Lake County Biomass Supply Assessment

Lake County Biomass Aggregation Pilot Project

Prepared for:
Lake County Resource Conservation District
Lake County Risk Reduction Authority
County of Lake

Prepared by:
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This report is intended to support the objectives of the Lake County Biomass Aggregation Pilot Project.

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Table of Contents

Table of Figures

Table of Tables

Table of Photos

List of Acronyms Used

BLM	Bureau of Land Management
CAL FIRE	California Department of Forestry and Fire Protection
CEQA	California Environmental Quality Act
CLERC	Clear Lake Environmental Research Center
CWHR	California Wildlife Habitat Relationships
LCI	Governor's Office of Land Use and Climate Innovation
LTO	Licensed Timber Operator
MFP	Mendocino Forest Products
MMBF	million board feet
MBF	thousand board feet
MOB	Mediterranean oak borer
MW	Megawatt
NF	National Forest
PG&E	Pacific Gas & Electric
RRA	Risk Reduction Authority (Lake County)
RCD	Resource Conservation District (Lake County)
SPI	Sierra Pacific Industries
SSCRA	Seigler Springs Community Redevelopment Association
SVEC	Scotts Valley Energy Corporation

I. Introduction

Project Background

The Lake County Biomass Aggregation Pilot Project (Lake County Biomass Project) is one of six pilot projects funded through the California Governor's Office of Land Use and Climate Innovation (LCI)'s Forest Sector Market Development Program. The goal of this project is to identify opportunities for the Lake County Risk Reduction Authority (RRA), an existing joint powers authority consisting of a variety of Lake County-based government entities, can better support utilization of forest biomass that is removed from vegetation management and wildfire prevention activities in Lake County. The Lake County Resource Conservation District (Lake County RCD) is the agreement lead, with support from County of Lake's Office of Climate Resiliency.

As part of the Lake County Biomass Project, the Project Team is tasked with identifying opportunities for the RRA to support biomass removal and utilization through a variety of activities, including: 1) Summarize the extent of forest biomass generating activities in Lake County and develop a Biomass Supply Report; 2) Assist the RRA with identifying potential activities for it to offer in support of forest biomass utilization, and identify sustainable financial sources to fund the RRA's ongoing operations; and 3) Modify existing foundational documents of the RRA to perform activities identified earlier, and develop an Entity Action Plan to guide the RRA with future activities in support of forest biomass removal and utilization.

This report accomplishes Task 4 of the LCI Agreement to develop a Biomass Supply Report based on biomass generating activities in Lake County. The study area for this report is defined as within the Lake County boundaries to be consistent with the intent of the Lake County Biomass Project's scope.

Report Objectives

This report evaluates Lake County's capacity for forest biomass removal and improved biomass supply chains. The objectives of this report are to:

- Discuss and quantify potential new sources of forest biomass in Lake County and the surrounding landscapes that could supply a new facility.
- Identify existing outlets for biomass within a 2-hour haul distance radius from Lake County.
- Identify and interview primary stakeholders in the region that are working to advance landscape restoration work that generates woody biomass.
- Interview licensed timber operators to identify barriers and opportunities around the vegetation management and biomass removal industry, obtain current and potential prices for delivered biomass, and discuss how a new biomass facility might help their operations.
- Provide recommendations to the RRA for moving forward.

Approach

Efforts to calculate the specific quantity of biomass on the landscape does not guarantee successful development of biomass feedstock contracts. Thus, this study examines the local factors in place that can make biomass available, such as permitting processes and other

regulatory considerations, funding, market prices, current wood processing methods, accessibility, transportation, land manager capacity, and operator capacity. To achieve this, we interviewed a variety of local Lake County-based stakeholders involved with fuels reduction, forest management, wood removal, wood processing, and utilization, including representatives from state, local, and federal agencies, non-profits, foresters, timber operators, tree contractors, fire districts, regional sawmills, and a wood processing facility. The result is a set of recommendations that the RRA can take to improve biomass supply chains in Lake County, especially in support of wildfire and forest resilience activities.

Lake County Community Risk Reduction Authority Background

The Lake County RRA was formed in 2018 to support Lake County's communities through the effective use of local governments authority, implementing programs that offer low- or no-cost risk reduction resources to the public, and providing informational and educational resources to the public so that they are better able to assess and manage these risks.

The RRA was created by a Joint Powers Agreement consisting of a variety of local government entities including the County of Lake, Lakeport Fire Protection District, Northshore Fire Protection District, South Lake County Fire Protection District, Kelseyville Fire Protection District, Lake County Fire Protection District, Lake County Water Protection District, various county water districts, City of Lakeport, City of Clearlake, and Native Sovereign Nations including the Habematolel Pomo of Upper Lake, Middletown Rancheria of Pomo Indians, Scotts Valley Band of Pomo Indians, and the Robinson Rancheria of Pomo Indians.

II. Lake County Landscape Overview

Understanding the geography and vegetation present in the region is helpful when analyzing biomass supply availability. For the purposes of this report, the study region is defined as the Lake County boundaries, totaling 1,329 square miles, or roughly 850,000 acres[1]. Lake County is located within Northern California's Coast Range, approximately 100 miles north of San Francisco. Its population is estimated to be 67,764, and the city of Lakeport is the county seat.

The topography of Lake County is hilly and mountainous with several large agricultural valleys. Elevations range from 640 feet to nearly 7,000 feet above sea level, with the highest point being Snow Mountain in the Snow Mountain Wilderness of the Mendocino National Forest. The Pomo Indians inhabited the region for over 19,000 years prior to European settlement. Lake County is home to Clear Lake, California's largest natural lake. Most of Lake County's communities are situated around Clear Lake. Another feature of note is The Geysers, the largest geothermal field complex in the world.

Figure 1. Lake County boundaries and location

[1] https://www2.census.gov/geo/docs/maps-data/data/gazetteer/counties_list_06.txt

Land Ownership

Public lands comprise approximately 51% of Lake County. The northern region of Lake County is dominated by federal lands under management primarily by the US Forest Service's Mendocino National Forest (at 254,608 acres), and the Bureau of Land Management's Ukiah Field Office (at 121,328 acres). Much of the southern portion of Lake County is under private ownership. Figure 2 below shows public land ownership types and locations in Lake County.

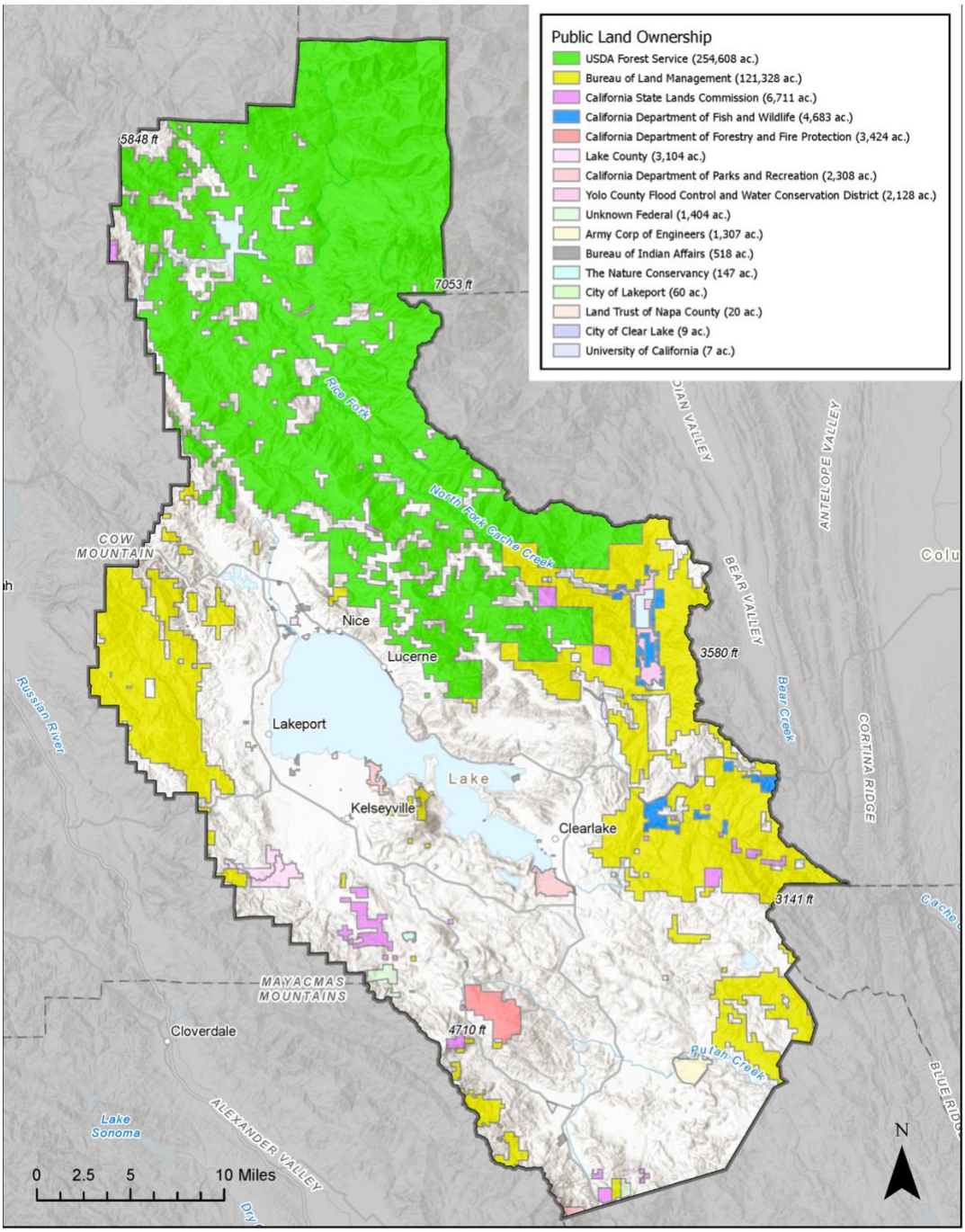

Figure 2. Public land ownership in Lake County.

Vegetation Types

Vegetation cover and the type of land management activity occurring within it influence the volume of woody biomass that can be made available to a biomass facility. Lake County has a wide range of vegetation types, with shrub being the dominant land cover type, followed by conifer and hardwood forests. Fuels reduction or forest health activities occurring within conifer and hardwood forests will generate a relatively higher volume of woody biomass given the stand density reduction needs to adequately achieve reduced fire risk or improved health, relative to other vegetation types such as shrub or grasslands.

Table 1 and Figure 3 include a breakdown of the total area of each California Wildlife Habitat Relationships (CWHR) vegetation type in Lake County. Land cover data available from the CWHR system does not demonstrate any potential change in vegetation type that has occurred following the Ranch Fire and Mendocino Complex which have both widely impacted Lake County's landscape (see Fire History section). As a result, the reported acreage of conifer forest should be interpreted cautiously if this value is used to understand where the highest volumes of woody biomass might be on the landscape.

Agricultural lands, particularly vineyards, may represent an additional source of woody biomass, but this source is beyond the scope of this study and not investigated in detail.

Table 1. Total acreage of each vegetation type in Lake County. Source: California Wildlife Habitat Relationships (CWHR) vegetation types

Vegetation Type – Lake County	**Acres**
Agriculture	50,013
Barren/Other	2,997
Conifer Forest	145,258
Hardwood Forest	126,423
Hardwood Woodland	99,266
Herbaceous	54,050
Shrub	309,404
Urban	12,841
Water	49,334
Wetland	403
Total	**849,989**

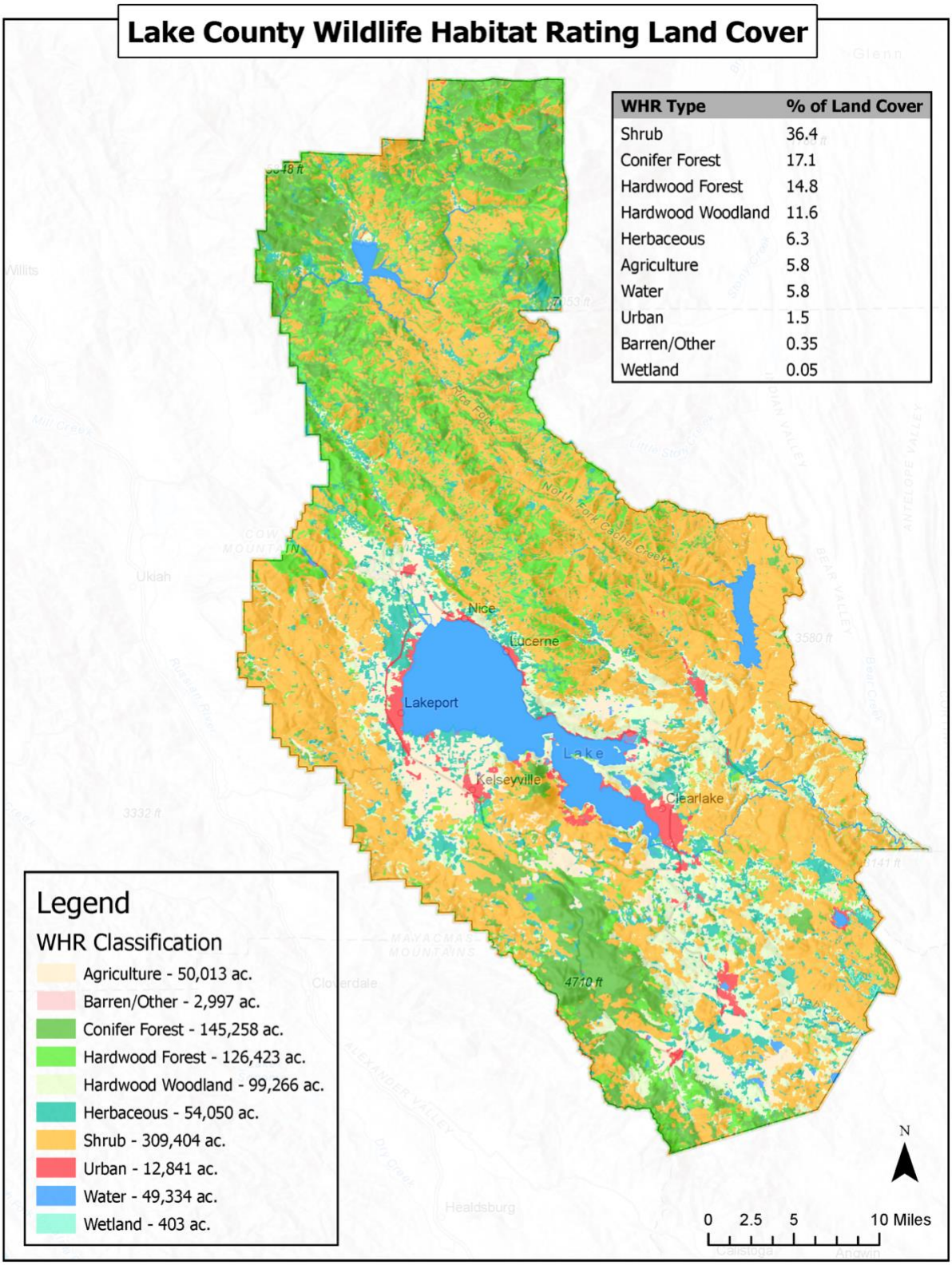

Figure 3. Vegetation types in Lake County.

Fire History and Fire Effects to Vegetation

According to the Lake County Community Wildfire Protection Plan, the County has lost more than 1,800 homes to wildfire since 2015[2]. Some estimates indicate nearly 70% of Lake County's land mass has burned since 2015 – see Figure 4 for a map of major wildfires since 2015. The region's residents are not strangers to wildfire, and every resident has been under mandatory evacuation orders at least once; many have evacuated multiple times.

Two major wildfires that have impacted significant portions of the county where conifer forests have historically been the dominant vegetation type are the Ranch Fire (Mendocino Complex) of 2018, August Complex of 2020, and the Valley Fire of 2015.

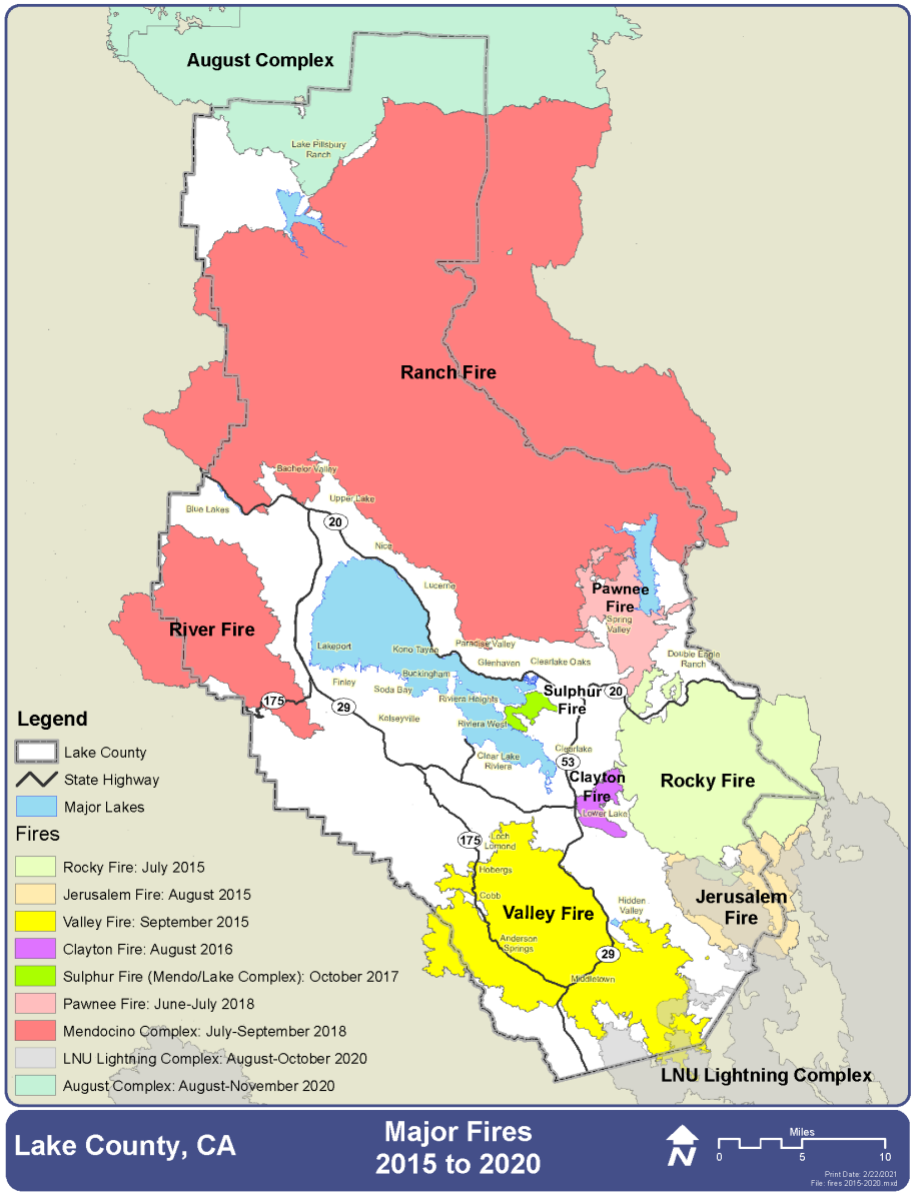

Figure 4. Lake County wildfires since 2015.

[2] https://www.lakecountyca.gov/1647/2023-Community-Wildfire-Protection-Plan-

The 2015 Valley Fire burned 76,067 acres across Lake, Sonoma, and Napa Counties, with the largest portion of the fire impacting Lake County. The Valley Fire destroyed almost 2,000 structures, and burned roughly half of the conifer forestland present in the Cobb area. The Valley Fire also burned 95% of the CAL FIRE Boggs Mountain Demonstration State Forest.

The 2018 Ranch Fire and 2020 August Complex together burned 940,000 acres of the Mendocino National Forest (Mendocino NF), or 88% of the Mendocino NF's total area. The US Forest Service estimates that just under half of areas impacted by these wildfires burned at high severity with stand-replacing fire effects. Across all high-severity patches within these recent wildfires, 31% of those areas were conifer forest; 82,279 acres of conifer forest within the Mendocino NF are thus considered degraded by recent fire. Much of this area is outside of Lake County's boundaries, but this data is still included to demonstrate wildfire impacts to conifers in the broader region. Large patches of high-severity fire in conifer forests can hinder forest recovery due to the distance to viable seed sources[3], and therefore may not represent a substantial source of woody biomass in the near future.

Tree Mortality Issues

The County of Lake proclaimed a local State of Emergency due to Pervasive Tree Mortality in May 2022, after extreme drought, groundwater depletion, and multi-species bark beetle infestation led to widespread tree mortality across the county[4]. An aerial tree mortality detection survey led by the US Forest Service conducted in 2022 estimated that 31,000 acres had been impacted by tree mortality, with approximately 590,000 dead trees county-wide, excluding dead trees from wildfires[5]; this number has grown since as demonstrated by additional surveys conducted in 2023 and 2024. Since then, the County has worked to conduct tree mortality surveys throughout the southern portion of the county with funding support from the state to better understand the extent of mortality and hazard tree removal needs.

Vegetation management and hazard tree removal performed to address widespread tree mortality in Lake County could generate meaningful volumes of woody biomass. This is made evident by the Middletown Wood Yard operation which is working to process wood removed by PG&E for enhanced line clearing to protect their infrastructure across the southern Lake County area following wildfire and widespread tree die-off (see page 14 for further detail).

In addition to bark beetles, Lake County is experiencing a rise in cases of the Mediterranean oak borer (MOB), an invasive ambrosia beetle that likely spread from Napa County in recent years. MOB targets oak trees by tunneling into tree trunks to disrupt water transport and create pathways to farm the fungus Raffaelea montetyi that it feeds on[6]. This fungus then weakens the trees and typically leads to the tree's death over 3-5 years. As a result of this infestation, it is critical that any movement of forest biomass, especially firewood, does not spread MOB; this can be achieved through heat treating or burning biomass[7]. Solarization (covering biomass with

[3] USDA Forest Service. April 2024. Mendocino Prescribed Fire and Fuels Management Strategy. https://www.fs.usda.gov/r05/mendocino/projects/archive/59722
[4] https://www.lakecountyca.gov/1748/Tree-Mortality-Program
[5] https://www.fs.usda.gov/r05/natural-resources/forest-health/aerial-detection-monitoring
[6] https://www.theclerc.org/mediterranean-oak-borer-monitoring-project
[7] https://ucanr.edu/sites/default/files/2020-08/332536.pdf

a tarp for extended periods of time) has shown to not successfully kill MOB and could still contribute to its spread[8].

Wood Processing Facilities Serving Lake County

The following facilities have historically processed both sawtimber and woody biomass from forest management activities within Lake County, but are located outside of the county boundaries. See Figure 5 for their locations.

DTE Woodland Biomass Power

Woodland Biomass Power is a 25 megawatt biomass power plant located in Yolo County. Woodland Biomass utilizes 180,000 tons of woody biomass annually, and 47% of that volume, or 85,000 tons per year, is from forested High Hazard Zones. The remainder of biomass utilized per year is sourced from urban wood waste, orchard removals, tree trimmings, and agricultural residues such as nut shells.

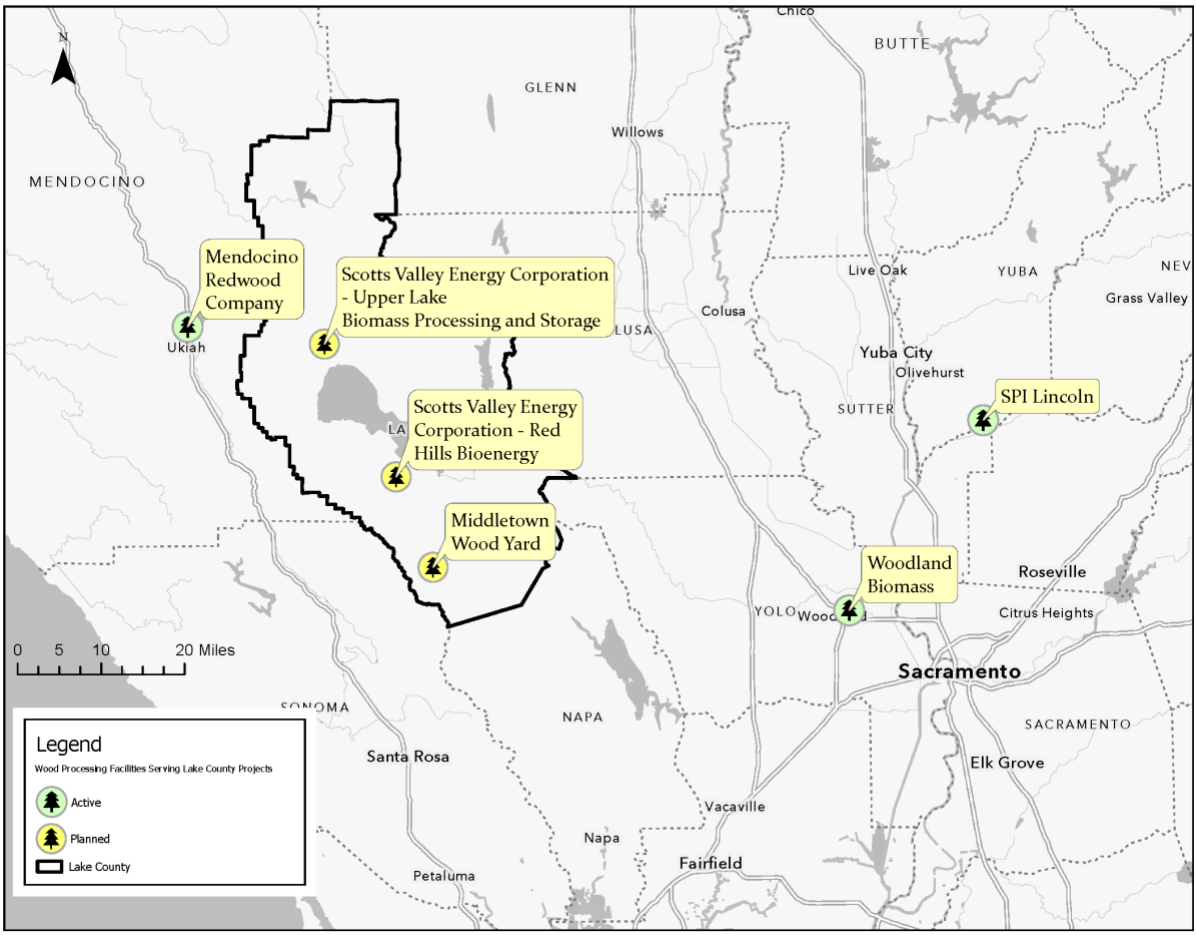

Figure 5. Primary wood processing facilities that have historically accepted sawlogs and biomass from Lake County's forest management projects, based on interviews with local foresters and licensed timber operators. Planned Lake County-based facilities that will process forest biomass locally are also included for reference.

[8] https://countyoflake.legistar.com/View.ashx?M=F&ID=13781523&GUID=1B641964-15B7-4DB2-80D1-3BE46161A1F5

Mendocino Forest Products – Sawmill and Pellet Plant

Mendocino Forest Products (MFP), a subsidiary of Mendocino Redwood Company, has a sawmill in nearby Ukiah that processes roughly 160 million board feet (MMBF) of timber into appearance grade lumber per year. MFP also has a pellet mill adjacent to the sawmill where it converts sawmill residuals into wood pellets, producing roughly 35,000 tons per year of pellets that are sold in retail stores throughout the US West.

MFP primarily processes redwood, which does not grow in Lake County, but will also buy Doug-fir, white fir, pine, and cedar, which are more typical species of Lake County's conifer forests. MFP will purchase sawtimber from Lake County-based projects when it is made available. MFP will buy salvage/dead logs, but typically only in the first 6-8 months following death of the tree due to insect damage that occurs over time in order to meet the mill's appearance grade specifications for lumber. Log prices vary based on species and wood quality but as of spring 2025, they can be expected to be in the $300s for pine, $400s for white fir, and $500s for Doug-fir.

The MFP pellet mill primarily utilizes mill residuals from the MFP sawmill as feedstock and does not typically purchase wood chips from outside sources.

Sierra Pacific Industries Lincoln – Sawmill

Sierra Pacific Industries (SPI)'s sawmill in Lincoln processes 348 MMBF of sawtimber per year, including white fir, Doug-fir, ponderosa pine, sugar pine, and incense cedar. SPI Lincoln has both a large and small log sawmill, and primarily produces structural products that are graded for structural applications (rather than appearance)[9]. SPI Lincoln also has a biomass cogeneration facility on-site where it produces energy and steam from sawmill residuals.

According to a timber operator in the Cobb area, SPI Lincoln has on occasion purchased logs from Lake County based projects, particularly in the Cobb area. However, according to local operators, log prices in recent years have made haul costs from Lake County to Lincoln cost prohibitive.

Unity Forest Products Yuba City – Sawmill

Unity Forest Products is a lumber remanufacture plant and sawmill in Yuba City that produces appearance grade lumber. As a result, Unity is usually more particular in the quality of logs purchased, similar to MFP. Unity is an approximately 1.5 hour haul from the City of Clearlake on the eastern end of Lake County, and an additional 20-30 minutes to more timbered areas of the county (such as in Cobb).

Other Facilities Farther From Lake County

The following facilities have at times received biomass and sawtimber from Lake County-based activities, but are not listed on the map in Figure 5 due to their longer haul distances. The feasibility of sending wood products to these facilities depends on prices for delivered biomass or sawtimber, or available of subsidy to offset transportation costs.

[9] https://ucanr.edu/sites/default/files/2018-01/238333.pdf

Shasta-Sustainable Resource Management Biomass Plant – Anderson
Shasta-Sustainable Resource Management (SRM) is a 50 MW biomass power plant located in Anderson, about a 2 hour or 132 mile one-way haul from Clearlake. This facility will on occasion receive material from Lake County-based projects, depending on the delivered price for biomass or if an Anderson/Redding-area based operator performs work on the Mendocino National Forest.

Sierra Pacific Industries Sawmill – Anderson
Sierra Pacific Industries operates a small log sawmill in Anderson which has on occasion purchased sawtimber from Lake County and on the Mendocino NF. This sawmill is approximately a 2-hour haul from Clearlake.

Local Wood Processing Facilities

Scotts Valley Energy Corporation (Planned)
The Scotts Valley Band of Pomo Indians established the Scotts Valley Energy Corporation (SVEC) in 2018 for the purpose of pursuing economic opportunities in the energy industry focused on small-scale bioenergy. Its current plans are to establish a network of distributed energy resource facilities that in total generate 200-2000 kilowatts of electricity from woody biomass. These facilities will be placed close to where woody biomass feedstock is available.

SVEC's first planned development site is the tribe's fee land on Red Hills Road in Kelseyville. The planned facility for development will be a 200 kilowatt bioenergy plant that will sell electricity to PG&E and generate biochar as a byproduct of the gasification process. This facility will utilize approximately 1,340 tons of wood chips per year.

Biomass storage and processing for this facility will be located at a separate site owned by the Watershed Protection District in Upper Lake. The Upper Lake site will receive unprocessed wood chips (hog fuel) to be further processed into refined wood chips that meet the size and moisture content specifications for use by proposed gasification system at Red Hills.

SVEC will continue working to build out its plan for a network of small-scale bioenergy plants throughout Lake County and surrounding areas. To date it has identified 8 sites for prospective development: 6 within the county and 2 outside the county (in Ukiah and in Yuba City). These sites have been selected based on their proximity to woody biomass sources, site viability in terms of zoning and permitting needs, quality of electric distribution network for grid interconnection, and potential for co-location with a larger electricity user. Additionally, three of these sites are on tribal trust lands (Robinson Rancheria, Habematolel Band of Pomo Indians, and Middletown Rancheria), and are therefore outside of the county's zoning code and have no use restrictions other than those set by the respective tribal council; this will help potential reduce the costly and time consuming regulatory permitting process.

Middletown Wood Yard (Temporarily Active and Planned)
PG&E in partnership with Clear Lake Environmental Research Center (CLERC), County of Lake, and Earth Foundries is piloting a Tigercat Carbonizer to process wood removed by PG&E on a County-owned site in Middletown. The Carbonizer is deployed in tandem with a CAL FIRE air curtain incinerator to ensure effective removal of wood, with the Carbonizer generating biochar as a value-added byproduct.

The goal of this Middletown Carbonizer Pilot Project is to identify if the biochar produced can be sold for local agriculture uses (including vineyards) or be used as a filtration method for creeks that feed into Clear Lake. Project partners hope to continue operations at this site longer term for processing forest biomass from the surrounding landscape.

A demonstration was held in March 2025 to showcase the project[10]. CLERC hopes to expand this effort through a Log Hauling Pilot Project where they will collect dead and downed trees from private properties and process the material at the Middletown site with the Carbonizer.

Quackenbush Resource Recovery

Quackenbush Resource Recovery is a composting facility located in Clearlake, and owned and operated by C&W Waste Solutions. Quackenbush accepts clean wood and green waste (meaning garden and yard waste), as well as construction and demolition material. Quackenbush has a contract with the County to take material from curbside green waste bins, as part of the County's effort to ensure California Senate Bill 1383 compliance for organic waste diversion. It also accepts material self-hauled to the facility where a tipping fee of $71/ton is charged for disposal. Quackenbush does not accept food waste.

Quackenbush sells compost, topsoil, clean and uniform sized wood chips, and recycled aggregated base rock. However, according to staff, the regional compost market has declined in recent years, especially following changes in policy regulating the cannabis industry.

Quackenbush staff report that their facility accepted 920 tons of "clean" construction wood waste in 2024; this could represent a potential source of biomass to SVEC or other future wood processing facilities in need of biomass supply. Quackenbush sells clean wood chips for $32/ton[11].

Owner-Operator Wood Processing – Throughout Lake County

There are several small owner-operator wood processing operations throughout the county, especially in the Cobb area where local contractors are hired by landowners for dead tree removal or by local entities to implement defensible space projects. These operations are all at a small scale, and include firewood processing and on-site milling of dead trees with mobile sawmills.

[10] https://www.youtube.com/watch?v=5OzAa7b30M0
[11] https://candswaste.com/wp-content/uploads/2024/07/FLYER-Landscape-Quackenbush-7.16.24.pdf

III. Biomass Transportation Network Analysis

Transportation costs are often the most expensive part of the biomass supply chain given high fuel costs combined with low prices for delivered biomass in recent years. As a result, biomass processing facilities typically end up procuring feedstock within areas relatively close by (such as within a 1-hour haul time), depending on the delivered price for biomass offered. To demonstrate areas of Lake County that are within a reasonable haul distance to local planned facilities, we performed a transportation network analysis displayed below in Figure 6 and Figure 7. Both the SVEC facility in Upper Lake and the Middletown Wood Yard in Middletown are used as the focus areas for the transportation analysis given existing efforts to permit these sites for wood processing operations.

Figure 6 shows areas in and around Lake County that are within a 30, 60, and 90 minute haul time to the SVEC wood processing facility in Upper Lake. Given SVEC facility's proximity to the western edge of Lake County, there are areas of Mendocino County that are within a 1-hour haul to Upper Lake. SVEC could theoretically source material from this region if Lake County-based activities did not consistently generate enough material to supply the facility year-round.

Similarly, Figure 7 shows the same haul times but centered around the Middletown Wood Yard in Middletown. This figure shows that there are areas of northern Sonoma and Napa counties that are within a 1-hour drive time of the Middletown wood yard, so if a facility were to establish on-site for long term operations, it could like source material from out of county as well.

On the other hand, Figure 8 identifies areas of Lake County that are within a 120 minute haul time to Woodland Biomass, the closest larger scale biomass facility to Lake County. This network analysis shows that most areas of Lake County are more than a 90 or 120 minute haul to Woodland Biomass, resulting in cost prohibitive hauls to Woodland (depending on the delivered biomass price offered by Woodland).

Figure 8 also shows that most areas of the Mendocino NF are more than 120 minutes (or 2 hours) driving time from Woodland. This transportation time likely challenges the economic viability of woody biomass removal from Mendocino NF projects without considerable subsidy or grant funding.

Finally, the longer haul times to Woodland demonstrated by Figure 8 also calls to the importance of development of local options for wood utilization or biomass processing.

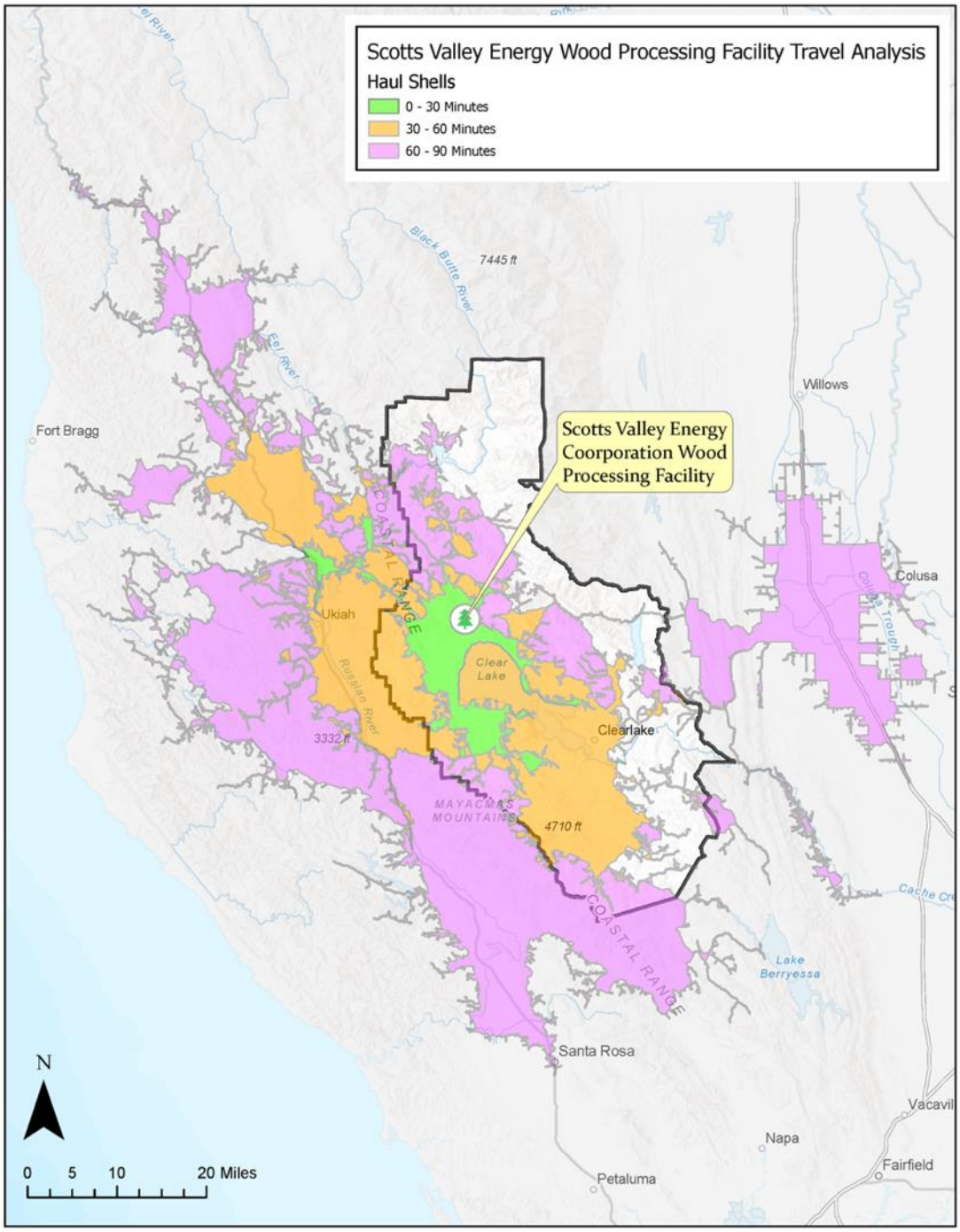

Figure 6. Transportation analysis for areas within 30, 60, and 90 minute haul times from the Scotts Valley Energy Corporation wood processing facility in Upper Lake.

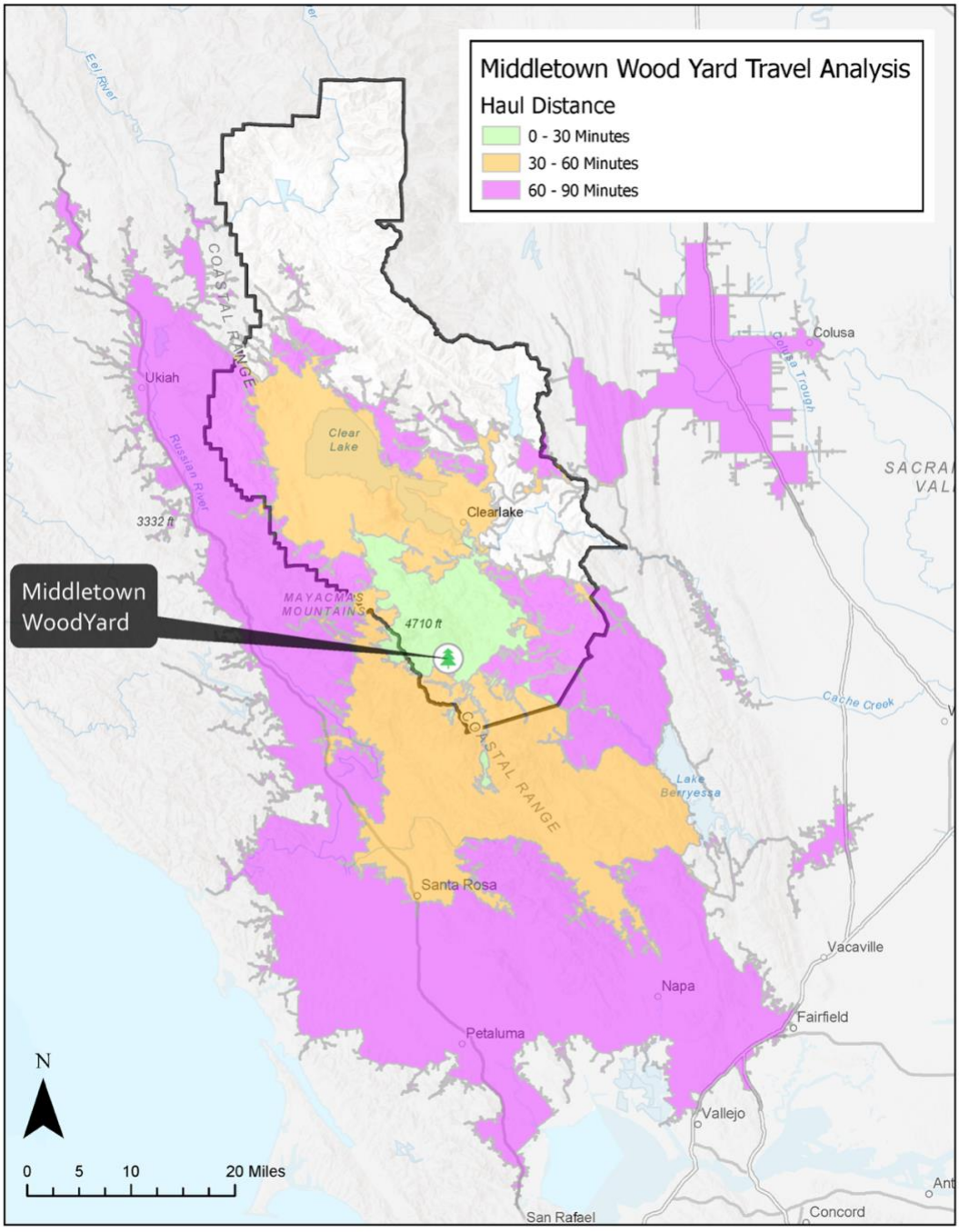

Figure 7. Transportation analysis for areas within 30, 60, and 90 minute haul times from the Middletown Wood Yard in Middletown.

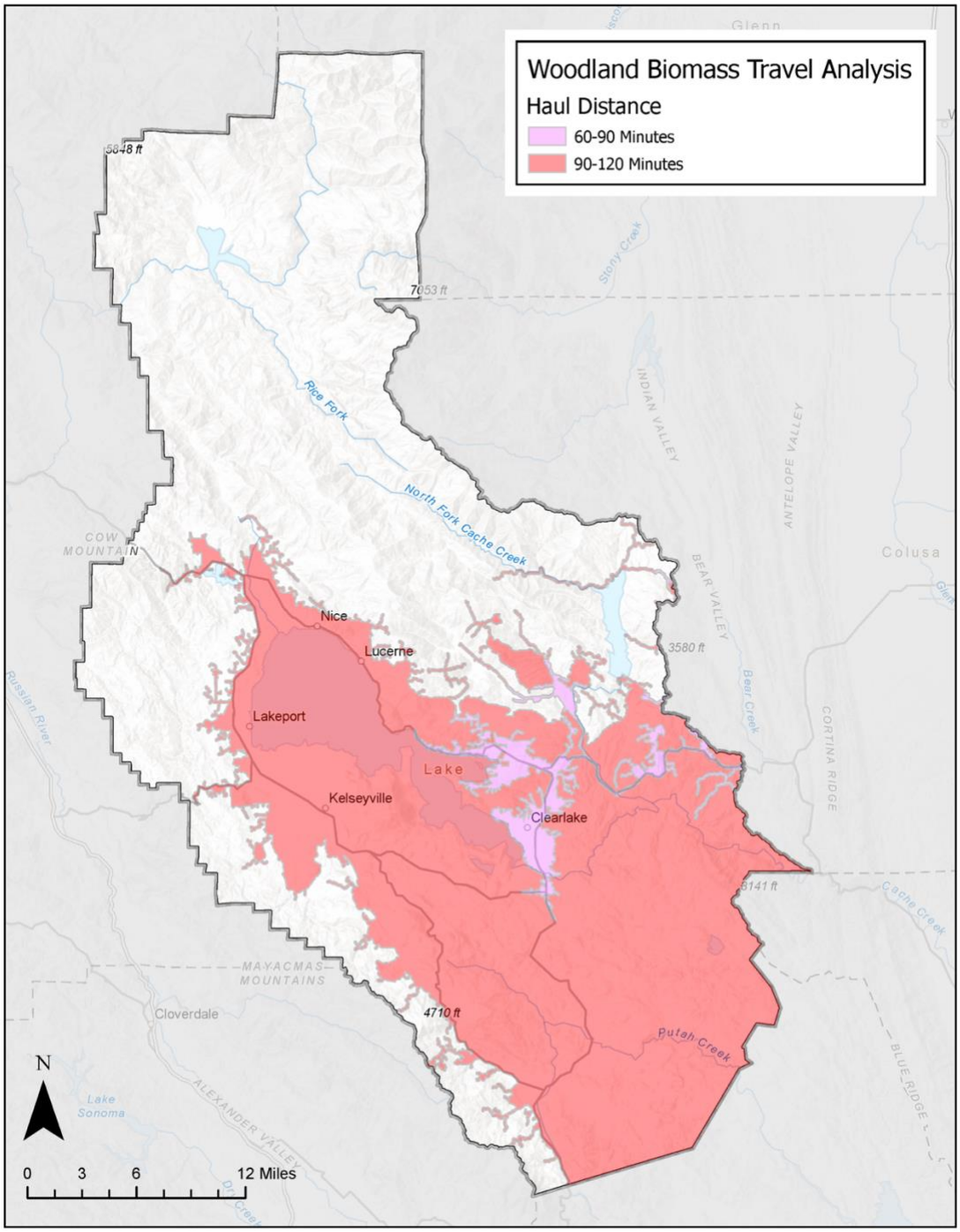

Figure 8. Areas of Lake County that are within 90 and 120 minute haul times to Woodland Biomass (note that the Woodland facility is located outside of the map area, and travel times are clipped to the county boundaries).

IV. Current Woody Biomass Generating Activities and Opportunities

The 2015 Valley Fire brought heightened awareness to Lake County residents on the importance of fuels reduction and vegetation treatment activities that reduce wildfire risk, and as a result the region has seen an increase in vegetation management projects over the last 10 years. This work has typically been grant funded, financed by private landowners, led by PG&E along utility lines, or led by the county or Caltrans along roadways.

Lake County does not have a robust timber harvesting industry or culture, according to local stakeholders, operators, and foresters interviewed. This could be in part due to nearby sawmills favoring redwood sawtimber, which does not grow in Lake County. There are no sawmills in Lake County. Similarly, the closest biomass facility to Lake County is Woodland Biomass, almost an 80 mile haul distance from Clearlake, 100 miles from Cobb, and 101 miles from Upper Lake. As a result of limited existing infrastructure to process biomass, many vegetation management activities in Lake County use mastication and hand thinning/piling as a wildfire risk reduction strategy.

Timber Harvesting

There has been little market-driven removal of timber or other forest products in recent years in Lake County. In the last decade, timber harvesting has primarily occurred as salvage logging on privately owned lands following large-scale wildfire events that have impacted the region, including the Valley Fire (2015) and Ranch Fire (2018). This trend is made evident by the spikes displayed in Figure 9 below, with the highest amount of merchantable timber removed in 2016 following the Valley Fire, totaling 55,367 thousand board feet (MBF), or about 55 million board feet, according to California Department of Tax and Fee Administration data. This volume of timber removed in 2016 represented 3.68% of the annual net volume harvested statewide.

Outside of fire salvage, some local operators will perform small-scale hazard or dead tree removal via CAL FIRE 10% Dead and Dying Exemptions, and ship sawlogs to the Mendocino Forest Products (MFP) sawmill in Ukiah. In recent years this work is often supported in part by forest health-related grant funding.

According to Mendocino NF staff, the Upper Lake Ranger District has not sold a timber sale since 2009. Generally, the Mendocino NF does not have a strong program around commercial product removal especially since widespread wildfire impacts to the Forest and subsequent prioritization of post-fire restoration activities.

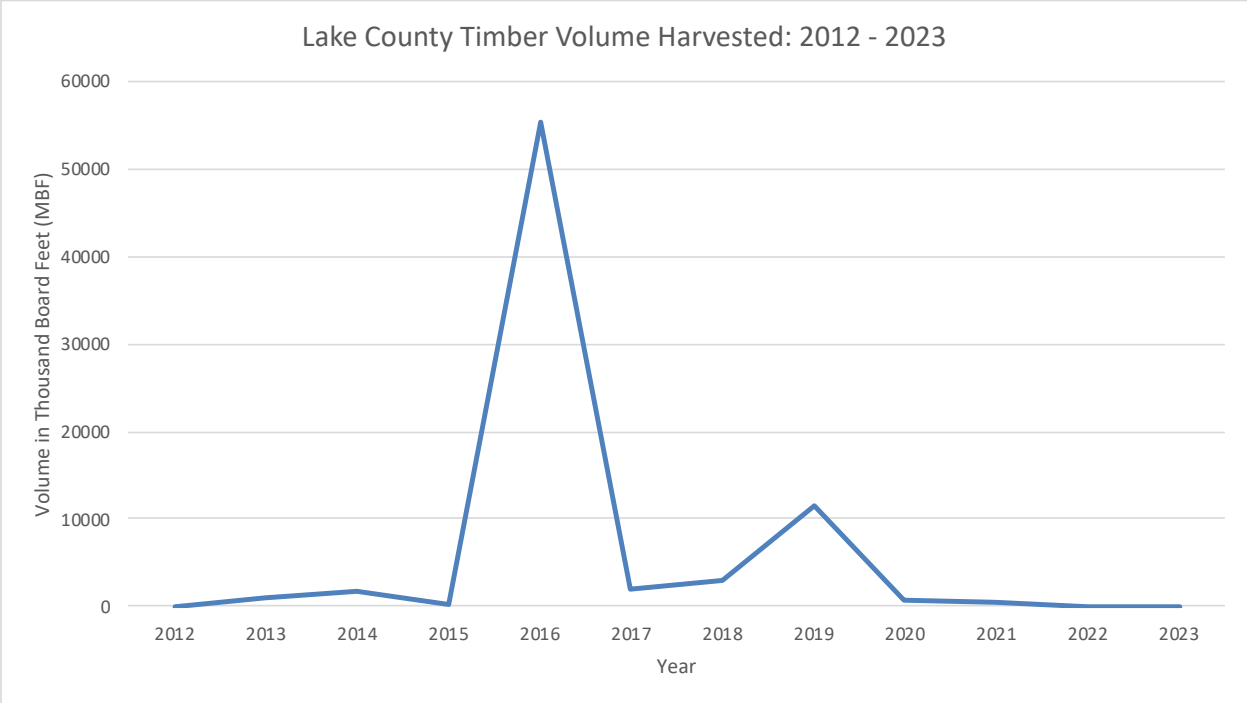

Figure 9. Volume of timber harvested from Lake County since 2012 in thousand board feet (MBF). Source: CA Department of Tax and Fee Administration – Timber Harvest Statistics

Table 2. Net volume of timber harvested per year in Lake County, since 2012. Data is sourced from California Department of Tax and Fee Administration Timber Harvest Statistics data.

Year	Volume (Net MBF)	Net Volume: % Of Total Volume Harvested Statewide)
2012	56	--
2013	966	0.06
2014	1,721	0.12
2015	330	0.02
2016	55,367	3.68
2017	2,029	0.13
2018	2,952	0.19
2019	11,365	0.79
2020	749	0.05
2021	420	0.02
2022	14	0
2023	40	0

Current Biomass Disposal Practices from Timber Harvesting

Standard practices for biomass and slash disposal performed by timber operators in Lake County typically involve pile burning and lop/scatter methods, given the long-haul distances to biomass power facilities. If a market for biomass were to develop in closer proximity to timber harvesting sites, some operators may opt to chip and haul biomass to said location, and this

work could therefore represent a potential supply of feedstock. However, given the limited extent of timber harvesting occurring in a “normal” non-fire salvage year in Lake County, the total volume of material may be minimal at first.

Fuels Reduction and Forest Health Projects

The following entities are the primary groups involved in advancing fuels reduction and forest health projects in Lake County that generate woody biomass or have the potential to long-term.

Mendocino National Forest

There are over 254,000 acres of lands managed by the Mendocino National Forest in Lake County that all lie north of Clear Lake, primarily within the Upper Lake Ranger District. Most of this area burned in the 2018 Ranch Fire and the 2020 August Complex.

The Mendocino NF developed the Prescribed Fire and Fuels Management Strategy in 2024 to guide post-fire restoration across the Forest following significant large-scale wildfire impacts in 2018 and 2020 (940,000 acres of the Forest burned in these wildfires). This Strategy outlines plans for manual and mechanical fuels reduction treatments to allow prescribed fire to be safely reintroduced to the landscape as a management tool. These tools identified in the Strategy include mastication, hand piling, machine piling, pile burning, lop and scattering, and chipping where feasible. The Strategy does not include sawtimber removal but does plan for biomass removal where needed. Both this Strategy and conversations held with Mendocino NF staff suggest that the overall land management direction for the Forest in the near future will be focused on re-introduction of prescribed fire and post-fire restoration.

However, there could still be opportunity to generate meaningful volumes of biomass as part of this restoration work. This could be achieved through stand density reduction or thinning treatments in “green islands”, or areas of forest that did not burn in recent wildfires that could still benefit from fuels reduction for improved forest health.

Another possible source of biomass could be from knobcone pine removal projects as the species has significantly encroached into hardwood stands and in WUI areas due to recent high-severity wildfires. Mendocino NF staff would like to expand programming around knobcone pine removal for forest restoration purposes, but this would be in small volumes and would be very contingent on grants or funding allocated to the Forest to plan for and implement this work.

A more specific near-term project planned is the North Shore Restoration Project, which is supported by CLERC via a Master Stewardship Agreement and with funding from a CAL FIRE Forest Health grant. This project involves post-fire restoration and fuels reduction within “green” areas that did not burn at a high severity; according to CLERC staff, it has the potential to generate 75,000 tons of biomass if a cost-effective outlet for this material could be identified – see the CLERC section below for further discussion.

According to Upper Lake Ranger District staff, there have been no timber sales offered on the Mendocino NF in the last two decades. This may be in part due to much of the conifer forestland lying within wilderness areas or late successional reserves, which restricts certain management activities that involve commercial timber removal. Furthermore, much of the Upper Lake Ranger District consists of oak, chapparal, and grassland ecosystems, which therefore do not require the same level of biomass management to reduce fuel loading.

Regardless, there has not been a culture around large-scale biomass removal on this ranger district in a long time, with a staff person sharing that the last time a chip van left the Upper Lake Ranger District loaded with biomass was 2007. Additionally, most areas of the Mendocino NF within Lake County are remote and any biomass removal would require long drive times to haul material off-site.

Bureau of Land Management – Ukiah Field Office

There are 121,00 acres of Bureau of Land Management (BLM) lands in Lake County, managed out of the Ukiah Field Office in the Central California District. Most BLM managed lands are directly west and east of Clear Lake, and there are small parcels on Mount Konocti directly south of Clear Lake. The Cache Creek Wilderness is located on the eastern county boundary.

The BLM state office signed a decision record in 2023 for the Statewide Wildland-Urban Interface Fuels Treatment Programmatic Environmental Assessment, a plan focused on reducing fuel loading on BLM lands near communities. There are 13,240 acres of BLM land in Lake County that are included in this plan[12], which could represent a source of biomass supply.

Boggs Mountain Demonstration State Forest – CAL FIRE

California Department of Forestry and Fire Protection manages the Boggs Mountain Demonstration State Forest, a 3,500-acre demonstration forest located in Cobb in southern Lake County. 99% of this forest burned in the 2015 Valley Fire. Following the fire, CAL FIRE salvage logged and very successful replanted 2,700 acres of the forest (see Photo 1). Salvage logs were sent to the SPI Lincoln sawmill.

Photo 1. Plantation at Boggs State Forest; this area was successfully replanted after the 2015 Valley Fire. Credit: District 5 Jessica Pyska.

[12] https://www.lakeconews.com/news/76417-bureau-of-land-management-unveils-plan-to-reduce-wildfire-risk-in-california-northwest-nevada

CAL FIRE staff at Boggs have plans for pre-commercial thinning efforts in plantations to improve growing space for trees, but the feasibility of this work is contingent on funding availability and staff capacity. Currently there are several vacant positions at Boggs. Without a cost effective and nearby outlet for biomass, thinning treatments will likely involve mastication, piling and burning, or lop and scatter methods.

Staff shared that Boggs is overall accessible – there is an establish road and skid trail network throughout the forest from past management activities. Should a local outlet for biomass be developed, Boggs could likely supply material to a facility.

California Department of Transportation, District 1

California Department of Transportation, or Caltrans, frequently performs tree work along state highways in Lake County, including both removal or pruning of hazard trees and branches, and general fuels reduction work. According to Caltrans District 1 staff, their crews generate chipped wood biomass almost daily, which is typically transported to a Caltrans owned disposal site for storage, or for future use as fill for miscellaneous agency projects. While staff were unable to provide a volume estimate of biomass produced, they did confirm that more wood chips are produced than the agency needs.

Clear Lake Environmental Research Center

The Clear Lake Environmental Research Center (CLERC) is a non-profit focused on improving wildfire resilience across the county and its communities. Its key focus areas include leading wildfire readiness efforts, bettering Clear Lake's ecosystem and its surroundings, bolstering local partnerships, and setting up necessary systems to achieve its mission. CLERC also performs environmental education work locally on several relevant issues.

CLERC: Fire and Forestry Program Work

CLERC coordinates forest health and fuels reduction projects in critical locations throughout the county through its Fire and Forestry Program, with support from various CAL FIRE and US Department of Agriculture grants. Activities performed include fuels reduction, reforestation following wildfires, prescribed burning, project planning, workforce development, and community engagement. A dashboard displaying all of CLERC's projects can be found here.

Since 2019, CLERC has treated over 3,900 acres for fuels reduction, forest health, and insect/dead tree removal primarily in the southern portions of the county impacted by the Valley Fire, and north of Clear Lake on the Mendocino NF. A larger project currently being led by CLERC under a Master Stewardship Agreement with the Mendocino NF is the North Shore Restoration Project. CLERC has secured funding to treat 1,065 acres of the larger 40,000 acre boundary that have been deemed as needing immediate attention, with project activities to include site prep, fuels reduction, removal of dead trees, and reforestation. Project activities will restore health and fire resilience to this area north of Clear Lake. This project could generate 75,000 tons of biomass if a local outlet or market for this material is developed; otherwise, material will be decked until funding is secured to support biomass removal and hauling, or it will be piled and burned to sufficiently achieve site prep and fuels reduction goals. However, this estimate of biomass may be time sensitive due to decay that will occur to the wood over time, making biomass more difficult to pick up with a grapple to be chipped.

CLERC: Community Chipping Program

CLERC provides free curbside chipping services throughout Lake County to support residents with implementing defensible space and reducing fire risk around structures. Different areas of the county are serviced by different chipping crews and in partnership with varying organizations[13], but most require the homeowner to lead the cutting and stacking of vegetation, while the chipping crew performs the chipping.

For most community chipping programming, the contractors are responsible for disposing of biomass, and most either broadcast chip the material on-site or haul to Quackenbush and pay its green waste tipping fee.

According to CLERC staff, its community chipping program could fully meet the biomass demand needs from the SVEC facility in Kelseyville, equivalent to 1300 tons per year. The challenge to achieving this will be maintaining funding to continue implementing chipping programs over time, especially given the costs associated with transporting small volumes of biomass to a centralized location.

Photo 2. Image of Hogback Ridge Fuels Crew Chipping. Image taken by Rachel Avilla.

Lake County Resource Conservation District

Following some organizational and staffing challenges, the Lake County Resource Conservation District (RCD) has re-grown in recent years and offers a variety of services to Lake County landowners. Current program areas of the RCD that involve treatment of forest biomass include grant funded fuels reduction projects, implementation of defensible space clearance for homeowners, and development of forest management plans for nonindustrial private forest landowners. The defensible space program likely represents the largest source of biomass from RCD projects at this time, although this work is very dependent on grant funding; RCD staff estimate that if this program continues, they anticipating treating 100-150 homes per year.

[13] https://www.theclerc.org/chipping-program

Longer term, the RCD looks forward to building its forest health and wildfire resilience programming and may eventually take on larger landscape-scale vegetation treatment projects that would generate woody biomass supply.

Pacific Gas & Electric

Following implementation of an enhanced vegetation management program along utility right-of-way corridors in Lake County, particularly after recent widespread tree mortality, Pacific Gas & Electric (PG&E) launched its Wood Management Program to remove wood larger than 4" diameter left behind from this work on private properties. This work and the abundance of wood resulted in the creation of the Middletown Wood Yard where a carbonizer has been deployed to process 5,000 tons of biomass into biochar.

PG&E predicts that this more intensive vegetation management program is winding down, but the utility company still plans to perform ongoing vegetation maintenance along its powerlines for the foreseeable future. Staff stated that moving forward, PG&E anticipates to "work" 25,000 trees per year along utility corridors in Lake County. This estimate includes limbing, trimming, or full removal of trees of all sizes along utility lines.

PG&E expressed that looking ahead for work in Lake County, they are an eager partner of opportunities for wood disposal.

PG&E: Hometown Wildfire Safety Collaborative

Launched by PG&E in 2023, the Hometown Wildfire Safety Collaborative (Collaborative) is a partnership between CLERC, PG&E, Northshore Fire Protection District, Lake County Fire Chiefs Association, California Fire Chiefs Association, Gordon and Betty Moore Foundation, US Forest Service, and CAL FIRE, and is an effort to provide financial support for local fuels reduction projects. The Collaborative is also piloting the Middletown Carbonizer Project at the Middletown Wood Yard.

Seigler Springs Community Redevelopment Association and Cobb Area Council

Seigler Springs Community Redevelopment Association (SSCRA) is a nonprofit based in Seigler Springs that was founded in 2015 following the Valley Fire to support the Cobb area in its recovery. SSCRA works to fill key roles in the evolution of the community by helping build its local prosperity, solidarity, and resilience.

SSCRA coordinates the Cobb Area Council, an advisory group to the Lake County Board of Supervisors on matters related to the Cobb area. The Forest Stewardship Working Group of the Cobb Area Council convenes local forest health practitioners and develop a stewardship plan for management of local forest and watershed resources. The group is currently working on a Cobb-specific Community Wildfire Protection Plan that will build the region's capacity for receiving funding for implementation of fuels reduction work, such as through the US Forest Service Community Wildfire Defense Grant. The Forest Stewardship Group and SSCRA partnered with CAL FIRE in 2022 to deploy a CAL FIRE-owned Series 220 FireBox Burner to support wood disposal efforts in the Cobb area[14].

Other goals of the group are to increase the total acreage in Cobb under forest management plans, increase establishment and maintenance of fuel breaks, increase landowner

[14] https://www.lakeconews.com/news/74339-cal-fire-piloting-air-curtain-incinerator-at-cobb-mountain

responsibility for proper forest management, and provide support to homeowners and neighborhoods to manage hazardous brush and trees[15].

Overall SSCRA and its advisory group are taking a lead role in the Cobb area to identify outlets for forest biomass, with a focus at the "hyper local" scale to find circular economy type solutions.

Other Private Landowners

The Prather Family owns much of the forestland to the west and south sites of Mount Hannah. The Prather's have previously managed their forestland on a sustained yield basis, but log prices in recent years have resulted in fewer harvesting activities. The Prather Family also sells firewood to the local community, performs small-scale logging and dead or hazard tree removal for local landowners, and uses a mobile sawmill to provide rough cut lumber from fallen dead trees to landowners. One family member also teaches tree falling and chainsaw safety trainings to the local community.

Current Practices for Disposal of Biomass from Fuels Reduction Projects

Contractors working on fuels reduction projects in Lake County use a variety of methods to dispose of byproducts of this work, including the following:

Drop at Quackenbush

Quackenbush Resource Recovery facility in Clearlake accepts clean wood waste, green waste (including yard waste), and construction and demolition material. It charges a tipping fee of $71/ton for green waste disposal. Per conversations with local entities and operators, many contractors dispose of green waste from chipping and defensible space programs at Quackenbush.

Firewood Processing and Sales/Donations

Many contractors who are hired to implement fuels reduction or defensible space projects in the region will sell or give away byproducts of this work as firewood. One local contractor R2 & Company started a firewood bank in 2024 based in Cobb, with funding support from the US Forest Service and Alliance for Green Heat.

Given invasive pest concerns, particularly Mediterranean oak borer, it is imperative that efforts to process local wood into firewood use heat treating methods to prevent its spread. Local officials suspect that the Mediterranean oak borer has spread quickly in Lake County in part through firewood, which calls to the importance of establishing best management practices, such as requiring wood to be seasoned and not transporting out of the area.

Air Curtain Incinerators and Carbonizers

There have been several local efforts to use an air curtain incinerator to dispose of waste wood, and this method is ideal for limiting the spread of the Mediterranean oak borer and other invasive pests present in Lake County. SSCRA partnered with CAL FIRE in 2022 to deploy a CAL FIRE-owned Series 220 FireBox Burner to support wood disposal efforts in the Cobb area[16]. While the project did successfully remove wood debris that was stockpiled at the demonstration site, those involved with this project reflect that it was an expensive endeavor

[15] https://www.sscra.org/_files/ugd/d8d70a_4a4f51c3259541c3b5f23dc39090a10a.pdf
[16] https://www.lakeconews.com/news/74339-cal-fire-piloting-air-curtain-incinerator-at-cobb-mountain

and the burner was less efficient with larger diameter logs. More recently, many local partners have launched the Middletown Carbonizer Project on the Middletown Wood Yard to identify if generation of sellable biochar from a Tigercat Carbonizer and could help bring down the per-unit costs of wood disposal.

Mobile Sawmilling – for Dead Tree Removal on Private Lands

When hired by landowners to perform dead tree removal, one operator in the Cobb area will process logs into rough cut lumber via a small portable sawmill for the landowner's use. This work is typically at a very small-scale, and usually involves processing of larger-diameter hazard trees rather than small diameter trees and biomass.

V. Operator Capacity and Costs

Operator Types

Licensed Timber Operators

A California Licensed Timber Operator (LTO) is authorized under the California Forest Practice Act to conduct forest tree cutting and removal. More specifically, a LTO license is required for any work permitted under the Forest Practice Act, such as via a Timber Harvest Plan or other CAL FIRE Harvest Document (including "exemptions"); use of Forest Practice Act document applies for any project involving "Timber Operations", or the cutting and removal of timber or other forest products from timberlands for commercial purposes[17].

Due to the limited extent of timber harvesting occurring in Lake County, LTOs that perform timber harvesting under CAL FIRE's regulatory oversight are less common in the area relative to general vegetation management or tree service contractors. According to interviewees, if work is offered in Lake County that involves large-scale implementation, such as for post-fire hazard tree removal and related work on the Mendocino NF, contractors will typically travel to Lake County from out of the area.

However, there are still some LTOs based in Lake County, particularly in the Cobb area who perform small-scale dead and hazard tree removal for private landowners. Sawlogs from this work are often sold to either the Mendocino Forest Products sawmill in Ukiah or SPI Lincoln sawmill in Lincoln. Slash piles and biomass remaining from these activities is usually pile burned or lopped and scattered in the woods, as the haul distance to a biomass facility (such as Woodland) is too far to justify investment in large chippers or chip vans needed to haul larger quantities of biomass.

Vegetation Management and Tree Contractors

According to interviewees, contractors that perform a range of vegetation management activities, including tree work, defensible space, and vegetation clearing, are more prominent in Lake County and surrounding areas relative to LTOs. This is in part due to PG&E's very active vegetation management program combined with frequent work opportunities for tree removal and defensible space vegetation clearing. According to CLERC staff, there are at least 73 vegetation management contractors on their email list for contract work opportunities.

This type of work is usually permitted under standard California Environmental Quality Act processes and not the California Forest Practices Act, particularly if wood removed is not being "commercialized"; in this scenario, CAL FIRE is not the lead regulatory agency and contractors therefore may not be required to possess a LTO license.

With tree work and defensible space projects more readily offered in Lake County, this helps operators justify investment of equipment to pursue this kind of work. Tree contractors often use chipper trucks (see Photo 4) to haul smaller volumes of chipped biomass material off-site. Chipper trucks can hold about 15-20 cubic yards of biomass that is chipped by a tow-behind disk chipper. Other equipment types used in this region by vegetation management contractors for processing and transporting biomass include dump trailers, skid steers, front end loaders, and mini-excavators (see Photo 5).

[17] FPA Section 4527 https://bof.fire.ca.gov/media/3vep4v0r/2025-forest-practice-rules-and-act-final.pdf

Photo 3. Example of a chipper truck commonly used by vegetation management and tree contractors. Photo credit: RentTreeTrucks.

Photo 4. Mini excavator and dump trailer used by Cobb contractor R2 & Company to load and transport biomass. Photo credit: R2 & Company.

CAL FIRE and Local Fire Districts Fuels Crews

CAL FIRE and the North Shore Fire Department have fuels crews that perform small-scale fuels reduction projects via hand piling or broadcast chipping, typically targeting only the smaller fuels (less than 6" in diameter) and leaving larger wood pieces on-site to be used as firewood. CAL FIRE and local fire districts priorities are to deal with flashy fuel and shrub build-up following recent wildfire history.

Operator and Feedstock Costs

Costs for forest and vegetation management work vary based on vegetation type and the volume of vegetation removed to achieve fuels reduction goals. For example, costs associated with hand cutting, piling, and burning will be higher in a dense conifer forest, versus in a landscape dominated by shrubs.

Operator costs for fuels reduction work also vary by project and treatment type. For example, one operator performing defensible space clearing in the Cobb area charges $425 per hour for the whole suite of vegetation management services, including transportation time for green waste disposal to Quackenbush. According to a major entity implementing fuels reduction and forest health projects in Lake County, operator costs for mastication and hand piling can range from $3,000 - $4,500 per acre.

The delivered cost of biomass in Lake County will vary based on a number of factors, including the location of the end-user's site, where the biomass is sourced from, and the type of project generating woody biomass. For this reason, this report does not attempt to quantify specific delivered prices for biomass. Instead, information on potential feedstock costs can be gathered by interested entities by discussing directly with local contractors performing vegetation management and removal work.

However, it is reasonable to expect the cost for delivered biomass to be higher than in other regions of California with a more robust timber harvesting and biomass utilization industry. Much of the fuels reduction and vegetation management work in Lake County occurs at a small-scale on fragmented properties. With fewer acres to spread "fixed" costs across (such as move in and move out costs), the result is higher per acre implementation costs relative to other regions in California where there are more landscape-scale forest restoration initiatives occurring, such as in the Sierra Nevada region on federally managed lands.

Additionally, with tree and vegetation management contractors being a prominent operator type in this region, woody biomass is moved in relatively small volumes, such as in dump trailers or chipper trucks, which adds higher transportation per unit of biomass costs.

While new markets for biomass in Lake County may not alone pay for the high costs of fuels reduction work associated with processing, loading, and transporting material in relatively smaller volumes, these new markets will still help offset per acre implementation costs of doing this work, allowing grant funding to reach more acres across the landscape.

Conclusion and Implications for Prospective Wood Utilization Businesses

Throughout Lake County, wood processing infrastructure and contractors are more commonly scaled for smaller-scale vegetation management projects, as opposed to larger-scale timber harvesting practices. It is therefore critical that any prospective biomass utilization facilities design their material unloading, storage, and handling systems to match existing equipment and infrastructure available to process, transport, and unload biomass. For example, a proposed biomass facility in Lake County may not need a truck tip dump to unload biomass as large chip vans are not commonly used to transport wood chips in this region. Alternatively, a small self-unloading dump truck (which is commonly used throughout Lake County) could easily transport and unload material to a wood processing facility, albeit relatively smaller volumes of biomass per load.

VI. Spatial Analysis of Potential Biomass Availability in Conifer Forestland

Fuels reduction and thinning activities planned in forested areas of Lake County could generate larger volumes of recoverable biomass on a per acre basis, relative to fuels reduction in shrub dominated landscapes where mastication or piling and burning may be a more common practice for wildfire prevention. Furthermore, it is often desirable to remove woody biomass from the site of a forest thinning or fuels reduction project to sufficiently meet wildfire resilience and prevention goals.

Southern areas of Lake County, including the Cobb and Mount Hannah areas, contain a large area of conifer forests that are privately owned and more easily accessible from major population centers around Clear Lake. It is estimated that approximately half of the conifer forests in southern Lake County burned in the 2015 Valley Fire (see Figure 10 for the footprint of the Valley Fire within conifer forest areas). According to soil burn severity surveys conducted by State Post-Fire Watershed Emergency Response Teams[18], a considerable amount of these conifer forests burned at high severity in the Valley Fire (Figure 11), which therefore impacts the total volume of recoverable biomass on this landscape.

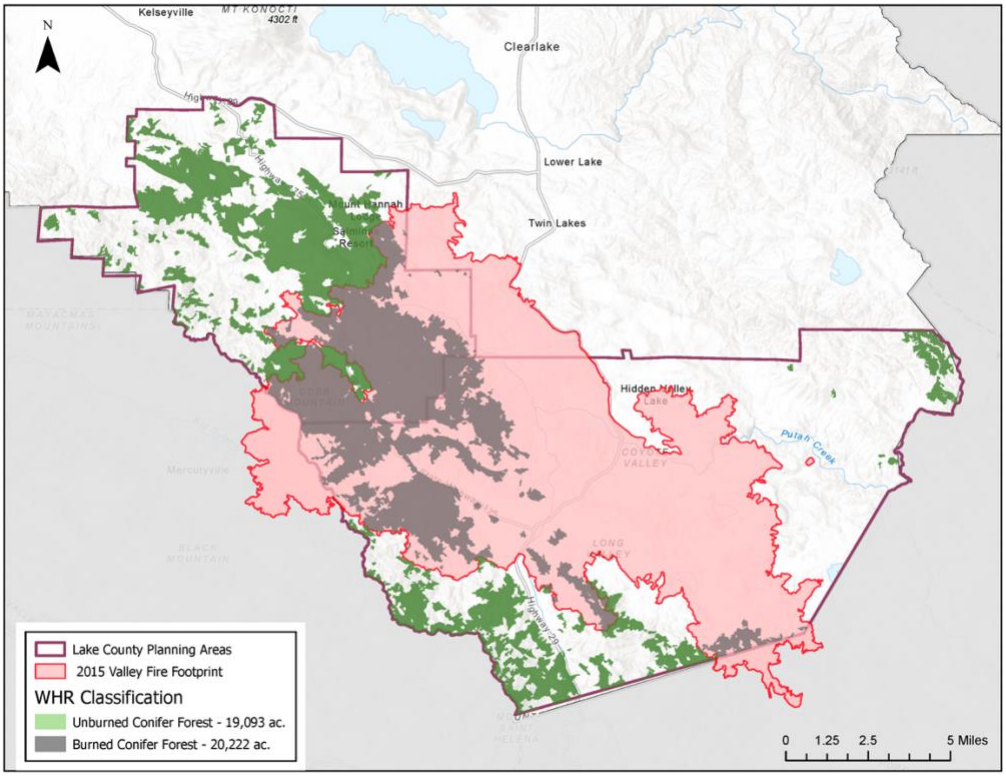

Figure 10. 2015 Valley Fire footprint and areas of conifer forests burned and unburned.

[18] Cafferata, P., Coe, D., Short, W. 2021. Lessons Learned from More than Sixty Years of Post-Fire Assessment and Monitoring on Non-Federal Lands in California: 1956 to 2021. California Forestry Report No. 6. California Department of Forestry and Fire Protection. https://www.researchgate.net/publication/359146019_Lessons_Learned_from_More_than_Sixty_Years_of_Post-Fire_Assessment_and_Monitoring_on_Non-Federal_Lands_in_California_1956_to_2021

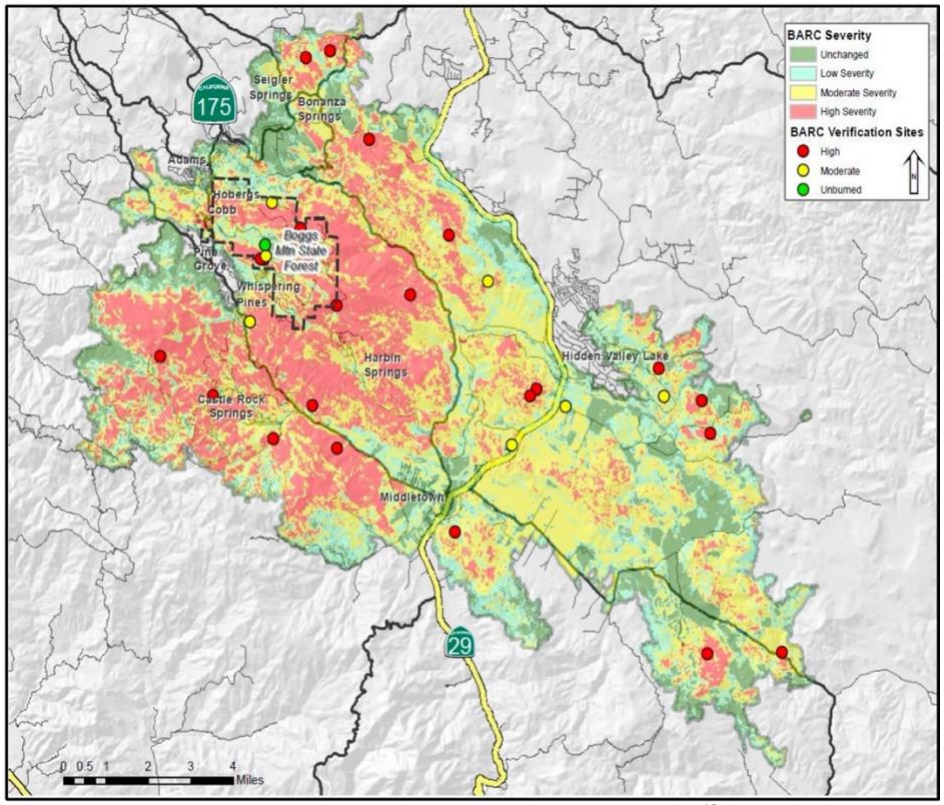

Figure 11. Valley Fire soil burn severity map (Cafferata et al 2021[19]).

Outside of the Valley Fire's impacts, there are a remaining 19,093 acres of unburned conifer forest in this area that would likely benefit from some level of thinning or density reduction treatment to improve forest health and resilience to wildfire and drought conditions.

However, if a program focused on improving forest health with mechanical thinning were to be advanced in this region, it is important to consider possible operational constraints on the total acreage available for fuels treatment, including topography and accessibility. More specifically, projects involving mechanical thinning, removal, and off-site transport of biomass may not be feasible on steep slopes or in areas that are not accessible by a road.

Figure 12 highlights 8,696 acres of conifer forest in the Cobb area that did not burn in the Valley Fire, have slopes less than 35%, and are within 1000 feet of a road. These areas could therefore yield recoverable biomass. Assuming mechanical thinning removes 8 bone dry tons (or 16 green tons) per acre, **there is approximately 69,568 bone dry tons or 139,136 green tons of recoverable biomass on this landscape**. This biomass tons per acre value is a conservative estimate based on the literature[20] and Mule Ears Consulting's field experience with biomass removal from mechanical thinning treatments designed for reduction in basal area to achieve forest health outcomes.

[19] See Footnote #18
[20] See Appendix A for a list of biomass studies that quantify tons per acre.

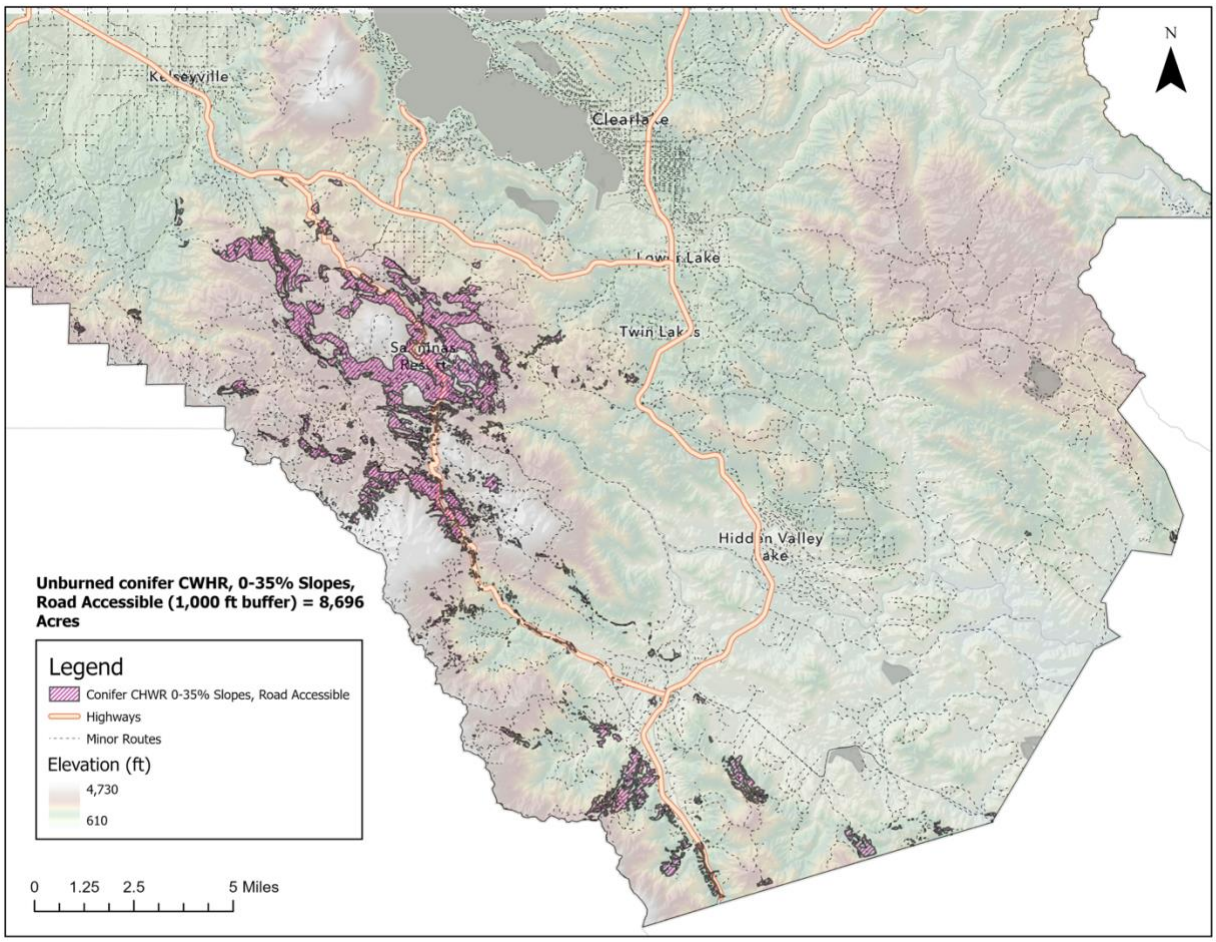

Figure 12. Spatial analysis of unburned conifer forest that are accessible by road and less than 35% slope.

A landowner assistance program designed to support forest health treatments in these areas could be developed to facilitate biomass availability for a prospective biomass utilization facility; this is discussed further in Section VIII. If roughly 500 acres of this area is treated with mechanical thinning and biomass removal per year, **this could yield 8,000 green tons per year**, which is more than the estimated annual demand for biomass from biomass facility planned by SVEC.

VII. Summary of Biomass Supply Availability

Based on findings discussed in prior sections and drawing from conversations with local stakeholders, Table 3 summarizes existing woody biomass generating activities in Lake County that a prospective wood utilization facility could source material from. Many of these activities already involve biomass removal and disposal designed into their programming. The entity responsible for generating biomass is included as well as an estimate for potential volume of material that could be produced. The third column identifies the reliability of the biomass source, from a scale of low to medium to high.

Note that many of the sources of biomass listed in Table 3, particularly from PG&E work, community chipping, and defensible space clearing, will likely include leaves and conifer needles and other non-woody components of vegetation.

Table 3. Existing sources of woody biomass in Lake County.

Existing Sources of Woody Biomass	Estimated Volume	Reliability
Caltrans – Roadside Hazard Tree Removal	Unknown	*High* – Caltrans performs roadside tree work daily, including removal, chipping, and transportation to a Caltrans owned yard in the region. Caltrans staff were unable to provide biomass volume estimates at the time of this report.
Quackenbush – Clean Chips	900 tons per year	*High* - Wood chips are generated from clean urban wood waste and are for sale for $32/ton.
Lake County RCD's Defensible Space Program	800 – 1200 tons per year[21]	*Medium/High* - Assumes ongoing grant funding. Operator is currently hauling biomass to his own yard in Cobb or to Quackenbush.
Community Chipping Programs	1300 tons per year	*Medium* – This work is grant funded. Material will include leaves/conifer needles.
North Shore Restoration Project – CLERC/ Mendocino NF (1000 acres of site prep)	75,000 total tons available	*Medium* - These estimates are time sensitive due to wood decay occurring over time post-fire.
Hazard Tree Removal and Small-scale Timber Harvesting	Variable	*Medium* - Timber operators currently dispose of biomass and slash piles by pile burning and lop/scatter methods. However, new markets for biomass or payments for its removal may incentivize operators to haul biomass off-site.
PG&E Vegetation Management	25,000 trees worked per year[22]	*Low* - There may be uncertainty in PG&E's ongoing role in wood removal.

[21] Assuming 8-12 tons of biomass removed per home, and at least 100 homes treated per year
[22] PG&E did not provide enough data to convert this value into a biomass tonnage estimate. Per PG&E staff, "trees worked" ranges from full tree removal to trimming.

Table 4 summarizes potential sources of additional biomass supply for a prospective wood utilizing business beyond existing sources in Table 3. The third column identifies strategies to increase supply availability from the specific source identified. A discussion of opportunities to increase the volume of available woody biomass broadly is discussed in Section VIII.

Table 4. Sources of additional woody biomass that could be generated with expanded programming and capacity.

Potential Sources of Woody Biomass	**Volume**	**What's Needed to Increase Supply**
Private Non-Industrial Forestland in Cobb Area	139,136 tons of recoverable biomass (see page 34 for more detail)	Landowner outreach and assistance programming designed around improving forest health for non-industrial timberland owners, including mechanical thinning and forest biomass removal.
Boggs Mountain Demonstration State Forest	Unknown – but Valley Fire plantations make up 2,700 acres	Funding to CAL FIRE for management and to fund implementation activities, improve CAL FIRE staffing too.
Mendocino NF: Other Restoration Activities (such as knobcone pine removal)	Variable	Funding to Mendocino NF and its partners to implement restoration programs.
Other Misc. Grant Funded Forest Health Projects Throughout the County	Variable	Funding to key local partners to advance project planning and implementation (such by CLERC, Lake County RCD, SSCRA, etc).

VIII. Discussion and Conclusion

Summary of Major Findings and Challenges for Advancing Biomass Utilization in Lake County

- Lake County is dominated by federally managed lands in the northern portions of the county, but most management priorities for the Mendocino NF are focused on post-fire restoration given widespread wildfire impacts.
  - ⇒ As a result, **there are few efforts planned for large-scale timber harvesting or commercial forest product removal on the Mendocino NF**.

- The southern region of Lake County consists of smaller parcels of privately owned lands, including both forestland and Wildland Urban Interface areas.
  - ⇒ This landscape of **fragmented smaller parcels could present economies of scale challenges for biomass removal and processing**, due in part to smaller project areas on non-contiguous properties, limited operating space, and higher planning costs associated with multiple landowners being involved on a project.

- There is little industrial timberland in Lake County, and there has been limited market-driven removal of forest products (timber harvesting) in recent years other than during periods of salvage logging following the 2015 Valley Fire and 2018 Ranch Fire.
  - ⇒ Timber harvesting produces unmerchantable slash that needs to be disposed of to complete project fuels reduction goals while also meeting state rules on logging slash disposal. **Without regular timber harvesting occurring, it can be challenging to rely on a consistent baseline of biomass supply generated**.

- Without strong markets for forest products, **most forest and vegetation management projects in Lake County in recent years are largely dependent on grant funding**, financed by private landowners, or led by PG&E along its utility lines.
  - ⇒ Current strategies to dispose of woody biomass in Lake County include mastication, broadcast chipping, piling/burning in place, lop and scatter (timber harvesting projects), transport and disposal to Quackenbush where a green waste tipping fee is paid, processing into firewood, and transport to Woodland if funding is available. Use of an air curtain burner and a Carbonizer are newer methods being used to dispose of wood thanks to strong partnerships between local stakeholders and entities.

- Due to small-scale nature of existing vegetation and forest health activities in Lake County, most contractors that are moving woody biomass are **tree contractors with smaller scale equipment and trucks**.
  - ⇒ The local workforce is not currently set up for moving large amounts of biomass via chip vans, but instead is for smaller scale collection and movement of biomass.

- Drawing on all the above, biomass utilization solutions should be small-scale and localized within general areas given volatility in available supply, the scale and types of existing trucking and wood processing infrastructure utilized locally, and to limit spread of the Mediterranean oak borer or other concerning pests.

Recommendations to Increase Biomass Supply and Incentivize Market Development

The following is a summary of opportunities that could be pursued by the RRA or other local entities to increase the volume of reliable biomass supply to support prospective and planned wood utilization facilities based in Lake County.

1. **Expand programming to improve forest health for private non-industrial forest landowners across southern Lake County's mixed conifer forests**

Mixed conifer forests are prevalent in the southern Lake County landscape, and this vegetation type can typically generate a higher volume of woody biomass as a byproduct of mechanical thinning operations. Spatial analysis conducted in Section VI identified that there are 19,093 acres of mixed conifer forest that did not burn in the Valley Fire. Within those 19,093 acres, there are 8,696 acres of mixed conifer forests that are on less than 35% slope and within 1000 feet of a road, therefore making them feasible for mechanical thinning operations involving forest biomass removal to achieve improved resilience and stand density reduction goals. If this work is implemented, it could represent at least 139,136 green tons of recoverable forest biomass on this landscape, using a conservative assumption of 16 green tons (or 8 bone dry tons) of biomass per acre generated from forest thinning treatments[23].

There are existing efforts to provide technical assistance to forestland owners in this area, including by CLERC through the North Bay Forest Improvement Program and by the Lake County RCD; these entities support landowners with development of Forest Management Plans for the Natural Resource Conservation Service's Environmental Quality Incentives Program eligibility or other cost-share programs. However, without an outlet for biomass or without sufficient funding to cover costs of biomass removal, landowners may opt to use pile burning or mastication as primary methods to reduce fuel loading instead of mechanical thinning and biomass removal. Thus, a more coordinated effort must be taken to aggregate these otherwise fragmented projects together so that biomass can be consistently made available to wood utilization facilities.

To maximize effectiveness of landowner outreach and avoid duplicating existing work, this effort should leverage work led by organizations such as the Lake County RCD, Seigler Springs Community Redevelopment Association, and CLERC in this area, drawing on their existing relationships, landowner outreach efforts, and other related programming in these communities.

2. **Use the Forest Practice Rules as an alternative to CEQA compliance, or pursue opportunities for CEQA exemptions via the Governor's March 2025 Emergency Proclamation**

Many stakeholders interviewed as part of this assessment identified that the typical timeline for CEQA compliance can be a significant hold up for vegetation management projects. Should this issue persist, there could be opportunity in using the California Forest Practice Rules as an alternative regulatory compliance pathway, especially if forest biomass will be commercialized and sent to a market pathways by an end-user[24]. There are various CAL FIRE exemptions that

[23] This volume estimate per acre is on the lower end estimates used in other feedstock availability reports conducted in California.

[24] See CAL FIRE memo from October 2024 for guidance on use of timber harvesting documents for environmental compliance – note that Forest Practice Rules only apply for "Timber Operations" (with commercial purposes) on "Timberland": https://files.constantcontact.com/3c053c7a901/3741984a-549e-4f4f-afb5-40cd95ebaba0.pdf?rdr=true

could be utilized for Forest Practice Rules compliance on these properties, including the Forest Resilience Exemption, a 10% Dead and Dying Exemption, or various structure protection exemptions; many of these are already used to permit dead tree removal in the Cobb area. In most cases both a Registered Professional Forester and a Licensed Timber Operator would need to be hired to permit and implement work under Forest Practice Rules, but the project would rely on CAL FIRE for regulatory oversight rather than the county, potentially resulting in fewer permitting delays.

This type of work may also be eligible for the CEQA exemption process recently set up by the Governor's recent Proclamation of a State of Emergency that exempts many wildfire resilience and fuels reduction projects from CEQA[25].

3. **Leverage strong presence of vegetation management and tree contractors in Lake County to accomplish this work**

As discussed in Section V, there are many vegetation management and tree service contractors present in Lake County and the surrounding areas. Many of these contractors already work to creatively identify outlets for biomass removal and off-site disposal as part of their contracts for vegetation management, maintaining defensible space, or community chipping.

One strategy for leveraging contractors' expertise in this space while fostering innovation in building markets for low-value wood could be to guarantee long-term work for forest and vegetation management contractors; for example, if a contractor knew they had multiple years' worth of work ahead of them, it may justify investment in equipment needed to develop value-added products from woody biomass.

The RRA and other entities could achieve this through supporting strategic long-term planning for vegetation and forest management activities across the county, to ensure that a consistent pipeline of work opportunities are offered in the years to come.

4. **Coordinate efforts to maintain funding long-term for forest and vegetation management across Lake County**

Through discussions had with local stakeholders as part of this report, one key strength to this region that was identified is the strong leadership, interest, open mindedness, and enthusiasm from entities and individuals to finding creative solutions for decreasing wildfire risk and promoting landscape health through biomass removal and disposal (or utilization). These perspectives are likely in part due to Lake County's traumatic history of wildfires and associated impacts, and increased desire among residents to promote county-wide resilience.

However, it was also made clear that maintaining consistent funding for fuels reduction and vegetation management will be critical to ensuring these goals are met, especially given the limited extent of market-driven removal of forest products currently happening in Lake County.

Until stronger markets for biomass are developed, it will be critical to maintain consistent funding for fuels reduction and forest health work to this region. Beyond state and federal grants, groups such as the RRA could work to establish strong relationships with foundations and donors to ensure ongoing funding, including through corporate sponsorships and local industry partnerships (such as PG&E or the Calpine geothermal energy producers), and overall serve in an advocacy capacity to maintain funding support to this region long-term.

[25] https://wildfiretaskforce.org/requests-to-suspend-state-statutes-and-regulations/

Conclusion

This report provides an assessment of existing woody biomass-generating activities in Lake County as well as potential sources of biomass. It also provides recommendation to the RRA on opportunities to increase biomass supply that can be made available to biomass utilizing businesses.

While development of new markets for woody biomass in Lake County may not alone pay for the costs of fuels reduction and the processing and transportation of forest biomass, new markets will still help offset the costs of doing so. Lake County's strong presence of vegetation management and tree contractors, high stakeholder enthusiasm, and collaborative inter-county partnerships position it well to achieve biomass utilization solutions that address wildfire risk and promote landscape health across Lake County.

Strategic planning led by local entities (including the RRA) for projects that involve biomass removal, as well as maintaining consistent funding for this work, will be key in incentivizing biomass market development. The RRA should look to future reports from the Lake County Biomass Project, including the Funding Mechanism Analysis and the Entity Action Plan, for guidance on this path forward.

Appendix A: References for Estimates of Tons of Forest Biomass Removed Per Acre

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