**FOREST INDUSTRY
RESEARCH PROGRAM**
UNIVERSITY OF MONTANA

# Timber Use, Processing Capacity and Capability Within the San Juan National Forest Timber-Processing Area

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**August 28, 2020**

## 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 San Juan National Forest (NF) is located, annual mortality across all ownerships from insect and disease on timberland[1] is estimated to be 927,962 hundred cubic feet (CCF), accounting for 80 percent of total annual mortality in the study area (USDA, 2018). In comparison, fire, and logging combined with other human caused mortality accounts for 7.2 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.

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[1] Timberland: Forest land that is producing or is capable of producing crops of industrial wood and not withdrawn from timber utilization by statute or administrative regulation.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 San Juan NF and seeks to:

1. examine the harvest of timber from the counties containing the San Juan NF's timberland – the "study area";

2. analyze the timber flow and identify the San Juan 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 2 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 San Juan NF timberland).

The San Juan 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 a. 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 a. 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.

## San Juan National Forest Study Area

The San Juan NF study area is situated in the southwestern corner of Colorado, spreading over nine counties (figure 1). The area contains 2 million acres of timberland (USDA, 2018), 85 percent (1,733,492 acres) is managed by the US Forest Service (table 1). The San Juan NF comprises 1,521,110 acres of timberland (USDA, 2019) of which 311,949 acres (20 percent) are considered suitable for timber production[2] (Sidon 2019).

**Table 1** – Acres of timberland[1] by county and ownership in the San Juan NF Study Area.

| County | National Forest | Private | Other Federal | State | Total |
|---|---|---|---|---|---|
| Archuleta | 260,310 | 116,467 | — | — | 376,777 |
| Conejos | 162,579 | — | — | 13,240 | 175,819 |
| Dolores | 200,979 | — | 11,013 | — | 211,992 |
| Hinsdale | 159,555 | 7,998 | 30,394 | 6,124 | 204,071 |
| La Plata | 294,450 | 47,985 | — | 7,076 | 349,511 |
| Mineral | 222,533 | 3,037 | — | — | 225,570 |
| Montezuma | 189,771 | 26,135 | 6,461 | 6,461 | 228,829 |
| Rio Grande | 174,827 | 1,679 | 5,828 | — | 182,334 |
| San Juan | 68,488 | — | 13,818 | — | 82,307 |
| Grand Total | 1,733,492 | 203,301 | 67,514 | 32,901 | 2,037,208 |

[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 2019.
Note: — denotes value less than one.

[2] Lands 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 estimated at 93,254 CCF (38,887 MBF) in 2016 (table 2). Timber harvested from National Forest timberlands in the study area accounted for 57 percent (53,492 CCF) of the timber harvested in the study area's nine counties. Private timberlands accounted for nearly 38 percent (35,176 CCF) of the timber harvested in the study area. Timber from the San Juan NF was estimated to account for approximately 39 percent (20,807 CCF) of the National Forest timber. The species composition of the timber harvested in the study area was spruce species (40 percent), lodgepole pine (27 percent), aspen (24 percent), and Douglas-fir (4 percent), with smaller volumes of ponderosa pine, subalpine fir, and white fir (Hayes et al. in press)

**Table 2** – Timber harvest by county and ownership San Juan NF Study Area, 2016.

| County | National Forest | Private | Other Federal | State | Grand Total |
|---|---|---|---|---|---|
| | ------------------------- Hundred cubic feet (CCF) ------------------------------- | | | | |
| Archuleta | 4,974 | 3,182 | — | 82 | 8,238 |
| Conejos | 9,365 | 8,525 | — | 139 | 18,029 |
| Dolores | 1,065 | 5,815 | — | — | 6,880 |
| Hinsdale | 20,388 | 10,273 | — | 269 | 30,930 |
| La Plata | 5,724 | 264 | — | — | 5,988 |
| Mineral | 2,151 | 863 | — | — | 3,014 |
| Montezuma | 5,276 | 1,906 | — | — | 7,182 |
| Rio Grande | 4,549 | 4,348 | — | 4,096 | 12,993 |
| San Juan | — | — | — | — | — |
| **Total** | 53,492 | 35,176 | — | 4,586 | 93,254 |

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

Note: — denotes value less than one.

## San Juan Capacity & Capability
## - Study Area -
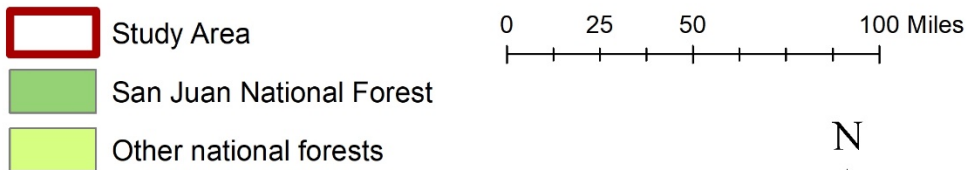


**Figure 1** – San Juan National Forest Study Area

## San Juan 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 San Juan NF TPA is made up of 17 counties which are located in central, and southwestern Colorado, with two counties in New Mexico. In addition to the nine counties in the study area, including Montrose County which is home to the state's largest sawmill, six other Colorado counties with timber-processing facilities received timber from the study area in 2016. Within the San Juan NF TPA there were 30 facilities operating as during 2016 (table 3). In addition to the active facilities, one inactive sawmill is shown with the active facility locations in figure 2. In March 2020, Ironwood in Dolores began operations at a revitalized plywood plant shuttered over 40 years ago to make veneer which is not included in the data for this analysis or displayed in figure 2 (Durango Herald 2020). According to the press release, the company wants to increase timber utilization to 50 million board feet (MMBF) Scribner annually, equivalent to approximately 42 percent of Colorado's 2016 timber harvest, obtained from the San Juan and other National Forests and private timberlands (Hayes et al. in press). Mill residuals are being used on site to make industrial wood pellets.  . Since the timber processing capacity of this mill is unknown, the potential effect on the overall capability to process trees by diameter class is also unknown. The authors suggest that San Juan 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 San Juan NF TPA, 2016.

| Type | 2016 |
|---|---|
| Sawmills | 19 |
| Post/poles | 1 |
| Houselogs | 7 |
| Log Furnuture | 1 |
| Excelsior/shavings products | 2 |
| **Total** | **30** |

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

# San Juan Timber Processing Area
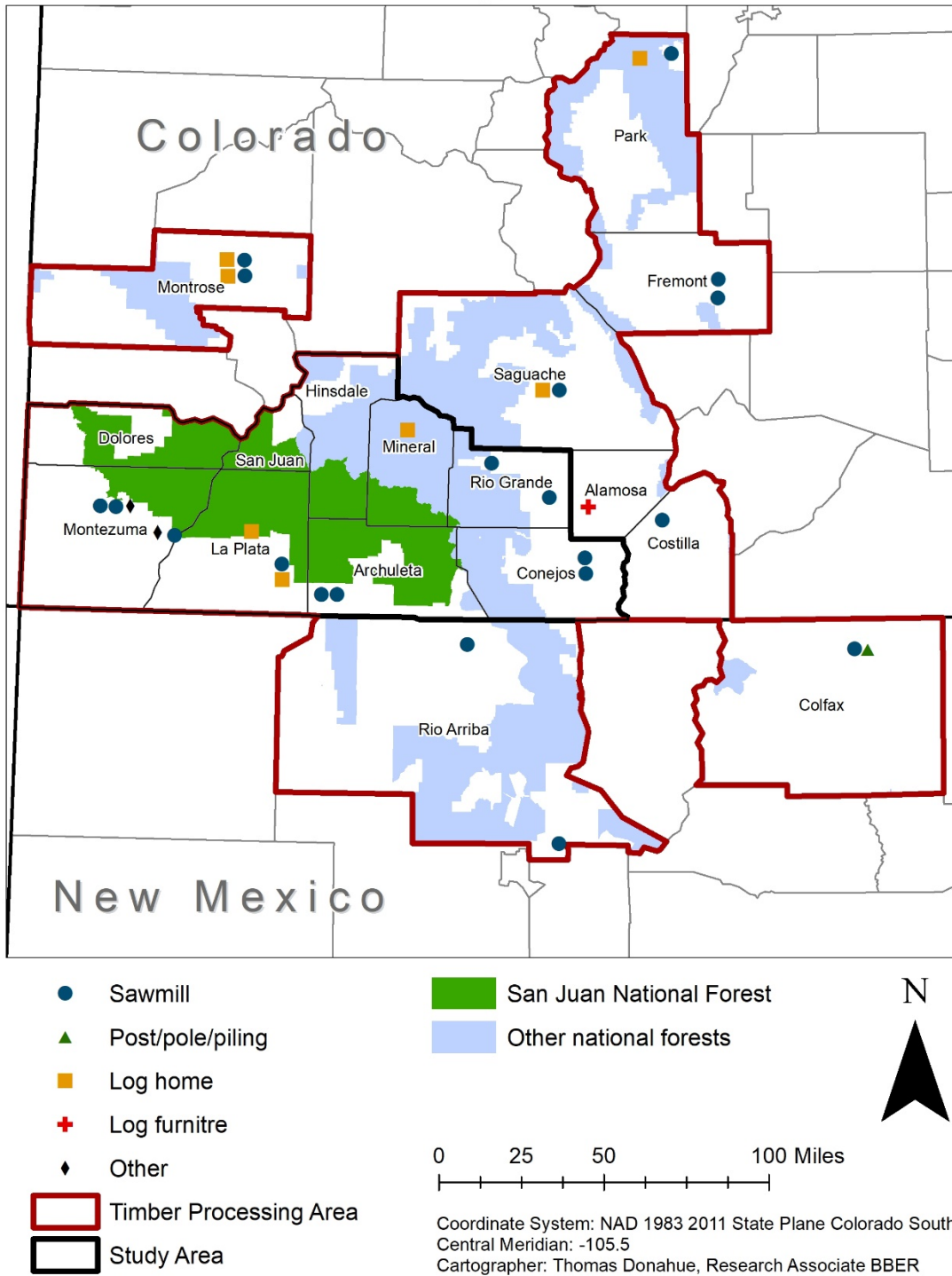## - Mill Types -



**Figure 2** –San Juan TPA and timber-processing facilities.

*Timber Flow*

Of the 93,254 CCF (38,887 MBF) of timber harvested in the San Juan study area in 2016, 19 percent (17,669 CCF) was processed in the county of harvest, 13 percent (11,978 CCF) was processed elsewhere within the study area, and 68 percent (26,524 CCF) was processed outside the study area but within the San Juan TPA (Table 4). Fifteen of the 30 active facilities in the TPA were located within the study area, most of the remaining facilities were in adjacent or nearby counties in Colorado. Facilities within the study area processed 29,647 CCF (12,363 MBF), 32 percent, of the timber from the study area of which 45 percent came from National Forest timberlands. This flow of timber indicates that landowners within the study area relied on facilities outside the immediate area to purchase 68 percent of their timber in 2016, 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 San Juan NF Study Area, 2016.

| County of harvest | Processed within the county of harvest | Processed elsewhere within study area | Processed outside study area |
|---|---|---|---|
| | -------------------- *percentage of harvest by county* ---------------------- | | |
| Archuleta | 2 | — | 98 |
| Conejos | 24 | — | 76 |
| Dolores | — | 100 | — |
| Hinsdale | — | 4 | 96 |
| La Plata | 5 | 9 | 86 |
| Mineral | — | — | 100 |
| Montezuma | 94 | — | 6 |
| Rio Grande | 48 | 25 | 27 |
| Total | 19 | 13 | 68 |

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

Note: — denotes less than one percent.

*Timber-Processing Capacity and Capability*

Capacity to process timber in the San Juan NF TPA during 2016 was 276,574 CCF, approximately 120,147 MBF (table 5). Capacity within the study area was 41,395 CCF (15,070 MBF), 15 percent of the total capacity in the TPA, further indicating that the San Juan 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 author's estimate that nearly 71 percent (195,567 CCF or 91,201 MBF) of timber-processing capacity in the San Juan NF TPA is not capable of efficiently utilizing trees < 10 inches dbh . Capability to efficiently utilize trees 7-9.9 inches dbh accounts for 25 percent of total timber-processing capacity; and less than 4 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 San Juan NF TPA, 2016.

| Hundred cubic feet (CCF) | | Thousand board feet, Scribner (MBF) | |
|---|---|---|---|
| **Tree dbh** | **Capability** | **Tree dbh** | **Capability** |
| < 7 in. | 10,042 | < 7 in. | 2,657 |
| 7 - 9.9 in. | 70,965 | 7 - 9.9 in. | 26,289 |
| ≥ 10 in. | 195,567 | ≥ 10 in. | 91,201 |
| **Total capacity** | **276,574** | **Total capacity** | **120,147** |

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

Table 6 shows that mills in the TPA processed 177,468 CCF (74,008 MBF), indicating that approximately 64 percent of total capacity (on a cubic foot basis) within the TPA was utilized. Overall, national forests supplied 60 percent (about 106,926 CCF or 44,590 MBF) of the timber processed in the TPA of which approximately 39 percent was from the San Juan NF. This suggests there is a strong dependence by the mills in the TPA on timber from multiple national forests, and a reciprocal dependence by the national forests on those mills. Trees with dbh ≥ 10

inches comprised 72 percent of the volume processed in the TPA. Nearly 25 percent came from

trees 7-9.9 dbh, while the remaining 3 percent was made up of trees < 7 inches dbh.

**Table 6** – Annual volume of timber processed by tree size class for the San Juan NF TPA, 2016.

| Hundred cubic feet (CCF) | | Thousand board feet, Scribner (MBF) | |
|---|---|---|---|
| **Tree dbh** | **Volume used** | **Tree dbh** | **Volume used** |
| < 7 in. | 5,437 | < 7 in. | 1,321.6 |
| 7 - 9.9 in. | 43,916 | 7 - 9.9 in. | 14,485.8 |
| ≥ 10 in. | 128,115 | ≥ 10 in. | 58,200.2 |
| **Total processed** | **177,468** | **Total processed** | **74,008** |

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

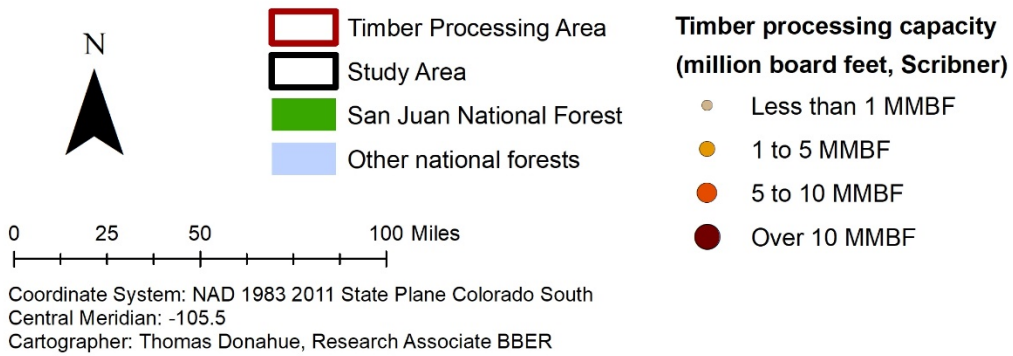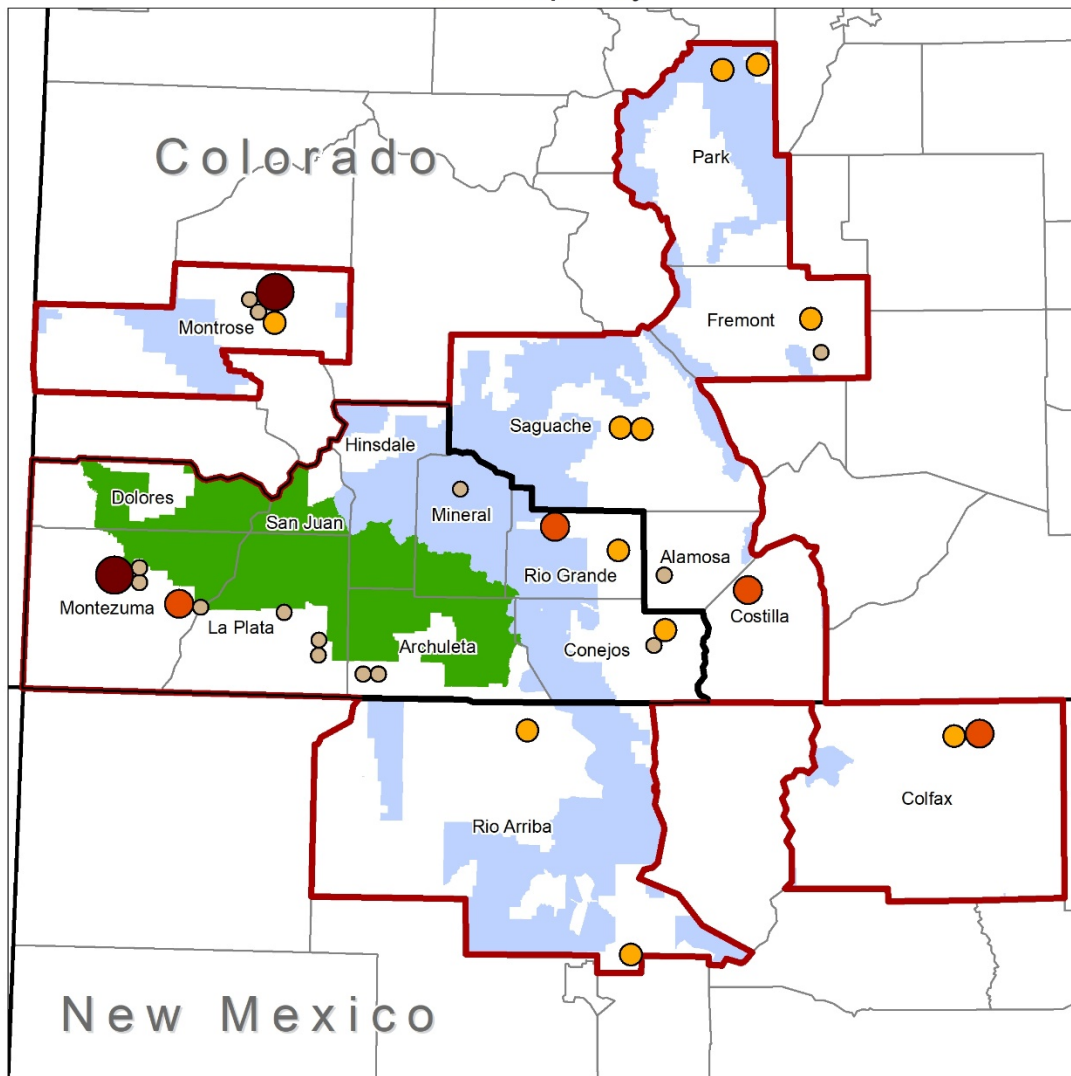## San Juan Timber Processing Area
## - Mill Capacity -



**Figure 3** – San Juan timber processing capacity by facility.

At 66 percent utilization in 2016, there is considerable unutilized capability, primarily at sawmills and houselog facilities, to process trees ≥ 10 inches dbh (67,452 CCF or 33,001 MBF). Approximately 61 percent of the capability to process trees < 10 inches dbh was used in 2016 resulting in unutilized processing capability of 31,657 CCF or 13,139 MBF. Capability in the < 7 inch dbh class had a utilization rate of 54 percent indicating unutilized capability of 4,605 CCF or 1,335 MBF. Available capability to process trees < 7 inch dbh is about 5 percent of the total unused capacity. Planning large scale or large numbers of treatments with substantial volumes of trees in this size class would likely 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 San Juan 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, primarily those in the 7-9.9 inch dbh class, 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, some (6 of 19) smaller sawmills in the San Juan 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 52 percent (42,370 CCF) of the capability in the < 10 dbh classes with trees 7-9.9 inches dbh accounting for the majority of the capability. However, 77 percent of that capability was utilized in 2016.  In 2016

nearly 46 percent (4,605 CCF) of the capability in the <7 inch dbh class was unused but capability in this size class accounted for only 4 percent of the total timber processing capacity in the TPA. Capability to process trees < 7 inches dbh tends to be concentrated among facilities that produce only posts, small poles, chips, mulch, shavings and log furniture. 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 capabilities to process trees < 7 inches dbh. 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 San Juan NF TPA has unutilized capability to process small-diameter timber, some sawmill operators have 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 may lead to unsold sales and fewer acres being treated.

A final note, many of the facilities throughout Region 2 are included in 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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