FOREST INDUSTRY RESEARCH PROGRAM
UNIVERSITY OF MONTANA

Timber Processing Capacity and Capability: Dinkey Collaborative Forest Landscape Restoration Project

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Introduction

Originally selected for the Collaborative Forest Landscape Restoration Program (CFRLP) in 2010, the Dinkey Landscape Restoration Project covers 130,000 acres of Sierra National Forest lands and 24,000 acres of private lands in Fresno County, California (Sierra National Forest, 2010). An unprecedented drought began midway through the Dinkey's initial decade as a CFLRP and profoundly changed the landscape with insect-related tree mortality exceeding 90 percent in some stands (Sierra National Forest, 2020). Now, "the Dinkey Landscape sits in the epicenter of unprecedented fuel loading due to tree mortality" (Sierra National Forest, 2020).

According to The Dinkey Collaborative – Application for Extension in Funding:

> We stand to lose: people's homes (~5000) and livelihoods; recreation opportunities (1.5 million visitors a year) which support local economies…; heritage lands of the Western Mono Indians; a giant sequoia grove…; societal goods including timber and high-quality water to one of the richest agricultural regions in the world (Sierra National Forest, 2020).

With the 2021 approval for an extension of CFLRP funding, the Dinkey Collaborative plans to treat 65,000 acres to reduce the risk of catastrophic fire and increase forest resilience. Forest treatments include timber sales focused on 10" to 20" diameter breast height (dbh) harvests to meet restoration objectives. Likewise, the Dinkey Collaborative will remove biomass material as markets and partnership funds allow (Sierra National Forest, 2020).

The Dinkey Landscape is contained within Fresno County, California, which makes up the "Study Area" in this report (figure 1). The Study Area covers 3.8 million acres. Analysis of timber flow indicates that timber harvested in the Dinkey Study Area is processed by facilities located inside and outside its boundaries. All counties that contain one or more facilities that process timber harvested in the Study Area constitute the "Timber Processing Area" or TPA. The TPA for the Dinkey CFLRP includes Fresno County as well as Kern, Tulare, and Tuolumne counties in California.

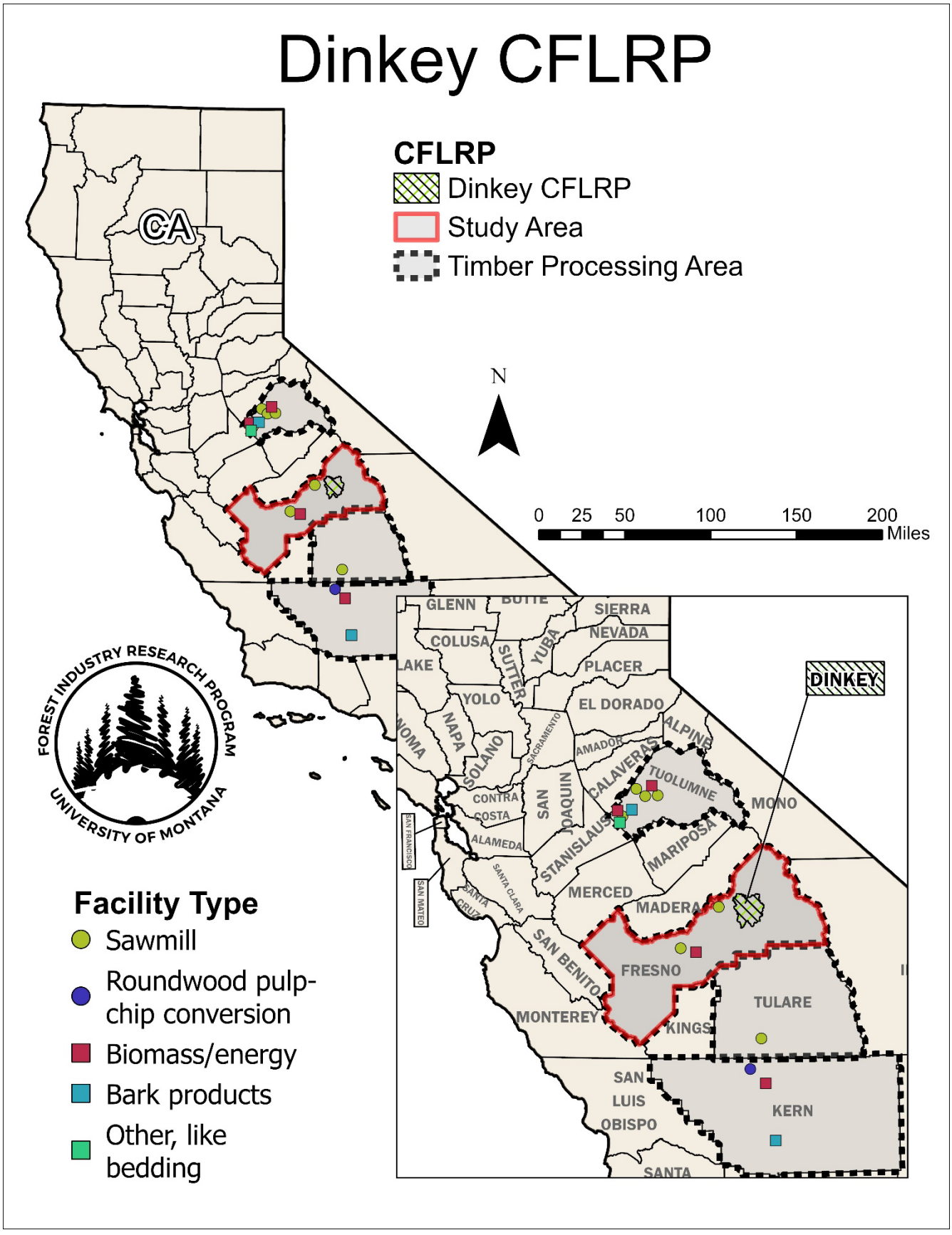
The data used to develop the information presented in this report were collected from timber-processing facilities by the University of Montana's Forest Industry Research Program (FIRP) within the Bureau of Business and Economic Research. FIRP would like to thank the timber-processing facilities for their participation, without which, analyses such as this one would not be possible.

The data were collected and processed by FIRP under joint venture agreements with the USDA Forest Service's Pacific Northwest Research Station. FIRP conducted a census of timber-processing facilities in California in 2000, 2006, 2012, 2016, and 2021. In 2018 FIRP began conducting annual sampling of timber-processing facilities in California. All but one of the tables in this report summarize data from the periodic census. Table 6 summarizes data from both the periodic census and from annual sampling.

FIRP makes every effort to identify and collect data from all commercial timber-processing facilities that buy logs and sell output products across the West. Hobbyists and timber processors that supply their own logs or saw for hire may not be included in FIRP's database. If the reader identifies facilities in the TPA counties that are missing from this analysis, please let FIRP know.

Additional information from FIRP is available upon request; however, mill- or company-level data are confidential and will not be released.

Figure 1. The Dinkey CFLRP, Study Area, Timber Processing Area, and facilities.



There are 15 timber processing facilities in the Dinkey TPA, including 7 sawmills, 4 biomass energy, 2 bark products facilities, 1 roundwood pulp-chip conversion facility, and 1 wood shavings facility (table 1).

Table 1. Dinkey TPA timber-processing facilities.

Facility name	Facility type	State	County	Current Facility Status	Included in log-processing capacity analysis
Rio Bravo Fresno	Biomass/energy	CA	Fresno	Active	No
Auberry Sawmill Inc	Sawmill	CA	Fresno	Active	Yes
Welker's Custom Cut Lumber	Sawmill	CA	Fresno	Active	No
West Coast Forest and Cinder Products	Bark products	CA	Kern	Active	No
DTE - Mt Poso	Biomass/energy	CA	Kern	Active	No
Lignum Support - McFarland	Roundwood pulp-chip conversi	CA	Kern	Active	No
Sierra Forest Products	Sawmill	CA	Tulare	Active	Yes
Sierra Pacific Industries - Chinese Camp Sawmill	Sawmill	CA	Tuolumne	Active	Yes
Sierra Pacific Industries - Sonora Sawmill	Sawmill	CA	Tuolumne	Active	Yes
Deutschman Lumber Co.	Sawmill	CA	Tuolumne	Inactive	Yes
Pacific Ultrapower Chinese Station	Biomass/energy	CA	Tuolumne	Active	No
Sierra Pacific Industries - Sonora Cogen	Biomass/energy	CA	Tuolumne	Active	No
Sierra Pacific Industries - Bark Operations	Bark products	CA	Tuolumne	Active	No
American Wood Fibers - California Wood Shavings	Other, like bedding	CA	Tuolumne	Active	Yes
Garber Lumber and Moulding	Sawmill	CA	Tuolumne	Active	Yes

[a] *Highlighted facility is new to BBER and without data for capacity calculations.*

Timber harvest within the Dinkey CFLRP Study Area

The total volume of timber harvested from the Dinkey Study Area and processed into commercial products in 2021 was estimated at 85,579 hundred cubic feet (CCF) or 43,217 thousand board feet (MBF), Scribner (table 2). In 2012 and 2016 the harvest was 72,500 and 12,460 CCF or 29,347 and 6,778 MBF, Scribner respectively. The 2016 harvest was almost six times greater than the 2012 harvest and the 2021 harvest was almost seven times greater.

Table 2. Timber harvested in the Dinkey Study Area, in thousand board feet, Scribner (MBF) and hundred cubic feet (CCF), 2012, 2016 and 2021.

	2012		2016		2021	
Study Area	MBF	CCF	MBF	CCF	MBF	CCF
Fresno County	6,778	12,460	29,347	72,500	43,217	85,579

The majority of timber harvested in the Dinkey Study Area in 2012, 2016, and 2021 was saw logs, at 100 percent, 71 percent, and 100 percent of the total harvest, respectively (table 3). Energywood chipped in the woods made up the remaining 29 percent in 2016.

Table 3. Timber harvested by timber product type in the Dinkey Study Area, in thousand board feet, Scribner (MBF) and hundred cubic feet (CCF), 2012, 2016 and 2021.

	2012			2016			2021		
Product	MBF	CCF	Percent	MBF	CCF	Percent	MBF	CCF	Percent
Saw log	6,773	12,450	100%	27,212	51,150	71%	43,217	85,579	100%
Log home	5	10	0%	-	-	0%	-	-	0%
Energywood log chipped in the woods	-	-	0%	2,135	21,350	29%	-	-	0%
Total	**6,778**	**12,460**	**100%**	**29,347**	**72,500**	**100%**	**43,217**	**85,579**	**100%**

White fir constituted the greatest portion of timber harvested in the Dinkey Study Area in 2012 and 2021, while ponderosa pine had the greatest portion in 2016 (table 4).

Table 4. Timber harvest by species in the Dinkey Study Area, in thousand board feet, Scribner (MBF) and hundred cubic feet (CCF), 2012, 2016 and 2021.

	2012			2016			2021		
Species	MBF	CCF	Percent	MBF	CCF	Percent	MBF	CCF	Percent
White fir	2,425	4,457	36%	9,877	19,433	27%	17,755	35,158	41%
Incense-cedar	890	1,637	13%	544	1,023	1%	6,750	13,366	16%
Lodgepole pine	100	184	1%	75	141	0%	228	452	1%
Sugar pine	573	1,054	8%	8,892	17,581	24%	4,389	8,691	10%
Western white pine	-	-	0%	-	-	0%	31	61	0%
Ponderosa pine	889	1,633	13%	9,884	34,182	47%	10,389	20,572	24%
Douglas-fir	1,897	3,487	28%	75	141	0%	3,633	7,194	8%
Redwood	3	6	0%	-	-	0%	44	86	0%
Giant sequoia	1	1	0%	-	-	0%	-	-	0%
Western redcedar	1	2	0%	-	-	0%	-	-	0%
Total	**6,778**	**12,460**	**100%**	**29,347**	**72,500**	**100%**	**43,217**	**85,579**	**100%**

In 2012 national forest timber harvest made up the vast majority of the harvest in the Dinkey Study Area while in 2016 the harvest was split nearly evenly between national forest lands and private lands (table 5). In 2021 harvests on private lands made up 77 percent of the total while national forest lands made up 14 percent and harvests on other public lands rose to 9 percent.

Table 5. Timber harvest by ownership in the Dinkey Study Area, in thousand board feet, Scribner (MBF) and hundred cubic feet (CCF), 2012, 2016 and 2021.

	2012			2016			2021		
Ownership	MBF	CCF	Percent	MBF	CCF	Percent	MBF	CCF	Percent
National forest	6,034	11,092	89%	10,302	36,702	51%	5,912	11,708	14%
Private	744	1,368	11%	19,029	35,769	49%	33,205	65,752	77%
Other public	-	-	0%	16	30	0%	4,100	8,119	9%
Total	**6,778**	**12,460**	**100%**	**29,347**	**72,500**	**100%**	**43,217**	**85,579**	**100%**

In 2019 58 percent of the saw logs harvested were live and the remainder was harvested dead (table 6). Live/dead harvest of saw logs in 2020 was evenly split. In 2021 the percent of saw logs harvested live had shrunk to 40 percent and shrank further to 9 percent in 2022 before bouncing back to 30 percent in 2023.

Table 6. Percentage of timber harvested live and dead in the Dinkey Study Area, 2019-2023.

	2019		2020		2021		2022		2023	
Study Area	**Live percent**	**Dead percent**	**Live percent**	**Dead percent**	**Live percent**	**Dead percent**	**Live percent**	**Dead percent**	**Live percent**	**Dead percent**
Saw logs	58%	42%	50%	50%	40%	60%	9%	91%	30%	70%
Energywood chipped in woods	0%	100%	13%	88%	0%	0%	0%	0%	0%	0%
Volume-weighted average	**31%**	**69%**	**39%**	**61%**	**40%**	**60%**	**9%**	**91%**	**30%**	**70%**

Timber-processing within the Dinkey Timber Processing Area

Facilities within the Dinkey CFLRP TPA processed 63 percent of the timber harvested in the Study Area in 2021, with the remainder of the harvest going to a log exporter. The counties where only a log exporter received timber from the Study Area were excluded from the TPA because the export of national forest timber is legislatively banned.

Of the total timber processed by facilities in the Dinkey TPA in 2021, 16 percent came from within the TPA, 30 percent came from the TPA outside of the Study Area, and 53 percent came from other California counties (table 7).

Table 7. Origin of timber processed within the Dinkey TPA, in thousand board feet, Scribner (MBF) and hundred cubic feet (CCF), 2021.

Origin of timber	**Volume (MBF)**	**Volume (CCF)**	**Proportion of the total timber received**
From Study Area	27,217	53,896	16%
From TPA outside Study Area	47,142	98,586	30%
From other California counties	88,234	174,722	53%
Total	**162,594**	**327,203**	**100%**

Timber-processing capacity and capability

The purpose of this report is to provide the Dinkey CFLRP and its stakeholders with information on 1) The current use of timber by primary wood-processing facilities in the vicinity of the Dinkey CFLRP, and 2) The maximum amount of timber these facilities could economically use in their current configuration. This information is intended to help stakeholders understand the available milling capacity within the TPA.

The term "capacity" refers to the maximum total volume of timber that existing timber processors within the TPA could use annually, given firm market demand for products, sufficient raw material, and ordinary downtime for maintenance. Also known as "timber-processing capacity", it is a measure of mills' timber *input* capacity and is expressed in MBF, Scribner and CCF per year. Input capacity is a useful measure when attempting to express the capacity of multiple types of mills in a common unit of measure. It is estimated from production (output) capacity information provided by facilities. Estimates in this report include the capacity of active facilities as well as idle (inactive) facilities with equipment still in place. Facilities that are permanently closed are not included. This analysis focuses on facilities that exclusively use timber in round form, including sawmills and plywood mills, among others. Facilities that use a mix of roundwood and non-roundwood inputs, such as chips, sawdust, shavings, and bark (e.g., biomass facilities) are not included in the capacity analysis because the combination of roundwood and non-roundwood inputs can vary widely from year to year, potentially over- or under-estimating capacity and use of roundwood by substantial margins.

The term "capability" refers to the volume of trees of a certain size class (measured as diameter at breast height, or dbh) that existing timber processors can economically process annually. This report uses three dbh classes: <7", 7 to 9.9", and ≥10". These size classes were chosen to focus analysis on the smallest log sizes that are merchantable in the western U.S. and that are often harvested in restoration treatments conducted on national forest lands. Some facilities are designed to operate using only trees of a given size class. Capability at these facilities is readily classified in just one of the size classes (e.g., plywood plants typically only use trees ≥10" dbh, and post manufacturers primarily use trees <10" dbh). Many facilities can and do use timber from a variety of size classes, especially sawmills, which often process logs that are larger than the smallest tree size they are capable of processing due to greater profitability. However, some mills that process larger logs are not capable of processing smaller-diameter timber due to the configuration of their equipment.

"Use" refers to the volume of timber, both in total and by tree dbh class, that facilities are currently processing.

Annual processing capacity, capability, and utilization

The estimated annual timber-processing capacity of facilities in the Dinkey TPA was 338,917 CCF or 171,161 MBF, Scribner (table 8). Of this volume, 93 percent (315,533 CCF or 159,348 MBF, Scribner) was in the ≥10" dbh size class, 6 percent (21,796 CCF or 11,010 MBF, Scribner) was in the 7-9.9" dbh size class and less than 1 percent was in the <7" dbh size class. As such, the vast majority of the Dinkey TPA facilities' timber-processing capacity is for larger logs and may not be able to process smaller ones, either due to their equipment or because such processing would have a profit margin too small to be economical.

Table 8. Annual timber processing capacity and capability, by the dbh size class, of facilities within the Dinkey TPA, in thousand board feet, Scribner (MBF) and hundred cubic feet (CCF), 2021.

Tree dbh	Thousand board feet, Scribner (MBF)	Hundred cubic feet (CCF)	Percent
< 7 in.	803	1,588	0%
7 - 9.9 in.	11,010	21,796	6%
≥ 10 in.	159,348	315,533	93%
Total	**171,161**	**338,917**	**100%**

Timber-processing facilities in the Dinkey TPA used 91 percent (307,618 CCF or 155,350 MBF, Scribner) of their timber-processing capacity (table 9).

Table 9. Annual timber processing capacity and consumption by facilities within the Dinkey TPA, in thousand board feet, Scribner (MBF) and hundred cubic feet (CCF), 2021.

	--------Capacity to process timber--------		-------Actual timber consumption-------		
Timber Processing Area	*Thousand board feet, Scribner (MBF)*	*Hundred cubic feet (CCF)*	*Thousand board feet, Scribner (MBF)*	*Hundred cubic feet (CCF)*	**Most recent utilization**
Fresno, Tulare and Toulumne counties	171,161	338,917	155,350	307,618	91%

Of the total timber processing capability for logs <7” dbh, 91 percent has gone unused while 82 percent of the 7-9.9” dbh capability has gone unused. By contrast, less than 4 percent of the ≥10” dbh capability has gone unused (table 10).

Table 10. Annual timber processing capability and unused capability for facilities within the Dinkey TPA, in thousand board feet, Scribner (MBF) and hundred cubic feet (CCF), 2021.

	Capability to process timber by dbh size class (CCF)			Unused capability to process timber by dbh size class (CCF)		
Timber Processing Area	*<7" dbh*	*7-9.9" dbh*	*≥10" dbh*	*<7" dbh*	*7-9.9" dbh*	*≥10" dbh*
Fresno, Tulare and Toulumne counties	1,588	21,796	315,533	1,449	17,805	12,045

Timber use by facilities in the Dinkey TPA in the ≥10” dbh size class was at a rate 76 times greater than the rate of use of the 7-9.9” dbh size class in 2021 (table 11). The facilities in the TPA used timber in the 7-9.9” dbh size class at a rate 29 times greater than the <7” dbh size class.

Table 11. Timber use, by dbh size class, for facilities within the Dinkey TPA, in thousand board feet, Scribner (MBF) and hundred cubic feet (CCF), 2021.

Tree dbh	Thousand board feet, Scribner (MBF)	Hundred cubic feet (CCF)	Percent
<7 in.	71	140	0%
7 - 9.9 in.	2,016	3,992	1%
≥10 in.	153,263	303,487	99%
Total	**155,350**	**307,618**	**100%**

In 2021 there was 31,298 CCF (15,811 MBF, Scribner) of unused timber processing capacity in the Dinkey TPA, 38 percent of which was for trees ≥10” dbh (table 12). The unused timber processing capability for trees 7-9.9” dbh constituted 57 percent of the total unused capacity while unused capability to process the smallest size class was 5 percent to the total.

Table 12. Unused timber processing capacity, by dbh size class, for facilities within the Dinkey TPA, in thousand board feet, Scribner (MBF) and hundred cubic feet (CCF), 2021.

Tree dbh	Thousand board feet, Scribner (MBF)	Hundred cubic feet (CCF)	Percent
<7 in.	732	1,449	5%
7 - 9.9 in.	8,993	17,805	57%
≥10 in.	6,085	12,045	38%
Total	**15,811**	**31,298**	**100%**

Discussion

The capacity utilization levels presented in this report indicate that the forest products industry in the Dinkey TPA has capacity available to process an increased yield of timber resulting from mechanized fuels reduction (table 12). However, the size and quality of timber available, as well as prevailing market prices and the availability of qualified labor, also affect the level of capacity at which primary processors are able to operate and in what size class(es) capability is concentrated. Fuels reduction treatments frequently involve the harvesting of smaller-diameter timber, the profitability of which diminishes as tree diameter decreases (Stewart et al. 2004). Harvesting salvage (standing dead) timber can become similarly unprofitable, especially if logs are less than 10" dbh, due to the lower grade recovery for these logs (Fahey et al. 1986).

While some operators have configurations capable of accommodating the processing of large and small logs, not all processors are able to do so. Processing a greater volume of logs from smaller trees, that typically yield lower recovery, could reduce profit margins to the point of a mill becoming unprofitable, especially in a weak lumber market.

Sources

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