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Timber Use, Processing Capacity and Capability Within the White River National Forest Timber-Processing Area

Prepared by:

Eric A. Simmons, Senior Research Associate
Bureau of Business and Economic Research
University of Montana.

Todd A. Morgan, Director of Forest Industry Research
Bureau of Business and Economic Research
University of Montana

Steven W. Hayes, Senior Research Forester
Bureau of Business and Economic Research
University of Montana

Luke Rymniak, Graduate Research Assistant
Bureau of Business and Economic Research
University of Montana

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**Josh Sidon, USDA Forest Service, Rocky Mountain Region
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Introduction

Insect and disease outbreaks in the central Rocky Mountains reached epidemic levels in the last two decades resulting in vast stands of dead trees across parts of Wyoming, Colorado and South Dakota. In the counties where the White River National Forest (NF) is located, annual mortality across all ownerships from insect and disease on timberland¹ is estimated to be 1,266,780 hundred cubic feet (CCF), accounting for 89 percent of total annual mortality in the study area (USDA, 2018). In comparison, fire, and logging combined with other human caused mortality accounts for 1.2 percent, remaining mortality is from other (i.e. weather, animals, vegetation) or unknown causes (USDA, 2018). The States and the Forest Service have increased investments in forest health, hazardous fuels mitigation and safety protection on private and public lands (Wyoming State Forestry Division 2017; State of Colorado 2017; USFS MBRNF 2017). 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 the capability of mills to handle timber of various sizes an important consideration for managers.

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.)

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 support document for the White River NF and seeks to:

1. examine the harvest of timber from the counties containing the White River NF's timberland – the “study area”;
2. analyze the timber flow and identify the White River NF's “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 use of timber. 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.

Definitions and Methods

This analysis is based on 2016 data for Colorado mills (Hayes et al. in press), and follows the methods outlined in the Region Two region-wide report (Simmons et al. 2019). When 2016 data for a mill were not available, prior (2012 or 2007) data were used as a baseline and adjusted to reflect 2016 harvest and market conditions. Mill survey data from Hayes et al. (in press), USFS Cut and Sold reports (USFS 2016) and conversations with mill owners, were used to analyze timber harvest and flow from all ownerships within the study area (i.e., the counties containing White River NF timberland).

The White River NF timber-processing area (TPA) includes the counties in the study area and counties containing mills that received timber from the study area during 2016. If historic (2012) mill survey data indicated a substantial flow of timber into a county, the county would be included in the TPA even if recent (2016) flows were relatively small or non-existent. Finally,

all other counties receiving timber from the study area were included if the volume from the study area represented more than 10 percent of the total timber received in that county.

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 generally 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 because 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 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 and sufficient raw material for all shifts and products produced. Estimates in this report include the capacity of facilities that use timber in round form; this includes sawmills and facilities processing timber into house logs, log homes, posts, poles, log furniture, excelsior, fuel pellets, firewood, and landscaping chips.

In contrast, “capability” refers to the volume of trees of a certain size class (measured as diameter at breast height – dbh) that timber processors can *efficiently and economically* 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).

For each mill in the TPA, 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, taking into consideration the financial feasibility and physical characteristics of the mill. For this report, three tree size classes were used: <7 inches dbh, 7-9.9 inches dbh, and ≥ 10 inches dbh. BBER researchers first assigned capability to efficiently process timber in the <7 inch and 7-9.9 inch dbh classes. Capability to process trees ≥ 10 inches dbh was then calculated as the

remaining proportion of total capacity *not* capable of efficiently using trees <10 inches dbh. Total timber-processing capacity and capability by dbh class are presented in both CCF and thousand board feet Scribner (MBF) to facilitate discussion among national forest managers, timber purchasers, and wood products facility operators.

White River National Forest Study Area

The White River NF study area is situated primarily in Northwestern Colorado, spreading over seven counties (figure 1). The area contains 2.2 million acres of timberland (USDA, 2018), 73 percent (1,595,155 acres) is managed by the US Forest Service (table 1). The White River NF comprises 968,735 acres of timberland (USDA, 2019) of which 425,000 acres are considered suitable for timber production² (Sidon 2019). Since the White River NF accounts for just 1.4 percent (6,202 acres) of the National Forest timberland in Routt County and timber harvested in the county came primarily from the Routt National Forest that timber and the receiving facilities have been excluded from this analysis.

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

County	National Forest	Private	Other Federal	State	Other public	Total
Eagle	274,142	27,908	18,857	–	–	320,907
Garfield	201,898	88,086	115,383	6,500	–	411,867
Mesa	271,542	43,928	–	–	–	315,471
Moffat	26,617	20,598	14,196	6,080	–	67,491
Pitkin	148,570	20,998	–	–	6,172	175,739
Rio Blanco	242,367	15,039	21,097	3,213	–	281,716
Routt	430,019	135,773	14,246	28,419	–	608,457
Grand Total	1,595,155	352,330	183,779	44,212	6,172	2,181,648

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.)

Source: USDA Forest Service, Forest Inventory and Analysis Program, Tue Dec 18 20:21:21 GMT 2018. 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>]

²Lands suited for timber production – Area that defines where timber harvest for the purpose of timber production may occur. Timber harvest for purposes other than timber production may also occur here.

The total volume of timber harvested and utilized from all ownerships in the study area was an estimated 48,583 CCF (17,490 MBF) in 2016 (table 2). Timber harvested from National Forest timberlands in the study area accounted for 70 percent (34,061 CCF) of the timber harvested in the seven counties (excluding timber harvested in Routt County from the Routt National Forest). Timber from the White River NF was estimated to account for approximately 59 percent (20,036 CCF) of the National Forest timber. The species composition of the timber harvested in the study area was lodgepole pine (73 percent), Engelmann spruce (19 percent), Douglas-fir (4 percent), ponderosa pine (3 percent), with smaller volumes of subalpine fir, aspen, and cottonwood.

Table 2 – Timber harvest by county and ownership in the White River NF Study Area, 2016.

County	National Forest	Private	BLM	State	Grand Total
	----- <i>Hundred cubic feet (CCF)</i> -----				
Eagle	11,936	1,581	0	0	13,517
Garfield	1,278	194	0	0	1,472
Mesa	16,747	4,206	0	164	21,117
Moffat	0	517	0	0	517
Pitkin	289	0	0	0	289
Rio Blanco	225	0	0	0	225
Routt ^a	3,586	5,992	1,667	203	11,447
Total	34,061	12,489	1,667	367	48,583

^a Excludes timber harvested in Routt National Forest

Source: Hayes et. al. (in press); Simmons et. al. 2019.

White River Capacity & Capability Study Area

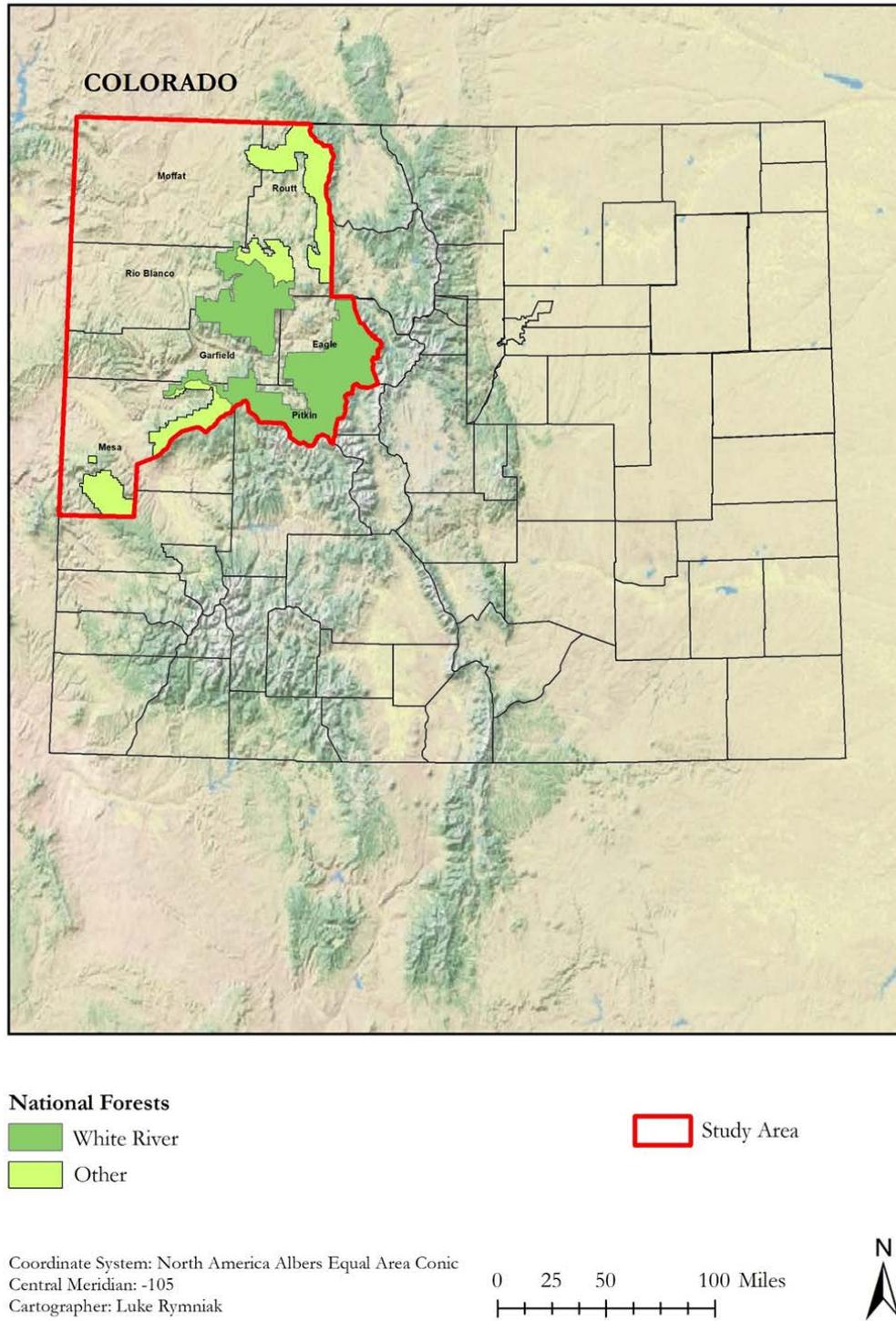


Figure 1 – White River National Forest Study Area

White River Timber-Processing Area

A national forest's timber-processing area (TPA) establishes the geographic region *potentially* influenced by timber harvested from that forest by analyzing the *flow of timber harvested* from all ownerships within the study area. The analysis also describes the area and extent to which timber processors are dependent upon the timber harvested in these counties, and federal timber more specifically.

The White River NF TPA is made up of 15 counties which are located in Northwestern Colorado. In addition to the seven counties in the study area, eight other Colorado counties with timber-processing facilities received timber from the study area, including Montrose County which is home to the state's largest sawmill. Within the White River NF TPA there were 26 facilities operating as of 2016 (table 3). Although Eagle Valley Clean Energy is in the TPA, data regarding their capacity, inputs, and outputs were not received for the 2016 mill census. As well, since the facility is tied closely to a specific stewardship project, estimating capacity/capability that may be available for projects outside of the stewardship contract could be problematic. The authors suggest that White River NF managers (e.g., timber sale administrators and forest planners) contact the facilities in the TPA to verify their current operating status as specific projects are being developed.

Table 3 – Active timber-processing facilities in the White River NF TPA, 2016.

Type	2016
Sawmills	13
Post/poles	5
Houselogs	5
Pellets	2
Log furniture	1
Total	26

Source: Hayes et. al. (in press); Simmons et. al. 2019.

White River Timber Processing Area - Mill Types -

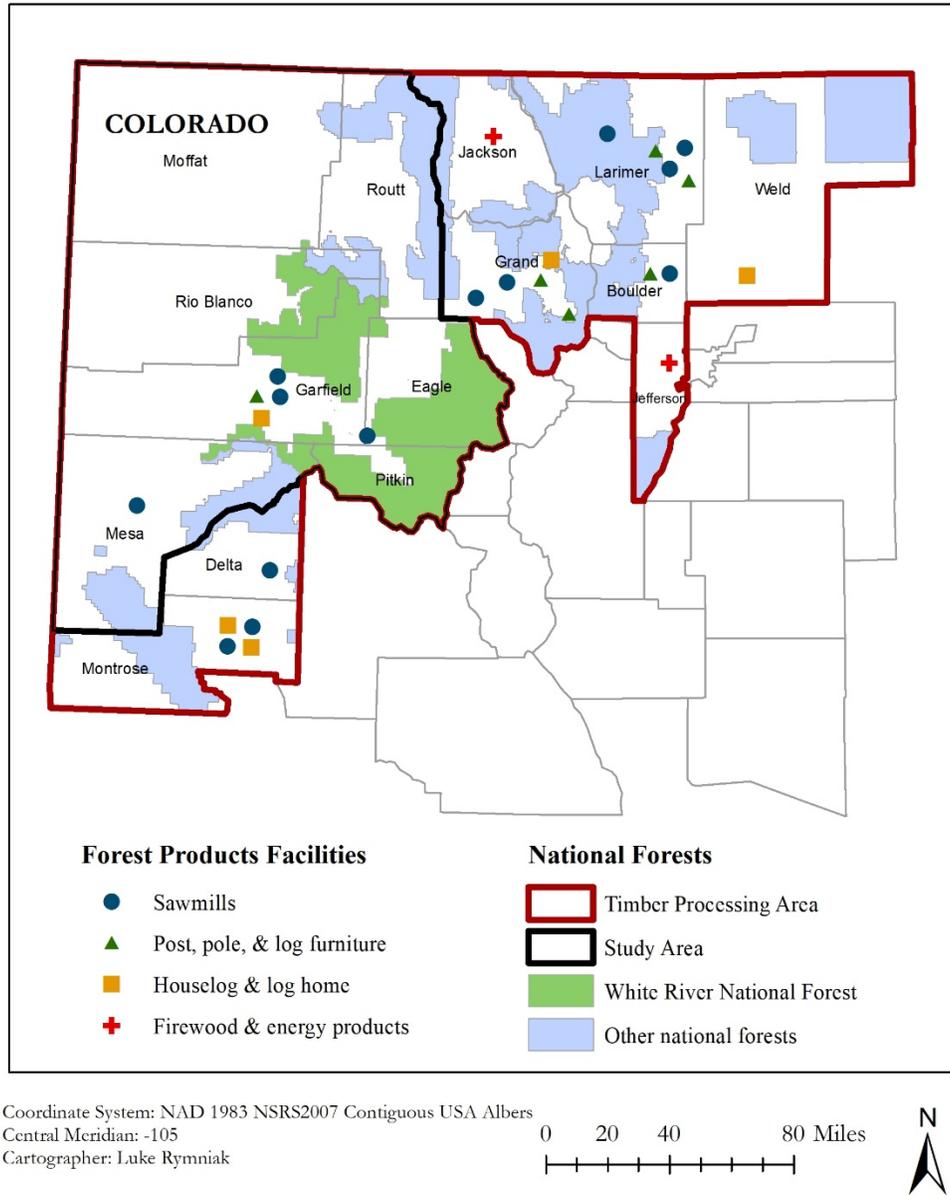


Figure 2 –White River TPA and timber-processing facilities.

Timber Flow

Of the 48,583 CCF (17,490 MBF) of timber harvested in the White River study area, nearly 4 percent (1,875 CCF) was processed in the county of harvest, 2 percent (833 CCF) was processed elsewhere within the study area, and 94 percent (45,875 CCF) was processed outside the study area but within the White River TPA (Table 4). Six of the 26 active facilities in the TPA are located within the study area, most of the remaining facilities are in adjacent or nearby counties in Colorado. Facilities within the study area processed 2,708 CCF (975 MBF) of the timber from the study area of which 42 percent came from National Forest timberlands. This flow of timber indicates that landowners within the study area are relying on facilities outside the immediate area to purchase timber, suggesting mills outside the study area may be better able to compete for timber than mills within the study area or may have better developed supply chains due to the larger volumes of timber they process.

Table 4 - Timber flow from the White River NF Study Area, 2016.

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> -----		
Eagle	0	6	94
Garfield	13	87	0
Mesa	8	0	92
Moffat	0	0	100
Pitkin	0	0	100
Rio Blanco	0	0	100
Routt ^a	0	0	100
Total	4	2	94

^a Excludes timber harvested in Routt National Forest

Source: Hayes et. al. (in press); Simmons et. al. 2019.

Timber-Processing Capacity and Capability

Capacity to process timber in the White River NF TPA during 2016 was 270,240 CCF (102,451 MBF). Capacity within the study area was 41,095 CCF (15,034 MBF), just 15 percent of the total capacity in the TPA, further indicating that the White River NF and other timber owners in the study area are relying on or marketing to the TPA’s broader timber market even though capacity in the study area exceeded harvest volume during 2016.

The authors estimate that 53 percent (144,212 CCF or 67,224 MBF) of timber-processing capacity in the White River NF TPA is not capable of efficiently utilizing trees < 10 inches dbh (table 5). Capability to efficiently utilize trees 7-9.9 inches dbh accounts for 22 percent of total timber-processing capacity; and 24 percent of total capacity in the TPA can efficiently utilize trees < 7 inches dbh.

Table 5 – Annual capacity and capability of mills to process trees by size class for the White River NF TPA, 2016.

<i>Hundred cubic feet (CCF)</i>		<i>Thousand board feet, Scribner (MBF)</i>	
Tree dbh	Capability	Tree dbh	Capability
< 7 in.	66,337	< 7 in.	12,872
7 - 9.9 in.	59,691	7 - 9.9 in.	22,355
≥ 10 in.	144,212	≥ 10 in.	67,224
Total capacity	270,240	Total capacity	102,451

Source: Hayes et. al. (in press); Simmons et. al. 2019.

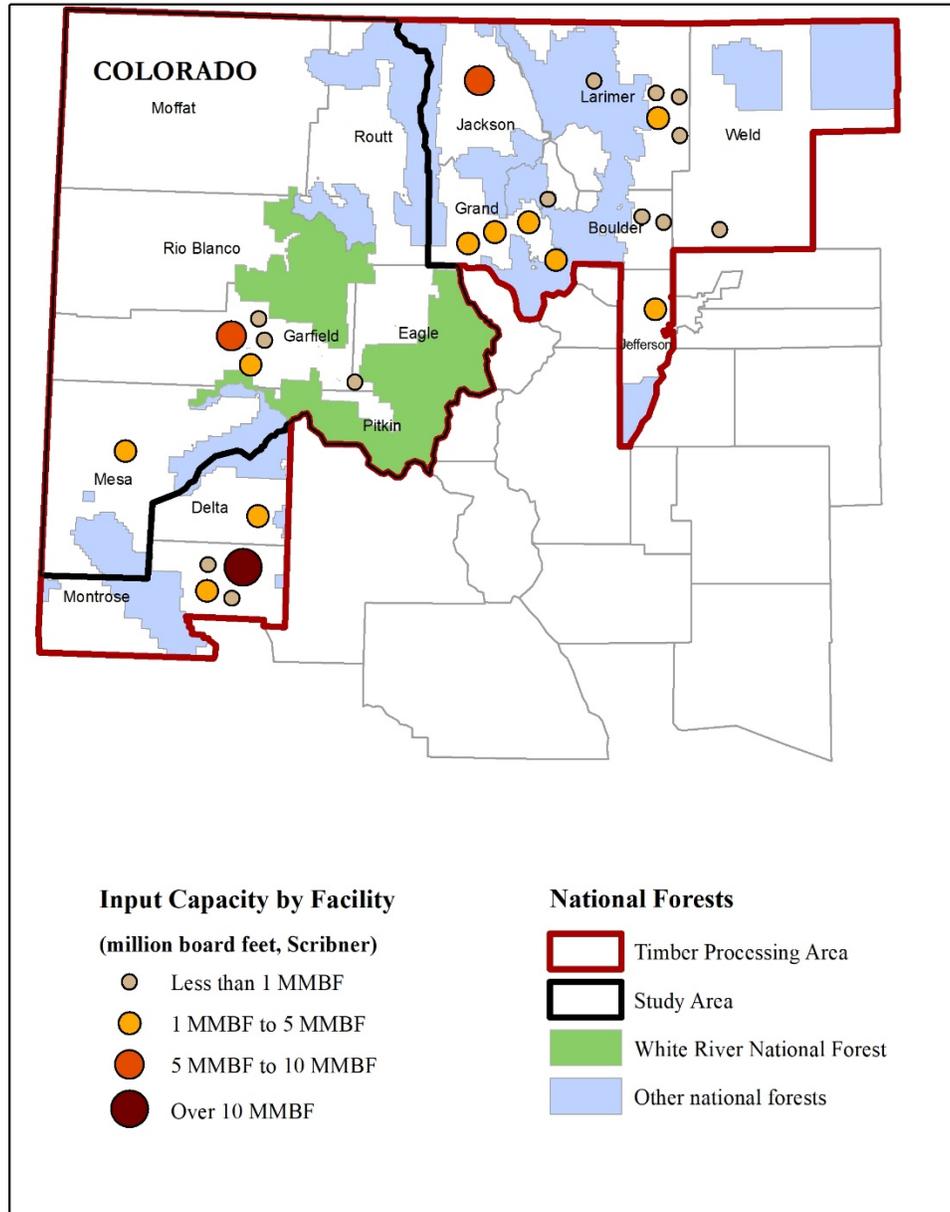
Table 6 shows that mills in the TPA processed 188,333 CCF (67,604 MBF), indicating that approximately 70 percent of total capacity (on a cubic foot basis) within the TPA was utilized. National forests supplied 79 percent (about 148,499 CCF or 53,305 MBF) of the timber processed in the TPA, which suggests there is a strong dependence by those mills on national forest timber, and a reciprocal dependence by the national forests on those mills. Trees with dbh ≥ 10 inches comprised 52 percent of the volume processed in the TPA. Nearly 25 percent came from trees 7-9.9 dbh, while the remaining 23 percent was made up of trees < 7 inches dbh.

Table 6 – Annual volume of timber processed by tree size class for the White River NF TPA, 2016.

<i>Hundred cubic feet (CCF)</i>		<i>Thousand board feet, Scribner (MBF)</i>	
Tree dbh	Volume used	Tree dbh	Volume used
< 7 in.	43,701	< 7 in.	7,492
7 - 9.9 in.	46,663	7 - 9.9 in.	14,735
≥ 10 in.	97,969	≥ 10 in.	45,377
Total processed	188,333	Total processed	67,604

Source: Hayes et. al. (in press); Simmons et. al. 2019.

White River Timber Processing Area - Mill Capacity -



Coordinate System: NAD 1983 NSRS2007 Contiguous USA Albers
Central Meridian: -105
Cartographer: Luke Rymniak

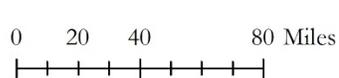


Figure 3 – White River timber processing capacity by facility.

At 68 percent utilization in 2016, there is some unutilized capability at sawmills and houselog facilities to process trees ≥ 10 inches dbh (46,243 CCF or 21,847 MBF). Approximately 72 percent of the capability to process trees < 10 inches dbh was used in 2016 resulting in unutilized processing capability of 35,664 CCF or 13,000 MBF. Capability in the < 7 inch dbh class had a utilization rate of 66 percent indicating unutilized capability of just 22,636 CCF or 5,380 MBF. Available capability to process trees < 7 inch dbh is about 27 percent of the total unused capacity. Planning large scale or large numbers of treatments with substantial volumes of trees in this size class could exceed the ability of the current infrastructure to profitably use the material without investments to increase capability.

Discussion

The largest sawmill in Colorado is in the White River TPA (i.e. Montrose Forest Products). This facility combined with houselog processors account for a considerable amount of the processing capability for trees ≥ 10 inches dbh. Many sawmills in the region have some capability to use trees 7–9.9 inches dbh. However, the feasibility and profitability of using smaller trees is improved with green trees, since more lumber can be recovered and operating costs are lower with live trees than dead or salvaged trees. Similar relationships among log size and log quality for live versus dead trees relative to value have been documented by Fahey et al. (1986) and Loeffler and Anderson (2018).

As in most of the interior west, several (7 of 13) smaller sawmills in the White River NF TPA, produce other products (e.g., firewood, posts, animal bedding, or pellets) in addition to lumber. This product diversification has augmented their capability to use smaller trees. When these multi-product sawmills are combined with facilities making other products (e.g., posts/poles, firewood, or chips) using trees in the < 10 inch dbh classes they account for 74 percent (93,641 CCF) of the capability in the < 10 dbh class. However, 79 percent of this capacity is utilized. Capability to process trees < 7 inches dbh tends to be concentrated among facilities that produce posts, small poles, chips, mulch, shavings and log furniture. Although 34

percent of the capability in the <7 inch dbh class was unused it is only 8 percent of the total timber processing capacity in the TPA. Considering that it is less capital intensive (i.e., less expensive) to increase post and pole capacity than to re-fit a larger sawmill to process smaller diameter logs into lumber, with sufficient markets and timber supplies some facilities may consider making the investments to increase small log capabilities. Some of these smaller facility operators expressed the sentiment that recent Federal efforts (e.g., timber sales and stewardship projects) favor large landscape projects, which are not economically viable for the smaller operators to bid on and thus can be a barrier to engaging more of this small-tree capability.

While the White River NF TPA has unutilized capability to process small-diameter timber, several mills already reported using greater volumes of small diameter timber than they felt was financially sustainable for their operation. This is likely a reflection of the national forests and other land owners wanting to remove substantial quantities of small trees as part of efforts to reduce fire hazard, conduct forest restoration, and mitigate the impacts of widespread tree mortality. When considering removing trees from the landscape, land managers should balance their need to remove small and/or dead trees with the local industry's ability to profitably use that material. Offering larger quantities of small and/or dead trees than the industry can profitably use can lead to unsold sales and fewer acres being treated.

A final note, many of the facilities throughout Region 2 are with the timber processing areas of more than one National Forest. So 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 provides information on total capacity and capability for the whole 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 buyers to prevent offering more timber in certain size classes than can be processed.

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