



**FOREST INDUSTRY
RESEARCH PROGRAM**
UNIVERSITY OF MONTANA

Timber Use, Processing Capacity and Capability of Mills to Utilize Timber by Diameter Size Class Within the Flathead National Forest Timber-Processing Area

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Introduction

In recent years, fires and insect outbreaks have been the leading source of tree mortality from natural causes in Montana, totaling 932 million cubic feet (MMCF) annually on average (MT DNRC, 2020). In the counties where the Flathead National Forest (NF) is located, annual mortality across all ownerships from insect and disease on timberland¹ is estimated to be 41 MMCF, accounting for 50 percent of total annual mortality in the study area (USDA, 2021). Mortality caused by wildfires is estimated at 31 MMCF annually, accounting for another 37 percent of total mortality. In comparison, logging and other human-caused mortality accounted for only 7 percent of total annual mortality; remaining mortality is from other (i.e. weather, animals, vegetation) or unknown causes (USDA, 2021).

The state of Montana and the U.S. Forest Service have increased investments in forest health, hazardous fuels mitigation and safety protection on private and public lands through former Governor Bullock's Forests in Focus investments and more recently through the Shared Stewardship Initiative launched by the USDA Forest Service. These treatments, designed to restore ecological condition and function and reduce fire hazard, often require the removal of a mix of timber valuable enough to offset some of the costs along with smaller trees with limited value and markets (Wagner et al. 2000).

The loss of milling infrastructure throughout the West during the 1990s and 2000s, combined with changing management objectives on federal lands, has raised questions about the industry's ability to purchase and use timber of varying sizes and quality at a rate adequate for forest management goals and economically sustainable for the industry (Keegan et al. 2005; Keegan et al. 2006). The expressed need to treat millions of acres in the western United States to meet management objectives has made accurate information on timber milling capacity and

¹ Timberland: Forest land that is producing or is capable of producing crops of industrial wood and not withdrawn from timber utilization by statute or administrative regulation. (Note: Areas qualifying as timberland are capable of producing at least 20 cubic feet per acre per year of industrial wood in natural stands. Currently inaccessible and inoperable areas are included.)

the capability of mills to handle timber of various sizes an important consideration for managers.

Goals and Objectives

This report was prepared by the Forest Industry Research Program at the University of Montana's Bureau of Business and Economic Research (BBER) as a forest planning and project level support document for the Flathead National Forest (hereinafter Flathead NF) and seeks to:

1. examine the harvest of timber from the counties containing Flathead NF timberland – the “study area”;
2. analyze the timber flow and identify the Flathead NF “timber-processing area” – the counties containing facilities that received timber harvested from the study area; and
3. describe the number and types of facilities and quantify their total capacity to process timber, their capability to use timber of various sizes, and their capacity utilization rates.

The study focuses on facilities that exclusively use timber in round form (i.e., logs).

Facilities that use only mill residuals (e.g., sawdust or chips) are not included.

Flathead National Forest Study Area

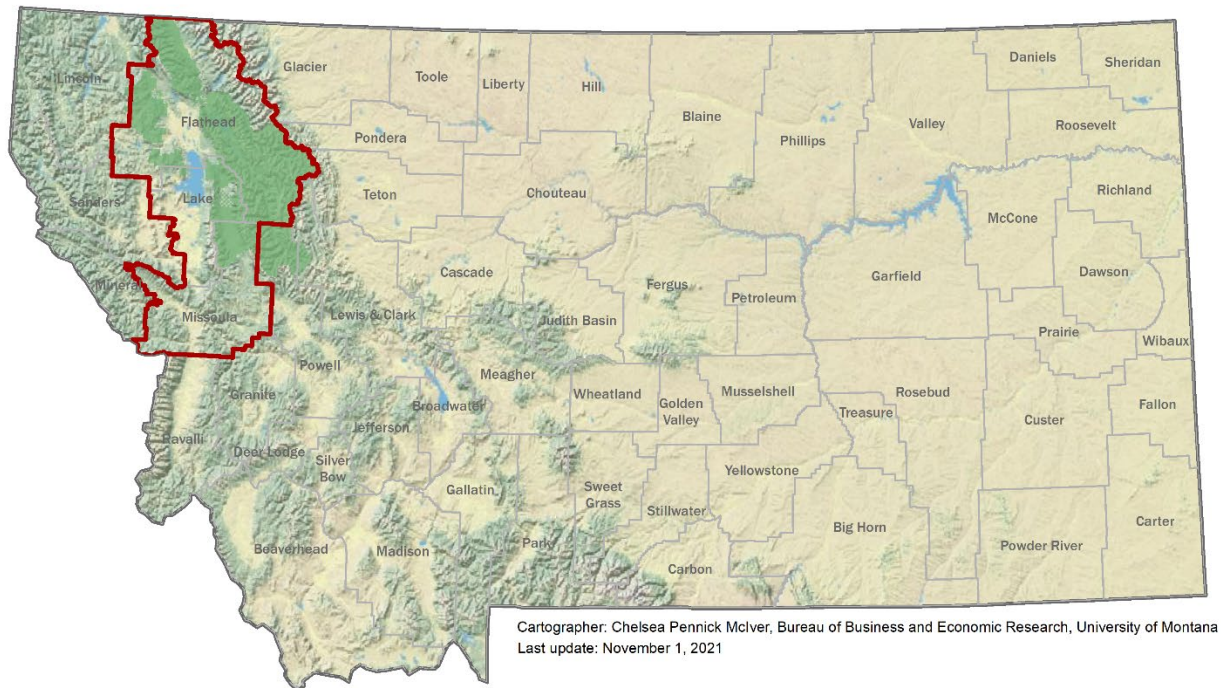


Figure 1 – Flathead National Forest and Study Area.

The Flathead NF study area is situated in the western region of Montana, spreading over four counties: Flathead, Lake, Lincoln and Missoula (figure 1). The resulting study (excluding Lincoln county which only contains a negligible portion of the Flathead National Forest) area contains approximately 3.6 million acres of timberland (USDA 2021), of which 55 percent (1.9 million acres) is managed by the USDA Forest Service (table 1).

Table 1 – Acres of timberland¹ by county and ownership in the Flathead NF Study Area.

County	National Forest	Private	Bureau of Land Management	State	County or Municipal	Total
Flathead	1,141,130	424,278	-	134,113	-	1,699,521
Lake	152,088	322,387	-	48,199	-	522,674
Missoula	652,301	454,645	19,522	182,380	4,495	1,313,343
Grand Total	1,945,519	1,201,310	19,522	364,692	4,495	3,535,538

¹Timberland: Forest land that is producing or is capable of producing crops of industrial wood and not withdrawn from timber utilization by statute or administrative regulation. (Note: Areas qualifying as timberland are capable of producing at least 20 cubic feet per acre per year of industrial wood in natural stands. Currently inaccessible and inoperable areas are included.).

Source: USDA Forest Service, Forest Inventory and Analysis Program, Tue Jan 29 20:47:43 GMT 2019. Forest Inventory EVALIDator web-application Version 1.8.0.00. St. Paul, MN: U.S. Department of Agriculture, Forest Service, Northern Research Station. [Available only on internet: <http://fsxopsx1056.fdc.fs.usda.gov:9001/Evalidator/evalidator.jsp>].

The total volume of timber harvested and utilized from all ownerships in the study area was estimated at 285,278 CCF (111,940 MBF) in 2018 (table 2). National forests contributed 28 percent (80,473 CCF) of the timber harvested in the study area's three counties. Of the other ownerships contributing to the study area's timber harvest, private and tribal timberlands accounted for 32 percent (90,049 CCF), state lands contributed 27 percent (76,930 CCF), industrial lands contributed nearly 12 percent (34,478 CCF), while BLM and other publicly-owned lands accounted for the remaining 1 percent (3,348 CCF). Timber from Flathead NF accounted for 72 percent of the National Forest timber harvested from the study area, with small volumes from surrounding national forests making up the balance. The species composition of the timber harvested in the study area was heavily weighted to Douglas-fir (38 percent), followed by lodgepole pine (15 percent), western larch (15 percent), ponderosa pine (14 percent), grand fir (8 percent), Engelmann spruce (6 percent), and smaller volumes of subalpine fir, western redcedar, western hemlock and western white pine (Hayes et al., 2021).

Table 2 – Timber harvest by county and ownership in the Flathead NF Study Area, 2018.

County	National Forest	Private & Tribal	State	Industry	Other Public	Grand Total
----- Hundred cubic feet (CCF) -----						
Flathead	57,957	40,718	25,838	32,705	-	157,218
Lake		21,060	22,273	958	-	44,291
Missoula	22,516	28,271	28,819	815	3,348	83,769
Grand Total	80,473	90,049	76,930	34,478	3,348	285,278

Source: Hayes et al. 2021

Flathead NF Timber-Processing Area

Timber Flow Trends – Into Study Area

Facilities in the study area received 731,523 CCF (287,556 MBF) of timber in 2018, making the region a net importer of timber. Of the timber received and processed by mills, 35 percent came from national forest timberlands in Montana and neighboring states. Private (industrial and non-industrial) timberlands in the study area provided 41 percent and state timberlands supplied 19 percent. The Bureau of Land Management provided 2 percent of timber received by mills in the study area, and tribal lands provided another 3 percent. The remaining timber received by mills came from a mix of other public and Canadian sources.

Timber Flow Trends – Out of Study Area

Of the 285,278 CCF (111,940 MBF) of timber harvested in the Flathead NF study area in 2018, approximately 60 percent (172,069 CCF) was processed in the county of harvest, and 40 percent (113,209 CCF) was processed elsewhere within the study area (table 3). Seven percent (19,998 CCF) of the harvest from the study area was processed in Idaho, up from just 1 percent in 2011 (Sorenson et al. 2012).

Table 3 - Timber flow from the Flathead NF Study Area, 2018.

County of harvest	Processed within the county of harvest	Processed elsewhere within study area	Processed outside study area
<i>----- percentage of harvest by county -----</i>			
Flathead	79	21	0
Lake	14	76	0
Missoula	49	51	0
Grand Total	60	40	0

Source: Hayes et al. 2021; Simmons et al. (in prep)

Based on analysis of timber flow trends, 12 counties were identified as encompassing the Flathead NF TPA. In addition to the three Montana counties in the study area, six other counties in Montana and three counties in Idaho contained mills that received timber from the

study area. A total of 67 primary wood products facilities operate within the TPA, of which 36 met the criteria above (table 4). Twenty-two of the 36 active facilities in the TPA were located within the three-county study area and three of the remaining facilities were located out-of-state.

Table 4 – Active timber-processing facilities included in the Flathead NF timber-processing area, 2021

Type	2021^a
Sawmill	17
Plywood/veneer	1
Post or pole	6
Log home/house log	8
Roundwood chipping/pulp	1
Log furniture	2
Firewood and Cedar Products	1
Total	36

^aHayes et al. 2021; Simmons et al. (in prep)

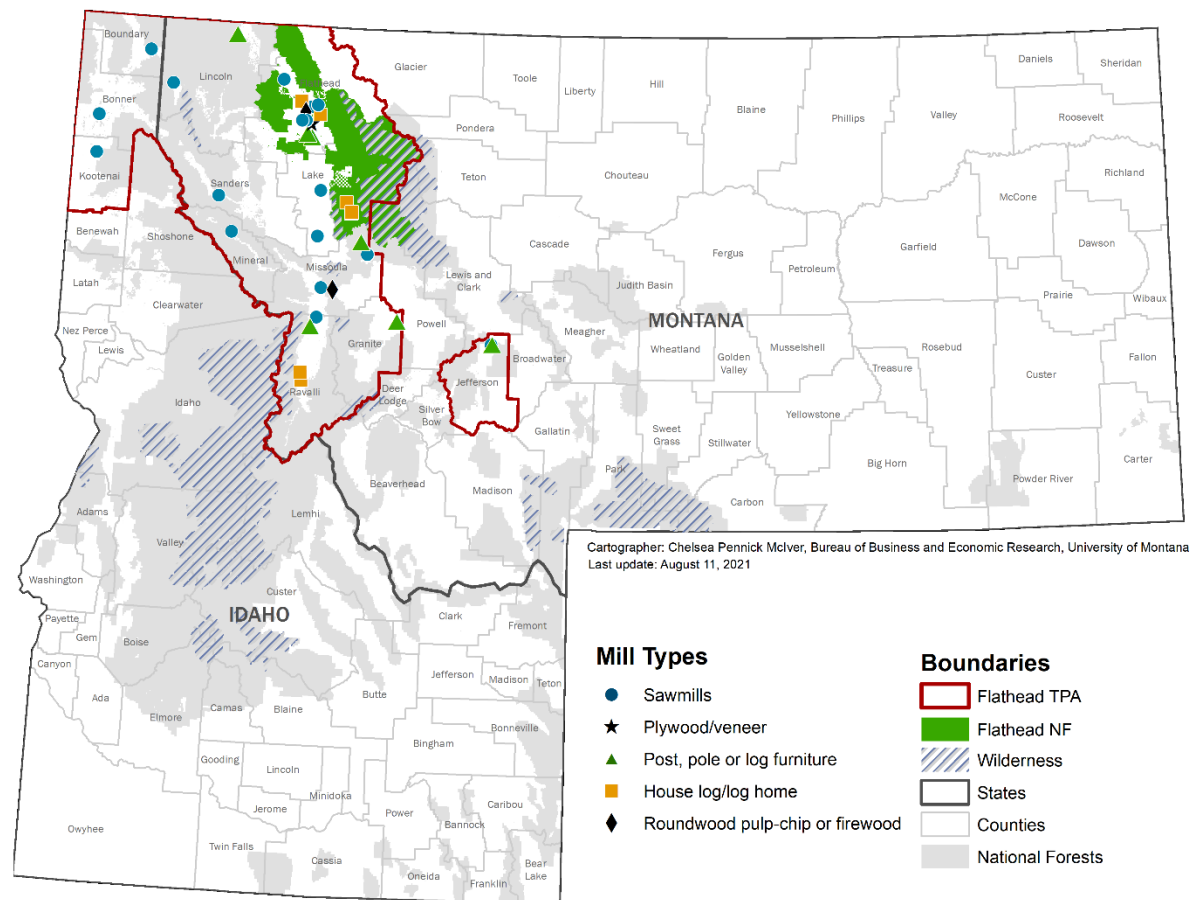


Figure 2 – Location and type of timber-processing facilities receiving timber from the Flathead NF study area.

Timber-Processing Capacity, Capability, and Utilization

Capacity to process timber in the Flathead NF TPA during 2021 was 1,555,387 CCF (653,052 MBF) and was adjusted to reflect the announcement that Idaho Forest Group would be idling the St. Regis mill in the fall of 2021 (table 5)(Chaney 2021). Capacity within the study area was 716,490 CCF (271,979 MBF), down just slightly from 2011 (Sorenson et al. 2012). Timber-processing capacity within the study area represented 46 percent of the total capacity

in the TPA. More than 60 percent (938,706 CCF or 411,852 MBF) of timber-processing capacity in the Flathead NF TPA is not capable of efficiently utilizing trees less than 10 inches dbh.

Capability to efficiently utilize trees 7-9.9 inches dbh accounts for 31 percent of total timber-processing capacity; while 9 percent of total capacity in the TPA can efficiently utilize trees less than 7 inches dbh. Fifty-seven percent of total capacity to process timber in the TPA resides with mills in Montana. Slightly less than half (47 percent) of capacity in the 7-9.9-inch size class resides in Montana while slightly more than half (56 percent) of the capability unable to process trees less than 10 inches dbh resides in Montana. Of note, all of the capability to process timber less than 7-inch dbh resides in Montana.

Table 5 – Annual capacity and capability of mills to process trees by size class in the Flathead NF TPA, 2021^a

<i>Hundred cubic feet (CCF)</i>		<i>Thousand board feet, Scribner (MBF)</i>	
Tree dbh	Capability	Tree dbh	Capability
< 7 in.	137,953	< 7 in.	32,596
7 - 9.9 in.	478,728	7 - 9.9 in.	208,604
≥ 10 in.	938,706	≥ 10 in.	411,852
Total capacity	1,555,387	Total capacity	653,052

Source: Hayes et al. 2021; Simmons et al. (in prep)

^aDoes not include IFG-St. Regis mill

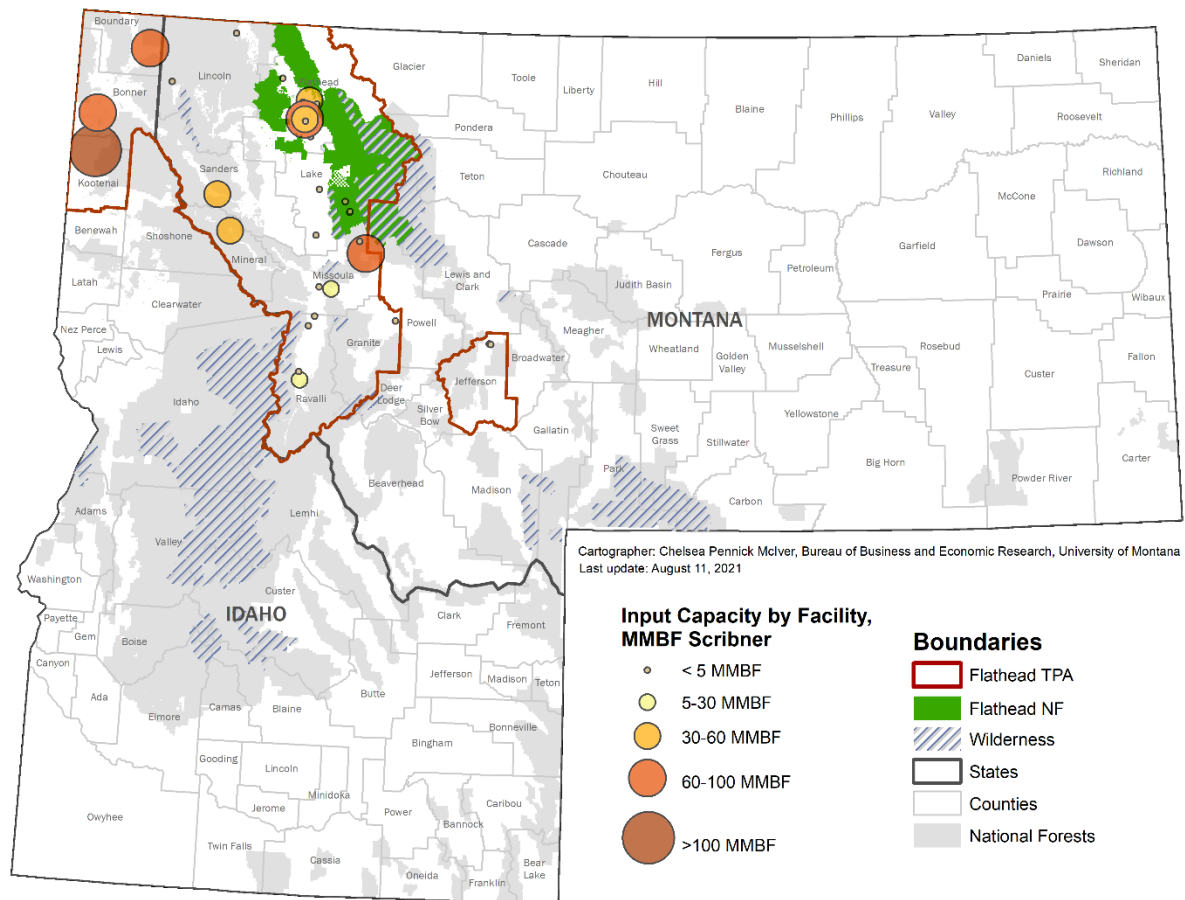


Figure 3 – Capacity of mills receiving timber from the Flathead NF study area.

Mills in the TPA processed 1,176,057 CCF (517,426 MBF) of timber in 2018--the most recent year in which a full census was conducted. Assuming a similar level of production in 2021, approximately 76 percent of total 2021 capacity (on a cubic foot basis) within the TPA would have been utilized. Slightly less than half of the timber processed in the TPA was processed in Montana (45 percent). Trees with dbh 10 inches or greater comprised 64 percent of the annual volume processed in the TPA, while 34 percent came from trees 7-9.9 dbh, and two percent was made up of trees less than 7 inches dbh (table 6). Comparing 2018 utilization trends to 2021 capacity, unused capability was distributed across all size classes, but was highest (on a cubic foot basis) for the smallest and largest size classes. However, mills used just 17 percent of their capability to process trees less than 7 inches dbh, representing unutilized

capability of 114,990 CCF (26,270 MBF) in this smallest tree size class, while utilization for the remaining two size classes remained between 80 and 85 percent.

Table 6 – Annual volume of timber processed by tree size class for the Flathead NF TPA, 2018.

<i>Hundred cubic feet (CCF)</i>		<i>Thousand board feet, Scribner (MBF)</i>	
Tree dbh	Volume used	Tree dbh	Volume used
< 7 in.	22,963	< 7 in.	6,326
7 - 9.9 in.	401,012	7 - 9.9 in.	174,393
≥ 10 in.	752,082	≥ 10 in.	336,707
Total processed	1,176,057	Total processed	517,426

Source: Hayes et al. 2021; Simmons et al. (in prep)

Discussion

The capacity and capability information used in this report represent mills that received timber from the study area's three counties and characterizes market dynamics in 2018-2019 with some updates to capacity changes in 2021. The steep rise and decline in finished wood product prices that took place in 2020 and 2021 combined with the focus on post-fire salvage harvest in 2018 and 2019 may have changed the ability of some mills to draw timber from more distant locations, potentially impacting the size and overall capacity of the Flathead TPA. The authors estimate that in 2018, 335,455 CCF of additional timber-processing capacity existed among mills in the TPA counties that did not receive timber from the study area in 2018-2019. Most of these mills were post and small pole, log furniture and log home manufacturers that either do not consume large quantities of timber or rely upon timber with specific size and species characteristics. Nearly all of the TPA mills that did not receive timber from the study area were located outside the study area. A list of all mills residing in the TPA regardless of whether they received and processed timber from the Flathead NF study area is included in Appendix A.

Over the last two decades, the size and composition of the forest products industry in the Flathead NF TPA has changed, primarily marked by a reduction in the total number of facilities operating in the region (Figure 4). This follows a similar trend across the western US (Keegan et al. 2006). Figure 4 displays the number and type of timber-processing facilities

included in each of the last three capacity reports for the Flathead National Forest along with the number of counties included in the TPA for each analysis year (red line).

A total of 78 facilities were located in the Flathead TPA in 2011, down from 135 in 2004 (Sorenson et al. 2012). As of 2018, 67 facilities were located in the Flathead TPA of which 35 actually received timber from the study area. As mentioned previously, between 2011 and 2018, the size and geographic distribution of the Flathead TPA increased from 9 to 12 counties and shifted to the west to include three Idaho counties. Furthermore, while the total number of facilities declined slightly, the total capacity to process timber within the 2021 TPA was 39 percent greater than in 2011, due to a combination of the inclusion of Idaho counties as well roundwood chipping capacity.

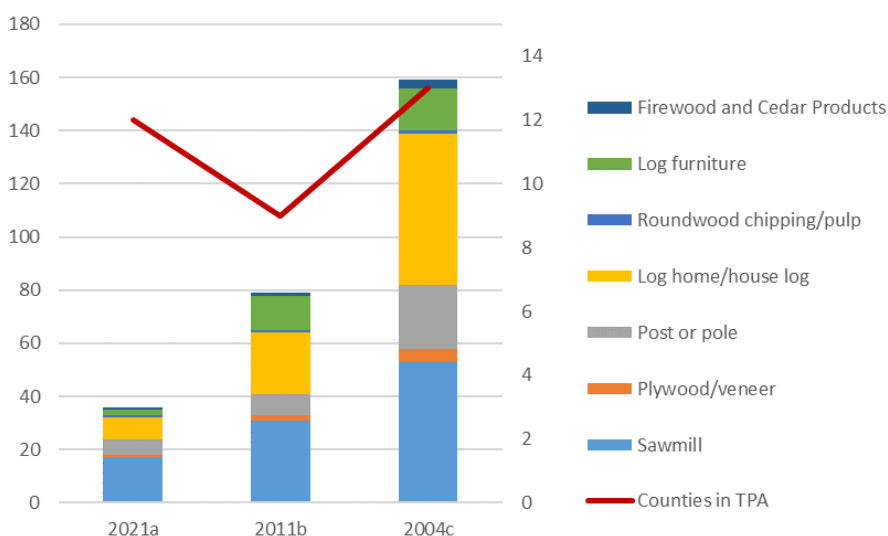


Figure 4—Number of timber-processing facilities and counties included in Flathead NF TPA, selected years.

Between 2004 and 2011, the size of the TPA decreased from 13 to 9 counties, perhaps as a result of the recession and poor markets for logs (Keegan, Morgan and Spoelma 2004; Sorenson et al. 2012). Since 2011, the size of the TPA increased from 9 to 12 counties and shifted westward to include three Idaho counties. The reason for this expansion was due in part to the decision by the authors to be more comprehensive when considering counties for inclusion in the TPA; while still small as a share of total timber processed, the three counties in

Idaho made up 7 percent of timber harvested in the Flathead study area, up from 1 percent in 2011 and 2004 (Sorenson et al. 2012).

Spatial distribution of capacity

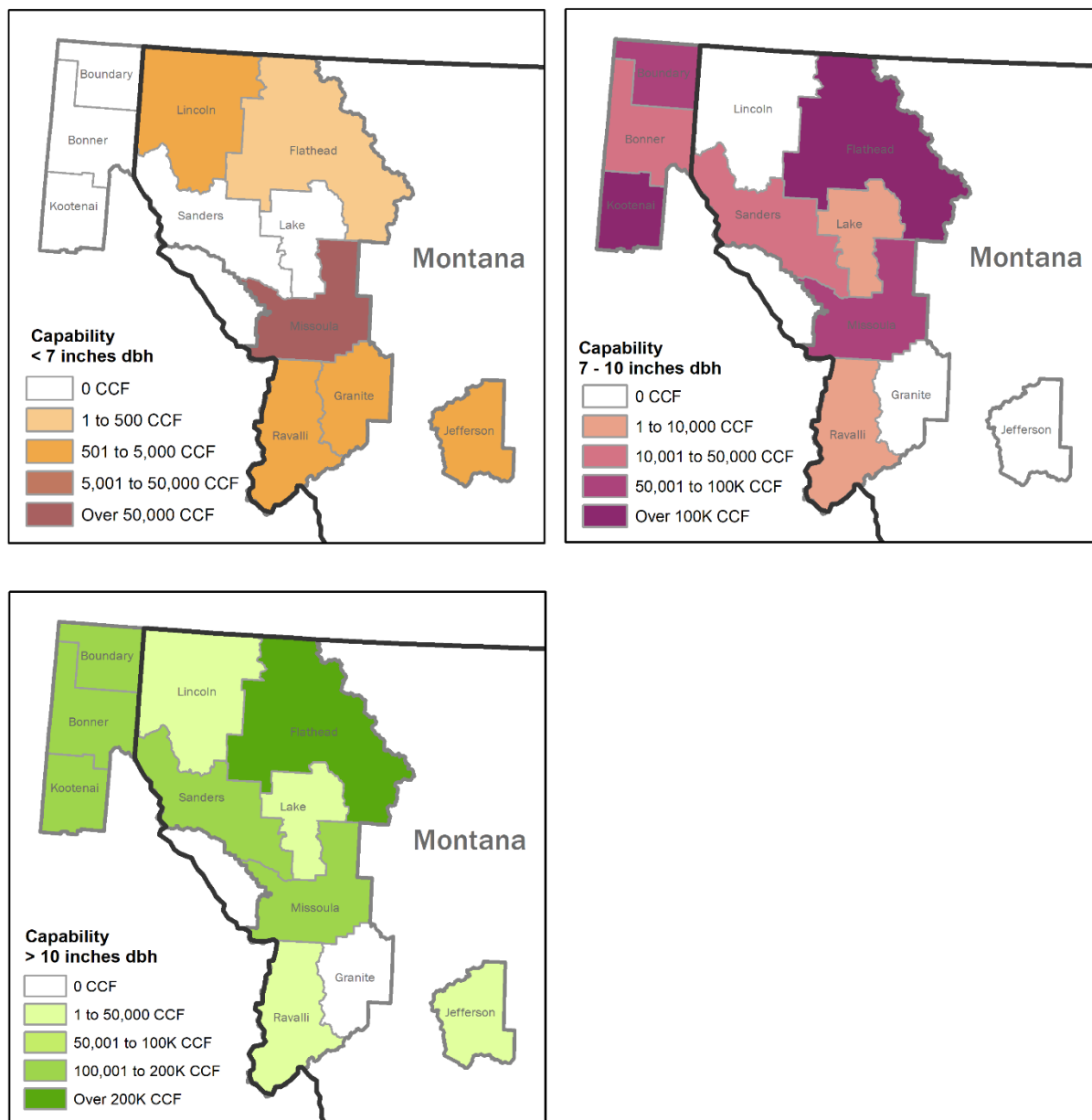


Figure 5 – Capacity to process logs by size class among mills receiving timber from the Flathead NF study area.

As demonstrated in Figure 5, the spatial distribution of capacity varied significantly by capacity size class. As noted earlier, capacity is closely tied to characteristics of specific

products and the configuration of sawmills. Capability to process trees in the smallest size class was concentrated in counties with roundwood chipping operations and post and small pole facilities. Capability in the 7 to 10-inch dbh category was distributed across multiple counties containing stud mills. Remaining capability not able to process trees <10 inches dbh was largely concentrated in house log facilities, veneer/plywood manufacturers and random length mills. It is worth reiterating that capability estimates represent the maximum volume of timber in the smallest size class that a facility can process economically, and does not necessarily preclude utilization of larger trees. For example, Figure 5 characterizes Lincoln County as having capability in both the smallest and largest size classes and none in the size 7-9.9 inch class. However, some of the capability designated in the less than 7 inch size class could likely also accommodate material in the 7 to 9.9 inch size class.

A moderate amount of the capability to use smaller diameter trees was being used to process larger trees or going unused. Slightly more than 15 percent of capability in the less than 7-inch dbh category was utilized to process trees less than 7-inch dbh, while nearly 80 percent of capability in the 7 to 9.9-inch dbh category was being used to process trees 7 to 9.9-inch dbh. Overall, mills receiving timber from the study area exhibited unused capability in all size classes during 2018 (figure 6). However, there was also evidence that some mills took in more timber in a size class than was economical for them to process. For example, mills in Kootenai County together took in 5,621 CCF more timber in the 7 to 10-inch dbh class than they were estimated to efficiently and economically process. Granite, Jefferson and Ravalli and Lincoln counties also took in more timber in this size class than they were estimated to efficiently process, perhaps

owing to the higher than average volume of salvage harvest occurring in the region during 2018.

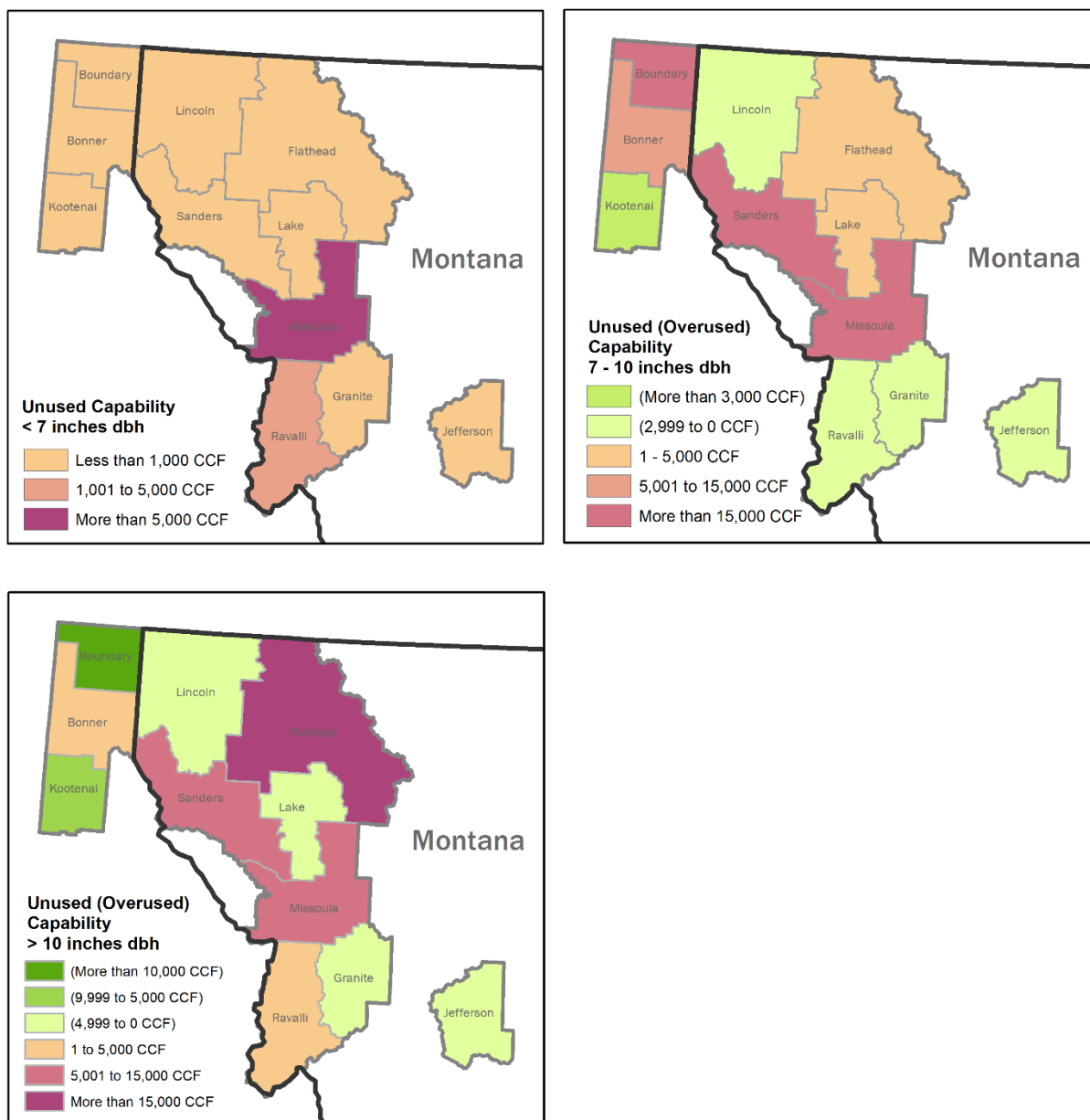


Figure 6—Unused capacity among mills receiving timber from the study area by size class and county.

The distribution of capacity by size class within the TPA changed in interesting ways since the last report (Sorenson et al. 2012). Since 2011, capacity to process trees less than 7

inches dbh increased, on a volume basis, by 44 percent². As a share of total capacity, capability to process trees less than 7 inches dbh also increased from 3.6 percent to 8.9 percent. Over the last decade, capability to process trees 7 to 9.9 inches dbh increased substantially, doubling from 104 MMBF to 208 MMBF and increasing as a share of overall capacity from 21.1 percent to 30.8 percent. The increase in the maximum capability of mills to efficiently utilize trees less than 10 inches dbh can be attributed to an increase in the size of the TPA and xxxx can be attributed to the percent and capacity to process trees 7 to 10 inches dbh increased 11 percent, while the share of capacity not capable of processing trees less than 10 inches dbh decreased by 11 percent. The increase in capacity to process the smallest trees can be explained by the inclusion of roundwood chipping operations in the current analysis, which were excluded from the 2012 analysis, and by the investments of sawmill owners to increase small-log processing capabilities.

Capability to process trees less than 7 inches dbh tends to be concentrated among facilities that produce pulp chips, studs, posts and small poles. Generally, it is less capital intensive (i.e. less expensive) to increase chipping or post and pole capacity than to re-fit a larger sawmill to process smaller diameter logs into lumber. However, demand for roundwood pulpwood tends to move counter-cyclically with demand for lumber since roundwood chips are a substitute for mill residues as a raw material input for pulp and paper mills. Thus, when demand for lumber is strong, increased lumber production at sawmills leads to increased availability of mill residue; while roundwood chipping facilities may increase production when lumber demand is weak because less sawmill residue is being generated.

Finally, many of the facilities throughout the Northern Region are included in the timber processing areas of more than one National Forest. Therefore, the sum of the capacity and capability of all the individual National Forests is greater than the total for the region. The region-wide report (forthcoming) provides information on total capacity and capability for the entire region. We encourage coordination at the Regional, Forest, and even the district level among timber planning staff to share information about prospective projects and potential

² This section uses thousand board feet as the reference unit due to differences in board foot to cubic foot conversion factors between the two reports.

buyers to prevent offering more timber, particularly in the smaller size classes, than can be processed.

References

Bureau of Business and Economic Research. 2021. *Forest Industries Data Collection System*. Forest Industry Research Program, Bureau of Business and Economic Research.

Chaney, Rob. "St. Regis sawmill to close ending 99 jobs." *Missoulian*, August 30, 2021. https://missoulian.com/news/local/st-regis-sawmill-to-close-ending-99-jobs/article_e1134165-f9e1-5442-a63e-e16490cd32d9.html

Hayes, Steven W.; Townsend, Lucas; Dillon Thale; Morgan, Todd A.; Shaw John D. 2021. Montana's forest products industry and timber harvest, 2018. Resour. Bull. RMRS-RB-35. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 54 p.

Keegan, Charles E.; Morgan, Todd A.; Wagner, Francis G.; Cohn, Patricia J.; Blatner, Keith A.; Spoelma, Timothy P.; Shook, Steven R. 2005. Capacity for utilization of USDA Forest Service, Region 1 small-diameter timber. *Forest Products Journal* 55(12): 143-147.

Keegan, Charles E.; Morgan, Todd A.; Gebert, Krista M.; Brandt, Jason P.; Blatner, Keith A.; Spoelma, Timothy P. 2006. Timber-Processing Capacity and Capabilities in the Western United States. *Journal of Forestry* 104(5): 262-268.

McIver, Chelsea P.; Sorenson, Colin B.; Keegan, Charles E.; Morgan, Todd A. 2013. "Timber use, Processing Capacity and Capability to Utilize Small-Diameter Timber within USDA Forest Service, Region One Timber-processing Area." Missoula, MT: Bureau of Business and Economic Research, University of Montana. 21 p.

Montana Department of Natural Resources and Conservation (MT DNRC). 2020. "Montana Statewide Assessment of Forest Conditions." Missoula, MT: MT DNRC. 245 p.

Simmons, Eric A.; Hayes, Steven W.; Morgan, Todd A.; Keegan, Charles E., III; Witt, Chris. 2014. Idaho's forest products industry and timber harvest, 2011. Resour. Bull. RMRS-RB-19. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 46 p.

Simmons, Eric A. and Todd A. Morgan. 2017. The Forest Products Industry in Idaho, Part 2: Industry Sectors, Capacity and Outputs. Forest Industry Brief No. 11. Missoula, MT: University of Montana, Bureau of Business and Economic Research. 8 p.

Simmons, Eric; Townsend, Lucas; Hayes, Steven W.; Morgan, Todd A.; Shaw John D. (In prep) Idaho's forest products industry and timber harvest, 2019. Resour. Bull. RMRS-RB-X. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. XX p.

Stewart, Hayden G.; Blatner, Keith A.; Wagner, Francis G.; Keegan, Charles E. 2004. Risk and feasibility of processing small-diameter material in the U.S. West, Part I: Structural lumber. *Forest Products Journal* 54(12): 97-103.

USDA Forest Service, Forest Inventory and Analysis Program. Forest Inventory EVALIDator web-application Version 1.8.0.01. St. Paul, MN: U.S. Department of Agriculture, Forest Service, Northern Research Station. Accessed August 24, 2021. [Available only on internet: <http://apps.fs.usda.gov/Evalidator/evalidator.jsp>]

U.S. Forest Service (USFS). 2018. Forest Products Cut and Sold from the National Forests and Grasslands. U.S. Department of Agriculture.
<https://www.fs.fed.us/forestmanagement/products/cut-sold/index.shtml>

Wagner, Francis G.; Fiedler, Carl E.; Keegan, Charles E. 2000. Processing value of small-diameter sawtimber at conventional stud sawmills and modern high-speed, small-log sawmills in the western United States—A comparison. *Western Journal of Applied Forestry* 15(4): 208-212.

Wagner, F.G., C.E. Keegan, R.D. Fight and S.A. Willits. 1998. Potential for Small-Diameter Sawtimber Utilization by the Current Sawmill Industry in Western North America. *Forest Products Journal* 48(9). p30. 5p.

APPENDIX A - Data Sources, Definitions and Methods

Data Sources

Information in this report is primarily generated through a statewide periodic census of manufacturers of primary forest products. The census is conducted through a cooperative agreement between the BBER and the USDA Forest Service, Interior West Forest Inventory and Analysis (FIA) program. This analysis is based primarily on 2018 mill survey data for Montana with supporting data from the 2019 Idaho mill survey (FIDACS; Hayes et al. 2021; Simmons et al. in prep). When 2018 data for a mill were not available, prior 2014 or 2010 data were used as a baseline and adjusted to reflect 2018 harvest and market conditions. Mill survey data from Hayes et al. (2021), Simmons et al. (in prep), USFS Cut and Sold reports (USFS 2018), annual timber product output (TPO) data (2019, 2020) collected by BBER on behalf of FIA, and conversations with mill owners were used to characterize timber harvest and timber capacity and consumption by mills. These sources were supplemented by literature from peer-reviewed journals when appropriate.

Study Area

The study area for a national forest is defined as all counties that contain timberland within that national forest. Timberland is defined by FIA as producing or capable of producing at least 20 cubic feet per acre per year (USDA Forest Service). Reserved lands are excluded from calculation of the study area because they are statutorily exempt from timber harvesting activity. Non-forested lands are also excluded from this calculation because they also do not have the capability to produce timber. Once defined, the study area is analyzed to understand harvest and utilization trends for timber originating from all ownerships in order to understand national forest harvest trends in context and to characterize the broader market for timber in the area.

Timber-processing Area

A national forest's timber-processing area (TPA), or area of influence, establishes the geographic region and wood product manufacturers that *potentially* influence and are

influenced by timber harvested from that forest by analyzing the flow of timber from all ownerships within the study area. Counties containing mills that received and processed timber from the study area during 2018 were identified from mill surveys and included in the timber-processing area, unless the volume received are very small. Mills receiving timber from the study area during 2019 or 2020 were also included if they were located in an adjacent county.

The list of mills receiving timber from the study area that are located within the TPA are identified and compiled in order to characterize the capacity and capability of manufacturers in the TPA to process timber in total, and by tree size class. Only mills receiving timber from the study area were included in this analysis in order to best represent 2018/2019 market conditions and supply chain differences between sectors. A mill's procurement distance is determined by multiple factors including finished good market demand, competition, the value-added nature of a product and the total volume of timber consumed annually. For example, log homes are a high-value product that require high quality raw material of a certain size, enabling manufacturers to procure timber from longer distances, including Canada. Log furniture manufacturers produce medium to high value products but use a very small volume of timber and therefore are less likely to draw timber from long distances. In many cases, these differences will explain why some mills are not included in a national forest's TPA even though they reside within a TPA county. A list of all mills residing in the TPA regardless of whether they received and processed timber from the Flathead NF study area is included in Appendix A.

Timber-processing capacity

In this report, "capacity" refers to the total volume of timber (a.k.a., roundwood or logs) that timber processors could utilize annually. Also known as "timber-processing capacity", it is a measure of input capacity and is expressed in board feet Scribner or cubic feet. Input capacity is a useful measure when attempting to express the capacity of multiple types of mills in a common unit of measure. Since finished products (mill outputs and output capacity) are measured in a variety of units: board feet lumber tally for lumber, lineal feet for house logs, and pieces for posts, small poles, and log furniture, input capacity provides for direct comparisons between mill types. Input or timber-processing capacity is a measure of the volume of logs that a facility can process in a given year given firm market demand, sufficient raw material, and

usual downtime for maintenance. Estimates in this report include the capacity of facilities that use timber in round form; this includes sawmills and facilities processing timber into plywood or veneer, house logs, log homes, posts, poles, log furniture, firewood, clean/pulp chips, and biomass energy.

Timber-processing capability

In contrast to timber-processing capacity, “capability” refers to the volume of trees of a certain size class (measured as tree diameter at breast height – dbh) that timber processors can efficiently process annually. Most facilities are designed to operate using trees of a given size class. For example, log home manufacturers typically use trees ≥ 10 inches dbh, and post manufacturers primarily use trees < 8 inches dbh. Capability at these facilities is readily classified in a single size class. This is true for some sawmills, but sawmills can vary greatly in equipment, configuration, product output, and ability to process timber of various sizes (Wagner et al. 1998, 2000; Keegan et al. 2005, 2006; Stewart et al. 2004).

Sawmills often process trees that are larger than the smallest tree sizes they are capable of processing. In other words, most mills capable of processing trees 7 to 9.9-inches dbh are also capable of, and prefer, processing trees greater than 10-inches dbh, thus these mills tend to process substantially more of the larger trees. However, some mills that process larger trees are not capable of processing smaller-diameter trees. For this reason, this report presents capability to process trees greater than 10-inches dbh as the proportion of total capacity *not* capable of efficiently using trees less than 10-inches dbh. Whereas, capability to process trees less than 7-inches dbh and 7 to 9.9-inches dbh are presented as maximum volumes of trees of these size classes that can be processed efficiently.

Assigning capacity and capability at the mill level

For each mill in the TPA that received timber from the study area, an estimate of the mill’s capability to process timber of a given size was made based on literature (Wagner et al. 1998, 2000; Keegan et al. 2005, 2006; Stewart et al. 2004), conversations with mill owners and the most recent BBER mill census data, which aim to take into consideration the financial feasibility and physical characteristics of the mill. For this report, three tree size classes were

used: less than 7-inches dbh, 7 to 9.9-inches dbh, and 10 inches dbh or greater. BBER researchers first assigned capability to efficiently process timber in the less than 7-inch and 7 to 9.9-inch dbh classes. Capability to process trees 10 inches dbh or greater was then calculated as the remaining proportion of total capacity *not* capable of efficiently using trees less than 10 inches dbh. Total timber-processing capacity and capability by dbh class are presented in both hundred cubic feet (CCF) and thousand board feet Scribner (MBF) to facilitate discussion among national forest managers, timber purchasers, and wood products facility operators.

APPENDIX B – MILL LIST

Table B1. Wood products facilities located within the Flathead National Forest TPA counties (includes facilities that did not receive timber from the study area).

Facility Name	Mill Type	County	State
Alta Forest Products	Sawmill	Bonner	ID
Bad Goat	Sawmill	Missoula	MT
Bell Lumber and Pole	Utility pole	Bonner	ID
Big Sky Forest Products	Post or pole	Mineral	MT
Big Sky Shavings, LLC	Bedding/Shavings	Granite	MT
Caribou Creek Log & Timber	House log/Log home	Boundary	ID
Chapel Cedar	Sawmill	Lincoln	MT
Conkle's Custom Cuts	Sawmill	Flathead	MT
Darby Schools	Biomass	Ravalli	MT
Dupuis Lumber	Sawmill	Lake	MT
F H Stoltze Land & Lumber Co	Sawmill	Flathead	MT
Finlay Lumber	Sawmill	Ravalli	MT
Fodge Pulp	Roundwood chipping	Boundary	ID
Frontier Log Furniture	Log furniture	Flathead	MT
Frontier Posts, LLC	Post or pole	Ravalli	MT
Glacier Log Mill / Lazarus Log Homes (House log)	House log/Log home	Flathead	MT
Glacier Log Mill / Lazarus Log Homes (Post/pole)	Post or pole	Flathead	MT
Huckaba Custom Designs	Log furniture	Jefferson	MT
Hunts Timber	Sawmill	Lake	MT
Idaho Forest Group (Chilco)	Sawmill	Kootenai	ID
Idaho Forest Group (Laclede)	Sawmill	Bonner	ID
Idaho Forest Group (Moyie Springs)	Sawmill	Boundary	ID
Idaho Forest Group, LLC. - ST Regis Mill*	Sawmill	Mineral	MT
John's Rough Cut	Log furniture	Bonner	ID
Kalispell Montana Log Homes, Inc.	House log/Log home	Flathead	MT
Log Homes Handcrafted	House log/Log home	Missoula	MT
Marks Lumber	Sawmill	Jefferson	MT
Marks-Miller Post & Pole Inc	Post or pole	Jefferson	MT
Master Log Homes	House log/Log home	Ravalli	MT
Meadowlark Log Homes	House log/Log home	Lincoln	MT
Medicine River Woodworks	Log furniture	Ravalli	MT
Misty Mountain Furniture	Log furniture	Bonner	ID
Montana Custom Log Homes Inc	House log/Log home	Ravalli	MT
Montana Timberline Firewood Co.	Firewood	Flathead	MT
Montana Woodworks	Log furniture	Lincoln	MT

Montana-Idaho Log & Timber	House log/Log home	Ravalli	MT
Mountain Gem Log Homes	House log/Log home	Bonner	ID
Mountain View Log Homes--Condon	House log/Log home	Missoula	MT
Neumayer Mills Unlimited	Sawmill	Boundary	ID
Nordique Systems Log Homes	House log/Log home	Missoula	MT
North Country Log Works	House log/Log home	Flathead	MT
North Idaho Log Furniture	Log furniture	Kootenai	ID
North Idaho Post and Pole	Post or pole	Kootenai	ID
Old Style Log Works	House log/Log home	Flathead	MT
Panhandle Forest Products	Post or pole	Bonner	ID
Pfendler Post & Pole	Post or pole	Granite	MT
Pyramid Mountain Lumber, Inc.	Sawmill	Missoula	MT
R & S Milling	Sawmill	Ravalli	MT
RBM Logging & Lumber	Sawmill	Flathead	MT
River Country Wood Products	Post or pole	Lincoln	MT
Rocky Mountain Log Homes	House log/Log home	Ravalli	MT
Rocky Mountain Log Homes-Victor	House log/Log home	Ravalli	MT
Roundwood West Corporation	Post or pole	Missoula	MT
Simonson's Log Furniture	Log furniture	Flathead	MT
Small Diameter Logs Company	House log/Log home	Ravalli	MT
Specialty Beams	Sawmill	Bonner	ID
Stella Jones-McFarland Cascade Sandpoint	Post or pole	Bonner	ID
Stillwater Post & Pole	Post or pole	Lincoln	MT
Stimson Lumber Company (Priest River)	Sawmill	Bonner	ID
Sula Log Homes	Sawmill	Ravalli	MT
The Rustics Of Montana	House log/Log home	Missoula	MT
Thompson River Lumber	Sawmill	Sanders	MT
Valley Board & Beam	Sawmill	Ravalli	MT
Weyerhaeuser - Evergreen Plywood	Plywood/Veneer	Flathead	MT
Weyerhaeuser - Evergreen Sawmill	Sawmill	Flathead	MT
Whiteman Lumber Company	Sawmill	Kootenai	ID
Wild Montana Wood	Sawmill	Flathead	MT
Willis Enterprises, Inc.-Bonner Chip Plant	Roundwood chipping	Missoula	MT

* Denotes inactive mills