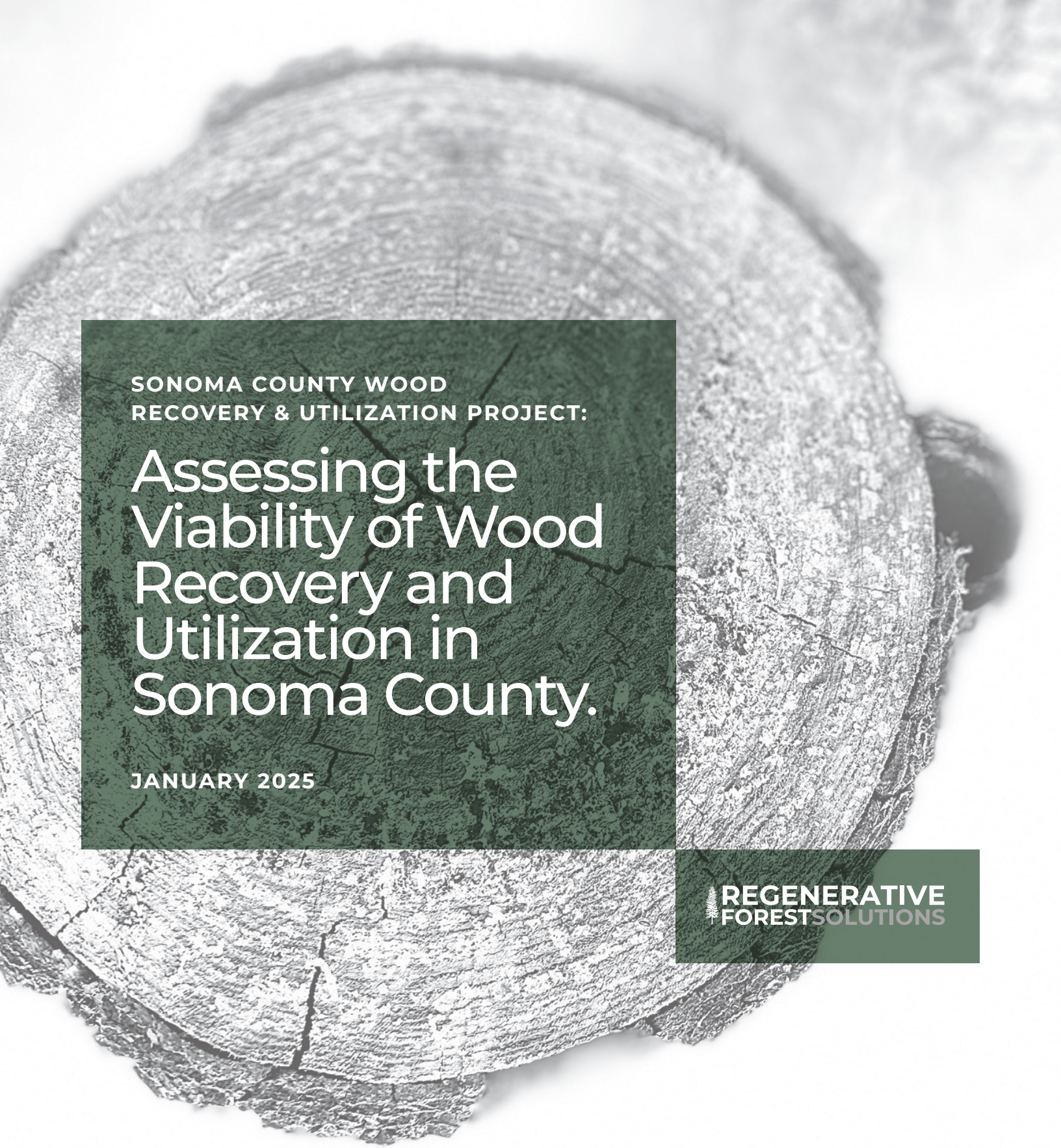

SONOMA COUNTY WOOD
RECOVERY & UTILIZATION PROJECT:

Assessing the Viability of Wood Recovery and Utilization in Sonoma County.

JANUARY 2025

REGENERATIVE FOREST SOLUTIONS

Prepared by Regenerative Forest Solutions (RFS), the Sonoma County Wood Recovery & Utilization Working Group, Consultants and Technical Advisors.

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Sonoma County is located within the ancestral, traditional and contemporary lands of the Kashia (also spelled Kashaya) Pomo and Southern Pomo, Wappo, and Coast Miwok Tribal Nations, which include the federally recognized Cloverdale Rancheria of Pomo Indians, the Kashia Band of Pomo Indians of the Stewarts Point Rancheria, the Dry Creek Rancheria Band of Pomo Indians, the Federated Indians of Graton Rancheria and Lytton Rancheria of California.

ABOUT REGENERATIVE FOREST SOLUTIONS

Regenerative Forest Solutions (RFS) is a Sonoma County-based non-profit organization providing organizational and leadership capacity for the Sonoma County Wood Recovery & Utilization Project. RFS is fiscally sponsored by Inquiring Systems Inc. who provided exceptional support that helped make this project feasible.

The authors of this report have made a good faith effort to assure the accuracy of the information provided and completeness of information found within. Omissions and misrepresentations are possible and are not the responsibility of LCI, NCRP, or any of the report's funders or contributors. The perspectives herein were written by Regenerative Forest Solutions and do not necessarily reflect the views of participating organizations.

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ACRONYMS & ABBREVIATIONS

BDT	Bone Dry Tons
BF	Board feet
BoF	Board of Forestry
CAL FIRE	California Department of Forestry and Fire Protection
CEQA	California Environmental Quality Act
CFIP	California Forest Improvement Program
CHP	Combined Heat and Power
CRCAP	Sonoma County Climate Resilience Comprehensive Action Plan
DBH	Diameter at Breast Height
GT	Green Ton
LCI	California Governor's Office of Land Use and Climate Innovation
LTO	Licensed Timber Operator
MBF	Thousand board feet
MMBF	Million board feet
NBFIP	North Bay Forest Improvement Program
NCRP	North Coast Resource Partnership
NIPF	Non-Industrial Private Forestland Owner
NRCS	U.S. Department of Agriculture Natural Resources Conservation Service
RCD	Resource Conservation District
RFS	Regenerative Forest Solutions
RPF	Registered Professional Forester
SCAPOSD	Sonoma County Agricultural Preservation + Open Space District
THP	Timber Harvest Plan
USDA	United States Department of Agriculture
USFS	United States Forest Service
WRTC	Watershed Research and Training Center

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EXECUTIVE SUMMARY

Sonoma County's forests require expanded, proactive stewardship to deliver critical social, ecological, and climate benefits. Addressing the increasing challenges of forest health decline, climate change, and wildfire risk necessitates scaling up forest management treatments across the county's 513,000 acres of forestland. However, limited financial resources, workforce capacity and infrastructure have hindered progress toward achieving community wildfire and climate resilience goals identified at local and state levels.[1][2][3] These constraints underscore the need for targeted solutions, and present a significant economic development opportunity: by strengthening the forestry, wildfire resilience, and wood products sectors, a portion of the costs associated with managing these vital forest ecosystems could be offset, enabling the ongoing treatments required for effective stewardship.

To assess the potential of scaling up forest treatments in Sonoma County, Regenerative Forest Solutions (RFS) launched the Sonoma County Wood Recovery & Utilization Project (project) in 2023. This project evaluated the county's existing landscape and identified key opportunities and challenges for implementing effective solutions. Support for the initiative came from the North Coast Resource Partnership (NCRP), with funding provided by the Governor's Office of Land Use and Climate Innovation's (LCI) California Forest Residual Aggregation for Market Enhancement (Cal FRAME) program and the Bay Area Council Foundation's California Resilience Challenge.

Existing forestry and wood products industries were analyzed to devise recommendations on how to best increase the county's ability to meet the intersection of social, ecological and economic benefits through this work. Inquiries included an assessment of existing organizations and ideal entity-types and activities; a

KEY FINDINGS:

- Sonoma County's private forestland owners have the highest potential to provide wood resources from their management of 442,968 acres, 86% of the county's forested lands.

- 13,670, 93%, of the 14,670 private ownerships manage parcels less than 100 acres. This landscape of ownerships presents both an asset and a challenge for treating forested acres and recovering wood resources.

- Enhanced wood recovery and utilization can help material "pay its way" out of the forest for increased wildfire resilience and forest health. Additional resources (e.g. grants, carbon credits, etc.) can be established through a centralized coordinating entity to expand economic offsets.

- 246,365 acres of forested acres were identified as "feasible" to treat, representing an estimated 48.4MMGT of forest biomass.

- 2,800 acres are presently treated annually on private forestlands in Sonoma County. To meet legislative requirements, the county would need to substantially increase workforce and wood processing capacities. For example, to meet the stated goals of AB 1757 (C. Garcia, 2022), the county would need to treat 10,400 acres annually.

- With engaged leadership in the county, but no existing organization interested in managing wood resources and requisite infrastructure, the project determined that the appropriate legal entity to implement recommendations at this time would be a 501(c)(3) nonprofit corporation, likely in partnership with private entities.

- Sonoma County is ideally positioned to create an exemplary model of community-scale wood management with dedicated organizations and agencies working together to care for our forest ecosystems. Establishing a "wood products campus" to increase wood processing capacities will allow the county to meet its goals of achieving successful ongoing, community and wildfire resilience, local economic development and associated climate benefits across its forested acres. Just as other infrastructure is necessary for the production and distribution of food, energy and water, a wood products campus is critical infrastructure to effectively manage our forests.

qualitative and quantitative analysis of available wood resources and infrastructure; appropriate ecological considerations; stakeholder engagement; identification of financing options; and, opportunities and barriers for the next phase of implementation.

Research conducted provided an update on forest biomass densities and wood resource availability to determine that forest health and wildfire resilience treatments are feasible in 242,365 of Sonoma County's 513,000 forested acres.[4] This represents roughly half of the total forested acres as it excludes waterways, slopes above 45%, and material that is not within sufficient proximity to roadways. The total volume of feasible forest biomass is approximately 48.4 MMGT, which would require a substantial increase across the forestry and wood products sectors to manage. [5]

Despite recent efforts and successes to bolster stewardship practices across Sonoma County, the project team discovered a general decline of in-forest treatment capacities and activities over the past three decades. The high number of small parcels, cost of treatments and permitting, finite workforce and the decline of timber-processing infrastructure have restricted annual treatments. This has led to substantial deferred maintenance in our forests and excessive fuels accumulation. Significant efforts are being made to re-introduce good fire, implement shaded fuel breaks and meet annual vegetation management needs. However, this work is falling short of local and state goals such as those stated in Assembly Bill 1757 (C. Garcia, 2022), the California Forest Carbon Management Plan, California Wildfire and Forest Resilience Action Plan and the 2022 Scoping Plan of the California Air Resources Board.[6][7][8][9] Legislative goals in AB 1757 alone translate into needing to treat 80,000 forested acres annually for wildfire resilience in Sonoma County, including 10,400 acres of this total as in-forest treatments.[2][3] Our analysis uses these in-forest treatment goals as the basis for our assessment of feasibility.

To address the project's goal of ensuring positive ecological outcomes, a subcommittee was convened to design preliminary ecological baseline conditions relevant to proposed activities and potential impacts. The project found that the potential for increased long-term carbon storage and fire resiliency achieved by reducing the density of forest stands outweighs any potential short-term negative externalities of initial forest treatments. Additionally, supporting an increase in number of treatments may enhance forest resilience to drought due to fewer trees per acre, helping to buffer these ecosystems from rising temperatures, and from pests and diseases that can impact forests under stress.[10] While specific treatments should vary depending on site conditions and ecosystem types, most of these actions will predominantly require involvement of a Registered Professional Forester (RPF) or Licensed Timber Operator (LTO) for upholding environmental regulations designed by the Forest Practice Rules (FPRs). Furthermore, the project will not be directly involved in the implementation of forest health and wildfire resilience practices, but will endeavor to ensure that the ecological health of our forests are improved through the recovery and utilization of wood resources generated to offset the cost of these activities.

Oversight of procurement and management of wood resources is the primary focus of this report. The project set out to assess the landscape of organizations and efforts and recommend the preferred type of legal entity to manage proposed activities. Based on these assessments, the project identified that a 501(c)(3) nonprofit corporation is the preferred type of entity. Overarchingly, this structure provides needed flexibility, tax advantages, increased public trust and access to a broad array of potential funding resources. While the project explored in some depth the possibility of partnering with existing local organizations, interviews determined that activities related to this entity were sufficiently unique as to fall outside of any existing organization's capacities.

In addition to the many benefits uncovered, the proposed entity would be well-positioned as a companion effort to support education and technical assistance efforts underway by local RCDs, Cooperative Extension, Permit Sonoma, NGOs and other agencies.

Once the proposed entity is created to oversee and manage wood resources, additional infrastructure for aggregating and processing the wood resources will also be required. The project finds that with the establishment of a wood products campus, Sonoma County will be better able to meet its climate resilience goals, add value to local resources and support private forestland owners to steward their lands. A new campus will also help reduce the cost of forest treatments, a primary barrier to scaling treatment acres, as it will offset the cost of hauling material through the creation and sale of value-added wood products. Moreover, campus administrators will seek to incorporate carbon credits and other financing mechanisms and partnerships to further support this work.

After assessing several potential sites and running a transportation analysis, the project identified an ideal wood products campus location at Berry's Sawmill in western Sonoma County, an historic sawmill that is presently for sale. Located within close-proximity to identified wood resources, existing use permits, infrastructure, and an established retail yard, this 32-acre site provides many of the required attributes to effectively manage wood resources. Alternative sites were explored throughout the County in the Santa Rosa Airport complex area, Windsor, Cloverdale, Sonoma, and along the Highway 101 corridor. Due to the proximity to material, and existing permitting, Berry's Sawmill is the preferred location.

The county's forests are an integral part of the solution to enable the county to meet its climate goals as recently quantified in the County of Sonoma Climate Resilience Comprehensive Action Plan (CRCAP) and Sonoma County Carbon Stock Inventory and Potential Sequestration Study.[2] [3] However, neither the county nor private forestland owners are able to successfully treat the required acres with limited funding resources available at the scale required. Wood recovery and utilization can solve part of the funding gap by creating various wood products from these resources that would otherwise be chipped, burned or left in place. This effort could support an evolving forest stewardship economy, defined by Rural Voices in Conservation Coalition (RVCC), as one that is shaped by the need, and the responsibility, to manage for the sustainability of both land and communities.[11]

The Sonoma County Wood Recovery & Utilization project's feasibility study affirms that Sonoma County is ideally positioned to create an exemplary model of community-scale wood management with dedicated organizations and agencies working together to care for our forest ecosystems. Establishing a "wood products campus" to increase wood processing capacities will allow the county to meet its goals of achieving successful ongoing, community and wildfire resilience, local economic development and associated climate benefits across its forested acres. Just as other infrastructure is necessary for the production and distribution of food, energy and water, a wood products campus is critical infrastructure to effectively manage our forests.

SECTION 1: INTRODUCTION

The Sonoma County Wood Recovery & Utilization Project (project) is part of the California Forest Residual Aggregation Market Enhancement (Cal FRAME) Pilot program. The Cal FRAME program was initiated by the Governor's Office of Land Use and Climate Innovation (LCI) as an important implementation measure within the overall California Wildfire and Forest Resilience Action Plan. Funding was allocated to six pilot regions across the state to assess the feasibility of supporting regional entities and aggregation efforts of wood resources to help resolve California's forest biomass challenge.

Support for the project came from the North Coast Resource Partnership (NCRP), with funding provided by the LCI and the Bay Area Council Foundation's California Resilience Challenge. Additional pilots along the North Coast are also occurring in Marin, Lake, Mendocino and Humboldt Counties and could prove a useful network for ongoing collaboration and sharing of information and resources.

The "Sonoma County Woody Feedstock Pilot project" commenced in December of 2023 and was renamed the "Sonoma County Wood Recovery & Utilization project" in Spring of 2024. This effort has been guided by an 11-member Working Group, 5 technical advisors, 6 consultants and overarching technical guidance provided by the WRTC. Over the study's 13-month period the team conducted outreach and engagement to a broader audience comprised of stakeholders from organizations, agencies and the general public.

1.1 SONOMA COUNTY LANDSCAPE OVERVIEW

Over the past decade or so, Sonoma County has been severely affected by multiple catastrophic wildfires along with the broader impacts of ongoing climate change. Current scientific research indicates that these trends are likely to

WHAT IS A HEALTHY FOREST?

We speak a lot about 'forest health' in this study. Just what exactly does this mean? A forest is not a single organism, rather, a forest is an association of plants, primarily trees, resident animals and insects, and the rich and very complex web of life in the canopies and belowground with fungi, roots, and groundwater. But when we think of 'forest' the main characteristics are the trees that define it. These may be conifer or broadleaf, with canopies which protect the understory plants and soil and provide refuge and habitat. A forest often has streams, its birds and wildlife, and its cultural and recreational aspects brought by people. Therefore, 'forest health' is the resilience, productivity and functioning of all of these aspects combined.

In this document, 'forest health' is also a goal for our forests–that they are resilient, productive and well-functioning for both the seen and the unseen aspects of the ecosystem. In general, this goal means revising the management practices of the recent past, and re-integrating a culture of forest stewardship - for fire, for wildlife, for individual tree health, for clean air, for groundwater, for soil health and protection, for carbon storage...for all of the many life-giving attributes that our forests sustain.

The healthy forests envisioned in this report reference reduced dead material in the understory and fewer trees per acre than what exists today in Sonoma County. The healthy forest has a canopy of individual tree branches which do not overlap adjacent trees' to maximize drought tolerance. Each tree has clear separation from the ground, for passage of birds, mammals and low intensity fire. Streams, steep areas, huckleberry and poison oak patches are left alone and protected to maintain habitat and diversity. These once, still, and future tended landscapes will increasingly again be imbued with the safety, wildlife, aesthetics, enjoyment, productivity and resilience that they are so very capable of with our care and attention.

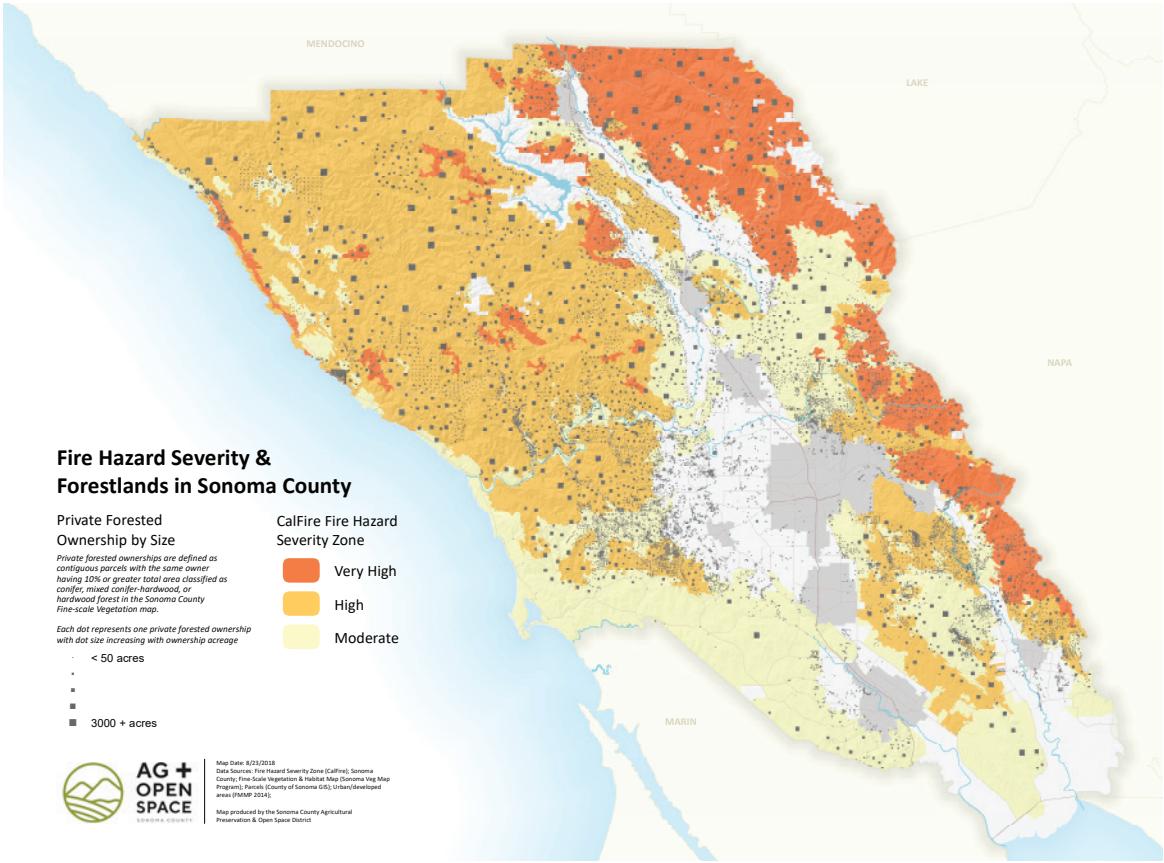
worsen such that proactive measures must be taken to steward the county's forested lands in particular to ensure improved climate resilience.[12] Forests cover nearly half (513,000 acres or 48%) of Sonoma County's 1.1 million acres of land. These areas range in composition from redwood and mixed conifer to mixed hardwood and oak savannah, a potent diversity that presents a significant opportunity (and challenge) to enhance vital positive social, environmental, cultural and economic outcomes.

Since 2017, nearly one-third of the county's forested acres have burned during catastrophic wildfire events (e.g. the Tubbs, Nunns, and Glass fires); and almost all of the spared acreage remains predominantly at "very high-risk" due to its overgrown state (see Figure 1).[13] Action is needed to reduce the intensity of wildfires in the county's remaining forests; to support areas that have burned and are now regrowing; and to respond to the changing dynamics caused by ongoing climate change.[14]

The heightened wildfire risk has significantly increased or eliminated insurance coverage for many landowners within the forested areas of Sonoma County, creating a significant value crisis.[15] This crisis also means that these private forestland owners are motivated by, and economically dependent upon, forest treatments to protect their assets and/or maintain their insurance.

Preservation of Sonoma's remaining forests is critical to protect ecosystems, watersheds, community members and infrastructure, as well as meeting the ambitious climate goals already set forth by both the county and the state. This imperative has created the Sonoma County Vegetation Management Program, wildfire prevention education via county agencies and other NGOs,

Figure 1: Fire Hazard Severity & Forestland Ownerships Across Sonoma County



acquisition of at-risk forestland and the establishment of conservation easements through the Sonoma County Ag Preservation + Open Space District and other conservation organizations. While ongoing public subsidies, outreach and education, and specific conservation efforts are all very important tools, even together they are presently insufficient to meet the scale and long-term needs of stewarding these critically important ecosystems. A stronger forest stewardship economy would ensure annual treatment objectives can be realized and replicated on an ongoing basis.

If Sonoma County were to apply the statewide goals set forth in AB 1757 (C. Garcia, 2022) for implementation of nature-based solutions to reach our State's climate targets by 2030, the County of Sonoma estimated that proportionate treatments each year will need to occur on approximately 80,000 acres. Fully 77% of these treatments would be related to wildfire resilience while 13%, or 10,400 acres, would involve in-forest treatments such as thinning and removal of dead and dying. As stated in the Climate Resilient Comprehensive Action Plan, Sonoma County is unable to reach these goals on its own, depending upon partnerships with other organizations and nonprofits to help attain them.[2]

Without an economically-viable mechanism to support ongoing effective stewardship of our forest ecosystems through thinning, ladder and surface fuels reduction and removal of dead and dying trees and invasives, it will be quite challenging to steer our forested landscapes towards an ecologically healthy and economically feasible future condition. Time is of the essence in taking such effective action, month after month and year after year. Several forest-related activities to date, including this project and the other Cal FRAME pilots, have begun to focus on the recovery and utilization of wood resources as a central and viable pathway towards achieving a more vibrant forest stewardship economy.

WHAT IS A FOREST STEWARDSHIP ECONOMY?

Rural Voices for Conservation Coalition (RVCC), describes a forest stewardship economy as an economy built on 5 pillars of land stewardship, value-added processing, education and training, access to capital, and policy frameworks to support investment in rural capacity and land stewardship.[11] Combined, these 5 pillars create a more virtuous and circular economic model that includes value-added processing of wood as one of the financing mechanisms.

Forest stewardship in California on private and public land alike has largely been funded to date via public subsidy, such as the California Climate Investments, federal grant programs, local initiatives and tax measures and private philanthropy. Many have worked over the years to create an economic metric for valuing ecosystem services provided by our ingenious ecosystems and natural resources to elevate the value of their essential contributions. While efforts in conservation finance and carbon markets are gaining traction, forests in California represent a unique opportunity to bolster economic activity via various wood products as well.

1.2 STUDY METHODOLOGY

The project's research activities have been overseen by a working group of representatives from various organizations and agencies, and supported on an ongoing basis by technical advisors and consultants. This ongoing participation of Working Group members was aided by technical assistance provided from WRTC. These key inputs allowed for the integration of local, regional, state and federal-level expertise into the project's Sonoma County-specific findings and recommendations.

Operating in accordance with a governing document that outlined responsibilities and roles, the project's Working Group members were each asked to consider the following guiding goals and criteria as they moved through deliberation and decision making over the project's duration:

- Support the continued viability of healthy forest ecosystems across Sonoma County's forested lands;
- Work across jurisdictional boundaries to achieve common objectives effectively and efficiently;
- Respect local autonomy and local knowledge in planning and implementation;
- Address climate change and extreme event effects, impacts, and vulnerabilities;
- Ensure that disadvantaged and underrepresented communities benefit from initiatives;
- Prioritize plans, projects and actions that result in long-term ecological improvements and sustainability of jobs and revenue.

The Working Group met 13 times throughout the study process, supported throughout by technical advisors and consultants hired to work on specific aspects. Priorities outlined in the original proposal titled "The Sonoma County Woody Feedstock Pilot project" are set forth in Table 1 and reflected in each of the project's sections.

Table 1: Seven Research Priorities of the Project

Project staff and consultants convened monthly Working Group meetings from December 2023 through January 2025; in addition, three subcommittees were created to explore specific aspects of the research objectives: (1) Entity-Type; (2) Wood Resources Supply; and (3) Stakeholder Engagement. Each subcommittee contributed in detail about their respective topics, and their members attended additional meetings to inform and guide the project's work. During the research timeframe, the general public was invited to attend informational meetings and feedback sessions outlined in Section 2. Additionally, one subcommittee meeting was held with an additional group of representatives to inform draft ecological considerations.

1.3 LITERATURE REVIEW – KEY REPORTS

During our efforts, the project team found nine documents to be particularly significant to the project's research priorities; their publication dates ranged from 2018 to 2024. Guidance for Recovery and Resiliency Planning in Sonoma County Forest Ecosystems written in 2018 by Ebalive, was our first report of significance; many of its defined research priorities parallel those of this project.[16] This study was prepared for the formerly existing Sonoma County Office of Recovery and Resiliency after the Tubbs Fire. It provided an assessment on the potential entities that could support delivery of increased treatment regimens to protect communities and ecosystems; these insights were greatly informative to this project. The report also provides information drawn from the Forest Inventory and Analysis data of the USDA Forest Service to assess potential economic viability of various wood utilization activities and potential to create energy using biomass residuals from primarily hardwood species.

In 2019, a consecutive report produced by EBalive in partnership with Pepperwood Preserve built upon these initial recommendations. Titled Taking Action on Wildfire: An Enterprise Solution for North San Francisco Bay Area Counties and Communities, this report revealed a four-county approach to provide needed coordinating activities and implementation, planning and outreach at scale.[17] Many of the challenges and analysis outlined in this report still resonate today, such as the following:

> *Coordination is required to scale-up solutions and achieve key economies central to attracting new financing mechanisms. Further, entrepreneurial approaches will be critical to innovating new revenue streams and job opportunities grounded in resilience for impacted communities. Our analysis shows that engaging the private sector is particularly important in a region when the majority of forest lands are in the hands of multitudes of private landowners.*

And lastly, an important report entitled "Accelerating Forest Restoration: Stimulating a Forest-Resilience Economy in California's Fire-Adapted Forests" was prepared by The Nature Conservancy and Bain & Company in 2020.[19] This document focuses on small-scale infrastructure as essential to re-invigorating forestry-sector livelihoods in rural communities while offsetting costs to forestland owners. The report's set of goals and actions are particularly important within the landscape of Sonoma County.

Further details on key reports and additional documents that helped shape the recommendations of this project can be found in Table 2; their insights are reflected throughout this new study.

Table 2: Key Informing Reports

REPORT TITLE	KEY FINDINGS RELATED TO THE PROJECT
Forest Climate Action Team. "California Forest Carbon Plan: Managing Our Forest Landscapes in a Changing Climate." Sacramento, CA. 178p. 2018.	The plan considers challenges and strategies to ensure that CA forests can continue to be carbon sinks and not net emitters of GHGs and black carbon emissions. The plan provides strategies that informed this project.
Forest Management Task Force. "California's Wildfire and Forest Resilience Action Plan: A Comprehensive Strategy of the Governor's Forest Management Task Force." January 2021. Accessed January 15, 2025.	Developed by the California Wildfire and Forest Resilience Task Force, the plan identifies strategies to increase the pace and scale of forest management and wildfire resilience strategies by 2025 to meet state and federal goals. Its overarching framework provides a basis for this project.
EBalive, "Guidance for Recovery and Resiliency Planning in Sonoma County's Forest Ecosystems," Prepared for the Sonoma County Office of Recovery and Resiliency, 2018.	This study set out to achieve research objectives similar to those of the project; its findings thereby are consistent with many of the recommendations of this new study. In addition to the many parallel research objectives, the study analyzed ecosystem service benefits as to their potential offset potential for treating forested acres effectively.
EBalive and Pepperwood Foundation, "Taking Action on Wildfire: An Enterprise Solution for North San Francisco Bay Area Counties and Communities," 2020.	This study addresses numerous themes of the project as well as potential insurance ramifications.
Berkeley Center for Law, Energy & the Environment (CLEE). "Priorities for Sonoma County's Wildfire Settlement Vegetation Management Funds." Prepared for the Sonoma County Board of Supervisors, 2021.	CLEE recommended that the county support completion of a feasibility study for establishment of a facility to process Sonoma's excess wood materials. This study effectively supports this goal by naming wood products and infrastructure as potential mechanisms for long-term financial sustainability.
Sonoma County. "5-Year Strategic Plan. 2021-2026."	Climate Action and Resiliency: Carbon Neutrality by 2023 – Goal 1: Objectives 1, 2 and 3 Healthy and Safe Communities: – Goal 2: Objective 3 Resilient Infrastructure – Goal 3: Objective 1
Sonoma County Agricultural Preservation and Open Space District. "The Vital Lands Initiative." 2021.	Outlines ownership and strategies to return local lands to a more resilient state.
County of Sonoma. "The Sonoma County Community Wildfire Protection Plan Update." May 2023.	Includes maps of recent county wildfires. Outlines priorities needed to effectively manage the landscape using Best Management Practices (BMPs) and calls for funding capacity development to attain annual vegetation management goals, including jobs. This report also outlines wildfire history and recommendations to return local lands to a more fire-resilient state.

Sonoma County. "Climate Resilience Comprehensive Action Plan." August 2024.	Identifies the outsized role that forest solutions play on carbon sequestration potential (41,871 MT CO2e) to support the county meeting its carbon neutrality goals outlined in the county's 5-year Strategic Plan.
Sonoma County. "Carbon Inventory and Sequestration Potential Survey." October 2023.	Outlines the potential of Sonoma County's natural and working lands to achieve the county's GHG reduction goals, as outlined in the County's 5-year Strategic Plan.
The Nature Conservancy and Bain & Company. "Accelerating Forest Restoration: Stimulating a Forest-Restoration Economy and Rebuilding Resilience in California's Fire-Adapted Forests." December 2020.	Substantiates why regional sawmill operations that focus on small-diameter wood utilization are needed for forest restoration to be viable and discusses the need for an overall forest restoration economy.

Many conditions have changed since Sonoma County received its first set of recommendations from EBalive in 2018, followed by the subsequent guidance from CLEE in 2021.[16] [19] These notably significant changes include the following aspects that favor the recommendations set forth by the project:

1. In 2020, Sonoma County received $149 million dollars in PG&E settlement funds after the 2017 Tubbs Fire; the county still has remaining funds available to invest in appropriate long-lasting solutions;
2. New goals and targets have been identified by the County of Sonoma's assessment on forestland treatment acres needed to meet AB 1757; the county invested in a new LiDar data set in 2023 to inform its work; and, the county wrote a carbon inventory plan that identified the significant role that forest carbon plays in attaining stated climate goals;
3. Permit Sonoma received $37 million in funding from FEMA's BRIC program, the first of its kind in the country. These funds can support wildfire resilience activities on over 200 privately-owned parcels representing 40,000 acres. Receipt, planning and implementation of this work establishes the agency as an engaged leader in realizing increased wildfire resilience;
4. Sonoma County's Resilient Climate Protection Authority has been acknowledged as the first Climate Resilience District in California. This agency could establish a financing mechanism for land-based climate solutions such as those identified by this project;
5. The shifting landscape of insurance providers has created new challenges and introduced potential for new incentives for proactive forest stewardship and wildfire resilience regimes;
6. Sonoma County passed Measure H in Spring 2024 to support local Fire Departments. From the estimated $30 million/year to be generated, an estimated $4 to $6 million per year is slated for vegetation management. Funds from this source could contribute to implementing the recommendations of this study;
7. The project concluded that insufficient facilities exist within the county to handle the volume of wood resources presently being generated, or desiring to be managed, annually. A significant deficit would become more apparent should the county realize an increase in treatment actions;
8. The project's online survey identified broad-based support from a wide-range of stakeholders for activities that recover and utilize wood resources from existing and projected sources.

SECTION 2: COMMUNITY OUTREACH, IMPACT AND ENGAGEMENT

The project's Engagement & Outreach Subcommittee helped devise outreach and engagement strategies, meetings' designs, agenda creation and outreach efforts. Stakeholder engagement occurred in line with the project's collaborative systems approach that sought to meet multiple needs and minimize negative unintended consequences. The purpose of stakeholder engagement was to access broad, collective knowledge across multiple perspectives and expertise to inform a stronger implementation plan that has been created and is supported by as many interests as possible.

***Stakeholder:** A stakeholder is defined as an individual or organization that has personal or professional engagement pertaining to the stewardship of the forest ecosystems referenced in this study.*

Woven across these varied audiences, the project honors the ongoing stewardship of land by several federally and non-federally recognized Tribes within Sonoma County: Cloverdale Rancheria of Pomo Indians, Dry Creek Rancheria Band of Pomo Indians, the Federated Indians of Graton Rancheria, the Kashia Band of Pomo Indians, the Lytton Band of Pomo Indians, and the Mishewal Wappo. Tribes have tended for millenia, and still do tend, the forests and ecosystems in Sonoma County through prescribed burning, selective harvest and planting, thinning, and other practices associated with cultivation of food and cultural resource management. For the project, Tribal organizations are understood as sovereign nations with whom to engage.

During the study, the project conducted outreach to over 100 organizations and individuals representing a wide range of perspectives. Outreach was focused on reaching individuals, organizations and entities that share overlapping interests with the project's research priorities and are engaged in one or more aspects of stewarding forest ecosystems and/or wood resources. The project also engaged several organizations that interact directly with landowners on related issues including Coast Ridge Community Forest, Fire Safe Sonoma, Safer West County and other landowner organizing groups. In sum, we reached several hundred members of the public via social media and online engagement. The key stakeholders engaged are summarized in Table 3 below as well as in Appendix C.

Table 3: Key Categories of Stakeholder Groups & Tribal Entities

WORKING GROUP	PUBLIC	TRIBAL	FORESTRY-RELATED ORGANIZATIONS & PROFESSIONALS			
			Practitioners	Land Managers	Wood Products	Organizations
Members Technical Advisors Consultants	Forestland Owners General Members of the Public	Federally Recognized Tribes Non-federally Recognized Tribes Tribal-support Organizations	Forestry Technicians LTOs RPFs Arborists Technical Assistance Providers	Timber Operators Private Forest Managers Public Lands Managers	Wholesale Operations Primary Product Manufacturers Secondary Product Manufacturers	Community-based Organizations Government Agencies Special Districts

2.1 OUTREACH AND ENGAGEMENT

Working Group

Working Group members represent many of the key stakeholders the project envisions as foundational to the project's success. The project Working Group met 13 times between September 2023 and January 2025 to support the design of the project and contribute directly to its preparation. Each Working Group member contributed an average of 40 hours preparing for and attending meetings, reviewing draft documents and supporting various objectives of the project's overall work plan. During their engagement, members were specifically requested to review draft recommendations as well as weigh in to validate, and improve upon, research findings.

Many members of the Working Group also participated in subcommittees. These subcommittees

included Wood Resources; Stakeholder Engagement; and Entity Types. The Stakeholder Engagement subcommittee helped design all public engagement and specialty meeting agendas as well as design of the online survey. The Wood Resources subcommittee reviewed all results from contractors to ground truth the data and to support estimation of actual work happening on the ground. And last but not least, the Entity-Type subcommittee met several times to deliberate the ideal entity-type to move these recommendations forward. The project is extremely grateful for the additional contributions of subcommittee members in support of identifying opportunities, challenges and gaps to inform the activities and outcomes of the project.

Public Engagement

Three public engagement meetings were held on March 27, May 15, and December 4, 2024. Outreach announcing these meetings occurred via social media efforts, the RFS's newsletter and website, social media and via direct outreach. Meetings provided an opportunity to present project updates to interested parties and solicit feedback and questions from the public.

Engagement revealed general support for the project's proposed activities from the majority of attendees and respondents in addition to important insights to be considered. These included requests for additional carbon quantification analysis, desire to know if there would be limitations on size class of trees recovered and utilized, as well as specific inquiries about potential energy applications.

To round out public engagement, the project team presented the project's goals and process at several in-person conferences throughout the study period including the Biomass Symposium in Hopland; the Forest Innovation Summit in San Francisco; the Rural Voices for Conservation Coalition in Tahoe; and the CA Resilience Challenge awardee announcement event in San Francisco. Project leaders presented online during the CA Ad Hoc Forest Biomass Working Group meeting, the Forest Business Alliance, and directly to one dozen local organizations and entities including the Sierra Club Redwood Chapter, Sonoma Clean Power, and the Northern CA RCD Soil Hub, among others. These presentations offered time for reflections and inputs from stakeholders on the project's approach, preliminary wood materials analysis, ecological considerations, preliminary entity-type analysis and potential implementation plans. Each event also helped identify evolving partnership and collaboration opportunities. An online survey was also conducted and is reported on in Section 2.1.1.

Overarchingly the project received broad-based support from a wide array of stakeholders regarding implementation of the entity and proposed wood products campus. This was especially true for forestland owners, as well as managers of forested acres that regularly manage large quantities of wood resources and recognize the ongoing, annual nature of addressing forest health and reducing surface fuels.

Tribal Organizations

The five federally recognized tribes within Sonoma County received an introductory letter describing the project and its goals along with an invitation to participate in the Working Group. Dry Creek Rancheria representatives met with project staff to discuss their Tribe's interest in soil amendment creation from forest residuals. The project also actively worked to engage with the Kashia Band of Pomo Indians to explore their interest in the purchase and ownership of Berry's Sawmill, the primary site selected for recovery and utilization work that is located on Kashia's ancestral lands. Update letters were sent to all tribes after the study was completed. The project remains open and interested in collaboration, learning from, or being in service to, Tribes' interests in related pursuits.

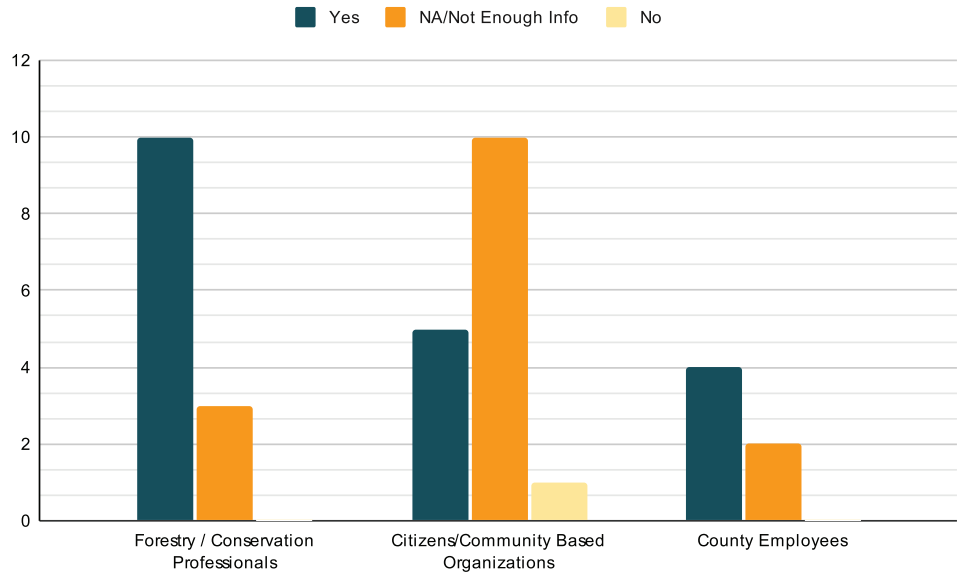
Interviews
In addition to direct engagement defined above, a total of 20 interviews were conducted to learn from the experience and technical knowledge of various experts in the field. These interviews informed the study's results and have been incorporated into this report as appropriate. All interviewees are listed in Appendix C.

2.1.1 ONLINE SURVEY RESULTS

The stakeholder engagement survey conducted between May 15 to October 1, 2024 unveiled support to formalize an entity to implement economically viable pathways for recovery and utilization of wood resources. Survey responses were received from 34 individuals including local citizens, engaged organizations, county employees and forestry professionals. These respondents covered all five of the county's five Supervisorial Districts: 44% were classified as citizens and representatives of community-based organizations; 18% were county employees; and 38% were forestry and/or conservation professionals.

Responses collected via the survey were analyzed and their contents are reflected throughout this study. These responses were particularly supportive for our development of recommendations in Section 3.5 that outline ecological baseline considerations. All known forestland owners responded positively to the potential support that could be afforded to them by such activities. A few of the respondents questioned whether desired wildfire and climate resilience goals could actually be realized through the proposed activities of recovery and utilization of wood resources. Related concerns addressed the carbon benefits of activities that include hauling and processing wood to achieve its highest and best uses versus chipping and burning in place, or transporting and tub grinding in the case of larger materials. Only one respondent replied that they were not supportive of wood recovery and utilization activities with the information provided. Over half of respondents replied with support for an improved process to recover extensive wood resources that are presently being chipped and burned to offer solutions building upon the county's shared goals of increased stewardship of Sonoma County's forests and climate resilience goals.

Figure 2: Support for Effective Implementation Activities



As a recommendation, any implementing entity should consider conducting a series of informational events to continue to engage private forest landowners in areas of high forest density as described in Section 3. This type of place-based community outreach has been recommended by other pilot regions as an effective strategy to ensure efficient ongoing community support, education and participation. Such efforts by the new entity could be conducted in partnership with multiple existing organizations, including Coast Ridge Community Forest, Diamond Mountain Mark West, Fire Safe Sonoma, Gold Ridge and Sonoma Resource Conservation Districts, Permit Sonoma, Sonoma County Ag Preservation + Open Space District, Safer West County and Sonoma Ecology Center, all of which already have compatible efforts underway. Further public outreach and education will be needed on an ongoing basis due to the nature of the proposed activities such as town halls in targeted areas.

2.2 VULNERABLE POPULATION RISK MITIGATION

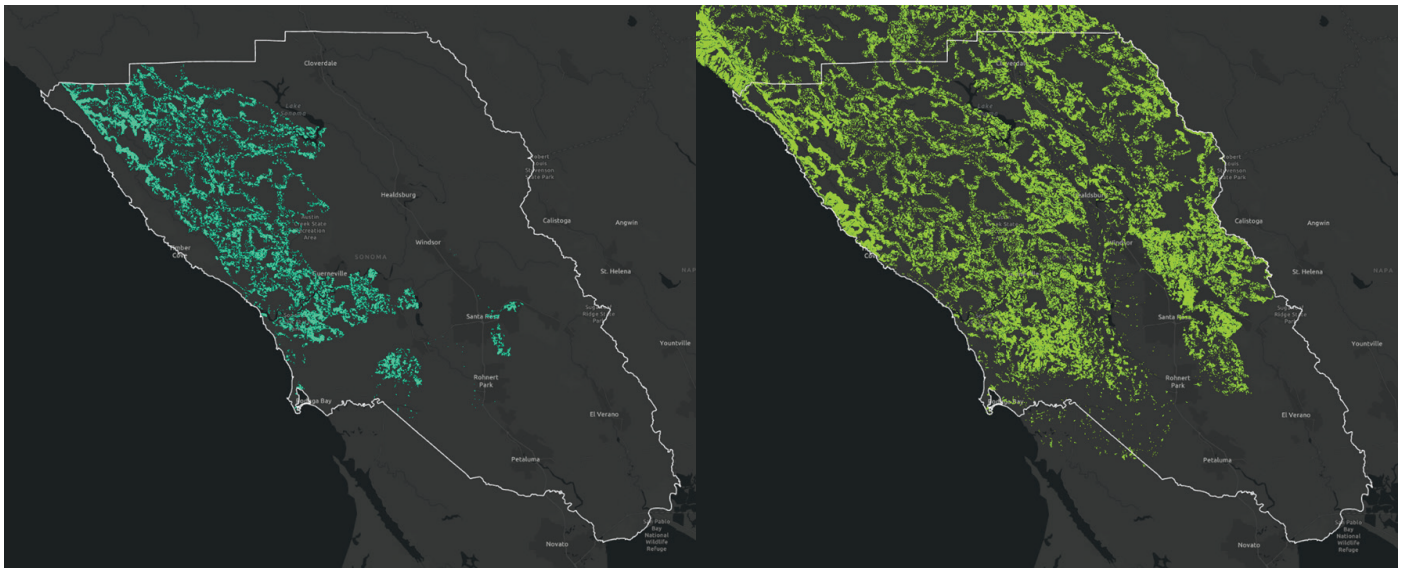
As an additional layer of community impact, and benefit, the project worked with VR Consultants to analyze vulnerable (at-risk) population demographics for wildfire, and to identify potential priority treatment areas to mitigate risk. During the course of research the effort found that the Sonoma County Vegetation Management Program and the Permit Sonoma BRIC program have progressed toward similar goals and have directed funding toward wildfire prevention treatment actions in identified areas. The following section takes an additional approach that verifies vulnerable populations and overlays this data with forested acres that are feasible to treat in addition to highlighting these efforts.

***Vulnerable Population:** The project defines vulnerable populations as economically or historically disadvantaged residents. Community members that meet this definition live mostly in the highly dense urban corridor located in both Santa Rosa and Windsor, others are dispersed throughout more rural parts of the county on the western side in rural locations.*

Rural Economies and Capacities

Overall, Sonoma County has a 9% poverty rate and generally lower percentages of economically disadvantaged citizens than in many other parts of California. Rates of poverty and fire frequency are interconnected and are often tied to rural areas that have trended toward less economic vibrancy. Hino and Field found a correlation between high poverty and wildfire frequency.[19] King and Kent found similar results in some 6.7 million private forest treatable acres; 4 million acres of these acres are concentrated in High Poverty Census Tracts; that is, 60% of total private area wood treatment needs are concentrated in areas where the poverty rate exceeds 20%—twice the national average.[20] The same authors estimated that of the acres in need of treatment, 71% are located in high-poverty areas (poverty > 20%). Therefore, if rural areas tend toward higher rates of disparity, these areas may be more challenged to conduct treatments due to the high associated costs and annual, ongoing nature of the work.

Figure 3: Overlay of Feasible Acres and Vulnerable Populations



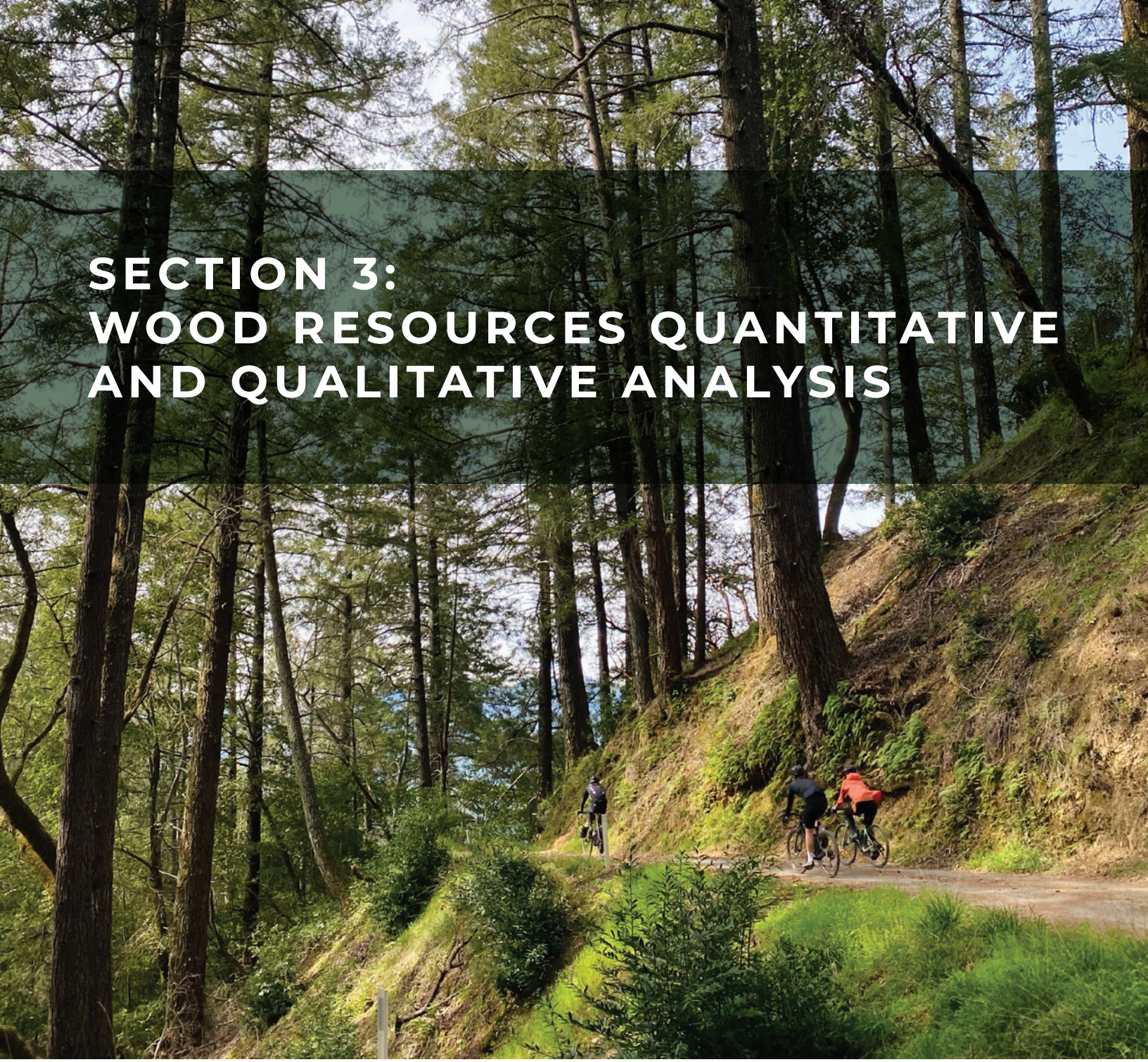
Source: Mechanical Harvest Feasibility Layer, Tukman Geospatial for NCRP.

The image on the left is an overlay of feasible acres and vulnerable populations representing 3,100 acres. The image on the right shows the total feasible acres for treatments.

Fuels Treatments Related to Vulnerable Populations

Our best current estimate as referenced in Section 3 sees 2,800 acres being treated/year across private forestland ownerships in Sonoma County. This number does not include public forestland treatments, work by utilities, prescribed fire efforts, nor roads right of way maintenance. Efforts by the California Office of Emergency Services or county-based vegetation management efforts are also excluded. Therefore, this number of 3,000 seems a reliable estimate, on average, of the total acres being treated/year in today's business-as-usual scenario and was used in this analysis.

When we overlay feasible-to-treat acres identified by Wuuii and Tukman Geospatial with areas that have greater than 40% poverty, we find a total of approximately 3,100 acres spread across the northwestern portion of the county. A modest portion of this area lies close to Santa Rosa's urban areas (see Figure 3). These defined areas align well with work in progress or being planned by the Sonoma County Vegetation Management Program and Permit Sonoma's FEMA grant treatment acres. This number of acres also aligns with the estimated goal of treating 2,500-4,000 acres/yr during the initial project phase. Were these acres and locations to be prioritized for effective action, these community treatment areas could greatly reduce fire risks for many vulnerable residents. It is significant to note that the majority of acres are within range of the recommended site for a wood products campus at Berry's Sawmill & Lumber Yard.



SECTION 3: WOOD RESOURCES QUANTITATIVE AND QUALITATIVE ANALYSIS

This section describes various ownership types and examines the potential supply of wood resources available where treatments could actually be conducted. We also clarify here the legal pathways constraining the use of these wood resources. Sonoma County's 513,000 acres of forestland, roughly half of the County's 1.1 million acres, is owned by 14,670 individual private forest landowners, or ownerships, defined as landowners who might own more than one parcel and are non-urban in nature.[13] This high number of ownerships represents 86% of all forested land and makes forest management an extremely fragmented process, creating a significant logistical and financial burden to increase effective forest stewardship treatments.

3.1 SONOMA COUNTY FORESTLAND OVERVIEW

Forests in the county can be largely characterized in two general categories: either true oak woodland (*Quercus* spp.) alliances or coast redwood (*Sequoia sempervirens)* and Douglas fir (*Pseudotsuga menziesii*) alliances. Other mixes of trees and alliances do exist within this array, including conifers grand fir (*Abies grandis*), knob cone pine (*Pinus attenuata)*, gray pine (*Pinus sabiniana*), Poderosa pine (*Pinus ponderosa*), Sargent cypress (*Cupressus sargentii)* and bishop pine (*Pinus muricata*). In addition, redeveloping (seral) hardwood stands currently dominate many of the forest lands and are strongly intermixed in the forest, particularly tanoak (*Notholithocarpus densiflorus),* bay laurel (*Umbellularia californica*), and Pacific madrone (*Arbutus menziesii*).

THE RISE OF GOOD FIRE

Good fire is starting to return as mindsets shift toward recognizing the many positive outcomes of this ancient ecocultural practice of Tribal Nations since time immemorial. In California, cultural fire was restricted first by the Spanish and then completely banned just prior to California achieving statehood by the Act for the Government and Protection of Indians in 1850, an act that legalized tribal member enslavement, taking of tribal lands and prohibited various cultural practices including burning. The state-mandated ban was officially lifted in 2022, and although cultural burning and prescribed fire are distinct, both practices are generally seen today by local, state and federal agencies as a beneficial tool. Cultural burn practitioners are increasing today as demonstrated by the trainings available to tribal members through organizations such as Tribal EcoRestoration Alliance, Cultural Fire Management Council, Lomakatsi, and the Karuk Wildland Fire Program, to name a few. In Sonoma County, tribes are actively conducting cultural burns and at times partner with organizations such as Fire Forward, Good Fire Alliance, Regional Parks, State Parks, SCAPOSD and CAL FIRE who are also putting fire on the ground on both public and private lands. To aid in good fire's return, a Prescribed Fire Liability Claims Fund was recently initiated by the California Wildfire and Forest Resilience Task Force to support fire practitioners and enable this tool to be more widely utilized once again.[21]

According to Cal FLORA, Sonoma County has 10 native species of true oak and 19 native conifer types. After a wave of harvesting at the turn of the 20th century and re-initiation of the timber industry in the 1950's, 1960's and 1970's, few old growth trees and fewer old growth stands of redwood or Douglas fir now remain.[21] Second- and third-growth redwood-Douglas fir forests dominate, and are roughly 40 - 45% of the half-million acres of forestland.[22] Those lands are presently in various stages of re-establishment (seral stages) following harvest and/or wildfire, with continued pressure for cutting from rural development, agriculture, and changes in forest management regimes.

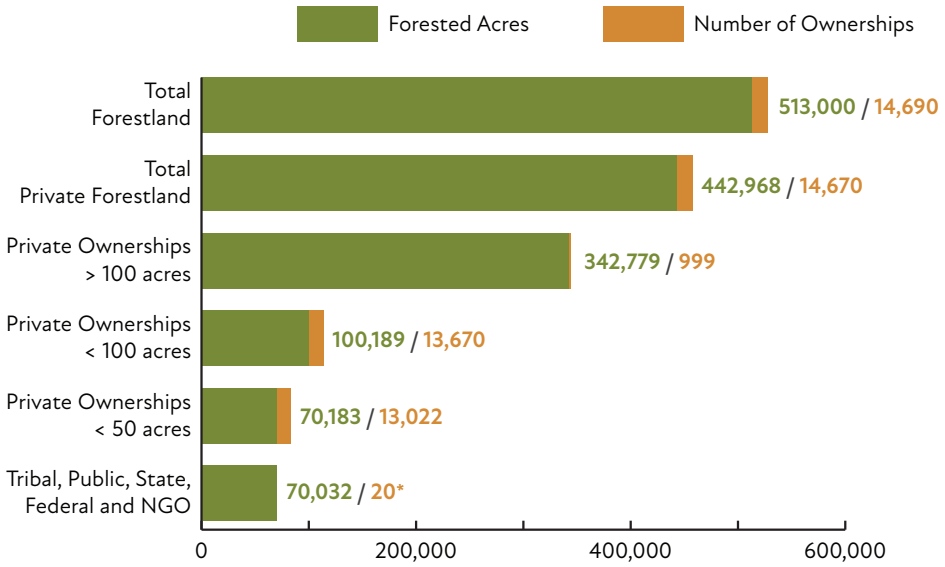
Most of Sonoma's forests are currently quite fire-prone, in what instead was once a fire-adapted landscape; resprouting hardwoods and conifers create dense forests with substantial fuel ladders.[23] For example, collected data at the Pepperwood Preserve (Ackerly, via Management Plan) found more than 1,000 trees per acre of Douglas-fir in oak woodlands. A general culture of fire suppression and a belief in 'hands-off' management over a century or more has increased the area's risk of renewed wildfire plus problems from forest pests and disease. These changes have deeply affected the area's ecosystems, people's lives, housing, roads, and streams. All of this heightened risk has directly increased or even erased insurers' coverages of landowners legally permitted structures within the forested areas, creating a palpable value crisis throughout the county and the broader North Coast of California region.[15] Even with complexity constraints, these impacts from ongoing fire risk and related needs for asset protection are palpable drivers for forestland owners to practice effective forest management.

3.2 FORESTLAND OWNERSHIP PATTERNS AND POTENTIAL WOOD RECOVERY ACTIONS

Sonoma County is exceptional in its diversity of both its ecosystems and its forest ownership patterns. Because this part of California was settled by European-Americans so early in the state's history, ownership is largely private, often based on Mexican Rancho lines; it is on these ranches that small holdings following logging became the norm. Clubs and associations purchased retreats near the Russian River. Freewheeling property splits were very common, leading to multiple approved legal parcels. The need for minerals, particularly mercury during the Gold Rush and magnesite for World War II, promoted some isolated holdings. And finally, the break-up of large ranches in the late 1960's and 1970's generated a slew of inconsistent, poorly designed parcels strewn across the overall forest landscape. All these complex factors have combined to create an unwieldy mess for management and permitting.

In sum, private forestland owners manage the majority, fully 86%, of the county's forests. Of these owners, 89%, are considered NIPFs, managing less than 50 acres. As such, the project views privatesuch land owners as the largest potential source of materials for wood recovery and utilization (see Table 4). The remaining 14% of Sonoma County's forested lands are owned by the state, county, tribal nations and NGOs.

Figure 4: Forestland Ownership Patterns in Sonoma County



Data source: Sonoma County Fine Scale Vegetation Map, Sonoma County Agricultural Preservation + Open Space District
** Estimated*

Table 4: Private Forestland Ownerships

SONOMA COUNTY					
	Number	Total Acres	Forested Acres	% of Ownerships	% of Forested Acres
Total Private Forestland Ownerships	14,670	657,655	442,968		
<50	13,022	107,165	70,183	88.77%	
>50 to <100	648	45,075	30,006	4.42%	
< 100				93.00%	
>100 to < 500	812	169,465	110,431	5.54%	
>500 to < 2500	152	151,747	96,932	1.04%	
> 2500	36	184,203	135,416	0.25%	31%
Ownerships < 2500	14,634	473,452	307,552	192.75%	60%
Total Private Forestland			442,968		86%
Tribally-owned and Publically-owned Forestland - State Parks, Regional Parks, County, Federal, NGOs	20*		70,032		14%
Total Forestland	14,690		513,000		

Data source: Sonoma County Fine Scale Vegetation Map, Sonoma County Agricultural Preservation + Open Space District

* Estimated number

3.3 AVAILABLE LOCAL PATHWAYS TO UTILIZE WOOD RESOURCES

This section outlines the range of pathways available locally to utilize wood resources and realize a more productive forest stewardship economy. We also address the set of applicable legal constraints required to operate within the complexity of permitting and regulations that apply to all forestland owners and managers, whether on 5 acres or 5,000.

The California Forest Practice Rules (FPRs), derived from the Z'berg-Nejedly Forest Practice Act of 1973, were put in place to protect the state's overall forest base. These requirements –- still in effect nearly a half-century later -- were introduced at a time of extensive clearcutting, no water quality standards applicable to logging, a regime of intensive fire protection (the expressed duty of the state's then Division of Forestry), no licensed foresters, and no licensed timber operators. This document's introduction states:

> (a) The Legislature hereby finds and declares that the forest resources and Timberlands of the state are among the most valuable of the natural resources of the state and that there is great concern throughout the state relating to their utilization, restoration, and protection.
> (b) The Legislature further finds and declares that the forest resources and Timberlands of the state furnish high-quality timber, recreational opportunities, and aesthetic enjoyment while providing watershed protection and maintaining fisheries and wildlife.
> (c) The Legislature thus declares that it is the policy of this state to encourage prudent and responsible forest resource management calculated to serve the public's need for timber and other forest products, while giving consideration to the public's need for watershed protection, fisheries and wildlife, sequestration of carbon dioxide, and recreational opportunities alike in this and future generations.[25]

CAL FIRE enforces, and Registered Professional Foresters (RPFs) uphold, relevant guidelines laid out by these FPRs to regulate all harvesting of trees of commercial size and species located on timberlands, particularly lands deemed Timberland Production Zones (TPZ), on which owners pay no property taxes on the standing value of their timber, but rather pay taxes after the trees are harvested. Urban trees are not included, and exclusions exist for trees near houses and roadways. An apparent "intent" to sell wood determines whether a landowner is required to have an approved/accepted harvest document in order to sell, barter, trade, or donate wood resources. The rules additionally intend for a Licensed Timber Operator (LTO) to manage all related machine operations.

Here in Sonoma County the project seeks to support ongoing effective recovery, processing, and sale of normally non-commercially viable wood from forested areas. Therefore, the project's presumed activities arguably fall within the FPR regulatory framework. Consequently, any actions coming from this study would have to source their wood materials from land that has had one of the following harvest documents or permits approved:

1. FPR Sec. 1038 exemption permits, particularly
    a. Fire control
    b. Defensible space
    c. Oak woodland improvement
2. Timber Harvest Plan
3. Non-Industrial Timber Management Plan
4. Modified Timber Harvest Plan
5. Working Forest Management Plan
6. Programmatic Timber Environmental Impact Reports

As the project seeks to find viable options to recover and utilize wood resources, creation of wood products, both primary and secondary, will be needed. By generating a moderate return to offset the costs of removal and transportation of the input assumed to be log-form, creation at scale of wood products could help return local forests to a more fire-adapted state. Such a circular process could replace today's practice of chipping trees that were cut onsite and then leaving the wood chips or hauling them outside of the county, burning them (or leaving a felled tree in place without chipping). (The project certainly acknowledges that some advantages can arise from leaving some materials in place for habitat, gully stuffing of class III watercourses, and other practices. We address these issues in further detail in Section 3.5.) Overall, our defined attempt is to achieve diversified forest stands as an outcome of appropriate treatments and forests which are able to meet changing climatic conditions and hopefully be more resilient to low and moderate intensity wildfires in the future.

Public Funding Resources for Forest Treatments and Commercialization

While the financial burden of conducting forest treatments largely falls on forestland owners, the project investigated what public funding resources might be available to help offset the costs for the relevant forest treatments and whether or not they allow subsequent utilization of the wood resources generated. Results of this exploration were not encouraging.

Together with the WRTC the project investigated several publicly-funded pathways that might allow subsequent utilization of the wood materials created. We discovered that only one program, CAL FIRE's California Forest Health and Fire Prevention Grant Program, readily enables commercialization. This funding has a number of specific constraints: it covers projects of a minimum size of 800 acres or more (parcels do not need to be contiguous) The minimum grant request is $750,000 and maximum grant request is $7,000,000. These are competitive grant programs meaning that only a single project per county is likely to be funded during an individual grant cycle; funding of course depends on the total amount available in any given round.

Wildfire resilience projects are being structured differently and are accomplished with grants from the NRCS Environmental Quality Incentives Program (EQIP), the NCRP, the Coastal Conservancy, the Wildlife Conservation Board (California Department of Fish and Wildlife), and CAL FIRE via the CFIP and NBFIP. Of these projects, which create shaded fuel breaks, forest thinning and roadside fuel reduction, there are few allowances for commercialization of the debris. These activities happen in both pre-fire and post-fire situations, and are not recorded as exemptions. These programs, along with Utility and Public Road Right of Way material and Cal VTP, all require a Section 1038 exemption to be filed on top of the project area's existing permit to enable commercialization and would incur an additional cost not funded by the grant.

In order to access any of these funds, a landowner is generally required to have in place a California Cooperative Forest Management Plan if not partnered with other property owners under a Community Wildfire Protection Plan (CWPP). This is an additional cost and requires several months to a year to complete depending on the complexity of the property.

Wood Donation

Again, in collaboration with the WRTC, the project explored pathways for donating wood for subsequent utilization. This pathway does not circumvent intent to sell or commercialize unless changes were made at the BoF to enable donation of wood materials of any size. While not discussed in detail in this report, the Timber Yield Tax would still apply to wood donations. It is important to recognize that, with current mill and market conditions, the value of non-commercial wood is *de minimus*. While the value added to the *wood* may be taxable, the State Board of Equalization (BOE) would assign "no value" to the harvested product -perhaps by finding that it is too small in diameter, too short in length (e.g. under 16'), does not follow the sawmill pathway, and generally only has a negative tipping-disposal value. Cords of firewood are taxable and have a separate rate.

Conclusions

As stated, wood provision to an entity proposed by the project's analysis would fall under the auspices of an intent to commercialize wood. Therefore, available options at this time are limited: work with forest landowners who are part of a CAL FIRE Forest Health and Fire Prevention Grant Program; or work with forestland owners who have a THP, NTMP, MTHP, a 1038 or Oak Woodland Management exemption. The raw wood itself, generally, does not meet scaling requirements for logs. (There are cubic feet of wood in hardwood or small wood, however BOE only works with log-scaled or fabricated wood in board feet.)

For these reasons, the project finds that existing pathways to commercialize wood material as overseen by the FPRs are presently restricting durable wood product enterprises within California, even when this material, such as small-diameter trees of 5" - 12" in diameter, are generally viewed as negative-value to the BOE at this time.

3.3.1 NON-INDUSTRIAL PRIVATE FORESTLAND (NIPF) OWNERS

According to the FPRs, sec. 4593.2.,
(a) "Nonindustrial Timberlands" means Timberland owned by a nonindustrial tree farmer.
(b) "Nonindustrial tree farmer" means an owner of Timberland with less than 2,500 acres who has an approved nonindustrial management plan and is not primarily engaged in the manufacture of forest products.

As noted earlier, Sonoma County has a significant number of NIPF's; the vast majority 89%, or 13,022, of the 14,634 owners that hold less than 2,500 acres, own <50 acres and in this group average just 5 acres. This large cohort would require considerable resources to enable access to public funding resources and engage in permitted forest health treatments. This makes permitting a primary barrier for the majority of NIPFs. Additional barriers are numerous: the land is not TPZ, the scale for industrial management is too small, the availability and cost of a forester is prohibitive, and the ability to create the roads and infrastructure for a regularly managed stand is limited by cost and entry frequency. When landowners receive funding, it is generally to create and implement a forest management plan that can cost $2,000 out of pocket plus implementing practices that cost $1,000 to $7,000 per acre. In addition to these combined efforts, smaller forestland owners may still conduct and provide wood resources to the entity by obtaining an FPR Sec. 1038 exemption permits. A few 1038 exemptions only require an LTO, but the majority of 1038s at this time require an RPF to apply for the permit and CAL FIRE regulates their implementation.

Due to the cost of planning and implementation, increasing collaborative efforts across parcels is recommended. Over one dozen Community Wildfire Prevention Plans have been put into place across Sonoma County and additional projects are being implemented via agencies that enable public resources to support forest health practices on private land. This includes Permit Sonoma's Wildfire Resilient Sonoma County and Hazardous Fuels Reduction project. This program received $37 million in funding in December 2020 through FEMA's Building Resilient Infrastructure and Communities (BRIC) grant program. The BRIC project will complement and scale up the projects, capabilities, and systems currently being developed by Permit Sonoma staff through its Sonoma County Wildfire Adapted program and the Hazardous Fuels Reduction project to reduce the risk of devastating wildfires. It has four project areas: Austin Creek/Dry Creek, NE Geyserville, Lower Russian River-Cazadero, and East Sonoma. These project areas were identified based on their burn history, fuel loads, population density, road networks and other factors. This effort is the first wildfire mitigation funding to be allocated in the country via FEMA.

Sonoma County is fortunate to have well-developed, county-level leadership represented by the proactive engagement of various agencies, special districts, and NGOs working to increase collaboration. Permit Sonoma, SCAPOSD, and Gold Ridge and Sonoma Resource Conservation Districts are all directly involved in supporting small and larger acreage landowners to collaborate on mutually-beneficial forest projects across fence lines. These projects most oftentimes occur in close partnership with aforementioned community-based organizations. Regardless of these noteworthy efforts, funds available are only a fractional offset, and oftentimes not a break-even solution for parcels under 100 acres to implement appropriate practices. Therefore, annual treatments are continuing to fall short of meeting forest treatment needs and remain by and large financially burdensome to forest landowners.

If wood aggregation activities were to support recovery from all NIPFs up to 2,500 acres, this would account for 60% of all forestland in the county. As the campus project scales up, it will be able to handle larger, more extensive landowners to help offset a portion of the treatment costs. Per The Nature Conservancy and Bain & Company's analysis, cost for treating forestland for private landowners in the Sierras can range from $150 - $350 per BDT and potential offsets through wood product development range from $75 - $120 per BDT. This means that wood recovery and utilization will likely only be able to help wood "pay its way" out of the forest by financing a percentage of the overarching cost; additional resources explored in Section 7 will be needed for full coverage.[19]

3.3.2 LARGE-SCALE FORESTLAND OWNERS

Sonoma County has 36 ownerships in the county that own greater than 2,500 acres and are of substantial size to warrant the classification of "Working Forest Landowner" and potentially hold a Working Forest Management Plan. Their land base of Sonoma County's total forested land is 135,416 acres, 31% of total privately-held acres. These loosely defined "industrial forestland owners" include local sawmill operators Mendocino Redwood Company and Redwood Empire. These industrial landowners use log byproducts to make mulch and create engineered forest products (like plywood and treated beams) in addition to standard lumber products. It is unclear if material for a local wood products campus might be sourced from these ownerships and therefore further research should occur.[13]

3.3.3 TRIBAL AND PUBLICLY-OWNED AND-MANAGED FORESTED LANDS

Federally and Non-Federally Recognized Tribes steward an estimated 2,000 forested acres in the county; this includes Kashia Band of Pomo Indians, Lytton Tribe and Ya-Ka-Ama. Federally recognized tribes were invited to participate in the study and those efforts are described in Section 2.1. It is recommended that additional effort be extended to build these relationships and find meaningful ways that the tribes could benefit from proposed activities and potential economic development opportunities.

Unlike most of California's vast forestland areas, the federal government's footprint here exists only in a small number of remote Bureau of Land Management (BLM) parcels and some Army

Corps of Engineers' holdings around Lake Sonoma. Sonoma County has no US Forest Service nor National Park land.

State Parks, Regional Parks, SCAPOSD, NGOs and the small amount of federal land own 14% of the county's forested acres. Interviews conducted during this pilot study with State and Regional Parks, as well as public entities managing forestland, conveyed a low-probability of provision of wood materials for subsequent utilization due to presently restrictive permitting and easement restrictions.

County-managed projects, such as those administered by Permit Sonoma in collaboration with private landowners and the County of Sonoma Vegetation Management Program, generally use the California Vegetation Treatment Program (Cal VTP) for their required environmental reviews. At this time, Cal VTP does not allow for barter, trade, or sale of wood from such projects. This restriction impedes expanding the number of acres that can be treated for potential carbon to be stored; instead, materials are presently being chipped, burned, or left onsite as a common practice. This of course increases treatment costs by prohibiting appropriate economic development activities. SCAPOSD also has forested areas under easement, still privately owned, that could also be a major source of thinning debris depending on the restrictions of the easements in place. Lastly, State Parks have their own internal processes for environmental review outside of CAL FIRE; they generally do not harvest trees for commercial purposes but may provide material for recovery and re-use.

3.3.4 OTHER POTENTIAL WOOD RESOURCES

Utilities

The largest acreage of exemptions in the 2020-2024 period is for Right-Of-Way Exemptions (ROW), accounting for 64% of exemptions filed.[26] Sonoma County Public Infrastructure, Cal Trans, and PG&E manage extensive wood material and vegetation in the County Road Right of Way (ROW) and along highways. These entities could be an important source of materials, but the quality, quantity, and consistency of anticipated wood resources presents logistical challenges and higher overhead costs compared with other potential sources. When public works departments clear fallen trees from roads or culverts, rot, disease or other issues oftentimes exist and decrease the volume of usable material and therefore its value. This material is generally chipped or hauled offsite via third party contractors.

Utility line clearance materials cut by PG&E or its contractors offers a vast potential source of wood.

However, this source has yet to be streamlined from a commercialization perspective. During clearings, large trees greater than 15" in DBH are generally left onsite in small, unusable sections, while smaller material is either chipped and left, or chipped, hauled, and dumped at receptive recovery sites (residential, orchards, vineyards, etc.). The project researched possible utilization of utility-line clearance materials and discovered that 1) a 1038 exemption would need to be filed for each landowner where wood is being felled or left; and, 2) landowner permission is required for removals. These factors combined create financial and administrative obstacles for widespread use. These obstacles, if overcome, or if removal becomes mandatory, could provide a huge quantity of wood to a wood products campus in Sonoma County.

Sonoma Water

Sonoma Water is a California special district with primary responsibilities to manage drinking water for over 600,000 customers in Sonoma and Marin Counties. The agency was originally created for flood control. Sonoma Water maintains a small subset of streams and waterways in the county (approximately 75 miles of engineered and riparian channels) for flood protection purposes. In many cases, vegetation management is the key maintenance activity in these channels. These efforts include thinning and limbing to achieve mutual goals of flood conveyance, riparian function, aquatic ecosystem and water quality enhancements, and wildfire risk reduction. Managing approximately 100 acres of vegetation each year, these materials are primarily chipped, lopped and scattered, or water-logged, and therefore are not considered a tangible source of materials for the entity to recover.

While likely not a material source for the campus, Sonoma Water is a potential partner for implementation activities due to the other associated benefits of increased water quality, quantity and wildfire resilience. Catastrophic wildfire poses a significant threat to water supply, delivery and ecosystem health. The protection of watersheds from catastrophic fire is a desired outcome that the project supports.

Wildfire Resilience

Defensible space, shaded-fuel break creation and management, and preparatory work for prescribed burning, may produce sporadic volumes of wood resources for potential utilization. This work is important to protect homes and infrastructure. As mentioned, Permit Sonoma presently manages several large FEMA grants for the county that includes communication and coordination with over 200 private forestland owners. This work is being conducted under Cal VTP and therefore, would not be applicable to provide materials to the entity unless an additional exemption permit were filed with landowner approvals.

In association with the CWPP, Fire Safe Sonoma, Firewise Communities, and SCAPOSD are actively involved in defensible space and shaded fuel break implementation for private landowners. Registered Firewise communities are starting to be recognized by insurers who may provide reductions in premiums. At the time of completing this study, the Palisades and greater Los Angeles fires were projected to surpass $40B, making this one of the most destructive natural disasters in U.S. history.[27] (In comparison, the Tubbs Fire in Santa Rosa in 2018 cost the State $11.1B.) In order for people to be able to insure homes located in the forested areas of the county, significant wildfire prevention fuel reductions will be needed on an annual basis. These treatments are generally restricted to the practices referenced above and may provide significant volume.

Post Fire Activities

Post fire cleanup work, including salvage logging, produces large quantities of material with varying end uses that include lumber, firewood and energy. Funding from these harvests or via

grants provided for post fire clean up on private lands is generally not sufficient to achieve 100% of post fire clean up goals. While larger trees may be harvested for sale to sawmills to offset clean-up costs, this practice is highly variable depending on landowners' expertise and timber markets. After major fires, both landowners and RPFs noted that regional sawmills were over-capacity, loggers and foresters were limited, and the harvests focused on high-value logs. Reducing sporadic, catastrophic wildfires through proactive stewardship has the potential to create both a steady supply of materials for recovery and even out work flows to sawmills, foresters and loggers. This can also reduce the practice of high-value log removal.

Arborists

Urban wood and wood materials generated by arborists were determined to be a significant potential source of wood but with limited utilization pathways and variable quality. Materials generally consist of a higher variability of species providing less uniform processing pathways as well as higher potential for metal and other mill damaging debris.

In addition to managing urban wood that is not regulated by the FPRs, arborists are oftentimes hired as third-party contractors to provide additional labor and support for forest treatments. Interviews with local arborists revealed that smaller trees, <12" in DBH, are generally chipped and left onsite or chipped, hauled, and dumped on properties that accept chips. These materials are considered by the project a usable wood resource for a variety of wood products. Trees larger than 12" may be left onsite, cut into smaller, non-merchantable pieces, or if not able to be left onsite, hauled to tub and grind operations for compost or soil amendments. This dimension is also worthy of recovery and utilization and has potentially higher value.

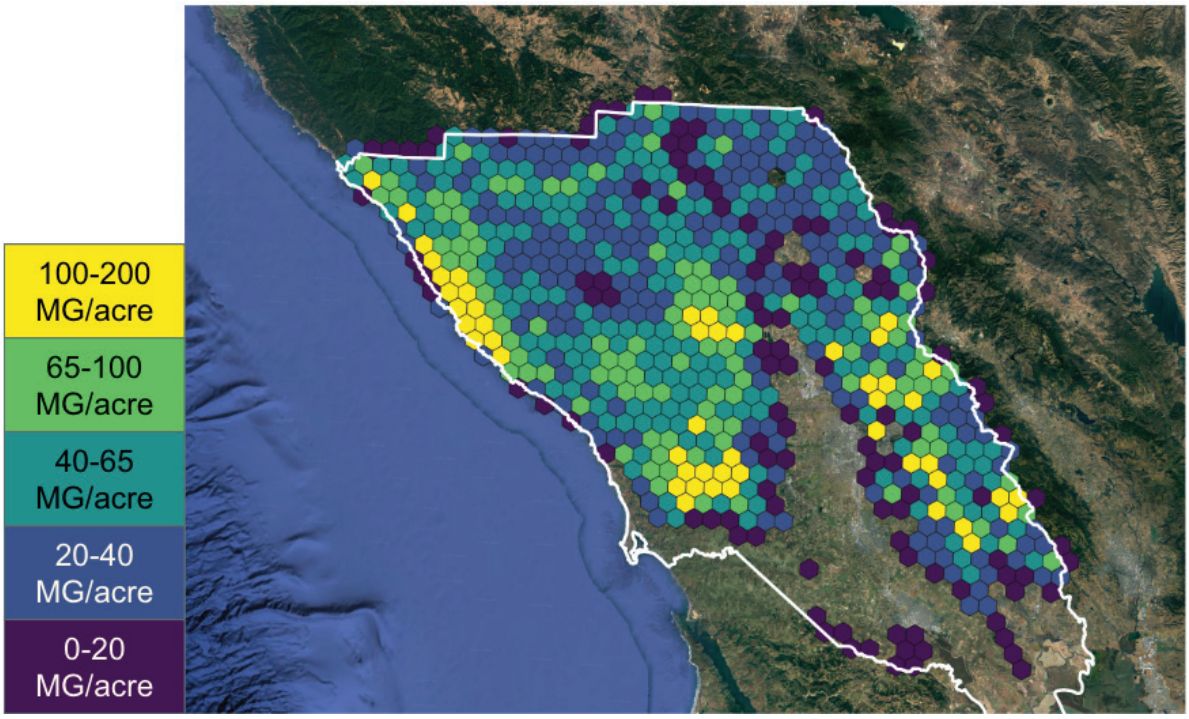
One local tree company reported an estimated 50 - 100 tons of green materials being generated per day, the equivalent of 25,000 tons per year if operating 50 weeks out of the year. With five arborist companies of similar and significant size operating within Sonoma County, this material source could be as high as 125,000 - 150,000 tons per year. These materials are generally not compliant with FPR requirements, and pathways to commercialization at this time are not feasible unless 1038 exemption permits are filed.

3.4 WOOD RESOURCE QUANTITY, QUALITY, AND ANNUAL OPERATIONS

The project worked with technical advisors and consultants to assess the quantity, quality and potential annual flow of wood materials that might be available to an entity in sufficient supply. In order to assess the potential volume of wood materials, the project consulted with Wuuii Inc. (Wuuii) to develop an updated biomass layer for Sonoma County. Wuuii integrated GEDI LiDAR data with existing species classification from Tukman Geospatial. Through their work, Wuuii. was able to establish areas of significant forest density, an important indicator of areas in need of forest health treatments and potentially available wood resources for recovery and utilization. Wuuii then developed an updated map of biomass for Sonoma County represented in a hexagonal grid spread across the county and reported in megagrams per acre (Figure 5). One megagram is one million grams or 1,000 kilograms, often called a tonne, all metric units. A US ton is 2,000 pounds. To convert from a metric tonne to a US ton, one multiples tonnes by 1.1, yielding 1.1 US tons or about 2,200 pounds further referred to as green tons or GT. To read Figure 5 below, assume 1Mg/acre = ~1 GT/acre.

The report has focused on GT as the primary unit of measurement.

Figure 5: Updated Biomass Layer for Sonoma County



Not all forested acres can be feasibly treated in the areas identified. For this reason, Wuuii limited the reported biomass to reflect the feasibility of mechanical treatment using feller/bunchers and other equipment, or manual harvest. This was based on data produced by Tukman Geospatial that weighted towards proximity to roads and excluded riparian areas and slopes greater than 45%.[25] This total biomass number was further categorized into biomass by tree type (hardwood or softwood), as well as DBH size-classes of 5-12", 12-20", and 20+".

3.4.1 WOOD QUANTITY

The research assessed that there is a total of 246,365 acres identified by the Mechanical Feasibility Layer as potentially "recoverable" for wood resources. Tukman's assessment was in an acceptable range of variance at 212,000 acres. During the study's research, the Working Group estimated that approximately 2,800 acres of private forestland acres are being treated each year, just 1% of the overarching total acres that might be feasible to treat. This number is based on field knowledge of work happening in forest, and does not include public lands management, ROW, prescribed burning, or other acreages. This number is an approximation of forest thinning and other in-forest treatments and is based off of published CAL FIRE historical data and approximated to achieve an annual estimate of actual private forestland acres treated. The Wuuii data was able to estimate tree type and size class in total tonnes across the 246,365 feasible or recoverable acres as listed in Table 5.

Table 5: Estimated Volume of Standing Material

Location	Recoverable Acres for Treatment	Tree Type	5" - 12" GT	12" - 20" GT	20+" GT
Sonoma County	246,365	Hardwood*	1,869,821	4,471,793	17,739,556
		Softwood	842,570	2,483,959	20,985,344
		Total GT per Class	2,712,391	6,955,751	38,724,900
		Total GT of all Classes	48,393,043		

The project uses green tons (GT) throughout versus BDT as the primary material sourced is assumed to be logs. From GT, potential board feet of lumber can be assessed.
* Potential uses of hardwood species are relatively limited to firewood at this time as markets and products must be established to make this material more economically viable. See Section 5 for more details.

The availability of wood resources is an important indicator of the potential for success of the proposed wood products campus. The combined total of all diameter classes of 48.4MMGT demonstrates that a significant amount of material is indeed potentially available for processing. This is the equivalent to 2.4 million dump trucks at 20 tons each. **The project does not propose removal of all recoverable biomass estimated and created a secondary analysis on volume of material based upon reduced quantities by DBH. This assumes 50% recovery from <12" diameter, 10% for diameters >12".**

Table 6: Proposed Reduced Recovery by Size Class of all Tree Types

DBH of Trees	Total GT
< 12"	1,356,196
> 12" - 20"	695,575
> 20"	3,872,490
Total	5,924,261

The estimated tons above gives a more realistic estimate on what amounts of material might flow to a wood products campus from the total recoverable acres. The project notes that there is a high degree of variability across acres.

3.4.2 ANNUAL FOREST MANAGEMENT TIMELINE

The Sonoma County commercial forest management season runs roughly from April through November 15, with specific dates highly dependent on moisture levels. Forest work cannot occur with machinery when the soil is wet and is overseen by CAL FIRE inspectors. During California's bird nesting season, bird surveys must occur in accordance with environmental review procedures. This means a range of 16 to 32 weeks of forestry activities that can occur throughout the year for harvesting operations. Other operations such as burn preparations, handwork, planning, surveying, grant writing, reporting and other activities can take place outside of these windows.

3.5 ECOLOGICAL BASELINE CONSIDERATIONS

The project's overall analysis has been guided by relevant ecological forestry principles and a vision that calls for returning Sonoma County's forests to fire-resilient landscapes and improving the ecological health, function and diversity of our forests upon which our communities and ecosystems depend.

Recommendations in this section were made under the following core assumptions:

(1) wood materials in our forests presently exist in overabundance. In order to return these ecosystems to some equivalent of the fire-adapted landscapes that they once were, some significant removal of wood resources will be required.

(2) wood to be aggregated and utilized would be created directly as the byproduct of forest health treatments that fall under State or federal environmental review;

(3) decisions to conduct these treatment actions would be made primarily by landowners, RPFs, and crews conducting the work;

(4) the potential new operational entity will not be involved directly in implementation of forest projects (that is, it will not actively manage forested lands via thinning, removal of trees or otherwise); and,

(5) active and effective forest management actions in Sonoma County are essential to ensure improved forest health, ecological and community resilience to climate change, along with the other benefits mentioned throughout the study.

A project sub-group identified areas of potential ecological concern. During its meetings, participants worked to address the following questions to outline and address potential direct and indirect impacts of wood recovery and utilization:

- *What ecological considerations would affect these proposed activities?*
- *How can implementation activities best support, and enhance, the ecological integrity of associated activities?*
- *What eco-cultural and social considerations and pathways apply to addressing them?*

This meeting and other inputs received during our study assisted to:

1. Develop a list of ecological considerations related to anticipated activities;
2. Draft priorities and strategies to uphold ecological integrity as the project proceeds;
3. Compile preliminary ideas regarding eco-cultural considerations and next steps; and
4. Identify additional questions and research needs.

This sub-group was able to reduce the assumed processes for wood recovery and utilization into the four basic categories listed below. While the project's proposed activities seek to engage directly in processes 2 - 4, the project considers Process 1, "In-Forest Treatment Goals," to be the top-priority area to positively influence in the future.

Table 7: Wood Recovery, Utilization Processes and Ecological Considerations

Process 1. In-forest Treatment Goals • Wildfire risk reduction and climate resilience • Improved carbon sequestration potential • Pathogen management • Understory protection • Improved aquatic animal health • Increased soil health • Enhanced watershed function and water infiltration • Habitat preservation • Bird nesting site sensitivity • Ensured invertebrate habitat • Monitoring and evaluation • Support interrelationship between eco-cultural stewardship, land and forestry practices • Avoid noise and disturbance impacts on animals and people	***Process 2. Materials Removal + Transportation Goals*** • Reduce road expansion impacts • Reduce wear and tear on county roads • Lower ecological impacts from log landing locations • Improve air quality • Quantified carbon emissions from transportation while working towards exceeding standards • Quantified carbon emissions related to worker' use of equipment on sites; improved local contracting prioritization and hiring
Process 3. Primary Processing Considerations • Monitor and assess energy requirements for processing • Creation of a healthy work environment and high-paid jobs • Exceed environmental quality and review standards • Work toward achieving "zero waste" • Minimize noise and disturbance impacts on animals and people • Implement renewable energy mechanisms for offsetting activities • Identify inefficiencies or negative impacts due to scale and seek to remediate with new technologies	***Process 4. Carbon Credits & Finance Considerations*** • Assess various financing and carbon credit programs to determine any negative externalities • Monitor energy use of processes in carbon and financing markets • Establish verification program to unlock opportunities to apply carbon credits and financing to this work

The project finds that the potential for increased long-term carbon storage achieved by reducing the density of forest stands outweighs any potential short-term negative externalities of initial forest treatments. Additionally treatments may enhance forest resilience to drought due to fewer trees per acre, helping to buffer these ecosystems from rising temperatures, and from pests and diseases that can impact forests under stress.[28] While specific treatments will vary depending on site conditions and ecosystem types, most of these actions will predominantly require involvement of an RPF, or LTOs, licensed individuals responsible for upholding the FPRs.

During stakeholder engagement and outreach, the majority of respondents expressed support for the proposed activities. Several respondents questioned the management practices and wildfire mitigation strategies due to habitat and soil disturbance and were concerned about possible carbon loss and the greenhouse gas emissions (GHGs) involved in harvest, transport and processing of materials. Transparent and complete carbon accounting was identified as a needed standard practice to determine the full footprint of activities and to address these underlying concerns.

Two individuals voiced strong opposition to the use of forest wood resources to produce energy at one stakeholder meeting, and one expressed concerns regarding negative impacts of burning wood due to air quality impacts. The project believes that this is in reference to industrial-scale pellet operations for export markets, and large biomass energy plants, neither of which are proposed here. The project finds that modern low-emission, biomass energy production at appropriate scale could be proven to exceed potential concerns regarding potential social and environmental impacts.

Diverging opinions on how to create healthier forests remain a common discussion point within the county and among forestland owners, landowner associations and the general public. We foresee provision of wood resources to the entity as voluntary, at the discretion of forestland owners. Furthermore, the project will work to create carbon accounting systems to track and determine the long-term impacts of its activities over time. These trials could look at the impacts of (1) no treatment; (2) treatment with materials chipped and/or intentionally left onsite; (3) treatment with chipping and burning; and, (4) treatment with removal of usable materials. The project will also seek to work with local researchers and UC Cooperative Extension to monitor and evaluate effectiveness of the treatments and will partner with other agencies and non-governmental organizations as needed to support this work.

3.5.1 PRIORITIZING ECOLOGICAL HEALTH AND RELATED STRATEGIES

The project has envisioned a phased plan for implementation of recovery and utilization of wood materials. Under Phase I, the entity will be established and will seek to secure a location to locate a new wood products campus. During this phase, the entity will have little to no control over how wood materials are recovered as the focus will be to utilize existing streams including small-diameter materials.

As the entity seeks to positively influence ongoing forest treatment practices, it should work to create an ecological procurement strategy and will search for funding resources sufficient to cover additional associated costs including enhanced post-treatment monitoring. With this goal to positively influence relevant practices, the sub-committee reviewed priorities and strategies to guide the project. These were then shared with key stakeholders for input and modified accordingly to produce the following recommendations, structured according to six priority levels:

Priority 1: Engage with Tribal organizations to ensure project activities support Tribes' goals and objectives.

Strategy 1a. Conduct outreach to Tribal entities in the geographical scope of proposed activities to determine their interest and local priorities.

Strategy 1b. Convene a working group of interested Tribal organization representatives to develop appropriate cultural resource and land stewardship considerations and incorporate collaborative input into design of activities.

Priority 2: Provide educational opportunities, materials, and information to the public regarding forest health practices and resources for their effective implementation.

Strategy 2a. Integrate education with offerings such as tours of aggregation site(s), forest health programming and more in collaboration with landowners, agencies, RCDs, non-profits, and other organizations.

Priority 3: Monitor and measure ecological outcomes achieved through practices and create pathways to increase positive impacts.

Strategy 3a. Identify ideal restoration activities to be conducted during forest health treatment implementation and design ecological key performance indicators (KPIs).

Strategy 3b. Conduct a cost analysis of additional restoration activities typically not supported by traditional funding opportunities and create mechanisms to implement more of these additional services.

Strategy 3c. Explore creation of an ecological forestry training certification program for timber harvest operators and RPFs for provision of wood resources.

Strategy 3d. Conduct an annual carbon footprint analysis to determine the sustainability of local wood recovery and utilization actions and priorities.

Priority 4: Develop thresholds for increasing ecological Key Performance Indicators as lumber processing efforts increase.

Strategy 4a. Set a threshold number of board feet of lumber to be processed annually, or a sales threshold, to determine when a secondary layer of ecological KPIs would be instituted. This effort would be overseen by an ecological advisory committee that reports to the entity's Board of Directors.

Priority 5: Consider incorporating programmatic components that actively support forest health through a variety of activities.

Strategy 5a. Consider afforestation methods for selected areas that had been forested historically but no longer remain in that condition.

Strategy 5b. Support activities to explore expansion of agroforestry as a way to

expand tree habitat and further integrate grazing animals and food crops into forest management regimens. These practices could educate and connect more people with effective and adaptive stewardship of these ecosystems.

Strategy 5c. Ensure movement towards old-growth characteristics as a high priority action. This would encompass maintenance of healthy, older growth stands and enable degraded forests to recover. To do so, consider forest thinning, removing invasive species and other related treatments.

Strategy 5d. Consider reforestation activities after forest health treatments and/or during recoverable post-wildfire events. Toward this priority, a tree nursery could be established, or hired, to support reforestation efforts. Also, the entity could consider collection and propagation of native tree and plant species.

Priority 6: Conduct product analysis and annual evaluation.

Strategy 6a. Develop Key Performance Indicators (KPIs) and Life Cycle Assessment (LCA) tools for products being created from wood resources.

Strategy 6b. Issue annual reports on ecological impacts of the new entity's activities. Set goals to improve ecological performance and track results.

Strategy 6c. Explore publishing a transparent chain-of-custody process via online tracking information for all wood products being created.

3.5.2 RECOMMENDATIONS & FURTHER INVESTIGATION

Environmentalists and others in Sonoma County strongly support forest practices that enhance the diversity and age class of forest stands. The updated 2024 Sonoma County Tree Ordinance, the Sierra Club Redwood Chapter, Northern California Forest Committee, Thinning Concepts and Strategies Document, and other policies as outlined in the recent Climate Resilience Comprehensive Action Plan reflect these priorities for a variety of ecologically beneficial outcomes.[29] [30] [31] [2] The project has concluded, based on research and engagement of experts, that forest health treatments, at scale, will support return of more fire-adapted landscapes that our ecosystems and communities need to thrive, can effectively support a forest stewardship economy, and will thereby support multi-aged forests along with other aforementioned benefits for generations to come.

SECTION 4: POTENTIAL AGGREGATION SITE LOCATIONS

In order to effectively recover and utilize wood resources in the county, the project assessed potential sites for aggregating and processing material. Through the updated biomass layer, the project was able to identify an ideal campus location, Berry's Sawmill in Cazadero, as well as assess the viability of two additional locations in the Santa Rosa Airport complex area and Cloverdale (see Figure 6). Wuuii's updated biomass layer revealed that the western side of the county clearly has the area's highest density of wood materials and historic Timber Harvest Plans with ongoing in-forest treatments required. The eastern hills also represent significant wood resource density but have burned significantly over the past decade. From a governmental perspective, the majority of the county's biomass is located in Supervisorial District 5, with most of the rest in Districts 4 and 1 respectively.

4.1 WOOD RESOURCES AND TRAVEL TIME

Site selection was based upon feasibility of wood resource recovery, proximity to selected sites and site specifications for commercial purposes. It is important to note that proximity to wood material resources largely determines the economic viability of a project as the costs of transportation and hauling, and availability of LTOs, either restrict or enable material to move from forests to sites for processing. This is why transportation time and volume are so incredibly important. The project assumed log form for the material type in this analysis. (Note that the project anticipates log form for resources recovered, but that the form of wood resource was not considered in the Wuuii analysis.)

Three sites were presented to Wuuii for investigation as possible operational locales for physically recovering wood for utilization. These included Berry's Sawmill & Lumber Yard, the Santa Rosa Airport complex, and a Cloverdale location positioned close to the existing Redwood Empire mill. These three potential sites are pictured in Figure 6. Using a road network layer provided by Tukman Geospatial,[22] the research team conducted drive time analyses for each of these three locations. Using information on speed limits and road characteristics, probable amounts of recoverable wood resources were identified for each location within 15-, 30-, and 60-minute travel times. Note that these estimates do not include time for loading, unloading, or speeds that could vary depending on type of truck. (For additional information, the full Sonoma County Wood Recovery Feasibility Report, including further details on the methodology, can be found in Appendix A.)

Figure 6: Three Potential Sites Explored

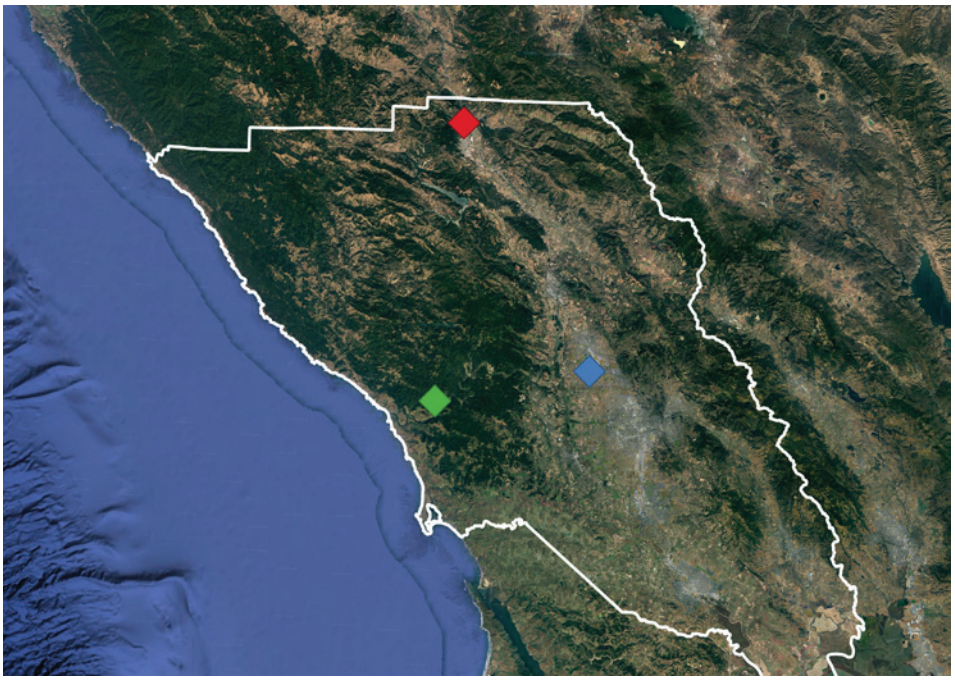


Image by Wuuii Inc.: Berry's Sawmill (green), Santa Rosa Airport (blue), Cloverdale (red)

By combining drive time estimates for the three proposed locations with our updated biomass map for Sonoma County, Wuuii was able to calculate the maximum available biomass (in tons) by hardwood and softwood species and size class for each of the three sites; they are listed in Table 8.

Table 8: Available Wood Materials Based on Drive Times to Reach Identified Sites

Location	Distance in	Recoverable Acres* Minutes	Tree Type*	5”-12” GT	12”-20” GT	20”+ GT
Berry's Saw mill	15	19,596	HW	124,913	326,451	1,364,053
			SW	91,819	267,412	2,398,935
	30	54,768	HW	358,912	947,965	3,943,411
			SW	231,466	683,097	6,572,916
	60	156,778	HW	1,114,166	2,772,875	11,086,847
			SW	585,102	1,734,381	15,515,239
Total volume within 60 min.				1,699,268	4,507,256	26,602,087
Cloverdale	15	18,434	HW	154,213	363,103	1,371,787
			SW	50,293	148,825	957,140
	30	51,038	HW	427,790	1,021,129	4,019,398
			SW	130,063	385,689	2,996,301
	60	158,173	HW	1,243,779	3,009,808	12,182,211
			SW	512,435	1,522,254	13,118,582
Total volume within 60 min.				1,756,214	4,532,062	25,300,793
Airport	15	20,342	HW	162,958	385,578	1,392,280
			SW	47,885	142,399	1,501,547
	30	92,189	HW	687,896	1,692,756	6,751,327
			SW	297,617	888,939	8,552,353
	60	169,721	HW	1,316,604	3,169,972	12,723,825
			SW	560,648	1,657,631	14,585,666
Total volume within 60 min.				1,877,252	4,827,603	27,309,491

* Note: “Recoverable” does not signify that all biomass will be removed. It merely provides insight on the potential acres where material is feasible to be recovered.

* HW = Hardwood; SW = Softwood

A few takeaways from this analysis include the following:

- The number of recoverable acres increases significantly with somewhat longer drive times
- While the Airport location outperforms at the 30-minute distance, by 60-minutes the locations are all within 10% of each other
- Across all sites and size classes, a greater quantity of hardwood trees exists
- Berry's Sawmill location offers the greatest access to large softwood trees at both 15- and 60-minute ranges; the Airport location outperforms other locations at the 30-minute range

To better visualize the relationships with potentially recoverable wood materials from each of these three sites, Figures 7, 8 and 9 below show the areas accessible from each location at 15-, 30-, and 60-minutes; the darker color represents the shortest time. Again, note that travel time does not include loading/unloading and also does not account for variable speeds that depend upon vehicle size and type.

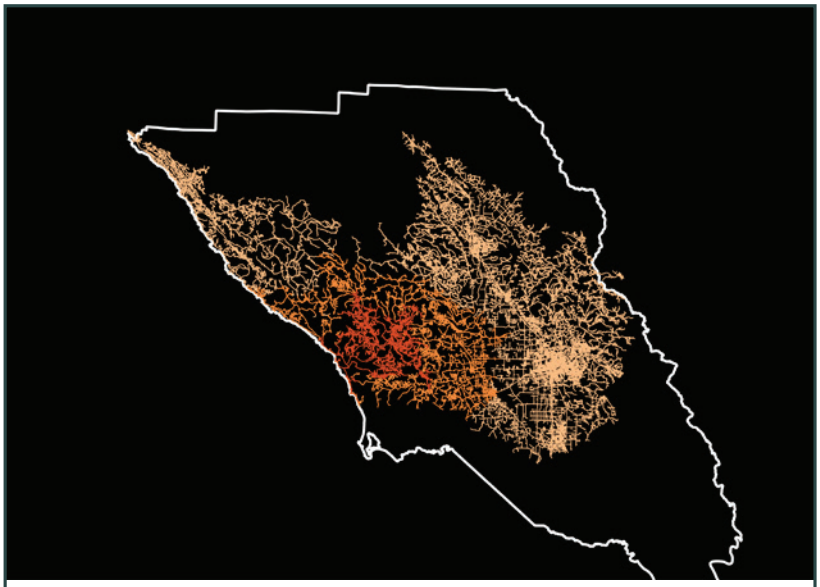


Figure 7. Berry's Sawmill & Lumber Yard
Proximity to Wood Resources
Greatest access to the Northwestern corner of the County's existing and historic Timber Harvest Plan areas.

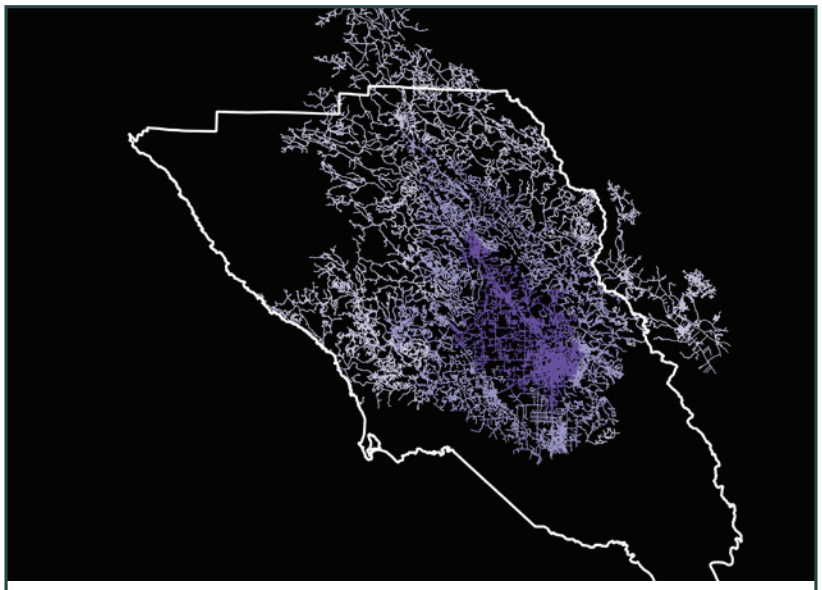


Figure 8. Santa Rosa Airport Proximity to Wood Resources
Centrally located near Hwy 101 with wide coverage across the County.

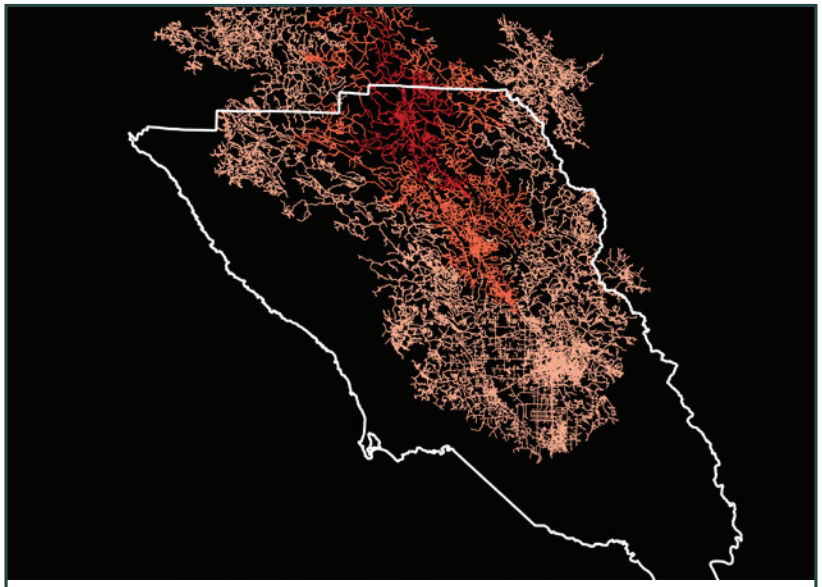


Figure 9. Cloverdale Proximity to Wood Resources
Significant access to additional areas in Mendocino and Lake counties.

Wuuii also assessed these three locations in terms of their proximity to historic and existing Timber Harvest Plans to add another layer of analysis for determination of the best site. While each of the three sites offers some specific potential advantages, their overall assessment finds the Berry's Sawmill location to be the most favorable of those considered. First, it is the only location within a 60-minute drive time of the northwest region of the county where the vast majority of current and historical Timber Harvest Plans are located. Second, with regard to softwood species (redwood, Doug-fir), it has the greatest access to recoverable biomass at both the 15- and 60-minute distances, while remaining competitive to the Airport location for access at the 30-minute distance. And third, the permitting considerations as articulated below.

4.2 PERMITTING CONSIDERATIONS & ASSOCIATED COSTS

The Permitting Feasibility Report written by WRA Inc. (WRA) worked to expand knowledge on site selection criteria by providing an analysis of permitting steps and necessary processes at potential sites. This report also provides estimated cost ranges for various requisites to obtaining completed permits, such as technical reports (e.g., air quality, biological, transportation studies) and state and federal agency consultations. (See Appendix B for the full report.)

WRA's Permitting Feasibility Report assessed the permitting needs for three sites within Sonoma County including Berry's Sawmill & Lumber Yard and a former sawmill site located near the existing Redwood Empire Mill in Cloverdale. While the project searched for a compatible site to serve as a third permitting case study in the Airport area, we were unable to find a suitable location due to price point, transportation restrictions and environmental concerns. Regardless, the central Airport zone was confirmed as an ideal, central location to continue to explore regardless of its generally higher lease values and potential environmental concerns.

4.3 CRITERIA FOR SITE SELECTION

Potential sites for an aggregation facility were selected based on the following criteria:

- Zoned for commercial or industrial use
- Sufficient distance away from watercourses or bodies of water
- Sufficient road access with industrial road dimensions to transport large, heavy material in and out of the site
- Within the jurisdiction of the Northern Sonoma County Air Pollution Control District
- Industrial 3-phase power (480 volts)
- Base rock and/or concrete available for log storage
- Reliable water supply present

4.3.1 OVERVIEW OF SITES

As mentioned, due to the challenges with finding a suitable location near the Airport, only two of the three potential aggregation sites were considered in the Permitting Feasibility Report. Selected locations are summarized below in Table 9.

Table 9: Aggregation Sites Overview

Site Name	Address	Zoning District	Zoning Overlay	Land Use Designation	Existing Use
Berry's Sawmill	23640 CA-116, Cazadero, CA 95421	Limited Commercial	Floodplain (F2), local guidelines (LG), riparian corridor (RC), valley oak habitat (VOH), scenic resource (SR)	Limited Commercial	Existing mill site
Cloverdale	32000 North Redwood Highway, Cloverdale, CA 95425	Limited Commercial, Limited Urban Industrial	Floodplain (F2), oak woodland (OAK), valley oak habitat (VOH), scenic resource (SR)	Limited Commercial, Limited Industrial	No formal operations

Berry's Sawmill / Potential Wood Product Campus Site

Berry's Sawmill (Assessor's Parcel Number [APN] 097-030-025) is a mill site of approximately 34.37-acres located along the Russian River in the unincorporated community and census-designated place of Cazadero, California. The site is functioning under an existing Use Permit approved by Sonoma County in 1980 (File number 8605) for a sawmill that operates five days per week from 7:45 AM to 4:30 PM, with up to 25 employees. A second Use Permit for the site was approved in 2010 (Permit number UPE 10-0015) for a contractor's storage yard, personal mini-storage, and a caretaker's unit. The site is zoned for Limited Commercial (LC), Floodplain Combining District (F2), Highway 116 Scenic Corridor (LG/116), Riparian Corridor Combining Zone (RC), Scenic Resources Combining District (SR), and Valley Oak Habitat Combining District (VOH).

The Berry's Sawmill site could be considered as a potential location for an aggregation facility for sorting and storage of logs and biomass. The facility would operate Monday through Friday and would process around 50 to 80 tons of material per day. This equates to processing approximately 20,000 tons of material per year, producing an equivalent of 3,300 MBF/year from an estimated 833 acres that would need to be treated. Such a facility could process logs of various species, including both softwoods and hardwoods. Potential components of the aggregation facility would include a merchandiser (electric conveyor belt); both large- and small-diameter sawmill operations; chip and grind operations; firewood operation; small scale (behind the meter cogeneration); kiln operation; a wood product manufacturing operation; and retail.

No Critical Habitat [as designated by the United States Fish and Wildlife Service (USFWS)] exists within the Berry's Sawmill site. Critical Habitat, as designated by the National Oceanic and Atmospheric Administration (NOAA), for California Coastal Chinook salmon, Central California Coast Coho salmon, and Central California Coast steelhead is present within the Russian River and Austin Creek. Essential Fish Habitat for Pacific salmonids is also present within all waterways in the area, including the onsite stream.

Environmental Setting

The Berry's Sawmill site is bounded by Old Duncans Grade Road to the north/northwest, Cazadero Highway and Highway 116 to the south/southeast, and a TPZ parcel to the west. Surrounding land uses include low density residential to the north, resources and rural development to the east and south, and timberland production to the west. The Russian River flows from east to west approximately 550 feet south of the site's southern boundary. Austin Creek runs parallel to the southeastern site boundary approximately 360 feet away before meeting its confluence with the Russian River approximately 550 feet south of the site.

Table 10 presents identification of the eight specific regulatory permits that would be required to site and operate an aggregation facility at the Berry's Sawmill location. WRA anticipated that a similar if not identical list of permits would be required at other alternative Sonoma County locations

Table 10: Summary of Potential Permits Required for Berry's Sawmill Site

Regulatory Agency	Applicable Permit
United States Army Corps of Engineers	Clean Water Act Section 404 Permit
United States Fish and Wildlife Service	Endangered Species Act Section 7 Consultation or Section 10 Consultation
California Department of Fish and Wildlife	Lake and Streambed Alteration Agreement
California State Water Resources Control Board	Construction Stormwater General Permit
Regional Water Quality Control Board	Clean Water Act Section 401 Water Quality Certification, Waste Discharge Requirements
Northern Sonoma County Air Pollution Control District	Authority to Construct, Permit to Operate
California Department of Resources Recycling and Recovery	Solid Waste Facility Permit
County of Sonoma	Tree Removal Permit, Construction Permit, Demolition Permit, Use Permit

Cloverdale Site

The Cloverdale site includes seven parcels that comprise approximately 15 acres off of North Redwood Highway in Cloverdale. The site is currently undeveloped but appears to be disturbed from previous activities. The site is zoned for Limited Commercial (LC), Limited Urban Industrial (M1), Floodplain Combining District (F2), Oak Woodland (OAK), Scenic Resources Combining District (SR), and Valley Oak Habitat Combining District (VOH). The Cloverdale site is presently being researched as a potential site for a compost operation led by Soil Management Co. and might provide a suitable co-location for aggregating logs and minimal processing before transport to the campus.

Environmental Setting

The Cloverdale site is bounded by McCray Road to the east and the Northwestern Pacific Railroad to the west. Surrounding parcels to its north are zoned for Limited Commercial and Rural Residential (RR) while and surrounding parcels to its south are zoned for Limited Urban Industrial. U.S. Highway 101 parallels the railroad further to the west of the site.

No Critical Habitat, as designated by the USFWS, exists within the Cloverdale site. Critical Habitat, as designated by the NOAA, for California Coastal Chinook salmon and Central California Coast steelhead, is present within the Russian River to the east of the site. Essential Fish Habitat for Pacific salmonids is also present within the Russian River.

4.3.2 ESTIMATED COSTS FOR PERMITTING AND REGULATORY APPROVALS

Estimated costs to obtain permits and comply with CEQA will depend on the existing conditions of the sites, which would be assessed by preliminary studies. It is recommended that a biological resources study be conducted as the first step for either site because it will inform what permits could potentially be required. Cultural, air quality, noise, and transportation studies may be needed to support the CEQA Initial Study; therefore, it is recommended that these studies begin concurrently with the Initial Study. These studies are typically included in a consulting firms' scope of work to prepare an Initial Study. However, the estimated costs for CEQA and NEPA documentation in the table below are in addition to the costs for any other preliminary studies that may be needed to support the documentation.

Table 11. Timeline and Estimated Costs for Preliminary Studies

Potential Permits/Studies	Estimated Cost
Preliminary Studies	
Biological Resources Study	$10,000
Wetland Delineation Study	$8,000
Cultural Resources Study	$8,000
Transportation Study	$40,000
CEQA Studies/Documentation	
Initial Study/MND	$30,000
EIR	$80,000
NEPA STUDIES/DOCUMENTATION	
Categorical Exclusion	$20,000
Environmental Assessment	$40,000
Environmental Impact Statement	$120,000
Total Estimated Expenses	$365,000

Creation of an aggregation facility at either the Berry's Sawmill site or the Cloverdale site would be subject to numerous environmental regulations and permit processes. The federal, State, and local permits that would be needed will ultimately depend on the biological and aquatic resources that may be impacted by activities to construct and operate the proposed facility. Therefore, it is recommended that the next step forward for either site would be to prepare a biological resources study and wetlands delineation study to document existing biological resources onsite and nearby and classify any aquatic resources that may be impacted by project activities. These studies would also be used to inform the CEQA analysis, which would be conducted prior to approval of the project by the County of Sonoma.

To initiate the CEQA process, it is recommended that Regenerative Forests Solutions reach out to the County of Sonoma to inform them of the potential project and clarify the intended appropriate CEQA approach. Some lead agencies are amenable to project applicants hiring consultants to complete their CEQA documentation, which would ultimately be subject to review and approval by the County; however, some agencies prefer to conduct the CEQA process on their own. The CEQA and permitting process could be initiated concurrently, but some permits from state agencies will not be authorized until CEQA is certified. It is generally recommended to reach out to agencies sooner rather than later to inform them of the potential project and ask questions, so that no budget is spent on unnecessary studies or applications.

4.3.3 CONCLUSIONS AND RECOMMENDATIONS

Despite the existence of substantial wood resources in Sonoma County across its forested land, a lack of infrastructure limits the potential for effective recovery and utilization of wood materials. This restricts the county's capacity to maintain Sonoma County's forests to help realize increased community and wildfire resilience and forest health. Primary challenges toward implementing an operational entity and wood campus include:

- The administrative and logistical challenge of managing forests across 14,670 different ownerships
- Cost for treatments to achieve ongoing resilient forest characteristics
- Permitting regulations that impede the commercialization of wood resources
- Costs of operational start up
- Fluctuating value of timber and related wood materials

Significant support will be needed by the County of Sonoma and existing industry practitioners to combine community, ecology and economy within a comprehensive new vibrant forest stewardship economic framework.

The State of California and USDA's USFS are already spending billions of dollars to support implementation projects that address the challenges facing our forests, yet significant additional resources will be needed to ease the numerous and complex pathways for recovery and utilization. Start up costs to establish new wood product campuses and bring old facilities back online are capital intensive. With limitations on how federal funding can be spent and only a few alternatives to private financing available (e.g. iBank, Blue Forest). Additional resources are needed for the scale of infrastructure investment required. Furthermore, markets need to be established to create demand for non-commercially viable wood to ensure overall financial viability.

Until changes are made, the primary means to dispose of wood that is too small to transport to a facility, or that is not appropriately permitted for use, is to lop and scatter materials; chip wood and leave it onsite; haul it to an accepting property; haul chips to a regional biomass plant; or, burn it in piles. Felling and leaving wood materials onsite as is, remains the lowest cost treatment option. With substantial density of materials in Sonoma's forests, leaving them onsite in various forms does not appropriately reduce fire risk. Community-scaled wood products campuses are required to resolve this challenge. Re-using low-value wood is a way to directly translate potential wildfire risk into carbon-sequestering products.

In the past, the timber industry was only interested in the biggest logs, hand cut, oxen towed, and set onto sailing ships. The industry changed to railroads and trucks, axes to chainsaws, and the biggest beams to particle board. The project's recommended wood utilization campus could well be the next step in this evolutionary process, where our area's needs for fuel reduction and elimination of excessive forest materials is supported by forestland owners, managers, and ecologists, becomes the driver of expanding ecological wood materials sourcing, and converting these materials into long-term, low-carbon products. This goal deserves and needs support at this time – with every acre completed, another step will be made towards increased resiliency.

SECTION 5: EXISTING INDUSTRY ANALYSIS AND FEASIBLE WOOD PRODUCTS

The project assessed existing capacities and gaps for Sonoma County to manage its current and future anticipated wood resource processing needs, based on treating an estimated 2,800 acres/year at present, with a goal of treating 10,400 acres/year in the future. This acreage is based on the current CAL FIRE legally permitted projects and may not completely represent the non-commercial projects occurring in the County. This section also explores several successful case studies; potential wood products that would enhance the economic viability of proposed activities; and next steps to create a more viable forest stewardship economy here in Sonoma County.

5.1 EXISTING INFRASTRUCTURE CAPACITIES WITHIN SONOMA COUNTY

California's wood products industry has been in a steady state of decline over the past 50 years. In 1968 the state had 275 sawmills; in 2021, only 31 mills were operational. During this time, elevated environmental awareness and protections paired with increasing global economic pressures challenged the viability of the industry. As a result, California's wood processing capacities dropped from 5 billion board feet (bf) of lumber annually in the late 1980s down to 1.5 billion bf in 2023, a decline of 70%. Active wood processing facilities during this period declined by more than 40% throughout the state and since this time, overall employment in the industry has dropped by nearly half.[18] These reductions were crucial and necessary to preserve the remaining old growth and biodiversity of our forests, improve watershed health, habitat, and to provide other incalculable benefits. At the same time, the economic impact on rural communities was devastating. An equilibrium is needed that matches ongoing forest stewardship needs, employment sector opportunities, and economic viability.

For the purposes of this study, Sonoma County's CRCAP goals identify a need to treat 10,400 acres of forest per year to meet AB 1757 requirements. These projections comprise the treatment goal from which to assess infrastructure and potential wood product volumes. The project's Working Group has estimated that approximately 2,800 acres of private forestland is being treated under Cal Fire Permits annually at this time, leaving a goal of increasing annual forest treatments by 7,600 acres annually. It is impossible to determine the number of acres that private landowners are treating out of pocket as no permitting is required for that work. Public and federal lands in the county are not presently considered viable wood resource providers so the study assumed privately owned land of <2,500 acres to be the main source of materials.

Existing Infrastructure

Local sawmills with the capacity to process small-diameter logs are necessary to realize the potential economic viability of appropriate forest health and wildfire resilience practices. Sonoma County once had many small-scale mills that supported employment of foresters, forestry technicians, loggers, haulers, mill workers, and various auxiliary businesses. In 1988 Sonoma County sold 38MMBF; in contrast, between 2000 and 2020 average annual timber production dropped to 11MMBF (a decline of 70%).[33] While the project certainly does not propose that the county seek to attain 1988 volumes, or even close to those levels, we note that reduction and consolidation of the industry presently restricts forest treatment potential.

Just seven industrial sawmills buy logs from Sonoma County and process all of the reported commercial timber; all but one of these sawmills are located outside of Sonoma County. (Project researchers note that the one operation in Sonoma County, Redwood Empire, technically operates at two locations in Cloverdale for primary and secondary processing.) According to interviews conducted with local RPFs, the lack of available local milling infrastructure adds costs for transportation and prevents some forest treatments from occurring; this limitation needs to be resolved in order to increase forest treatments and meet the stated goals. While creating additional value for the forest materials via recovery and utilization is perceived as a way to have these materials increasingly "pay their way" out of the forest, In Sonoma County, these efforts are not anticipated to offset the entire cost of planning, permitting, in-forest treatments, and hauling. While private financing and public subsidy currently pay for treatments, they are insufficient to

adequately scale the work to targeted levels on an ongoing basis. It is apparent that the combined efforts of investment in the forest stewardship and wood products economy along with private financing and public subsidies are needed in order to achieve the annual treatment goals.

Several small-scale mills are operating today in Sonoma County. Of these small operations, only one has the capacity to process small-diameter and non-merchantable logs at a commercial scale. While this study considers small-diameter material to be 12" or less, sending these logs to a sawmill is generally not viable due to their low value compared to the high cost of transportation. Effectively using small-diameter materials is essential to meet the county's climate goals and remains one of the key challenges to overcome throughout California.

Numerous mobile and custom milling operations add processing capacity for private forest landowners wishing to mill and utilize their own wood resources. While these operations offer similar carbon sequestration potential through wood products versus chipping or burning, they do not lead to cost savings in removal or significantly increase utilization at the scale the study deems necessary.

Case Study: Forestree Collective has been piloting the utilization of small-diameter timber in primary and secondary wood products since 2022. The company utilizes a single pass sawmill (Woodlandia Log Ripper 200 XP) at its historic small-mill site in western Sonoma County. They also have a portable bandsaw mill and operate a woodshop in Penngrove to manufacture value-added wood products. Their work piloting the use of small-diameter timber has broadened the range of potential uses for local wood resources. Forestree currently offsets the cost of ongoing forest treatments by paying for transportation from the forest to their mill for logs that meet their specifications. By doing so, they support wildfire resilience, offset a portion of the total costs of treatment, and increase carbon sequestration potential of harvested materials by turning them into durable wood products. To date their primary product offering is furniture, and are in the R&D phase of a mass timber building system.

The project proposes as its core solution the emergence of small, community-scale infrastructure located relatively close to sources of wood and requiring lower upfront investment compared to a traditional, industrial scale mill. Using estimated volumes from Wuuii on feasible acres, treating 2,800 acres per year would generate an estimated 11.2 MMBF of timber. Were the much larger annual goal of treating 10,400 acres to be achieved, an estimated 41.7 MMBF of timber would be generated per year. Note that these scenarios do not assume 100% removal; they foresee 50% removal of small-diameter materials (5" - 12" DBH), and 10% of materials over 12" DBH. The project worked to ascertain the volume of material that might be processed by a potential wood products campus annually to determine the size of the facility needed.

Table 12: Log Volume and Processing Scenarios

	Processing Scenarios			
Log Input (MBF/Year)	1,000	3,000	4,000	10,000
Green Tons/MBF	6	6	6	6
Green Tons/ Year	6,000	18,000	24,000	60,000
Aggregation Yard (GT/day)	80	80	96	240
Truckloads/Day	5	5	6.4	16
Operating Days per Year	75	225	250	250
Acres/Year	250	749	998	2,495

The wood products campus location at Berry's Sawmill in Duncans Mills is recommended due to its active sawmill permit, proximity to forest resources in western Sonoma County, and available infrastructure. The project estimates that Berry's would likely be able to service 1,000 acres of forest thinning treatments per year (using the Wuuii data to estimate volumes), increasing the county's capacity by over 40% from the current estimated 2,800 treated acres per year up to 3,800.

Leveraging these volume assumptions, the project worked to ascertain the number of existing industry professionals, businesses, technical assistance providers and equipment operators required to meet forest treatment goals. Results of this analysis are shown in Table 13.

Table 13: Assessment of Current and Future Infrastructure, Sales, and Professional Service Provision Needs of Sonoma County

Type	Description	Current Level at 2,800 Acres/Yr	Projected Total at 10,400 Acres/Yr
Fee for Service Log Disposal Facilities	Existing and proposed local waste facilities, compost facilities, and transfer stations could co-locate a wood recovery program to upcycle logs that meet the potential entity's specifications.	7	8
Wood Products Campus	The project identified that either 1 or 2 such new facilities are needed to effectively process the substantial amount of wood materials to be generated within Sonoma County.	0	2
Industrial-Scale Mills Serving Sonoma County	More industrial scale mills are needed to support the potential to increase from 2,800 up to 10,400 acres of treatments per year.	7	10
Firewood Operations	The county has over 15 small firewood operators; the number reflected here represents full-time business operations.	7	10
Cogeneration Plants	Technology is rapidly advancing to limit air quality contaminants from cogeneration plants, which could provide a much-needed solution to create energy and heat from those wood materials that cannot be effectively processed otherwise. We anticipate that the county could easily accommodate 1 small-scale cogeneration plant (less than 3 megawatts) and likely two such plants, considering the volume of materials being created daily from arborists alone (~50 - 100 tons/day).	0	1 - 2, small scale
Retail Lumber Operations	Retail lumber operations included are only those forecasted to buy from a new local wood products campus.	6	10
Licensed Timber Operators (Class A)	The number shown reflects the number of LTOs needed to support in-forest treatment activities. (CAL FIRE's online database has over 60 registered Class A operators, but only 9, or 2% of those with licenses are supporting in-forest treatment material handling. Each operator can support 500 - 800 acres per year.	8	20
Registered Professional Foresters	RPFs counted are actively working directly with private forestland owners to write plans and manage projects.	9	20
In-forest Hand Crews	Each hand crew has 10 - 15 members. The county will need to continue to increase the number of people employed in the forestry sector and will need to consider paying them a living wage to enable this to occur.	7	20
Forestry Technicians	The number of individuals supporting RPFs in the field needs augmentation to reduce costs as leveraging a technician to mark trees versus an RPF is more cost effective.	3	25
Technical Assistance Providers	These experts are essential to support private forestland owners apply for permits, create FMPs, and complete other technical aspects of forest management.	8	20

The project finds that Sonoma County's existing infrastructure, market development and professional service providers are insufficient to meet targeted goals of treating 10,400 acres per year as outlined in the CRCAP. We anticipate that a wood products campus would help support the establishment of additional forestry professionals and wood-related businesses needed to meet the targeted increase in forest treatments in the county. While the new wood products campus alone would not be able to recover and use the anticipated large volume of materials needing to be treated, it is an important and essential first step to grow the county's capacity by as much as 40% to achieve its community and wildfire resilience, economic development, and related climate action goals.

5.2 WORKFORCE DEVELOPMENT

As the Sonoma County Wood Recovery & Utilization project is focused on recovery and utilization of wood resources from existing or planned projects, the research team worked to assess current and potential job creation through proposed activities if the project were to be implemented. We conclude that increasing local capacity to process wood materials will lead to an increase in work opportunities, including both direct and indirect jobs, related to coordinating the flow of wood materials from Sonoma County forests to end markets.

Direct jobs are anticipated in logistics, transportation and hauling of wood materials; wood processing; manufacturing from available wood; and sales of new wood products. Many of these roles would involve facilitating and managing the stream of wood materials at a wood campus or aggregation yards. Indirect jobs include forestry professionals conducting forest treatments, Licensed Timber Operators and haulers, wood product businesses that would buy the material, and others.

Direct positions are estimated at 36 full-time equivalents (FTEs) during Phase 1; and we estimate indirect jobs related to removing forest materials at another 37 during the same period. However, since a general multiplier for the forestry sector is approximately 2.3 indirect jobs to direct jobs, approximately 85 indirect jobs could also be created.[34] New job data is based on initial treatment of 3,000 acres/year in Phase 1, building to 5,000 acres annually in Phase 2 and 10,400 acres per year in Phase 3. Table 18 in Section 7 also has numbers on workforce actuals at 3,000 and projected needs at 10,400 acres treated. Please note that this information is not reflected in the same way that VR Consultants expressed the numbers below. Both sets of data are insightful for projecting staffing and infrastructure scenarios.

Direct Jobs

See Table 14 for details on direct jobs estimated for each of the phases. This assumes the emergence of one wood recovery and utilization campus close to potential wood resources, as currently proposed in western Sonoma County at Berry's Sawmill. The location was selected due to its historic use as a sawmill and its proximity to large volumes of potential materials to reduce transportation and hauling distances. By adding one to two additional sort yards by 2030, 15 FTEs would be created to staff the units.

Mill and firewood staff would manage the sawmill and firewood operations; biomass staff would be in charge of managing sourcing of wood materials as well as increasing efficiencies for all offtakes and development of potentially new markets (e.g. hardwood products); manufacturing and retail will handle value add and sales; education and outreach will provide tours, educational events, training, and manage an informational center where the public can come and receive information on benefits of healthy forest ecosystems.

Table 14: Direct Jobs Created

Additional FTE Direct Jobs	Phase 1	Phase 2	Phase 3
Staffing	7	12	15
Mill & Firewood	15	26	31
Biomass	2	6	11
Manufacturing & Retail	10	23	39
Education & Outreach	2	9	11
Total	36	76	107

Indirect Jobs

We have also made assumptions for the number of indirect jobs to be supported through emergence of the pilot project. For Phase 1, we have assumed that 2,800 acres/yr would be treated in the feasible treatment areas identified by the North Coast Resource Partnership analysis. Although these treatments may vary in their specifics, we assume that they focus on mastication and feller-buncher actions. A masticator can treat approximately 0.57 acres/hr.[33] Dividing 2,000/0.57 gives 3,508.8 hours or approximately 1.7 FTEs (3,508.8/2080). Note that this does not take into account the obvious seasonality of this industry, which is likely to affect indirect job availability.

To treat our target of 3,000 acres, hand crews would need to thin an additional 1,000 acres of terrain unsuitable for machines. A capable crew member can thin approximately 0.25 acres/day. Therefore, a 10-person crew thins 2.5 acres/day. Dividing 1,000/2.5 gives 400 days, equivalent to 4,000 (400 x 10 crew members) total days or 32,000 hours. Dividing 32,000/2,080 gives approximately 15 FTEs. Combining the estimated 1.7 FTEs for machine treatments with 15 in the hand crews gives 17 FTEs.

For prescribed fire crews, we assumed there would be ~50% overlap in crew members between hand crews and prescribed fire crew members that perform dual functions, starting with 2 FTEs in the initial phase and ending with 6.

Table 15: Indirect Jobs Created

Additional FTE Direct Jobs	Phase 1	Phase 2	Phase 3
Staffing	7	12	15
Mill & Firewood	15	26	31
Biomass	2	6	11
Manufacturing & Retail	10	23	39
Education & Outreach	2	9	11
Total	36	76	107

Both suppliers and admin support staff for indirect positions are estimates and we used the following multipliers:

1. Suppliers: 1 supplier FTE for every 3 indirect FTEs (forest techs, thinning, and prescribed fire crews).
2. Admin/support staff: 1 support staff for every 5 indirect FTEs (forest techs, thinning, and prescribed fire crews).

More generous multipliers are used for the forest sector at the national scale. For instance, Bivens used a multiplier of 2.3 indirect jobs for every direct job created.[31] This figure, however, includes all spending and jobs created, so it is much higher than our estimates and may estimate how the project would impact the entire Sonoma economy. Bivens' multiplier gives 83 FTEs during Phase 1 of the pilot and 191 FTEs by Phase 3.

Structural hardening was also included in the indirect jobs created. In Sonoma County, 13,776 buildings exist in areas classified as extreme in the wildfire risk index.[14] Assuming that each building will require 100 sq. ft. of treatment for structural hardening, that is equivalent to approximately 32 acres, at 0.25 acres treated/day, which equals 128 days of work or 0.5 FTE. Since nearly 14,000 home treatments would comprise a massive effort overall, the number is doubled to include time to arrange and complete these important treatments. While total FTEs would likely remain constant through these phases, possibly even decreasing, we've assumed that home hardening needs to be maintained over time and, therefore, have added 1 more to each phase of the indirect thinning FTEs.

Takeaways

Implementing the recommendations of the Sonoma County Wood Recovery & Utilization project would benefit the county through direct wildfire mitigation, creation of many new and valuable wood products, significant job creation, increased education on the benefits of forest health, and a number of new businesses created or supported. Key findings include the following:

- The gap remains at present between treatable and treated acres in Sonoma County is nearly 100% (99.7%).
- Combining feasible-to-treat acres with areas with greater than a 40% poverty rate gives an acreage of 3,100. Work in these Identified areas could help greatly reduce wildfires and decrease risk in the most fire-prone and economically disadvantaged areas.
- Phase 1 of the project would create a total of 36 jobs, increasing to 107 by 2040 (Phase 3).

The total number of indirect jobs created increases from 69 in Phase 1 to 175 in Phase 3.

5.3 POTENTIAL WOOD PRODUCTS

As economic viability of this work is paramount, this section explores the various wood products that are feasible from anticipated wood sources in the county. These economically viable pathways to process and utilize this material are anticipated to lead to an increase in the number of direct and indirect jobs as well as greater profitability of forest treatments and considers both hardwood and softwood species.

Hardwood

Hardwood species, or Class B species under the FPRs, such as tan oak, California Bay, madrone, eucalyptus and others, represent a large volume of biomass in the county. All of them have relatively underdeveloped markets at this time beyond firewood.

The development of new hardwood product markets has been well-researched,[36] yet to this day remains elusive mainly due to market demands, and the cost and complexity of processing. While local hardwoods will remain a niche market into the foreseeable future, thanks to the important body of historical research and development, we believe there is market growth potential in the affluent Bay Area as local, low carbon, sustainable wood products.

Hardwood flooring, for example, has been attempted in the past due to the high volume availability of "come along" material associated with softwood timber management. During research, the project learned about a former hardwood flooring manufacturer in Ukiah that was purportedly profitable but was stated to have closed as it did not meet the economic expectations of the owners. Despite the difficulties, several companies in Oregon such as Zena Forest Products have recently made significant investments to make a number of innovative secondary hardwood products and are working to develop primary hardwood markets as well. The project notes

Case Study: Oregon-based Sustainable Northwest Wood is a certified B-Corp that has a lumber yard in Portland and provides sales and marketing for sustainably harvested wood products in the Pacific Northwest. This entity was created by the nonprofit Sustainable Northwest and is a reference model for the Sonoma County project. Sustainable Northwest wood offers both FSC Certified lumber and plywood as well as wood products sourced from family-owned forests, Tribal lands, and wood that is salvaged from the waste stream. "We aim to make finding local, sustainable wood products easy and to be a bridge between responsible sourcing and the built environment. We believe it is not only possible, but also vital, to protect and restore ecosystems, to salvage and upcycle wood from the waste stream, and create economic opportunities when supplying the wood products our community needs."

that beyond flooring, numerous artisans and craftspeople commonly use hardwood material to create livelihoods through various wood products such as furniture, bowls, utensils, slabs, and other handmade specialty items.

Processing hardwoods effectively requires special attention and skill to overcome the challenges, not the least of which is the widespread pathogen Phytophthora Ramorum (sudden oak death). Sterilization through kiln treatment would therefore be a critical part of the process for any wood products made from local hardwoods. Since hardwood materials are predominantly chipped and hauled, or made into firewood and distributed to various sites, pathogens are presently not well contained through existing pathways. Including kiln drying as part of the campus could potentially help reduce the spread of such pathogens.

Case Study: Heartwood Biomass is often referenced as an impressive model of successful utilization of small-diameter timber. Their first location at a former sawmill site in Wallowa County, Oregon, was in partnership with the nonprofit organization Wallowa Resources. The operation lies at the heart of what was once one of Oregon's major timber producing regions. Similar to Sonoma County, changes in land management and fire suppression combined with extensive mill closures created an ecological and rural economic development challenge for this area. As their website states: "We make our products out of the wood others throw away, like scrap from forest waste, forest thinning, and wildfire mitigation projects. The result is wood that not only helps preserve our forests, but helps preserve jobs in our rural community." With their success in Oregon, Heartwood has begun expansion into California in Tuolumne County. Heartwood accomplishes their work in California by managing third-party contractors to conduct forest treatments on USFS land, recovering available materials at their facility. At their new site they process the small-diameter material for various end uses (e.g. firewood, mass timber, wood straw). The larger diameter logs are sold to regional sawmills, helping "pay the way" for removal and transport of the smaller-diameter materials. Much of the wood product campus model presented in this study has been adopted from Heartwood's strategies of sourcing a diversity of materials; then efficiently sorting and processing all these items for their "highest and best use".

Potential wood products from hardwood species include:

- Flooring
- Lumber for millwork and furniture
- Artisan crafts
- Firewood
- CHP/Biochar

Softwood

Considered Class A species under the FPRs, softwoods comprise the entirety of the current timber market within Sonoma County. Redwood is the wood of highest value with Douglas fir as secondary value. While excellent as a building material, according to local foresters, Douglas fir presently costs more to harvest and haul to mills than landowners receive for the sale of the logs.[37] The project notes that while Sonoma County's Douglas fir market has subsided due to both supply and demand issues, it will play a major role in the fast-growing mass timber market due to the structural quality of this material. Softwood species are generally sold as larger diameter sawlogs for a variety of purposes within California, or exported. There are ever increasing technological solutions to mill smaller logs for multiple wood products that are presently being piloted in the state (see Case Study: Forestree Collective) and are well-established in both Canada and Europe.

Overarchingly, the project seeks to find ways to utilize any harvested material for its highest and best use. This includes the goal to increase utilization of small-diameter logs (<12" diameter) as well as limbs and tree tops from larger saw logs, all of which are currently considered non-merchantable. Below on the left is a list of all potential primary and secondary wood products identified that could be manufactured. Proposed products for implementation are shown on the right in Figure 10 and include: lumber; pallets; veneer; posts and poles; wood straw; firewood; soil amendments; and, back of the meter heat and power to support the mill and kiln operations.

While the specific business model and market analysis for each of these products lie beyond the scope of this study, we have provided some baseline considerations regarding each of the wood products below. The project recommends a thorough market analysis, proforma and business planning process for each product in order to prioritize capital expenditures.

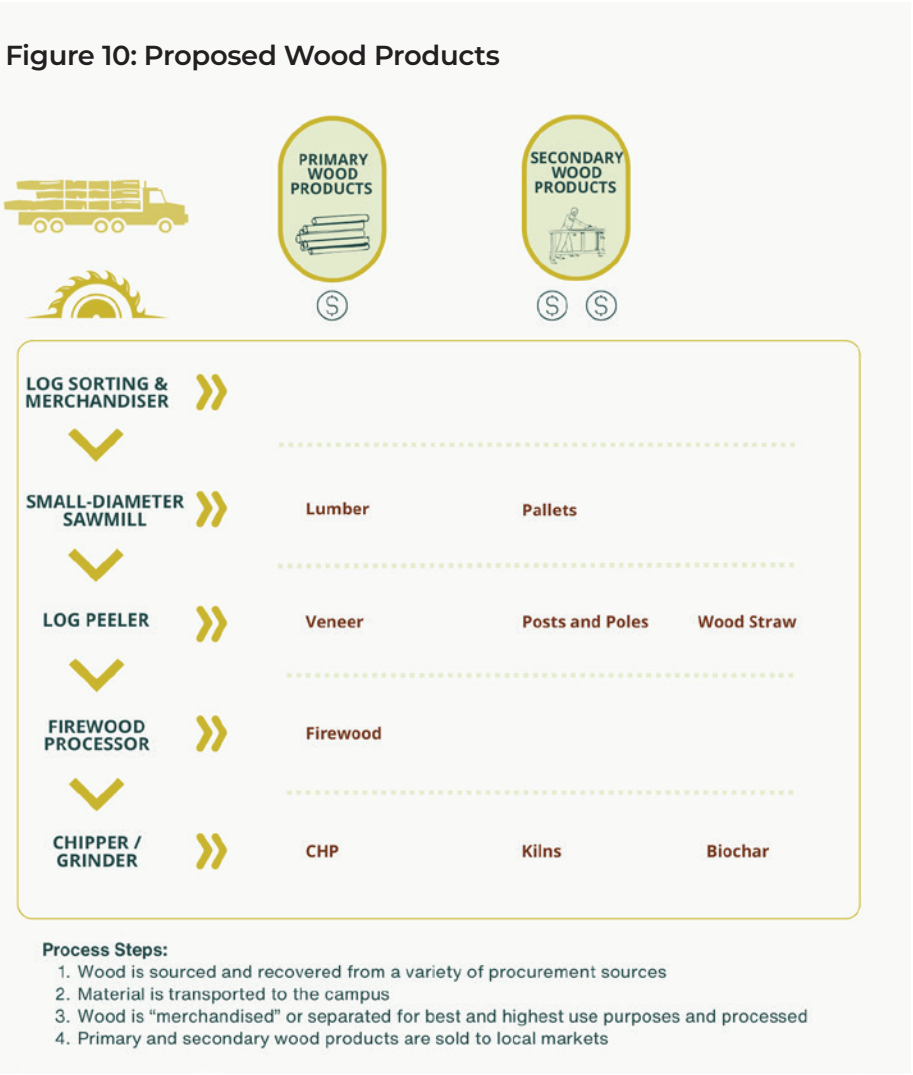
Potential
Primary Wood Products:

- Lumber
- Veneer
- Post and Pole
- Fencing/Siding
- Firewood

Potential
Secondary Wood Products

- Mass timber
- Furniture
- Pallets
- Thermally modified wood
- Wood straw
- Landscaping
- Animal bedding
- Compressed logs
- Wood pellets
- Soil amendments
- Biomass Combined Heat and Power (CHP)
- Biochar

Figure 10: Proposed Wood Products



Primary Wood Products

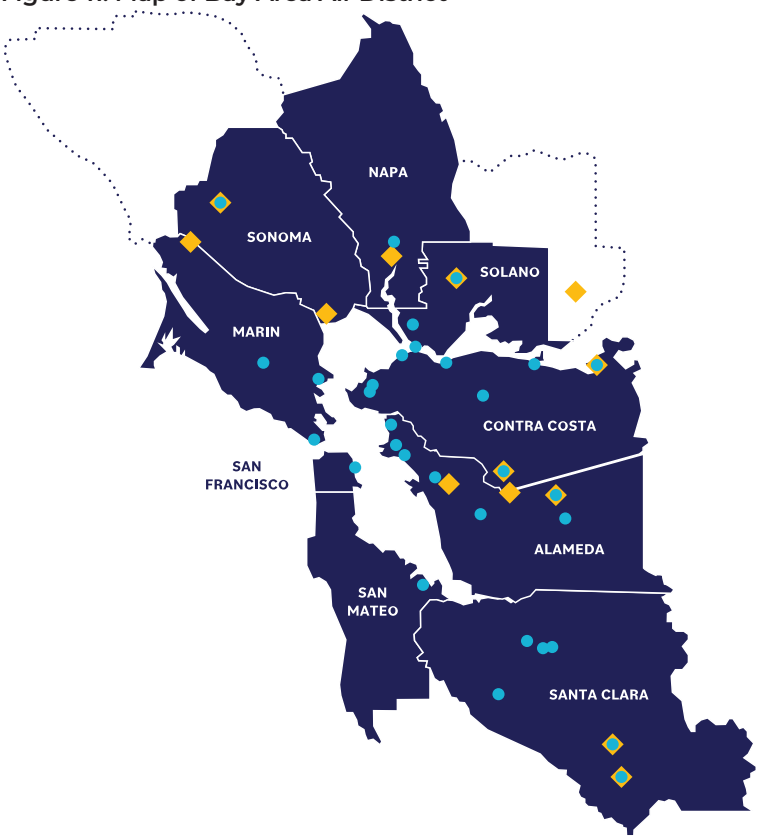
Lumber
A sawmill operation would produce dimensional lumber, pallet lumber, timbers, fencing, and trim as primary lumber products. We propose that the wood products campus focus on small-diameter processing efficiencies to ensure the largest possible utilization of these materials.

Veneer Lathe / Log Peeler
A veneer lathe operation would produce veneer that could be sold and/or turned into plywood, mass timber and/or wood straw, and could also produce posts and poles.

Fencing / Siding
The benefit of selling fencing and siding is that the wood can be sold green. The numerous fencing retailers in Sonoma County may prove to offer a feasible opportunity for sales depending on price competitiveness with other local producers of material and ability to meet industry standards.

Firewood
Hardwood and softwood species alike can be used for wood burning stoves.. Hardwood species earn a market premium for their longer burning and higher heat emission (BTU) qualities. According to interviews with firewood operators in the county, if one considers the firewood products industry as a whole, which includes all burnable materials, restaurant cooking, home heating, industrial uses, the existing market is estimated at roughly $10MM per year with room for growth.[37] The amount of growth is presently unknown for all categories. The project notes that limitations exist for wood intended for wood stoves in more urban locations due to the ban on installing new wood stoves and “no burn days” within the Bay Area Air District’s jurisdiction.

Figure 11: Map of Bay Area Air District



A certified Sonoma County firewood program, fuel load reduction firewood program, and/or community firewood bank could offer supportive programmatic and marketing aspects for increasing the viability of local firewood operators and fuel load reduction cleanup programs. This program could also seek to educate the public regarding cleaner burning methods, reduced spread of pathogens, and create standards regarding proper seasoning for lowered emissions.

Adding value through a kiln operation would improve the quality and competitiveness of the product, decrease emissions, and lower risks of spreading pathogens. Entrance into existing larger markets could prove challenging and may take several years to accomplish. Regardless, the amount of hardwood material that is anticipated to be available necessitates firewood becoming one of the wood campus's first products for economic viability.

Secondary Wood Products

Otherwise known as value-added wood products, secondary products take primary wood products as inputs to create additional products of higher economic return. Due to the high cost of wood recovery and utilization in Sonoma County, the project sees secondary wood products as a likely needed component for economic viability. Following is a list of various value-added wood products determined as feasible for Sonoma County.

Mass Timber

Nail laminated timber (NLT), cross-laminated timber (CLT), and glue laminated timber (glulam) are different types of mass timber products that can be produced using small-diameter materials. Made by bonding layers of several pieces of wood together with nails, glue or dowels, to make panels for buildings. As part of the California Building Code, mass timber is one of the ways that the state hopes to decarbonize buildings. When compared with concrete and steel, mass timber products represent a renewable building material that requires less energy and emits less greenhouse gases when produced and consumed within California.

Furniture

A variety of furniture items can be made from various wood species of differing dimensions. This material would be sold to manufacturers as aggregated sustainable lumber, which would add marketing value to their products.

Pallets

Due its market size and the lack of any substantial manufacturers in Northern California, this low-margin yet high volume market could be an excellent outlet for small-diameter Douglas Fir lumber.

Thermally Modified Wood

Currently, California has only one thermal modification manufacturer. This is a fast-growing market for high end, rot resistant siding and decking products. The required high temperatures for treatment could theoretically be obtained through the waste heat of a new CHP system.

Wood Straw

A relatively new wood product on the market made from wood veneer, wood straw is currently being produced in California by Heartwood Biomass. This manufacturing process, patented by Forest Concepts, could either be produced in partnership with that entity or a similar non-identical product could be created. Wood straw, typically made from non-merchantable timber, is an erosion control material superior to normal straw as it is heavier and longer lasting. One additional advantage is that it eliminates the spread of unwanted weeds and invasives, a common problem with straw. This is significant for post-fire remediation efforts when high volumes are needed and introduced species can otherwise readily proliferate.

Landscaping

The landscaping market for decorative chips in Sonoma County appears to be relatively saturated at this time. However, some value can be created since redwood is one anticipated species that would become available and these chips could be used in various landscaping products. Cutoffs after making lumber could be chipped to create un-died, natural, redwood chip mulch. Redwood bark also has numerous applications that could prove viable were it to be converted into a horticultural substrate alternative to peat moss or added as a soil amendment to increase water holding capacity. Provided to numerous horticultural operations in Sonoma County, this product could prove locally viable depending on pricing. Bulk options may be most appealing unless operating capital were available to develop a retail product. This would require a deeper market analysis.

Animal Bedding

The animal bedding market derived from sawmill or wood manufacturing byproducts have great potential in Sonoma County predominantly due to the existing poultry, livestock, and equestrian facilities. According to Verified Market Reports, the global market size for animal bedding was valued at $4.25B in 2023 and is estimated to double to $8.23B by 2030.[38] Additional analysis is needed to assess potential demand within Sonoma County in particular. Potential considerations to enter this market include: potential additional specialized equipment needs; species consistency; marketing requirements; moisture content allowed in material; and any storage requirements to meet either bulk or retail expectations. The project does not recommend pursuing a retail market product focused on small-indoor animal bedding (e.g. hamster, bird) at this time due to perceived challenges in accessing this established market.

Local dairies have expressed interest in off-hauling sawdust to their operations and horse ranches

Case Study: Soil Carbon Management Company has created a unique and sustainable business that uses Sonoma County wood biomass to regenerate agricultural soils and sequester CO2. This business is being piloted at Old World Winery (off of River Road), and converts wood chip biomass into Primordial Biome™, an agricultural soil amendment that sequesters CO2 in the soil while improving soil health. By providing landowners with a portion of the carbon credits that they generate, Soil Carbon Management Company helps strengthen and preserve agriculture in Sonoma County.

may also be interested in bulk options. These larger animal operations could provide a good fit for the start-up phase of any wood products campus as provision of material may require less investment and could provide a service of off-hauling excessive material that would otherwise become a cost to the operation if not managed or utilized.

Compressed Logs / Briquettes
Compressed logs or briquettes represent a potential market for leftover residuals. Hydraulic presses are required to extrude wood materials into brick shapes. The process uses heat that melts naturally-occurring lignins to fuse the wood together. Compressed logs can be used as a substitute to firewood or other biomass fuels. Additional drying may be needed prior to processing to reach the desired moisture content.

Wood Pellets
Using similar technology as compressed logs, wood pellets are smaller-sized wood products typically less than 1" in diameter and ¼" to 1 ½" in length. They are generally stored in bulk totes which makes them easy to transport. Before processing, the material must typically achieve a moisture content below 10%. Pellet mills are sized to handle various throughput volumes from small to industrial scale. Wood pellets have numerous uses for residential and commercial heating applications and are also used in industrial scale energy production.

Pellets have become quite controversial since the European Union classified wood biomass as a renewable energy source in 2009, which significantly increased wood pellet exports from the U.S. There is substantial, and growing, public opposition due to the often-cited negative externalities of large-scale wood pellet projects for the export market.

Compost
Wood residuals from sawmills and other operations represent a needed carbon additive to compost mixes and may be further processed as value-added soil amendments. Several compost operators have expressed interest in receiving wood product residuals from any related sawmill activities such as sawdust. This could also add value to the county's goals under SB 1383.

Biochar
Biochar is one of the few value-added products possible to produce either in-forest and/or at a wood products campus. Biochar can be used as a high-value, upcycled soil amendment that provides a quantifiable carbon sequestration value that could be leveraged to access funding for forest treatments through carbon banks. It is also increasingly being used in stormwater pollution mitigation efforts, in road and various building materials, as an additive to reduce emissions during compost operations, and to reduce enteric methane in cattle.

Case Study: Locally, Sonoma Ecology Center's (SEC) Sonoma Biochar Initiative has been a leading proponent of biochar production and expansion since 2009. SEC was awarded a CAL FIRE Urban Forestry grant in 2021 to install and study a low-emissions modern biochar production system from the Advanced Renewable Technology International (ARTi) company in Iowa. This machine uses pyrolysis (high heat in the absence of oxygen) to "cook" (not burn, surplus wood materials (chips) and convert them to biochar. The unit was approved in 2024 by EPA for installation in Napa County, with the required air emissions permit issued by Bay Area Air Quality Management District in early 2025.

Several models of biochar production units are on the market in various stages of development. The Char-Boss, Tigercat Carbonizer, Pyreg Pyrolysis, and Ring of Fire kilns are all appropriate for use at landscape and community scales. Such machines are being used by various organizations and represent potential for making a valuable and sustainable product from wood residuals that do not otherwise have a commercial value. Despite biochar's early stage of market development its use has been growing exponentially worldwide and remains a viable product to consider as a beneficial addition for co-location at a new wood products campus in Sonoma County.

Combined Heat and Power (CHP)

Operating a wood products campus requires a significant amount of heat and electricity. Wood residuals that cannot be otherwise used in the higher-value products mentioned above can be used to offset onsite energy requirements through a "back-of-the-meter" combined heat and power (CHP) unit and even potentially create a carbon-neutral facility. The facility's combined carbon footprint from not having to off-haul waste plus production and use of heat and electricity for operations can become at or near neutral using a modern small-scale biomass CHP unit. These units are especially economically viable in California due to the high cost of energy.

Case Study: Biomass energy and wood utilization in the US West is uniquely tied to the health of our forested landscapes. Wisewood Energy uses in its projects wood residuals from existing forest health and wildfire risk reduction activities that have no other highest and best use, thereby strengthening a more circular economy. Wisewood Energy purposefully sizes its systems to be consistent with locally available biomass fuel sources, ensuring both a stable demand for these byproducts and a sustainable supply for the operating life of the system.

Biomass Power Plants

Four power generation plants in northern California currently source biomass for their energy production: DTE Woodland, DTE Stockton, Ultrapower Chinese Station Sonora, and Sustainable Resource Management Redding. Hauling distances and pay rates by the ton of wood inputs determine the viability of moving forest materials (typically in the form of chips) from Sonoma County to one or more of these sites. Due to the high cost of transportation and hauling, the distance from source to facility generally needs to be under 30 miles one way to be viable.

SECTION 6: ENTITY-TYPE RESEARCH & SELECTION

The project Working Group was tasked with recommending the ideal functions and entity-type to oversee management of local wood resources. To determine the most suitable type across a range of options, an Entity-Type subcommittee composed of several Working Group members carried out research and conducted several deliberations. Two key questions guided this sub-group's inquiries and focused its final recommendations to the full set of Working Group members:

1. What entity-type would be best able to manage aggregation, processing, and redistribution of wood materials in Sonoma County?
2. What entity-type would be able to achieve maximum successful implementation within the existing and evolving organizational landscape of Sonoma County, considering likely available financial resources and potentially appropriate functions?

6.1 RESEARCH EXPLORATIONS

To inform its recommendations, the subcommittee created a scoring matrix designed to identify the ideal contributions of a new entity. Working Group members, technical advisors, and key stakeholders used this matrix to communicate their preferences, scoring each possible activity from 0 to 5. These activities then informed the entity-type selection. See Appendix D for a full list of activities selected.

Once these primary entity activities were solidified, the subcommittee then identified and assessed the core characteristics of the ideal entity-type for implementing this large range of activities. This approach combined consideration of the several organizations and entities already operating within the county with identification of existing gaps and additional functions that a new organization could potentially fulfill. Entity-types considered are listed in Table 16 below.

Table 16: Entity-Types Considered

CLASSIFICATION	TYPE	INITIAL ASSESSMENT
Corporation	Cooperative	A cooperative has potential to provide a variety of services; it can also function as an umbrella organization to support multiple businesses. Guided by a board, manager, and its employees and members, its membership could include landowners, forest management professionals, log haulers, wood products manufacturers, and other stakeholders. This type of entity could potentially gain broad-based support.
Corporation	LLC, S-Corp, or B-Corp	A for-profit business may be a viable option to manage wood recovery and utilization. This will be especially true after demand has been established for wood products that encourage enhanced utilization and help offset additional costs of labor and processing required to manage wood materials.
Corporation	Perpetual Purpose Trust	A Perpetual Purpose Trust (or simply Purpose Trust) could be a possible vehicle to create and manage an entity to restore local forests and create a circular economy while also taking care of its employees. This entity-type would be formalized as a corporation with all voting rights assigned to the underlying trust. Profits generated are generally assigned to a parallel non-profit charitable organization that enables these monies to be used for employee welfare and support, and ensures ongoing fulfillment of the organization's mission (e.g., Patagonia is a Perpetual Purpose Trust linked to an associated 501(c)4).

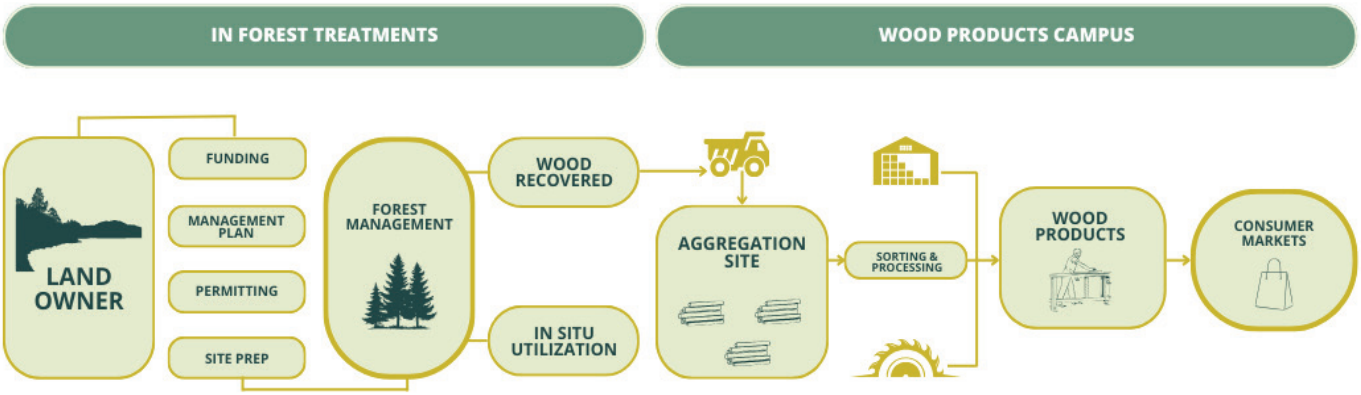
Government Entity	Joint Powers Authority (JPA)	As part of the process Sonoma County is undertaking in 2024/25, its Resilience Coordination Team (RCT) advised the project not to choose a government entity-type, stating two reasons: (1) to avoid interfering with the county's consideration of forming a new entity to manage available wildfire mitigation funds and related strategies; and (2) since numerous entities already exist in the county, calling for creation of a new entity to be supported via taxes would be unlikely to succeed.
	Climate Financing District	A similar entity already exists; SB 852 (Dodd) established climate financing districts with the Sonoma County Regional Climate Protection Authority (RCPA) listed as the first such entity in the state.
	Special District - Enterprise	Several special districts already exist within Sonoma County, so that formation of a new wood materials management district appears unlikely due to the landscape of organizations as well as recently passed Measure H. While a Forest Resilience Authority (FSA) has the potential to manage much of the aggregation and contractual services proposed by the project, it appears that a new special district is unlikely to be implemented at this time.
	Special District - Non-enterprise	
Nonprofit	Nonprofit Public Entity	The aggregation entity could be well served by a nonprofit 501(c)(3) that could raise initial funds to start the entity and offset associated costs.
	Membership-Based Nonprofit	A membership-based nonprofit organization offers an interesting potential option for the entity; its members would have voting rights, pay annual membership fees, and determine the direction of the entity.

6.2 ENTITY-TYPE CONSIDERATIONS

The project Working Group members noted that our overall research findings in 2024 have largely mirrored the prior analysis of this complex issue completed by EBalive Consulting in 2018. However, various changing conditions have influenced the project recommendations. These include: technological advancements in monitoring and assessing forestland conditions; climate action mandates; the changing insurance sector; and county-driven efforts to create forest and vegetation management pathways.

Without question, Sonoma County has a robust and engaged landscape of various organizations, agencies, and entities working to increase the pace and scale of forest management practice implementation with primary goals of improving wildfire and community resilience and improving forest health. The project recommends that a new potential entity avoid duplicating efforts of existing organizations and focus on actions that can effectively support the ongoing, annual needs of forest management treatment efforts. To garner a better sense of what type of work the new entity might provide, Figure 12 illustrates the proposed activities of the entity .

Figure 12: Entity Activities



The new entity would provide two overarching functions: 1) logistics planning, financing and coordination of wood resources; and, 2) receiving, sorting, primary processing, minimal secondary processing, and selling of wood products.

The aggregation entity would work in concert with RPFs and other forest managers to support recovery and utilization of wood materials after forest health treatments have been completed and sawlogs, if applicable, have moved on to regional sawmills for processing. This means that the entity might be engaged in the planning process with partners to incorporate removal of wood for utilization; in responding to applicable permitting questions; and, in seeking needed grant funds and other financial opportunities such as carbon credits to support offsetting the treatment costs.

6.3 RECOMMENDATIONS

Based on the detailed analysis conducted, the project recommends that Sonoma County focus on several key factors, each of which can directly affect how wood resources here are managed into the future. The entity-type selected from project's deliberations should support all of the many efforts underway and be sufficiently flexible to match its services to enhance the present and future landscape within the county (e.g. AB 2346 (Lee) and the Climate Resilience Financing District). Specifically, all implementation activities that occur prior to Sonoma County establishing its new wildfire resilience agency or department should directly benefit its anticipated goals.

WHY DO WE CONCLUDE THAT A JPA IS NOT VIABLE AT THIS TIME?

Funding from LCI's Cal FRAME program supported research and legal resources to determine the potential viability of JPAs as a potential entity-type to fulfill the needs of this work throughout the State. JPAs can function with an impressive level of financial wherewithal, oversight, and efficiency on behalf of those local governing agencies that form them. Since these JPAs are generally created with taxing authority, they can charge fees sufficient to cover their services and can issue bonds to access further capital when needed for larger investments. As a key part of its work, the project considered the recommendations and findings of a report on this topic completed by CLERE Inc. and has determined that a JPA is not a viable entity-type for Sonoma County at this time.[25]

Recent passage of Measure H in Sonoma County supports local fire departments to meet their areas' annual vegetation treatment needs; any new JPA would duplicate this voter-approved effort to a large extent and would not be passed by voters again for wood material management specifically. Moreover, Sonoma County has an internal strategic planning process underway to determine best pathways to leverage available PG&E settlement funds to support local ongoing wildfire resilience strategies. This process, being led by consulting firm ERG and the County's Resilience Coordination Team, is on track to "develop recommendations for organizing, managing, and funding wildfire resilience on an ongoing basis." The combination of Measure H with this process underway effectively puts on hold any consideration of an alternative or competitive new JPA that might overlap with the functions of wildfire prevention services. After the county completes its internal process in 2026, the structure of a JPA can be re-assessed.

The overwhelming need for ongoing flexibility to serve a currently-unmet niche of wood resource management, and following additional factors are influencing the project's entity-type recommendation:

1. Present lack of financial viability for core proposed activities:
   The activities associated with wood recovery and utilization include coordination with forestry professionals and hauling, processing, manufacturing and marketing of any wood products. Any implementing entity will need to locate, permit and site this work within the county, an effort that will require significant upfront capital. The project has identified one primary recommendation for the campus that is presently available, Berry's Sawmill, as well as several potential aggregation yards for accessing materials from various locations throughout the county.

   The cost of transporting wood materials for aggregation, especially those deemed "unmerchantable" by the timber industry, makes this work challenging from an economic perspective. However, Sonoma County has several key resources that could be applied to support implementation of a new wood products campus. that are identified in Section 7.

2. Timeliness to access available funding:
   Sonoma County's timeline to implement its internal work of developing a wildfire resilience program or agency falls beyond the current window of opportunity to access potential implementation funds via LCI and related government and federal sources. Therefore, it appears essential to encourage use of an intermediary or bridge entity to start working on implementation tasks prior to Sonoma County's own eventual readiness to do so at scale.

subsidy of some sort, like those outlined above and in section 7, will be required for proposed activities until a stronger wood products market can be developed and sustained. Once established, it is assumed that market demand will be able to offset the costs of recovery and utilization or a portion thereof. This will be further explored in an ongoing business planning process.

Final Entity-Type Considerations

Considering the factors above, and the changing landscape of multiple organizations already at work within the county, the project narrowed potential implementation entities to the following three types:

Nonprofit Entity

Creating a public 501(c)(3) organization would have the following core benefits to manage wood materials' recovery and aggregation:

1. Ability to raise both public and private resources to support its activities
2. Explicit public benefit commitment
3. Able to prioritize ecological outcomes above profits by reinvesting profits back into services that meet mission
4. Limited taxation benefits

Cooperative

With various stakeholders engaged in the proposed activities – transportation, forestry, wood products manufacturing, construction – a multi-stakeholder cooperative could bring value to each of these subgroups and be able to unite various interests to conduct this work successfully. The project received initial guidance from the California Center for Cooperative Development.

For-Profit Company

Significant investment will be required to establish a new wood recovery and utilization site within Sonoma County. To do so, a for-profit corporation would most easily enable venture capital to invest in bringing a new facility online. Due to the competitive nature of the timber industry, challenges to access wood materials efficiently within the county, and proximity to two larger sawmill facilities less than 75 miles from the identified potential aggregation site, a for-profit company without an existing and established market would be challenged to succeed. If a for-profit option were pursued, it is recommended that the entity consider becoming a Benefit Corporation (B-Corp) to more fully build in the ecological service aspects of this work and to track key performance indicators toward increasing forest health and wildfire resilience. It is important to note that many of the grant funding resources listed in Section 7 available for wood utilization entities would be available to both for-profit and nonprofit entities.

Final Implementation Entity Recommendation: 501(c)(3) Nonprofit Corporation

As project Working Group members deliberated on the benefits and challenges associated with various entity types, they determined that a nonprofit corporation is indeed the preferred entity-type to achieve the designed activities of the entity in Sonoma County at this time. It is relevant to note that the project explored in some depth the possibility of partnering with existing local organizations. Through interviews it was determined that activities related to this entity

were sufficiently unique as to fall outside of any currently existing organization's capacities or strategic priorities, namely the physical recovery and management of wood materials for their subsequent utilization.

A 501(c)(3) nonprofit corporation offers several key benefits for advancing environmental causes, making it a valuable structure for a new organization focused on wildfire resilience, climate, conservation, sustainability, and ecosystem protection. The benefits are as follows:

Table 17: Identified Benefits of a 501(c)(3) Nonprofit Corporation

Tax Exemptions	- Federal Income Tax Exemption: One of the primary benefits of 501(c)(3) status comes from its exemption from federal income tax. This allows the nonprofit to direct more resources towards its programs without the burden of federal tax obligations. - State and Local Tax Exemptions: Many states (including California) and municipalities offer additional tax exemptions, such as sales and property tax exemptions, enabling nonprofits to further reduce operational costs. - Donations made to a 501(c)(3) organization are tax-deductible for the donors, providing a strong incentive for individuals, corporations, and foundations to contribute. This encourages larger donations and long-term financial support, enhancing fundraising potential.
Access to Grants and Funding	- Many foundations, government agencies, and philanthropic organizations see nonprofit status as a prerequisite for awarding their grants. A new 501(c)(3) would gain access to a wider pool of grant funding. - These funds can support a range of activities, including environmental research, conservation projects, advocacy, and public outreach campaigns. They can also be used to cover operational costs like staff salaries and equipment.
Public Trust and Legitimacy	- The 501(c)(3) designation conveys legitimacy and transparency to the public, providing an important benefit to the organization's potential operations.
Advocacy and Awareness Raising	- 501(c)(3) corporations are allowed to advocate for environmental policy changes and raise awareness on key issues such as forest health, wildfire and climate resilience. (Lobbying activities are not allowed.) - Nonprofits can focus their efforts on education, research, and outreach without being taxed, which allows them to inform the public and influence policy from a nonpartisan stance.
Collaboration Opportunities	- A 501(c)(3) status opens doors to partnerships of varied types with government agencies, private corporations, academic institutions, and other nonprofits. - These collaborations often result in greater impact, as they combine resources, knowledge, and expertise from various sectors.

Volunteer and Community Support	- The nonprofit status helps attract volunteers who are passionate about environmental causes, as many individuals seek out 501(c)(3) organizations for meaningful, cause-driven volunteer and employment opportunities. - Volunteers play a critical role in many environmental nonprofits, from on-the-ground restoration work to education campaigns and fundraising efforts.
Ability to Receive In-Kind Contributions	- A 501(c)(3) can receive in-kind donations such as equipment, office space, or professional services, which can significantly reduce operational costs. - For environmentally focused organizations, this might include donations of land for conservation, supplies for field research, or legal and financial services, helping the organization stretch its budget further.

Overarchingly, the 501(c)(3) nonprofit structure could provide the flexibility, financial advantages, increased public trust, access to a broad array of funding sources, and long-term sustainability that it may need. These factors would enable the organization to focus on its work while ensuring it has the resources and credibility to effect lasting change.

As mentioned above, numerous benefits would ensue from formalizing a new nonprofit entity to manage wood materials in Sonoma County. Since the project has found no existing local nonprofit organization to be willing to take on these activities in their entirety, the project recommends that a new nonprofit be created to fulfill the potential outlined in this study.

In order to be successful for implementation, our team expanded upon the initial set of activities selected by the Working Group members that informed our entity-type selection to determine that the new entity should perform the following functions to achieve goals of the project:

Coordination, Administration, and Oversight

- Oversee operations and development to manage a wood products campus
- Manage logistics from various wood procurement resources
- Oversee permitting and regulation of the campus
- Identify and write grant applications to access diverse funding resources
- Support new small wood- and forestry-related businesses with tools to reduce long-term reliance on fiscal subsidies
- Bring in new grant dollars and financing opportunities

Education and Marketing

- Increase market buying and selling power for new product development
- Provide best available science as appropriate guidance to forest landowners
- Provide educational opportunities and resources to forest landowners and the general public in collaboration with partners
- Engage volunteers to support forestland owners identify and prepare for their needed onsite work
- Provide space for workforce training, professional development and educational opportunities for interested individuals of all ages

- Develop restoration materials and resources (e.g. wood straw) for the county to use in post-fire recovery
- Establish a native tree nursery and seed saving infrastructure at the campus location
- Research and develop efficiencies for processing and transport of materials (e.g., portable milling, new technologies for in-situ pyrolysis, canting logs for transport)
- Support appropriate reforestation activities
- Support retail sales of available wood products

Wood Recovery and Utilization

- Coordinate private forestland owners for increased efficiency and treatments
- Aggregate and process logs
- Buy and sell material
- Enter into direct sales contracts
- Conduct sawmill operations
- Provide a log peeler for poles, veneer, and wood straw operation
- Provide firewood operations
- Provide chip and grind operations for off-cuts
- Operate a cogeneration unit sized to offset the facility's electrical use and produce heat for lumber drying and firewood and pallet sterilization
- Operate a kiln
- Provide secondary wood products manufacturing
- Support entrepreneurial innovation towards development of innovative wood products and services to generate revenue

The above list of activities is neither final nor exhaustive, but is proposed as an informed list of services needed to achieve the goals set forth in this report. The project did not identify any existing entities that were willing or able to fulfill the role of managing all these vital activities. However, the Sonoma County Wood Recovery & Utilization Project is prepared to work towards potential implementation solutions in 2025 and is well-situated to do so with potential funding available for these purposes from the Cal FRAME program.

SECTION 7: FINANCING

Implementing an entity to aggregate and process non-merchantable timber requires scalable financing, in an amount and type dependent on the size of the site and the complexity of its operations. Startup costs include entity formation fees, staffing, aggregation site lease or purchase, planning and permitting, equipment, installation, commissioning, marketing, and operations and management. To assess the startup needs, it is recommended that the entity develop a five-year projection plan for Phase I in addition to engaging with potential resource providers (identified in Table 18) to assess probable production volumes and current/anticipated market prices.

The project recommends that a 501(c)(3) nonprofit corporation provide governance for such an entity; it is believed that this structure will enable a diversified portfolio of capital through government grants, philanthropy and public resources to aid in financing requisite start-up expenditures. The project recommends considering a private/public partnership be structured to optimize a full range of financing options.

Table 18: Financing Resources

Revenue-generating activities	The project envisions increasing Sonoma County's capacity to support forestry and wood products-related jobs, infrastructure development, and climate and wildfire resilience through production and sale of a variety of primary and secondary wood products.
PG&E Settlement Funds	Sonoma County has ~$10M remaining for vegetation management and wildfire resilience efforts. County decision-makers (Board of Supervisors and senior staff) are exploring creation of a new entity to manage remaining funds. This new entity could potentially support/oversee/manage establishment of a wood products campus.
Measure H Funds	Passed in Spring 2024, Measure H will generate ~$60M/year, of which an anticipated $5M/yr. could be used for vegetation management. The potential process to access funding from this source is still unknown.
SB 85	SB 85 is a $536 million wildfire and forest resiliency budget package that was signed by Governor Newsom in 2021. Some implementation funds may become available to pilot entities for implementation.
Climate Resilience Financing District [SB 852 (Dodd)]	SB 852 (Dodd) was passed in 2022 to establish climate financing districts, and is a potential instrument for future tax-related funding for climate resilience work. Sonoma County's Regional Climate Protection Authority (RCPA) has been listed as the first CFD in California. The CRCAP notes that RCPA
	has investigated one scenario that could generate $45 million annually. These funds would need to be approved by voters; they could then be applied to support priority measures.

Federal Funding Resources

USDA Rural Business Development Grants	USDA provides numerous grants applicable for private businesses in rural areas with fewer than 50 employees. Eligible activities range from business planning and feasibility studies to leadership and other training. Applications are due in February of each calendar year.
USDA Rural Innovation Stronger Economy (RISE) Grant Program	Supports the creation of high-wage jobs in rural areas with grants ranging from $500,000 - $2,000,000. Applications are generally due in April.
US Forest Service Wood Innovations Grant Program	The USFS has various forest and wood products funding resources available. Grant announcements are generally made in Fall.
HUD Community Development Block Grant Program	This source could provide funding for energy conservation and renewable energy resources and rehabilitation of structures at a potential site.
EPA Brownfield Grants and Loan Program	Applicable to brownfield clean ups, EPA offers various funding and a revolving loan program to support planning, community engagement, and financing clean up.

State Funding

IBank Climate Catalyst Revolving Loan Fund	The IBank manages a Climate Catalyst Revolving Loan fund and is a potential source for funding a wood products campus.

Coastal Conservancy	Applicable to Sonoma County, the Coastal Conservancy funds millions of dollars in grants each year for projects that help increase wildfire and climate resilience. Applications are generally on a rolling basis.
California Energy Commission EPIC grant program	This fund is available for emerging energy and biomass solution technologies (e.g. Taka Char, Charm Industrial, etc.).
Jobs First Initiative, formerly the Community Economic Resilience Fund (CERF)	Focused on equitable distribution of jobs, high-wage jobs, climate change and serving historically disadvantaged communities, this program was initiated by California with $600 million set aside. While funding has diminished from the original poo it is still being offered. Distribution of resources happens through the hubs and also through the state. In the Bay Area, and Sonoma County, this work is overseen by All Homes.
CAL FIRE Wood Products and Bioenergy Business and Workforce Development Grants	Business development, workforce development, and various funding sources for forest treatment funding, including support of funding forest management plans, CAL FIRE and USFS are the main funders of wood products and forest treatment innovation for California.
Rural Community Assistance Corporation (RCAC) Loan Fund	RCAC's loan fund is a resource to rural communities and may be applicable for various economic development financing needs.

Other Potential Resources

CDFI Fund New Markets Tax Credit Benefits	This program incentivizes private investment in distressed communities by using tax credits. Applications are due in January.
California Competes Tax Credit	A competitive application to receive tax credits for locating, expanding, or operating within California in any location. Applications are accepted in January, February and July.
EPA Land Revitalization Technical Assistance Program	EPA offers technical assistance for land revitalization activities.
US Economic Development Administration Economic Development Directory for California	https://www.eda.gov/grant-resources/economic-development-directory/ca
Carbon Credits/Carbon Banking	1. Anew Climate is a third-party firm specializing in California CEQA carbon mitigation credits (among other work on a national scale). In addition, Sonoma County could create a working lands carbon mitigation bank program as outlined in the CRCAP. The CRCAP does not identify how likely the county is to implement this option. 2. New Leaf Climate Partners
Other	1. Blue Forests' Resilience Bond 2. Avoided Wildfire Emissions (AWE) Forecast Methodology: Developed by Spatial Informatics Group and Element Markets, can be paired with carbon market partners such as Anew Climate or New Leaf Climate Partners to support forest treatments and avoided wildfire emissions.

SECTION 8: CONCLUSION

The Sonoma County Wood Recovery & Utilization Project has determined that Sonoma County is ideally positioned to create an exemplary model of community-scale wood management with dedicated organizations and agencies working together to care for our forest ecosystems. Establishing a "wood products campus" to increase wood processing capacities will allow the county to meet its goals of achieving successful and ongoing community and wildfire resilience, local economic development and associated climate benefits. **Just as other infrastructure is necessary for the production and distribution of food, energy and water, a wood products campus is critical infrastructure to effectively manage our forests.**

Improving community wildfire and climate resilience requires coordinated effort, diversified strategic funding, and development of community-scale infrastructure. Wood products offer one of the few ways to help pay for this work on an ongoing basis. In order to be successful in these endeavors, infrastructure development, consistent wood resource supply, marketing, and workforce development are needed to ensure overall success.

Sonoma County's engaged landscape of organizations, agencies and individuals dedicated to stewarding our forestlands spans across forest ecosystems, watersheds, political districts and property lines. There is a shared concern for the future of our forests and how to approach our work with both the care and the urgency required of these times. Actions are required and viable solutions are needed. With research priorities and recommendations now complete, the project will continue to move toward implementation by leveraging the findings to gauge interest from local, state and federal resources to support the realization of a more vibrant forest stewardship economy for Sonoma County.

Below is a defined set of opportunities and challenges toward the implementation of the wood products campus.

Opportunities

1. Well-developed County-Level Leadership
   Sonoma County's existing forest stewardship sector consists of an abundance of organizations and leaders already working toward many of the objectives expressed in the study. Notably, the Gold Ridge and Sonoma RCDs, Permit Sonoma, Sonoma County Vegetation Management Program, North Bay Forest Improvement Program, Audubon Canyon Ranch's Fire Forward Program, Fire Safe Sonoma, local fire districts, CAL FIRE, and the Sonoma County Forest Conservation Working Group all work to support private forest landowners to increase their in-forest treatment actions. These organizations and agencies are an asset to the success of a new entity and wood product campus.

2. Diverse Potential Financing
   Several opportunities exist to finance the implementation of the new wood aggregation management entity and wood products campus. These include the Climate Financing District that is in process, Blue Forest's Investment Fund, IBank, Coastal Conservancy, USDA Rural Development grants, USFS and other resources.

3. Significant Wood Resources
   The forested lands of Sonoma County contain a substantial volume of wood resources that could, and should, be recovered to supply a wood products campus for multiple benefits. This includes an estimated total of 48.4 MMGT of wood resources greater than 5" DBH available across the identified 246,365 feasible acres. The project anticipates it is feasible to recover 50% of small-diameter wood resources from 5" - 12" DBH, plus another 10% of the trees above 12" DBH We anticipate an ability to bolster the current estimated 2,800 treated acres of privately-owned forestland annually, and expand over time toward the AB 1757 target goal of treating up to 10,400 acres.

4. Close Proximity to Substantial, Local Markets
   It is anticipated that Sonoma County, a hub of environmental awareness and economic vitality, will provide a robust market for the wood products envisioned by the project. In addition, the project's close proximity to the broader Bay Area markets are a significant benefit toward achieving the economic viability of activities related to the marketing and sale of locally-produced, climate smart wood products.

Challenges

1. Large Number of Private Forestland Owners
   86% of the county's total forested acres is held and managed by 14,670 private forestland owners. The majority of these ownerships manage fewer than 50 acres each. As echoed strongly by local RPFs, and technical assistance providers such as Gold Ridge and Sonoma RCDs, and county staff members, coordination amongst this multitude of landowners combined with the high costs of permitting present significant barriers to addressing forest treatments at scale.[10]

2. Lack of Sufficient Workforce
   The study identified a significant gap in available workforce resources. To overcome this challenge, the proposed activities will need to support living-wage jobs and partner with workforce development programs such as Resilience Works/Jobs with Justice, Santa Rosa Junior College and others workforce development programs, to grow the county's workforce capacities on the forestry and wood products sectors.

3. Insufficient Wood Processing Infrastructure and High Cost of Treatments
   According to interviews conducted with local RPFs, the lack of available milling infrastructure adds costs for transportation and often prevents forest treatments from occurring. The project's findings indicate the need for increased financial viability of practices with the establishment of wood recovery and utilization infrastructure such as the proposed wood products campus.

Implementation of the new entity and wood products campus could begin as soon as available funding resources are confirmed. The three anticipated phases and activities are outlined below, to be further expanded upon prior to site acquisition for the new campus. Significant resources will be required to get the entity and campus operational prior to financial solvency, but is perceived as feasible and a financially viable endeavor in combination with the various funding resources identified in Section 7.

Table 19: Phased Development Plan

Phase I: 2025 - 2030	Phase II: 2030 - 2040	Phase III: 2040 +
- Raise funds for Phase 1 & Phase II actions - Formalize entity to manage activities - Develop business plan - Identify intended Phase 1 products and activities - Conduct a carbon analysis on selected plan - Secure lease or purchase land for wood products campus - Secure contracts and long-term materials supply agreements - Complete design - Obtain needed permits - Hire staff for Phase 1 activities - Develop marketing, outreach and educational efforts - Open wood products campus	- Secure additional funding needed - Expand Phase I activities and program offerings - Begin monitoring and evaluation program - Grow products and sales/ build regional markets - Support broader CA local wood products marketing program - Explore financing of a forest landowner revolving fund to enable in-forest treatments - Expand operations to include a climate resiliency center - Expand to multiple aggregation yards and/or wood products campuses depending on impacts, supply and demand	- Establish criteria for community-scale mills to participate in shared product marketing - Grow partnerships to increase success - Increase sales and program offerings - Continue to grow community offerings and services - Establish procurement guidelines and third party contractor qualifications for harvest (e.g. environmental sustainability program) - Develop additional programs needed - Evolve product offerings and service to other community-scale wood products campuses

APPENDICES

Appendix A. Sonoma County Wood Recovery Feasibility Report, Wuuii Inc.
Appendix B. Permitting Feasibility Report, WRA Inc.
Appendix C. Key Organizations and Stakeholders
Appendix D. Entity-type Activity Scoring Matrix
Appendix E: EBalive Report. *Guidance for Resilience and Recovery*

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PHOTO CREDITS

COVER/BACK: Edge of a small-diameter Douglas fir log recovered for utilization in Sonoma County. © RFS

Page 10. Two people working to clean up a fallen tree. © Davor Lovincic/iStock

Page 19. Young people stand at the base of a resprouted redwood tree in Sonoma County. © RFS

Page 25. Cyclists climb Old Cazadero Highway in western Sonoma County. © RFS

Page 26. Prescribed burn practitioners discuss burn conditions in western Sonoma County. © Sashwa Burrous

Page 27. Neighbors gather to discuss potential for shared forest stewardship strategies as part of Safer West County's Bohemian Collaborative. © RFS

Page 30. Thinned small-diameter logs that were recovered and utilized by Forestree Collective from a Sonoma County forest health project. © Matt Greene Forestry and Biological Consulting

Page 34. Small-diameter Douglas fir recovered for utilization. © Forestree Collective

Page 44. Aerial image of Berry's Sawmill, Cazadero, CA. © Berry's Sawmill

Page 55. Jeremy Fisher and Fred Euphrat (not pictured) unload logs from Forestree Collective's small-diameter mill. © TOPO Collective/Living with Fire Conference

Page 57. Woodmizer mill for milling larger diameter "waste" wood that would otherwise be chipped, chopped or burned. © Forestree Collective

Page 63. Firewood stacked. © ewg3D/iStock

Page 67. A bench and stool made by Forestree Collective from small-diameter Douglas fir. © Sashwa Burrous/Forestree Collective

Page 71. Students from UC Berkeley participate in forest stewardship in western Sonoma County. © RFS

Page 80. Sonoma County small-diameter lumber ready for production. © Forestree Collective

Page 83. Small-diameter logs to be recovered and utilized by Forestree Collective versus chipping and burning during a forest health project. © Matt Greene Forestry and Biological Consulting

Appendix A. Sonoma County Wood Recovery Feasibility Report, Wuuii Inc.

WUUII INC. SONOMA COUNTY WOOD RECOVERY FEASIBILITY REPORT

OCTOBER 2024

Executive Summary

This report outlines the successful development of an updated biomass layer for Sonoma County through the integration of advanced Bayesian inferential methods and remote sensing data. The primary objective was to update and refine the estimates of biomass distribution in order to provide insight into the site selection process for Regenerative Forest Solutions' biomass collection facility.

In applying the updated biomass layer, we conducted drive time analyses for three proposed sawmill locations, assessing both accessibility and biomass availability. This was complemented by a detailed evaluation of existing Timber Harvest Plans, providing insights into sustainable resource management practices.

Overall, the project successfully updated and refined the biomass mapping process for Sonoma County, offering significant improvement to decade old data. This updated biomass layer facilitates more informed decision-making for harvest operations and site selection.

Approach

The objective of this project was to develop an updated biomass layer for Sonoma County. To achieve this, we implemented a Bayesian inferential method that integrates GEDI LiDAR data with existing species classification from Tuckman Geospatial.

For this, we implemented a Bayesian inferential process that systematically evaluated the congruence between observed GEDI LiDAR data and a hypothesized distribution of tree characteristics derived from USDA Forestry Inventory and Analysis (FIA) data. By leveraging Bayesian statistics, we assigned probabilities to different tree distributions within each GEDI footprint based on their likelihood of producing the observed canopy height and biomass measurements. The process involved running multiple simulations (10,000 for each point), where each simulation proposed a potential forest structure, compared it against the actual LiDAR data, and then scored its accuracy. The top 100 most probable distributions were then averaged to estimate the most likely distribution of trees that represents the true forest composition at each site, thereby enhancing the precision of our biomass layer prediction.

We aggregated all the GEDI points within 5 square kilometer hexagonal grid cells to consolidate our biomass estimates across broader geographical areas. This aggregated data was then used in conducting drive time analyses for three proposed sawmill locations, providing a detailed assessment of accessibility and logistical feasibility based on the updated biomass layer. Additionally, the aggregation facilitated a comprehensive analysis of existing Timber Harvest

Plans in Sonoma County, providing insights into the availability of biomass and composition of harvestable material within Sonoma County.

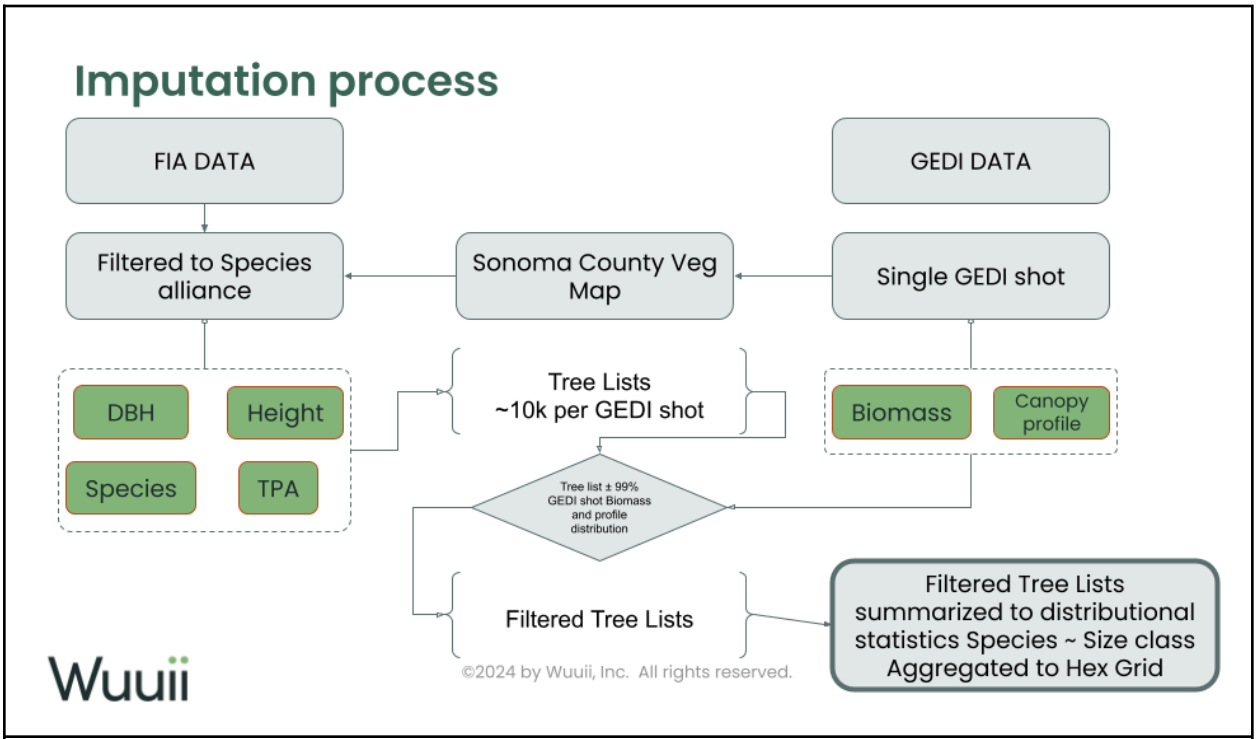

Figure 1. Imputation process diagram.

Data Sources

GEDI LiDAR Program[1][2]: The Global Ecosystem Dynamics Investigation (GEDI) LiDAR program, initiated by NASA, aims to enhance our understanding of the Earth's carbon cycle and biodiversity. GEDI, mounted on the International Space Station (ISS), employs advanced Light Detection and Ranging (LiDAR) technology to capture high-resolution, full-waveform profiles of forest canopy structures worldwide.

Sonoma Vegetation Map[3] (species classification): For each GEDI footprint location, we utilized the Sonoma Vegetation Map for species alliance assignments (e.g., Sequoia Sempervirens Alliance). This map provides detailed information on the distribution of various species alliances across Sonoma County.

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[1] **NASA ORNL DAAC.** (2022) *Global Ecosystem Dynamics Investigation (GEDI) L4A Footprint Level Aboveground Biomass Density, Version 1.* Accessed 12/6/23. Retrieved via API from NASA EarthData: https://cmr.earthdata.nasa.gov/search/

[2] **NASA LP DAAC.** (2022) *Global Ecosystem Dynamics Investigation (GEDI) L2A Geolocated Elevation and Height Metrics, Version 2.* Accessed 1/24/24. Retrieved via API from NASA EarthData: https://cmr.earthdata.nasa.gov/search/

[3] **Sonoma County Agricultural Preservation and Open Space District, Tuckman Geospatial.** (2017). *Sonoma County Fine-Scale Vegetation and Habitat Map (2017)*. Accessed: 1/8/24. Retrieved from https://sonomaopenspace.maps.arcgis.com/home/item.html?id=2d7728a8aba44df5b154c80aa8588d79

FIA Data[4]: We incorporated data from the USDA Forest Inventory and Analysis (FIA) program, which includes measurements of height, diameter, and biomass for hundreds of tree specimens representative of the major species in Sonoma County. This data is critical for linking observed LiDAR profiles to actual tree characteristics.

North Coast Mechanical Treatment Feasibility[5]: The North Coast Mechanical Treatment Feasibility assessment is one of four spatial assessments conducted by NCRP to help prioritize hazardous fuel treatment projects at the landscape scale in the North Coast region. Mechanical Treatment Feasibility provides screening level maps of where mechanical fuel treatments of hazardous fuels are difficult for legal or operational reasons, and where they are not.

CalFire Timber Harvest Plans[6]:

Methodology

Bayesian Inference Process: A Bayesian inferential framework was employed to estimate tree species and size classes within each GEDI footprint. The process involved:

Tree Distribution Sampling: Randomly selecting distributions of trees' species and size classes that could plausibly be present within each GEDI footprint.

Height Profile and Biomass Comparison: Comparing the canopy height profiles of these sampled distributions to the actual profiles observed in the GEDI data. Combining this score with a measure of similarity to between the GEDI observed biomass and the summed biomass of trees in random sample

Iterative Sampling: Repeating the sampling and comparison process 10,000 times for each GEDI point to ensure robustness and statistical validity.

Optimal Distribution Selection: Selecting the 100 highest-scoring distributions and averaging them to derive a representative distribution for each footprint. This approach ensures a high degree of confidence in the resulting estimates.

Spatial Aggregation: To facilitate subsequent analyses, all GEDI points were aggregated into 5 square kilometer hexagon grid cells. This spatial aggregation method was chosen for its ability to minimize edge effects and provide consistent area coverage, which is crucial for accurate spatial analysis.

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[4] **U.S. Forest Service.** (2024). *Forest Inventory and Analysis (FIA) Data.* Accessed: 2/1/24. Retrieved from USDA Forest Service, FIA DataMart: https://research.fs.usda.gov/products/dataandtools/tools/fia-datamart

[5] **North Coast Resource Partnership, Tukman Geospatial.** (2022). *North Coast Mechanical Treatment Feasibility (GeoTIF)*. Accessed 2/15/2024. Retrieved from: https://ncrp.maps.arcgis.com/home/item.html?id=b72b2ea500c84c12a2f84a620336280e

[6] **CAL FIRE.** *CAL FIRE Timber Harvesting Plans All TA83.* Accessed May 29, 2024. Retrieved from: https://forest-practice-calfire-forestry.hub.arcgis.com/

Applications

Drive Time Analysis: A drive time analysis of three proposed sawmill locations was used to assess the biomass availability within a 15, 30, or 60 minute drive from these locations. This analysis helps in assessing the accessibility and logistical feasibility of these sites.

Timber Harvest Plan Evaluation: The updated biomass layer was utilized to analyze existing Timber Harvest Plans in Sonoma County.

Assumptions

GEDI Data Quality and Accuracy

Assumption: The GEDI LiDAR full-waveform data is complete, correct, and the positional information is accurate.
Rationale: GEDI data is collected using advanced lidar technology designed to provide high-resolution, full-waveform measurements of forest structure. The data collection and processing protocols are stringent, ensuring that the data meets high standards of accuracy and completeness. This data has been validated through extensive peer review and ground truth comparisons, making it a reliable source for remote sensing applications.
Implications: The accuracy and completeness of the GEDI data are essential for correctly estimating tree species and size classes. Positional inaccuracies can lead to errors in species alliance assignments, particularly in forest transition zones where species composition changes over short distances. This can result in misclassification and result in incorrect estimates of tree species and size classes.

GEDI Biomass Estimate

Assumption: The GEDI Level 4A data product accurately estimates Above Ground Biomass Density at the point location.
Rationale: The GEDI L4A data product is derived from lidar waveforms and algorithms designed to estimate biomass density. It has undergone extensive peer review and validation against ground truth measurements[7], making it a widely accepted and reliable source for biomass estimation in remote sensing applications. The reliability of these estimates is critical for accurate Bayesian inference in ecological modeling.
Implications: The accuracy of the GEDI L4A data is crucial because it serves as a major component of the Bayesian inference priors. Any inaccuracies in the GEDI L4A data will directly impact the Bayesian process, potentially resulting in different or incorrect estimates of tree species and size classes.

FIA Data Accuracy

Assumption: The Forest Inventory and Analysis (FIA) data - specifically Hight, Diameter, and Above Ground Biomass - is accurate and representative of forests in Sonoma County.
Rationale: The FIA program collects data through rigorous, standardized methods across various forested regions. This data is generally considered accurate at both the tree and plot

[7] **NASA ORNL DAAC.** (2022) *GEDI L4A Footprint Level Aboveground Biomass Density, Version 1.* Available at: https://daac.ornl.gov/GEDI/guides/GEDI_L4A_AGB_Density.html

levels. Species distributions used in the analysis are derived from plots within Sonoma County, ensuring representativeness for the local forest conditions. Additionally, trees were sampled from across California are included to broaden the scope and enhance the robustness of species identification during random sampling processes.
Implications: The accuracy of FIA data is critical for correlating canopy height profiles with diameter classes. If there are inaccuracies in the correlation between Diameter and Height, it will compromise the ability to accurately translate between these metrics. This could lead to incorrect estimations of tree size classes and biomass, impacting the overall accuracy of the Bayesian inference model.

Bayesian Inference Model Assumptions:

Assumption: The Bayesian inference model used accurately captures the statistical relationships between tree species, size classes, and the GEDI LiDAR data.
Rationale: Bayesian inference is chosen for its flexibility in incorporating prior knowledge and updating estimates based on observed data. This approach allows for robust ecological modeling by integrating historical data, expert knowledge, and the latest observations. The Bayesian framework is particularly suited for dealing with uncertainties and providing probabilistic estimates, which are crucial for understanding forest dynamics.
Implications: If the Bayesian model does not accurately represent the underlying statistical relationships, it could lead to incorrect biomass estimates. This misrepresentation can result from inappropriate priors, model misspecification, or data inaccuracies.

Hexagon Grid Cell Aggregation:

Assumption: Aggregating GEDI points into 5 square kilometer hexagon grid cells provides an accurate spatial representation of biomass distribution.
Rationale: Hexagon grid cells are used because they offer a uniform spatial structure that minimizes edge effects and provides consistent area coverage, which is crucial for spatial analyses. This method helps to create a more continuous and less biased spatial representation of biomass distribution compared to other grid shapes like squares. Hexagons are known to better represent spatial patterns and connectivity, which is important for ecological studies.
Implications: If the aggregation method introduces biases or inaccuracies, it could impact the results of the drive time analysis and the evaluation of Timber Harvest Plans. Potential issues include over- or underestimation of biomass in certain areas, leading to flawed decision-making.

Stability of Forest Types:

Assumption: The general forest types and species compositions are stable over the time period between the previous biomass layer creation and the current project.
Rationale: While specific biomass levels and forest conditions may change due to harvesting, fires, and natural growth, the overall forest types and species compositions may remain relatively stable. The Sonoma Vegetation Map provides a reliable basis for identifying these forest types and species alliances, and this stability allows for updating of biomass estimates using historical data and current observations.
Implications: If there have been significant shifts in forest types or species compositions that are not accounted for, it could affect the accuracy of the biomass estimates. This project aims to address these potential changes by incorporating up-to-date data and adjusting the biomass

layer accordingly. Regular monitoring and updating of forest type data are recommended to ensure ongoing accuracy and relevance of the biomass estimates.

Distribution of GEDI points

Assumption: The distribution of GEDI points is representative of the actual forest conditions within the study area.
Rationale: Aggregating data into hexagon grid cells allows us to leverage a high number of GEDI points, which enhances the statistical robustness of our estimates. The assumption that GEDI points are representative ensures that our aggregated data accurately reflects the variability and characteristics of the forest at the hexagon level.
Implications: If the GEDI points are not evenly distributed within a hexagon grid cell, it could lead to minor biases in the estimates of species, size class, and biomass. This uneven distribution might slightly affect the accuracy of the aggregated results, but the high density of GEDI points generally mitigates these effects, maintaining overall reliability.

Definitions

Forest: Land which is covered by 10% or more tree canopy per acre.
Feasible Acres: The portion of forested land that can be feasibly harvested using mechanical or manual methods.
Mechanical Treatment / Harvest: Mechanical treatment refers to the use of equipment such as chainsaws, chippers, masticators, and other heavy machinery to reduce hazardous fuels and manage forest biomass.
MG/Acre: Megagrams per acre, a unit of measurement used to quantify the amount of biomass in a given area. One megagram (MG) is equivalent to one metric ton, or 1,000 kilograms.
Timber Harvest Plan (THP): A detailed plan required for legal logging operations in California, outlining the methods and practices to be used in harvesting timber. Timber Harvest Plans are crucial for planning and regulating the removal of biomass from forested areas.

Results

Updated Biomass Map

Biomass is a measurement of the amount of forested material that exists in an area. It is an important indicator of the available feedstock for lumber mills and other processing facilities. Through our process, we have developed an updated map of biomass for Sonoma County. This map is aggregated to a hex grid spread across the county, and is reported in megagrams per acre.

Not all forested acres can be feasibly treated or harvested. For this reason, we have limited the reported biomass to reflect the feasibility of mechanical treatment or harvest. This was based upon data produced by Tuckman Geospatial which accounted for proximity to road and riparian areas, slope steepness and other factors.

This total biomass number is further categorized into biomass by species (i.e. Hardwood or Softwood) as well as diameter size-class (i.e. 5-12 inches, 12-20 inches, and 20+ inches).

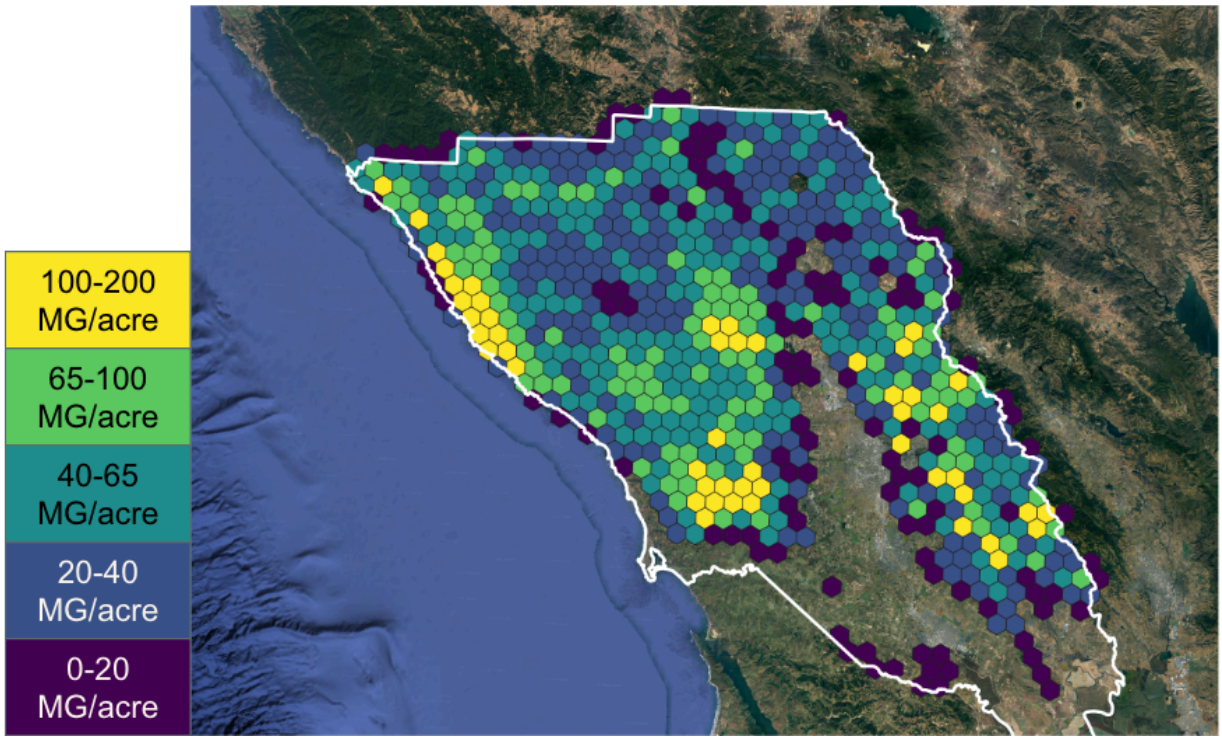

Figure 2. Total feasible biomass in Sonoma County.

Total Feasible Biomass in Sonoma County

In Sonoma County, there are a total 246,365 acres that are identified by the Mechanical Feasibility Layer as feasible. The biomass breakdown between species and size class is below and listed in MG/acre.

Location	Feasible acres	Species	5”-12”	12”-20”	20”+
Sonoma County	246,365	HW	1,696,752	4,057,888	16,097,601
		SW	764,583	2,254,046	19,042,962

Road Network Analysis and Drive Time Access

Three sites were presented to our team for further investigation: Berry’s Sawmill & Lumber Yard, Santa Rosa Airport, and Cloverdale. Using a road network layer that was provided by Tuckman Geospatial[8], we conducted a drive time analysis from each of these three points. Using speed

[8] NorthCoast_RoadNetwork.gdb Accessed February 5th, 2024.

limit and road type information, we identified an area that is accessible from each location in 15, 30, and 60 minutes.

This methodology will be familiar to anyone used to using Google Maps for directions. Google Maps will identify the fastest route between two locations, along with the expected drive time. This could be represented by the pseudo-equation:
Location A —> Location B = X Time

If instead you know Location A and Y Time (the drive time distance), then this methodology returns all the Location Bs that can be reached in Y Time or less from Location A.
Location A + Y Time = Location B(1,2,3…)

The images below show the area accessible from each location at 15, 30 and 60 minutes with the darker color being the shortest time. Does not a) include loading/unloading and 2) does not account for variable speeds depending on vehicle size/type

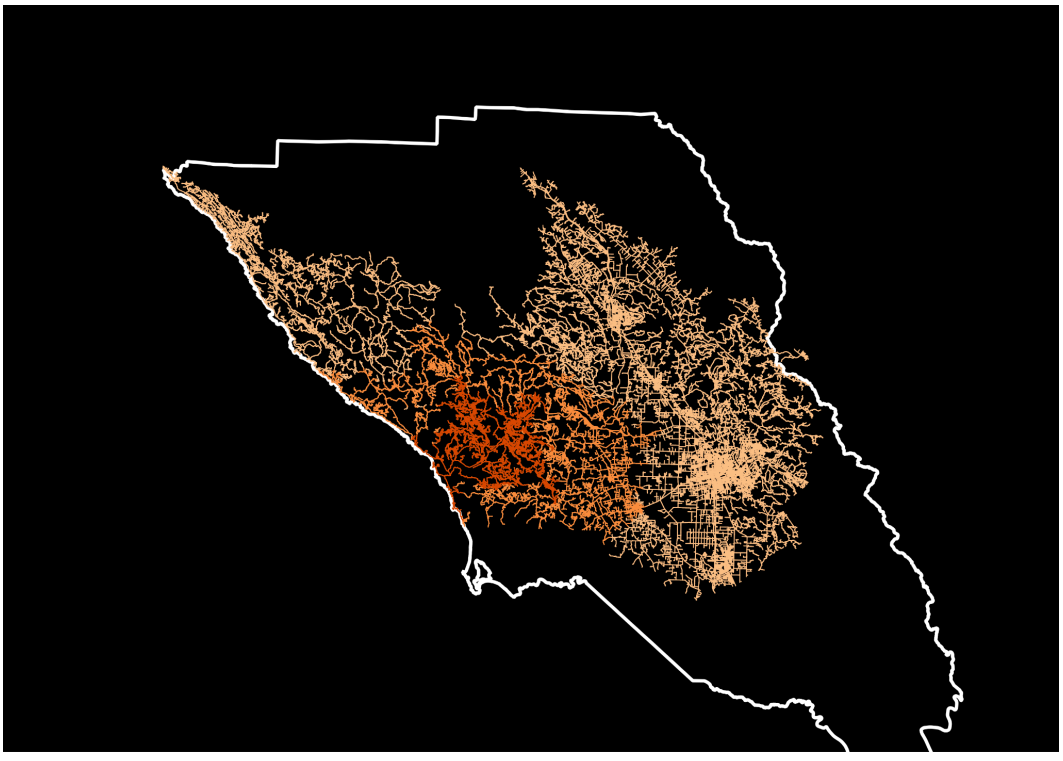

Figure 3. ***Berry's Sawmill & Lumber Yard***
Great access to the North-western corner of the county's 'Redwood Belt', and existing Timber Harvest Plan areas.

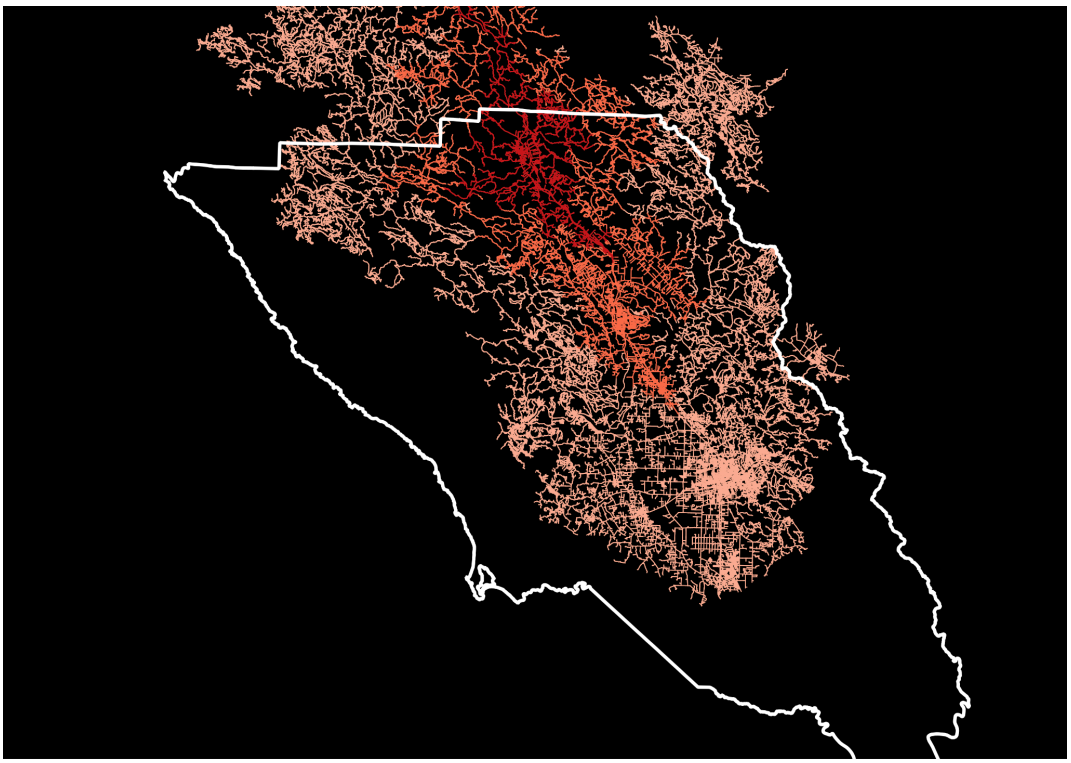

Figure 4. ***Cloverdale***
Significant access to additional areas within Mendocino County.

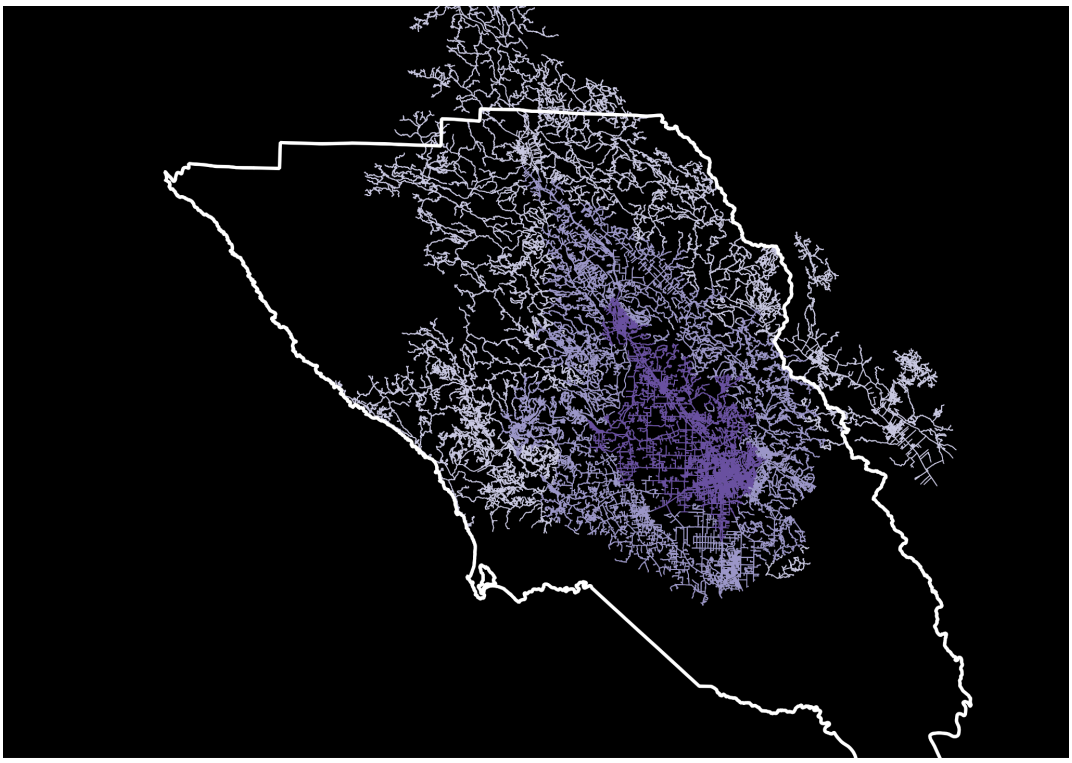

Figure 5. ***Santa Rosa Airport***
Centrally located near Hwy 101 with wide coverage across the county.

Biomass by Drive Time

By combining the drive time access area for the three proposed locations, with our updated biomass map for Sonoma County, we are able to provide the Maximum Available Biomass (in megagrams) by Hardwood / Softwood and Size Class for each of three drive time distances from Berry Sawmill, Cloverdale, and Airport locations.

- Across all sites and size classes, there is a greater quantity of Hardwood trees present
- Berry Sawmill offers greatest access to large Softwood trees at 15 and 60 minute range
- Airport outperforms other locations at 30 min range.

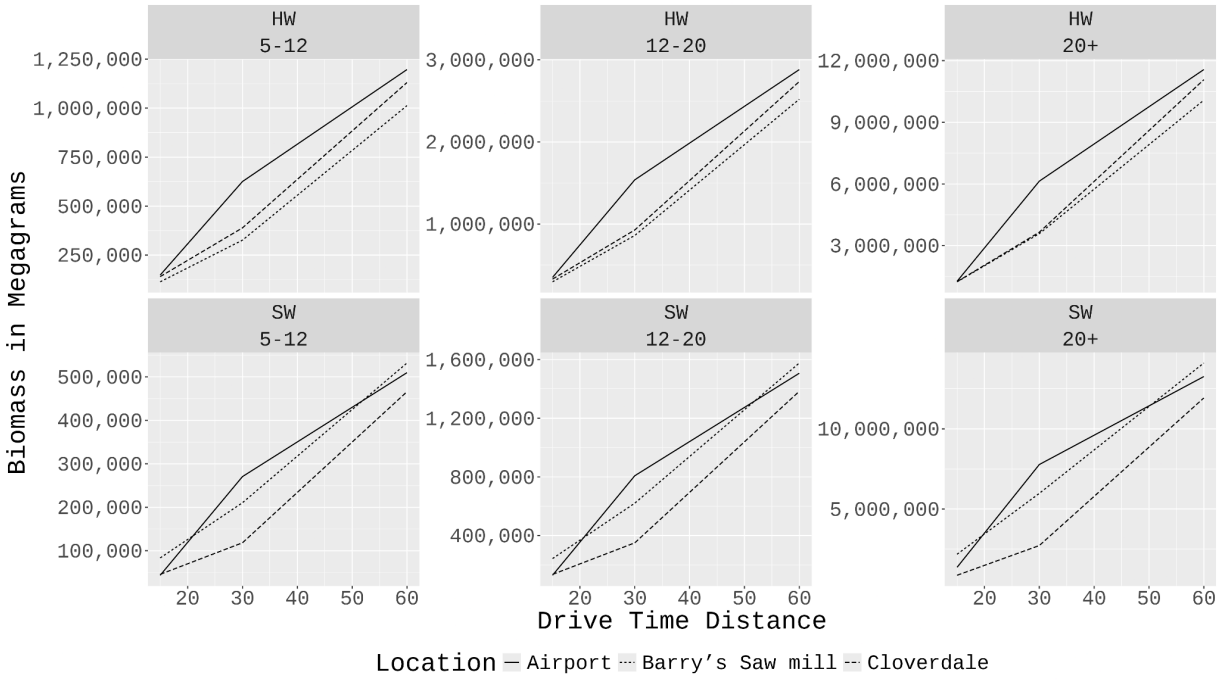

Figure 6. Drive Time Distance by Species / Size Class

Location	Distance	Feasible acres	Species	5"-12"	12"-20"	20"+
Berry's Saw mill	15	19,596	HW	113,557	296,774	1,240,048
			SW	83,472	243,102	2,180,850
	30	54,768	HW	326,284	861,786	3,584,919
			SW	210,424	620,997	5,975,378
	60	156,778	HW	1,012,878	2,520,795	10,078,952
			SW	531,911	1,576,710	14,104,763
Cloverdale	15	18,434	HW	140,194	330,094	1,247,079
			SW	45,721	135,295	870,127
	30	51,038	HW	388,900	928,299	3,653,998
			SW	118,239	350,626	2,723,910
	60	158,173	HW	1,130,708	2,736,189	11,074,737
			SW	465,850	1,383,867	11,925,984

Airport	15	20,342	HW	148,144	350,525	1,265,709
			SW	43,532	129,454	1,365,043
	30	92,189	HW	625,360	1,538,869	6,137,570
			SW	270,561	808,126	7,774,866
	60	169,721	HW	1,196,913	2,881,793	11,567,114
			SW	509,680	1,506,937	13,259,696

Feasible acres

The number of feasibly harvestable acres increases with drive time. The Airport location outperforms at the 30 min distance, but by 60 min, the locations are within 10% of each other.

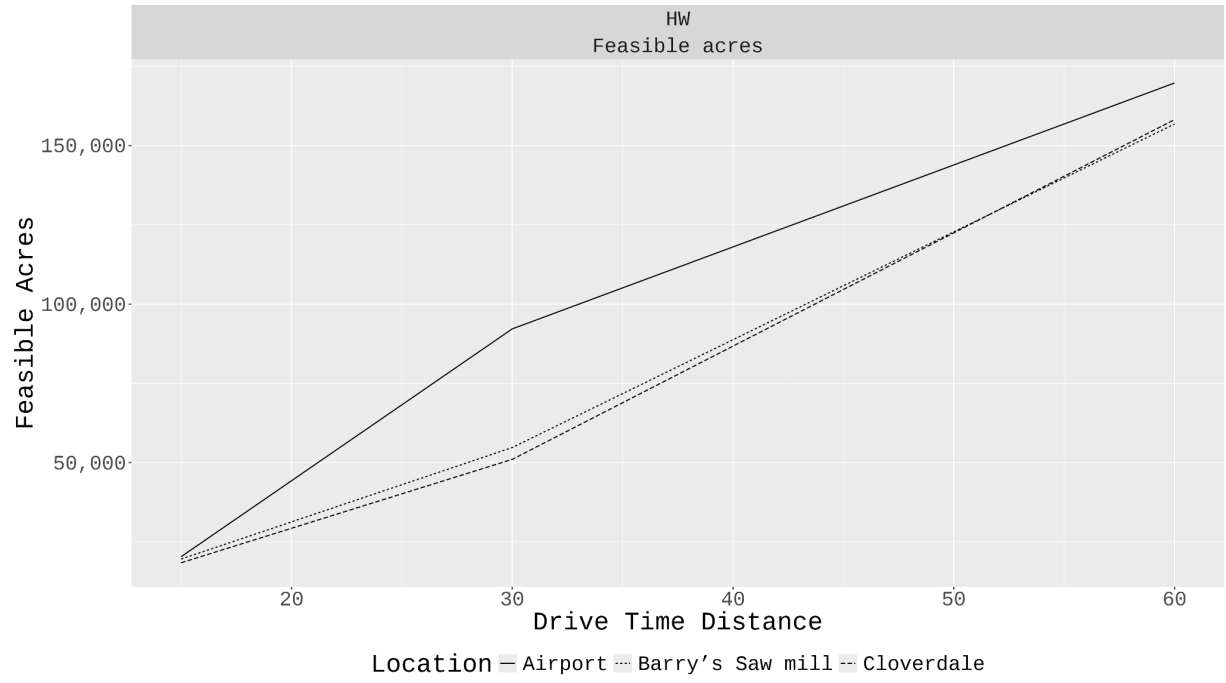

Figure 7. Number of Feasible Acres by Drive Time Distance.

Timber Harvest Plan analysis

Timber Harvest Plans (THPs) are detailed documents required for legal logging operations. These plans ensure that timber harvesting is conducted sustainably and responsibly, minimizing environmental impact while optimizing forest management. It includes an environmental assessment to evaluate potential impacts on soil stability, water quality, wildlife habitats, and plant biodiversity. THPs can take years to implement and complete.

Timber Harvest Plans are one of the primary ways of removing biomass from forested areas in Sonoma County, and will likely count as one of the main sources of biomass for proposed processing facilities. By reviewing historical THPs, and combining with our updated county Biomass layer, we are able to provide a maximum biomass per year estimate for THPs in Sonoma County. This is useful to understand the minimum, maximum, and mean biomass expected for processing in Sonoma County.

THP Status

According to the California Department of Forestry and Fire Protection (CalFire)[9], there were a total of 45 full Timber Harvest Plans approved from 2009 to 2022. Each of these larger plans are broken out by the site specific spatial boundary, and the specific management and harvest practices being utilized. For the purposes of this analysis we focus on these segments and consider them individually. 579 Timber Harvest Plans segments (THPs) were approved in Sonoma County from 2009 - 2022 with an average of 41 segments per year.

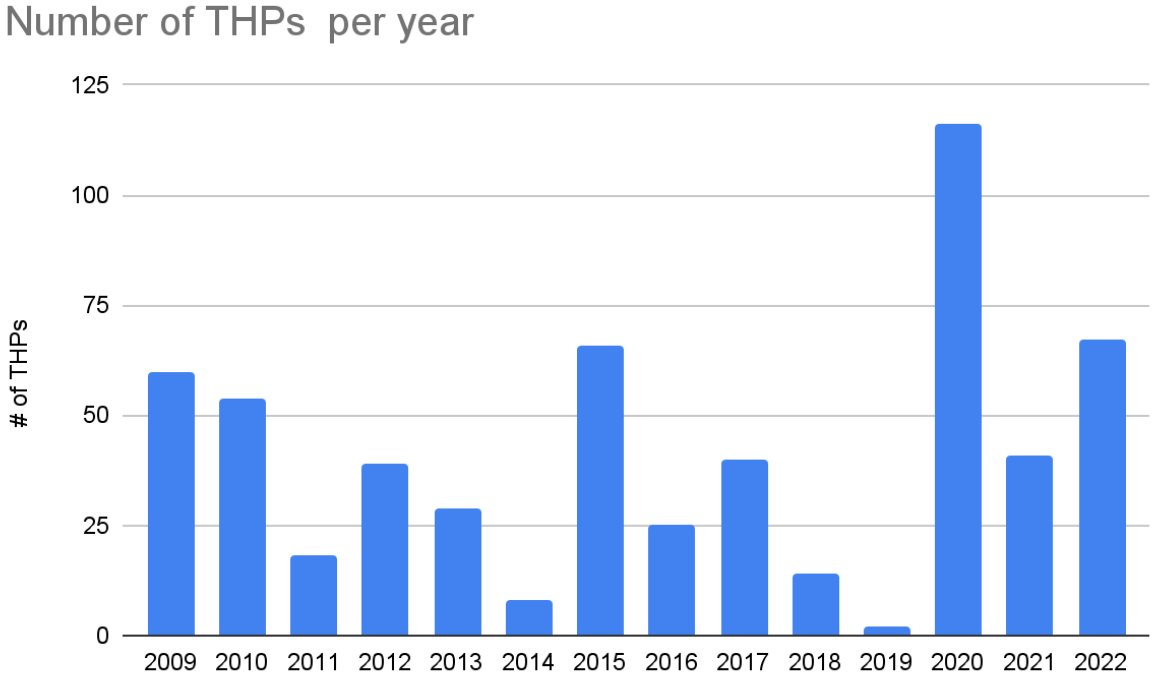

Figure 8. Number of Timber Harvest Plan segments per year

Of the 579 THP segments, 184 (32%) have been completed, 22 (4%) have been marked Unlogged, and 10 (2%) were withdrawn. The remaining 363 (63%) are labeled 'Approved' and are in some state of completion.

[9] **CAL FIRE.** *CAL FIRE Timber Harvesting Plans All TA83.* Accessed May 29, 2024. Retrieved from: https://forest-practice-calfire-forestry.hub.arcgis.com/

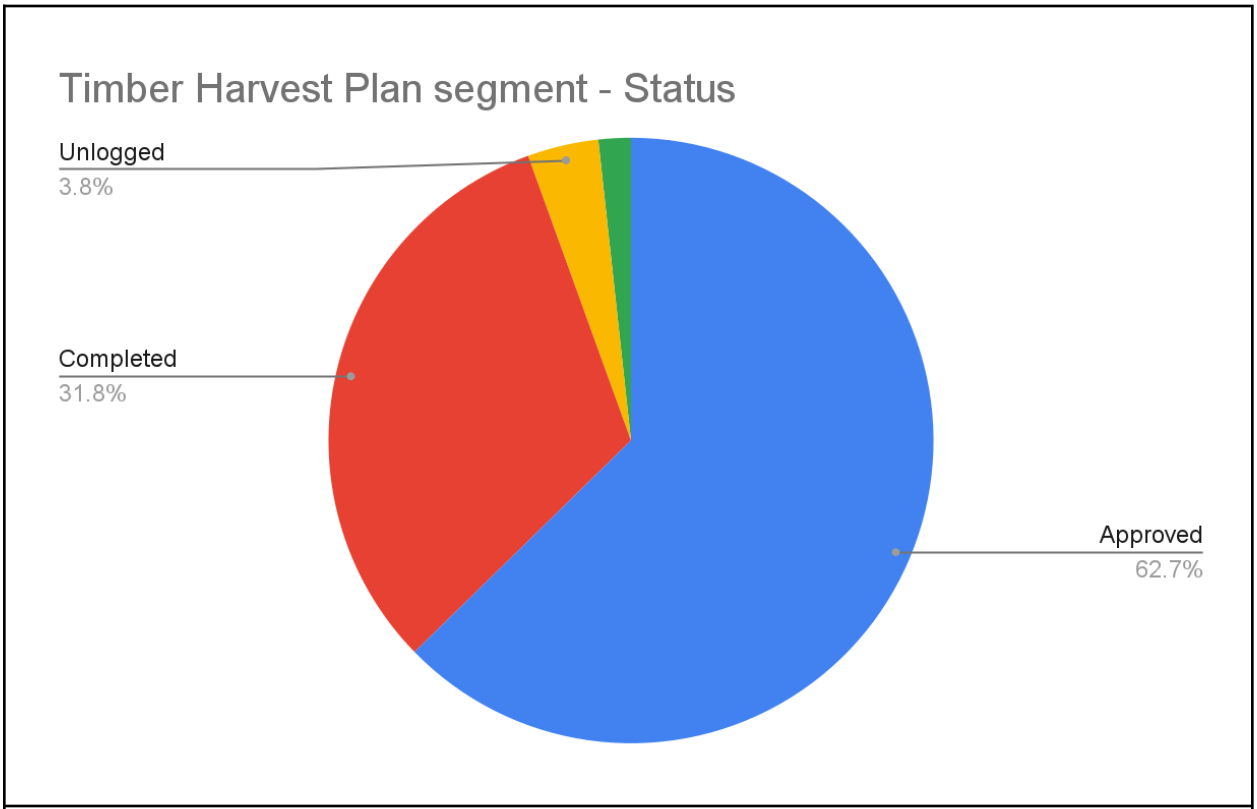

Figure 9. Timber Harvest Plan segment Status

THP Acreage and Spatial Distribution

All together, these THPs cover 11,300 acres. The acreage covered by each THP varies widely from a minimum of .05 acres, to a maximum of 375 acres. The median size is 6.1 and the mean is 19.5 acres.

The Completed projects account for 3,382 acres, while the approved projects account for 7,031 acres.

An average of 807 acres is approved for harvest each year in Sonoma, but there is a wide range year to year, from 92 acres in 2019, to 1654 acres in 2020.

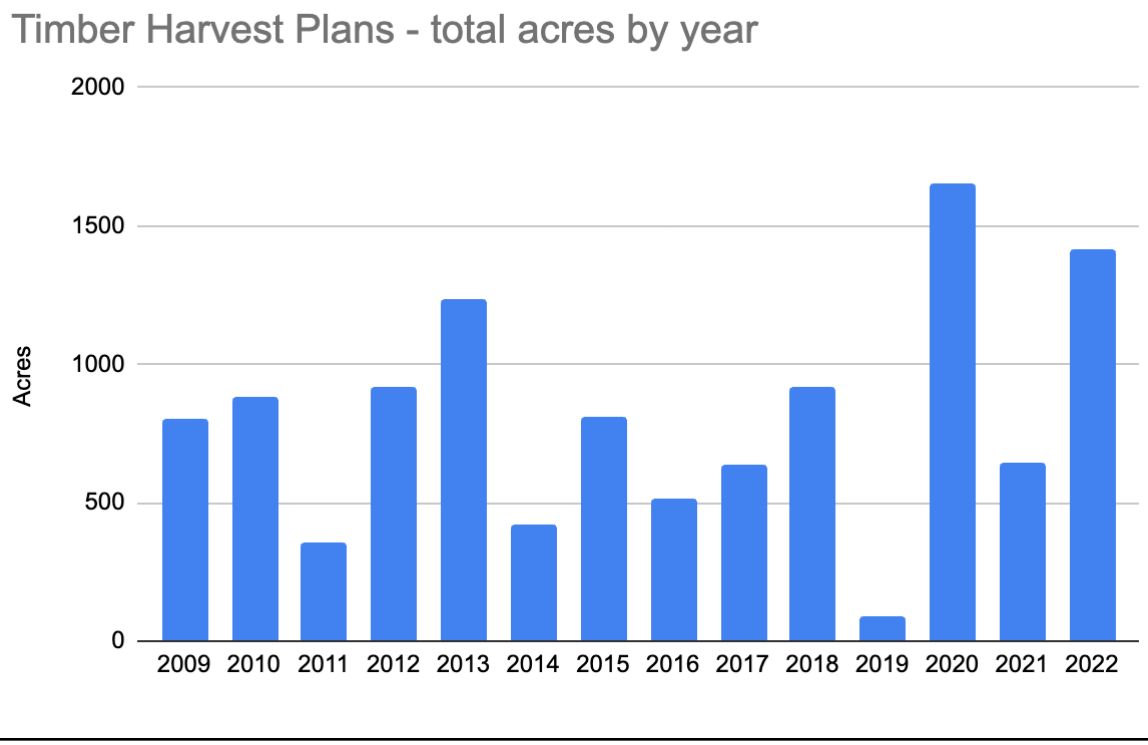

Figure 10. Timber Harvest Plans - total acres per year

THPs are not uniformly dispersed around Sonoma County. Instead, they are concentrated primarily in the Redwood forests of the Northwestern corner of the county. This can be observed in the below heatmap of the number of acres with Timber Harvest Plans (by Hexagon).

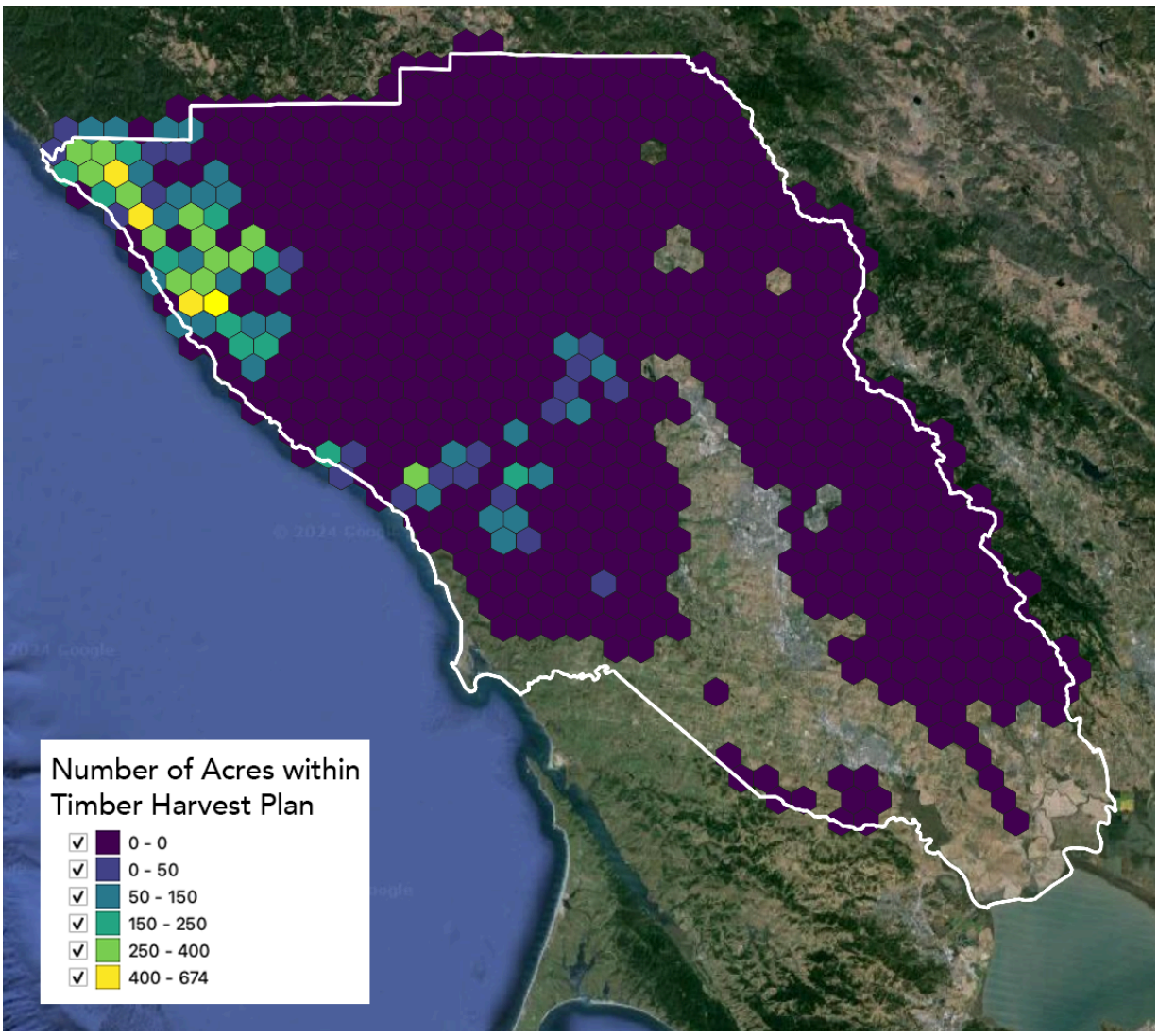

Figure 11. Map showing the number of acres within THPs within hexagon grid.

THP Drive Time Access

Using the same drive time distances discussed above, we are able to calculate the number of acres of existing / historic Timber Harvest Plan acres for each of three drive time distances from Berry's Sawmill, Cloverdale, and Airport locations.

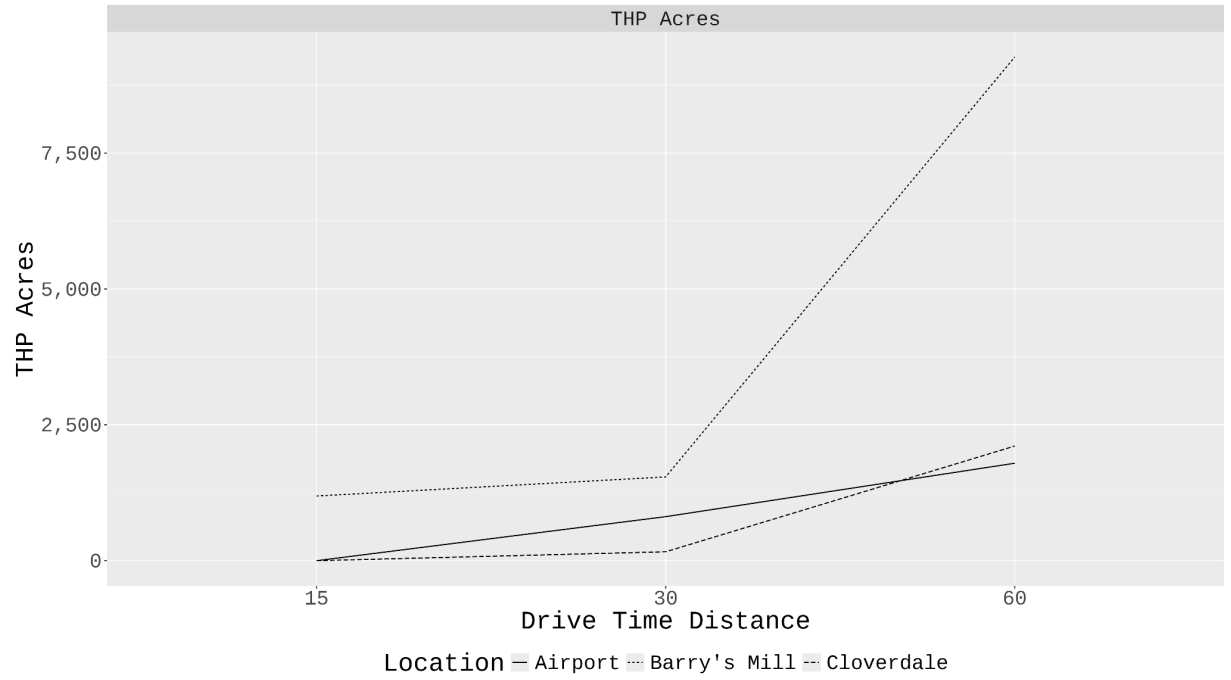

Figure 12. Number of acres within THPs by drive time distance.

Clearly, Berry's Mill has significantly more access to existing / historic THP locations than the other two locations. If it is to be expected that future THPs will be issued for roughly the same area as existing / historic THPs due to land ownership patterns, species merchantability, historic acceptance of logging practices or other reasons, then Berry's Mill is clearly favorable to Santa Rosa Airport or Cloverdale.

Location	**Distance**	**Existing / Historic THP (in Acres)**
Berry's Mill	15 minutes	1,190
	30 minutes	1,541
	60 minutes	9,266
Cloverdale	15 minutes	0
	30 minutes	164
	60 minutes	2,109
Airport	15 minutes	0
	30 minutes	810
	60 minutes	1,793

THP Biomass estimates

By using the Biomass estimate produced by this report, we have estimated maximum potential biomass retrievable by Timber Harvest Plans in Sonoma County. Per year, an average of over 156,000 megagrams is covered by THPs.

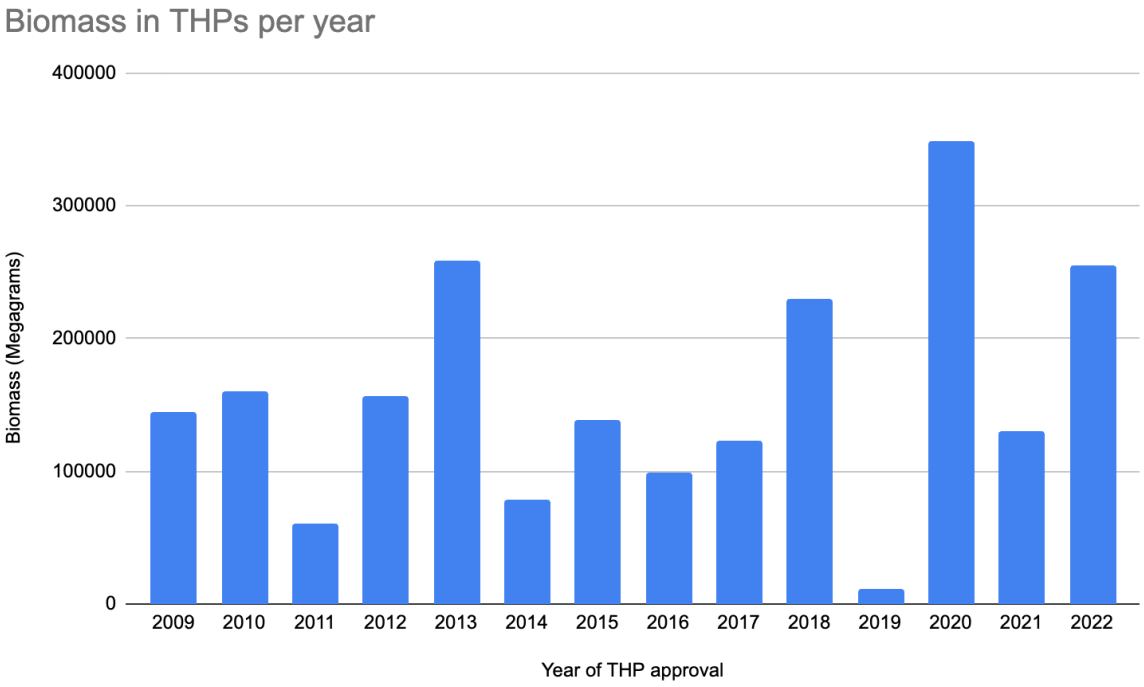

Figure 13. Biomass in Megagrams within Timber Harvest Plan segments, by year

Management and Harvest Type

It is not typically expected that all biomass will be removed during a harvest as that would entail a clear cut and completely removing all slash from the landscape. Only about 18% of THPs are designated as Clearcut harvest, with nearly 46% designated as a Selection type harvest.

Land covered by the THPs were managed as Unevenaged and Evanged forests.

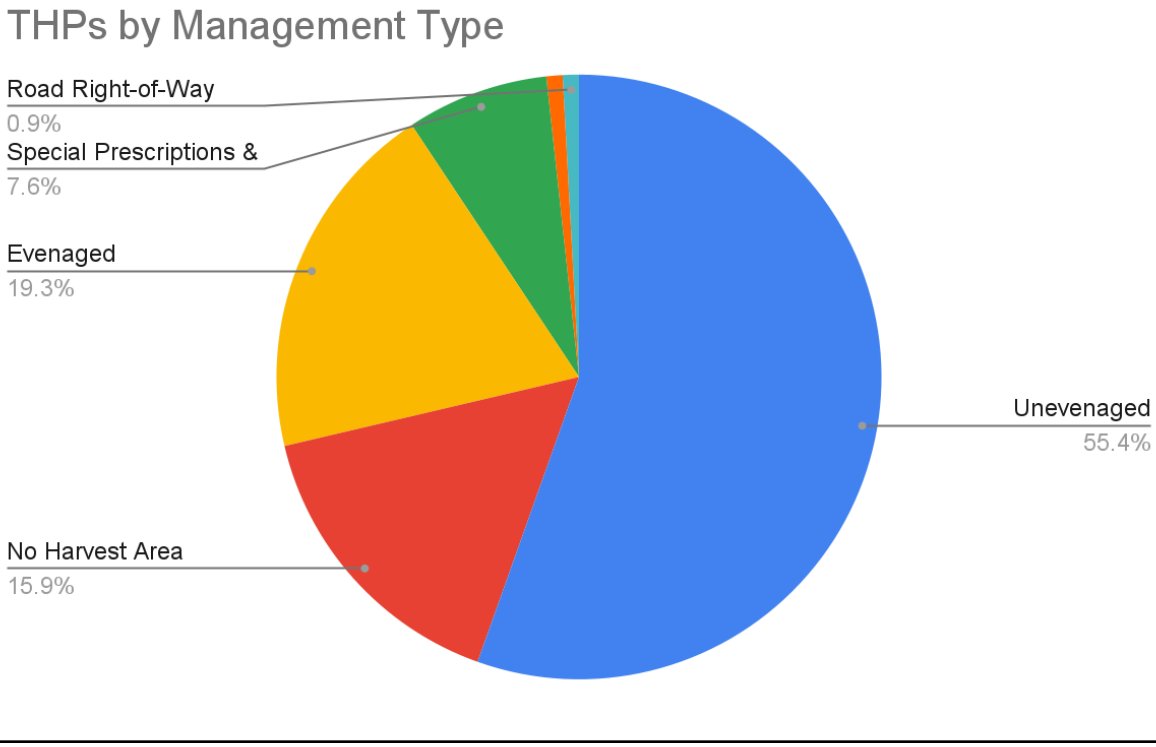

Figure 15. Timber Harvest Plan segments by management type.

Species distribution in THPs

By cross referencing the footprint of the THPs in Sonoma County with the Sonoma County Vegetation Map, we are able to identify the species that are being selected for harvest. About 80% of THPs fall within Sequoia sempervirens (Redwood) Alliance. About 10% is Pseudotsuga menziesii (Doug Fir) Alliance.

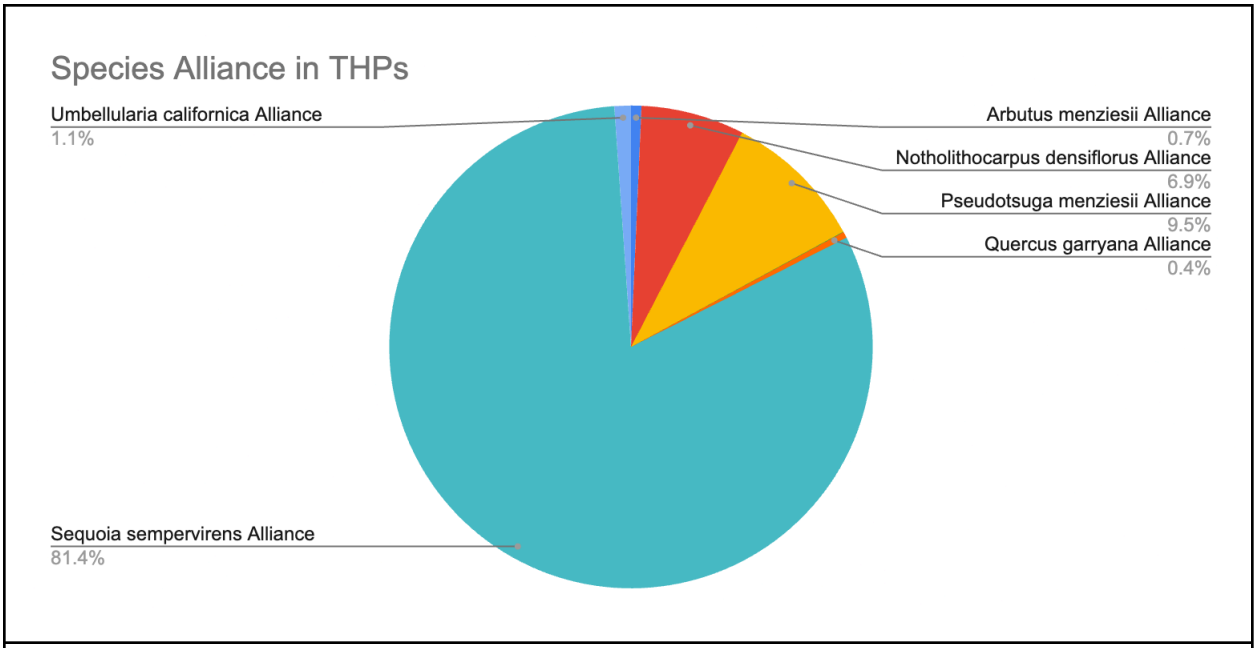

Figure 16. Dominant species alliance across THPs.

Ownership

There are 24 landowners who obtained a THP from 2009 - 2022. Three landowners - Gualala Redwood Timber LLC, Mendocino Redwood Co and Richardson Ranch LLC - accounted for 60% of the acreage for this period.

THPs Feasibility

Not all land inside the boundaries of THPs are feasible. In fact, only about 56% of land identified in THPs is considered feasibly treatable / harvestable by mechanical or hand crew methods according to the Mechanical Feasibility Layer from Tuckman Geospatial. This would further limit the amount of biomass reasonably expected to be harvested from the landscape.

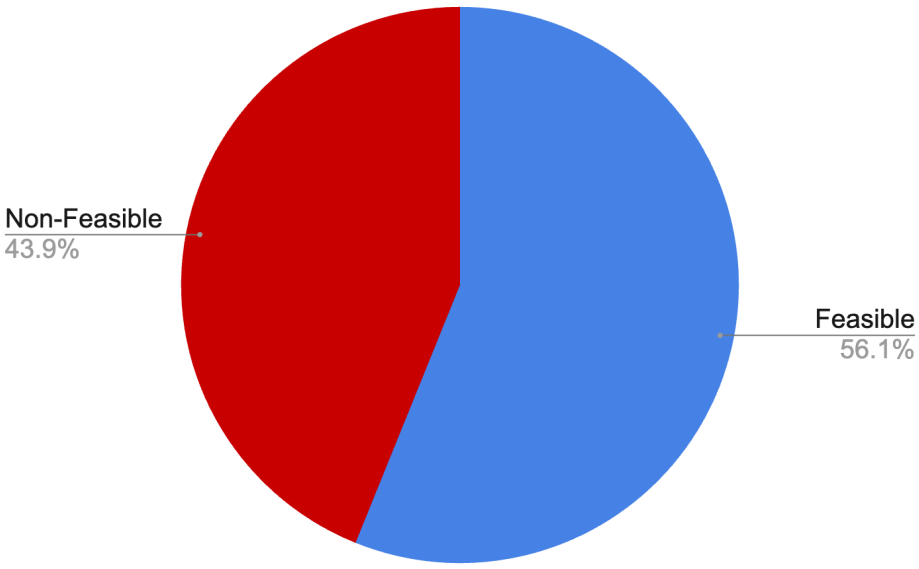

Figure 18. Percent of land in Timber Harvest Plan segments considered Feasible / Non-Feasible by Tuckman Geopspatial's Mechanical Treatment Feasibility layer.

Conclusion

This report outlines the successful development of an updated biomass layer for Sonoma County, and the application of this biomass layer to inform decision making regarding the site selection for a biomass collection facility.

It is our assessment that the Berry's Saw Mill location is the most favorable of those considered. First, it is the only location within a 60 minute drive time of the north west region of the county where the vast majority of current and historical Timber Harvest Plans are located. Second, with regard to softwood species (Redwood, Doug Fir), it has access to move feasibly accessible biomass at the 15 and 60 minute distances, while remaining competitive to the Airport location for the 30 minute distance.

Appendix B. Permitting Feasibility Report, WRA Inc.

MEMORANDUM

TO:	Temra Costa	FROM:	Molly Curley O'Brian
CC:	Jeremy Fisher	Rob Carnachan, Liv Niederer	
DATE:	December 14, 2024		
SUBJECT:	CEQA and Permitting Feasibility Report – Potential Woody Material Aggregation Sites for the Sonoma County Woody Feedstock Pilot Program		

1.0 INTRODUCTION AND PURPOSE

The Sonoma County Wood Recovery & Utilization Project Feasibility Study (SCFS) is a multi-benefit regional planning effort to explore the ecological and economic viability of rebalancing fuel loads in Sonoma County forests and identify potential opportunities to help offset the costs associated with forest health project implementation. The SCFS is being undertaken by Regenerative Forest Solutions and is funded by several grants awarded by the North Coast Resource Partnership (NCRP) and Bay Area Council Foundation's California Climate Resilience Challenge. The purpose of this memorandum is to assess the permitting feasibility of potential aggregation sites as potential solutions to enable more wildfire resilient forests and to provide an estimate of costs associated with permitting and other regulatory approvals.

Regenerative Forests Solutions is currently undertaking the SCFS to analyze wood resources, potential markets, and outline the implementation of an aggregation entity to reach an economy of scale to re-establish a vibrant wood products economy within the region. The project would require the creation of biomass utilization aggregate centers (hereinafter referred to as "aggregation facilities") to store and process woody material collected from various areas within the County.

The purpose of this memorandum is to provide a summary of permitting needs, including California Environmental Quality Act (CEQA) compliance, for the creation of an aggregation facility, and to estimate the anticipated costs for permitting this work.

2.0 OVERVIEW OF POTENTIAL WOODY MATERIAL AGGREGATION SITES

2.1 Criteria for Site Selection

Potential sites for an aggregation facility were selected based on the following criteria:

- Zoning for commercial or industrial use
- Sufficient distance away from watercourses or bodies of water
- Sufficient road access with industrial road dimensions to transport large, heavy material in and out of the site

- Within the jurisdiction of the North Bay Air Quality Management District
- Industrial-phased power is available (480 amps)
- Base rock and/or concrete available for log storage
- Reliable water supply is present

Biomass, a measure of the amount of forested material that exists in an area, is also an important factor in considering where to site an aggregation facility. The distance of potential aggregation sites to feasibly harvestable forest material was estimated and modeled by The Sonoma County Wood Recovery Feasibility Report prepared by Wuuii, Inc. in 2024.[1]

The purpose of this Permitting Feasibility Report is to expand knowledge on site selection criteria by providing an analysis of permitting steps and necessary processes for establishing an aggregation facility at each of the potential sites. This report also provides estimated cost ranges for various requisites to obtaining completed permits, such as technical reports (e.g., air quality, biological, transportation studies) and state and federal agency consultations.

2.2 Overview of Sites

Two potential aggregation sites are considered in this Permitting Feasibility Report, which are summarized below in Table 1.

Table 1. Aggregation Sites Overview

SITE NAME	ADDRESS	ZONING DISTRICT	ZONING OVERLAY	LAND USE DESIGNATION	EXISTING USE
Berry's Sawmill	23640 CA-116, Cazadero, CA 95421	Limited Commercial	Floodplain (F2), local guidelines (LG), riparian corridor (RC), valley oak habitat (VOH), scenic resource (SR)	Limited Commercial	Existing mill site
Cloverdale	32000 North Redwood Highway, Cloverdale, CA 95425	Limited Commercial, Limited Urban Industrial	Floodplain (F2), oak woodland (OAK), valley oak habitat (VOH), scenic resource (SR)	Limited Commercial, Limited Industrial	No formal operations

Source: Permit Sonoma. 2024. Permit Sonoma GIS, Zoning and Land Use. Accessed November 25, 2024, at https://sonomacounty.maps.arcgis.com/apps/webappviewer/index.html?id=06ac7fe1b8554171b4682dc141293962.

[1] Wuuii, Inc. 2024. Sonoma County Wood Recovery Feasibility Report. October 2024

3.0 SITE DETAILS

3.1 Site 1. Berry's Sawmill

3.1.1 Overview

Berry's Sawmill (Assessor's Parcel Number [APN] 097-030-025) is an approximately 34.37-acre mill site located along the Russian River in the unincorporated community and census-designated place of Cazadero, California. The site is functioning under an existing Use Permit approved by Sonoma County in 1980 (File number 8605) for a sawmill that operates five days per week from 7:45 to 4:30, with 25 employees. Another Use Permit for the site was approved in 2010 (Permit number UPE 10-0015) for a contractor's storage yard, personal mini-storage, and a caretaker's unit. The site is zoned for Limited Commercial (LC), Floodplain Combining District (F2), Highway 116 Scenic Corridor (LG/116), Riparian Corridor Combining Zone (RC), Scenic Resources Combining District (SR), and Valley Oak Habitat Combining District (VOH).

The Berry's Sawmill site is being considered as a potential location for an aggregation facility for the sorting and storage of logs and biomass. The facility would operate Monday through Friday and would process around 50 to 80 tons of material per day, which equates to approximately 20,000 tons of material per year. The type of materials being processed at the facility would include logs of various species, including both softwoods and hardwoods. Potential components of the aggregation facility would include a merchandiser (electric conveyor belt); sawmill operations; chip and grind operations; firewood operation; kiln operation; wood product manufacturing; education; a native tree nursery; and retail.

3.1.2 Environmental Setting

The Berry's Sawmill site is bounded by Old Duncans Grade Road to the north/northwest, Cazadero Highway and Highway 116 to the south/southeast, and a parcel zoned for Timberland Production (TP) to the west. Surrounding land uses include low density residential to the north, resources and rural development to the east and south, and timberland production to the west. The Russian River flows from east to west approximately 550 feet south of the southern site boundary. Austin Creek runs parallel to the southeastern site boundary approximately 360 feet away before meeting its confluence with the Russian River approximately 550 feet south of the site.

BIOLOGICAL RESOURCES

Vegetative Communities and Aquatic Resources

Based on aerial imagery from Google Earth, the Berry's Sawmill site appears to be primarily developed, with the exception of the southwestern corner which is obscured by a dense tree canopy. Vegetative communities surrounding the site consist of coast redwood forest and Vancouverian riparian deciduous forest.[2] Coast redwood forest is typically dominated by coast redwood (*Sequoia sempervirens*) with associated species such as bigleaf maple (*Acer macrophyllum*), tanoak (*Notholithocarpus densiflorus*), Douglas fir (*Pseudotsuga menziesii*), California nutmeg (*Torreya californica*), and California bay (*Umbellularia californica*). which is

[2] Sonoma County Agriculture and Open Space District. 2018. Sonoma County Vegetation and Habitat Map. Accessed November 25, 2024, at https://www.arcgis.com/home/webmap/viewer.html?webmap=d6f34a00d21e451b8fdf914d1e555c77.

dominated or co-dominated by the following species: white alder (*Alnus rhombifolia*), red alder (*Alnus rubra*), Oregon ash (*Fraxinus latifolia*), and shining willow (*Salix lucida*).[3]

There is one on-site stream in the southwestern corner of the site where Riparian Corridor Combining Zone applies. There is also an approximately two-acre potential wetland mapped in the northeastern corner of the site.[4] A formal wetland delineation study would be needed to classify the stream and confirm the limits of wetlands on-site.

Though the Berry's Sawmill site is primarily developed, activities which would expand or alter the existing development on the site could potentially impact special-status species either directly or indirectly through the modification of habitat or light or noise disturbance. Based on a preliminary review of special-status plants in the area, most rare plant species are unlikely to occur on-site; however, a site-specific assessment by a qualified botanist would be required to determine presence or absence of rare plant species if any disturbance of undeveloped areas would occur. Special-status wildlife that have the potential to occur within the area include the following:

- Foothill yellow-legged frog, north coast distinct population segment
- Central California Coast steelhead distinct population segment
- Northern spotted owl
- Central California Coast Coho salmon
- California Coastal Chinook salmon
- California red-legged frog
- Nesting birds
- Roosting bats

There is no Critical Habitat, as designated by the United States Fish and Wildlife Service (USFWS), within the Berry's Sawmill site. Critical Habitat, as designated by the National Oceanic and Atmospheric Administration (NOAA), for California Coastal Chinook salmon, Central California Coast Coho salmon, and Central California Coast steelhead is present within the Russian River and Austin Creek. Essential Fish Habitat for Pacific salmonids is also present within all waterways in the area, including the on-site stream.

3.1.3 Regulatory Permitting

Creation of an aggregation site at the Berry's Sawmill site would be subject to federal, State, and local regulations which may require permit approval. A summary of permits which may be required to establish such a facility at the Berry's Sawmill site are summarized below in Table 2 and described in further detail in the following sections.

[3] Sonoma County Vegetation and Habitat Mapping Program. Sonoma Vegetation and Habitat Map Key – Updated 10-8-15. Accessed November 25, 2025, at https://sonomaopenspace.egnyte.com/dl/xObbaG6lF8.
[4] United States Fish and Wildlife Service. 2024. National Wetlands Inventory. Accessed November 27, 2024, at https://fwsprimary.wim.usgs.gov/wetlands/apps/wetlands-mapper/.

Table 2. Summary of Potential Permits Required for Berry's Sawmill Site

REGULATORY AGENCY	APPLICABLE PERMIT
United States Army Corps of Engineers	Clean Water Act Section 404 Permit
United States Fish and Wildlife Service	Endangered Species Act Section 7 Consultation or Section 10 Consultation
California Department of Fish and Wildlife	Lake and Streambed Alteration Agreement
California State Water Resources Control Board	Construction Stormwater General Permit
Regional Water Quality Control Board	Clean Water Act Section 401 Water Quality Certification, Waste Discharge Requirements
Northern Sonoma County Air Pollution Control District	Authority to Construct, Permit to Operate
California Department of Resources Recycling and Recovery	Solid Waste Facility Permit
County of Sonoma	Tree Removal Permit, Construction Permit, Demolition Permit, Use Permit

UNITED STATES ARMY CORPS OF ENGINEERS

Section 404 of the Clean Water Act creates a program to regulate the discharge of dredged or fill material into waters of the United States, including wetlands. This program regulates activities in waters of the United States, including fill for development, water resource projects, infrastructure development, and mining projects. Proposed activities which may result in discharge of dredged or fill material in waters of the United States are regulated through a permit review process overseen by the U.S. Army Corps of Engineers.[5]

The USFWS's National Wetlands Inventory online mapping tool shows that there is an approximately two-acre wetland in the northeastern corner of the site and a stream in the southwestern corner of the site. Prior to any consultation with the U.S. Army Corps of Engineers, a formal wetland delineation study would be needed to classify the stream and confirm the limits of wetlands on-site. If these aquatic resources are determined to qualify as waters of the United States and if the creation of an aggregation facility would result in the discharge of dredged or fill material into these waters, a permit would need to be obtained through the Section 404 permit process.

UNITED STATES FISH AND WILDLIFE SERVICE

If the creation of an aggregation facility at the Berry's Sawmill site would result in potential impacts to a special-status plant or wildlife species or their habitat, consultation with the USFWS would be required. If it is determined that there is a "federal nexus," meaning that a federal agency is involved with the project (such as the U.S. Army Corps of Engineers), the project would need to undergo the Section 7 Consultation process. Section 7 of the Endangered Species Act requires federal agencies to consult with the USFWS on actions that they fund, authorize, permit, or carry out, to ensure that they will not harm federally listed species or their habitat.

[5] United States Environmental Protection Agency. 2024. Permit Program under CWA Section 404. Accessed December 4, 2024, at https://www.epa.gov/cwa-404/permit-program-under-cwa-section-404.

In the event that there is no federal nexus (i.e., federal funding is not used and no federal agency becomes involved with the project), the project would need to undergo the process of Section 10 Consultation. Section 10 of the Endangered Species Act allows for the "take" of a listed species if a Habitat Conservation Plan (HCP) is developed. The first step in the process is to prepare an HCP and submit an application for an Incidental Take Permit (ITP). The HCP and ITP application are subject to review and approval by the USFWS; once approved, the applicant is responsible for implementing the HCP.

CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE

If the project would require activities in or near the on-site stream, a Lake and Streambed Alteration Agreement (LSA) from the California Department of Fish and Wildlife (CDFW) would potentially be required. An LSA is needed for activities which would divert or obstruct the natural flow of water or obstruct or use any material from a streambed.

STATE WATER RESOURCES CONTROL BOARD

The California State Water Resources Control Board (State Water Board) regulates stormwater discharges from construction sites due to its potential to mobilize pollutants and discharge into waterbodies or watersheds. The State Water Board adopted the 2022 Construction Stormwater General Permit, Order 2022-0057-DWQ, on September 8, 2022, and it went into effect on September 1, 2023. Construction activities subject to this permit include clearing, grading, and disturbances to the ground surface such as stockpiling or excavation; however, this permit does not apply to regular maintenance activities performed to restore the original line, grade, or capacity of the facility. Dischargers whose projects disturb one or more acres of soil are required to obtain coverage under the National Pollutant Discharge Elimination System General Permit for Stormwater Discharges Associated with Construction and Land Disturbance Activities.[6]

The 2022 Construction Stormwater General Permit requires dischargers to effectively develop and implement site-specific Stormwater Pollution Prevention Plans (SWPPP) with the help of a stormwater professional. Stormwater professionals developing the SWPPP must be Qualified SWPPP Developers (QSD) and/or Qualified SWPPP Practitioners (QSP).

NORTH COAST (REGION 1) REGIONAL WATER QUALITY CONTROL BOARD

The State Water Board and Regional Water Quality Control Boards (Regional Water Boards) are responsible for regulating the discharge of dredged or fill material to waters of the state. These discharges are regulated under section 401 of the Clean Water Act and the Porter-Cologne Water Quality Control Act. Section 401 Water Quality Certifications are issued under Section 401 of the Clean Water Act, which requires that any applicant for a federal permit or license that may result in discharge to waters of the United States must obtain a certification that the activity will comply with state water quality standards. If there is no federal nexus (i.e., if no federal agency is involved in the project and no federal funding is used), a Section 401 Water Quality Certification is not required.

[6] State Water Resources Control Board. 2024. Welcome to the Construction Stormwater Program. Accessed November 25, 2024, at https://www.waterboards.ca.gov/water_issues/programs/stormwater/construction.html.

Under the Porter-Cologne Act, the Regional Water Boards are responsible for setting Waste Discharge Requirements (WDRs, which are conditions under which waste can be released into waters of the state, ensuring that they do not violate water quality standards). Typical discharge types that qualify for WDRs include domestic or municipal wastewater, food processing related wastewater, and industrial wastewater. A permit can be obtained through the application process with the North Coast Regional Water Quality Control Board.

NORTH SONOMA COUNTY AIR POLLUTION CONTROL DISTRICT

The North Sonoma County Air Pollution Control District (District) issues permits for emissions from stationary sources in a two-step permit process. During the first step, a source applies for an Authority to Construct (ATC) permit with temporary operation. This allows for modifications to existing equipment or construction/installation of new equipment for a source, and to operate for up to 12 months. Once construction is complete, the District will inspect the site and review performance for compliance with applicable air quality requirements. When compliance is verified, the District will issue the second permit, which is an ongoing Permit to Operate (PTO).[7] Facility owners must pay an application fee and an annual operation fee, the amount of which depends on the type of source being permitted. To initiate the permit process, applicants should set up a free consultation call with the District to discuss the permitting pathway and receive application forms.

CALIFORNIA DEPARTMENT OF RESOURCES RECYCLING AND RECOVERY

The California Department of Resources Recycling and Recovery (CalRecycle) issues permits for solid waste facilities, which include solid waste transfer or processing stations, composting facilities, gasification facilities, transformation facilities, Engineered Municipal Solid Waste conversion facilities, and disposal facilities. There are five tiers for the solid waste facility permit, including full, standardized, registration, notification, and excluded. As a woody material processing facility, the aggregation site best fits into the category of a transfer/processing facility. However, according to Public Resource Code Section 40201, transformation facilities do not include biomass conversion facilities. As such, the project may qualify for the notification permit tier, in which the project applicant shall submit a notification to CalRecycle to confirm that the operations on-site qualify for the notification tier. Upon an initial review, the project may qualify for notification tier as a small volume C&D wood debris chipping and grinding operations (less than 200 tons per day), as defined by California Code of Regulations, Title 14 Section 17383.3.

COUNTY OF SONOMA

The creation of an aggregation facility at the Berry's Sawmill site may require various development permits from the County of Sonoma, such as a demolition permit, building permit, building revision permit, grading permit, and others. Other permits and design review and approval may also be required, depending on the final design of the proposed facility. Potential permits and approvals that may apply are summarized in the following sections.

Tree Protection Ordinance

The Sonoma County Tree Ordinance, contained in Sonoma County Municipal Code Chapter 26, requires ministerial zoning permit for the removal of protected trees. A permit application for the

[7] Northern Sonoma County Air Pollution Control District. 2022. Business Permits. Accessed November 25, 2024, at https://nosocoair.org/permits/business-permits/.

removal of protected trees must provide an accompanying site plan that includes the location, species, and size of all impacted trees as well as those near project-related activities where effects of such could damage trees. The County encourages that protective measures be included for trees not scheduled for removal. Trees scheduled for removal must be evaluated for their "arboreal value" and compensated with either on-site or off-site plantings, preservation of existing trees not scheduled for removal, or with in-lieu fees.

Protected trees are defined as the following native trees with a diameter-at-breast height of nine inches or greater:

- Big leaf maple (*Acer macrophyllum*),
- Black oak (*Quercus kelloggii*),
- Blue oak (*Quercus douglasii*),
- Coast live oak (*Quercus agrifolia*),
- Interior live oak (*Quercus wislizenii*),
- Oracle oak (*Quercus morehus*),
- Oregon oak (*Quercus garryana*),
- Valley oak (*Quercus lobata*),
- Coast Redwood (*Sequoia sempervirens*),
- Madrone (*Arbutus menziesii*),
- California bay (*Umbellularia californica*), and
- Hybrids of any of the above species.

In addition, the valley oak shall receive special consideration under the Tree Ordinance to the extent that mature specimens of the species shall be retained to the fullest extent feasible. A use permit is required for the removal of redwoods with a single stem with a diameter-at-breast height exceeding 48 inches, or the removal of oaks and other hardwoods with a single stem with a diameter-at-breast height exceeding 36 inches.

Valley Oak Habitat Combining Zone

The majority of the Berry's Sawmill site is within the Valley Oak Habitat (VOH) Combining Zone, which requires a zoning permit and mitigation for the removal of valley oak trees within the specified zoning district. The permit shall be required for the removal of valley oak trees over six inches diameter-at-breast height. Applicants must mitigate the valley oak loss by either of the following methods:

1. Planting replacement valley oaks on the subject property or on another site in the county having the necessary conditions to support valley oaks, or
2. Paying an in-lieu payment amount for valley oak planting programs within the county.

The applicant shall have the discretion to decide which mitigation measure to use to mitigate the valley oak loss; however, the selected mitigation measure must be undertaken or completed within one year after the trees are cut down or removed. The removal of valley oak trees with a single stem over 36 inches diameter-at-breast height shall require a use permit, per the County's Tree Protection Ordinance.

If the project is determined to be subject to design review pursuant to another provision of the Code of Ordinances, the design review approval shall include measures to protect and enhance valley oaks on the project site. Such measures shall include, but not be limited to, a requirement that valley oaks shall comprise a minimum of 50 percent of the required landscape trees for the development project.

Scenic Resources Zone

Areas along the southeastern border of the Berry's Sawmill site are within the Scenic Resource Combining Zone and therefore, are subject to the requirements of Article 22 of the Sonoma County Code of Ordinances. This article contains development criteria, such as maximum building heights, minimum lot areas and widths, yard requirements, and maximum percentages of lot coverage. Because the site is in a scenic corridor for Highway 116 and Cazadero Highway, the development of an aggregation facility at this site would be subject to design review and approval to ensure compliance with applicable development standards.

Riparian Corridor Combining Zone

The Riparian Corridor Combining Zone applies to designated streams and includes the stream bed and an adjacent streamside conservation area on each side of the stream as measured from the top of the higher bank. Development activities, including grading, vegetation removal, agricultural cultivation, structures, roads, utility lines, and parking lots, are generally prohibited aside from specific exceptions. An exception to prohibited activities may be approved with a use permit if a conservation plan is adopted that provides for the appropriate protection of biotic resources, water quality, floodplain management, bank stability, groundwater recharge, and other applicable riparian functions. It appears that current development on the Berry's Sawmill site avoids the stream and the adjacent conservation area.

3.1.4 California Environmental Quality Act

OVERVIEW

CEQA requires government agencies to consider the environmental effects of their actions before approving plans and policies committed to a course of action on a project. A "project" under CEQA is defined as a "whole action" which is subject to a public agency's discretionary funding or approval that has the potential to either 1) cause a direct physical change in the environment or 2) cause a reasonably foreseeable indirect change in the environment. The creation of an aggregation facility may require a discretionary permit, such as a use permit, from a local agency, and therefore, may be subject to review under CEQA.

The Berry's Sawmill site is currently operating under two Use Permits which allow for the operation of the on-site sawmill, a contractor's storage yard, personal mini-storage, and a caretaker's unit. The sawmill is permitted to operate five days per week from 7:45 to 4:30 with 25 employees. The County was contacted regarding whether the existing Use Permit would allow for a tipping fee to be charged for disposing of material at the on-site facility. A planner from the County responded that the sawmill is permitted to dispose of its own waste on-site, but accepting materials from offsite would require a Use Permit modification. The planner further recommended that a pre-application consultation meeting may be useful to determine whether the proposed aggregation facility would require a modification to the existing Use Permit.

If the creation of an aggregation facility at the site would require a new Use Permit, this would constitute a discretionary action by the County, thus triggering CEQA. It would ultimately be up to the County to decide whether proposed changes in the on-site facility operation would require a new Use Permit. If the County decides that a new Use Permit is not required for the facility, it is likely that the only discretionary action which would be required for operation of the facility would be approval of a stationary source permit from the North Sonoma County Air Pollution Control District. If this is the case, the air district would serve as the CEQA Lead Agency and would be in charge of overseeing and approving the CEQA review for the project.

POTENTIAL CEQA PATHWAYS

Depending on the final scope of the project, there are three CEQA pathway scenarios which may apply. The lowest level of CEQA review which may apply to the project is a Categorical Exemption. Public Resources Code Section 21084 provides guidelines for projects that have been determined to not have a significant effect on the environment and are therefore determined to be exempt from the provisions of CEQA. The creation of an aggregation facility at Berry's Sawmill could potentially qualify for a Categorical Exemption pursuant to CEQA Guidelines Section 15301, Existing Facilities (Class 1). The Class 1 Exemption applies to the operation, repair, maintenance, permitting, leasing, licensing, or minor alteration of existing public or private structures, facilities, mechanical equipment, or topographical features, involving negligible or no expansion of existing or former use. Depending on how the final design of the facility would change the existing operational use of the site, it is possible that a Categorical Exemption may be sufficient for CEQA compliance. However, given the scope of the potential alterations to the site's existing use, it is unlikely that the County of Sonoma would conclude that the project is categorically exempt from CEQA.

If it is determined that the project would not qualify for a Categorical Exemption, the next step would be to prepare an Initial Study of environmental impacts. An Initial Study is a preliminary analysis which is prepared to determine whether a Mitigated Negative Declaration or Environmental Impact Report (EIR) must be prepared to identify potential significant environmental impacts of a project. The Initial Study should provide an analysis of potential impacts of the project in the 20 topic areas required by CEQA and may follow the checklist format as provided in Appendix G of the CEQA Guidelines. If the Initial Study shows that there is no substantial evidence that the project may have a significant effect in any of the 20 topic areas, a Negative Declaration is prepared. If the Initial Study shows that there is no substantial evidence that the project may have a significant effect with the implementation of mitigation measures, the Initial Study should identify those mitigation measures that have been developed, and a Mitigated Negative Declaration (MND) should be prepared. If the Initial Study shows that the project may have a potentially significant impact even after mitigation measures have been considered, an EIR must be prepared.

As the creation of an aggregation facility at Berry's Sawmill would not substantially change the existing conditions or general timber-related use of the site, it is likely that an Initial Study/MND would be sufficient for CEQA compliance.

If the findings from the Initial Study show that there are potentially significant environmental impacts of the project that cannot be mitigated to a level that is below the thresholds of significance, an Environmental Impact Report (EIR) would be required. An EIR is the most detailed level of CEQA analysis and provides the most opportunities for public engagement.

TECHNICAL STUDIES

Various technical studies would be necessary to support the documentation prepared for the permitting and CEQA process. A biological resources study would be needed to determine potential impacts to special-status species, their habitats, and other sensitive vegetative communities. In addition, a wetland delineation study would be needed to determine the extent of the on-site wetland and classify the on-site stream. Based on the findings of these studies, additional studies may be required, such as rare plant surveys or pre-construction surveys for nesting birds and other special-status species. Such surveys are standard measures for development projects to confirm that no special-status plant or wildlife species will be harmed during project construction.

To support the CEQA analysis for the project, it is likely that air quality, noise, and transportation technical studies will be required. An air quality study would need to assess the emissions generated from constructing the aggregation facility and the site, as well as the emissions associated with operating the proposed facility. A noise technical study would also need to address the noise generated from constructing the proposed facility, as well as any change to ambient noise conditions in the area resulting from operating the proposed facility. A transportation study would need to address the vehicles trips that would result from operation of the proposed facility, including the vehicles miles traveled and any impacts to the local transportation network. If potentially significant impacts to air quality, noise, or transportation are identified, the report preparer should provide recommended mitigation measures to reduce potential impacts as much as possible.

3.1.5 National Environmental Policy Act

The National Environmental Policy Act (NEPA) is triggered when a federal agency proposes a major federal action that could significantly impact the quality of the environment. A project may require review under NEPA if 1) the action is proposed on federal lands or requires passage over federal lands, 2) the action is being funded by the federal government, or 3) the action affects air or water quality regulated by federal law. The NEPA process offers three potential pathways for analysis: Categorical Exclusion determination (CATEX), Environmental Assessment/Finding of No Significant Impact (EA/FONSI), and Environmental Impact Statement. The specific regulations and format to be followed for each pathway are different under each federal agency. Therefore, the level of detail of the analysis will ultimately depend on which federal agency will be the Lead Agency overseeing the NEPA review.

3.2 Cloverdale

3.2.1 Overview

The Cloverdale site (APNs 115-160-058, 115-150-055, 115-150-002, 115-150-039, 115-150-038, 115-150-054, 115-150-052) includes seven parcels that comprise approximately 15 acres off of North Redwood Highway in Cloverdale. The site is currently undeveloped but appears to be disturbed from previous activities. The site is zoned for Limited Commercial (LC), Limited Urban Industrial (M1), Floodplain Combining District (F2), Oak Woodland (OAK), Scenic Resources Combining District (SR), and Valley Oak Habitat Combining District (VOH). The Cloverdale site is presently being researched as a potential site for a compost operation of which log aggregation for minimum processing could potentially be co-located.

3.2.2 Environmental Setting

The Cloverdale site is bounded by McCray Road to the east, the Northwestern Pacific Railroad to the west, and surrounding parcels to the north and south. Surrounding parcels to the north are zoned for Limited Commercial and Rural Residential (RR), and surrounding parcels to the south are zoned for Limited Urban Industrial. U.S. Highway 101 parallels the railroad further to the west of the site.

BIOLOGICAL RESOURCES

Vegetative Communities and Aquatic Resources

Based on aerial imagery from Google Earth, the Cloverdale site appears to be primarily disturbed grassland with scattered piles of aggregate from previous activities. Vegetative communities surrounding the site generally consist of California annual and perennial grassland, coyote brush (*Baccharis pilularis*) alliance, and coast live oak (*Quercus agrifolia*) alliance.[8] There are no apparent wetlands or streams on-site; however, the Russian River flows from north to south approximately 1,400 feet east of the site. A stream is also mapped on the western side of U.S. Highway 101 approximately 250 feet west of the site.[9]

Construction and operation of an aggregation facility at the Cloverdale site could result in activities which could potentially impact special-status species either directly or indirectly through the modification of habitat or light or noise disturbance. Based on a preliminary review of special-status plants in the area, one rare plant species, Colusa layia (*Layia septentrionalis*), has the potential to occur on site. Because the site appears to be disturbed it is unlikely that this species is present on-site; however, a site-specific assessment by a qualified botanist would be required to determine presence or absence of any rare plant species. Special-status wildlife species that have the potential to occur within the area include the following:

- Northwestern pond turtle
- Central California Coast steelhead distinct population segment
- California Coastal Chinook salmon
- California red-legged frog
- Nesting birds
- Roosting bats

There is no Critical Habitat, as designated by the USFWS, within the Cloverdale site. Critical Habitat, as designated by the NOAA, for California Coastal Chinook salmon and Central California Coast steelhead is present within the Russian River to the east of the site. Essential Fish Habitat for Pacific salmonids is also present within the Russian River.

[8] Sonoma County Agriculture and Open Space District. 2018. Sonoma County Vegetation and Habitat Map. Accessed November 25, 2024, at https://www.arcgis.com/home/webmap/viewer.html?webmap=d6f34a00d21e451b8fdf914d1e555c77.
[9] United States Fish and Wildlife Service. 2024. National Wetlands Inventory. Accessed November 27, 2024, at https://fwsprimary.wim.usgs.gov/wetlands/apps/wetlands-mapper/.

3.2.3 Regulatory Permitting

The creation of an aggregation facility at the Cloverdale site would be subject to the same federal, state, and local regulations as the Berry's Sawmill site. A summary of permits which may be applicable to either site is provided in Table 2.

3.2.4 California Environmental Quality Act

Creation of an aggregation facility at the Cloverdale site would potentially be subject to the requirements of CEQA. The County of Sonoma would likely be the CEQA Lead Agency for this project. It is recommended that an Initial Study be prepared to assess the potential environmental impacts of developing such a facility, which would be supported by technical studies for biological resources, cultural resources, air quality, noise, and potentially transportation. If the findings of the Initial Study show that all potentially significant impacts can be mitigated to a level that is less than significant under CEQA with the inclusion of mitigation measures, an Initial Study/MND shall be prepared. If the Lead Agency determines that potentially significant impacts remain after the inclusion of mitigation measures, an EIR shall be prepared.

4.0 ESTIMATED COSTS

The estimated costs of obtaining permits and complying with CEQA will depend on the existing conditions of the sites, which would be assessed by preliminary studies. It is recommended that a biological resources study be conducted as the first step for either site because it will inform what permits could potentially be required. Cultural, air quality, noise, and transportation studies may be needed to support the CEQA Initial Study; therefore, it is recommended that these studies begin concurrently with the Initial Study. These studies are typically included in a consulting firms' scope of work to prepare an Initial Study. However, the estimated costs for CEQA and NEPA documentation in the table below are in addition to the costs for any other preliminary studies that may be needed to support the documentation.

Table 3. Timeline and Estimated Costs for Preliminary Studies

POTENTIAL PERMITS/STUDIES	ESTIMATED COST
PRELIMINARY STUDIES	
Biological Resources Study	$10,000
Wetland Delineation Study	$8,000
Cultural Resources Study	$8,000
Transportation Study	$40,000
CEQA STUDIES/DOCUMENTATION	
Initial Study/MND	$30,000
EIR	$80,000
NEPA STUDIES/DOCUMENTATION	
Categorical Exclusion	$20,000
Environmental Assessment	$40,000
Environmental Impact Statement	$120,000

5.0 CONCLUSIONS AND RECOMMENDATIONS

Creation of an aggregation facility at either the Berry's Sawmill site or the Cloverdale site would be subject to numerous environmental regulations and permit processes. The federal, state, and local permits that would be needed will ultimately depend on the biological and aquatic resources

that may be impacted by activities to construct and operate the proposed facility. Therefore, it is recommended that the next step forward for either site would be to prepare a biological resources study and wetland delineation study to document existing biological resources on-site and classify any aquatic resources which may be impacted by project activities. These studies would also be used to inform the CEQA analysis, which would be conducted prior to approval of the project by the County of Sonoma.

To initiate the CEQA process, it is recommended that Regenerative Forests Solutions should reach out to the County of Sonoma to inform them of the project and clarify the CEQA approach. Some lead agencies are amenable to project applicants hiring consultants to complete their CEQA documentation, which would ultimately be subject to review and approval by the County; however, some agencies prefer to conduct the CEQA process on their own. The CEQA and permitting process could be initiated concurrently, but some permits from state agencies will not be authorized until CEQA is certified. It is generally recommended to reach out to agencies sooner rather than later to inform them of the project and ask questions, so that no budget is wasted on unnecessary studies or applications.

Appendix C. Key Organizations and Stakeholders

APPENDIX C: KEY ORGANIZATIONS AND STAKEHOLDERS

PART 1: Key Organizations
PART 2: Stakeholders Engaged

PART 1: Key Organizations

The Sonoma County Wood Recovery & Utilization Project has identified the following key agencies, organizations and Tribal entities within the landscape of Sonoma County, and at state and federal levels, that relate to forest health, wildfire resilience and wood resource management within the county.

This appendix is not exhaustive but provides a high level overview of key organizations identified.

COUNTY, STATE AND FEDERAL AGENCIES

County

- Bay Area Air District
- Northern Sonoma County Air Pollution Control District
- North Coast Regional Water Quality Control Board
- Northern Sonoma Fire Protection District
- Permit Sonoma
- Sonoma County Fire Departments
- Sonoma County Vegetation Management Program
- Regional Parks
- Sonoma Public Infrastructure
- Sonoma Water
- Zero Waste Sonoma

Federal

- USDA:
    - Forest Service
    - Natural Resources Conservation Services
    - Rural Development

State

- CA Natural Resources Agency
- CA Environmental Protection Agency
- CA Dpt. of Forestry and Fire Protection
- CA Air Resources Board
- State Board of Forestry and Fire Protection
- CA Dpt. of Parks and Recreation
- CA Dpt. of Fish and Wildlife
- CA Dpt. of Water Resources
- CA Ad Hoc Biomass Working Group
- CA Office of Emergency Services
- CA Wildfire and Forest Resilience Task Force
- Forest Business Alliance
- Governor’s Office of Land Use and Climate Innovation
- Joint Institute for Wood Products Innovation

FOREST HEALTH AND WILDFIRE RESILIENCE INFORMATION, SERVICE AND TECHNICAL ASSISTANCE PROVISION

- Audubon Canyon Ranch's Fire Forward Program
- Circuit Riders Inc.
- Coast Ridge Community Forest
- Conservation Corps. North Bay
- Fire Safe Councils
- Fire Safe Sonoma
- Gold Ridge Resource Conservation District
- Grey Tree Tenders
- Jobs with Justice
- LandPaths
- North Coast Resource Partnership
- Occidental Arts & Ecology Center
- Pepperwood Preserve
- Resilience Works
- Safer West County
- Santa Rosa Junior College
- Sonoma Ecology Center
- Sonoma Land Trust
- Sonoma Resource Conservation District
- University of California Cooperative Extension

FORESTRY SECTOR

- Atlas/Anvil
- Biswell Forestry
- Environmental Resource Solutions (ERS)
- Environmental Science Associates
- Falk Forestry
- Fred Euphrat, Forest, Water and Soil
- Hanford ARC
- Matt Greene Forestry and Biological Consulting
- Mountain Enterprises
- Ralph Osterling Consultants Inc.
- Roger Sternberg Forestry and Land Conservation
- Timberline Pacific Co.
- Various LTOs / Haulers

FEDERALLY AND NON-FEDERALLY RECOGNIZED TRIBES & EFFORTS

- Dry Creek Rancheria Band of Pomo Indians
- Cloverdale Rancheria of Pomo Indians
- Federated Indians of Graton Rancheria
- Heron Shadow
- Kashia Band of Pomo Indians of the Stewarts Point Rancheria
- Lytton Rancheria
- Mishewal-Wappo
- Ya-Ka-Ama

WOOD MATERIALS HANDLING / DISPOSAL

- Annapolis Transfer Station
- Daniel O Davis Inc.
- Grab N' Grow / Soiland Company
- Guerneville Transfer Station
- Healdsburg Transfer Station
- Republic Services
- Soil Management Co.
- Sonoma Landscaping
- Sonoma Transfer Station
- United Forest Products
- Windsor Material Transfer Facility
- Zero Waste Sonoma

PART 2: Stakeholders Engaged

The following individuals were engaged during the project and provided valuable insights. The project is grateful for their time and thought-leadership that helped guide recommendations in addition to the support provided by our Working Group, Consultants and Technical Advisors.

ORGANIZATION	FIRST NAME	LAST NAME
All Seasons Firewood	Glenn	Kantock
Atlas Tree Care	Rich	Kingsborough
Audubon Canyon Ranch	Sasha	Berleman
Blue Forest	Luke	Carpenter
Blue Forest	Phil	Saska
CAL FIRE	Chief Paul	Duncan
CAL FIRE	Kim	Sone
Coast Ridge Community Forest	Judy	Rosales
County of Sonoma (formerly CARD)	Barbara	Lee
County of Sonoma (formerly CARD)	Jaida	Nabayan
County of Sonoma (formerly CARD)	Simone	Albuquerque
Department of Conservation	Elizabeth	Betancourt
Dry Creek Rancheria Band of Pomo Indians	Lacie	McWhorter
ERS	Harlan	Tranmer
ERS	Patrick	Ziegler
Fire Safe Sonoma	Marika	Ramsdensen
Forest Landowner/Manager	Sashwa	Burrous
Independent Operator	Barton	Stein
J&L Palo Urbano	Jesse	Running
Kashia Band of Pomo Indians of the Stewarts Point Rancheria	Otis	Parrish
Kashia Band of Pomo Indians of the Stewarts Point Rancheria	Vaughn	Peña
Marin Wildfire Prevention Authority	Bruce	Goines
Mendocino Redwood Company	John	Anderson
Merlin Arborist Group	Merlin and Nicole	Schlumberger
Noble Bioresources	Dan	Noble
Permit Sonoma	Caerleon	Safford
Permit Sonoma	Robert	Aguero

PG&E	Kevin	Johnson
PG&E	Kevin	McKernan
Redwood Empire	Jesse	Weaver
Regional Climate Protection Authority	Tanya	Narath
Safer West County	Amy	Beilharz
Sandborn Tree Services	Matt	Bonchero
Soiland Inc.	Mark	Soiland
Sonoma Clean Power	Deb	Emerson
Sonoma Clean Power	Geof	Syphers
Sonoma County Economic Development Collaborative	Bradley	Johnson
Sonoma County, District 4	Supervisor James	Gore
Sonoma County, District 4	Chris	Grabil
Sonoma County, District 5	Supervisor Lynda	Hopkins
Sonoma County, District 5	Che	Casul
Sonoma Ecology Center	Eric	Schoos
Sonoma Land Trust	Chris	Carlson
Sonoma Land Trust	Joe	Plaugher
Sonoma Land Trust	Shanti	Edwards
Sonoma Public Infrastructure	Johannes	Hoevertsz
Sonoma Public Infrastructure	Rob	Houweling
Sonoma Resource Conservation District	Jason	Wells
Sonoma Water	Dale	Roberts
Sonoma Water	Susan	Hayden
Spatial Informatics Group (SIG)	Rob	Lawson
Spy Engineering	Michael	Zehr
State Parks	Ryan	Klausch
TALS	Bob	Ewing
TALS	Dee	Swanhuyser
TALS	Walter	Keiser
Tukman Geospatial	Mark	Tukman
UC Ag and Natural Resources / UCCE	Cindy	Chen
UC Ag and Natural Resources / UCCE	Haris	Gilani
UC Ag and Natural Resources / UCCE	Tori	Renae Norville
Watershed Research & Training Center	Martin	Twer

Watershed Research & Training Center	Nick	Goulette
Wildlands Conservancy	Luke	Farmer
WWF	Jason	Grant

Appendix D. Entity-Type Activity Scoring Matrix

SONOMA COUNTY WOOD RECOVERY & UTILIZATION PROJECT

POTENTIAL SERVICES TO BE PROVIDED BY ENTITY	Working Group Members ranked the following services on a scale of 1 to 5 with 5 being highly desireable. Numbers that averaged 4 and 5 were elevated to recommended services in the final study.													Average
General Organizational Structure														
- Develop a fee for service model for revenue generation	3	2	2	5	4	3	5	5	5	1	4	4	4	**4**
- Employ administrators, managers and other positions to execute services below	4	4	5	4	5	5	5	5	4	1	5	4	5	**4**
- Equipment purchasing / leasing (log haulers, flame cap kilns, mills, kilns, chip sorters, industrial bins, etc.)	4	5	3	4	5	5	5	2	3	1	5	2	3	**4**
- Real estate purchasing / leasing (Berry's Sawmill, aggregation sorting yards, administrative offices, etc.)	2	3	4	3	4	2	5	2	2	2	4	3	2	**3**
List any additional ideas/items in column "R"										5				
Landowner Engagement														
- Education and outreach	5	5	4	2	2	5	1	2	3	5	4	3	5	**4**
- Ensure cost reduction for shared services to contractors, loggers and haulers	4	3	3	3	3	5	5	5	4	1	3	3	3	**3**
List any additional ideas/items in column "R"										5				
Forest management planning and contracts														
- Support the continuity of a forest planning process that enables new markets to develop		5	5	5	5	5	4	3	4	2	5	4	5	**4**
- Support CEQA, NEPA, CAL VTP, Exemption filing	4	3	5	2	4	5	3	5	5	1	4	5	3	**4**
- Bundling contracts for services to reach better price points	3	4	4	4	3	5	4	5	3	1	4	5	4	**4**
- Workforce development training	4	2	4	2	5	3	5	5	4	1	5	4	4	**4**
List any additional ideas/items in column "R"										5				
Aggregation, storage, processing														
- Own/lease a mill, regional campus facility, aggregation sites	3	5	?	5	4	5	5	2	2	2	5	?	3	**4**
- Sorting, storage, chipping	4	5	4	5	4	4	5	5	4	1	5	4	5	**4**
- Primary processing (green lumber milling)	4	5	4	4	3	3	5	3	3	1	4	3	3	**3**
- Storage of material for existing and future businesses	5	5	5	5	5	2	5	5	4	1	5	5	4	**4**
- Energy generation to run facility, micro-grid energy storage	3	3	3	3	3	2	4	5	3	1	4	3	3	**3**
- Buy and sell biomass; enter into direct sales contracts; manage supply contracts between third parties	4	5	5	5	5	5	5	5	4	0	5	5	3	**4**
List any additional ideas/items in column "R"														
Market Development														
- Increase market buying and selling power for new product development	4	5	?	4	4	3	5	5	5	5	4	4	4	**4**
- Provide regional markets an ongoing analysis of market trends and workforce needs	4	4	5	5	4	4	4	5	5	0	5	4	5	**4**
- Bring in new grant dollars at a larger scale, including serving as fiscal agents	3	3	5	3	5	5	4	4	3	5	5	5	5	**4**
- Carbon sequestration valuation and carbon market creation	4	2	4	2	5	4	4	5	3	1	4	3	4	**3**
- Avoided cost calculations (wildfire, drought, etc)	4	4	4	4	4	4	4	5	4	0	4	4	4	**4**
- GHG emmission calculations	3	2	4	4	4	3	4	4	3	0	3	3	5	**3**
- Support new small wood and forestry-related businesses with tools to avoid long-term reliance on subsidies	3	5	3	5	5	5	5	5	4	5	5	5	5	**5**
- Advocate at the state and federal level to streamline regulations and permitting	5	4	4	3	4	3	4	2	2	5	5	4	5	**4**

Appendix E: EBalive Report. *Guidance for Resilience and Recovery*

Final Report

Prepared for the Sonoma County Office of Recovery and Resiliency

Guidance for Recovery and Resiliency Planning in Sonoma County Forest Ecosystems

By

EBalive

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Final Report

Prepared for the Sonoma County's County Administrator's Office, Office of Recovery and Resiliency
By EBalive

Introduction

This report provides recommendations and a summary of the work performed by EBalive under contract with the Sonoma County Office of Recovery and Resiliency in 2018. The purpose of the project and this report is to identify key leverage points for improving the health and resilience of forest (i.e., conifer, oak woodland and shrub communities) ecosystems relative to reducing wildfire hazards. The guidance will be integrated in adaptation planning for natural and working lands[1] in Sonoma and adjacent counties.

The Office of Recovery and Resiliency (ORR) was established by the Sonoma County Board of Supervisors (Board) to assist with recovery from the devastating wildfires of October 2017 and help chart pathway to enhanced resilience to withstand future disturbances including drought, flood, and wildfire. The Board adopted a Recovery and Resiliency Framework in December 2018 that affirmed the County's vision for recovery, including continued stakeholder involvement and organized around five strategic areas for action.

The framework's strategic areas for action are community preparedness and infrastructure, housing, economy, safety net services and natural resources. While a focus on the area's natural and working lands falls most clearly within the natural resources category, programs to manage, sustain and protect the area's forest, oak woodland, shrub, grassland and agricultural landscapes also contribute to all five of the strategic areas. Given the patterns of development and importance of the natural environment in Sonoma County, efforts to make landscapes more resilient in the face of disturbance will help protect life and property, improve preparedness and infrastructure, and add to the strength of the regional economy.

The EBalive project work was organized into four tasks: coordination with the Governor's Forest Management Task Force, outreach with key regional leaders, development of organizing and governance options, and an overview of ecosystem services economic values. To highlight what was learned during the project, this report covers:

[1] Forest' in this context is all of the major woody plant communities. 'Natural and Working Lands' spans all major land uses: agricultural, grazing, recreational, forest and woodlands, and their intrinsic ecosystem services.

Strategic recommendations and findings

Challenges facing Sonoma county and the region

Work completed by project task

An appendix

Strategic Recommendations and Findings

Sonoma and other North Bay counties have been at the forefront in developing integrated natural resource programs that address a combination of economic, social and environmental objectives. The county has seen the development of a number of governmental, non-profit, business and citizen programs to address environmental protection and natural resource management. The opportunity now is to build on this foundation and take the next step in response to the damaging wildfires, evidence of deteriorating forest and landscape health, and the growing effects of climate change and other stressors. The following recommendations provide guidance for further policy development and successful adaptation:

Strategic

1. Make the goal of natural and working land resilience a more explicit county and region wide priority

- Sonoma County's Recovery and Resiliency Framework is a call to action for the county as a whole. The Framework's natural resource goals and objectives appropriately identify several key initial actions and pilots as a place to start. But an explicit overall strategic intent for the entire geographic area must also be identified—as the threats, resource conditions, and the need for a programmatic response are current and county wide. These actions focus on the lands beyond and between structures, and are in addition to efforts for home hardening and creation of defensible space around property.
- The Framework positions the County as a leader working with other governments, the private and nonprofit sectors, and individuals to develop an adaptation strategy for the region's natural and working lands. Leadership will require adequately framing the challenges, acting at scale and with urgency, and focusing on the primacy of landscape resilience—a forward-looking goal that recognizes the interdependencies across people, nature and infrastructure.

2. Develop an organizational model that has the on-going financial and operational basis to attract public and private investments, compensate landowners and members, charge for services, attract employees and contractors, and create new wealth and economic returns for the region.

- Finding a way to create an organization or infrastructure that provides the necessary and sufficient conditions to support scale, county-wide management activity is a substantial challenge. But without such a system in place only incremental, place-by-place actions are likely to occur. Managing fuels, reducing forest stocking, utilizing prescribed fire, recovering and restoring degraded properties, protecting and conserving ecosystem and economic assets, all take money, equipment, knowledge and coordination across ownerships and among jurisdictions. A comprehensive institutional environment must be in place to create the synergies among these elements to gain the scale and wherewithal to do the job.

3. Empower landowners to implement solutions through a formal structure or organization—with membership available to other partners and collaborators

- Private and public forest and woodlands occupy more than half the county area, approximately 514,000 acres. Of this area, 87% is in about 16,000 relatively small private or NGO parcels (Figure 9). Public owners, primarily the County, are owners of the remaining area. To respond at scale to the job of building resiliency into these landscapes, both classes of owners must have the means to work together to address common management objectives, gain economies of scale and make the overall collective financially self-sustaining

Organizational

4. Explore various County options to establish a formal forest or landscape health organization

- Sonoma County's approach to managing natural resource and environmental systems has benefited greatly from innovative organizational models. Special district examples include the Agricultural Preservation and Open Space District and the Gold Ridge and Sonoma Resource Conservation Districts (RCDs). Formation of a district specifically focused on forest and landscape health goals could be an innovative conservation solution. Additional organizational and governance candidates include a coordinated network, a joint power authority, a legislatively created 'entity,' a marketing order, or a cooperative. All these options need to be evaluated against a set of operational principles including organizing, governance, financial management, value chain development, monetization of goods and services, public program and service delivery, regulatory compliance and bundling, best available science and expertise and staff.

5. Work to channel the delivery of public policies, programs and regulations through the organization

- There is a long-held understanding of the effectiveness of delivering public programs through so-called 'intervening structures.' Such structures are generally aggregations of constituents, clients, residents, or landowners. As noted, there are several key local natural resource and environmental organizations and civic groups that are helping with communication, implementation and feedback on the variety of land use, forest practice, environmental compliance and incentive programs. Leveraging public grant and incentive programs through these groups of can be beneficial both to for the agencies and the landowners. Pooling responsibilities for planning and permitting can allow greater flexibility and greater participation within the landowner community.
- Some of the policy changes in newly passed SB 901 build on this approach. Currently under Board of Forestry forest practice regulations, smaller landowners can qualify for nonindustrial timber harvest and working forest harvest plans that can streamline environmental approval. CALFIRE has also led pilot 'programmatic' CEQA reviews for vegetation management and forest health improvement projects across scale geographies.

6. Recognize that organizational effectiveness and sustainability must rest on a solid financial foundation

- There is an opportunity to establish a member organization that can generate the revenue required to underwrite the costs to landowners and to the broader community of supporting the treatment regimes. To be sustaining and develop a sufficient resource base, the organization must try to position itself to attract private and public investments, charge for services, underwrite landowner and member initiatives, attract employees and contractors, and create new wealth and economic returns for the region.

Treatments/Environmental Science

7. Develop a set of wildfire and climate-adaptive treatment regimes to guide local projects, experimentation and research

- Managing landscapes to improve resilience entails an understanding and review of a broad number of potential treatments, including a mosaic of landscape uses, open space and fuel breaks, house hardening and defensible space, managing forest stocking through thinning and prescribed fire, restoration and other environmental improvement practices.
- There is much to learn about which combination of treatments will create a resilient landscape. The end point is relatively clear—a landscape that is wildfire and climate adaptive and provides the goods and services that people want and need—but the path to get there will be one of trial and error and experimentation. The best approach is to move forward with a science-based, learn-and-improve process relying on monitoring, evaluation and timely decision-making and adaptive response.

8. Ensure that all programs and actions meet evolving environmental standards

- Threats to environmental health are largely human caused and solutions must address human and organizational behavior over time and their impacts on environmental quality. Current laws and regulations offer important protections, but most put an emphasis on minimizing short-term environmental impacts and at a project-by-project scale. This makes it difficult to pursue longer-term resilience goals on a programmatic basis over larger areas and multiple ownerships. Consideration of cumulative beneficial or adverse outcomes are less readily addressed in project-level environmental reviews.
- Even with the current level of governmental regulatory intervention, Sonoma county's forests are not thriving, and changes are needed to make them more resilient to drought, insects, disease and to raise their level of environmental quality. Forest volume has roughly tripled in the past five decades resulting in high-density, overstocked stands that are more susceptible to large and damaging wildfire and less productive in terms of forest growth, carbon sequestration and provision of watershed values.

9. Base adaptation strategy and practices on science, experimentation and programmatic learning

- Science is crucial to evaluating past and current conditions and informing decisions about how to foster a healthy and resilient landscape. Quality decision making is advanced by research on biological and physical processes as well as of socio-cultural systems and decision-frames. Such research on adaptive management forms the foundation for treatments on the landscape and how these treatments are linked to organizational and individual behavior.

Economics/Financial

10. Embrace the opportunity to develop a green enterprise sector providing jobs, capitalizing projects and creating new wealth throughout rural areas and the region

- Managing the landscape actively requires new green infrastructure to appropriately plan, harvest, move and process large amounts of vegetation and manage a planned landscape mosaic of natural and production lands. A work force with the necessary know-how and economic incentives needs to be developed to do the continuing work on the landscape. Natural resource and small business educational opportunities need to be enhanced to develop the needed labor force in sectors that have not been active for decades. Roads and bridges need upgrades to improve access. This new infrastructure will drive additional value to the ecosystem goods and services provided by rural landowners, enhancing the economic vitality or rural communities.

11. Find innovative ways to attract private capital to develop an appropriate infrastructure including facilities, technologies, equipment, expertise and labor

- Private capital will be needed to purchase equipment, expand physical and technological infrastructure, and to build and operate new processing capacity. Both institutional and impact investors are seeking to place money in projects that yield positive environmental (as well as financial) benefits. However, any organizational solution chosen will need to demonstrate sufficient scale and consistent flow of ecosystem services to attract and retain private investors.

12. Champion development of a value chain network that can successfully monetizes a full range of ecosystem and risk reduction services

- While economic research can provide compelling evidence for the value of ecosystem services, all too often such goods and services are not priced by the market, making it difficult for landowners to be fairly compensated for what they provide. Value chains exist already for ecosystem goods and services such as agricultural products, traditional wood products and carbon credits. Additional work must be done to develop market-based values for other goods and services such as: biomass, biodiversity, water quality and quantity, recreation and avoided costs (e.g., fire supression, fire-fighting, damages from fire or flood).

Challenges

The recent series of severe, damaging wildfires in Sonoma and adjacent counties have made paramount the need to address the health and resilience of the region's natural and working lands. Various governmental agencies understand this challenge and are adopting programs designed to make these lands more climate and wildfire adaptive. Fortunately, a sizeable number of non-governmental organizations, businesses, universities and individuals have also prioritized activity focused on landscape health. Perhaps most importantly with the memories of the Sonoma and Mendocino Complex fires still fresh, private landowners and members of the general public are increasingly aware of the connection between their safety and well-being and environmental conditions and threats.

Yet even with all this attention, a successful strategy to mitigate and adapt to the various drivers of landscape vulnerability and health is challenging to develop. Several dynamics have contributed to this situation, some historical, some projected, all needing to be considered when building solutions. Over the last 50 years the forest lands portion of the land area has been relatively stable (Figure 1). During this period, harvest has fallen significantly, and forest inventory has increased dramatically (Figure 2).

Historic inventory and harvest patterns

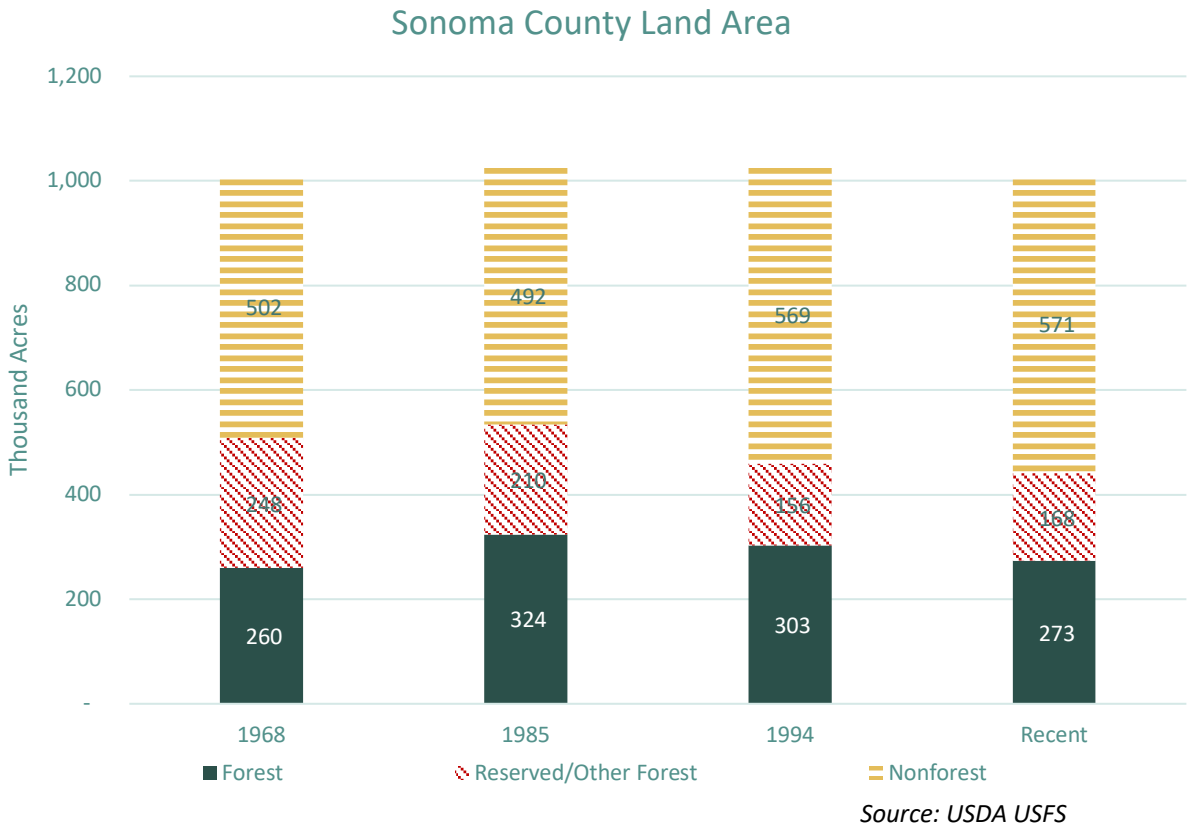

Figure 1. Sonoma County Land Area

Sources: (Metcalf, 1972) (Lloyd, 1986) (Waddell, 1996) (USDA Forest Service, 2017)

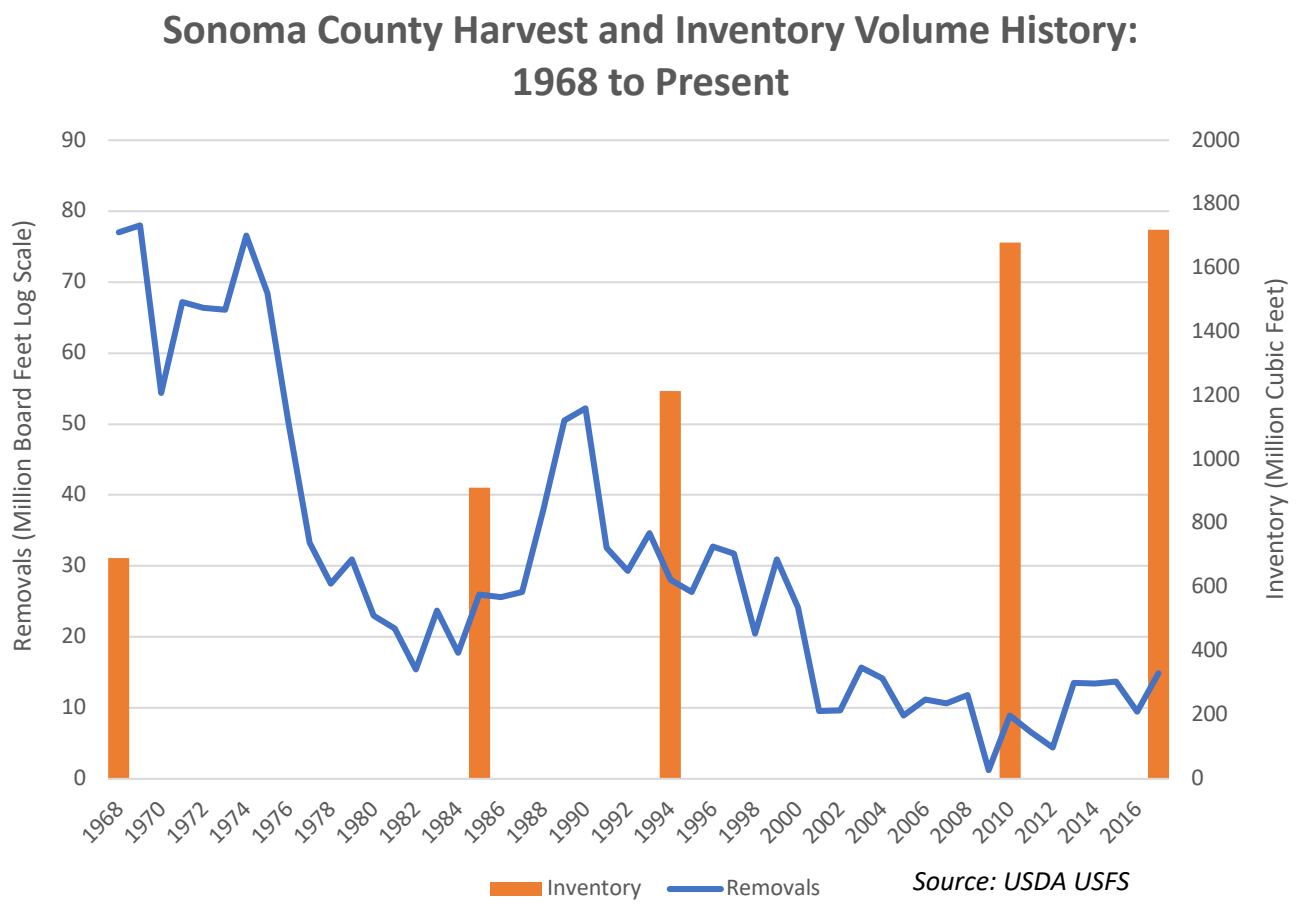

Figure 2. Sonoma County Harvest and Inventory Volume History: 1968 to Present (Metcalf, 1972) (Lloyd, 1986) (USDA Forest Service, 2017)

Sources: (Metcalf, 1972) (Lloyd, 1986) (Waddell, 1996) (USDA Forest Service, 2017)

Parcelization and Wildland Urban Interface

The small size of many privately-owned forest properties in Sonoma County and elsewhere creates unique management challenges. Such landowners acting alone are not in a strong position to move forward with plans to thin out unwanted vegetation or to engage in either traditional timber harvesting or conservation and restoration practices that require scale operations. As a result, forests on many properties can remain too densely stocked and less resistant to drought, insects, and wildfire. In this condition they increase potential hazards for their owners and neighbors. Continued development pressure in the WUI creates additional challenges in promoting forest health and resilience.

Fire suppression and primacy of human life and structural protection

Over the last 100 years, the well-intentioned policy of protecting human life and property by fire suppression has contributed to the build-up of fuel loads, large areas of stressed and dying forests and catastrophic wildfires. It will take some time to prioritize and restore forest lands to a more wildfire-adapted state, using tools such as fuel breaks, thinning and prescribed burning.

Homeowners also need to create defensible space and harden their homes against fire in order to limit the loss of life and property to the extent possible.

Work Completed by Project Task

California's Forest Management Task Force

The California Forest Management Task Force was created by the Governor's Executive Order B-52-18 to provide a high-level, unified focus to wildfire and forest health issues. The purpose is to drive collaboration across relevant agencies on wildfire, climate, public health and safety, ecosystems, water quality, land use, bioenergy and wood products—by addressing more specific management goals:

- Implement the recommendations of the California Forest Carbon Plan
- Strategically coordinate the state's investments in forest management to enhance forest health
- Minimize regulatory barriers for prescribed fire, forest health, and fuels reduction
- Expand the use of prescribed fire across public and private ownerships.
- Increase public education and awareness of the importance of forest health and resiliency to achieving California's long-term climate, watershed, wildlife, economic, and public health
- Encourage capacity building in forested communities to support implementation.
- Incentivize innovations in the forest product and building industries to utilize material from forest health and fuel reduction

The Task Force structure and organization is modeled closely on the Tree Mortality Task Force and the lessons learned from that group. Strategies related to wildfires, forest health and watershed management are being drawn largely from recent Brown Administration policy reports. The new Administration has issued EO N-09-15 directing CAL FIRE to lead the planning efforts. Key policy reports and advice to the new Governor are contained in the following reports: *California's Fourth Climate Change Assessment*; *Safeguarding California*; *California Forest Carbon Plan*; Legislative Analyst Office's *Improving California's Forest and Watershed Management;* Public Policy Institute of California's *Improving the Health of California's Headwater Forests*. Commonalities the reports emphasize:

- California is currently experiencing climate change and its effects will increase over the coming decades. These climate effects along with impacts from other human-driven activities include more wildfires of greater severity, a reduction in watershed functionality, and a decline in forest health and resilience.
- The State has adopted an impressive and reasonably comprehensive set of adaptation policies and programs to prepare for and respond to changing conditions and to attempt to build resilience into human, natural and infrastructure systems. However, the scale and pace of actions recommended is substantial and progress must be carefully assessed and accordingly adjusted and augmented.

- There is recognition that a successful overall strategy must include actions at the state, regional, and local levels. Many of the programs to build resilience in people, communities and natural systems will need to be implemented by local government decision makers.
- A number of federal and state regulatory; cost-share, grant and incentive; technical assistance; and market development and infrastructure investment programs are available to local government entities. However, the competition, time to process, and bureaucracy associated with each program create a significant barrier to effective deployment.
- Strong endorsement for the use of prescribed burning, managed wildfire, and mechanical thinning of overstocked stands as means to improve forest health, make forest more climate-adaptive, and lessen the risk of catastrophic wildfire.
- The importance of collaborative organizational structures to deal with multi-jurisdictional, scale, funding and associated requirements are lighted touched on. The PPIC report does recommend consideration of public/private organizations such as special districts.

In addition, the State Legislature has given specific direction to CALFIRE and the State Board of Forestry to advance currently mandated policies for land use, fire protection and forest practice regulation. The most important directives are in SB 901.

- Clarification in statute that multiple landowners may participate in a single working forest management plan that is located within a single watershed. But the acres of a single WFMP is reduced from 15,000 to 10,000 acres and a revision to timing of disclosure for certain types of erosion control sites
- Clarification that multiple owners may participate in a single nonindustrial timber management plan and that a single plan may not exceed 2,500 acres.
- Revised statute to effectively increase the pace and scale of fuel hazard reduction efforts on state and private lands through providing regulatory relief to small timberland owners and substantially revised forest fire prevention exemption.
- Expands the Board of Forestry's existing regulatory framework for State Responsibility Area to Very High Fire Severity zones within Local Responsibility Areas. Requires the Board to update regulations for greenbelts and fuelbreaks to increase community perimeters and increase protection from wildland fire
- Requires the Board to develop criteria for and develop list of 'fire risk reduction communities.'

Currently under Board of Forestry forest practice regulations, smaller landowners can qualify for nonindustrial timber harvest and working forest harvest plans that streamline environmental approval. CALFIRE has also led a few pilot 'programmatic' CEQA reviews for vegetation management and forest health improvement projects. If these provisions could be extended to a county-wide association of landowners, the ability to treat lands effectively would be enhanced.

Discussions have been held with a number of individuals knowledgeable about and committed to finding solutions to Sonoma's forest health challenges. Talked with County and State officials and staff; representatives from landowner groups, wine sector, farm bureau and real estate; professional foresters; researchers, scientists and journalists; and members of non-profit, special district and environmental groups.

Outreach with Key Regional Leaders

Table 1: Key Leaders

NAME	AFFILIATION
David Ackerly	UC, Berkeley
Henry Alden	Gualala Redwoods (retired)
Bob Anderson	Consultant
Harold Appleton	Consultant
Kim Bachelder	Sonoma Open Space District
Roger Burch	Redwood Empire
Tosha Comendant	Pepperwood Preserve
Bob Cooley	Landowner
Caitlin Cornwall	Sonoma Ecology Center
Anne Crealock	Sonoma County Water Agency

Arthur Dawson	
Steve Dutton	Dutton Ranch
Helge Eng	Cal Fire
Fred Euphrat	Landowner
Karen Gaffney	Sonoma Open Space District
James Gore	County Supervisor
Matt Greene	Forester
Caryl Hart	Public Official
Susan Haydon	Sonoma County Water Agency
Russ Henley	CA Resources Agency
Lynda Hopkins	County Supervisor
Jay Jasperse	Sonoma County Water Agency
CJ Johnson	Landowner
William Keene	Sonoma Open Space District
Nick Kent	Redwood Empire
Walter Kieser	Economic and Planning Systems
Tony Korman	Consultant
Karissa Kruse	Sonoma County Winegrowers
Stephanie Larson	UC Cooperative Extension
Alan Levine	Coast Action Group
Brian Ling	Sonoma County Alliance
Lisa Micheli	Pepperwood Preserve
Ben Nicholls	CALFIRE
Christy Pichel	Center for Effective Philanthropy
Jennifer Potts	Audubon Canyon Ranch
Valerie Quinto	Sonoma Resource Conservation District
David Rabbit	County Supervisor
Peter Rumble	Santa Rosa Metro Chamber
Carleone Safford	Fire Safe Sonoma
Bill Stewart	UC, Berkeley
Cordel Stillman	Sonoma Clean Power
Steven Swain	UC Cooperative Extension
Genevieve Taylor	Ag Innovations
Dennis Thibeault	Mendocino Redwoods
Jennifer Gray Thompson	Rebuild North Bay
Carolyn Wasem	Jackson Family Wines
Nick Wobbrock	Blue Forest Conservation

Some preliminary learnings:

- There is strong support for a scale, comprehensive solution for forest and landscape resiliency but there is recognition that the odds of making it happen are long and the right path forward is in question.
- Many people want to first try to expand the mandate and operations of existing entities, districts and programs. Yet when leaders from these organizations are asked about such expansions, their answers are generally that they are not equipped to take on the full range of functions.
- Recognition that leadership is necessary to better align myriad efforts to get on top of forest sustainability. There is openness to and understanding of necessity of building a large and diverse (government, citizen, environmentalist, business, non-profit) coalition.
- Some discomfort in jumping immediately to forest health district solution. Encouragement to first work with open space and resource conservation districts and others.
- Differences of opinion in how best to intervene in natural and working forest systems—i.e., use of timber harvesting, fuels management, aggressive restoration programs, 'fuel break mosaics,' and prescribed fire to create a climate-adaptive forest landscape. Important to work through options, benefits and consequences and to thoroughly addressed criticisms and questions.

Organizing Options for Key Partners and Private Landowners

Several dozen national, state and regional agencies and organizations have become involved with efforts to support mitigation and adaptation plans for Sonoma and adjoining counties. Effectively engaging these entities is critical in building a successful strategy. In addition, given that roughly 85 percent of Sonoma's forestland base is owned privately by more than 16,000 landowners, any successful strategy must empower broad landowner response and actions. These landowners, and the organizations and agencies that serve them, need to act cooperatively to successfully address opportunities and threats operating at larger scales and across property and jurisdictional boundaries. The County can look to a number of organizational and governance models that can improve longer-term landscape planning approaches. Potential options for consideration include a coordinated network, a joint power authority, a special district, a legislatively credit 'entity,' a marketing order or a landowner and partner-based cooperative.

To judge potential effectiveness and fit, these options need to be evaluated against a set of operational principles or criteria, including:

- effective organizing,
- governance,
- financial management,
- monetization of ecosystem goods and services,
- attraction of private investment and capital
- public program and service delivery,

- founded on best available science, and
- regulatory compliance and bundling

Coordinating Network

There is already a good deal of coordination and joint planning and delivery of programs in Sonoma county. The County Office of Recovery and Resiliency is designed to have a lead organizing role and progress is being made with significant movement in terms of pilot project initiation and development of information systems. The Office has recently kicked off a comprehensive campaign to increase the pace, scale and effectiveness of management on public and private forestland to reduce wildfire hazards, benefit life and safety, improve ecosystem services, and generate landscape resiliency. The intent is to foster a 'network of networks' pursuing aligned and connected efforts at local and regional scales.

This effort will be foundational to any more formal organizational effort. But it can only go so far to address the full range of operational requirements. First, the campaign is primarily relying on a set of traditional tools--regulation, incentives, extension, training and education—that have had important but limited success over time. Second, this approach alone does not meet the requirements of attracting private capital and investment, bundling of services and regulatory compliance, monetization of ecosystem goods and services, nor substantially lowering operational costs for individual landowners.

Joint Power Authority

One step the County could take to advance the operational platform for improving landscape health and reducing the risk of damaging wildfire is to form a new Joint Power Authority (JPA). This was an approach taken to form Sonoma Clean Power, Sonoma County Waste Management Agency and Sonoma County Library Commission. Such a move could provide more focus, additional resources and a clarity effort to the job.

The Joint Exercise of Powers Act governs the establishment and operation of JPAs. Agencies can only form a new entity that are common to the member agencies, so it becomes critical to determine exactly what service needs the JPA would address. But importantly, a JPA can charge for services, operate like a business, issue revenue bonds, and develop alternate financing mechanisms. And federal and state government units and federally recognized Indian tribes may voluntarily agree to participate in activities of a JPA. The JPA establishment document sets out the governance structure of the new entity including the size and composition of a governing board. Typically, the board consists of officials from the member agencies, but there is no strict requirement regarding board composition and no requirement that board members be elected officials.

Special District

Sonoma County's approach to managing natural resources and environmental systems has benefited greatly from four special districts: the Agricultural Preservation and Open Space District, the Sonoma Resource Conservation District, the Gold Ridge Resource Conservation District, and the Sonoma County Water Agency. Formation of a district specifically focused on forest and landscape health goals could provide an innovative solution to the many natural resource management and protection challenges Sonoma faces.

Such districts can function in a manner similar to a utility or similar district: land is privately owned, but decision making can be shared and supported among all landowners in the district. This model could be used to bring public, private, and other landowners and managers together to set and pursue forest health and resilience goals at larger scales. All parties would benefit from economies of scale that come from planning forest management over larger spatial areas. Planning for larger areas can cost much less on a per unit basis than developing forest management plans for smaller areas. Likewise, stand thinning and tree removal activities may be more profitable when plans can be developed over larger areas, and are more likely to attract necessary investments in infrastructure and processing or biomass plants. Equally important, wildfire and insect outbreaks could be collectively addressed across property boundaries, overcoming the common problem that poor management by one landowner may have adverse impacts on neighboring landowners as well, while good management will bring benefits. Forest health districts could help ensure that all landowners are in a position to deploy the best practices for improving watershed management, linking habitats across ownerships and creating fire safe corridors and fuel breaks.

Special districts are local government agencies that provide public infrastructure and essential services, including but not limited to, water, fire protection, recreation and parks, and garbage collection. Since California became a state in 1850, voters have established over 2,000 independent special districts to meet their local needs. Special districts can serve large regions or small neighborhoods based on need, and they are governed by board members elected from their local communities or appointed by other voter-approved local bodies. They have corporate powers, so they can hire employees, enter into contracts, and acquire property. Within constitutional limits, they can also issue bonds, impose special taxes, levy benefit assessments, and charge service fees.

There are two basic types of special districts—non-enterprise and enterprise districts. Non-enterprise districts are funded primarily through property taxes and assessments. They provide services that do not lend themselves to fees. For example, fire protection services are provided to all residents and benefit the community as a whole. Enterprise districts are funded primarily through fees for services. For example, water districts charge their constituents fees for water delivery and health care districts, which can operate hospitals, charge patients for room fees.

Enterprise districts rely less on property tax revenue as compared with non-enterprise districts. However, property tax revenue is often an important source of funding for enterprise districts.

Likewise, non-enterprise districts may derive some revenue from fees. For example, a recreation and park district may charge a fee for joining a district-run soccer league.

A great deal of work and resources are required to form a special district and entering into this process should not be done lightly. The long-term success and sustainability of a district requires careful, detailed planning and purposeful execution. Each community deserves the best possible quality of service, delivered in the most efficient manner at the most affordable cost. Once a district is formed, it is up to its board, its staff, and the public to ensure its success.

Forest health districts seem likely to be able to be established under existing state law authorizing special district formation. In the absence of state action, it may be possible for individual landowners to form a cooperative that brings some of the same benefits. Establishing such a cooperative can be challenging from within the landowner community alone. Support from outside groups such as NGOs and other agents can be very helpful to a formation effort.

Legislatively Created 'Entity'

There is a question as to whether current statutory authority exists to authorize formation of a forest health district. State legislation may be needed to authorize the County and property owners to move forward with such a plan. In addition, there is discussion in Sacramento about the need for the State to create the authority for establishment of a legal structure or organization of some form to meet forest health and wildfire management requirements California-wide.

Marketing Order

Another suggested organizational model that may be available for forestry application is a marketing order. California marketing orders are authorized by the California Agricultural Marketing Act of 1937. The provision has been extensively used by the state's agriculture community for a wide range of commodities. Permitted are programs for advertising and promotion, research, the prohibition of unfair trade practices, product inspection, stabilization pools and the regulation of grades and standards. An order must be approved by a majority of the producers within a sector. Once established, an order is binding on all producers.

Marketing orders have never been deployed for forest products but may be worth consideration. Such an entity could provide scale and the ability to jointly market forest products across individual landowners and producers. Even more challenging would be to expand the definition of forest products to include new wood products and the full range of ecosystem goods and services—but this could be a mechanism for bundling and pooling watershed values, carbon credits, easements and various resiliency benefits.

Landowners Cooperative

Structured cooperation among private landowners could address the majority of requirements facing the larger landowner community. In the absence of, or in lieu of, governmental action, an independent landowner-based organization has merit. It may be possible for individual landowners to form a cooperative that brings some of the same benefits. Establishing such a cooperative can be challenging from within the landowner community alone and as a result the inclusion of other partners and stakeholders would be key.

The cooperative model has been successful in agricultural sector by increasing the achievement of individual goals while maximizing benefits in the marketplace and on landowners' properties. But historically this model has had very limited success in forest because the landowner objectives are most often individualistic and diverse and products coming off the forest happen over years and not annually.

A cooperative is an organization that is owned and controlled by members, who use products, supplies and services. Cooperatives can vary in particular purpose, but share a common fact: Cooperatives are formed to meet specific member objectives, and adapt structurally to the changing needs of members. Co-op benefits may include better prices for goods and services, improved services, and dependable sources of inputs and markets for outputs. Most cooperatives also realize annual net profits, all or part of which are returned to members in proportion to their patronage (thus, they are aptly called patronage refunds). Cooperatives can also return a portion of their profits as dividends on investment. In the United States, however, federal and most state statutes set an 8 percent maximum on annual dividend payments. The purpose of these limits is to assure that the benefits of a cooperative accrue to those who use it most rather than to those who may have the most invested.

Members join cooperatives to get services otherwise not available, to get quality supplies at the right time, to have access to markets or for other mutually beneficial reasons. Acting together gives members the advantage of economies of size and bargaining power. They benefit from having these services available, in proportion to the use they make of them. Members also benefit by sharing the earnings on business conducted on a cooperative basis. When cooperatives generate margins from efficient operations and add value to products, these earnings are returned to members in proportion to their use of the cooperative. Without the cooperative, these funds would go to other middlemen or processors.

Initial Fit Analysis

Adoption of any of these organizing models could add capacity to County programs designed to accomplish resiliency goals. Most programs currently focus on landowners one-by-one and generally are only in contact with landowners who ask for assistance, or have complaints lodged against them. By orienting program outreach through a district or cooperative structure, the County has the potential to reach many landowners with a single contact. On the regulatory

compliance side, a programmatic option for compliance through an organizational structure would be less costly for individual landowners and add administrative efficiencies.

Table 2 summarizes the relative fit of the various models against several criteria:

- A coordinating network would be foundational to the establishment of the other models but functionally would be limited to a traditional set of programs. It would do little to help landowners with costs and would be unlikely to attract any additional private capital investment.
- A JPA would allow the County to provide specific services to landowners by acquiring land treatment equipment, investing down the value chain, and bundling projects to provide scale benefits.
- Special districts, depending on how they were structured, could raise the importance of forest health as a County goal and public a good. The district could also generate improved services and economies of scale.
- A landowner cooperative or marketing order would allow landowners the most control over their collective activities and satisfy the highest number of functional requirements.
- From a value generation and cost control perspective, the more 'business-like' organizational structures would provide the largest benefits.

	Leader(s) and Key Members	Landowner Involvement	Ease of Formation	Functions	Public Policy Role	Private Investment and Business	Revenue and Cost Economies
Coordinating Network	County, CALFIRE	Low	High	3 -	Low	Low	Low
Joint Powers Authority	Agencies	Low	Medium	3 -	Medium-Low	Low	Medium – Low ?
Special District	District	Medium	Medium-High	6 +	Medium	Medium	Medium -High
Legislative-Created 'Entity'	?	?	Low	?	?	?	?
Marketing Order	Landowners, Producers	High	Medium	6 +	Medium - Low	Medium - High	Medium - High
Cooperative	Landowners	High	Low	7	Medium	Medium-High	Medium - High

Table 2. Relative Fit of Organizational Structures

Note: Qualitative evaluation based on discussion with stakeholders in Sonoma county. A "low" rating suggests less favorable circumstances while a "high" rating indicates more favorable circumstances.

Application of Ecosystem Service Economic Values and Metrics

Ecosystem Goods and Services

The UN Millennium Ecosystem Assessment provides a useful means to categorize and measure ecosystem services. The 4 major types of ecosystem services (with examples) are:

Figure 3. Types of Ecosystem Services

These ecosystem services support the health and well-being of the residents of Sonoma county.

A landowner-based organization could plausibly generate about $25 million/year from private forest lands, if values in addition to standing timber (biomass, carbon credits, watershed values and avoided costs) are monetized.

Ecosystem Service Valuation Framework

The focus of this work begins with an inclusive framework to illustrate the range and diversity of goods and services, and then confines our discussion to the forest and woodlands of Sonoma County as an initial case for monetizing in relation to forest fuel management. The focus areas are outlined by the box in the figure below.

Natural and Working Land Use Types	Product/Service								Land Value
	Ag	**Wood Products**	Bio-mass	Carbon	Watershed	Recreational/ Cultural	Easements	Avoided Cost	
Conifer: Douglas-fir		X	X	X	X	X	X	X	X
Conifer: Redwood		X	X	X	X	X	X	X	X
Conifer: Other			X	X	X	X	X	X	X
Deciduous Woodland: Oak	X		X	X	X	X	X	X	X
Evergreen Woodland: Tanoak/Laurel	X		X	X	X	X	X	X	X
Woodland: Other			X	X	X	X	X	X	X
Agriculture	X		X	X	X	X	X	X	X
Vineyard	X			X	X	X	X	X	X
Grassland	X			X	X	X	X	X	X
Chaparral/Shrubland			X	X	X	X	X	X	X
Urban/Suburban				X	X	X	X	X	X

Figure 4. Ecosystem Service Valuation Framework

Value Propositions

Value propositions Identify clear, measurable and demonstrable benefits consumers get when buying a particular product or service. In the case of ecosystem goods services, some are priced in the market, while others are not. For a forest landowner, the value of standing timber depends upon the size, species and quality of the timber to the buyer, and their timber competes against other available supply. Other ecosystem goods and services, e.g., forest biomass, do not have an active market in Sonoma county, and are thus difficult to price. Enhancing landscape resilience requires us to adjust how we consume and pay for ecosystem services.

Value Chain

The value chain is a concept which deconstructs the value of goods and services into their component parts. For example, construction demand drives the demand for lumber which determines how much a sawmill can pay for logs, and thus how much a logger can pay the landowner for standing timber. As noted above, ecosystem goods and services do not often have market values. There is not an active market for biomass, watershed values, outdoor recreational values or for the costs of avoiding catastrophic fires.

Economics of Forest Lands

Sonoma County contains some 400,000 acres of privately held forest lands. The section describes the likely economic values that can be realized from these lands.

A landowner-based organization could generate about $25 million/year from private forest lands, if values in addition to standing timber (e.g., biomass, carbon credits, watershed values and avoided costs) are monetized. The contribution from each good/service is shown below.

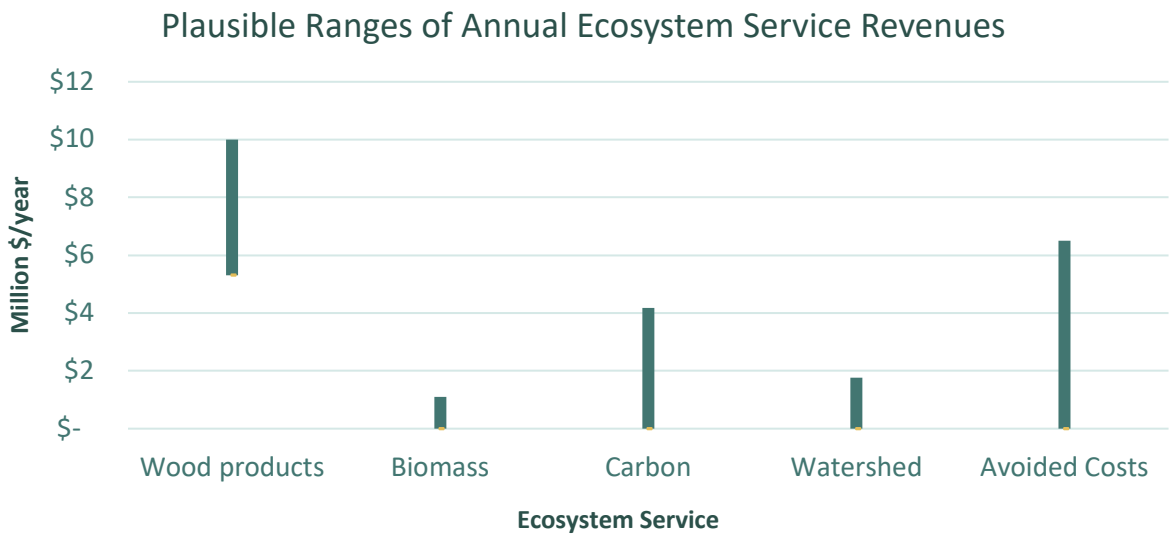

Figure 5. Plausible Ranges of Annual Ecosystem Service Revenues

Traditional Wood Products

Harvest for traditional wood products (logs) in Sonoma county has varied between 10-15 million board feet (MMBF) annually over the past few years. Prices for logs vary with the market. Recent prices for standing trees have been $450-$550/MBF on average.

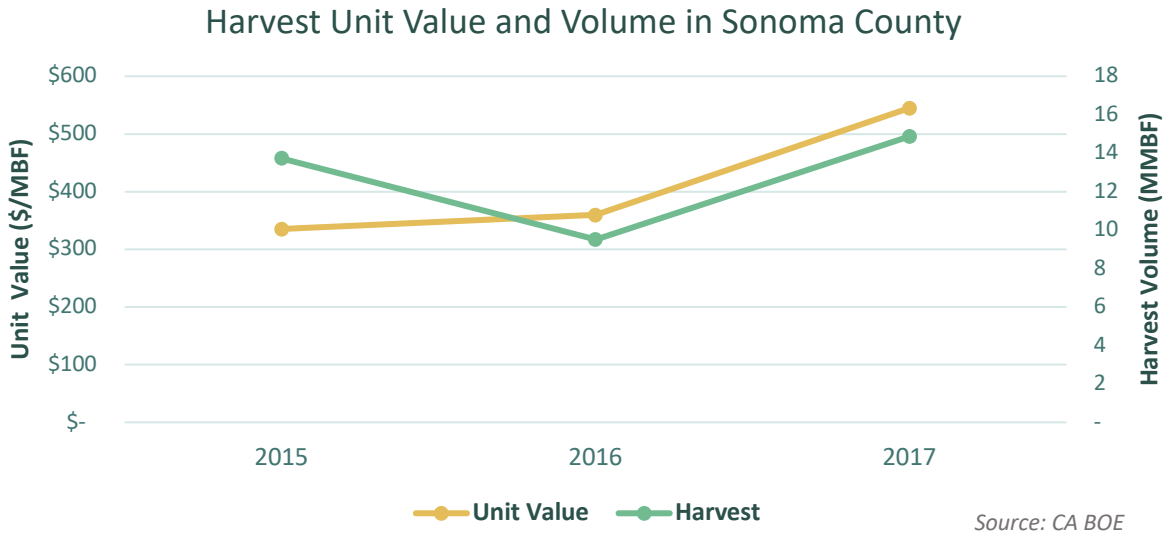

Figure 6. Harvest Value and Volume in Sonoma County

More harvest for wood products is possible in Sonoma county. Volume growth far exceeds current levels of removal. If removals were to double from recent levels (still well below current growth), assuming a price of $400/MBF, more than $5 million/year in additional revenue would be generated, totaling some $10 million/year.

Biomass

Much of the woody material in the forest is not suitable for use in solid wood product processing facilities (tree tops, branches, parts of stems not meeting merchandising specifications). Such material is typically referred to as biomass. Biomass does have potential to serve as a feedstock for energy products, such as liquid transportation fuel, wood pellets, material for direct combustion or for biochar. For example, biomass is used to generate electricity in Sweden.

The demand for biomass will be driven by the end-use products which can be made from biomass e.g., electricity, liquid transportation fuel or biochar.

The economics of using biomass for energy products is challenging. Biomass products must compete with other energy alternatives (e.g., fossil fuels, wind, solar). The costs of producing electricity from combustion using biomass have been higher than the alternatives and may well require some subsidy in order to incent customers to purchase these products. In addition, it would require private capital investment in a facility, in equipment, infrastructure.

Microwave assisted pyrolysis is a technology under development which holds promise. This technology produces liquid transportation fuels from biomass, and the processing equipment can be mounted onto a mobile trailer, greatly reducing the production carbon footprint. The technology and the economics of production are still under development.

The market size for biochar is unknown, but likely to be at too small of a scale to be of consequence.

There are substantial volumes of tanoak in Sonoma County. There is no current local commercial use for wood from tanoak at scale. The risk of wildfire in forests can be reduced by thinning out the volume and reducing fuel loads. According to the US Forest Service data, volumes in tanoak forest types are increasing by about the equivalent of 150,000 bone dry tons (BDT) of biomass per year. By taking only about 50% of that volume, or 87,500 BDT/year, one could source a 10 MW electrical generation facility. At a delivered cost of $50/BDT, after accounting for harvest and transport costs, the biomass raw material used to source the facility could generate $875,000/year for a landowner-based organization. Several significant challenges, including securing customers for the electrical power at potentially above market rates, capital for the facility, attracting contractor capacity and road upgrades would need to be overcome for this to be a success.

Carbon Credits

The private forests of Sonoma County contain a substantial amount of carbon, some 17-18 million tons aboveground (USDA Forest Service, 2017).

Carbon credits currently do have an active market in California. Recent data indicates prices at about $13/ton CO2e (1 ton C = ~ 3.67 tons CO2e). Realizing the value from carbon credits is challenging due the way carbons credits are calculated. Typically, a ton of carbon is recognized a creditworthy if it is considered "additional." That is, it needs to be created by managing your forest differently from a "business as usual" case, so the owner must do something in addition to business as usual to achieve recognition for that incremental ton. Carbon accounting is challenging and complex, so any estimate of value will contain many assumptions. Just to dimension what might be possible, we assume here that 0.5% of the carbon inventory generates credits. At $13/ton CO2e, that generates about $4 million/year.

Watershed

The private forests of Sonoma County provide substantial ecosystem services through watershed protection, water supply and water quality, and preservation of biodiversity. Using costs from the Yuba City Water Agency project to improve water quality and quantity, a landowner organization could receive $2 million/year using conservative assumptions .

Avoided Costs

By managing the forest for health and resilience, landowners should be reducing the wildfire risk to forest lands in the county. Examples of benefits to be accrued by a landowner-based organization over time include the values of lower fire suppression costs, reduced fire-response costs and lower insurance rates (associated with less property loss pay-outs).

The costs resulting from the October 2017 Tubbs fire provides a way to dimension the avoided costs. Property loss was estimated at $1.2 billion. Fire suppression costs were estimated at $100 million. If such a fire were to occur every 40 years, that works out to $32.5 million/year. Thus, if managing land differently avoids the losses from such a fire, a $32.5 million/year benefit is realized. If the landowner organization received 10% of the annual benefit, $3.25 million of funding would be made available.

Summary

The private forest lands of Sonoma County can plausibly provide $25+ million/year in compensation to a landowner-based organization from ecosystem goods and services. Several challenges remain in enabling the realization of the values.

Appendix

Baseline Forestland Inventory and Product/Service Flow Potential

Sonoma County has over 1 million acres of land area, about 52% of that is forest.

Land Use	Acres
Forest: Douglas-fir	112,586
Forest: Redwood	104,168
Forest: Oak	187,428
Forest: Tanoak	42,001
Forest: Other Conifer	19,013
Forest: Other Hardwood	76,376
Grassland	280,290
Shrubland	42,161
Urban/Suburban	70,508
Vineyard	62,930
Other Ag/Other	50,712
Total	1,048,173

Table 3. Sonoma County Land Area by Land Use Type (Tukman, 2018)

Forestland Inventory

The vast majority of the forestland acres and volume in Sonoma County are privately owned.

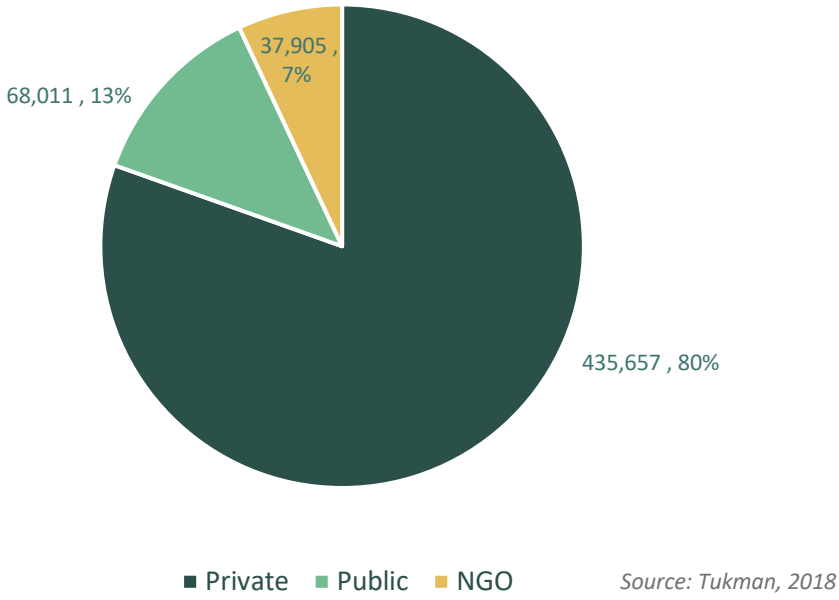

Figure 8. Forestland Acres in Sonoma County by Owner Type

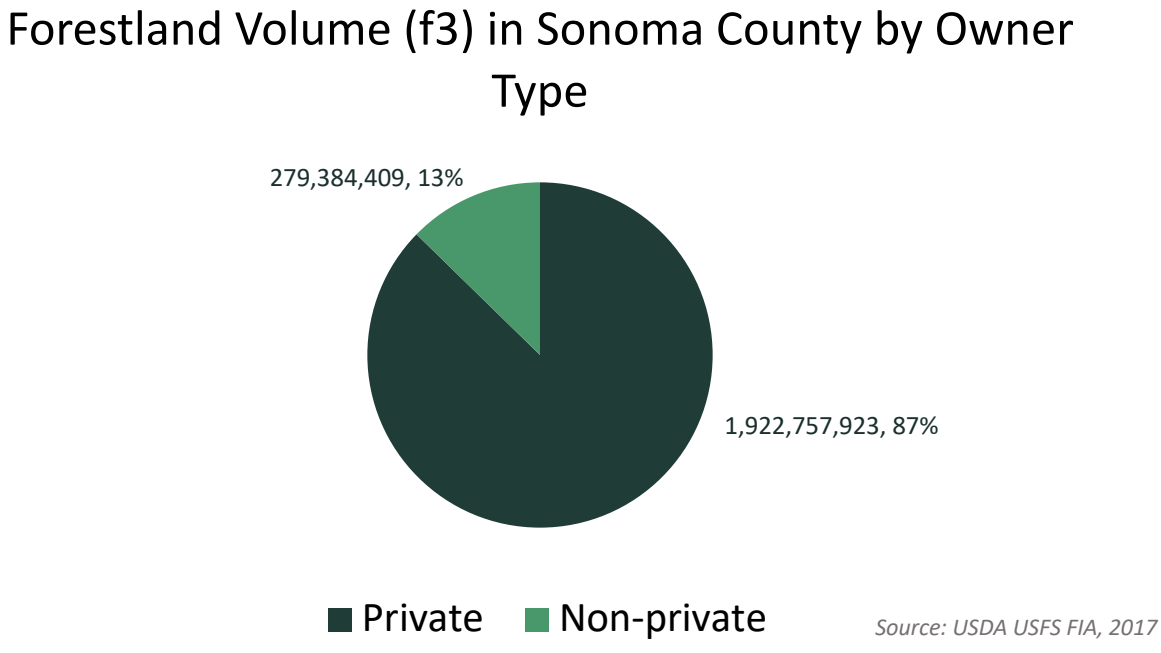

Figure 9. Forestland Volume in Sonoma County by Owner Type

Most of the forestland volume on private land occurs in 4 major forest types:

1. Douglas-fir
2. Redwood
3. Oak
4. Tanoak/laurel

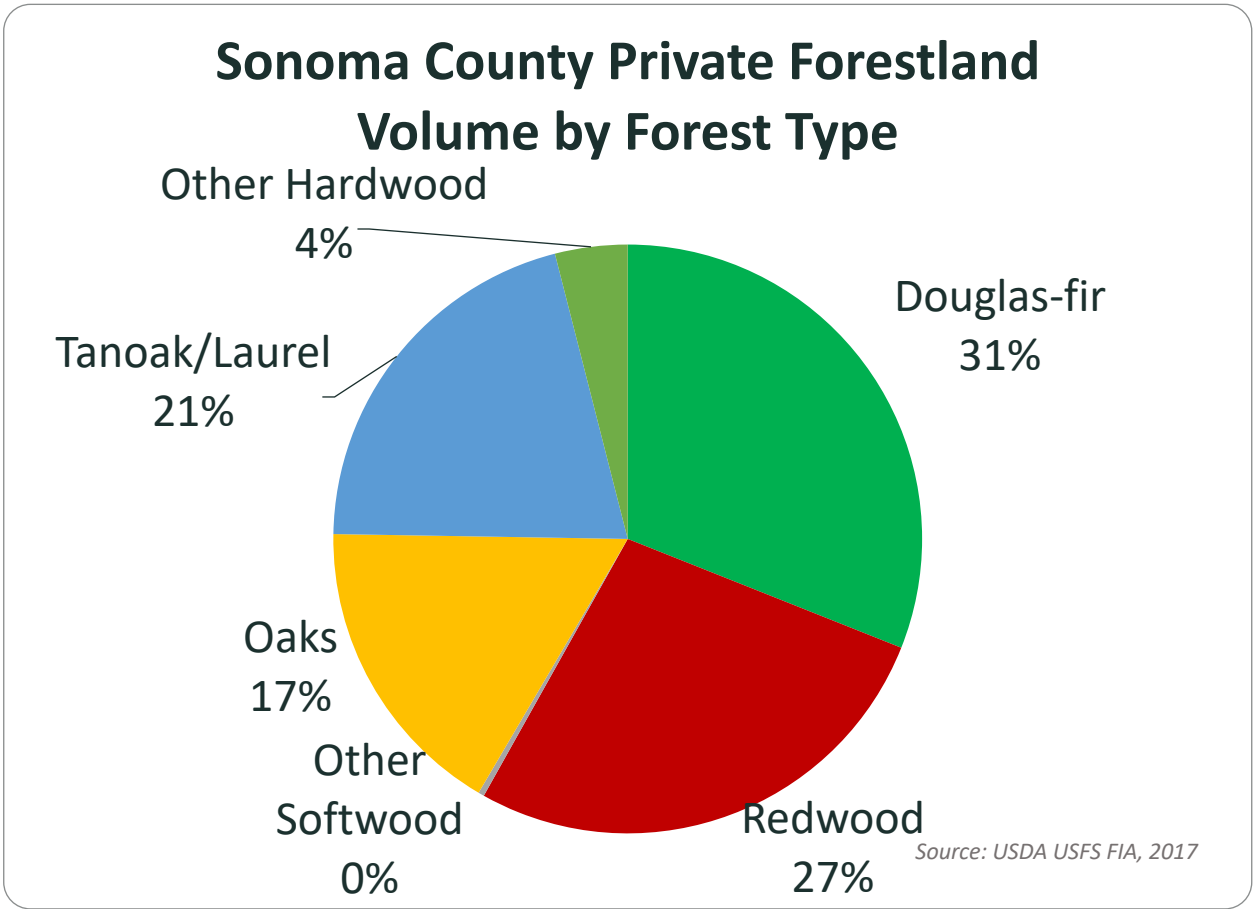

Figure 10. Sonoma County Private Forestland Volume by Forest Type

Carbon Inventory

The vast majority of the carbon inventory in Sonoma County private forestlands exhibit a pattern similar to the inventory volume.

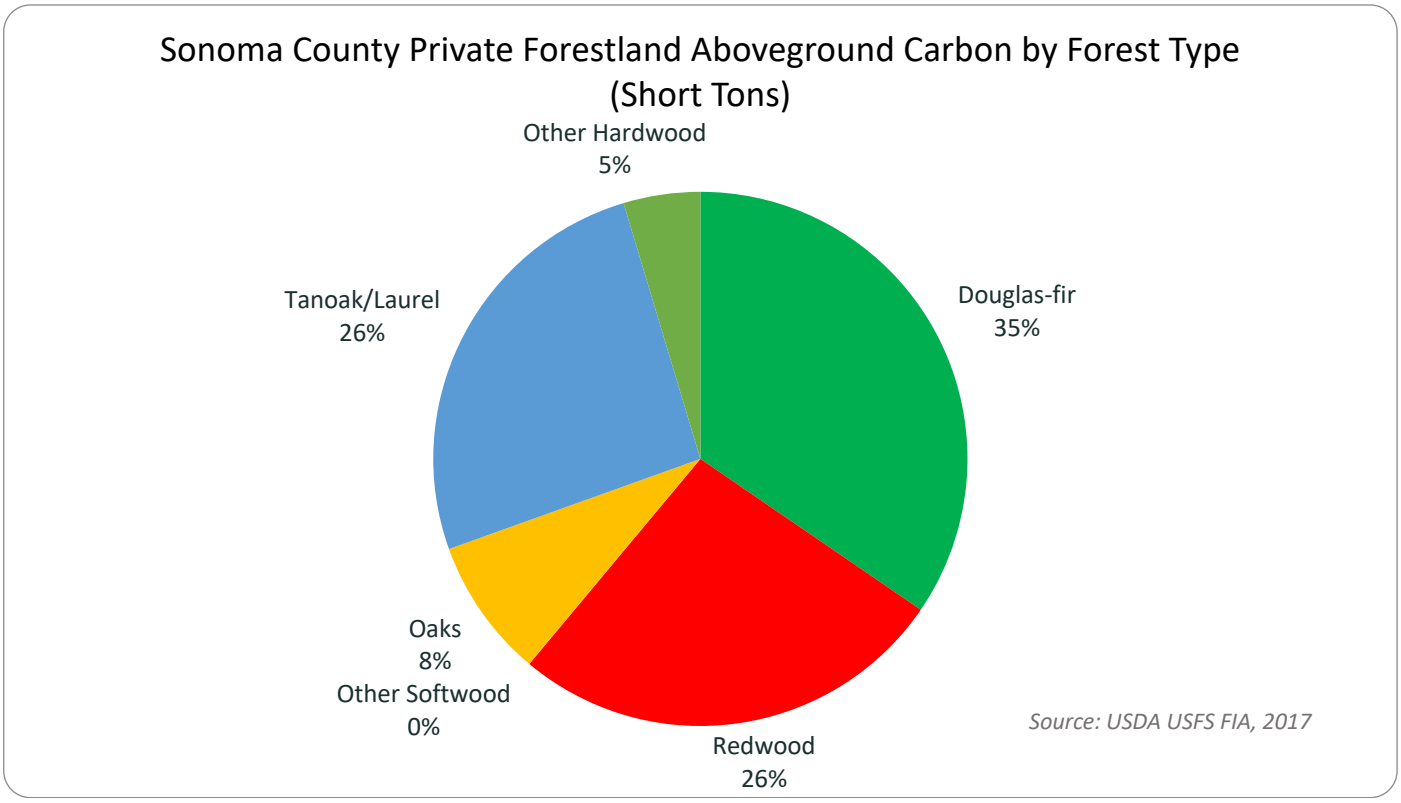

Figure 11. Sonoma County Private Forestland Carbon Inventory by Forest Type

Product/Service Flow Potential

There are 7 basic potential product/service flows used for estimating economic values of lands:

1. Volume flow for wood products
2. Biomass volume flow
3. Carbon credit services
4. Watershed health services
5. Recreational/Cultural
6. Easements
7. Avoided cost services (e.g., fire suppression, insurance, etc.)

For the purposes of this analysis, there are 6 forest/land use type to consider:

1. Douglas-fir
2. Redwood
3. Other Conifer
4. Oak

5. Tanoak/laurel
6. Other hardwood

The different forest and land use types have varying opportunities to provide products and services as shown below:

Natural and Working Land Use Types	Product/Service								Land Value
	Ag	**Wood Products**	Bio-mass	Carbon	Watershed	Recreational/ Cultural	Easements	Avoided Cost	
Conifer: Douglas-fir		X	X	X	X	X	X	X	X
Conifer: Redwood		X	X	X	X	X	X	X	X
Conifer: Other			X	X	X	X	X	X	X
Deciduous Woodland: Oak	X		X	X	X	X	X	X	X
Evergreen Woodland: Tanoak/Laurel	X		X	X	X	X	X	X	X
Woodland: Other			X	X	X	X	X	X	X
Agriculture	X		X	X	X	X	X	X	X
Vineyard	X			X	X	X	X	X	X
Grassland	X			X	X	X	X	X	X
Chaparral/Shrubland			X	X	X	X	X	X	X
Urban/Suburban				X	X	X	X	X	X

Figure 12. Product and Services by Forest and Land Use Type (source: EBAlive)

Volume flow for wood products

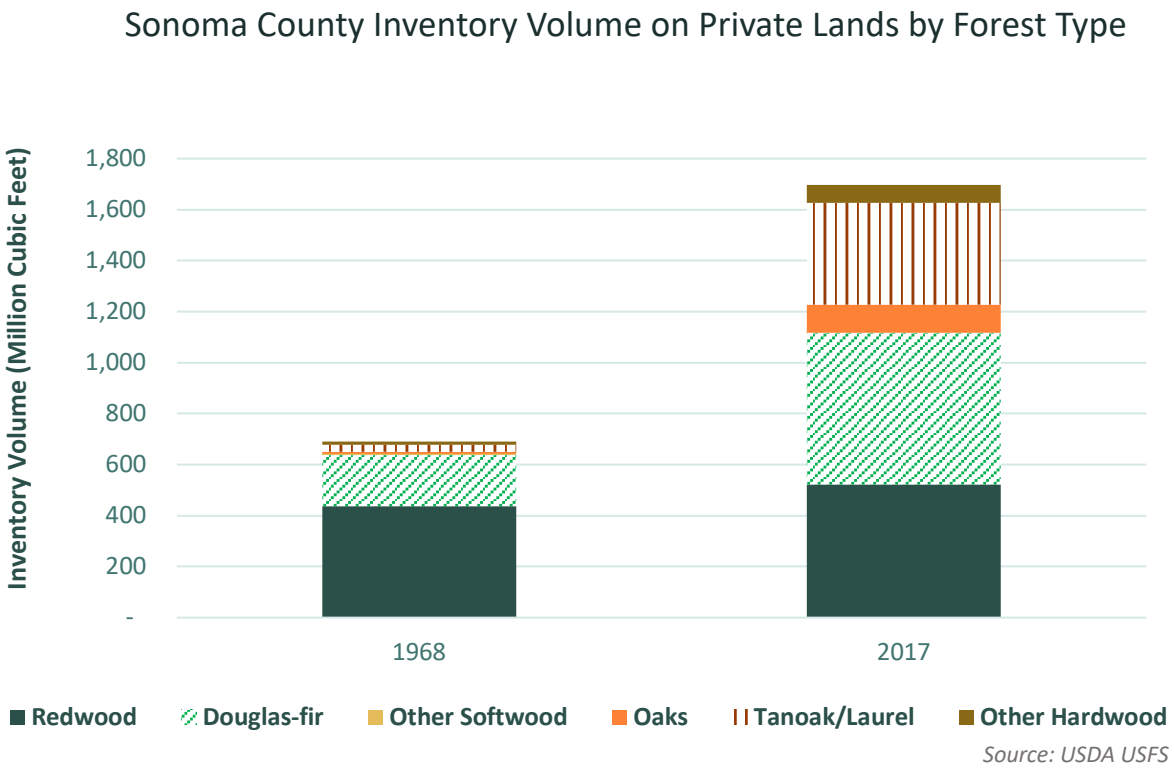

Figure 7. Sonoma County Inventory Volume on Private Land by Forest Type

While volume increment has remained similar between 1968 and the present, the composition of forest growth since 1968 has changed from primarily redwood types to Douglas-fir and tanoak types. This corresponds to the annual growth by forest type (Figure 12).

Managing the growth and inventory volumes on Sonoma forests to promote forest health and resilience will require more and different processing capacity than currently exists. Douglas-fir is a common species used for structural lumber, and current manufacturing capacity is insufficient to process more Douglas-fir at scale volumes. Currently, tanoak has limited commercial options. The most likely scale opportunity would be for biomass feedstock. Development of processing at scale would be required to handle volumes removed.

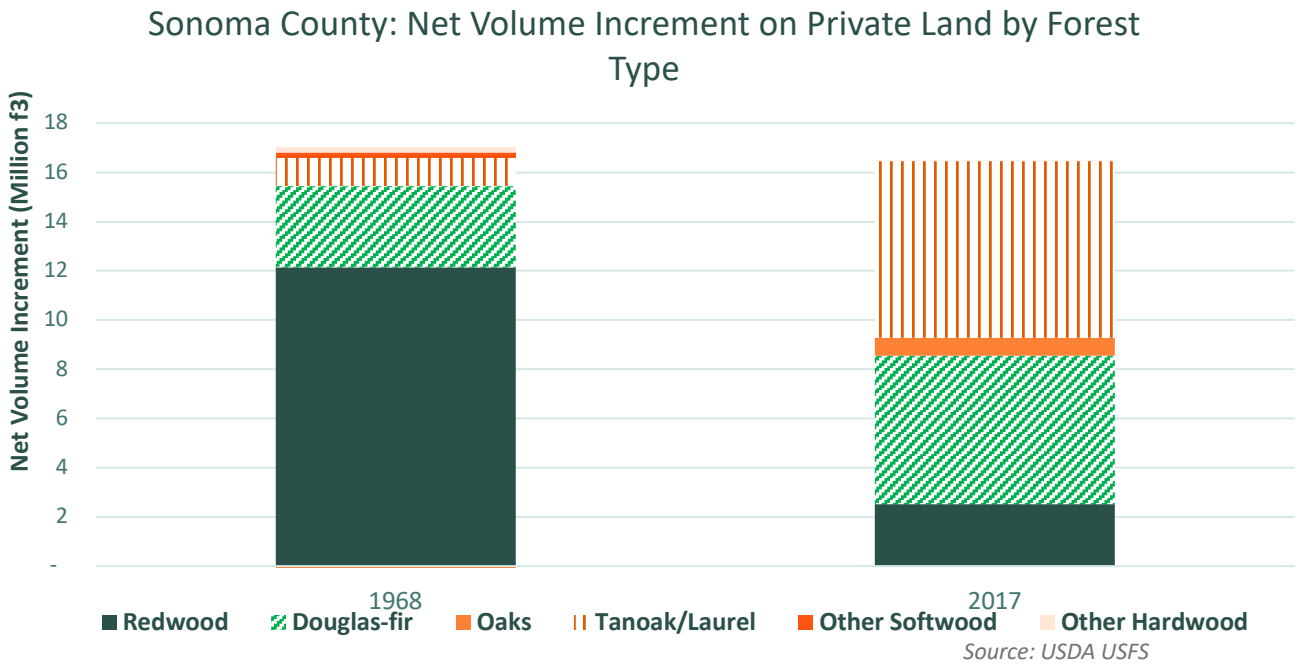

Figure 8. Sonoma County: Net Volume Growth on Private Land by Forest Type

Due to past harvest patterns, much of Sonoma County's conifer stands were established 60+ years ago. Most of the growth in conifer stands occurs on that age class.

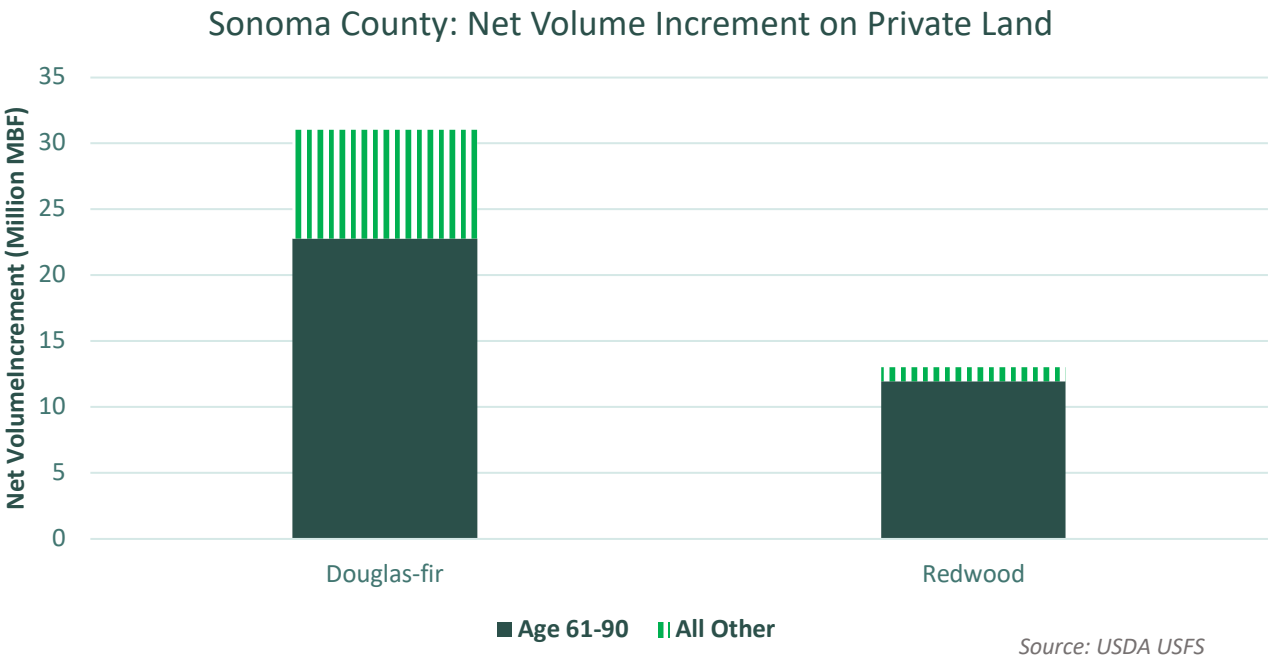

Figure 9. Sonoma County Net Volume Increment on Private Land

The notion of age classes is associated with even-aged forest management. While such management may have been practiced in the past, it is likely that uneven-aged management of conifers is the future. Over time, the forest will transition to state where there is a continuum of tree ages and sizes in a forest stand, rendering the notion of age classes moot.

Commercial harvest volume is only about 26% of estimated volume increment on Douglas-fir and Redwood forest types on private lands. It is not known how much of the volume growth that owners would want to make available, or how much of available volume would be economic.

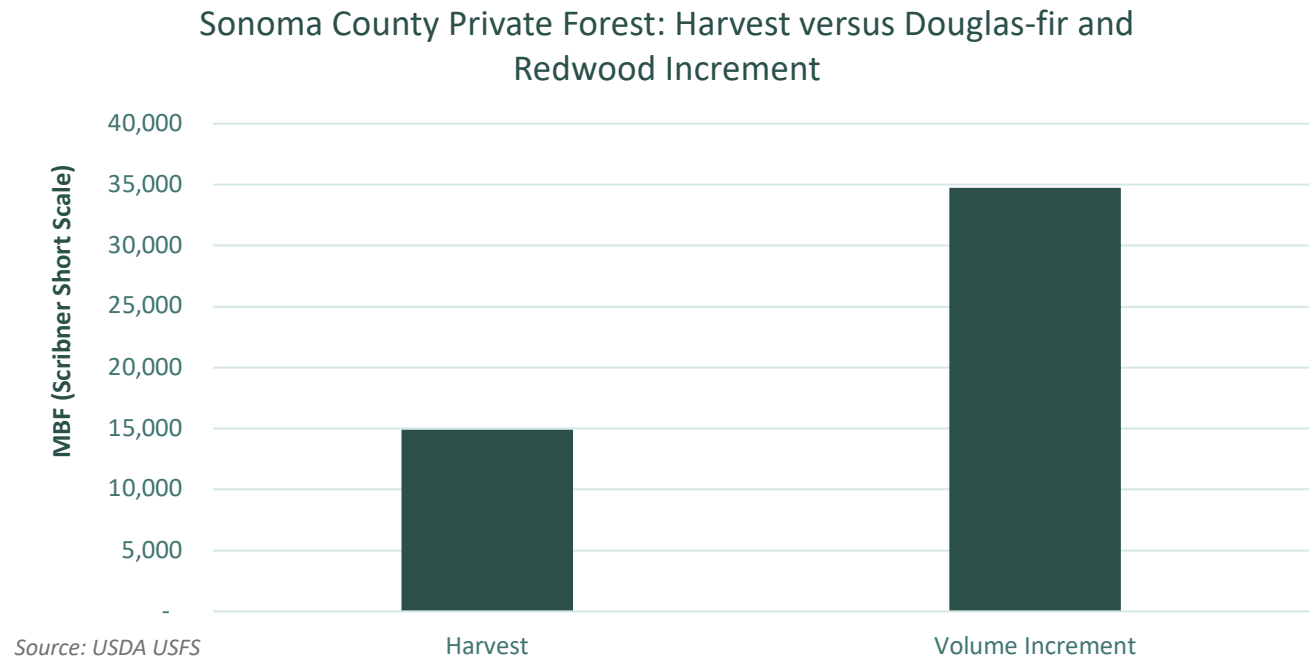

Figure 10. Sonoma County Private Forest: Harvest versus Douglas-fir and Redwood Increment

Commercial thinning in conifer stands in this age class would reduce fuel loads and concentrate volume on fewer, larger stems. There would need to be a marked increase in certified harvesting and processing infrastructure in order increase commercial thinning to anywhere near the current physical volume growth.

Biomass volume flow

Work done by the California Biomass Collaborative (Williams, 2015) indicates about 338,000 BDT/year of forest residues are available in Sonoma County. This number represents a physical, not necessarily an economic volume availability, and thus should be viewed as a maximum.

Assuming the current level of commercial harvest volume of 14,875 MBF/year assumed above, the amount of tanoak “come along” volume (volume that “comes along” with the commercial

softwood harvest) could be assumed at 20%. This would produce about 11,600 BDT/year of tanoak biomass volume (Table 1).

Commercial Harvest	**Percent Tanoak Come along**		**Tanoak**			
MBF/year	20%	GT/MBF	Green Tons/year	Green Tons per Dry Ton	BDT/year	MW
14,875	2,500	7.81	23,235	2	11,617	1.3
44,000	8,800	7.81	68,728	2	34,364	3.9

Table 4. Estimated Tanoak Come Along Biomass Volume

Assuming 8,750 BDT are needed to produce one MW of electricity, current harvest would yield about 40% of what would be needed for a small-scale (3 MW) biomass electrical generation facility, while harvesting current growth would provide 130% of the raw material needs for a 3 MW facility.

Using average tanoak stocking of about 4,800 f^3/acre, and assuming 33% thinning removal to reduce fuel loads (1,600 f^3/acre), about 275 acres/year would need to be thinned to provide for 1 MW. Assuming a 10 MW facility, an additional 2,500 acres/year would need to be thinned. In order to harvest growth, about 5,000 acre/year would need to be thinned, providing enough raw material for an 18 MW facility.

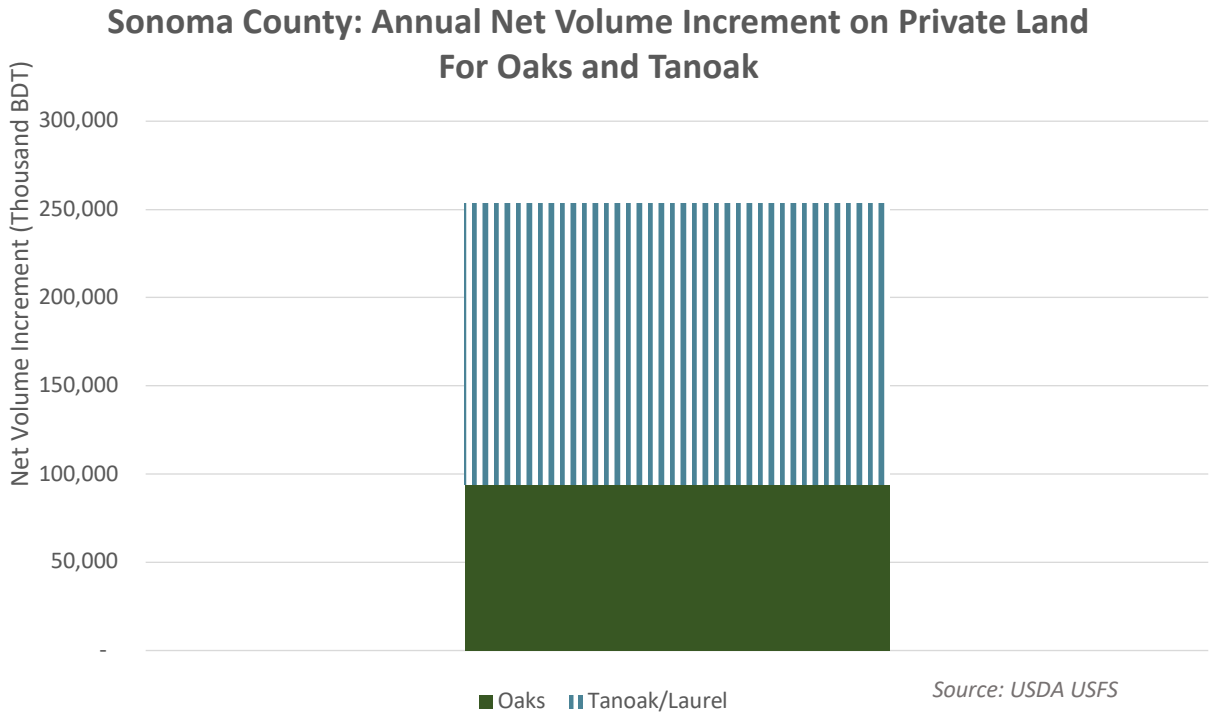

Figure 11. Sonoma County: Net Volume Increment on Private Land for Oak and Tanoak

Biochar is another option. The economics and logistics of scale biochar operations would be challenging, and were not quantified in this report.

Carbon credit services

Forest carbon accounting is a difficult and complex subject. This section will describe carbon credit services at a very simple, high level perspective.

Aboveground C (tons)	17,559,882		
Aboveground CO2e	64,386,234	3.6667	
% realized by landowner organization	321,931	0.50%	
	$ 4,185,105	$ 13.00	$/ton

Table 5. Estimated Carbon Benefit

Note that recent prices for CO2 were about $15/ton (CARB, 2019)

Watershed health services

Maintaining a healthy forest cover improves watershed health by such services as reducing soil erosion, increasing infiltration and storage of stormwater, to name a few. The Yuba project data from Blue Forest Conservation (Blue_Forest_Conservation, 2018)

	Yuba Project
$4,6000,000	Program Cost
15,000	Acres treated
$307	$/acre
10	years
31	Benefit ($/acre/year)
	Sonoma County
541,572	Forest acres
87%	Percent private
473,562	Private forest acres
14%	Assumed % benefit paid to landowners
$4.25	Landowner revenue/acre/year
$2,012,639	Annual Landowner revenue

Table 6. Estimated Watershed Health Benefits

Avoided Cost Services

Tubbs Fire Example.

Acres	36,807	$/acre	Annualized
Property loss	$ 1,200,000,000	$ 32,602	$ 815.06
Suppression costs	$ 100,000,000	$ 2,717	$ 67.92
Total	$ 1,300,000,000		$ 882.98
Annual	$ 32,500,000	40	Fire cycle years
Benefit	$ 3,250,000	10%	% Realized by landowner organization

Table 7. Estimated Avoided Cost Benefit

Sources: (Nelson, 2017), (Ortiz, 2018)

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