0.22	0.13	0.12
Total	**0.80**	**0.90**	**0.92**	**0.95**	**0.53**	**0.71**

Residual factors are shown as a function of mill output wherein values indicate the number of bone-dry units (BDUs) per 1,000 board feet (MBF) of lumber tally.

Bone-dry units = 2,400 pounds of oven-dry wood, — = data unavailable.

Sources: Smith et al. (2014, 2017); Stephenson et al. (2010); Van Schoorl et al. (2006, 2007).

Table 20—Residual factors from the Forest Industries Data Collection System for Washington and nearby Western states (Idaho, Oregon, California)

Type of residue	WA 2020	ID 2019	OR 2017	CA 2016
	BDU/MBF LUMBER TALLY			
Coarse	0.38	0.36	0.36	0.33
Sawdust	0.13	0.12	0.13	0.14
Planer shavings	0.08	0.06	0.07	0.10
Bark	0.12	0.15	0.16	0.21
Total	**0.71**	**0.69**	**0.72**	**0.78**

Residual factors are shown as a function of mill output wherein values indicate the number of bone-dry units (BDUs) per 1,000 board feet (MBF) of lumber tally.

Bone-dry units = 2,400 pounds of oven-dry wood.

Sources: Marcille et al. (2020); Simmons et al. (2021, 2022).

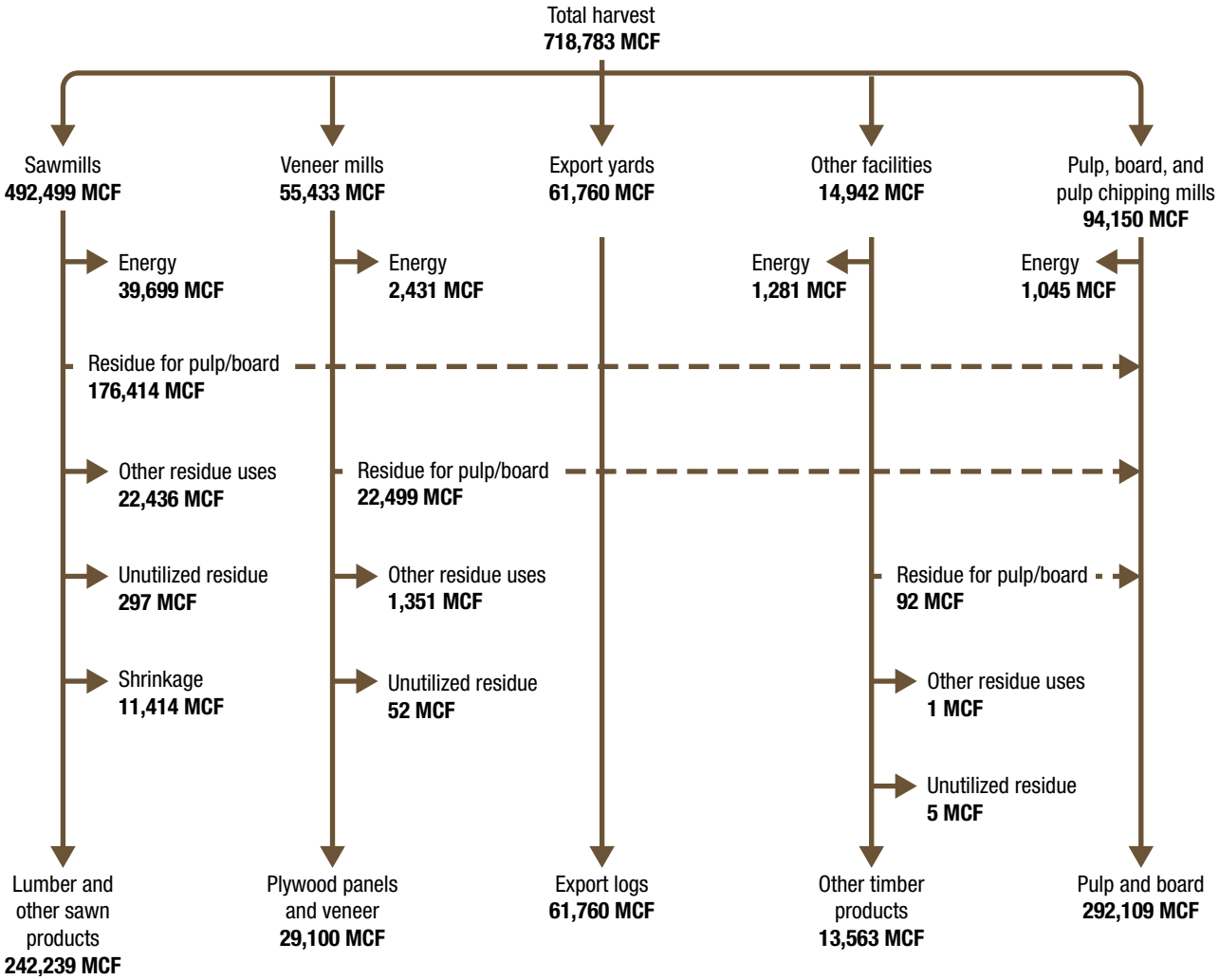

Figure 4—Flow of wood fiber from Washington's 2020 timber harvest through primary and residual wood processing sectors. Total harvest volume does not include bark; other facilities include utility pole, house log and log home producers, and specialty cedar products; and other uses include landscape, mulch, and animal bedding. MCF = thousand cubic feet.

Washington's 2020 total timber harvest was about 718.8 million cubic feet. Of the total harvest, 69 percent went directly to sawmills; 13 percent went directly to pulp, board, and chipping plants; 9 percent went to export yards; 8 percent went to veneer mills; and the remaining 2 percent went directly to other facilities in the post and pole, house log, specialty cedar, and energy sectors.

Looking at the end-uses of wood products in Washington, in 2020 about 41 percent of all harvested wood fiber was utilized by the pulp, paper, and board sector, while 34 percent found its way into finished sawn products. About 6 percent (44,456 MCF) went to generating electricity and operating kilns, while the remaining 104,423 MCF was distributed among the many other end uses for wood fiber. We found that 355 MCF (less than 1 percent of all wood fiber) was not used after leaving the woods.

Economic Impacts

Sales Value

Washington's primary producers reported total sales of $5.60 billion in the 2020 census (table 21). About 45 percent ($2.54 billion) of sales were in the sawmill sector, 40 percent ($2.24 billion) of sales were in the pulp and paper sector, 8 percent ($432 million) of sales were in the veneer and plywood sector, and the remaining 7 percent ($393 million) of sales were in other sectors. In addition, mills sold their residuals for a combined $279 million.

The majority (53 percent) of primary sales were intrastate. International customers were the next largest market segment, accounting for just more than $1 billion (19 percent) of Washington's primary wood products. On the far side of the domestic market, the Northeast,

South, and North Central regions combined for $512 million (9 percent) of sales. Looking further west, producers reported $258 million (5 percent) of sales going to the Rocky Mountain region. The other west coast states (Alaska, California, Oregon) and Hawaii contributed $811 million (14 percent). Nearly all (99 percent) of mill residual sales were in state.

Because mills distribute their products through a combination of selling agents, independent wholesalers, and their own channels, these numbers may not reflect the final destinations of the sold wood products.

Employment and Income

Beyond primary manufacturing, the forest products industry contributes to the Washington economy throughout its supply chain. The North American Industrial Classification System (NAICS) is used to define the various sectors within the industry: forestry and logging (NAICS 113), forestry support activities (NAICS 1153), wood products manufacturing (NAICS 321), and paper manufacturing (NAICS 322). We further disaggregate NAICS 321 and NAICS 322 into primary and secondary activity. For example, a paper converting facility that purchases raw paper and produces tissue paper would be a secondary paper manufacturing facility within NAICS 322. These NAICS sectors represent a conservative estimate of the effect of the wood products industry. Key elements of the supply chain are not always included in these estimates, and they are difficult to account for using the methods presented here. Important absences include log-hauling companies, road construction companies, lumber wholesalers, and services carried out by governmental agencies and nonprofit organizations.

Our employment and labor income estimates combine results from the 2020 Washington FIDACS census with data from the U.S. Bureau of Labor Statistics' Quarterly Census of Employment and Wages, the U.S. Department of Commerce, Bureau of Economic Analysis' Regional Economic Accounts, and the U.S. Department of Commerce,

Table 21—Destination and sales value of Washington's primary wood products and mill residues, 2020

Product	Washington	Other Far West States[a]	Rocky Mountain States[b]	Northeast[c]	South[d]	North Central States[e]	Other countries[f]	Total
				THOUSAND 2020 DOLLARS				
Lumber, timber, and other sawn products	1,550,739	364,678	126,952	76,441	16,936	123,322	282,501	2,541,569
Pulp and board	1,167,098	339,733	115,585	91,905	9,867	99,798	413,748	2,237,734
Other products[g]	157,359	34,520	3,825	—	—	—	197,261	392,964
Veneer and plywood	86,957	71,891	11,564	57,820	—	36,344	167,800	432,375
Total primary wood products	2,962,153	810,821	257,926	226,166	26,803	259,464	1,061,310	5,604,643
Mill residues	278,379	654	—	—	—	—	—	279,033

— = no sales values.
[a] Other Far West States includes Alaska, California, Hawaii, and Oregon.
[b] Rocky Mountain States includes Arizona, Colorado, Idaho, Montana, New Mexico, Utah, and Wyoming.
[c] Northeast includes Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont.
[d] South includes Alabama, Arkansas, Delaware, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia.
[e] North Central States include Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin.
[f] Other countries refers to products being shipped outside the United States.
[g] Other products include post and poles, clean chips, specialty cedar prodcuts, houselogs, energywood, and export logs.

Census Bureau's County Business Patterns (USDC BEA 2020a, 2020b; USDC CB 2020; USDL BLS 2020).

In 2020, total employment in the Washington forest products industry was estimated at 28,154 full- and part-time workers (fig. 5). This is lower than previous years, and the lowest employment level since 1998. Following the sharp decrease caused by the Great Recession, Washington has seen a slight but steady decline in forest industry employment. This is in line with other Western states (Marcille et al. 2021, Simmons et al. 2021).

The forestry support sector has been increasing as a proportion of total forest industry employment in several Western states over recent years, but not in all Western states (Hayes et al. 2021a, Marcille et al. 2020). Washington and Oregon, two states with relatively large forest products industries, have not seen this proportional increase (Simmons et al. 2021).

Labor income measures the total income reported by workers within a given industrial sector. It includes wages and salaries, benefits, intersector income, and

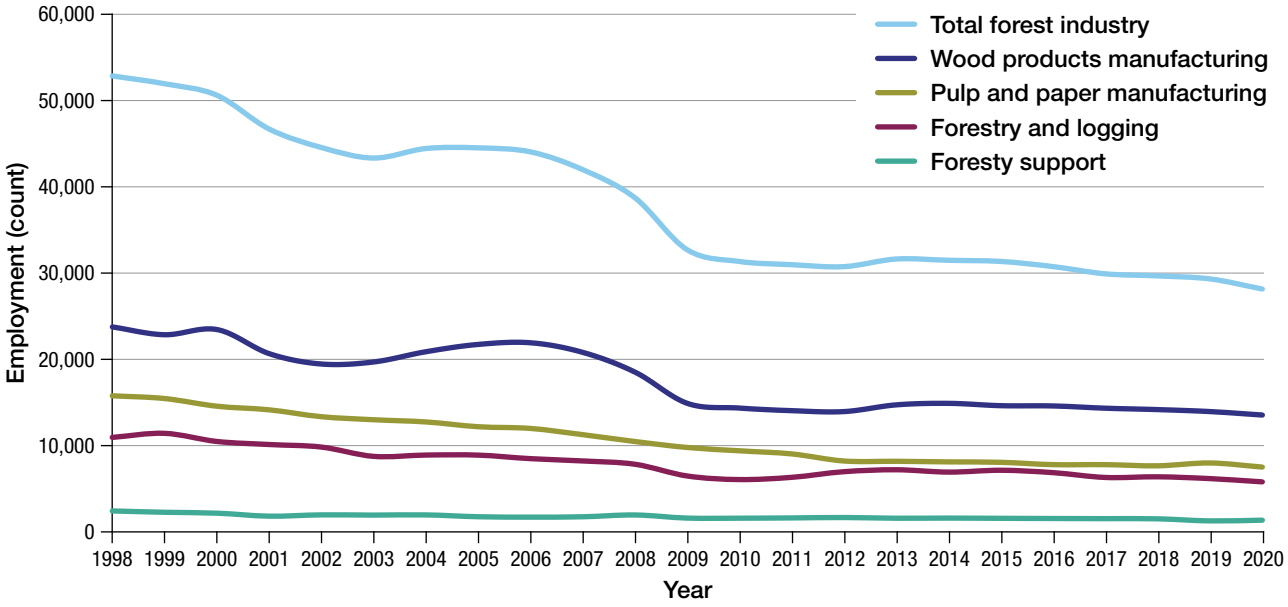

Figure 5—Washington forest industry employment by sector, 1998–2020.

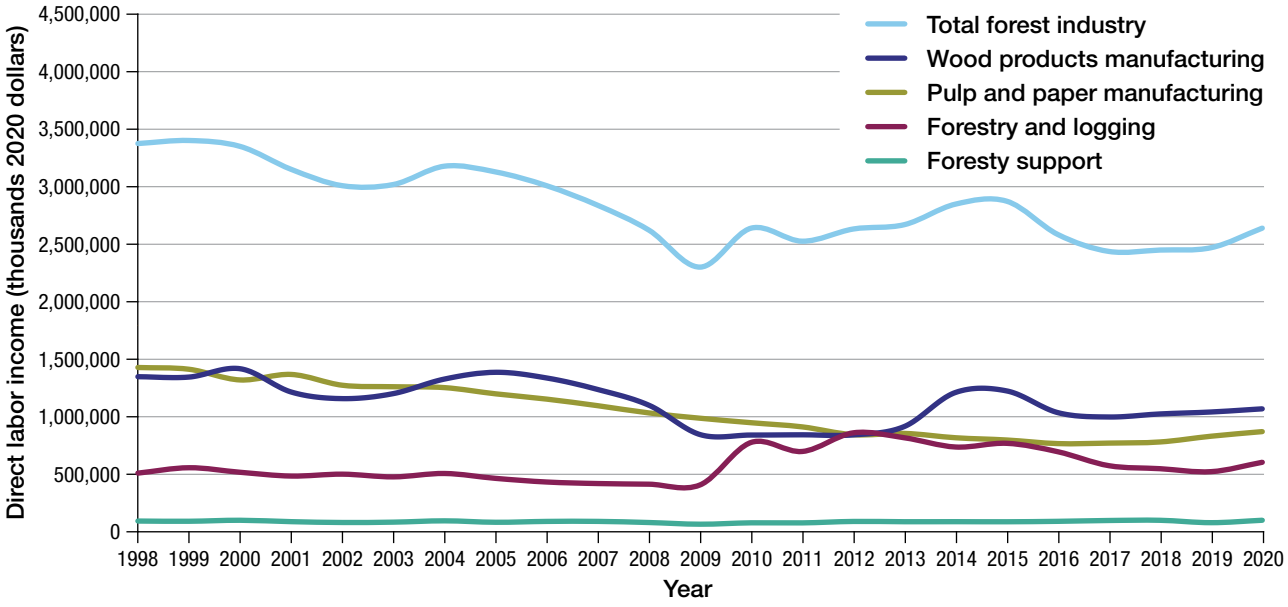

Figure 6—Washington forest industry direct labor income by sector, 1998–2020.

government transfers. Over the past 30 years, labor income across the sector has been volatile compared with employment, especially in the forestry, logging, and wood products manufacturing sectors. Employers frequently add or reduce workers' hours before hiring or firing workers, so this is to be expected.

While employment decreased between 2019 and 2020, inflation-adjusted labor income increased from $2.47 billion (2019) to $2.64 billion (2020) over the same period (fig. 6). This is a common trend throughout the West, primarily tied to the early days of the COVID-19 pandemic: increased hours per worker, increased pay and bonuses, and increased government transfers.

Economic Contributions

The forest products industry also supports industries beyond those directly involved in the harvesting and manufacturing process. For example, manufacturing facilities purchase machinery and hire accounting firms, and the wages paid to workers are used at the grocery store and doctor's office. One way to account for these indirect contributions to the economy—money spent by forest products companies on products and services in other industries—and induced contributions to the economy—money spent by forest products workers—is with the use of an economic input-output model. We use type I and type II multipliers from the Bureau of Economic Analysis' RIMS II input-output model to estimate these contributions (USDC BEA 2023) (table 22).

The largest sector in terms of both employment (49,190 jobs) and income ($3.88 billion) contributions is wood products manufacturing. Most of the sector's contributions come from facilities involved in secondary manufacturing, such as window, door, and truss manufacturers that purchase lumber from sawmills. The second largest contributor is the pulp and paper industry with 30,733 jobs and $2.62 billion in income. Note that the wood products manufacturing and pulp and paper industry contributions cannot be added together because they contain many of the same workers and income. For example, some of the work performed in harvesting trees for lumber production is also captured as harvesting trees for pulp production.

Table 22—Employment and labor income contributions from Washington's forest industry, 2020

Sector	Direct employment	Indirect and induced employment	Total employment contribution[a]	Direct labor income	Indirect and induced labor income	Total income contribution
				THOUSAND 2020 DOLLARS		
Forestry and logging	5,797	10,009	15,806	604,256.00	620,027.08	1,224,283.08
Forestry support activities	1,357	424	1,781	100,235.01	44,925.33	145,160.35
Wood product manufacturing	13,487	35,703	49,190	1,064,486.00	2,817,907.34	3,882,393.34
Primary wood product manufacturing	6,386	8,192	14,579	572,385.78	795,330.04	1,367,715.83
Secondary wood product manufacturing	7,101	21,984	29,084	492,100.22	990,794.58	1,482,894.80
Pulp and paper manufacturing	7,513	23,260	30,773	870,901.00	1,753,472.07	2,624,373.07
Primary paper manufacturing	4,100	12,692	16,792	528,346.06	1,063,771.95	1,592,118.01
Secondary paper manufacturing	3,413	6,484	9,898	342,554.94	585,357.89	927,912.83
Total forest industry	**28,154**	[a]	[a]	**2,639,878.01**	[a]	[a]

[a] Indirect and induced employment and labor income should not be summed for multiple sectors because some employment and income shows as both direct contributions to their own sector as well as indirect contributions to other sectors.

Sources: USDC BEA (2020a, 2020b); USDC CB (2020); USDL BLS (2020).

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Metric Equivalents

When you know:	Multiply by:	To find:
Acres	0.405	Hectares
Cubic feet	0.028	Cubic meters
Pounds	0.454	Kilograms
Tons	907	Kilograms

Species Referenced in This Report

Common name	Scientific name	Authority
Pacific silver fir	*Abies amabilis*	(Douglas ex Loudon) Douglas ex Forbes
White fir	*Abies concolor*	(Gord. & Glend.) Lindl. ex Hildebr.
Grand fir	*Abies grandis*	(Douglas ex D. Don) Lindl.
Subalpine fir	*Abies lasiocarpa*	(Hook.) Nutt.
Bigleaf maple	*Acer macrophyllum*	Pursh
Red alder	*Alnus rubra*	Bong.
Walnut	*Juglans* spp.	L.
Western larch	*Larix occidentalis*	Nutt.
Engelmann spruce	*Picea engelmannii*	Parry ex Engelm.
Sitka spruce	*Picea sitchensis*	(Bong.) Carrière
Lodgepole pine	*Pinus contorta*	Douglas ex Loudon
Western white pine	*Pinus monticola*	Douglas ex D. Don
Ponderosa pine	*Pinus ponderosa*	Lawson & C. Lawson
Black cottonwood	*Populus trichocarpa*	Torr. & A. Gray ex. Hook.
Douglas-fir	*Pseudotsuga menziesii*	(Mirb.) Franco
Oak	*Quercus* spp.	L.
Western redcedar	*Thuja plicata*	Donn ex D. Don
Western hemlock	*Tsuga heterophylla*	(Raf.) Sarg.

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