# COMMUNITY WILDFIRE PROTECTION PLAN

**TUOLUMNE COUNTY** 

February 2024 FINAL

Prepared by the Tuolumne Fire Safe Council in partnership with the County of Tuolumne



Funding for this project provided by the California Department of Forestry and Fire Protection's (CAL FIRE) Wildfire Prevention Grants Program as part of the California Climate Investments Program.



(Tuolumne County)		2024 Community Wildfire Protection Plan
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# Acknowledgements

The following organizations and agencies provided invaluable time, resources, and feedback in the development of the Community Wildfire Protection Plan for Tuolumne County, as well as support during site visits and public outreach and engagement activities.

- Tuolumne Fire Safe Council Karen Caldwell, Secretary Board of Directors; Diane Bennett, Executive Coordinator; Glenn Gottschalk – President Board of Directors; Michael Olenchalk – Vice President Board of Directors
- + Tuolumne County Office Emergency Services (TC-OES) and County Administrative Office (TC-CAO)

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- Tuolumne County GIS Madeline Amlin, County GIS Coordinator
- + CAL FIRE Tuolumne-Calaveras Counties Unit TCU Unit Chief Nick Casci and Andrew Murphy, Gary Whitson, Pre-Fire Division Chief/Unit Forester
- + **Stanislaus National Forest** Jason Kuiken, Forest Supervisor, Clinton Gould, Assistant Forest Fire Management Officer
- + Bureau of Land Management, Mother Lode Field Office Jason Schroeder, Fire Mitigation Specialist
- + City of Sonora Fire Department Chief Aimee New

This plan was prepared by Tuolumne Fire Safe Council, in partnership with Tuolumne County, and supported by an external consultant, Jensen Hughes.



Funding for this project provided by the California Department of Forestry and Fire Protection's (CAL FIRE) Wildfire Prevention Grants Program as part of the California Climate Investments Program.



### **Disclaimers**

This CWPP is not a legal document and is not intended to be an all-encompassing fire planning, wildfire resiliency or disaster risk management in Tuolumne County. The CWPP is considered a living document that serves as a road map for planning and prioritizing wildfire mitigation activities throughout the County, while also providing a resource to help increase public awareness and engagement in wildfire safety principles and preparedness at the individual, household, and neighborhood levels. Any opinions, findings, conclusions, or recommendations expressed in this publication are those of the authors and do not necessarily reflect the view(s) of any governmental agency, organization, corporation or individual with which the authors may be affiliated.

As a living document, the CWPP is a work in progress and is anticipated to be monitored, evaluated, and updated over the next several years, as wildfire hazards and risks evolve, human development increases, community needs change, and the social, economic, and regulatory landscape change with time.

Recommended actions identified in this CWPP should not be interpreted as a project "activity" as defined under the "Community Guide to the California Environmental Quality Act, Chapter Three; Projects Subject to CEQA." Because the CWPP does not legally commit any public agency to a undertake a specific course of action or conduct, the plan and associated recommendations are not a project subject to CEQA or NEPA. However, if and once grant funding is received from state or federal agencies and prior to work performed pursuant to this CWPP, or prior to issuance of discretionary permits or other entitlements by any public agencies to which a project is under CEQA or NEPA, if the lead agency makes a determination that the proposed activity is a project subject to CEQA or NEPA, the lead agency must perform environmental review pursuant to CEQA or NEPA.





# Executive Summary

The Community Wildfire Protection Plan (CWPP) for Tuolumne County provides a road map and principle guiding document to assist agencies, organizations, and general public to better prepare for, mitigate against, respond to, and recover from future wildfire threats. The plan is an update to the previous Tuolumne County CWPP dated December 12, 2004, which primarily focused on the northern county, but is now expanded in geographic scope to cover the entire County.

In accordance with the 2003 Healthy Forest Restoration Act (HFRA), the CWPP was developed through a collaborative process involving the Tuolumne Fire Safe Council (TFSC), Tuolumne County Office of Emergency Services (TC-OES), Tuolumne County Fire Department, surrounding fire agencies, City of Sonora, county officials, county-, state-, and federal-land management agencies, HOAs, community groups and the general public. In addition, the plan also satisfies additional CWPP requirements set forth in the HFRA, including:

- Identifying and prioritizing areas for fuel reduction activities
- + Collaborating with Stakeholders
- + Addressing structural ignitability

Wildfires have historically been a major part of Tuolumne County's natural ecosystem. The climate, surrounding rugged topography, rural landscapes and fire-adapted vegetation creates an environment for periodic burns. This is made more dangerous by the abundant risks associated with a resident population of 55,810 and growing, 32 identified Communities at Risk by CAL FIRE, a high tourist and transient worker population, remote settings, limited access/egress and increasing effects of changing climate (e.g., increasing frequency and severity of droughts,



extreme storms, flooding, increased number of fire danger days, etc.). This is further complicated by the presence of not only local, but regional and national-level high value assets such as Federal and State managed lands (e.g., Stanislaus National Forest, Yosemite National Park, two State Parks), recreation, ecological services, water resources and lands that are pivotal to the county's economy and the well-being of its residents.

To better understand, assess and develop recommended actions for the unique set of hazards, assets-at-risk and vulnerabilities across the County, the plan was developed using the latest tools, resources, best practices, and guidance on wildfire planning and preparedness, particularly at the wildland-urban-interface (WUI). This included science and engineering-based hazard, risk and vulnerability assessments using high resolution data (e.g., topography, fuels, weather, and values). The assessment was focused on identifying areas of concern throughout the County and in sub-regional planning units, and prioritizing areas where wildfire threat potentials create the greatest risk to communities. Hazard and risk mitigation efforts and other action items were specifically tailored to address the unique issues in the areas of greatest concern (see Sections 5.0 and 6.0), using a range of strategies, including:

- + Pre-fire planning.
- Wildfire preparedness using holistic fire safety principles and strategies for protecting life, property, natural resources, and other communities' assets.
- + Public education and outreach to promote and increase wildfire awareness, action and mitigation activities.
- Vegetation management and fuel reduction at the community level, including the enforcement of defensible space standards on private lands.
- Reducing structure ignitability by promoting and enforcing building codes, ordinances, and statutes.

As such, this document provides a framework that can be used to identify, prioritize, implement, and monitor hazard and risk reduction activities throughout the Planning Area. This document is also intended to support the California Fire Plan and the 2020 Tuolumne-Calaveras Unit Strategic Fire Plan. While this CWPP covers the entire Planning Area, the plan also supports and encourages focused wildfire protection actions at the community and neighborhood scales.

# Revision Record Summary

Version	Date	Description of Updates
Draft 0A	11/2023	Draft CWPP prepared by Jensen Hughes
Draft OB 12/2023 Integrated comments from Stakeholder Working Group and Steering Committee		Integrated comments from Stakeholder Working Group and Steering Committee
Final	2/2024	Integrated public comments and additional comments from Stakeholders

# Signatures

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The 2023 Community Wildfire Protection Plan (CWPP) for Tuolumne County was developed in accordance with the Healthy Forests Restoration Act. The plan was developed collaboratively among Tuolumne County stakeholders including Tuolumne Fire Safe Council, Tuolumne County Office of Emergency Services, federal, state- and county-fire agencies, county and local government, private-landowners, residents, community groups and other interested parties. The plan includes a prioritized list of hazardous fuel reduction strategies, measures that community members can take to reduce structural ignitability, as well as recommendations on additional studies, policy changes, educational programs and other initiatives that can be undertaken to provide a more holistic wildfire mitigation strategy in all stages of wildfire disaster risk management (i.e., prevention/mitigation, preparedness, response and recover).

The undersigned have reviewed and mutually agree to the contents of the "2024 Community Wildfire Protection Plan for Tuolumne County".

Tuolumne Fire Safe Council, Acting President, Michael Olenchalk  Michael Olenchalk	Date 2/27/2024
Tuolumne County Office of Emergency Services, Dore Bietz	Date 3/18/2027
DAVNUS	n a deplace
Tuolumne County Fire Chief, Chief Nick Casci	Date 2/29/24
CAL FIRE, Tuolumne County Unit Chief, Chief Nick Casci	Date 2/29/24
City of Sonora, Mayor Mark Plummer	Date
County Board of Supervisors, Chair, David Goldemberg	Date 03/19/2022

I hereby certify that according to the provisions of Government Code Section 25103, delivery of

this document has been made.

HEATHER D. RYAI Board Clerk

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## Acronyms

AHJ Authority Having Jurisdiction

BMP Best Management Practices

CAL FIRE California Department of Forestry and Fire Protection

CAO County Administrative Officer

CAR Community at Risk

CEQA California Environmental Quality Act

CCR California Code of Regulations

CWPP Community Wildfire Protection Plan

ESHA Environmentally Sensitive Habitat Areas

FEMA Federal Emergency Management Agency

FHSZ Fire Hazard Severity Zone

FPU Fire Planning Unit

FRA Federal Responsibility Area

FRAP Fire and Resource Assessment Program

GIS Geographic Information System

HFRA Healthy Forest Restoration Act

HVRA High Valued Resources and Assets

HIZ Home Ignition Zone

HUD U.S. Department of Housing and Urban Development

IBHS Insurance Institute for Business and Home Safety

LANDFIRE Landscape Fire and Resource Management Planning Project

LRA Local Responsibility Area

MTT Minimum Travel Time

NFP National Fire Plan

NFPA National Fire Protection Association

NIMS National Incident Management System

NPS National Park Service

NRDC Natural Resources Defense Council

OES Office of Emergency Services

PRC Public Resources Code

RAWS Remoted Automated Weather Station

SRA State Responsibility Area

SWIFT Southwest Interface Team

TCFAC Tuolumne County Fire Advisory Committee

TCFD Tuolumne County Fire Department

TFSC Tuolumne Fire Safe Council

TC-OES Tuolumne County Office of Emergency Services

USFS United States Forest Service

WFDSS Wildland Fire Decision Support System

WIMS Weather Information Management Systems

WUI Wildland Urban Interface

#### 1.0 Introduction

Tuolumne County and the surrounding area have an extensive history of large wildfires that have caused substantial impacts to human health and life safety, the built environment, local economies, the natural environment, and cultural/historical resources. Impacts from wildfire have also included numerous other short and long-term costs to social capital, human psychology, vulnerable groups, and recovery capacities. While government agencies can play an important role in developing and implementing a range of wildfire hazard and risk mitigation activities, programs, and policies, wildfires are not fully preventable. Thus, it is critical that the "whole" community works collectively to build individual and societal capacities to prevent, prepare for, respond to, and recover from major wildfire incidents. As wildfires are an inevitable part of life in Tuolumne County and surrounding Calaveras and Mariposa Counties, it is not a question of if a wildfire will burn, but when it will burn and how prepared and resilient the whole community is to minimize potential impacts.

The 2023 Community Wildfire Protection Plan (CWPP) for Tuolumne County is the result of a county-wide planning effort to quantify and evaluate the wildfire threat to the Planning Area and to develop mitigation strategies that enhance protection of human life safety and a range of community values from wildfire. This plan meets the requirements of the 2003 Healthy Forests Restoration Act and positions the County well to obtain state and federal grants for any additional studies and/or implementation activities identified in the recommended actions. This plan incorporates the latest wildfire science and engineering tools, as well as industry best practices, to holistically mitigate the risks of wildfires across the county.

Fundamental to any CWPP is the engagement and collective action of all community Stakeholders in protecting the things that are of value, addressing the specific challenges of the local context and developing comprehensive risk management strategies that work for the whole community.

#### 1.1 PURPOSE OF PLAN

The primary purpose of the Community Wildfire Protection Plan (CWPP) is to minimize the wildfire threat to human life and wellbeing and reduce the wildfire risk to community values/assets such as residential structures, critical infrastructure, businesses, the natural environment, and historic/cultural resources within the County.

The CWPP provides guidance for future actions of County Stakeholders including Tuolumne County Fire Department (TCFD), CAL FIRE, TC-OES, TFSC, the City of Sonora, local residents, businesses, homeowner associations, local community groups and other interested parties in their individual and collective efforts to reduce the potential wildfire threat to the communities in the Planning Area. Successful implementation and long-term sustainability are subject to available funding, the collective action and will of all community Stakeholders, other County priorities, collaboration between Stakeholder groups on private and public lands, and environmental review under the California Environmental Quality Act (CEQA) or National Environmental Protection Act (NEPA).

#### 1.2 GOALS & OBJECTIVES

The goals and objectives of the CWPP were developed in collaboration with the Steering Committee through a combination of meetings, open forum workshops and an on-line feedback form/survey. The goals represent broad-based visions for the CWPP and provide general long-term guidelines to drive the desired end-states for communities across the County. The objectives define strategies or implementation steps to attain the identified goals. They are both specific and measurable and will have defined completion dates as determined by the respective, responsible stakeholder. The goals and objectives for the CWPP for Tuolumne County are summarized in Table 1.

Tak	Table 1. Goals & Objectives of the 2023 CWPP for Tuolumne County			
	Goals		Objectives	
1.	To enhance life safety and preparedness for responders and the public	a) b) c) d) e) f)	Reduce human caused ignitions through public education.  Assess wildfire hazards, risks, and vulnerabilities within the Planning Area, utilize results to set priorities to reduce threat to life safety  Review the existing public alert programs and evacuation resources for wildfires and make recommendations for enhancement as necessary  Develop guidelines that address vulnerable populations in consideration of special needs for pre-planning evacuation Improve collective action in reducing wildfire risk through enhancements to community engagement, participation, and education programs  Assess individual and community-level coping capacities to prevent, mitigate, respond and recovery from wildland fire disaster events (e.g., communication systems, evacuation planning, people management, emergency power supplies, short-/long-term recovery resources).  Enhance evacuation planning and preparedness including emergency communication and messaging to the general public before, during and after an event.	
2.	To create healthy and productive fire adapted communities	a) b) c) d)	Wildland urban interface (WUI) fuel reduction treatments are planned, funded & implemented Identify measures that homeowners, businesses, and communities can take to reduce the ignitability of structures Identify existing community preparedness programs and activities that provide community wildfire safety and planning. Promote wildfire awareness, understanding of fire behavior, structure and site assessments, evacuation and shelter-in-place planning, emergency communication and safe individual and community practices Identify community-focused entities and programs that can address the immediate needs of residents throughout a wildland fire incident (from prevention to response and recovery)	
3.	To restore and maintain healthy and fire resilient landscapes	a) b) c)	Restore and maintain healthy, resilient landscapes in all ecotypes Plan, prioritize, and coordinate fuels reduction treatment projects and funding sources to ensure smart investments based on risk and potential effectiveness Identify and prioritize potential hazardous fuel reduction treatments, and types and methods of treatments (including maintenance and fire use) Create collaborative partnerships for all lands treatments (large scale)	

Goals	Objectives
Reduce the wildfire threat to values/assets at risk	<ul> <li>a) Identify values/assets at risk from wildfire in the Planning Area.</li> <li>b) Utilize wildfire hazard, risk, and vulnerability assessments to develop prioritized mitigation strategies to reduce the threat to physical, social, environmental, and economic assets.</li> <li>c) Develop fuel treatment methods and strategies for property owners and agencies that provide guidance for adequate defensible space for structures and transportation routes in all types of wildland fuels</li> </ul>

To help manage the implementation of the action items and achieve the goals identified in the CWPP, a monitoring and evaluation plan has been developed in Chapter 7.0 and Chapter 8.0 of this document.

#### 1.3 DEVELOPMENT TEAM

This section identifies the agencies, parties or other organizations who were either involved and/or provided input into the development of this CWPP. The roles and responsibilities are indicated in the table below.

CWPP Development Entities	Ro	les/Responsibilities
Lead Organization: Tuolumne Fire Safe	+	Manage CWPP development and consultants
Council (TFSC)	+	Grant funding for CWPP
	+	Coordinate Core Working Group and public outreach
	+	Provide guidance and support for CWPP
	+	Distribute media releases about CWPP
	+	Conduct direct outreach
	+	Coordinate with neighboring jurisdictions
Core Working Group	+	Lead the day-to-day development of the CWPP
Tuolumne Fire Safe Council (TFSC) Tuolumne County Office of Emergency	+	Form and facilitate Steering Group and Stakeholder Working Group meetings and engagement
Services / County Administrative Officer (TC- OES/CAO)  CWPP Consultant	+	Plan, coordinate, and execute general public engagement activities
	+	Provide general guidance, expertise, and support for CWPP development
	+	Coordinate with county agencies

CWPP Development Entities	Roles/Responsibilities
Steering Group: 11 members	+ Approve the CWPP goals and objectives.
Bureau of Land Management (BLM) CAL FIRE	<ul> <li>+ Approve methodology for the planning units.</li> <li>+ Allocate resources and point of contacts.</li> </ul>
Chicken Ranch Band of Me Wuk Indians City of Sonora County of Tuolumne Fire Chiefs Association of Tuolumne County Tuolumne Fire Safe Council Tuolumne Band of Me Wuk Indians Stanislaus National Forest Yosemite National Park Tuolumne County Fire	
Stakeholder Working Group: ~73 members  See Section 2.2.3 for full list of members	Represent a wide range of agencies, organizations, and entities in the County
Coo Coolon 2.2.0 for fair flot of monisore	<ul> <li>Provide general feedback, expertise, and local context for CWPP development and associated products</li> </ul>
	+ Identify gaps in CWPP development process
	<ul><li>Support public outreach activities</li><li>Support site visits</li></ul>
General Public and Other Interested Parties	+ Attend public outreach workshops
	+ Provide responses to online survey
	<ul> <li>Provide input on CWPP values, values to protect, areas of concerns, community projects and ongoing grass-roots initiatives</li> </ul>
CWPP Consultant: Jensen Hughes	+ Support the development of the CWPP
	+ Develop the Stakeholder and Public Outreach Plan (POP
	<ul> <li>Facilitate and support implementation of POP (e.g., general public workshops)</li> </ul>
	+ Administer digital polling/form
	<ul> <li>Provide supporting materials and content for public outreach activities (e.g., CWPP development page)</li> </ul>

#### 1.4 POLICY & REGULATORY FRAMEWORK

The following codes, standards, policies, and regulations at the federal, state, and local levels were governing at the time of the development of this CWPP. A more detailed summary of these policies and regulations are provided in Appendix B.

#### Relevant Policy and Regulatory Documents for Wildfire Risk Mitigation

#### **Federal**

- Disaster Mitigation Act (2000–present)
- + National Fire Plan (NFP) 2000
- National Cohesive Wildland Fire Management Strategy (2009)
- + NFPA Standards (NFPA 1, NFPA 1140)
- + National Incident Management System (NIMS)

#### County

- + Visit Tuolumne County 2019-2020 Annual Report
- + CAL FIRE Tuolumne-Calaveras Unit Strategic Plan
   2023
- + CAL FIRE / Tuolumne County Fire Department, 2021-2025 Strategic Fire Plan
- Kittelson & Associates & Jensen Hughes,
   Tuolumne County Evacuation Needs Assessment
   and Communication Strategies 2023
- + Tuolumne County CWPP 2004
- Emergency Operations Plan for Tuolumne County
   2023
- + Tuolumne County Multi-Jurisdictional Hazard Mitigation Plan 2018 Update
- Tuolumne County Community General Plan –
   Public Safety Element
- + Tuolumne County Ordinance Code Chapter 8.14, Title 15

#### **State**

- + California Strategic Fire Plan 2018
- + California State Hazard Mitigation Plan, 2018
- + California's Wildfire and Forest Resilience Action Plan, 2021
- + Public Resource Code: 4125-4137, 4201-4204, 4290, 4291, 4292-93, 4296, 4296.5, 4421-4446, 4741
- + California Code of Regulations 1299.1, 1256
- California Code of Regulations, Title 24
- + 2022 California Fire Code
- + 2022 California Building Code Chapter 7A
- + 2022 California Residential Code Chapter 3
- + Government Code 51175-51189; 65302.5
- + California Health and Safety Code: DIVISION 12
- + California Environmental Quality Act (CEQA)
- + California Civil Code 1103.C.3
- California Emergency Services Act Chapter 7, Section 8550-8551 (CESA)
- + California Regional Water Quality Board
- California Air Resources Board
- + Senate Bills: 160, 167, 190, 465, 560, 670 901, 979, 1260
- + Assembly Bills: 836, 1054, 1877, 1956, 2911
- + 2019 California Green Innovation Index, 11<sup>th</sup> Edition

#### Local

- + Pacific Gas and Electric Company (PG&E) 2021 Wildfire Mitigation Plan Report
- + Greater Tuolumne City Community Wildfire Protection Plan 2004
- NRDC Fuel Breaks Project, Environmental Assessment Determinations and Compliance Findings for HUD-assisted Projects – 2020
- + City of Sonora Defensible Space Ordinance No. 835
- + Emergency Operations Plan for the City of Sonora 2014
- Twain Harte Community Services District, Ordinance No. 30-01, THCSD Fire Code
- Mi-Wuk Sugar Pine Fire Protection District Strategic Plan 2017

#### **Neighboring Counties and Community CWPPs**

- + Alpine County CWPP 2018
- + Calaveras County CWPP 2020
- + Mariposa County CWPP 2021
- + Mono County CWPP 2009
- + Yosemite West CWPP 2007

#### 1.5 FUNDING FOR CWPP DEVELOPMENT

Funding for this project has been provided by the California Department of Forestry and Fire Protection's (CAL FIRE) Wildfire Prevention Grants Program as part of the California Climate Investments Program. The period of performance started in March 2023 and is estimated to conclude by January 31, 2024. Management and reporting of the project to the County, TFSC Board and other key county Stakeholders has been conducted by the Tuolumne Fire Safe Council.

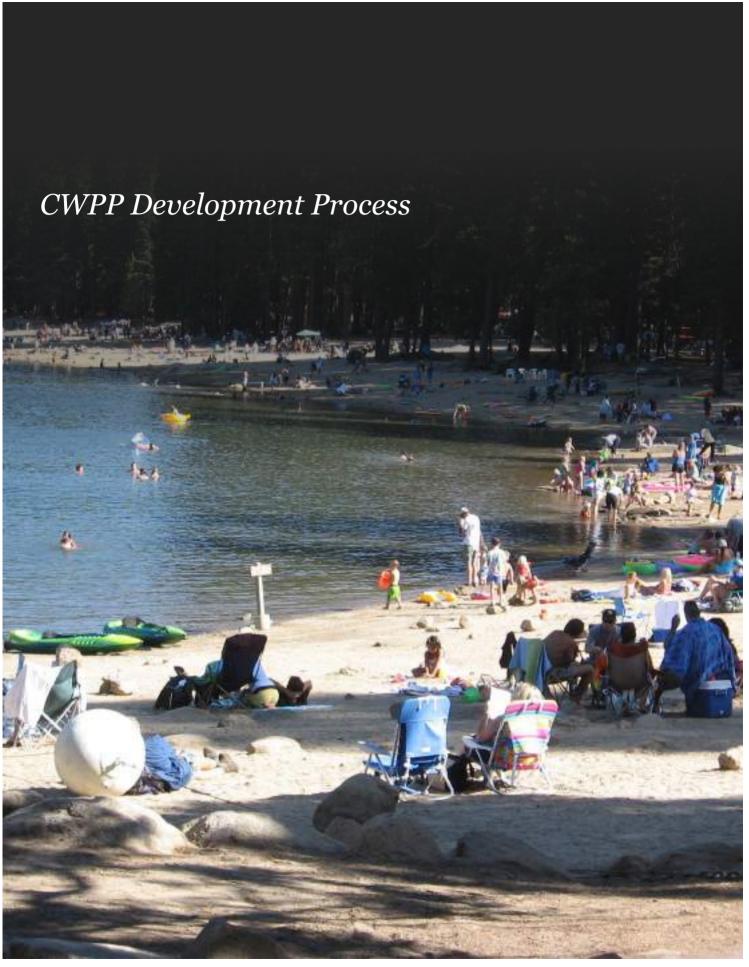


Funding for this project provided by the California Department of Forestry and Fire Protection's (CAL FIRE) Wildfire Prevention Grants Program as part of the California Climate Investments Program.



#### 1.6 GLOSSARY OF TERMS

A glossary of terms can be found in Appendix A.



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# 2.0 CWPP Development Process

#### 2.1 OVERVIEW

The development of a CWPP is a collaborative process where community stakeholders assess the wildfire threat, identify community values at risk, and ultimately develop prioritized mitigation measures and actions to increase community resilience to wildfire threats. The language in the 2003 HFRA provides maximum flexibility for communities to determine the substance and detail of their CWPP action plan and the procedures they use to develop them. The CWPP planning process provides communities the autonomy to develop locally relevant plans that influence where and how federal agencies implement fuel treatment activities on federal land and the distribution of federal funds for projects on non-federal lands.

The CWPP planning process brings together broad and diverse local interests to holistically identify common concerns and values related to public safety, sustainability of environmental and natural resources and long-term resiliency and sustainability of the whole community. The process should provide a positive, solution-oriented environment in which to address the challenges of living in a community at risk to wildfire. Because not all community members will attend workshops or meetings, it is important to provide multiple opportunities in which the whole community can provide input, voice issues and concerns, and participate in the process of developing a CWPP.



Figure 1. CWPP Development Process

As part of the 2003 HFRA, there are three minimum requirements for a CWPP, including:

- + <u>Collaboration</u> A CWPP must be collaboratively developed. Local and state officials must meaningfully involve federal agencies that manage land in the vicinity of the community, as well as other interested parties (particularly non-governmental stakeholders) that can work collectively to implement and manage wildfire risk mitigation measures and can help build a "culture of resiliency" at an individual and community-level.
- + <u>Prioritized Fuel Reduction</u> A CWPP must identify and prioritize areas for hazardous fuel reduction treatments on federal and non-federal land, and recommend the types and methods of treatment that, if completed, would reduce risk to the community.

+ <u>Treatment of Structural Ignitability</u> – A CWPP must recommend measures that homeowners and communities can take to reduce the ignitability of structures throughout the area addressed by the plan.

In the development of a CWPP, the more inclusive the group and the greater the diversity of interests involved, the more likely the plan will represent the community as a whole. These three basic requirements, however, do not preclude the community from developing broader wildfire disaster risk management and capacity building efforts (e.g., evacuation planning, community emergency communications, early warning detection systems, post-fire recovery services, etc.).

#### 2.2 TUOLUMNE COUNTY COLLABORATIVE APPROACH

This Community Wildfire Protection Plan (CWPP) for Tuolumne County was developed by the Tuolumne Fire Safe Council (TFSC) with guidance, support, and input from Tuolumne County Office of Emergency Services (OES), CAL FIRE, United Stated Forest Service and numerous local agencies, organizations, and general public. As the CWPP is intended to be a "living" document, the various CWPP coordination and development groups, as well as public outreach plan was designed to reinforce existing regional relationships, establish ongoing networks to implement, maintain and monitor the CWPP actions, as well as integrate ongoing mechanisms to obtain community input, promote widespread community education and enable the ongoing monitoring and evaluation of the ever evolving wildfire risk landscape (e.g., impacts of changing climate, changes in development, impacts of mitigation activities etc.).

#### 2.2.1 Convene The Core Working Group

The CWPP core working group was formed in January 2023, and refers to a smaller group of key representatives from:

- + Tuolumne Fire Safe Council
- Tuolumne County CAO/OES
- + Consultant: Jensen Hughes

This group was responsible for the day-to-day development of the CWPP, organizing the engagement and participation of a broad range of stakeholders, agencies, organizations, and individuals (i.e., federal/state/local government agencies, surrounding fire authorities, landowners and stewards, community groups, residential/commercial owners, infrastructure, general public), forming the Steering Committee and Stakeholder Working Group, monitoring project progress, reviewing key documents produced, etc.

The group considered input from all working plans, community groups, agencies, and strategic groups. The objective was to have city, county, state, federal, and local public participation through the Fire Safe Council to work cooperatively to help protect life, property, and natural resources from wildfires. Once the "Core Working Group" was satisfied that the CWPP document captures the goals, objectives and needs identified by the public and other key stakeholders, this group will forward the Plan to the approving officials



#### 2.2.2 Convene The Steering Committee

The Steering Group was identified and formed at the start of the project in January 2023. The group included leaders of representative key government agencies and community organizations who are relevant to the development, implementation, and long-term operations of the CWPP. The Steering Group developed and approved the goals and objectives for the CWPP and planning unit boundaries, as well as provided feedback on key CWPP products (as requested).

#### Members:

- + Bureau of Land Management (BLM)
- + CAL FIRE
- + Chicken Ranch Band of Me Wuk Indians
- + City of Sonora
- + County of Tuolumne
- + Fire Chiefs Association of Tuolumne County
- + Tuolumne Fire Safe Council
- + Tuolumne Band of Me Wuk Indians
- Stanislaus National Forest
- Yosemite National Park
- + Tuolumne County Fire

The Steering Group met two times over the course of the project – for a kickoff meeting (held on March 9, 2023) and to review and agree on CWPP recommendations and actions (held on November 16, 2023).



#### 2.2.3 Convene Stakeholder Working Group

The Stakeholder Working Group was formed in March 2023. Membership included representatives from a wide range of agencies and community organizations other than those that made up the Steering Group. Several Steering Group members are also members of the Stakeholder Working Group. The Stakeholder Working Group served as an advisory group of interested parties to provide local context and subject matter expertise, identify gaps, support public outreach activities (as needed), support site visits, and provide general feedback on the CWPP development process and CWPP products (as requested).

Due to the size of this group, several sub-groups were identified based on area of primary focus (e.g., infrastructure, government and tribal agencies, community groups). Each sub-group convened for at least one focus group meeting or one-on-one meetings during the CWPP process to provide feedback and guidance.

#### Members:

- + BLM
- + Bureau of Reclamation (BOR)
- + CAL FIRE
- + California Department of Fish and Wildlife
- California State Parks
- + Central Sierra Environmental Resource Center (CSERC)
- + Chicken Ranch Band of Me Wuk Indians
- + City of Sonora
- + Columbia College
- + Don Pedro Recreation Agency
- + Firewise Community Leaders
- + Groveland Community Services District
- + Hetch Hetchy
- + Individual community members
- + PG&E

- + Motherlode Prescribed Burning Association
- Pine Mountain Lake Resort
- Sierra Nevada Conservancy
- + Tri-Dam Project
- Tuolumne Band of Me Wuk
- + Tuolumne County Alliance for Resources and Environment (TUCARE) Representative
- + Tuolumne County Resource Conservation District (TC-RCD)
- + Tuolumne County Office of Emergency Services (TC-OES)
- + Tuolumne County Sherrif's Department
- + Tuolumne Fire Safe Council (TFSC)
- Tuolumne River Trust
- + Tuolumne Utilities District (TUD)
- + Tuolumne/Stanislaus County Farm Bureau
- + Twain Harte Community Services District

The Stakeholder Working Group met formally two times over the course of the project – for an introductory meeting (held on June 12, 2023) and to review and agree on CWPP recommendations and actions (held on November 16, 2023). Smaller working group meetings, one-on-one conversations, direct email exchanges and a digital poll were additional methods used to gather information, receive feedback and provide specific input on the concerns, needs and current practices, policies and programs for wildfire resiliency in the County.

#### 2.2.4 Stakeholder Engagement and Coordination

Participation and engagement of a broad range of community stakeholder groups was a critical component in the development of a comprehensive CWPP for Tuolumne County. As such, a Stakeholder and Public Outreach Plan was developed to help guide how community members, project partners and other stakeholders would be engaged throughout the CWPP development process This was intended to encourage a sense of ownership and a vested interest in the future safety and well-being of individuals, families, businesses, agencies, community groups, and other interested parties across the County to wildfires. This process also helped ensure that recommendations developed as part of the CWPP update will be implemented and sustained over time.

The primary goals and objectives of the outreach process were as follows:

- (1) Provide various opportunities for community stakeholders and the general public to participate, collaborate and engage throughout the CWPP development process.
- (2) Gather feedback on a broad range of concerns regarding wildfire hazards, risks, and vulnerabilities at various scales (e.g., county-wide, community, neighborhood, parcel, individual).
- (3) Gather feedback from community members that will guide goal setting, action items and prioritization at the county-level and within each Planning Unit.
- (4) Identify key project participants, working groups and steering group members as part of the process.

- (5) Identify appropriate levels and methods of stakeholder engagement.
- (6) Develop a Public Outreach Plan (POP) implementation plan incorporating key initiatives, activities and formats specifically tailored for each stakeholder group or set of groups.
- (7) Raise awareness of wildfire hazards and risks across the County, as well as the range of existing, planned, and proposed wildfire resiliency plans, programs, and projects.

Framing the Stakeholder Engagement and Public Outreach Plan were a set of guiding principles, based upon discussions amongst the Core Working Group and literature.

- + **Accessible** Stakeholders must be aware and be provided with a variety of engagement opportunities and formats to participate in the process.
- Participatory Creating an environment to facilitate the expression and the participation of different and diverse actors, such as oral communication, written communication, and schematic or visual representations. Promote a culture of participation with programs and activities that support ongoing engagement and ownership.
- + **Informative** Help all involved to listen to each other, explore new ideas, learn, and apply information in ways that generate new solutions, methods, or opportunities.
- + **Collaborative** Support and encourage participants, government and civil society groups, and other interested parties to work together to advance the common good.
- + **Representative** Equitably incorporate diverse people, voices, ideas, and information to lay the groundwork for quality outcomes and democratic legitimacy.

To effectively engage the various category of Stakeholder (i.e., infrastructure, governmental & tribal agency, residential/commercial/individuals, agricultural & land-use, landowners & stewards, and community groups) and general public, various engagement tactics and implementation plan were identified to solicit the desired input or feedback specific to the targeted audience.

#### 2.2.5 General Public Outreach

#### 2.2.5.1 Public Workshops and Community Events

A priority for the Tuolumne Fire Safe Council was to get broad community participation and engagement in the development of the CWPP. The initial step was to organize workshops to introduce the CWPP planning process, encourage participation, and solicit input from a broad range of community stakeholders. Four workshops were held at the beginning of the CWPP planning process – July 21st 2023 at the Twain Harte Bible Church, July 22nd and 28th 2023 at Tioga High School in Groveland, and August 4th 2023 at the Elks Lodge in Sonora. Stakeholders were invited to the workshops via public announcements on the Fire Safe Council's website, TV, social media accounts and calendar, as well as direct communications with key stakeholders and community groups.



Figure 2. General public workshop at Tioga High School

The range of stakeholders who took part in the initial workshops included local residents, homeowner association representatives, CAL FIRE, County Fire Department, City of Sonora, business owners and other interested parties. In addition to learning about and providing feedback on the CWPP process, participants also had the opportunity to exam the results of initial wildfire hazard and risk assessments, identify areas of specific concern, provide feedback on what worked and didn't work during previous wildfires and confirm CWPP goals and objectives.

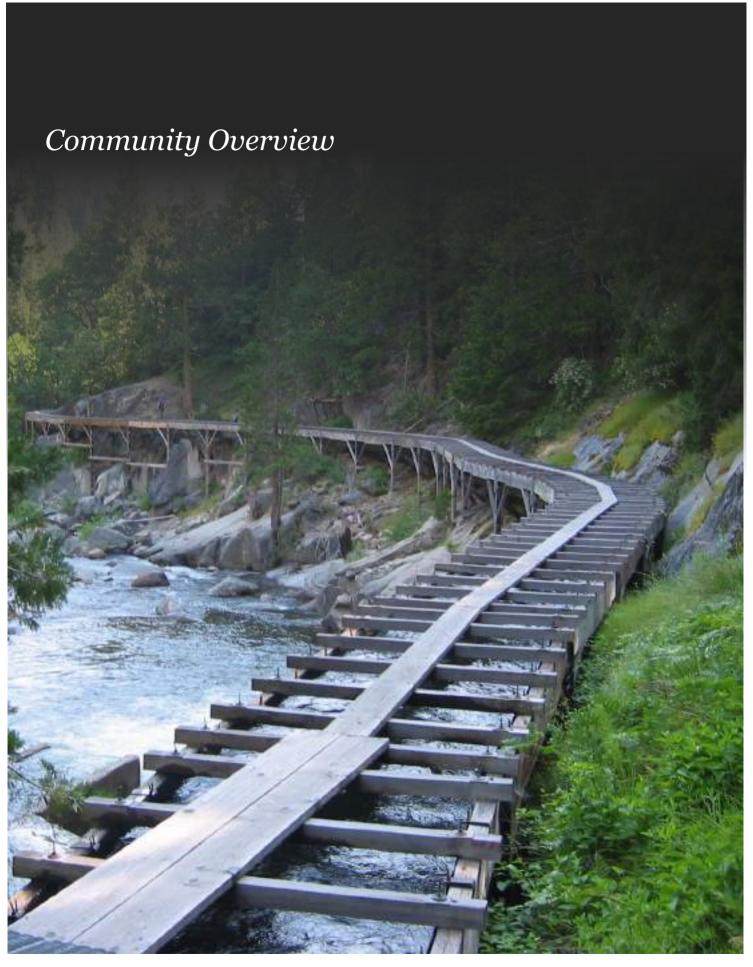
Following the formal presentation, an informal phase of the workshop provided stakeholders with the opportunity to talk in breakout groups on specific topics of interest or concern.

Upon completion of the CWPP development, a final workshop was held on January 13<sup>th</sup> 2023 at the Stanislaus National Forest Supervisor's Office to review the overall process and recommended actions for the Fire Safe Council, County Fire and other key Stakeholders in the next 5-10 years. Smaller presentations were also given to the City of Sonora, County Departments and Council and County Supervisor staff.

A summary of all workshops, meeting notes and stakeholder comments are available in Section 5.3.4 and Appendix A.

#### 2.2.5.2 General Public Digital Polling

A targeted online poll was developed to solicit additional input from stakeholders. Polling questions focused on several topics relating to wildfire concerns, mitigations, and recommended actions. The poll was open between August 14, 2023 to September 8, 2023. A summary of stakeholder comments has been synthesized with comments received during the workshops in Section 5.3.4. Appendix G provides the raw data collected.



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# 3.0 Community Overview

#### 3.1 OVERVIEW

Wildfires have historically been a major part of Tuolumne County's ecosystem. The climate, rugged topography, and fire-adapted vegetation create an environment which periodically burns naturally. Wildfire events are made more dangerous by the abundant risks associated with Tuolumne County's resident population of 55,810 and growing, a large population of part-time residents (e.g., second homeowners), 32 identified Communities at Risk, high tourist and transient worker population, remote and rural setting, limited access/egress, and the increasing effects of changing climate (e.g., increasing frequency and severity of droughts, extreme storms, flooding, increased number of fire danger days). Fire risk is further complicated by the presence of not only local but also regional and national high value assets such as national parks, recreation areas, ecological services, and water resources that are pivotal to the county's economy and the well-being of its residents.

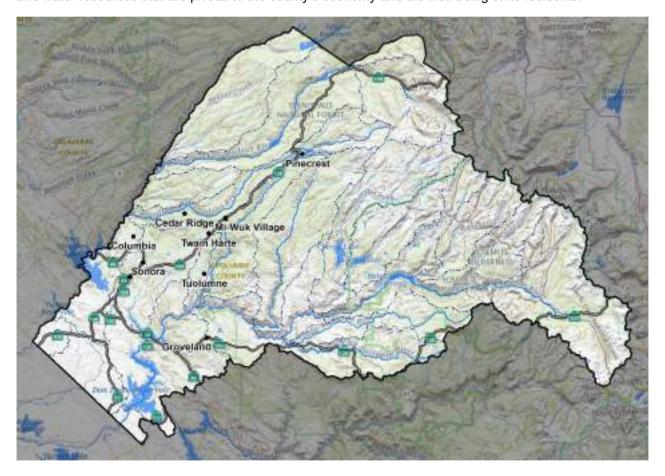


Figure 3. Planning Area for the CWPP

#### 3.2 FIRE HAZARD SEVERITY ZONES

Fire Hazard Severity Zones (FHSZ) maps identify geographic areas of significant fire hazard in both State and Local Responsibility Areas and are produced by CAL FIRE. Designation of areas into FHSZs is based on parameters including vegetation, terrain, weather, and other factors relevant to wildfire likelihood and behavior. There are three categories of FHSZ based on relative degree of severity: moderate, high, and very high. All State Responsibility Areas (SRA) are classified into one of these three categories, while only very high FHSZs in

Local Responsibility Areas (LRA) are categorized. FHSZs are based on wildfire hazards over a 30- to 50-year period, but do not consider how recent wildfire activity or fuel modification actions may have influenced potential fire severity. CAL FIRE is required to produce FHSZ maps under California Public Resources Code 4201-4204, California Code of Regulations Title 14, Section 1280, and California Government Code 51175-89.

FHSZs are based on wildfire hazards over a 30- to 50-year period, but do not consider how recent wildfire activity or fuel modification actions may have influenced potential fire severity.

While FHSZs do not predict when or where a wildfire may occur, they do identify areas where wildfire hazards are likely more severe and of greater concern. As such, FHSZs identify areas where increased wildfire safety provisions for various building and site components (e.g., defensible space, fire or ignition resistant materials including vents, decks, and windows) are required for all new construction per California Building Code Chapter 7A. The FHSZ designation of a property must also be included in real estate disclosures and is used by local governments to support wildfire risk analysis and hazard mitigation planning (<a href="https://osfm.fire.ca.gov/divisions/community-wildfire-preparedness-and-mitigation/wildfire-preparedness-fire-hazard-severity-zones/">https://osfm.fire.ca.gov/divisions/community-wildfire-preparedness-and-mitigation/wildfire-preparedness-fire-hazard-severity-zones/</a>).

Of county area which is included in FHSZ maps (SRA and LRA land), most area (over 65%) is classified as being in very high FHSZ (VHFHSZ) under the currently adopted 2007-2008 FHSZ maps. See Table 2 and Figure 4. Approximately 21.6% of the SRA land is classified as high FHSZ and approximately 13.7% is classified as moderate FHSZ. 75.3% of the county is Federal Responsibility Area (FRA) and is not classified into FHSZs¹. CAL FIRE is in the process of producing revised FHSZs for all SRA and LRA lands, which will be reviewed, modified (as needed) and adopted by local jurisdictions in 2023-2024. Note: The updated 2023 SRA map, which is currently under regulatory review, increased 0.3% (985 acres) of the county's area from moderate and high FHSZ designations to very high FHSZ.

Table 2. Percentage Breakdown of Fire Hazard Severity Zones in the County

Responsibility Area	Fire Hazard Severity Zone (% of Direct Protection Area)			Direct Protection Area in acres (% of total area)
•	Very High	High	Moderate	
FRA <sup>1</sup>	N/A	N/A	N/A	1,097,495 (75.3%)
SRA	64.7%	21.6%	13.7%	358,544 (24.6%)
LRA	72.4%	N/A	N/A	2,014 (0.1%)

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<sup>&</sup>lt;sup>1</sup> Note: The federal government has a different fire hazard scoring system to CAL FIRE's FHSZ classification system.

(Tuolumne County)

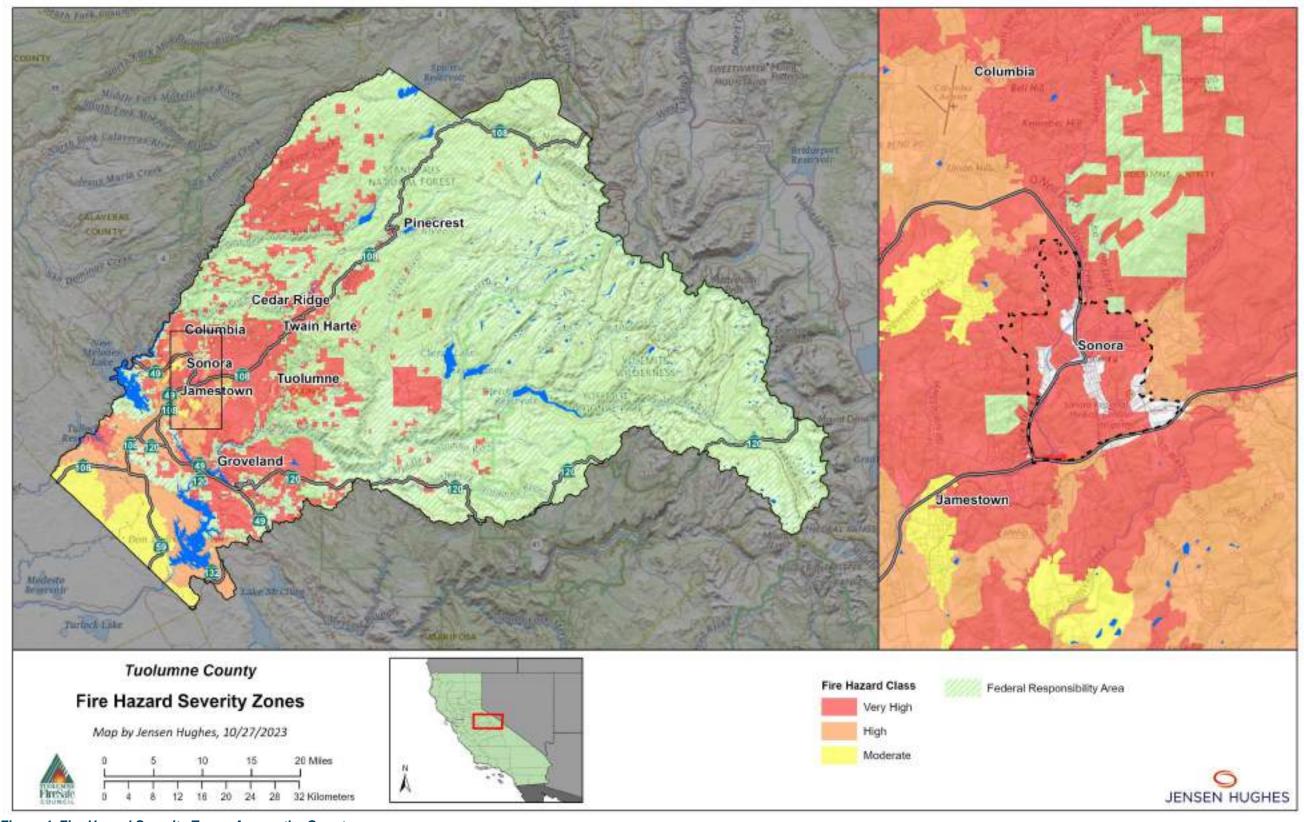


Figure 4. Fire Hazard Severity Zones Across the County

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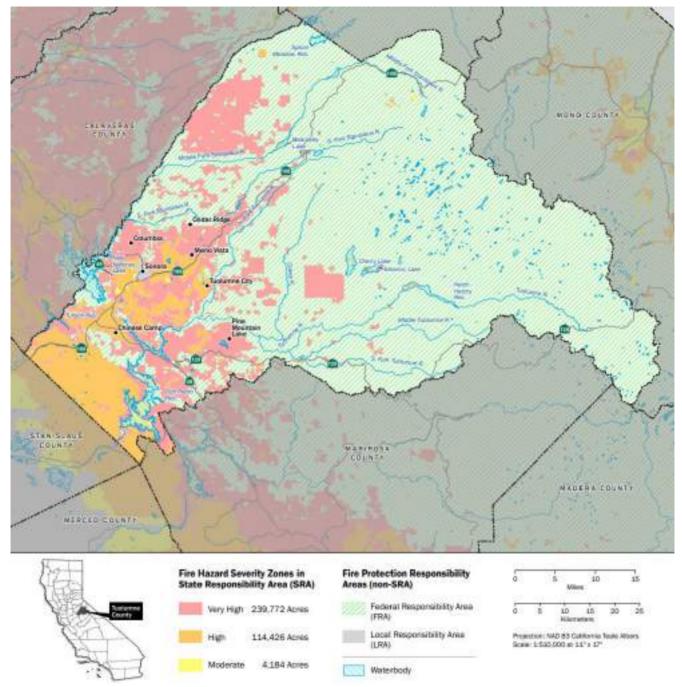


Figure 5. Fire Hazard Severity Zones under regulatory review as of June 15, 2023 for the Planning Area. LRA zones are pending publication for draft review in 2024 (CAL FIRE).

#### 3.3 THE WILDLAND URBAN INTERFACE (WUI)

The wildland-urban interface, commonly called the WUI, is defined as the line, area, or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels (NWCG, 2018). Oftentimes, the WUI is perceived as rural areas where uninhabited wildlands (primarily timbered forests) meet individual structures or homes. This perception has led many who live in more suburban and urban areas

"near the WUI" to believe they are not at risk from wildfire because they are not exactly at the interface of wildlands, or they live adjacent to large open spaces of primarily grass and shrub-lands (instead of forestlands) [FEMA, 2022].

To help protect people and property from potential catastrophic wildfire, the 2000 National Fire Plan (NFP) required the identification of communities in the wildland-urban interface (WUI). As seen in Figure 6, most if not all the populated areas of the county (i.e., along highway 108, 102, and 49 corridors) are considered in the WUI per CAL FIRE, whether in the interface, intermix or influence zones.

The National Wildfire Coordinating Group (NWCG, 2009) defines the WUI as "the line, area, or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels."

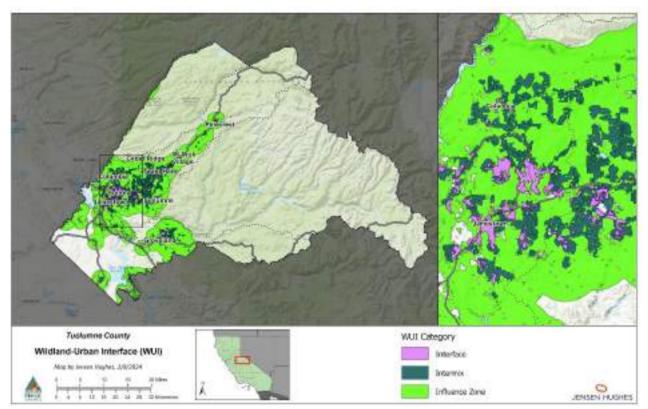


Figure 6. CALFIRE identified WUI areas in Tuolumne County

All three WUI designations are considered at risk and susceptible to wildland fires. Below is a brief description of each of the WUI zones:

- 1. **Wildland-Urban Interface**: dense housing development adjacent to vegetation that can burn in a wildland fire.
- 2. **Wildland-Urban Intermix:** housing development interspersed within an area dominated by wildland vegetation subject to wildfire.
- 3. **Wildland-Urban Influence Zone:** wildfire susceptible vegetation up to 1.5 miles from Wildland-Urban Interface and/or Intermix areas.

As seen in Table 3, the WUI interface and intermix zones – the most at-risk zones – only comprise a small fraction of the county's total land area (i.e., 0.31% and 1.87% of county, respectively). However, in terms of where structures are located, approximately 65% of homes and other structures are located in the interface and

intermix zones. Much of these high risk WUI lands are clustered around Sonora, the surrounding area along Highway 108 and Groveland. Considering the WUI influence zone, this adds another 14.63% of the county land area and 22.7% of the homes/structures in the County in the WUI (totaling 16.8% of County land area and 86.7% of the structures in the County). The influence zone, while not in the interface or intermix of wildlands, is at risk to wildfire threats primarily from embercast originating from wildland or structure-to-structure fires. *Note: Embercast from wildfires are known to travel anywhere from 100s of feet to upwards of 2 miles from the fire front, whether from vegetative fuels or urban fuels.* See Section 5.3.3 for more details.

Table 3. Wildland Urban-Interface (WUI) Zone Acreage

WUI Zone	Acres	% of Area in County	# of Structures	% of Structures in County
Interface	4,574	0.3%	4,262	18.8%
Intermix	27,255	1.9%	10,258	45.2%
Influence	213,248	14.6%	5,162	22.7%
Non-WUI	1,212,420	83.2%	3,022	13.3%
Total	1,457,497	100.0%	22,704	100.0%

# **Understanding the Wildland-Urban-Interface ("WUI")**

# Why is the WUI a Major Concern?

- o A fire in the WUI poses the greatest potential impact to people, property, and livelihoods.
- The WUI has an unpredictable mixture of native vegetation, non-natives, and man-made fuels that are oftentimes the primary sources of structure ignition.
- Man-made fuels include combustible structures (e.g., homes, businesses, outbuildings), combustible non-structural features (e.g., decks, fences, ornamental landscaping) and other items (e.g., vehicles, fuel tanks, ornamental landscaping, yard waste). These fuels can burn at greater intensities and longer fire durations than wildland fuels.
- WUI fuels and their associated fire behavior are not well understood, and therefore ignored in most fire models.
- Most structures in the WUI pre-date modern WUI building codes and standards, and therefore have limited fire resistance making them highly vulnerable to fire.

# Why Should I Care? I Don't Live in the WUI. Here are the facts:

Nearly 86.7% of residential / commercial structures in the County are located in the WUI.
 See Figure 6 and Table 3.

## Go to Section 5.3.3 for More Details

### 3.3.1 Communities-At-Risk (CARs)

Communities at Risk (CARs) are a special designation originating with the Federal government to identify communities that are at high risk of damage and/or loss from wildfire <u>and</u> which abut federal lands. These lands were identified as CARs in the Federal Register in 2001 (National Archives and Records Administration Federal Register, 2001), which was intended to help facilitate fuel treatments on federal lands and adjacent lands to help protect local communities from wildfires. Overtime, responsibility for maintaining this list was then turned over to the states.

In California, CAL FIRE is responsible for managing the CARs list and uses three main factors to determine inclusion on the list as follows: 1) high fuel hazard, 2) probability of a fire, and 3) proximity of intermingled wildland fuels with urban environments<sup>2</sup>. CAL FIRE has also expanded the definition to include communities which are not adjacent to federal lands.

In Tuolumne County, the following communities are considered CARs by CAL FIRE.

- Arastraville
- Buck Meadows
- + Bumblebee
- + Chinese Camp
- + Cold Springs
- Columbia
- + Confidence
- Cow Creek
- + Dardanelle
- East Sonora
- + Groveland-Big Oak Flat

- Harden Flat
- + Jamestown
- + Jupiter
- Kennedy Meadow
- Lake Don Pedro
- + Long Barn
- + Mather
- Mi-Wuk Village
- + Moccasin
- Mono Vista
- + Phoenix Lake-Cedar Ridge

- + Sierra Village No.1
- + Smith Station
- + Sonora
- + Soulsbyville
- + Standard
- Stent
- + Tuolumne City
- + Tuolumne Rancheria
- + Tuttletown
- Twain Harte

As seen in Figure 7, the majority of the CARs are located along Highway 108, near Sonora. A smaller grouping of CARs lay along Highway 120, near Groveland.

Note: Additional communities may be added to the list of CARs by CAL FIRE based on changes in risk and understanding of risk. Existing and new communities on land designated as WUI or very high FHSZ may also be added as CARs.

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<sup>&</sup>lt;sup>2</sup> https://www.cafirealliance.org/communities\_at\_risk/communities\_at\_risk\_history/

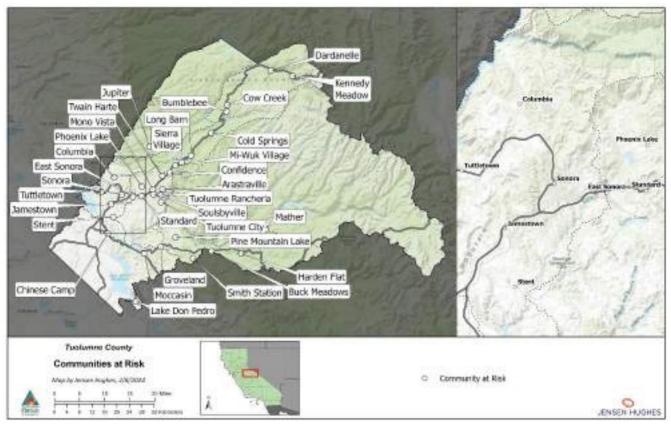


Figure 7. CALFIRE designated Communities at Risk Tuolumne County

#### 3.4 **VALUES AT RISK**

Tuolumne County is an important location for both locals and visitors with its outdoor recreation opportunities, access to Yosemite National Park, agriculture and livestock operations, and educational facilities. Attempts to capture all of Tuolumne County's many measurable and intrinsic values is difficult, therefore this plan only considers those values that can be most readily compromised by wildfire.

Community values-at-risk to wildfires are often considered as life safety, buildings, and critical infrastructure. However, values can also include human health, natural resources, sensitive species and habitats, cultural and historical resources, viewscapes, and other intangibles (e.g., social capital, community culture, livelihood). Although not all values can be protected directly through wildfire mitigation measures, actions can be taken to indirectly protect those values by developing strategies that reduce the wildfire threat overall. An ongoing challenge is to balance the level of hazard mitigation work required to protect one set of values without compromising others. In public meetings and through community surveys (Appendix G ), residents and other stakeholders emphasized the importance of the following values:







**Property** 



& Natural **Resources** 



**Cultural &** Historical Resources



Recreation



Local **Economy** 

#### 3.4.1 Human Life and Health



The highest priority for agencies, organizations and individuals in Tuolumne County is human life safety. Historically, large fires in the region have resulted in injuries and causalities. The 2013 Rim Fire had major impacts to human health, as well as to property in Tuolumne County.

The County has numerous direct and indirect life safety challenges due to wildfires including:

- Various populations with access or functional needs, and other vulnerable groups (e.g., tourists, limited English proficiency, low income, elderly, medical baseline persons).
- + High percentage of existing buildings with deficient structural hardening and resistance to smoke/ash infiltration
- + Limited and/or deficient defensible space in many neighborhoods
- + Limited infrastructure for early warning detection and notification for wildfires
- + Limited emergency public communication coverage, consistent messaging, and physical resiliency
- + High number of neighborhoods with limited number, capacity, and separation of travel routes for access/egress

While all of these factors contribute in varying degrees to the risk wildfires present to life-safety in the County, the factors that are considered foundational to life safety risks relate to people characteristics (e.g., how many people are at risk, where people are located relative to hazards, what vulnerabilities people may have to preparedness, response, and recovery).

Based on 2020 U.S. Census Bureau data, Tuolumne County has a population of ~55,000 people (not including transient populations and part-time residents) with the highest concentrations of individuals in the southwest of the county and located along SR-49, SR-108 and SR-120. All the populated areas of the county border or are intermixed with areas of wildland vegetation which increases their wildfire hazard. See Figure 8, Population Density Map, for additional detail.

In addition to the number of people at risk, most residents live and work at properties or in neighborhoods that are not only distant from major access/egress routes, but also have limited escape options in the event of a fire such as Cedar Ridge, Yankee Hill, and Twain Harte. The limited number of routes through the County (i.e., SR-49, SR-108 and SR-120) is a particular vulnerability for both access and egress. Other limitations include narrow, winding, and/or steep roads, vegetation encroachment into roadways, locked gates, poorly labeled addresses, other speed limiting factors such as unlit roads, intersections, speed bumps, street signage, and limited turnaround capabilities. The topography and past development practices in Tuolumne County have resulted in limited access for emergency services and challenging evacuation conditions for residents and visitors in the event of a wildfire.

In addition to baseline access/egress challenges, vulnerable or functional needs populations have special needs and may have limited capacities to prepare for, respond to, and recover from a wildfire incident. These individuals are also less likely to get involved in wildfire mitigation activities (Ojerio, 2008). As a proxy for individual-level vulnerability data, key demographic, and other population statistics for Tuolumne County from

Life safety includes the protection of both life and physical well-being for all people in a community.

the 2020 U.S. Census (U.S. Census Bureau, http://data.census.gov) were assessed to identify potential vulnerable populations. These data were as follows:

- + Population: 55,620 and 31,415 housing units
- + Average population density: ~25 people/square mile
- + Racial makeup: 79.5% White, 12.8% Lation/Hispanic, 1.8% American Indian or Alaska Native, 1.8% Black or African American, 1.5% Asian, 0.2% Native Hawaiian/Pacific Islander, 15.2% Other/Two or More Races
- + Spanish-speaking at home: ~5.2% of the population
- + **Disabilities:** 19.8% of the population
- + *Vulnerable age groups:* 4.5% of the population under 5 years, 26.2% 65 years and older
- + **Poverty:** 9.9% of the population lives below poverty level

Vulnerable or functional needs populations include those who are physically and/or mentally disabled (e.g., blind, cognitive disorders, limited mobility), limited or non-English speaking, culturally isolated, medically or chemically dependent, unhoused, Deaf and hard-of-hearing, frail or elderly, and children.

These population statistics for Tuolumne County indicate that there may be individuals and households with vulnerabilities, which affect their ability to prepare, respond, and/or recover from a wildfire event. Physical and mental limitations may reduce these individuals' capacities to evacuate independently in a disaster. Limited access to financial resources may hinder the ability of lower-income populations to invest in emergency preparedness and mitigation measures, and to recover from losses. Language barriers can present major challenges to effectively receiving emergency notifications, evacuation instructions, and/or support services. In addition, visitors to Tuolumne County can be particularly vulnerable to wildfire incidents, as they are less likely to be familiar with the risks of wildfires, local response management practices, emergency resources, public communication channels and other support services. Planning for vulnerable populations is critical to providing a holistic wildfire mitigation preparedness plan that works for the entirety of the community.

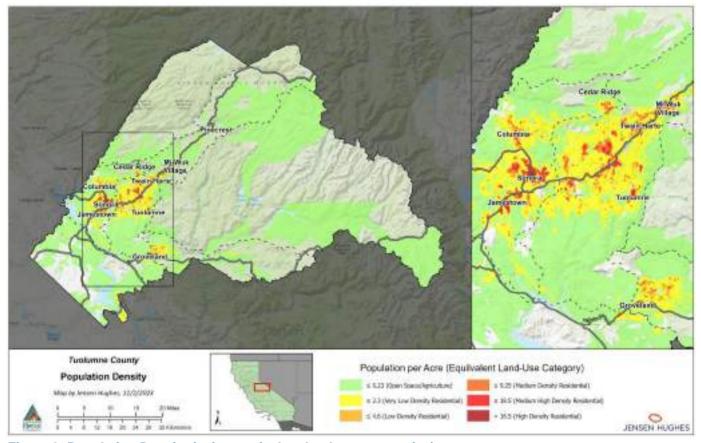


Figure 8. Population Density (using equivalent land-use categories)

### 3.4.2 Critical Facilities and Infrastructure



**General Description:** Critical facilities and infrastructure are the structures, facilities, systems, and networks, whether physical or virtual, that are considered essential to maintaining the normalcy of daily life and overall functionality of a community or society. As such, they are essential for the efficient functioning, and delivery, of basic services provided in cities, towns, and rural areas.

According to United Nations Office for Disaster Risk Reduction (UNISDR), California Office of Emergency Services (CAL OES) and FEMA, destruction, disruptions, or interruptions in critical facilities and infrastructure, including health and education facilities, could lead to cascading effects across sectors and sometimes across borders.

Per the CAL OES, critical facilities and infrastructure consist of nine sectors:

- 1) Emergency Services
- 2) Government Facilities
- 3) Healthcare and Public Health
- 4) Energy
- 5) Water and Wastewater Systems

- 6) Communication Systems
- 7) Chemical
- 8) Transportation
- 9) Food and Agriculture

As the facilities and infrastructure supporting these sectors can be located in and/or in close proximity to high fire prone areas, the potential direct and indirect impacts of wildfires can cause significant damage, destruction and/or disruption to these essential public services. These major facilities and infrastructure are priority locations for hazard reduction and wildfire hardening projects. Note: Wildfire mitigation actions to protect critical infrastructure is often the responsibility of the entity operating these facilities or services.

The following is a brief description of critical infrastructure identified as part of the CWPP planning process. Figure 11 depicts key critical infrastructure within the County.

### 3.4.2.1 Emergency Services

**General Description:** The emergency services sector is defined by dispatch centers, law enforcement facilities (e.g., police stations, sheriff offices), fire stations, emergency operations centers, and office of emergency services.

- + Law Enforcement Facilities: Tuolumne County has two (2) police stations with centralized dispatch Sonora Police Department located at 100 S Green St. in City of Sonora and the Tuolumne Rancheria Police Station at 19595 Mi-Wuk Street in Tuolumne for tribal security. In addition, the County has a Sheriff's Department located at 28 North Lower Sunset, Sonora, with several Community Services Units (CSUs) located throughout the County.
- Fire Stations: There are several Fire Stations and Emergency Medical Services (EMS) Stations throughout the County. Most of these stations are located within or adjacent to Sonora, Groveland and along the Highway 108 corridor. There are 12 County Fire Stations within the County. Most of the Stations are staffed with permanent or volunteer fire personnel. There are also a total of 4 EMS stations within the County. They are colocated within or adjacent to Fire Stations or Police Stations within or near Sonora and Groveland.



Figure 9. Standard fire station in Sonora.

- + Emergency Operations Centers: The primary and alternate emergency operations center for the County are located in government facilities within or adjacent to City of Sonora. The exact locations, however, are restricted and therefore not shown in Figure 11. Office of Emergency Services are provided at the county level at 2 S. Green Street, Sonora, CA 95370. https://www.tuolumnecounty.ca.gov/1567/Office-of-Emergency-Services
- Search and Rescue: Search and Rescue is provided by the Sheriff's department with the headquarters located in the City of Sonora.

#### 3.4.2.2 Government Facilities

**General Description:** The government facilities sector is defined by schools, military facilities, jails and prisons, homeless shelters, community centers, senior centers, independent living centers (as defined by the California Department of Rehabilitation), voting centers and vote tabulation facilities.

+ Schools: Tuolumne County is home to 11 school districts and a public charter school, Gold Rush Charter. There are approximately fourteen (14) combined elementary and junior high schools, two (2) combined junior high and high school, approximately nine (9) high schools, one (1) combined elementary through high school, one (1) continuing education high schools, three (3) outdoor schools, and various adult schools located within County. There is also one community college, Columbia College. See Table 3. Note:

Headquarters for home school and online learning programs are not included in this summary or in the list below.

Table 4. Private and Public Schools Across Tuolumne County

School	Type	Location
Sonora Elementary School	K – 8	Sonora
Gold Rush Charter	K – 8	Sonora
Gold Rush Charter High School	9 – 12	Sonora
Columbia College	Community College	Columbia
Dario Casina High School	9 – 12	Sonora
Theodore Bird High School	9 – 12	Sonora
Sonora High School	9 – 12	Sonora
Belleview Elementary School	K – 8	Sonora
Curtis Creek School	K – 8	Sonora
Foothill Horizons	Outdoor School	Sonora
Sierra Outdoor School	Outdoor School	Sonora
Old Oak Ranch Environmental	Outdoor School	Sonora
Mother Lode Adventist Junior Academy		Sonora
Soulsbyville Elementary School	K – 8	Soulsbyville
Twain Harte School	K – 8	Twain Harte
South Fork High	9 – 12	Twain Harte
Pinecrest Elementary School	K – 8	Pinecrest
Tenaya Elementary School	K – 8	Groveland
Tioga High School	9 – 12	Groveland
Don Pedro High School	9 – 12	La Grange
Summerville Elementary School	K – 8	Tuolumne
Summerville Union High School	7 – 12	Tuolumne
Connections VPAA	7 – 12	Tuolumne
Cold Spring High School	9 – 12	Long Barn
Long Barn School	11 – 12	Long Barn

School	Туре	Location
Mountain High School	9 – 12	Pinecrest
Mother Lode Christian School	Pre-K – 8	Tuolumne
Columbia Elementary School	K – 8	Columbia
Sierra Waldorf School	K – 8	Jamestown
Jamestown Elementary	K – 8	Jamestown
Chinese Camp Elementary	K – 8	Chinese Camp

- Military Facilities: There are no military facilities in the County.
- + **Jails and Prisons**: There is one County Jail in City of Sonora. There is also the Mother Lode Regional Juvenile Detention Center. There are no other known corrections facilities in the County.
- + **Homeless Shelters:** There are several homeless, transitional, battered women's and other shelters across the County. Locations are confidential.
- + Community Centers: There are approximately eleven community centers, public meeting rooms, halls and courtyards located in the County, providing a range of facilities and services for socializing, participating in recreational or educational activities, gaining information, and seeking counseling or support services: (1) David Lambert Community Center (behavioral health needs and the homeless), (2) Southside Community Connections/The Little House, (3) Groveland Community Resiliency Center, (4) Tuolumne Community Resiliency Center, (5) Groveland Community Hall, (6) Jamestown Community Hall, (7) Pinecrest Community Hall, (8) Sonora Main Library Meeting Room, (9) Sonora Youth Center, (10) Tuolumne Veterans Memorial Hall and (11) Sonora Veterans Hall.
- + Senior Centers, Independent Living Centers and Retirement Communities: There are numerous, approximately thirteen (13) senior care centers, independent living centers or retirement communities located in the County e.g., Sonora Senior Living, Southside Senior Services, Sonora Community Estates, Mother Lode Ombudsman, Tuolumne County Senior Center, Sierra Foothills Residential Care, Adventist Health Sonora Sierra Care Center Unit 6 & 7, Sonora Hills, Golden Sonora Care, Skyline Place Senior Living, Meadowview Manor, Forest View Senior Housing. These facilities are primarily located along the Highway 108 corridor in or near Sonora.
- + Voting Facilities: There are generally five voting centers located in the County at the time of elections. However, the specific location of these facilities can oftentimes change. The Tuolumne County Elections Department in Sonora is the only voting location that is known to be fixed.

#### 3.4.2.3 Healthcare and Public Health

**General Description:** The healthcare and public health sector is defined by public health departments, cooling (or warming) centers, temporary facilities established for public health emergencies, medical facilities, including hospitals, skilled nursing facilities, nursing homes, blood banks, healthcare facilities, dialysis centers, and hospice facilities, but excludes doctor offices and other nonessential medical facilities.

Tuolumne County has a public health department, headquartered in Sonora, which provides and coordinates a variety of community resources (<a href="https://www.tuolumnecounty.ca.gov/DocumentCenter/View/25582/Community-Resource-Guide">https://www.tuolumnecounty.ca.gov/DocumentCenter/View/25582/Community-Resource-Guide</a>). There is one hospital, Adventist Health Sonora Hospital in Sonora, which provides emergency services. Minor emergency services are also available at the Groveland Family Medical Center in Groveland

and Prompt Care in East Sonora. Several skilled nursing facilities and nursing homes also exist. Cooling centers include libraries in Groveland, Sonora, Tuolumne, and Twain Harte and the Community Resilience Centers in Groveland and Tuolumne.

### 3.4.2.4 Energy

**General Description:** The energy sector is defined by public and private facilities vital to maintaining or restoring normal service, including but not limited to interconnected, publicly owned utilities and electric cooperatives.

- + **Electrical utilities** Pacific Gas and Electric (PG&E) is the primary service provider in the County. There are approximately 25 substations located within the County with 36 separate electrical transmission lines ranging from 60 kV to 230 kV with most of the lines providing 115 kV service to the communities and rural residents in the western portion of the County and along the highway 108 and highway 120 corridors. Many of these transmission lines occur in forested vegetation types on steep slopes.
- + **Gas Pipelines** The county does not contain any gas transmission or hazardous liquid pipelines according to the National Pipeline Mapping System from the US Department of Transportation.

### 3.4.2.5 Water and Wastewater Systems

**General Description:** The water and wastewater sectors are defined by facilities associated with the provision of drinking water or processing of wastewater, including facilities used to pump, divert, transport store, treat, and deliver water or wastewater.

Water Infrastructure – The primary municipal water service is supplied by Tuolumne Utilities District (TUD). The district currently has a contract with PG&E to provide a water supply from the South Fork Stanislaus River. This water is stored in Pinecrest Lake, Lyons Reservoir, Phoenix Lake, and other small reservoirs on the TUD ditch system. PG&E operates Lyons Reservoir and the 15.7-mile Main Canal that leads to its Phoenix powerhouse. From the Main Canal, TUD's water splits into three branches – one serves Twain Harte, Soulsbyville and Tuolumne; and another feeds TUD's network of ditches, pipelines and treatment plants that serve Crystal Falls, Big Hill, and Columbia. The remainder goes into Phoenix Reservoir to serve Phoenix Lake, East Sonora, and Jamestown. Lastly, the Groveland Community Services District obtains its water from the Hetch Hetchy Reservoir and distributes water to Big Oak Flat, Groveland, and Pine Mountain Lake.

TUD currently operates and owns 11 consolidated water systems and water treatment plants, 78 treated water storage tanks, 71 miles of ditches and 330 miles of treated pipeline. This service is provided to over 14,000 connections with a majority occurring in the Sonora District (<a href="https://tudwater.com/customer-services/">https://tudwater.com/customer-services/</a>).

Another critical water infrastructure is the Hetch Hetchy System. The Bay Area Water Supply and Conservation Agency relies on this water system to provide water to residents in the Bay Area. The dam and reservoir, combined with a series of aqueducts, tunnels, and hydroelectric plants as well as storage dams.

Wastewater Treatment Facilities – There are currently four primary wastewater collection systems that include TUD, Twain Harte Community Services District (THCSD), Tuolumne City Sanitary District (TCSD), and Jamestown Sanitary District (JSD). TUD has the most expansive wastewater collection system (140 miles of pipeline) throughout the area with primary collection services and wastewater treatment plants. Additionally, a reclamation system is in place. THCD has approximately 25 miles of sewer lines that collect wastewater and is treated at TUD's Twain Harte Wastewater Treatment Plant (https://tudwater.com/customer-service/water-services/). The Jamestown Sanitary District provides sewer

collection and treatment within the serviced boundaries within Jamestown. TCSD has a wastewater collection system and treatment plant for Tuolumne, Carter, Black Oak Casino, Willow, and Apple Colony. Lastly, the Groveland Community Services District provides wastewater collection for 1550 customers and operates a wastewater treatment plant.

Table 5. Water Purveyors Located in the Planning Area

Water Provider	Туре	Location
Groveland Community Services District (CA5510009)	WP	Groveland
Hetch Hetchy Water & Power	WP	Moccasin
Mi-Wuk Mutual Water Company (CA5510006)	WP	Mi-Wuk Village
Phoenix Lake Country Club Estates Mutual Water Company (CA5510026)	WP	Sonora
Ponderosa Water Company (CA5510002)	WP	Tuolumne
Sonora Meadows Mutual Water (CA5510023)	WP	Soulsbyville
Sonora Water Company (CA5510024)	WP	Sonora
Twain Harte Community Services District (CA5510005)	WP	Twain Harte
Del Oro's Water Company	WP	Strawberry
Tuolumne Utilities District (CA5510003)	WP	Sonora
Pinecrest Permittees Association (CA5510004)	WP	Pinecrest

WP - Water Purveyor

#### 3.4.2.6 Communication Systems

**General Description:** The communication sector is defined by carrier infrastructure, including selective routers, central offices, head ends, cellular switches, remote terminals, and cellular sites.

Cellular communication is good for most of the urban areas within the county. Outside of the urban areas, the coverage can range from poor to limited-service level. Additionally, there are over 100 public and private communication towers throughout the County. Most of these towers are near urban areas, but several are in remote areas. Due to the steep topography and numerous canyons throughout the area, cell communication is currently considered unreliable as a primary method for first responders to alert and inform the public concerning wildfire threats. Alternative methods of communication to notify the public should be considered during wildfires.

#### 3.4.2.7 Chemical, Industrial and High Hazard Facilities

**General Description:** The chemical sector is defined by facilities associated with the provision, manufacture, maintenance, or distribution of hazardous materials and chemicals.

There are a number of hazardous, chemical, or manufacturing sites and facilities that are located throughout the County. The majority of these sites are in the communities of Columbia, Tuolumne, and Groveland, and along SR 120 and SR 108. There are also five waste management sites located throughout the County – Pinecrest Transfer Station, Cal Sierra Transfer Station in East Sonora, Big Oak Flat Transfer Station, Blue Mountain Minerals in Columbia, and Triple J Farms in Jamestown. Refer to the County General Plan EIR for more details on the range of hazardous materials facilities.

### 3.4.2.8 Transportation

**General Description:** The transportation sector is defined by facilities associated with automobile, rail, aviation, major public transportation, and maritime transportation for civilian and military purposes, as well as traffic management systems. Transportation and the movement of individuals to safety ahead of a wildfire is typically a major challenge for City, County and State governments.

The main State Highways are 49, 108, and 120. Highway 49 is the shortest highway that runs from the north to south in the western portion of the county. Highway 108 is one of the primary routes running from southwest to the northeast. Highway 120 is also a primary route running generally west to east in the southern portion of the county. It is also considered one of the most scenic and direct routes to Yosemite National Park and has the heaviest traffic during the peak fire season. Additionally, narrow single and two-lane roads, which lead to many communities and recreational sites, present ingress/egress concerns in the advent of an unplanned fire ignition. Evacuations of the public in concert with incoming firefighting resources present unique challenges to public safety officials who attempt to move the public out of the area while allowing suppression resources to safely access the area to attack the fire.

In addition to challenges with the major access/egress routes into and out of the County, there are also many communities that only have access to major routes via a single point consisting of narrow local roads. These



Figure 10. 2013 Rim Fire burnout. Source: Mike McMillan.

features cause additional evacuation challenges in the event of a wildfire.

Protecting the viability of road systems throughout the County is critical to the safety of the public and emergency responders. The maintenance of roadside rights-of-way and prevention of neighborhood landscape vegetation from encroaching onto the road networks will be imperative for the resiliency of not only protecting the physical transportation network, but also the capacity to provide access and egress for the first responders and the public during a major wildfire event.

In addition to road networks, Sierra Pacific Railroad transports hazardous materials and heavy timber by rail throughout the County.

(Tuolumne County)

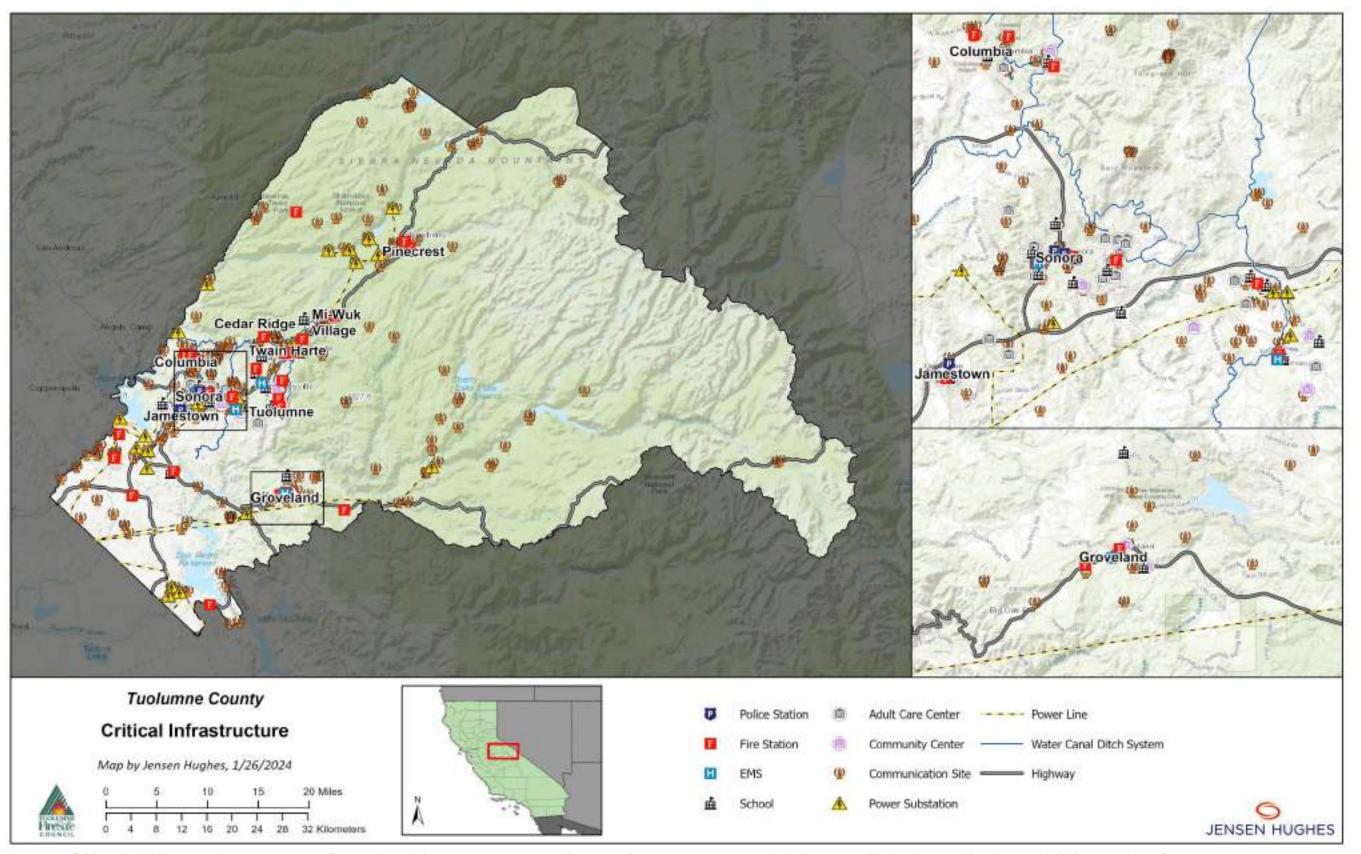


Figure 11. Critical Facilities and Infrastructure Map (Note: Water infrastructure and associated services, key government buildings, chemical and other high hazard facilities not shown)

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### 3.4.3 Private Residential Property, Commercial Businesses and Schools



Most housing in Tuolumne County consists of single-family detached homes ( $\sim$ 81.5%) built between the 1960s-1990s on parcels of varying sizes, dimensions, and topographic conditions. The total number of housing units in the County in 2020 is approximately 31,637, with  $\sim$ 2,500 located in City of Sonora and the remainder - 29,137 - located in unincorporated areas<sup>3,4</sup>. Of these housing units

approximately 8,279 (~26%) are vacant, which is indicative of the substantial percentage of units that are used seasonally or as second homes. Multi-family housing complexes with five or more units make up 3.2 percent of total housing units, with two-to-four-unit multi-family complexes making up 3.0 percent<sup>4</sup>. In addition, mobile homes make up 9.7 percent of total housing units<sup>4</sup>.

The majority of housing is concentrated along the SR-108 and SR-120 corridors in the City of Sonora and the communities of Jamestown, Columbia, Tuolumne, Cedar Ridge, Twain Harte, Mi-Wuk, Groveland and Pinecrest, with pockets of smaller communities farther out from the main highway corridors. In general, housing density is highest in the City of Sonora and the other communities previously mentioned, with very low densities in the rest of the County.

As most of the existing building stock in the County was built before 2008 – when Chapter 7A of the California Building Code was first adopted – most structures are likely not constructed per modern wildfire building

construction standards making them more susceptible to ignition. This presents a major challenge for the County due to the high loss potential, but also the increase in urban fuel loads and higher likelihood of structure-to-structure fire spread. In 2021, the median value of homes within the County was approximately \$383,750, estimated to be \$401,783 in 2023 (www.zillow.com, accessed November 1, 2023). With approximately 85.6% of County structures located in Very High or High Fire Hazard Severity Zones, the potential property value loss could be substantial.

Most structures in the County are not constructed per modern wildfire building construction standards making them more susceptible to ignition. This presents a major challenge due to the high loss potential, but also an increase in urban fuel loads and higher likelihood of structure-to-structure fire spread.

In addition to housing, the Planning Area also has about 3,600 acres of commercial and industrial land-uses, which accounts for less than 0.2% of all land-uses. Similar to the distribution of housing units, the majority of commercial and industrial properties are located along the SR-120/SR-108 highway system, with the City of Sonora representing the commercial core of the County. There are scattered pockets of standalone commercial and industrial uses outside of the city limits. In many cases, commercial and industrial developments are either immediately adjacent to wildland vegetation or within 0.5 miles of wildland space, making commercial/industrial buildings, as well as other uses having a high chance of direct exposure to wildfire or within ember cast range. As with residential developments, the majority of commercial and industrial developments lie within designated Very High to High Fire Hazard Severity Zones.

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<sup>&</sup>lt;sup>3</sup> 2024-2029 Tuolumne County Draft Housing Element Report.

<sup>&</sup>lt;sup>4</sup> 2019-2024-Sonora-Housing-Element-Draft-Sept-2019



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(Tuolumne County)

2023 Community Wildfire Protection Plan

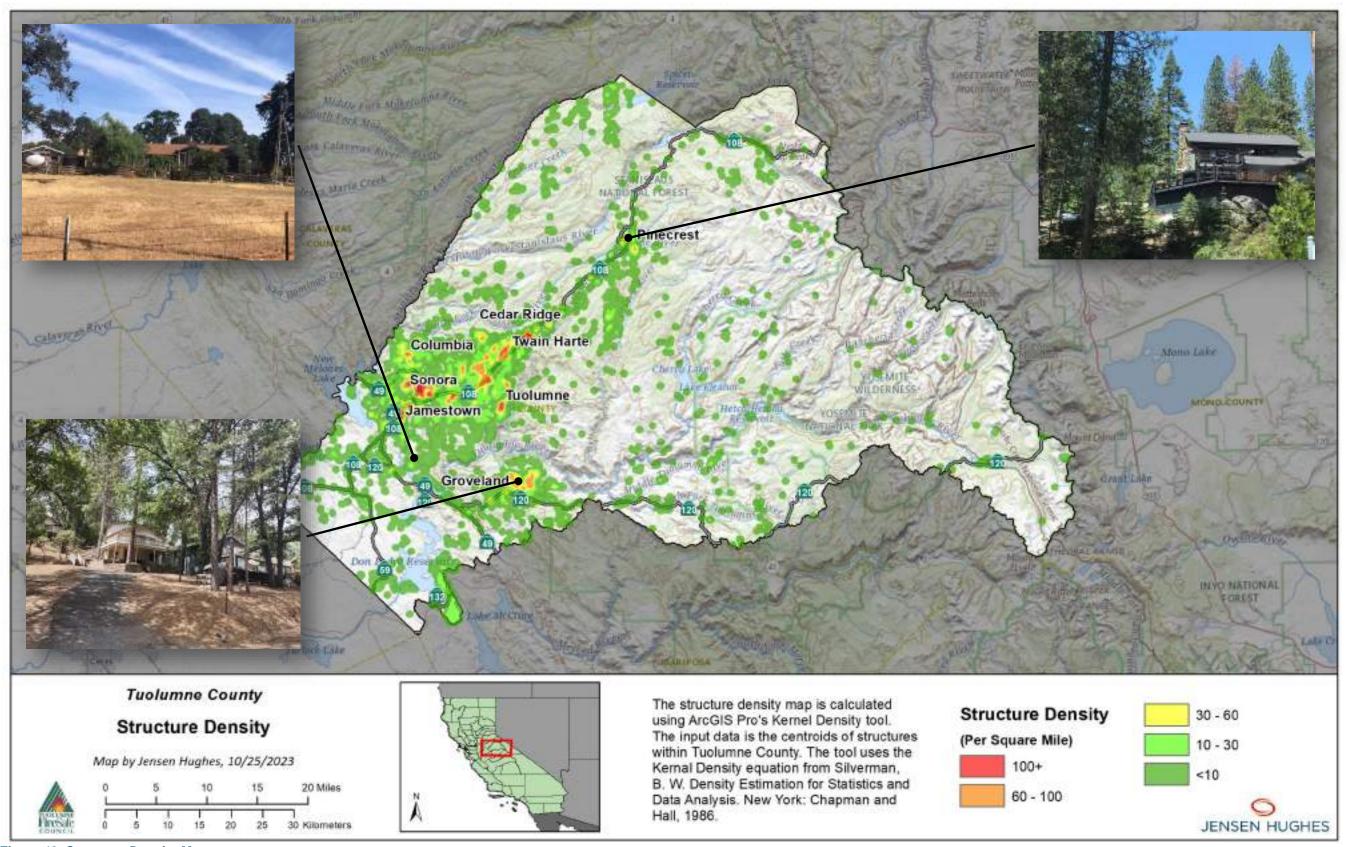


Figure 12. Structure Density Map

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#### 3.4.4 Environmental and Natural Resources



**General description**: Environmental and natural resources consist of a variety of components including biological resources, historical and cultural resources, air quality, water, recreation, geological and archaeological resources.

First settled by American Indians and later by immigrants when gold was discovered, the demand for natural resources in the County have occurred for thousands of years. Recreation, wildlife, and wilderness natural resources are important natural resources from a diverse, social, and economic perspective. Most of the natural resource attention has focused on supplying water and extracting resources such as minerals, timber, and agriculture. Lastly, the preservation of cultural resources related to indigenous people, mining, and railways are important to local and state history (Mittelbach and Wamben 2002).

The interrelationships between healthy vegetation and animal life are important to overall ecosystem health and function. Within the Sierra Nevada mountains, approximately 400 animal species occupy areas at different elevations depending on season or stages in the precipitation cycles. (Mittelbach and Wamben 2002). Seasonal habitat loss is a concern that has effects on other areas in the region. There are six (6) species which have designated critical habitat within the County. The Sierra Nevada bighorn sheep and Central Valley steelhead, as well as four plant species: fleshy owl's clover (also called succulent owl's clover), Hoover's spurge, Colusa grass and Greene's tuctoria. In addition, there is one habitat type, vernal pools, for which a statewide recovery plan exists. The recovery plan covers 33 plant and animal species associated with vernal pools, 20 of which are federally listed as endangered or threatened (Brandman, 2011)

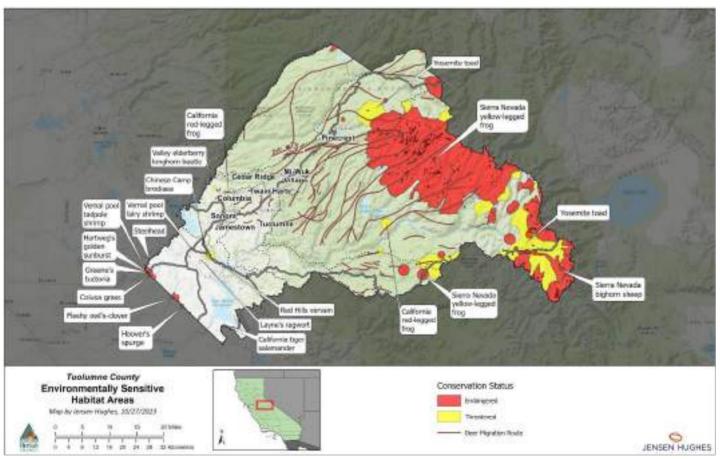


Figure 13. Environmentally Sensitive Habitat Areas

#### 3.4.5 Cultural and Historical Resources



Tuolumne County is rich in cultural and historical resources including prehistoric resources, historic resources, Native American resources, and paleontological resources<sup>5</sup>. Given the abundance of these significant resources, all projects associated with this plan need to be carefully evaluated for their potential impacts.

Tuolumne County's past begins with prehistoric habitation more than 10,000 years ago. The County's indigenous peoples, the Central Sierra Me-Wuks, arrived between 2,000 and 600 years ago. Tuolumne County was a significant residential and resource procurement area for the Central Sierra Me-Wuk<sup>5</sup>. Currently, the Me-Wuk culture is alive and still widely practiced. The Tuolumne Band of Me-Wuk Indians is a federally recognized Indian Tribe located in the Sierra Nevada foothills and hosts several annual traditional events. The governing body of the tribe is the Community Council, which is composed of 141 members. The Tribal committee for Cultural and Historic Preservation makes recommendations to the Community Council for approval<sup>6</sup>. The Chicken Ranch Rancheria Me-Wuk Indians is also a federally recognized Indian Tribe located just below the southeastern face of Table Mountain.<sup>7</sup> Both tribes have tribal trust land and lands held in fee, currently referred to as Reservations (previously known as Rancherias).

Due to its location in Gold Country, Tuolumne County also houses many historic structures from the California Gold Rush period. The communities of Sonora, Columbia, Jamestown, Groveland, Big Oak Flat, and Tuolumne are known to contain high concentrations of historic structures. Additionally, individual or small groups of historic structures can be found outside of these communities<sup>8</sup>.

Lastly, due to its location and geological characteristics, Tuolumne County is home to several areas and deposits where fossils and evidence of Pleistocene-era large mammals can be found<sup>5</sup>.

To protect cultural and historical sites, maps of these resources are confidential, but can be made available to Fire District Personnel. A sample of these resources is listed in Table 6.

Table 6. Representative Sample of Cultural and Historical Resources in the Planning Area

Resource	Location
Sullivan Creek Park (Elsey's Pool)	East Sonora
Old Strawberry Road Bridge	Strawberry
West Side Memorial Park	Tuolumne
Jamestown Community Hall (Old Justice Court)	Jamestown
1925 Craftsman Bungalow and 1940 Garage	Columbia
Mark Twain Cabin	Tuttletown
Mt. Carmel Catholic Church and Cemetery	Groveland

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<sup>&</sup>lt;sup>5</sup> https://www.tuolumnecounty.ca.gov/DocumentCenter/View/5760/45-Cultural-Resources?bidId=

<sup>6</sup> https://mewuk.com/cultural/history/

<sup>&</sup>lt;sup>7</sup> https://chickenranchrancheria.org/about

<sup>&</sup>lt;sup>8</sup> Highway 108 Fire Safe Council CWPP, 2004

#### 3.4.6 Recreation



According to Section 4.14 of the Tuolumne County General Plan Update EIR, the 1996 General Plan designates 4,827 acres of land for Park and Recreation use. The National Forest Service, Bureau of Reclamation, National Park Service, Bureau of Land Management, California State Parks and Recreation, and the California Department of Fish & Wildlife are additional agencies that have

jurisdiction over parks and other recreational areas within Tuolumne County.9

Tuolumne County is home to hundreds of hiking trails – some limited by snowfall, and others open year-round. Other popular recreational activities include camping, biking, whitewater rafting, horseback riding, off-highway vehicle use, fishing & boating, and winter activities such as over snow vehicle use, skiing and snowboarding. There are a variety of trail opportunities related to these popular recreational activities throughout the County. Larger recreational facilities within the county include Yosemite National Park, Stanislaus National Forest, and New Melones Lake. Popular hiking trails include Dragoon Gulch (near Sonora), Ferretti Road Trail Network (near Groveland), and the Pinecrest Lake Loop Trail (Stanislaus National Forest). <sup>10</sup>

#### 3.4.7 Local Economy



The potential short and long-term impact of wildfires in Tuolumne can be devastating to finances and local economies across all areas of the built environment, natural environment, and people domain.

Tuolumne County's local economy is highly concentrated along Highway 108 and 120 corridors, and heavily dependent on seasonal tourism. The majority of employment is in the hospitality sector (e.g., hotels, restaurants, and bars) and is located in and around the City of Sonora, Groveland, Stanislaus National Park, and Yosemite National Park. Public sector employment is the second largest employment sector and includes county and city government, local public schools, and federal and state government (national forests, BLM, national park, CAL FIRE, and Highway Patrol). The next three largest industry sectors are retail trade, healthcare/social assistance, and construction. These five industry sectors account for 81.2 percent of all local employment. Tourism connected to Yosemite National Park, which attracts more than five million visitors annually, is expected to remain the County's primary major economic generator.

Note: While the local economy has shifted to tourism and other recreational uses, historically the county's economy was driven by mining, lumber, and ranching, which can be seen in the % of land-use still being dominated by these categories. Refer to Section 3.5 for more details.

#### 3.5 LAND USE / ZONING

The Land Use Element of the 2018 Tuolumne County General Plan serves as a framework for the County's forthcoming growth. It defines permissible land use categories based on specific locations, identifies new opportunities for expansion, and enforces controlled growth within regions of the County that are either saturated with existing development or constrained by limited growth capacity due to insufficient infrastructure, inadequate public facilities, or challenging natural attributes.

Table 7 and Figure 14 illustrate the current composition and spatial distribution of various land use categories in Tuolumne County. Covering a vast expanse of over 1,120,000 acres, publicly owned land stands as the County's predominant land use designation, constituting roughly 77% of the Tuolumne County area. Agriculture

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https://www.tuolumnecounty.ca.gov/DocumentCenter/View/5769/414-Recreation?bidId=

<sup>10</sup> https://www.visittuolumne.com/download-best-trails-map

emerges as the second-largest land use category, encompassing 157,000 acres and occupying 10.8% of the County's total land area. Meanwhile, timber production (85,650 acres) and residential land (76,500 acres) collectively contribute 5.9% and 5.2%, respectively, to the County's land use composition. In contrast, other land use designations, such as parks, commercial, industrial, open space, and mixed use, collectively account for less than 1% of the County's total land area.

Table 7. Land uses across Tuolumne County

Land Use Category	Area (acre)	% of County Area
Public	1,121,674.2	77.0
Agriculture	157,224.9	10.8
Timber Production	85,650.8	5.9
Residential	77,602.4	5.3
Parks and Recreation	5,343.9	0.4
No Land Use	3,926.3	0.3
Commercial	1,998.3	0.1
Industrial	1,647.2	0.1
Open Space	734.9	0.1
Mixed Use	582.7	0.03
Total	1,456,386	100%

(Tuolumne County)

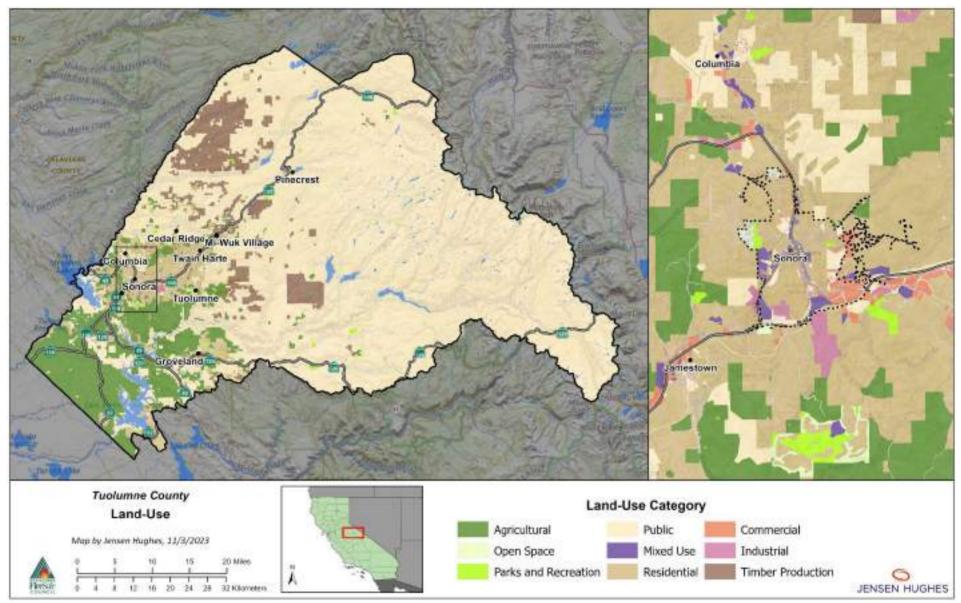


Figure 14. Tuolumne County Land Use Map and Zoning

#### 3.6 FIRE PROTECTION RESPONSIBILTY

Wildland fire protection in the State of California is the responsibility of State, Local, and Federal government fire agencies. The ability to muster a timely and robust response to a wildland fire can influence the eventual impact of that fire on a community. Fire suppression responsibilities within the County are defined by Direct Protection Areas (DPAs). DPA also defines who has the primary fiscal responsibility for paying for wildland fire suppression. Three DPAs exist within the Planning Area – Local Responsibility Area (LRA), State Responsibility Area (SRA) and Federal Responsibility Area (FRA). See Figure 15.

On a statewide basis, CAL FIRE and the federal agencies attempt to balance the acreage totals of these tradeoffs so that no single agency is protecting more of the other agency's land than the reciprocating agency. In many cases DPA swaps have been agreed to where agency jurisdictions border and is guided by the California Master Cooperative Wildland Fire Management Agreement (CFMA). Through this agreement, the CAL FIRE Tuolumne-Calaveras Unit and the Stanislaus National Forest (STF) provide direct wildland fire protection on portions of each other's Responsibility Areas. The Bureau of Land Management (BLM), Bureau of Reclamation (BOR), Army Corps of Engineers and Bureau of Indian Affairs (BIA) are other federal agencies with land holdings within the Tuolumne- Calaveras Unit on which CAL FIRE provides direct protection (Bohall and Whitson 2023).

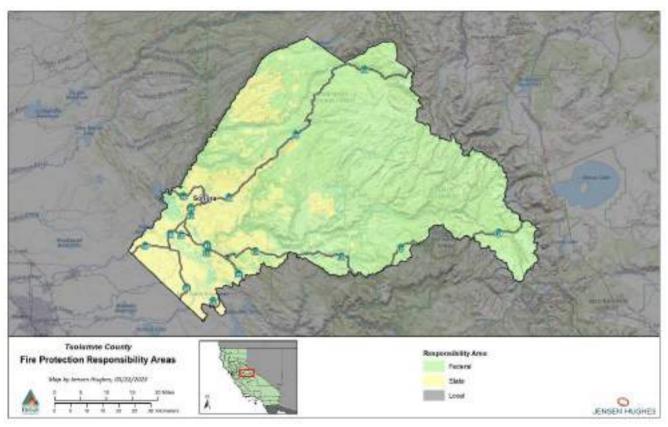


Figure 15. Fire Protection Responsibility Areas in and around Tuolumne County

### + Local Responsibility Areas (LRA)

**General definition:** These areas are private lands outside of watershed areas designated by the state or lands incorporated into cities. City fire departments, fire protection districts, counties, and CAL FIRE under contract to local governments typically provide wildland fire protection for these areas.

There are several fire districts and one City department in Tuolumne County. Columbia, Jamestown, Tuolumne, Mi-Wuk Sugar Pine (MWSPCSD), Rancheria Fire Department, Strawberry Fire Districts, and Sonora City Fire Department. Twain Harte Community Service District (THFD) and Groveland Community Services District (GCSD) also provide fire protection. The district's boundaries encompass a relatively small area surrounding the communities they are named for. Several of these fire districts are staffed with a combination of salaried and/or volunteer personnel, and some by volunteers only. Twain Harte Fire, Mi Wuk Fire, Tuolumne City Fire, and Sonora City Fire Departments staff full-time salaried personnel (Bohall and Whitson 2023).

Most of Unincorporated Tuolumne County is situated outside a fire district boundary and is protected by the Tuolumne County Fire Department (TCFD); administered by CAL FIRE, under a contractual agreement with the County since 1974. There are 13 Stations in the County Fire Department, including Station 51-Mono Village, Station 53-Ponderosa Hills, Station 54-Long Barn, Station 55-Pinecrest, Station 56-Mono Vista, Station 57-Crystal Falls, Station 58-Cedar Ridge, Station 61-Chinese Camp, Station 63-Smith Station, Station 64-Don Pedro, Station 76Jamestown, Station 78-Groveland, and Station 79-Columbia College. (Bohall and Whitson 2023). Several of the County fire stations are staffed with a combination of salaried and/or volunteer personnel. Some are not staffed.

#### State Responsibility Areas (SRA)

**General definition:** SRA are the areas where the State of California is jurisdictionally and financially responsible for the prevention and suppression of wildfires. SRA, typically, does not include lands within incorporated city boundaries, or in federal ownership, and is where CAL FIRE has the jurisdictional responsibility for the suppression of wildfires.

Under the Tuolumne-Calaveras Unit Strategic Plan (2023), CAL FIRE manages a large "Schedule B" organization throughout the Unit, and a "Schedule A" organization in Tuolumne County. The "Schedule B" program consists of the personnel, facilities and equipment directly funded by state dollars for providing wildland fire protection on SRA lands. The "Schedule A" program offered by CAL FIRE to local government consists, in part, of equipment owned by Tuolumne County. Staffing and administration are provided by CAL FIRE under a contractual agreement. In Tuolumne County, CAL FIRE provides year-round staffing for the following "Schedule A" facilities. The resources in Tuolumne County are also administered by the Deputy Chief of Operations and include two battalions. It encompasses the southeastern portion of Stanislaus County. Columbia Air Attack (fixed wing and helicopter) Base and the Sierra Forestry Training program are administered by a Division Chief.

Battalion 5 covers the Tuolumne County area north of the Tuolumne River and includes the Standard CAL FIRE Station and the Twain Harte CAL FIRE Station and 4 "Schedule A" stations; Station 51 in Mono Village, Station 56 in Mono Vista, Station 79 at Columbia College, and Station 76 in Jamestown.

Battalion 6 covers the area north of the Tuolumne River at Highway 120 and 49 Bridge and then follows Highway 108 to Obyrnes Ferry to Tulloch at the Calaveras County line. Communities and stations within the Battalion are Groveland, Blanchard, and Green Springs CAL FIRE Stations as well as two "Schedule A" Station 78 and 63, located in Groveland.

### + Federal Responsibility Areas (FRA)

**General definition**: The primary financial responsibility for wildfire suppression and prevention on federal lands is that of the federal government through the United States Forest Service (USFS), Department of the Interior – Bureau of Land Management, National Park Service, Fish and Wildlife Service, Bureau of Indian Affairs, and Defense Department for military lands.

The Stanislaus National Forest and Yosemite National Park have fire protection on National Forest and National Park Service wildlands that are located throughout the County. Most of these wildlands are located within wilderness or outside of urban areas. Through the CFMA, CAL FIRE and Stanislaus National Forest provide protection on portions of their respective responsibility areas. In addition, other Federal agency landholdings are protected by CAL FIRE.

### 3.6.1 Fire Agencies in Tuolumne County

The current Emergency Service Plan for Tuolumne County has identified objectives that pertain to identification of fire jurisdictions and organizations that require planning and emergency response coordination. As Identified in (Table 8). Tuolumne County has four Fire Departments, one Fire Protection District, one Corrections Unit, one County Facility, Stanislaus National Forest, and Yosemite National Park. Within each of these organizations, there are numerous fire stations, units, and resources that contain both paid and volunteer firefighters to provide fire protection throughout the County. There are also numerous combinations of engines, crews, heavy equipment, and aviation utilized to effectively implement tactical fire suppression operations.

Table 8. Tuolumne County Fire Agencies, Capabilities and Preparedness

Fire Station	Personnel	Fire Apparatus	Additional Equipment/Services
	CAL FIRE / Tuolumne C	Sounty Fire Department	
TCFD Station 51 Mono Village	CAL FIRE Captain (1) CAL FIRE Engineers (5) Volunteer Firefighters (2)	Type 1 Engine (1) Type 2 Engine (1) Water Tender (1)	CAL FIRE / Tuolumne County Fire Department is an All-Risk All-
TCFD Station 53 Ponderosa Hills	Volunteer Firefighters (2)	Type 2 Engine (1) USFS Type 3 Engine (1)	Hazard Fire Department.
TCFD Station 54 Long Barn	Volunter (Unstaffeed)	Type 2 Engine (1) Water Tender (1)	
TCFD Station 55 Pinecrest	Volunteer Firefighters (5)	Type 2 Engine (1) Type 6 Engine (1) Fireboat (1) Snowmobile/Trailer (5)	
TCFD Station 56 Mono Vista (outside of business hours, the engine is co-located at Stn. 51 due to no sleeping quarters at Stn. 56)	CAL FIRE Captains (1) CAL FIRE Engineers (2) CAL FIRE Firefighters (3) Volunteer Firefighters (2)	Type 1 Engine (1) Type 2 Engine (1) Type 3 Engine (1) Water Tender (2)	

Fire Station	Personnel	Fire Apparatus	Additional Equipment/Services
TCFD Station 57 Crystal Falls	Volunteer (Unstaffed)	Type 2 Engine (1) USFS Type 3 Engine (1)	
TCFD Station 58 Cedar Ridge	Volunteer Firefighters (6)	Type 2 Engine (1) Type 3 Engine (1)	
TCFD Station 61 Chinese Camp	Volunteer Firefighters (1)	Type 1 Engine (1) Type 2 Engine (1) Water Tender (1)	
TCFD Station 63/78 Groveland ((Engine is currently co-located with Groveland CSD Stn. 78)	CAL FIRE Captain (3) CAL FIRE Engineer (3) CAL FIRE Firefighter (4) Volunteer Firefighters (0)	Type 1 Engine (1) Utility Vehicle (1)	
TCFD Station 63 Smith Station	USFS Leased Station Unstaffed by TCFD	USFS Type 3 Engine (1)	
TCFD Station 64 Don Pedro (co-located with CAL FIRE Blanchard Station)	Volunteer Firefighters (1)	Type 2 Engine (1)	
TCFD Station 76 Jamestown	CAL FIRE Captain (1) CAL FIRE Engineers (4) Volunteer Firefighters (0)	Type 1 Engine (2) Utility Vehicle (1)	
TCFD Station 79 Columbia College	CAL FIRE Captain (2) CAL FIRE Engineers (3) CAL FIRE Firefighters (4) Student Firefighters (9)	Type 1 Engine (1) Type 2 Engine (1) Breathing Support (1)	
CAL	FIRE Tuolumne-Calaveras U	nit (Tuolumne County Fac	ilities)
Columbia Air Attack/Helibase	CAL FIRE Pilot (2) Contract Pilot (4) CAL FIRE Captain (7) CAL FIRE Engineer(5) CAL FIRE Firefighter (	Air Tactical (1) Air Tanker (2) Helicopter (1) Contact Helicopter (1) Fuel Tender (1) Utility Vehicles (2)	
Baseline Fire Center	CAL FIRE Heavy Equipment Operator (1) CAL FIRE Captain (7) CAL FIRE Engineer (6) CAL FIRE Firefighters (80)	Crew Buses (6) Bulldozer Transport (1) Bulldozer (1) Bulldozer Support (1) Utility Vehicle (3)	

Fire Station	Personnel	Fire Apparatus	Additional Equipment/Services
Mother Lode Fire Center	CAL FIRE Captain (4) CAL FIRE Engineer (3) CAL FIRE Firefighters (40)	Crew Buses 3 Utility Vehicles 2	
Sonora Fuels Crew	CAL FIRE Heavy Fire Equipment Operator (1) CAL FIRE Equipment Operator (1) CAL FIRE Captain (1) CAL FIRE Engineer (1) CAL FIRE Forestry Technician (9)	Heavy Truck (1) Crew Bus (1) Utility Vehicle (1) Excavator (1) Skidsteer (1)	CAL FIRE TCU is an All-Risk All-Hazard Fire Department
CAL FIRE Standard	CAL FIRE Captain (2) CAL FIRE Engineer (5) CAL FIRE Firefighters (11)	Type 3 Engine (2) Utility Vehicle (1)	_
CAL FIRE Twain Harte	CAL FIRE Captain (2) CAL FIRE Engineer (5) CAL FIRE Firefighters (11)	Type 3 Engine (2)	
CAL FIRE Green Springs	CAL FIRE Captain (2) CAL FIRE Firefighters (5)	Type 3 Engine (1)	•
CAL FIRE Blanchard	CAL FIRE Captain (2) CAL FIRE Firefighter (5)	Type 3 Engine (1)	
CAL FIRE Groveland	CAL FIRE Captain (2) CAL FIRE Engineer (5) CAL FIRE Firefighters (11)	Type 3 Engine (2)	•
CAL FIRE Sierra Center Forestry Training Program	CAL FIRE Captain (11)	Crew Bus (3)	
CAL F	IRE / Groveland Community	Services District Fire Dep	artment
GCSD Station 78 Groveland	CAL FIRE Captain (1) CAL FIRE Engineer (4)	Type 1 Fire Engine (2) Type 3 Fire Engine (1) Utility Vehicle (1)	CAL FIRE / GCSD is an All-Risk All- Hazard Fire Department
	Columbia Fire Pro	otection District	
1	Merged with CAL FIRE / Tuolu	mne County Fire Departme	nt
	Jamestown Fire P	rotection District	
1	Merged with CAL FIRE / Tuolu	mne County Fire Departme	ent

Fire Station	Personnel	Fire Apparatus	Additional Equipment/Services		
Columbia College Fire Department					
M. J. W. OM, FIRE / T. J. O. J. F. D. J. J.					

Merged with CAL FIRE / Tuolumne County Fire Department

	California Departm	ent of Corrections	
Sierra Conservation Center	Overhead (5) Inmate Firefighters (10)	Type 1 Engine (1) Type 3 Engine (1) BLS Ambulance (1) for Institutional use only	Extrication Equipment Air Bags T.I.C.'s Rope Rescue Equip. Confined Space Trailer
	Sonora Fire	Department	
75 Fire Station	Full Time Captain (3) Full Time Engineer (3) Intern Firefighters (6) Volunteer Firefighter (9) Administrative (1)	Type 1 Engine (1) Type 3 Engine (2) Type 6 Engine (1) Aerial Quint 75' (1) Support Vehicles(3)	Sonora City is an All- Risk All-Hazard Fire Department
	Tuolumne Fire Pr	otection District	
73 Tuolumne Fire District	Full Time Firefighters (2) Intern Firefighters (6) Volunteer Firefighters (12)	Type 1 Engine (1) Type 2 Engine (1) Type 3 Engine (1) Support Truck (1)	Auto Extraction
	Tuolumne Rancl	heria Fire Dept.	•
TRFD Station 81 (Engine Personnel)	Full Time Captains (2) Full Time Engineers (2) Full Time Firefighters (3)	Type 1 Engine (1) Type 3 Engine (1) Type 6 Engine (1) 75ft Quint (1) Support Truck (1)	Auto extrication equipment Stabilization equipment Thermal imaging
TRFD Station 81 (Hand Crew Personnel)	Full time Supt. (1) Full time Asst. Supt. (1) Full time SQDB (2) Full time Crew Members (8) Seasonal Crew Members (6)	Supt. Truck (1) Crew Carrier (2) Support Truck (1) UTV (1)	

Fire Station	Personnel	Fire Apparatus	Additional Equipment/Services	
	Stanislaus Na	tional Forest		
4 Ranger Districts 1 Supervisors Officer 12 Fire Stations	Primary Eemergency Responders (215) Fire Leadership (14) ECC (9) Fuels Techs (11) Fire Prevention Techs (13)	Type 3 Engine (12) Water Tenders (2) Fire Dozers (2) Type 2 Helicopter (1) Hotshot Crews (2) Wildland Fire Module (1)	3 Staffed Lookout Towers	
	Yosemite Na	tional Park		
Crane Flat Helibase Hodgdon Engine Station	Permanent Firefighters (2) Temporary Firefighters (7)	Type 2 Helicopter Type 3 Engine (Interagency with Stanislaus NF)	Engine not staffed in 2023.	
Big Oak Flat Ranger Station	Staffed by Park Medics	NA	Ambulance and Emergency Medical Services	
	Bureau of Land Management			
Field Office Eldorado County	Fire Personnel (27)	NA	There are no local fire resources	

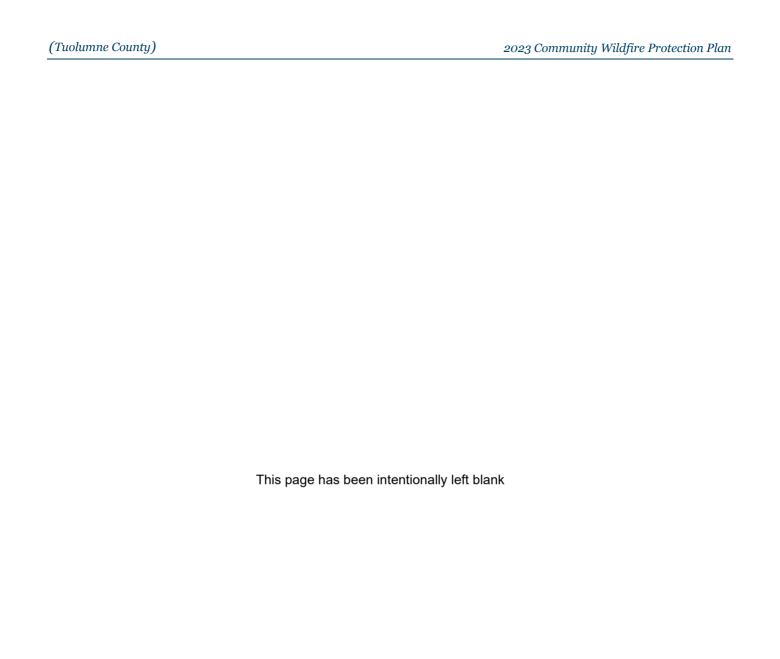
#### 3.6.2 Fire Protection Agreements and Plans

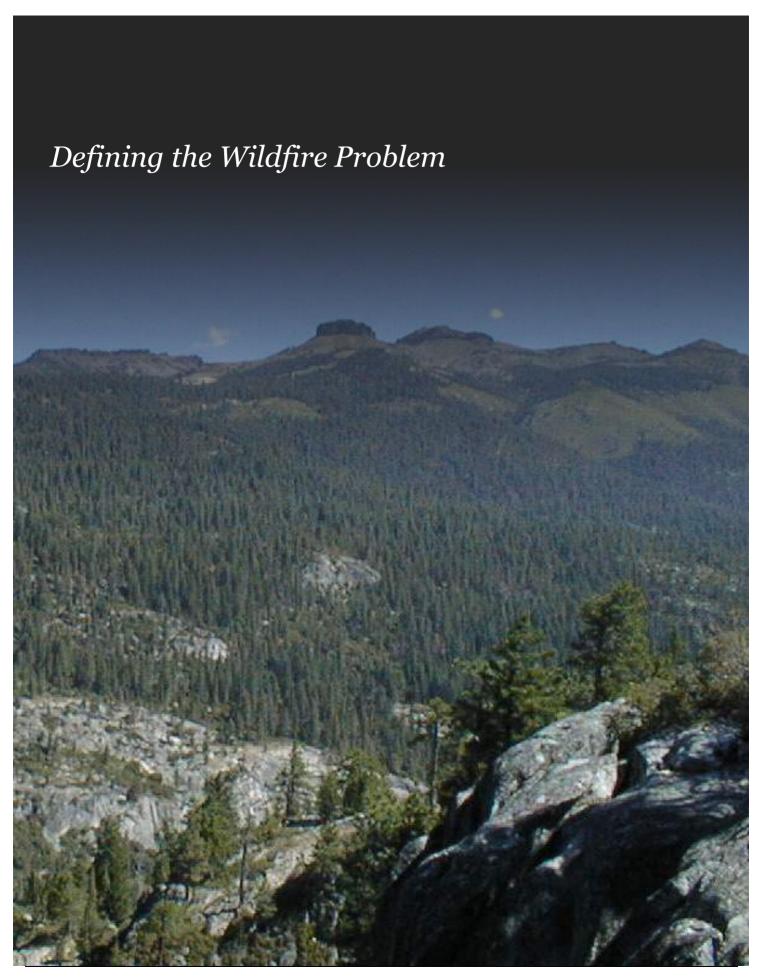
There are several agreements in place that pertain to fire preparedness and prevention planning within the State and County. The mutual aid assistance for hire agreements provides the foundation for agencies to coordinate within the County to increase the effectiveness of initial attack operations and prevention planning and to reduce fire protection costs. The agreements include resources from all fire agencies, law enforcement, fire departments, Office of Emergency Services, CAL FIRE, BLM, NPS, and USFS. Table 9 lists the mutual aid agreements/plans and assistance-for-hire agreements. Additional Automatic aid agreements are agreements among emergency responders to lend assistance across jurisdictional boundaries to supplement the resources of any fire agency during a period of actual or potential need.

Table 9. Tuolumne Mutual Aid Agreements and Plans

Mutual Aid Agreements and Plans				
Tuolumne County Automatic Aid Agreement				
Copperopolis Fire Protection District Mutual Aid Agreement				
Tuolumne County Automatic and Mutual Aid Agreement and amendment 1				
Tuolumne County/Mariposa County Automatic Aid Agreement				
Tuolumne County/Jamestown cooperative agreement				
Tuolumne County/Columbia cooperative agreement				

California Master Cooperative Wildland Fire Management Agreement				
Tuolumne County/YCCD Columbia College cooperative agreement and amendment 1				
Assistance for Hire Agreements				
CAL FIRE TCU ABH				
California Fire Assistance Agreement (represented by CAL OES)				





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# 4.0 Defining the Wildfire Problem

The nature of the wildfire problem is a product of natural and/or man-made ignition sources, vegetative fuels, topography, and weather. Understanding the wildfire problem requires an understanding of how these factors interact. Each year only a small fraction of wildfires become large enough to result in significant negative impacts. These low percentages can be attributed to a combination of favorable environmental conditions and availability of firefighting resources to effectively respond to fire incidents, especially during the incipient stages of fire development. This, however, is not to imply that large catastrophic fires are not possible. Wildfires have historically been a major part of Tuolumne County's ecosystem and will continue to be.

To effectively develop a mitigation strategy to address the potential negative effects of a wildfire within the Planning Area requires an understanding of the fire history, fire ecology, climatology, and human interactions with these various facets.

#### 4.1 FIRE HISTORY

Fire history provides a useful tool for fire prevention and preparedness as it can provide an understanding of fire frequency, fire season, fire behavior and characteristics, major sources of ignition and portions of the landscape that are the most vulnerable.

#### 4.1.1 Overview

Prior to Euro American settlement, frequent low-intensity fires occurred in Tuolumne County in the local oak woodlands as often as every five years<sup>11</sup>. These frequent, low intensity fires helped limit the accumulation of highly dense vegetation that can result in high intensity, high-loss potential fires if ignited, but they also increased drought tolerance by reducing the number of trees competing for water.



Figure 16. Historic images of Yosemite Valley pre-development.

Over the last century and a half, mining, logging, grazing, and fire suppression have all played a role in disrupting the healthy balance of wildfires and vegetative growth that had existed for thousands of years. Indications are that this disruption has become more pronounced in the last seventy-five years. Local historical and modern forest inventories indicate that stand density increased by 13.6 stems per acre between the 1930's and the 2000's. The greatest proportional changes occurred between 1,500 and 6,000' in elevation 12, where most of Tuolumne County's population resides.

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<sup>&</sup>lt;sup>11</sup> Safford, Hugh D., and Kip M. Van De Water. "Pacific Southwest Research Station." Using Fire Return Interval Departure (FRID) Analysis to Map Spatial and Temporal Changes in Fire Frequency on National Forest. United States Department of Agriculture, Forest Service, Jan. 2014. Web. 27 Oct. 2016.

<sup>&</sup>lt;sup>12</sup> Merriam, Kyle. "Natural Range of Variation in Hardwood Vegetation In the Sierra Nevada, California Over the Holocene Epoch." (2013): 16. U.S. Forest Service. U.S. Dept of Agriculture, 26 Feb. 2015. Web. 27 Oct. 2017.

Over the years, some of the major wildfires that have occurred in and around the County include the 2021 Washington Fire, 2018 Donnell Fire, 2013 Rim fire, 1996 Ackerson Fire Complex and 1987 Stanislaus Fire Complex. See Figure 17. Structures destroyed/damaged in Table 8 were either provided directly by the CAL FIRE dataset or computed using current structures that would have been destroyed if they were present at the time of the historic fire. The southern portion of the Planning Area had experienced at least one major wildfire on average every 10-15 years. The western portion of the Planning area has not experienced a major wildfire since the 1990s. The north and northeastern portion of the Planning area, outside of the 2018 Donnell fire, has not experienced a major wildfire since the early 2000s.

Table 10. Sample historical wildfires and associated impacts within and adjacent to Tuolumne County

Fire Name	Date	Fire Size (acres)	Structures Destroyed/ Damaged	Fatalities/ Injuries
Unnamed	1949	26,378.3	12	-
Granite	8/17/1973	16,290.3	5	-
Larson <sup>b</sup>	8/30/1987	48,087	1	-
Hamm <sup>b</sup>	8/30/1987	33,143.9	53	-
Paper <sup>b</sup>	8/31/1987	45,020.3	31	-
Ackerson <sup>c</sup>	8/14/1996	59,111.8	25	12
Rogge <sup>c</sup>	8/14/1996	20,944	6	-
Rim	8/17/2013	256,176	112	-
Donnell	8/1/2018	36,461.4	26	9
Washington	8/6/2021	100	18	-

<sup>&</sup>lt;sup>a</sup> No structures were lost In Tuolumne County.

Source: CAL FIRE 2020b

While the majority of ignitions occur in the more populated areas of the County (e.g., Sonora, Groveland), the ignition points that have led to the larger wildfire incidents have started near the Tuolumne River close to the Buck Meadows region. This can be seen in the "hot spot" map in Figure 18. In this map, the "hot spots" are clusters of ignition locations. Two different types of hot spot analyses were performed – "unweighted hot spots" include all ignition points, regardless of the size of the resulting fire, while the "weighted hot spots" identifies the ignitions that resulted in large fires (i.e., 1,000 acres or more). Note: The confidence levels indicate how sure we are statistically speaking a location is a hot spot (e.g., 99% confidence is the highest for this calculation).

<sup>&</sup>lt;sup>b</sup> Constitutes a portion of what is widely known as the Stanislaus Complex Fire of 1987.

<sup>&</sup>lt;sup>c</sup> Constitutes a portion of what is widely known as the Ackerson Fire Complex.

(Tuolumne County)

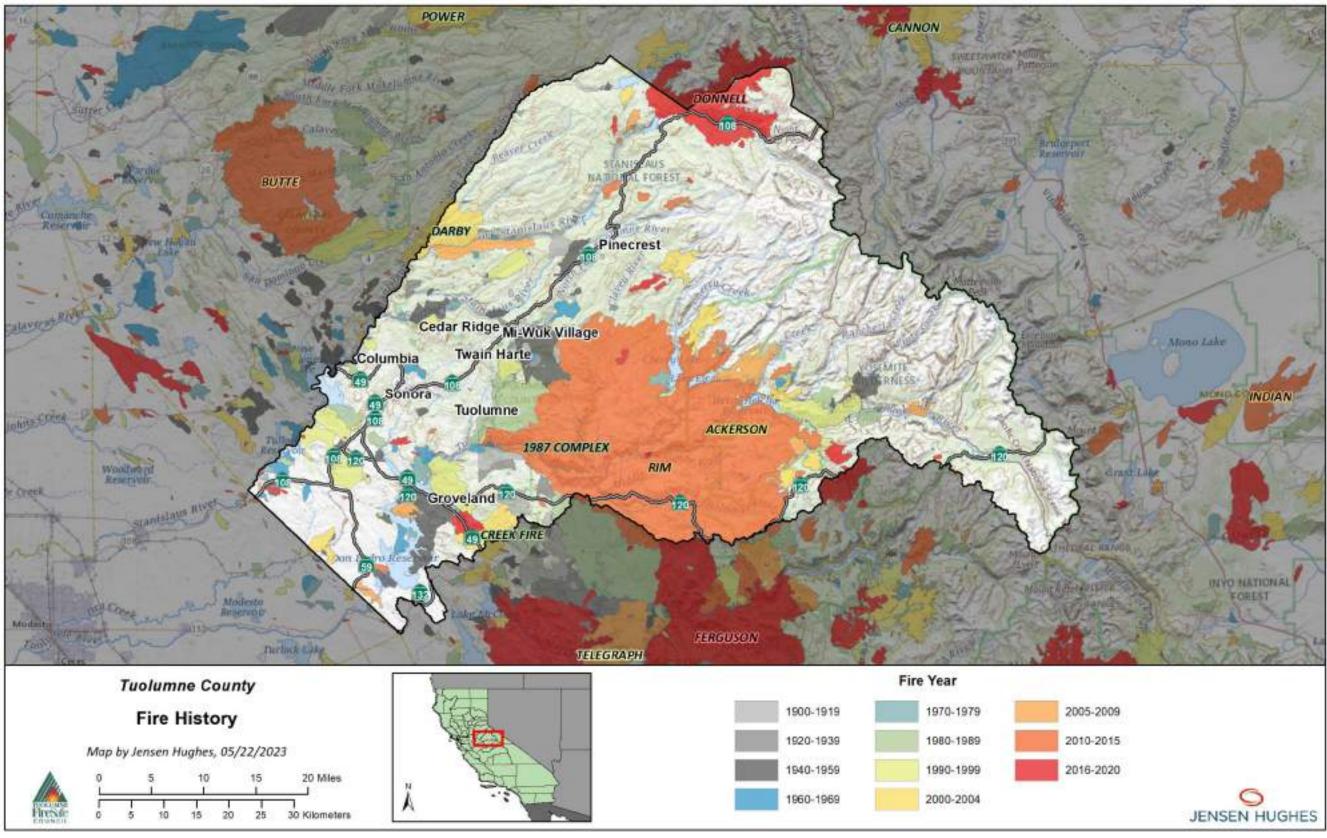


Figure 17. Fire History in the Tuolumne County

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( Tuolumne County)

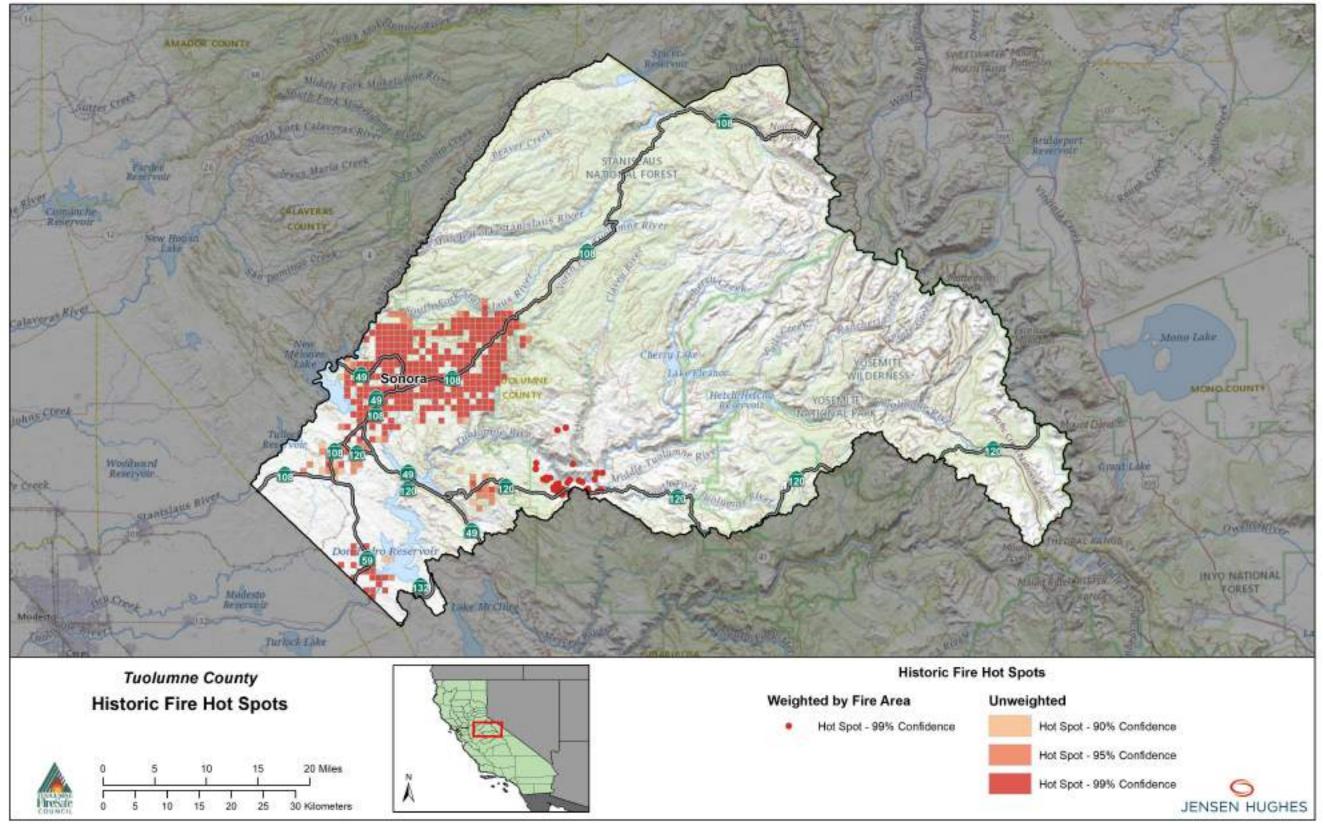


Figure 18. Ignition History "Hot Spot" in the Tuolumne County

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#### 4.1.2 Rim Fire

Of the high fire activity that has occurred in and around the County, the 2013 Rim Fire is the largest fire in recent history that had catastrophic impacts to natural resources, watersheds and associated water services, homes and other structures in the built environment, air quality, local/regional economies and more. This major fire started in a remote canyon in the Stanislaus National Forest when a hunter lost control of an illegal campfire on August 17, 2013, resulting in approximately 257,314 acres (402 sq mi) in largely remote areas of the Sierra Nevada, including a large portion of Yosemite National Park. The fire was not fully contained until nine weeks later, and not officially declared totally extinguished until one year later on November of 2014. At the time of occurrence, the Rim Fire was the third largest fire in state history.



Figure 19. Aerial view of smoke from 2013 Rim Fire (credit: James Duff)

Detailed accounts indicated that the fire was first spotted by a pilot on August 17th, 2013, in the midafternoon. The fire first grew in an isolated region, up a north facing slope of the Clavey River canyon towards Jawbone Ridge. Within the next day, the fire grew to 250 acres. Within the next three days, the fire grew to 16,200 acres with only 5% containment. Over these three days, the fire continued to move up the south slope of the Clavey River drainage, prompting several advisory evacuations for nearby areas. On August 30th, 2013, the fire reached 201,894 acres, with only 32% containment and involving approximately 4,931 firefighters. It wasn't until September 4th,

2013, that the fire was 80% contained, and growth had been significantly slowed. In the end, the fire burned 257,314 acres (77,000 of which were in Yosemite National Park) and causing damage and/or loss to 384 structures. See Figure 17 for extent of the Rim Fire. Refer to the motherlode website for a detailed timeline of events. <a href="https://www.mymotherlode.com/community/fire/rim-fire-summary-timeline">https://www.mymotherlode.com/community/fire/rim-fire-summary-timeline</a>

# 4.2 FIRE ECOLOGY

The Planning Area is a diverse and complex landscape characterized by a 13,000-foot elevation gradient from the lowest to highest points. Below 1,000 feet in elevation lies the grassland and shrubland plain of the Central



Figure 20. Sample grasslands with oak savannahs located at lower elevations in Tuolumne County.

Valley, a region that historically alternated between flood and fire, but today has mostly been converted to rangelands dominated by non-native grasses. Fires at this elevation occur frequently along roads and anywhere humans utilize the land at higher densities. From 1,000 to approximately 3,000 feet in elevation, the grasslands transition to a foothill Mediterranean biome of rolling hills covered in oak savannahs, with the gray pine (Pinus sabiniana) and four main species of oak dominating across this elevation band: blue oak (Quercus douglasii), valley oak (Q. lobata), canyon live oak (Q. chrysolepis), and interior live oak (Q. wislizeni). Numerous chapparal species and scrub oaks grow at this elevation band as well, with patches of chamise

(Adenostoma fasciculatum), deer brush (Ceanothus spp.), and manzanita (Arctostaphylos spp.) dominating on more south-facing aspects where the soil and geology don't support trees. Prior to colonization, this biome was characterized by frequent low severity fires primarily set by the Miwok and Yokuts people who sought to promote certain beneficial plants and uses of the landscape. The native species thus evolved with regular fire and are relatively resilient to the flames. The native grasses are primarily perennials that go dormant during the dry season and will often regrow almost immediately after fire. Similarly, the oaks are resprouters that draw from

belowground reserves to easily regenerate postfire, even before receiving any rain.

The oak savannah becomes mixed conifer forest
between approximately 3,000 to 6,000 feet in
elevation. Dominant tree species at this elevation

Figure 21. Sample mixed conifer forest found between 3000ft – 6000 ft throughout Tuolumne County

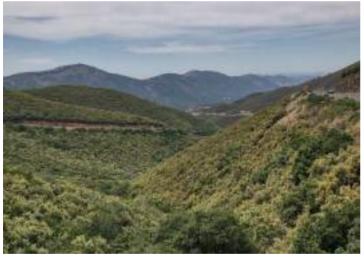


Figure 22. Chamise-dominated shrublands at Old Priest Grade

between approximately 3,000 to 6,000 feet in elevation. Dominant tree species at this elevation are the conifers Ponderosa pine (Pinus ponderosa), sugar pine (P. lambertiana), Douglas fir (Pseudotsuga douglasii), white fir (Abies concolor), incense cedar (Calocedrus decurrens) and the deciduous black oak (Q. kelloggii). Prior to colonization, this landscape experienced frequent fire (approximately 5-30 year fire return interval at this elevation) due to both Indigenous burning and abundant lightning ignitions. The two pine trees and the black oak are highly adapted to regular fire, with thick bark and self-pruning of lower limbs that reduce tree damage by fire. Black oaks further benefit when fire removes other trees, opening up the canopy and providing greater access to sunlight; the suppression of cultural burning and regular fire has contributed to the decline of black oak in the mixed conifer forest. By contrast, the fir and cedar trees are more vulnerable to fire and were historically a relatively small portion of the forest, with seedlings easily killed by regular fire. The extensive fir and cedar populating mid-elevation Sierra Nevada forests today is a symptom of fire suppression but are also problematically contributing to increased fuel loading and more extreme fire behavior, such as was observed on the 2013 Rim Fire.

Above the mixed conifer belt is the sub-alpine forest. This is an elevation dominated initially by white (*A. concolor*), red (*A. magnifica*), and Jeffrey pine (*P. jeffreyi*) that gives way to monocultures of lodgepole pine (*P. contorta*). At this elevation, summer thunderstorms have always produced a high frequency of lightning ignitions, and prior to colonization these ignitions produced frequent small fires that burned from a single tree to several acres over weeks to months of slow smoldering. In particular, dry years with a coinciding wind event, a larger fire might burn, but the mosaic of smaller burn scars and overall lower productivity at this elevation generally precluded large, high severity fires. The 2018 Donnell Fire was uncharacteristic compared to a pre-colonization subalpine fire due to both its size and severity, stemming from the high density of relatively even-aged trees.

Given the substantial elevation gradient of the County and the effects of orographic lifting of incoming storm systems over the western Sierra Nevada, there is also a considerable gradient of temperature and precipitation. The County has a cool-to-cold and wet winter and a hot, dry summer. The climatology of three sample locations is provided in the Climate and Climate Change (Section 4.3). Tuolumne County is sufficiently inland that there is no marine or coastal effect, and the elevation and topography of the Sierra Nevada prevents the type of autumn downslope east wind events that have been observed to contribute to catastrophic fire behavior further north (e.g., along the American and Feather River canyons) and along the coast (e.g., in Sonoma and Napa counties). As such, fire season is primarily confined to late spring to early autumn in the County. Fires are possible as soon as the fine fuels cure at lower elevations and will easily spread until autumn rains end fire season. Precolonization indigenous burning likely occurred across all seasons. By contrast, the higher elevations are susceptible to fire primarily from July through September when soil moistures are low enough for ground fuels to carry fire, and persistent soil moisture in patches generally inhibits spread of larger fires.

Throughout the County, a century of extensive logging of the largest trees and fire suppression has fundamentally altered the composition of the forests and woodlands, substantially increasing fuel loads, with up to ten times the tree density that was present pre-colonization. Changing climate has further exacerbated the fuel loading through recent multi-year, intense droughts (such as the 2012-2017 drought) that killed millions of trees across the Sierra Nevada, including in the

A century of extensive logging of the largest trees and fire suppression has fundamentally altered the composition of the forests and woodlands, substantially increasing fuel loads, with up to 10x the tree density during pre-colonization

Planning Area, adding to the amount of woody fuel available to burn. As such, a key facet of managing the fire ecology of this region is using prescribed fire and active forest management to both reduce the excess fuel load and restore a natural process to the forests. Despite recent increases in area burned and large, high-severity fires (e.g., 2013 Rim Fire), there is substantial scientific evidence supporting the need to continue expanding low-intensity prescribed fire use to restore natural forest resilience and reduce risk of future catastrophic wildfires (Prichard et al., 2021; Arkle et al., 2012; Fernandes & Botelho, 2003). This is most pronounced in the mid-latitude mixed conifer forest, but also applies to the lower elevation oak savannah, which is predominantly private lands. Thus, fuel treatments that include mechanical fuel reduction and grazing with regular prescribed fire are scientifically supported for ecological restoration for most of the county at broad scales.

# 4.2.1 Vegetation and Fuels



Vegetation is the primary fuel source for wildfires, and along with weather, is a key factor in determining the risk of wildfire hazards. However, in the case of Tuolumne County, both wildland vegetation and urban fuels present a hazard. Urban sources of fuel such as combustible structures (e.g., homes, businesses, industrial facilities, outbuildings), combustible

non-structural features (e.g., decks, fences, ornamental landscaping), vehicles, fuel tanks, etc., can contribute to the fire environment and significantly influence the fire behavior and overall hazards in the Planning Area. Locally the abundance of non-native trees and shrubs used as landscaping vegetation and screening has a negative effect on the overall wildland fire environment. Thus, the potential risk of a large-scale, destructive wildland fire can be linked to the proximate vegetation and associated characteristics.

Table 11 provides a summary of the vegetation types and percentages that occur within the County, while Figure 23 shows their spatial distribution. The County consists of a range of timbered forest, shrublands and grasslands, with a relatively large percentage of barren land (i.e., granite from the Sierras). The vegetative types in the higher northern and eastern regions primarily consist of conifer forest and barren land. The middle elevation regions consist primarily of hardwood and mixed conifer/hardwood forest, especially in the mountain

valleys. The southwestern (lower elevation) portion of the County consists mainly of shrubland, grassland, herbaceous land, hardwood forest, and a minor amount of urban land. The conifer forests contain approximately triple the area of the hardwood forests (45.1% to 13.2%, respectively) and are mostly concentrated in the northern and eastern mountains, generally above the hardwood forests. Barren land is found mainly in the north and east at high elevations, consisting of rocky or snow-covered areas (10.1% of the total area). There are also 9% of mixed conifer/hardwood forest in the middle elevation areas and near the edges of the WUI zones. Shrubs, grassland, and herbaceous land combine to 20.1% of the vegetation. Human development, including agriculture, makes up 0.2% of the total area and is centered around Sonora, Highway 108, and Highway 120.

Table 11. Existing Vegetation Types in the County

Vegetation Type	Acres	Percent of County
Annual Grassland	112,673	7.7%
Barren	147,180	10%
Blue Oak Woodland	82,403	5.6%
Chamise-Redshank Chaparral	17,060	1.2%
Cropland	645	0.05%
Jeffrey Pine	40,799	2.8%
Juniper	17,783	1.2%
Lacustrine	31,308	2.2%
Lodgepole Pine	45,468	3.1%
Mixed Chaparral	83,970	5.7%
Montane Chaparral	101,641	7%
Montane Hardwood	157,045	10.8%
Montane Riparian	12,233	0.8%
Ponderosa Pine	66,609	4.6%
Perennial Grassland	32,427	2.2%
Red fir	89,127	6.1%
Urban	2,780	0.2%
Subalpine Conifer	102,045	7%
Sierran Mixed Conifer	276,956	19%
Wet Meadow	14,317	0.98%
White fir	11,611	0.8%
Other species	11,417	0.8%
Total	1,457,497	100%

(Tuolumne County)

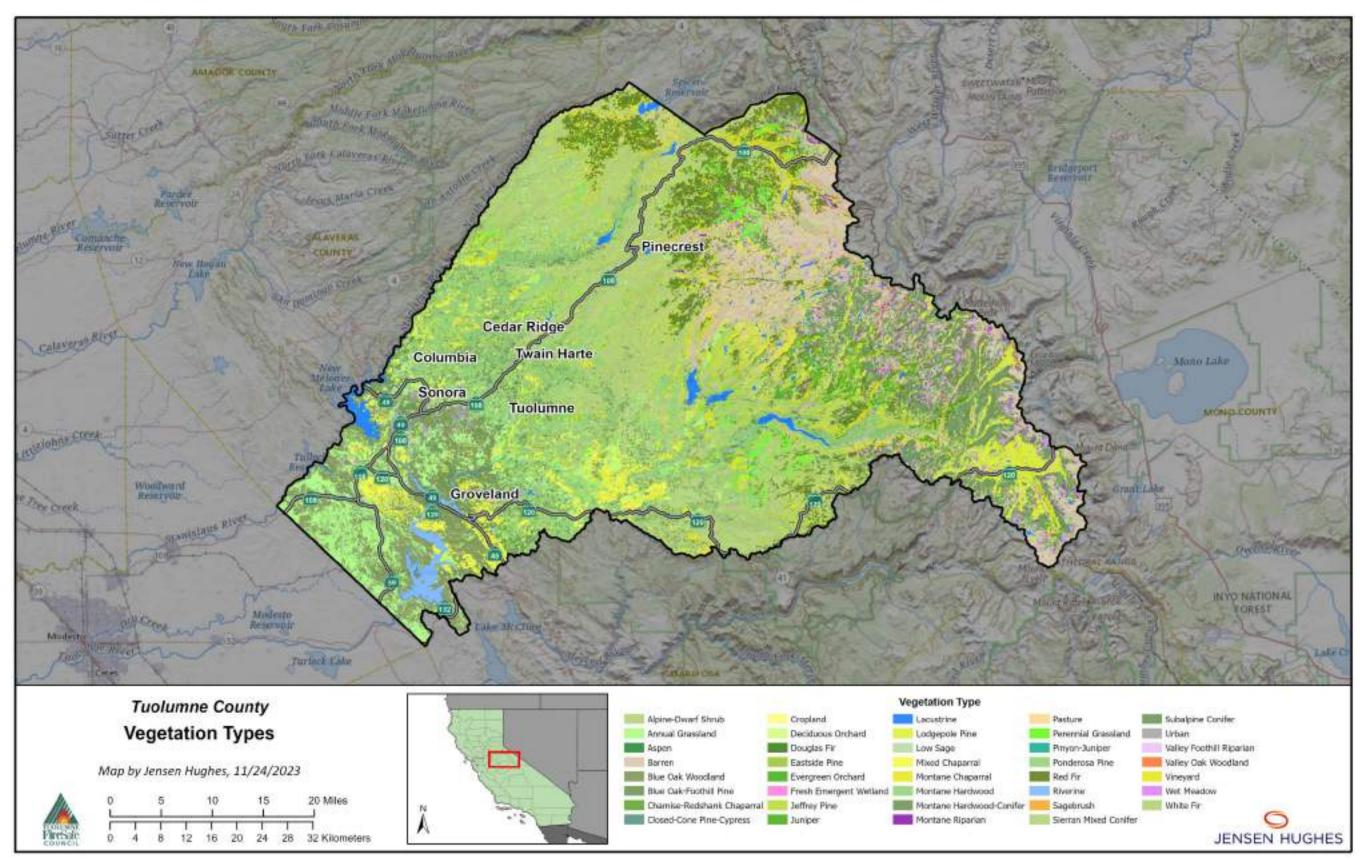


Figure 23. Vegetation across and outside the Planning Area (source: California Wildlife Habitation Scheme)

(Tuolumne County)

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#### 4.3 CLIMATE AND CHANGING CLIMATE

The Planning Area is primarily characterized as a Mediterranean climate, but the higher elevations of Tuolumne County are too cold to be considered Mediterranean and are instead characterized as an alpine or sub-arctic climate. As the focus on this CWPP on wildfire risk in communities in the lower and mid-latitudes, Twain Harte was identified as a focal point for the climatological analysis given the central location, extreme wildfire risk, and mid-elevation of the community within the county. Twain Harte sees an average of 41.5" of annual precipitation falling primarily in the winter and early spring. Some portion of this precipitation falls as snow, but snowfall is not tracked at this location and is highly annually variable. The lowest elevations of the Planning Area have no recorded snowfall in the observed record, while the upper elevations routinely receive over 10 feet of snow annually. The average daily high temperature during summer (88 °F) versus the average winter low (32 °F) represents a relatively moderate range of mean temperatures of approximately 66 °F (Figure 24). Twain Harte is occasionally subject to extreme temperatures, however, with recorded historical maximum temperatures of over 100 °F in July, August, and September. This supports a moderate climate that occasionally sees extreme temperature and extreme rain and snowfall events. At higher elevation, the range is much greater due to the extremely cold winter low temperatures, while lower elevations experience even more moderate season fluctuations in temperature.

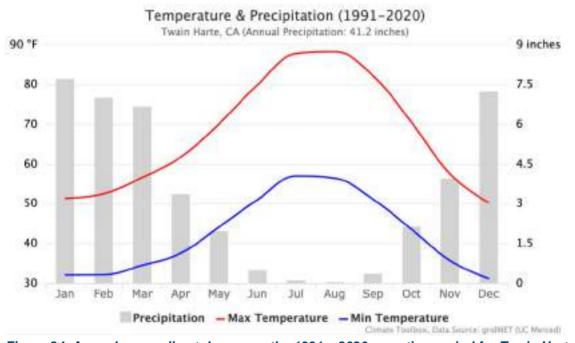


Figure 24. Annual mean climatology over the 1991 – 2020 reporting period for Twain Harte.

While global climate change is often reported as an average rise in temperature (i.e., warming) for the entire planet, the observed changes are highly variable across the globe and even within states, such as California. Changes in temperature, precipitation, and other meteorological phenomena are also variable both across the seasons of the year, and in terms of the intensity of extreme events. As wildfire tends to occur under extreme conditions in the Planning Area, namely extreme heat events concurrent with abnormally dry fuels, it is critical to understand how climate change specifically impacts both the frequency and intensity of these extreme weather events, as well as how it affects the vegetation fueling the fire.

Twain Harte has warmed 2.1° F overall in the last 100 years (Figure 25). While temperatures are highly variable from year-to-year, nine of the ten hottest years on record for Twain Harte since 1895 have occurred in the last decade. Warming has occurred across all four seasons and for both daytime highs and nighttime lows, but the greatest warming trends in summer (Figure 26), when the average temperature has increased over 5 degrees F, in part due to substantial nighttime warming. These trends are consistent with reduced nighttime relative humidity recovery, where it remains dry at night rather than becoming more humid and support anecdotal observations from fire suppression personnel that fires are more active at night now than they have been in the past. Reduced nighttime humidity recovery across spring, summer, and fall seasons is a contributing factor to an observed trend towards increased fire danger, specifically because fuel aridity is higher and fuels are less resistant to fire spread (Abatzoglou and Williams 2016, Goss et al. 2020, Tuolumne County 2022).

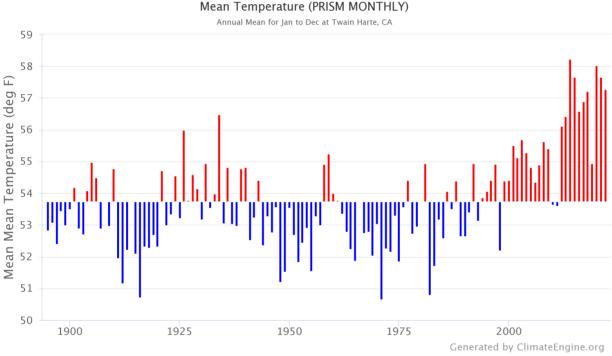


Figure 25. Mean annual mean daily temperature for the Planning Area from 1895-2022, showing departure from the long-term average of 53.7 F.

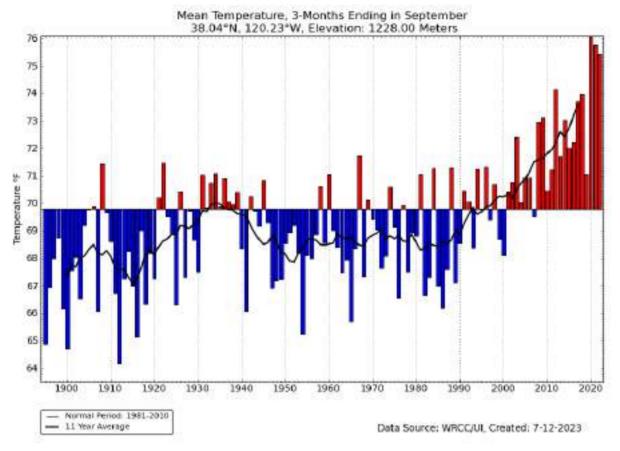


Figure 26. Peak fire season (July-August-September) mean daily temperature for the Planning Area from 1895-2022 (the black line is an 11-year moving average) showing departure from the long-term average of 68 F and an increase of over 5 F over the last century.

In contrast to a clear warming trend, annual precipitation in the planning area has not changed significantly over the past century (Figure 27). Notably, however, precipitation has declined approximately 50% in the last four decades in Autumn (Figure 28). Overall, the rising temperatures and the declining autumn precipitation have altered fire potential in the Planning Area, as indicated in trends of Fire Danger indices. Notably the peak fire season (July-August-September) maximum Energy Release Component (ERC; Figure 29) has increased over 25 percent since 1980. ERC is a good proxy for fire intensity and is utilized by fire management agencies to identify days when the most extreme fire behavior, such as blow ups and the formation of pyrocumulonimbus clouds can occur. Such fire behavior defies suppression and is often associated with loss of structures and fatalities. This trend is consistent with increasing disastrous fire days over the last four decades, when fires make large runs, consume homes, and are nearly impossible to control. A similar trend is observed for the maximum Burning Index (BI; Figure 30), which is a proxy for flame lengths, where the maximum summer daily BI value has increased 30% over the last four decades.

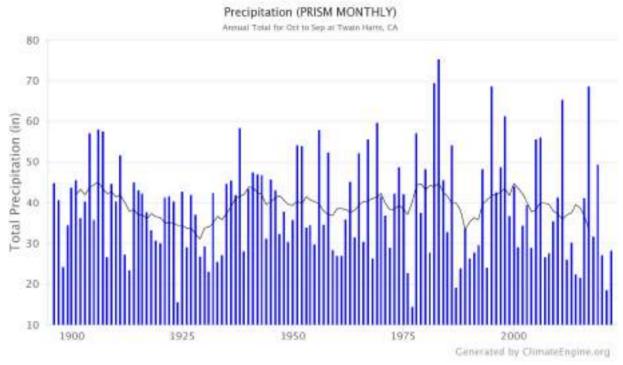


Figure 27. Mean annual water year (Oct. – Sept.) total precipitation for the Planning Area from 1895-present. The black line represents an 11-year moving average.

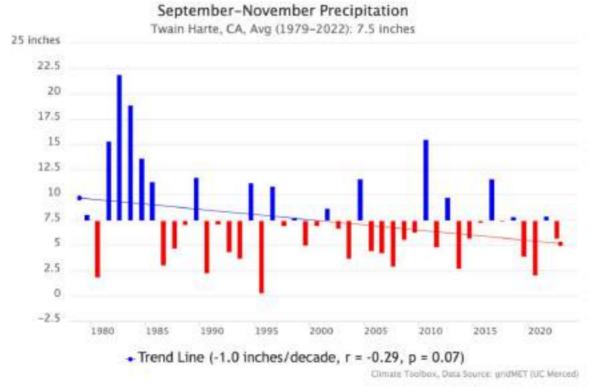


Figure 28. Decline in Autumn precipitation from 1979-2022. While this decline is primarily driven by a wet series of autumns in the early 1980s, it is striking that no such multi-year wet autumn period has been observed since.

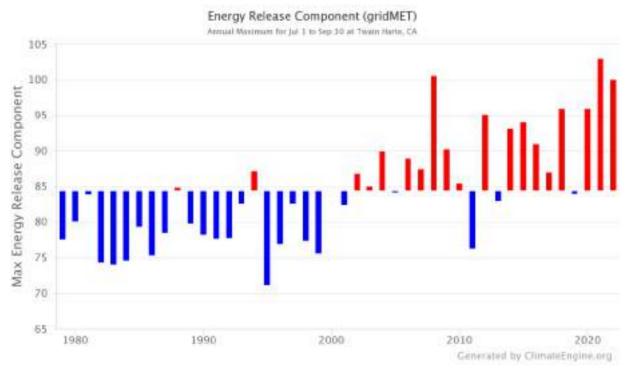


Figure 29. Peak fire season (July through September) daily maximum Energy Release Component (ERC) for Twain Harte shows the increase in extreme fire danger days. ERC is considered a proxy for fire intensity, with higher daily max ERC facilitating extreme fire behavior such as blow ups and pyrocumulonimbus formation.

Projections of future climate change are modeled based on anthropogenic (i.e., human) emissions of greenhouse gases, but also account for natural climate variability. Increases in fire activity across the western United States have been definitively partially attributed to anthropogenic climate change (Abatzoglou and Williams 2016), so there is high confidence that projections of future climate will have implications for fire. These trends aren't just part of Earth's natural climate variability.

In Twain Harte, as representative of the Planning Area, warming is projected not only to continue but to accelerate. For daily high temperatures, the most extreme fire behavior days, there is a projected increase of an additional 10° F in summer and 12° F in autumn by 2100 (Figure 30 and Figure 31), although this is a conservative projection - the most extreme heat waves are likely to produce even hotter days. Nighttime low temperatures are similarly projected to increase (Figure 32), making it more difficult to apply effective suppression tactics at night due to more active fire behavior. In contrast to the high relative certainty that temperatures will continue to increase, precipitation trends are relatively difficult to predict into the future, and projections of precipitation show no trend. What is certain about future precipitation is that extreme precipitation events with high rates of rainfall will become more frequent, even if precipitation ultimately declines. The projected temperature increases, especially the increasing nighttime lows, reduced relative humidity, and the increasing frequency of extreme events, such as heatwaves and droughts, drive a substantial increase in the number of days per year where there is Extreme Fire Danger (Figure 33 and Figure 34). Although global climate models vary widely, they generally agree on an increase in the number of days of Extreme Fire Danger compared to the historic period, with the most extreme models projecting a doubling of Extreme Fire Danger days. It is worth noting that historically most climate model projections have turned out to be fairly conservative and underestimated what has actually happened.

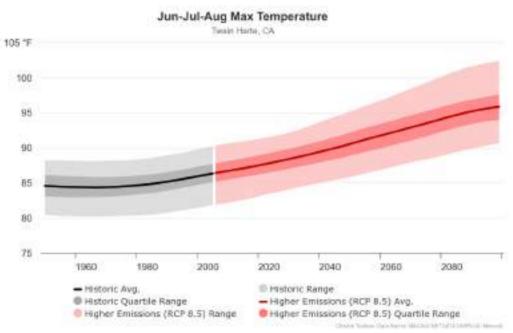


Figure 30. Increasing trends in average daily high summer (Jun-Jul-Aug) temperature for Twain Harte as representative of the Planning Area from 1979-present (in gray) and projected into the future to 2100 (pink). The projected increase in maximum daily temperature is approximately 9-10 degrees F hotter than today, representing that the highest temperatures, usually occurring during heat waves, will likely register temperatures 9-10 degrees F higher than today's hottest temperatures.

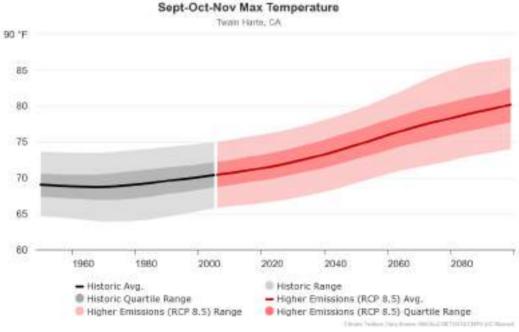


Figure 31. Increasing trends in average daily high autumn (Sept-Oct-Nov) temperature for Twain Harte as representative of the Planning Area from 1979-present (in gray) and projected into the future to 2100 (pink). The projected increase in maximum daily temperature is approximately 10 degrees F hotter than today, representing that the highest temperatures, usually occurring during heat waves, will likely register temperatures 10 degrees F higher than today's hottest temperatures.

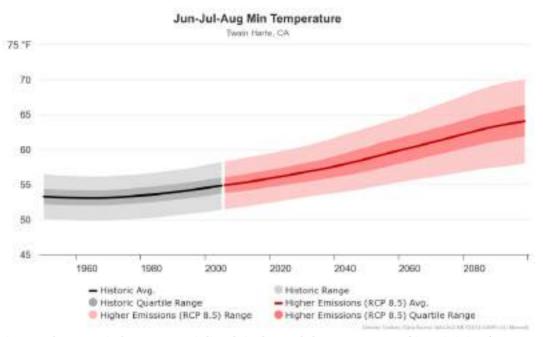


Figure 32. Increasing trends in average daily nighttime minimum summer (Jun-Jul-Aug) temperature for Twain Harte as representative of the Planning Area from 1979-present (in gray) and projected into the future to 2100 (pink). The projected increase in overnight low temperature is approximately 9 degrees F hotter than today, representing that the highest temperatures, usually occurring during heat waves, will likely register temperatures 9 degrees F higher than today's hottest temperatures.

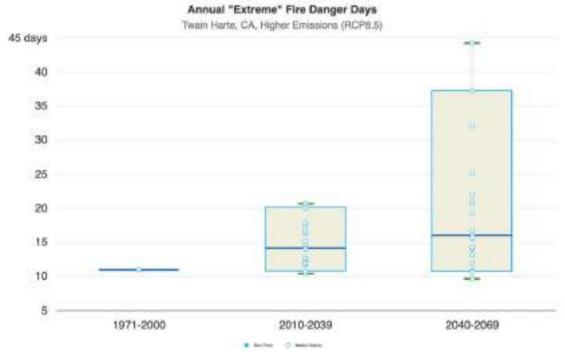


Figure 33. Projected change in number of days of extreme fire danger annually for Twain Harte based on global climate model outputs, for both the early 21<sup>st</sup> century (the current period) and the mid-21<sup>st</sup> century (future period 2040-2069) as compared to the historical period of 1971-2000. Each future boxplot represents a range of projections from different climate models, with the white dots representing the projection of a specific model, and the dark blue line in the middle representing the median (middle)

projection. For the future period (2040-2069), the highest projections are for an average of 16 days per year of Extreme (97<sup>th</sup> percentile) fire danger (but up to 37 days in the most extreme model projections), a 50% increase over the 11 days per year observed in the historic period.



Figure 34. Projected reduction in average 100-hr fuel moisture and increase in the average number of days of extreme fire danger for the summer/autumn months for Twain Harte based on global climate model outputs.

#### 4.4 TOPOGRAPHY

The County lies along the western slope of the Sierra Nevada Mountains and can be described as rolling foothills on the west side of the County with steeper rugged granite slopes on the east side of the County. Elevation ranges from 102 feet above sea level to 12,690 feet, with an average elevation of 5,154 feet. See Figure 35. As the elevation increases, vegetation types go from grass savannah in the foothills to moist forest vegetation types in the mid to upper elevations. Steep terrain and the dynamic vegetation conditions create fuel characteristics that promote the potential for high to extreme fire behavior characteristics.

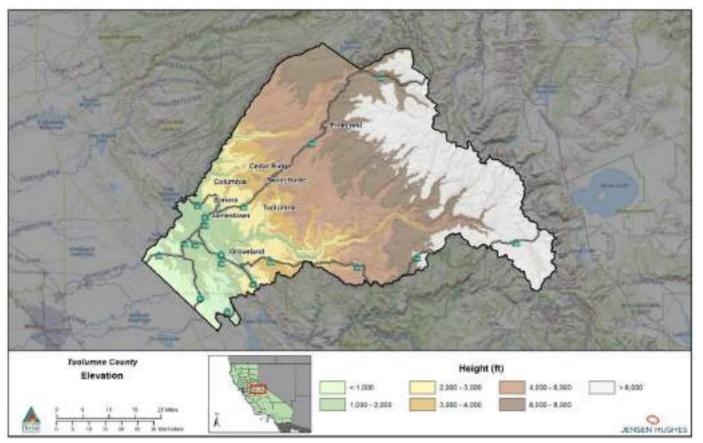
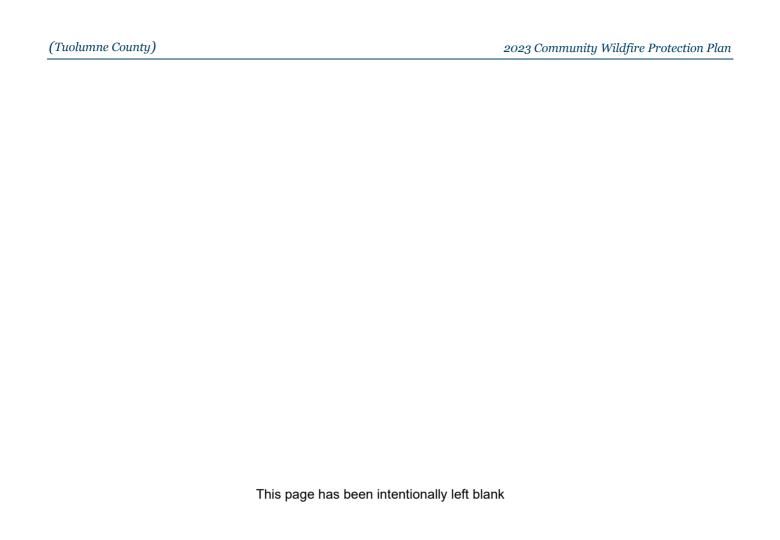
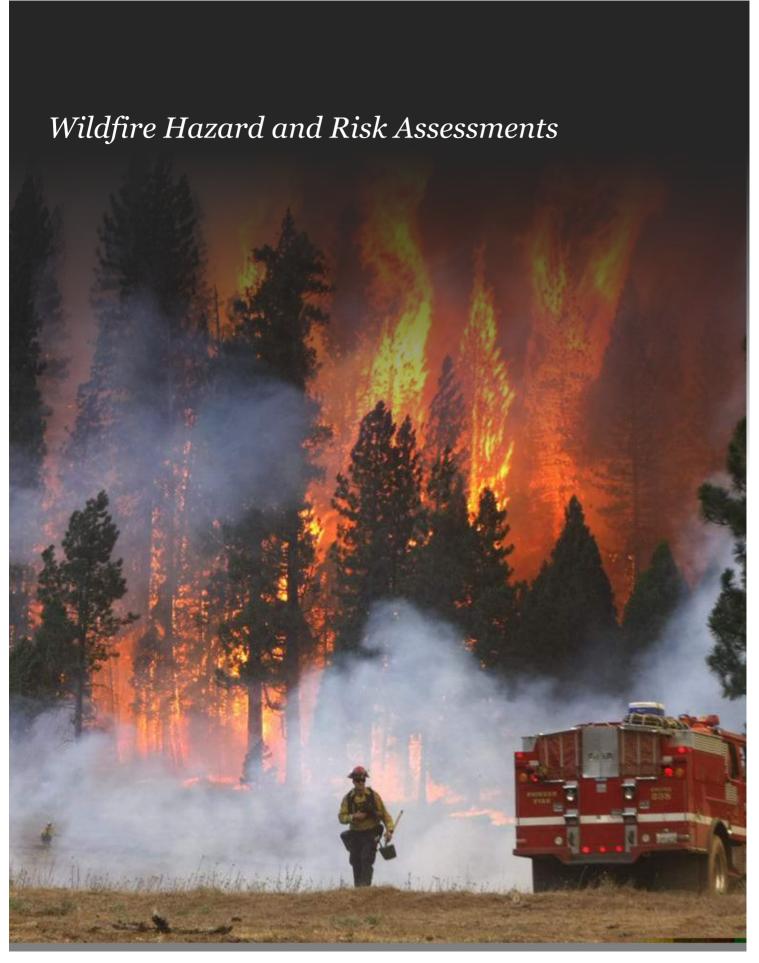


Figure 35. Topography across the Planning Area

Topography and terrain include the Stanislaus River drainages and Tuolumne River drainages. The river drainages have steep slopes and chimneys that contribute to strong erratic winds. These types of terrain features can support extreme fire behavior with high fire intensities, increased spotting potential, and rates of spread that can impact values within the County. The topography input related to fire behavior is percent slope which is highly variable and not further evaluated in this analysis.





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# 5.0 Wildfire Hazard and Risk Assessments

Given the high fire prone nature of the County and surrounding areas, a wildfire risk assessment comprised of hazard, exposure and vulnerability analyses has been undertaken to help identify the most at-risk communities, as well as inform strategic planning and preparedness efforts. See Figure 36. The assessment was based on a combination of methods – field visits, wildfire behavior modelling, geospatial analytics, current research, and best practices – in collaboration with the Fire Safe Council, County OES and other subject matter experts. The purpose of the assessment is to provide a framework and basis for prioritizing a range of wildfire mitigation strategies across the County.

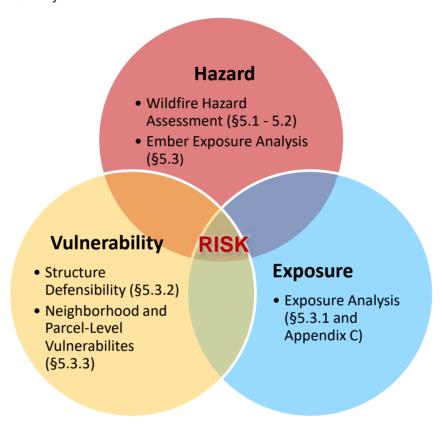


Figure 36. Key Components of Wildfire Hazard and Risk Assessment for this CWPP

#### 5.1 WILDFIRE BEHAVIOR MODELLING INPUT

Fire behavior modeling is performed to estimate several fire behavior characteristics. There are three main categories of inputs to fire behavior modeling: weather, fuels, and topography. These inputs are described in more detail below.

The wildland fire behavior models used in this analysis provide the basis for evaluating the wildfire hazard, defensibility, ember exposure, and fire run damage potential for the Planning Area. These models included FlamMap (Version 6.2) and FireFamily Plus (Version 5.0).<sup>13</sup> These models are the most widely adopted tools

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<sup>&</sup>lt;sup>13</sup> Fire Family Plus is a software package used to calculate fuel moistures and indices from the National Fire Danger Rating System (NFDRS) using weather observations from a system of Remote Automated Weather Stations (RAWS).

for analyzing wildfire potential. Data used in the models came from state and federal sources, including LANDFIRE, Weather Information Management System (WIMS), and the Fire Resource and Assessment Project (FRAP).

# 5.1.1 Weather Data and Analysis

Weather is the most variable element of the wildland fire environment. Important components of fire weather that influence fire behavior are temperature, relative humidity, precipitation, wind, and atmospheric stability. All of these elements have the potential to enhance or retard wildfire spread and intensity. Refer to Section 4.3 for more detail.

Weather information was obtained from https://nap.nwcg.gov/NAP/for a selected number of Remote Automated Weather Stations – Cottage, MT Elizabeth, Pinecrest2 and Crane – from 1993 through 2023. Fire Family Plus Version 5.0 (USDA Forest Service 2020) was used to compare historical and current fire weather parameters associated with temperature, wind, and precipitation. The 90th and 97th percentile weather conditions were determined based on Energy Release Component (ERC) for fuel model G. ERC is a measure of the energy released at the flaming front of a fire and is in units of energy (BTU) per unit area (square foot) (Bradshaw and others 1983). An ERC index, as used in the US National Fire Danger Rating System (NFDRS), provides an approximation of dryness based on estimates of fuel moisture. Thus, the larger the ERC value, the 'hotter' and potentially more severe the fire. Values typically range from 0 to 100, though they can be higher depending on weather extremes and fuel model. Specifically, ERC is used to describe fire danger trends because it is sensitive to wetting rains that change fuel conditions. The ERC calculation is also affected by fuel loadings in different size classes. Fuel model G, which includes both live and dead fuels, has a significant portion of the fuel load driven by large dead fuels.

Based on the cumulative fire analysis (1993-2022), fires over 1,000 acres occurred when the ERC was greater than 47. See Figure 37. Seasonal trends for ERCs that no longer support fire growth are used to inform the fire season dates for a given area.

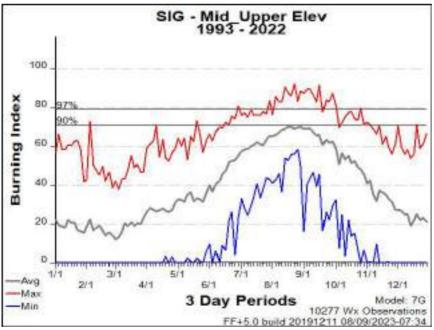


Figure 37. ERC for Mid to Upper Elevations within Tuolumne County

The County has a mild climate with an above average number of sunny days. The County's geographic location is conducive to patterns where wet or dry seasons can prevail. The most active fire season is normally about five to six months in duration beginning in May and ending late October to early November. Dry weather patterns can create conditions for wildfire activity occurring as early as March and can last into December. Under these conditions, daytime temperatures can reach 90 degrees Fahrenheit. Most of the precipitation falls during the winter months with an annual average of 41 inches (Best places).

Summertime conditions are influenced by gradient winds that are

created when low-pressure systems pass through the area. Northerly winds are not as common but can be quite strong, especially in the foothills on the west side of the County and drainages that are positioned in a North/South direction. The prevailing wind direction is generally from the southwest. Terrain such as steep slopes and river drainages can dramatically increase wind speeds throughout the County. Refer to Section 4.3 for additional weather and climate information.

#### 5.1.2 Fuel Characteristics and Fuel Models

The key characteristics of vegetative fuels that affect fire behavior include fuel type, fuel moisture, fuel loading, chemical properties, horizontal continuity, and vertical arrangement. These characteristics are combined to create fuel models that describe fire behavior when used in combination with weather and topography. Understanding fuel models, their effects on fire behavior, and how the models change after the implementation of a fuel treatment can help fire managers design effective wildfire mitigation strategies.

#### 5.1.2.1 Fuel Types/Fuel Models

Fuel types associated with the Planning Area include grasslands, chaparral, broadleaf forest and woodland, and conifer forest and woodland (nrm.dfg.ca.gov and Nature Serve 2018). These fuel types are categorized into specific fuel models (e.g., non-burnable, grass, grass-shrub, shrub, timber-understory, timber-litter, and slash-blowdown), which describe the physical properties of the vegetation that support fire. Fuel models are grouped by fire-carrying fuel type. The number of fuel models within each fuel type varies. Each fuel type has been assigned a mnemonic two-letter code.

- + Non-burnable fuel models (NB). Land areas that are considered non-burnable portions of the landscape are displayed on a fuel model map as NB. Urban development, barren land and water, all considered unburnable in fire behavior models. There are approximately 262,192 acres represented by this fuel type within the Planning Area.
- + **Grass (GR).** The primary carrier of fire in the GR fuel models is grass. Grass fuels can vary from heavily grazed grass stubble or sparse natural grass to dense grass more than 6 feet tall. Fire behavior varies from moderate spread rate and low flame length in the sparse grass to extreme spread rate and flame length in the tall grass models. There are approximately 161,502 acres represented by this fuel type within the Planning Area.
- + Grass-Shrub (GS). The primary carrier of fire in the GS fuel models is grass and shrubs combined; both components are important in determining fire behavior. The effect of live herbaceous moisture content on spread rate and intensity is strong and depends on the relative amount of grass and shrub load in the fuel model. There are approximately 199,378 acres represented by this fuel type within the Planning Area.
- + **Shrub (SH).** The primary carrier of fire in the SH fuel models is live and dead shrub twigs and foliage in combination with dead and down shrub litter. A small amount of herbaceous fuel may be present, especially in SH1. There are approximately 153,130 acres represented by this fuel type and represents the bulk of the fuels within the Planning Area.
- + **Timber-Understory (TU).** The primary carrier of fire in the TU fuel models is forest litter in combination with herbaceous or shrub fuels. The effect of live herbaceous moisture content on spread rate and intensity is strong and depends on the relative amount of grass and shrub load in the fuel model. There are approximately 459,344 acres represented by this fuel type within the Planning Area.

- + **Timber-Litter (TL).** The primary carrier of fire in the TL fuel models is dead and down woody fuel. Live fuel, if present, has little effect on fire behavior. There are approximately 222,044 acres represented by this fuel type within the Planning Area.
- + Slash-Blowdown (SB). The primary carrier of fire in the SB fuel models is activity fuel or blow down. Forested areas with heavy mortality may be modeled with SB fuel models. There is a very small, almost negligible amount of this fuel type within the planning area.

To quantify the fire behavior characteristics, a fuel model is one of the primary inputs for fire behavior modeling. A fuel model is chosen by the primary carrier of the fire (e.g. grass, brush, timber litter, slash) and its fuel characteristics (e.g. fuel loading, surface area to volume ratio, fuel depth, etc.). Table 12 below provides a

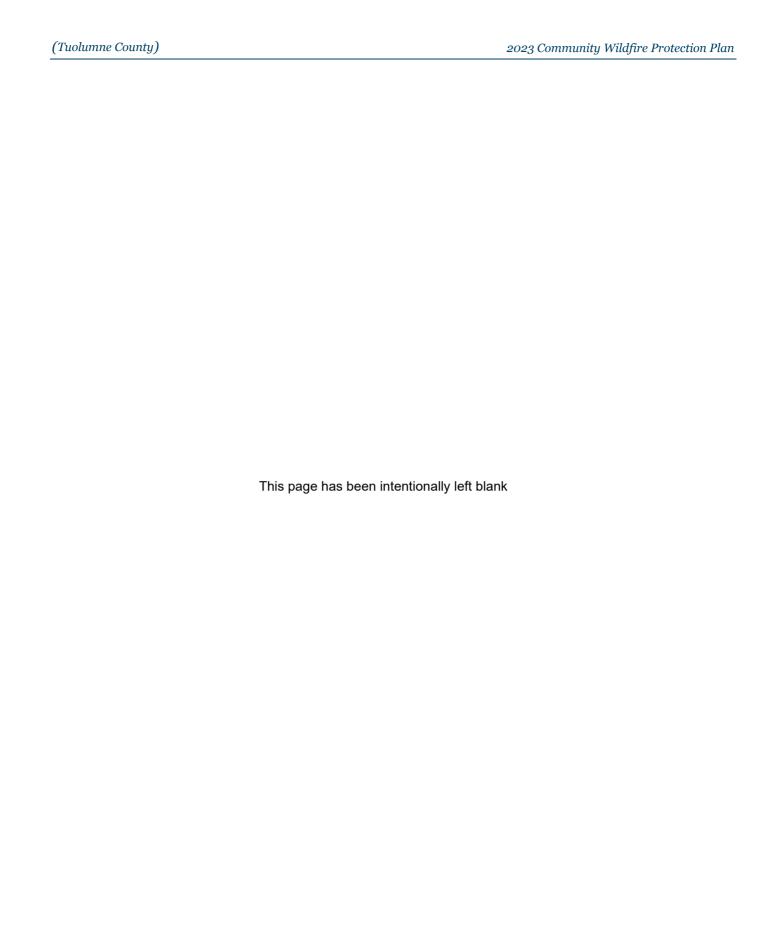
breakdown of vegetative fuels by fuel model for the County. In addition, Figure 38 shows the spatial distribution of fuel model types across the County. As shown in the figure the existing fuel conditions are variable across the landscape, with a high percentage of the project area containing fuel models with high fuel loading characteristics. Refer to Appendix C for spatial distribution of fuel models at the sub-county level.

Note: Refer to Appendix C for spatial distribution of fuel models at the sub-county level (i.e., fire planning units).

Table 12. Breakdown of Generalized Fuel Types/Fuel Models within the Planning Area.

Fuel Model Type	Vegetation Group	Fuel Type Acres	% Coverage
Non burnable – Fuel models (NB1-NB9)	Non-burnable	262,192	18%
<b>Grass</b> - Nearly pure grass and/or forb types are represented by grass fuel models (GR1-GR9)	Grassland/Forb	161,502	11%
<b>Grass-Shrub</b> – Up to about 50 percent shrub coverage are represented by grass shrub fuel models (GS1-GS4)	Grassland/Forb Broadleaf Forest and Woodland	199,378	14%
Shrubs – Cover at least 50 percent of the site; grass sparse to non-existent are represented by shrub fuel models (SH1-SH9)	Chaparral	153,131	11%
<b>Timber-Understory</b> – Grass or shrubs mixed with litter from forest canopy are represented by timber understory fuel models (TU1-TU5)	Conifer Forest and Woodland	459,345	32%
<b>Timber-Litter</b> – Dead and down woody fuel (litter) beneath a forest canopy is represented by timber litter fuel models (TL1-TL9)	Broadleaf Forest and Woodland Conifer Forest and Woodland	222,045	15%

Fuel Model Type	Vegetation Group	Fuel Type Acres	% Coverage
Slash Blowdown – Activity fuel (slash) or debris from wind damage (blowdown) are represented by slash blowdown fuel models (SB1-SB4)	Conifer Forest and Woodland	10	<0.1%



(Tuolumne County )

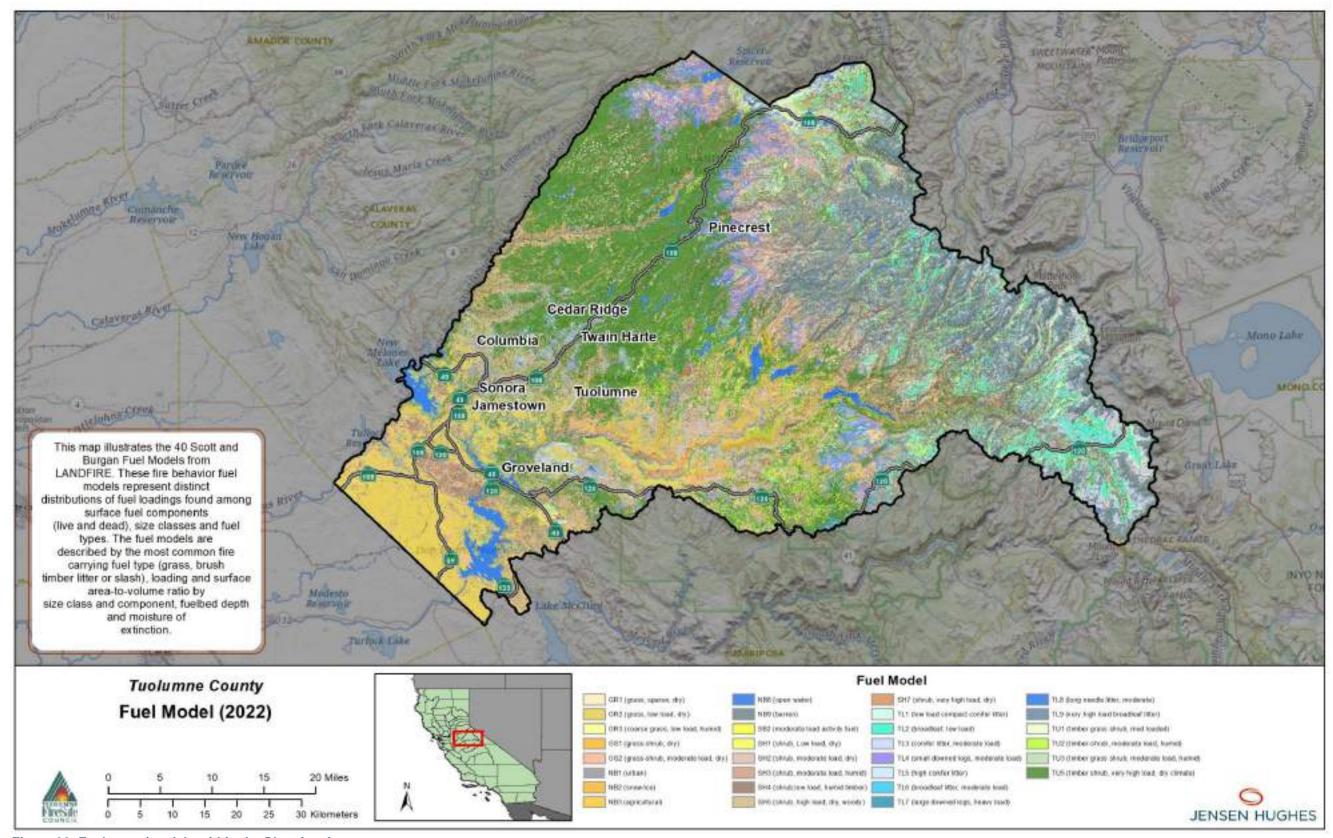


Figure 38. Fuel types/models within the Planning Area.

(Tuolumne County )

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#### 5.1.2.2 Fuel Moisture

Fuel moisture is a dynamic variable controlled by seasonal and daily changes in the weather and is an important component influencing wildland fire behavior. Simply stated, vegetation is most flammable when fuel moisture levels are low and less flammable when they are high. Fuel moisture levels will largely determine if a fire will ignite and spread. Fuel moistures are typically categorized into dead and live fuel moisture.

- + **Dead fuels.** Dead fuels act like a sponge absorbing or giving up moisture to the air and ground which surrounds them. The moisture exchange rate between dead fuels and their surrounding environment varies by the size of the dead fuel particle, with fuels less than ¼ in diameter reaching equilibrium with their surroundings within one-hour. Because of this rapid exchange rate, these smaller size class fuels exert significant control over wildfire burning characteristics, especially in the grass and shrub dominated fuels associated with the Planning Area.
- Live fuels. Live fuel moisture is the moisture in living, growing vegetation and is controlled by the internal physiological mechanisms of the vegetation and external influences such as rainfall, drought, aspect, elevation, and seasonal drying patterns. Typically, live fuel moistures are highest in the spring through early summer and at their lowest in late summer through early winter when seasonal rains typically begin.

Note: Live fuel moisture of 60% or below is a "critical" threshold where live fuels display similar burning characteristics as dead fuels.

Because climate influences fire both directly through fuel moisture and indirectly through biological and ecological effects on vegetation, the National Fire Danger System (NFDRS) Index Energy Release Component (ERC) is most often used to describe the fuel moisture conditions associated with climatology changes throughout a fire season. For Tuolumne County, the core fire season – which is determined by fire occurrence, weather, and fuel moisture conditions to produce large fires – occurs from May through October. Local approved NFDRS Remote Automated Weather Stations (RAWS) were analyzed to represent weather and fuel moisture conditions within the County.

An analysis using Fire Family Plus 5.0 was conducted by comparing the changes in ERC values and the correlation of fuel moisture and weather conditions during the core fire season that promote extreme fire behavior. Extreme fire behavior occurred when the ERC was greater than the 90th and 97th percentile. In order to capture extreme fire behavior, the 97th percentile fuel moistures and weather conditions (Table 13) were modeled in FlamMap 6.2 and the Interagency Fuel Treatment Decision Support System (IFTDSS) to calculate fire behavior outputs, and ultimately to inform the wildfire hazard and risk analysis, ember cast, and potential fuel treatments across the County.

Table 13. Percentile Fuel Weather by Energy Release Component (ERC).

Fuel/Weather Inputs	90 <sup>th</sup> Percentile	97 <sup>th</sup> Percentile
1 Hour Fuel Moisture %	4	3
10 Hour Fuel Moisture %	5	4
100 Hour Fuel Moisture %	6	5
1000 Hour Fuel Moisture %	8	7
Herbaceous Fuel Moisture %	60	30

Fuel/Weather Inputs	90 <sup>th</sup> Percentile	97 <sup>th</sup> Percentile
Woody Fuel Moisture %	90	60
20-ft Wind Speed Direction	SW	SW
20-ft Wind Speed MPH	10	13

#### 5.2 WILDFIRE HAZARD ASSESSSMENT

The objective of the wildfire hazard assessment is to identify areas within the Planning Area that are prone to severe fire conditions, and to use this as the basis for designing and prioritizing fuel treatments. The main body of the report summarizes the wildfire hazard analysis at the County level. Detailed maps at sub-regional scales are provided in Appendix C.

Note: Refer to Appendix C for detailed maps of the wildfire hazard assessment at sub-county scales (i.e., fire planning units).

#### 5.2.1 Hazard Analysis

Using FlamMap (Version 6.2) – a fire behavior model based on static fuel and weather conditions – was used to understand potential fire characteristics (e.g., fire severity, rate-of-spread), potential impacts to community values or assets at risk, and then prioritize various hazard-based mitigation activities (e.g., fuel treatments). The wildfire hazard assessment was performed to identify where on the landscape unwanted ignitions, potential fire behavior, potential fire effects, and existing hazardous fuel conditions are likely to be most problematic for the Planning Area. This type of approach is not intended to prioritize current and existing projects, but rather take a holistic approach to having readily available data and prioritized landscapes to rapidly respond to potential opportunities and project requests by individual landowners, community groups, partners, federal, state, and local agencies. Additionally, this type of information can be utilized to develop proposals and respond to different types of funding sources as they come available.

The Wildfire Hazard Assessment performed to support the CWPP include:

- 1. Landscape Burn Probability
- 2. Conditional Flame Length
- 3. Integrated Hazard
- 4. Fire Type / Crown Fire Potential
- 5. Relative Risk

# **Landscape Burn Probability**

To better understand the current likeliness of fire and hazardous fuels in Tuolumne County, the Interagency Fuel Treatment Decision Support System (IFTDSS) model was used to determine landscape burn probability. Landscape burn probability quantifies the relative likelihood and intensity of fire occurring across the County under a fixed set of weather and fuel moisture conditions, as well as given a random set of ignition points. For this analysis, the most recent LANDFIRE data (2020) for topography, slope, aspect, fuel models, canopy cover, etc. were used. It should be noted that while the 2020 LANDFIRE data may not reflect the most current vegetation treatments or conditions, the outcomes of the modelling should still reasonably capture landscape-level risks and help support fuel treatment planning.

The spatial distribution of relative burn probabilities for 97<sup>th</sup> percentile conditions across the County is shown in Figure 39, with Table 14 providing a breakdown of acreage and % of the total land area.

Table 14. Breakdown of Relative Burn Probabilities at 97th percentile weather conditions in the County.

Relative Burn Probability*	Acres	Percent
Lowest (0-20% of maximum)	503,218	43%
Lower (20-40% of maximum)	306,003	26%
Middle (40-60% of maximum)	240,580	20%
Higher (60-80% of maximum)	111,333	9%
Highest (80-100% of maximum)	16,135	1%

\*Note: The non-burnable acres and percentages have been included in the "Lowest" category. "Burnable but not burned" acres and percentages are not included.

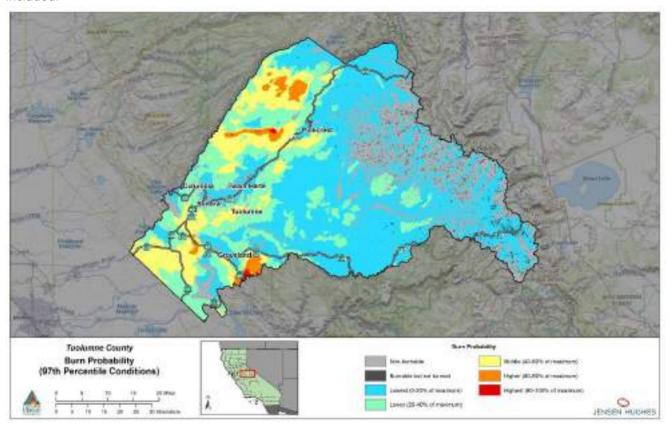


Figure 39. Relative burn probability at 97th percentile conditions across the County.

As seen in the table and figure above, a considerable amount of the County has low burn probabilities. This is due, in part, because there is no or limited burnable fuels (e.g., granite in the high country). Additionally, large fires (Rim 2017, Donnell 2018) burned almost 300,000 acres, resulting in a lower probability of fuel burning or high intensity burning in the near to middle term. However, 30 percent of the county has middle to the highest burn probabilities. It is also important to note where the middle to highest burn probabilities occur regarding High Value Resources and Assets (HVRAs) or areas of concern.

# **Conditional Flame Length**

Conditional flame length is an estimate of the average flame length that may occur across the landscape, if a fire were to occur at any given point on the landscape. Conditional flame length is typically delineated into six classes based on potential fire intensity, but also fire spread such as heading, flanking, and backing fire, which is a more realistic way to determine overall hazard. Flame lengths over 4 feet are considered moderate hazard, while flame lengths over eight feet are considered high hazard. Figure 40 shows the conditional flame lengths calculated across the county. As seen in the figure and in Table 15, approximately sixty-nine percent of the county has moderate to very high conditional flame lengths. This is important for determining where vegetation treatments should be located, potential concerns associated with fire suppression tactics exist, and potential impacts to HVRAs.

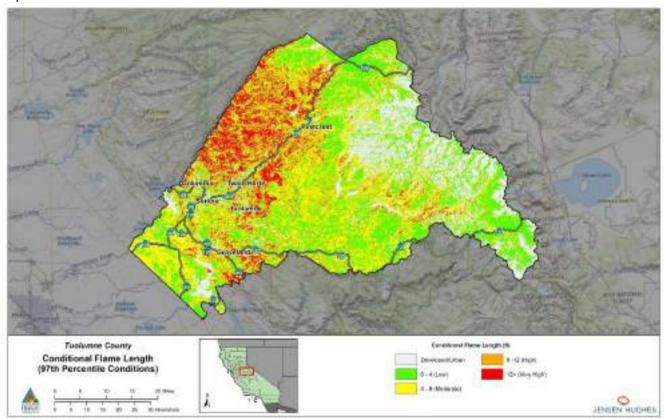


Figure 40. Map of conditional flame lengths acres and percentage within the County.

Table 15. The number of Conditional Flame Length acres and percentage within the County.

Conditional Flame Length (feet)	Acres	Percent
>0-2 ft	18,170	2%
>2-4 ft	337,805	30%
>4-6 ft	346,874	31%
>6-8 ft	152,450	14%
>8-12 ft	131,311	12%
>12 ft	136,304	12%

**IMPORTANT NOTE**: Although there appears to be areas on the flame length map that are not at risk from a wildfire, this reflects the limitations of the fire model. With most wildfire modelling tools, wildfire behavior is limited to lands with vegetative fuel loads. As developed areas within the city consist mostly of structures and other man-made fuel loads (e.g., infrastructure, ornamental vegetation, propane tanks or high concentrations of non-burnable fuels (such as granite mountains), the fire behavior model does not account for fire spread in urban fuels, and thus will show as "unburnable". However, as was evident in many WUI fires, wildfire will spread readily through developed areas, particularly under conditions of high wind and low relative humidity.

#### **Integrated Hazard**

Integrated hazard is the combination of burn probability and conditional flame length. This is typically used by the wildland fire community to define a variety of conditions or situations where damage to assets by fire is being evaluated. Integrated Hazard is categorized into seven distinct classes. The first two are for pixels (30m x 30m units of land) that essentially are unburnable or did not burn in simulations, while the remaining five classes are dynamic based a relative scale of hazard. They include:

- + Non-burnable
- + Burnable but not burned
- Lowest hazard
- + Lower hazard

- + Middle Hazard
- + Higher Hazard
- + Highest Hazard

Figure 41 shows the spatial variation of integrated hazard across the County for 97<sup>th</sup> percentile weather conditions.

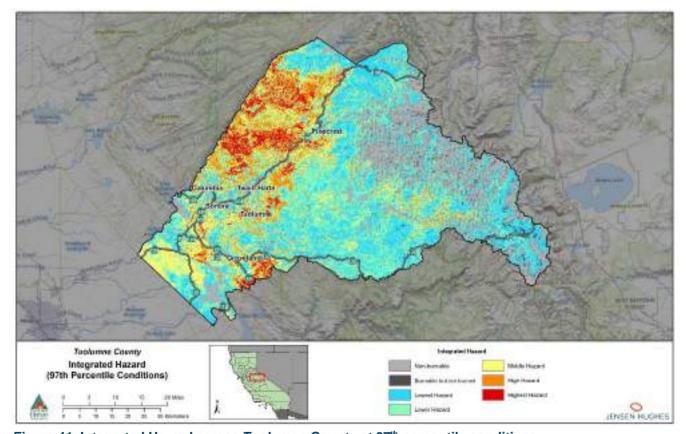


Figure 41. Integrated Hazard across Tuolumne County at 97th percentile conditions

As seen in the figure and in Table 16, approximately 37% of the County has an integrated hazard of middle to highest. Without maintenance or restoration fuel treatments or other natural disturbances, there is a considerable percentage of the county with integrated hazard levels prompting consideration for hazardous fuel mitigation.

Table 16. The number of Integrated Hazard Level acres and percentage within the County.

Integrated Hazard Level	Acres	Percent
Lowest	385,609	33%
Lower	358,445	30%
Middle	231,047	20%
Higher	131,583	11%
Highest	71,806	6%

Without maintenance, fuel treatments or other natural disturbances, there is a considerable percentage of the county with integrated hazard levels prompting consideration for hazardous fuel mitigation.

# Fire Type

In addition to flame length, the type of predicted fire can provide a strong correlation to the potential for extreme fire behavior characteristics such as how fires spread (surface or crown). The type of predicted fire also governs the potential strategic and tactical operations alternatives by fire agencies during a wildfire. Examples could include the use of aircraft or the potential for indirect attack methods based on crown fire potential or fast-moving brush fires.

The following at fire types and how they can influence potential fire behavior:

- + Surface Fire A surface fire burns in the surface fuel layer, which lies immediately above the ground fuels, but below the canopy, or aerial fuels. Surface fuels consist of needles, leaves, grass, dead and down branch wood, logs, shrubs, low brush, and short trees (<3 feet). Surface fire behavior varies widely depending on the nature of the surface fuel complex (vertical and horizontal arrangement). Surface fires are generally easier to contain than any type of crown fire.
- + Crown Fire A crown fire burns in the elevated canopy fuels. Canopy fuels normally consumed in crown fires consist of the live and dead foliage, lichen, and very fine live and dead branch wood found in the forest canopy. Reducing the potential for crown fire is very important in reducing the risk of lofted fire brands that may threaten structures.

As a crown fire is dependent on a surface fire for both its initial emergence and continued existence, its advancement is linked to both the fuel layers and fire phases of the surface and tree canopy (Alexander and Cruz 2016). Based on the crown fire potential, fire managers can estimate how successful suppression efforts would be or how resistant the fire is to control. It can also highlight the potential increased risk of lofted firebrands. In addition, widespread crown fire can decrease forest health because of lost habitat structure and variability. Van Wagner (1977) defines the three types of crown fire as passive, active and independent crown fire. Independent crown fire is rare, so the two most common types, passive and active crown fire, are modeled.

The potential fire type for future fires across the County is summarized in Table 17. Based on the current fuel conditions, there is the potential for 28 percent of the County to experience a crown fire, given the current fuel loading, if a fire were to occur during a period when the fuel moisture/weather conditions are high or extreme.

Table 17. Fire Type potential under high to extreme weather and fuel conditions.

Fire Classification	Acres within Planning Area	Percent of Planning Area
Non-Burnable	258,514	18%
Surface Fire	791,402	54%
Passive Crown Fire	394,687	27%
Active Crown Fire	13,074	1%

### 5.2.2 Ember Exposure Analysis

Embers constitute one of the greatest threats to homes and other structures as they may be carried for long distances ahead of the main fire front or from burning urban fuels (e.g., structures), igniting receptive fuel beds in and around structures. See Figure 42 for general transport mechanism for embers or firebrands during a wildfire incident. For this plan, fire modeling was used to evaluate the potential ember exposure expected under the same two 97th percentile conditions scenarios as in the previous section (Summer and Shoulder Season).

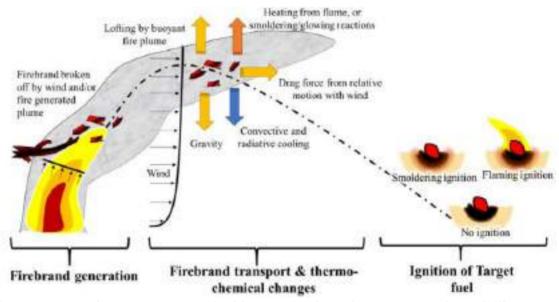


Figure 42. General generation, transport and ignition mechanisms for ember cast in a wildfire.

To develop Ember Exposure maps (Figure 43 and Figure 44), the maximum spotting distance of each pixel on the digital landscape was determined from FlamMap using a 14-mph southwest wind and the "dry" fuel moisture scenario (i.e., 3, 4, 5, 40, 80 percent). Using the outputs from FlamMap, each pixel on the landscape was buffered in ArcGIS to represent the maximum spotting distance. For example, a pixel with a 300-foot MAXSPOT distance was buffered 300 feet in all directions from the center of the pixel. This creates a circle on the digital landscape with a 300-foot radius. When all pixels on the landscape are buffered, the outcome is a series of overlapping circles that represent how many surrounding pixels might contribute embers to the pixel in the middle. The number of potentially contributing pixels is then divided by the total number of pixels that could contribute within a radius equivalent to the maximum spotting distance observed for the Planning Area. This yields a percentage that represents the proportion of surrounding pixels (i.e., the surrounding landscape) that would potentially provide embers to a given pixel: the Ember Exposure.

As spotting from embers is highly erratic and very difficult to model accurately with the current best available cience and modeling, it is best to assess these percentages relative to each other, rather than as a direct probability. For example, the maximum probability of Ember Exposure for the Planning Area is just over 20%. Rather than interpreting this as a 20% probability that a location will be exposed to embers, interpret it as 20% of the surrounding landscape will contribute embers in a wildfire. A location that received embers from 20% of the surrounding landscape will have 4x the Ember Exposure level of a location that only receives embers from 5% of the surrounding landscape.

It is extremely important to recognize that it only takes a single ember to create a spot fire or burn down a home; therefore, areas characterized by Low Ember Exposure are still at risk during a wildfire, and mitigation measures can reduce the probability of ignition and spread.

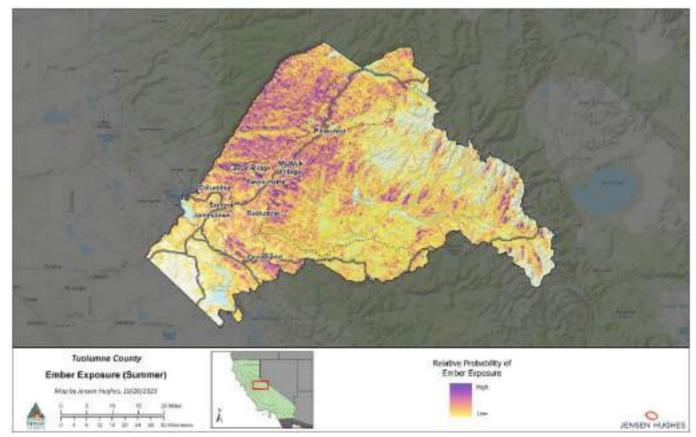


Figure 43. Ember exposure probability across County in <u>summer months</u>. Note: The percentage represents the proportion of the surrounding area that would contribute embers to a given location, rather than the probability of the location being exposed to embers.

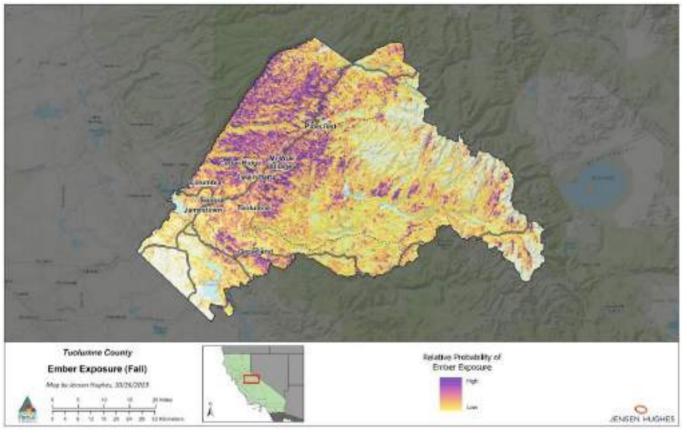


Figure 44. Ember exposure probability across County in the fall months.

# 5.3 RISK ASSESSMENT

For the purposes of this Plan, the risk of a wildfire occurring within and immediately adjacent to the Planning Area has been based on an evaluation of fire frequency across the landscape during the time period 1925 – 2018. To develop the risk map, a relative risk scale was developed based on the number of times fire burned a particular area (Table 18). Where a point was found to have burned nine or more times since 1925, relative risk is classified as Very High". Figure 45 illustrates the relative risk for the Planning Area.

Table 18. Relative Risk Scale based on Fire Frequency (1926 – 2018)

Frequency of Fire	Risk Classification
5-8	Very High
3-4	High
2	Moderate
1	Low

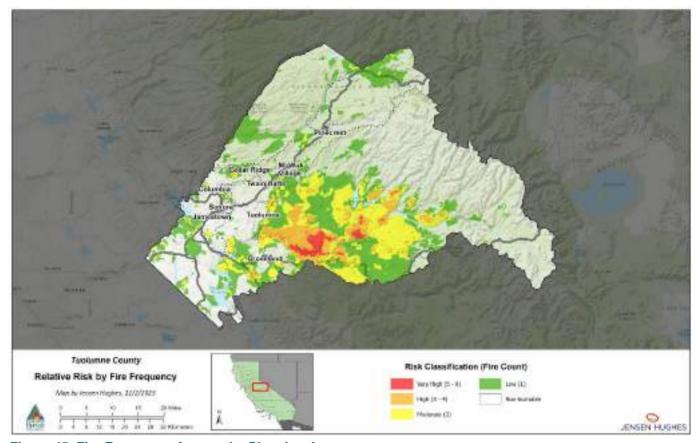


Figure 45. Fire Frequency Across the Planning Area.

As seen in the figure, wildfire has been a common occurrence in the Planning Area through the years and if history is to serve as a guide, it is not a matter of if Tuolumne County will see another significant wildfire in the coming years, but rather when and what portions of the County will be impacted.

In terms of the number of wildfires which have occurred on the local landscape, the area in the south has burned more frequently than other portions of the Planning Area, having burned up to 8 times during the analysis period. About half of the county has never seen wildfire going back to 1926, however it is a mistake to assume that these areas are without risk of being involved in future wildfires. These unburned locations are generally associated with developed landscapes, where vegetation that supports wildfire spread has been significantly modified over the years. While these areas may not have a fuel complex that will support wildfire spread, ember cast into these locations places residences and businesses at risk, particularly during times where winds drive embers from a wildfire into the community.

# 5.3.1 Exposure Analysis

To meet the Healthy Forest Restoration Act (HFRA) and the goals of the CWPP, an Exposure Analysis was developed to evaluate the threat of wildfire from the current

hazardous fuel conditions that could potentially impact values at risk. Integrated Hazard – the combination of burn probability and flame length as indicated in Table 19 – was used to quantify fire exposure within each Fire Planning Unit (FPU). See Appendix C.

Note: Refer to Appendix C for detailed exposure analysis and mapping at the Fire Planning Unit (FPU) Level.

Table 19. Integrated Hazard

ses	Burn Probability Classes					
gth Class		Lowest 0-20% of max	Lower 20-40% of max	Middle 40-60% of max	Higher 60-80% of max	Highest 80-100% of max
en	> 12 ft					
Conditional Flame Length Classes	> 8 – 12 ft					
	> 6 – 8 ft					
	> 4 – 6 ft					
Dua	> 2 – 4 ft					
diţi.	> 0 – 2 ft					
on o		Lowest	Lower	Middle	Higher	Highest
O		Hazard	Hazard	Hazard	Hazard	Hazard

For the CWPP project, six Fire Planning Units (FPUs) (A-E) were identified by the CWPP Steering Committee at the start of the development process to allow interested parties at a more localized level to focus efforts on their specific subregion and community. See Figure 46. The six FPUs are as follows:

- + FPU A North County
- + FPU B Sonora, Columbia, and Jamestown
- + FPU C SR 108 Corridor

- + FPU D Emigrant
- + FPU E West County
- + FPU F Groveland South County

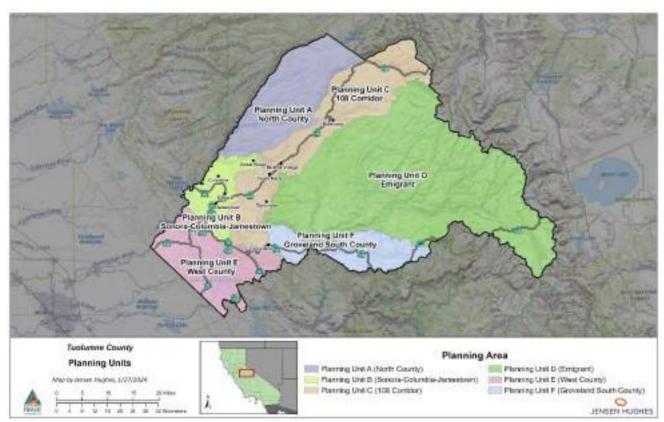


Figure 46. Planning Units Identified by the Steering Committee to Sub-Divide Tuolumne County for the Purposes of Evaluating, Designing and Implementing Potential Actions from the CWPP

The primary purpose of developing FPUs in fire management planning is to assist in organizing information on complex landscapes. FPUs divide the County into smaller geographic areas used to describe wildfire exposure to communities. Any community that is located where wildfire likelihood is greater than zero (in other words, where there is a chance wildfire could occur) is exposed to wildfire. For example, a home in a flammable forest is exposed to wildfire. Communities can be directly exposed to wildfire from adjacent wildland vegetation, or indirectly exposed to wildfire from embers and home-to-home ignition (wildfirerisk.org).

For the exposure analysis, the Wildland Urban Interface (WUI) zones and other private property within the county are used as proxies to calculate fire exposure to the primary highly valued resources and assets (HVRAs) at risk. The primary HVRAs within the WUI Zones include human life and health, critical infrastructure, and private property. CAL FIRE uses the FHSZ to support classifying and mapping three WUI categories that are impacted by the exposure analysis. Refer to Figure 7 and Section 3.3 for the spatial distribution of WUI areas across the County, and a brief description of the three WUI designations from CAL FIRE.

The results of this analysis will assist stakeholders in strategically prioritizing fuel treatments to modify fire behavior potential, support safe and effective fire suppression, and reduce the impacts to HVRAs. Refer to Appendix C for details of the exposure analysis at the FPU level.

# 5.3.2 Structure Defensibility

Research studies of structure loss during wildfires have shown that <u>one</u> of the key determinants influencing building survivability is whether firefighters are able to have sufficient operational space to safely defend a structure for wildfire (e.g., direct flaming, embers, or flying debris). In reality, defining the degree to which a structure might be defendable is highly complex and typically requires an onsite inspection of an individual property to assess the range of factors that can influence risk (e.g., site layout, local topography, proximate vegetation, building materials and construction, local landscaping, outbuildings, access, water supplies). The Incident Response Pocket Guide by the National Wildfire Coordinating Group (NWCG) provides a list of broader tactical challenges of fighting fire in the WUI, almost all of which occur in the County (NWCG, 2014). Below is a list of some of these challenges.

- + Narrow roads, unknown bridge limits, and septic tank locations
- + Ornamental plants and combustible debris next to structures
- + Poor driveway access and low clearances
- + Limited opportunities to observe the main fire
- Wooden siding and/or wooden roof materials
- + Structural components, such as open vents, eaves, decks, and other ember traps
- + Fuel tanks, propane tanks, and hazardous materials
- + Powerlines
- + Limited water sources or low water flow rates
- Property-owners remaining on-site

It is not possible to conduct a county-wide assessment of individual structure defensibility due to a lack of information on the most relevant criteria listed for each individual structure. Thus, a more generalized approach to defensibility has been adopted to help identify areas within the Planning Area where structure defensibility may be challenging based on the potential safety concerns for firefighters. In this analysis, defensibility has been defined as a function of both wildfire hazard (i.e., flame length) and fireline production rate criteria. Fireline production rate is based on how quickly firefighters can establish a fireline given various vegetative fuel types. Generally, grasses and low brush have faster fireline production rates than do heavy brush or timber-based fuel models.

Table 20 summarizes the matrix used to determine how fireline production rates and wildfire hazard combine to create a defensibility potential. In general, the higher the hazard class and the slower the fireline construction rate, the lower the defensibility. A "Low Defensibility" rating means that the location is relatively more difficult to defend than a "High Defensibility" rating.

Table 20. Defensibility Matrix

Defensibility Potential				
Wildfire Hazard	Fireline Production Rate			
(i.e. flame length)	Slow	Medium	Fast	
Low	Medium	High	High	
Moderate	Low	Medium	Medium	
High	Low	Low	Low	
Very High	Low	Low	Low	

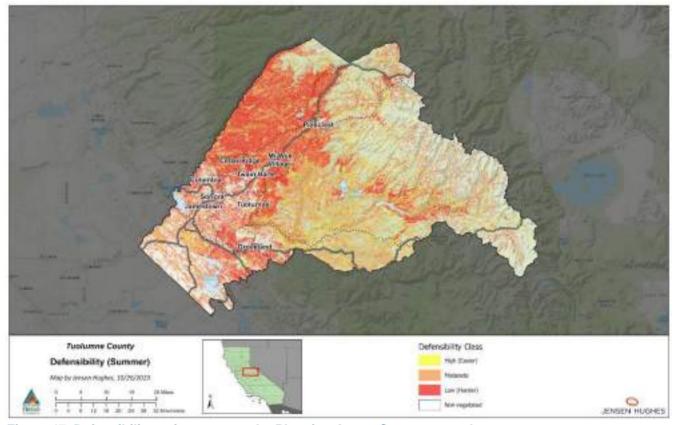


Figure 47. Defensibility ratings across the Planning Area – Summer months.

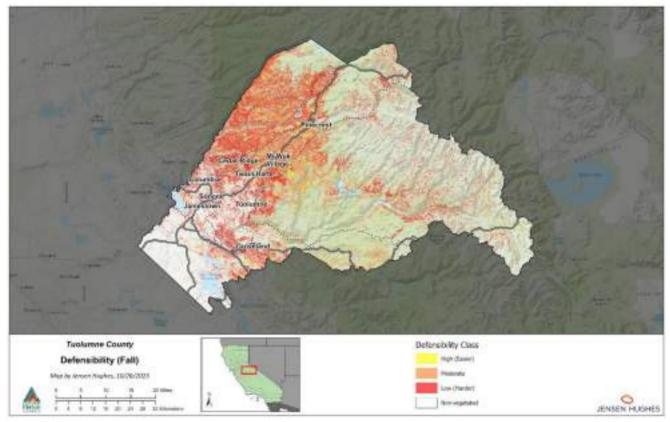


Figure 48. Defensibility ratings across the Planning Area – Fall months.

As the County has been extensively impacted by fires in the past, it is critical to plan for rapidly changing defensibility and identify where mitigation efforts are most critical. To aid in this assessment, a defensibility assessment was conducted for two different scenarios to demonstrate the difference between summer and shoulder-season fire events. Specifically, defensibility was characterized for 1) a 97<sup>th</sup> percentile summer fire scenario and 2) a 97<sup>th</sup> percentile shoulder season (spring/fall) scenario. As the Planning Area covers the entire county, much of the area is considered non-vegetated or non-combustible (Table 21) due to either a lack of any vegetation (e.g., the high elevation granite outcrops) or because it is developed.

Table 21. Structure Defensibility in acres and percent of the Planning Area for three different fire scenarios. Low defensibility is the most difficult to successfully protect, while High Defensibility has the highest probability of successful resource-at-risk protection.

Defensibility Classes by area for two scenarios					
	Fire Scenario				
Defensibility Class	Summer		Shoulder Season		
	Acres	% Planning area	Acres	% Planning area	
High	106,805	7%	10,160	1%	
Moderate	305,491	21%	142,791	10%	
Low	329,374	23%	231,089	16%	
Unburnable or Urban	713,972	49%	1,071,601	74%	

Important Note: Property owners and other stakeholders should recognize that locations classified as having "Not vegetated" or having a "High Potential of being defendable" during a wildfire are still at risk of damage or destruction. Vegetation classifications focus on wildland vegetation and classify areas where there are homes as "developed and not flammable", even though both the homes and the landscaping around the homes can be highly flammable if the homes are not hardened and defensible space principles are not followed.

Fuel and fire behavior modeling utilizes fuel layers derived from landcover maps that characterize much of the WUI as housing and roads, which are considered unburnable because they are not wildland vegetation. However, most wildfire disasters that destroy homes occur specifically because homes and landscaping are flammable. So, it is important for planning efforts to look at the Defensibility of communities and neighborhoods and assess the Hazard and Defensibility immediately adjacent to homes, since this is often where firefighters will seek to stop fire advancement. For example, in the Defensibility assessment, the communities along the Hwy 108 corridor, including Twain Harte, Miwok, and Cedar Ridge, are primarily classified as "Urban/Unburnable" but this is due to landcover maps representing them as developed. In reality, the wildland area immediately adjacent to these communities is primarily Low Defensibility, and the substantial vegetation immediately next to homes in these communities (i.e., a lack of defensible space) and the flammability of the homes themselves makes the neighborhoods difficult to defend against wildfire. Fuel breaks around these communities to increase Defensibility in the wildlands would make the neighborhoods more defensible.

These scenarios estimate Defensibility in the absence of risk reduction and vegetation management activities, which can be strategically placed to promote High Defensibility immediately adjacent to structures and the community. The most effective strategic fuel reduction activities to support structure Defensibility would be placed in locations that are currently low or moderate Defensibility and are places that can be easily accessed by fire suppression resources. Even locations with High Defensibility see poor outcomes if fire suppression resources are unable to access the site due to steep or narrow roads, low visibility, lack of turnaround, gates, or other barriers to safely placing engines or crews at a location.

#### 5.3.3 Neighborhood and Parcel-Level Vulnerability

# 5.3.3.1 Technical Background

In 2022, wildfires destroyed 2,717 structures across the United States, 757 of which were in California. Of all the destroyed structures, nearly half were primary residences <sup>14</sup>. In 2018, these figures were at catastrophic levels with wildfires destroying 25,790 structures,18,137 of which were residences. Of the destroyed residential structures 17,133 were in California, primarily as a result of the Camp Fire and Woolsey Fire. <sup>15</sup>

While earlier research focused on the home ignition zone as providing the primary sources of structure vulnerability (e.g., construction materials, home hardening and defensible space features immediately around the home), current research and technical guidance also highlight the significance of landscape level features and neighborhood designs on influencing structure vulnerability to wildfires. That is, structure vulnerability is determined by a complex interaction of vulnerabilities at different scales – building, parcel, neighborhood, and community scales. Ways in which these scales influence vulnerabilities are indicated below:

 Potential neighborhood and community design vulnerabilities – Key influences on vulnerability include housing density or fire separation distances to other structures, zoning and land-use planning,

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<sup>&</sup>lt;sup>14</sup> www.predictiveservices.nifc.gov/intelligence/intelligence.htm, 2022

<sup>&</sup>lt;sup>15</sup> www.predictiveservices.nifc.gov/intelligence/intelligence.htm, 2018

access/egress routes, setbacks to hazardous topographic features both natural and man-made (e.g., steep slopes, ridges, gullies, drainage ditches, open spaces/parks). integration of greenbelts and recreational uses within the built environment, road placement etc. Many of these characteristics can either increase or decrease the likelihood of (1) wildfire spreading into a community. (2) frequency and/or intensity of fire exposure, (3) structure-to-structure ignitions and associated fuel loads and intensities. Figure 49 shows an example of how neigborhood or community design can lead to fire

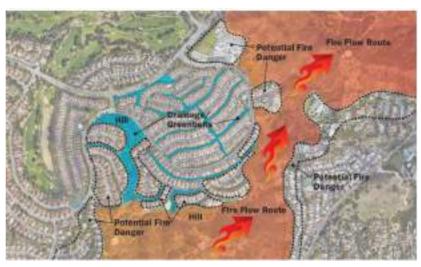


Figure 49. Example of a fire flow path via a greenbelt into a community. (Source: FEMA)

flowing into a neighborhood and influence structure vulnerability.

- Potential vulnerabilities from adjacent vegetated open space Large, uninterrupted, mostly unmanaged open space (e.g., parks, greenbelts, recreational use spaces) can provide a potential source of wildland fire or fuel bed for ember ignitions proximate to homes.
- + Potential vulnerabilities from adjacent non-WUI designed structures or neighborhoods Older neighborhoods located within the WUI or proximate to the WUI are generally not designed to meet modern building and fire code standards for wildfire resistance. As such, these neighborhoods and structures are more easily ignitable, they can ultimately become a fire source and ember generator that may present a

threat to adjacent homes and neighborhoods – whether those neighboring structures are designed to WUI standards or not.

Heatils – Non-WUI-compliant building construction, lack of vent protection, combustible siding, combustible decking and fencing, non-fire resistance roofing, location of structure on site (e.g., mid-slope, hilltop), maintenance practices of structure and landscaping, and proximate fuels (e.g., flammable materials, sheds, other structures) within 30-100 feet all impact ignitability

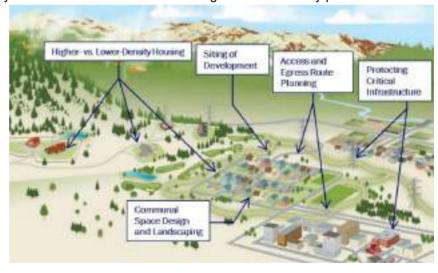


Figure 50. Various community and neighborhood level features that can influence wildfire exposure at a local level (Source: FEMA).

The heat transfer mechanisms by which structures ignite not only occur due to fire from wildlands, open spaces, greenbelts, and communal spaces to structures, but can also be due to fire spreading from structure-to-structure and/or other items in the built environment. This latter phenomenon is known as an urban conflagration.

Figure 51 provides a high-level overview of the various heat transfer mechanisms that directly cause structure ignition regardless of the characteristics of the community, neighborhood, parcel or building.





Direct Contact by Flame or Hot Gases - With a poorly prepared and maintained defensible space on a property, flames and hot gases can come into direct contact with a homeowner's property where the fuels from the wildland/open space go uninterrupted to the home. These columns of flame and intense gases can ignite a home and anything flammable they contact. Particularly in high wind events, flames and hot gases from remote wildland/open space fuels (e.g., 10-30 feet away) can still come into contact with a home or property, as the high winds can push the flames/gases diagonally or even horizontally.

# Flying Embers & Firebrands



Embers - Surning materials from wildlands, open spaces and urban fuels (e.g., homes, other structures, vehicles) can be blown 10s to 100s of feet by wind. Particularly during extreme wind events (e.g., 40-100 mph) embers can travel more than a mile away from their source and depending on the fuel, starting new fires wherever they land.

# **Radiated Heat**



Radiation – Process by which wildfires heat up the surrounding area. Radiant heat from a wildfire and fires in open spaces, greenhelts and communal spaces can ignite combustible materials and break glass in windows when proximate to the home (typically within 100 feet but can be more). Fires from burning structures (e.g., homes, pergolas, gazebos, detached garages, other buildings) can also ignite other homes and combustible materials from even closer distances (e.g., within 10-60 feet). In high wind events, flames from burning structures or vegetative fuels can oftentimes be tilted closer, leading to increased heat from rediction.

Figure 51. A structure can ignite during a wildfire due to direct contact, flying embers, and radiated heat. (Source: FEMA)

#### 5.3.3.2 Evaluation of Neighborhood- and Parcel-Level Vulnerabilities in Tuolumne County

Most communities in Tuolumne County are vulnerable to wildfires due to their proximity to wildland vegetation in various national and state parks, large open spaces, and general intermixing of fuels, as evidenced by their classification as WUI lands by CAL FIRE (See Section 3.3). However, even structures more remote from vegetation, such as those in downtown Sonora, are also vulnerable due to embers or firebrands that can be carried large distances from the front of the fire. Receptive fuel beds can include ornamental landscaping, dead vegetation, litter, debris build-up in rain gutters, and mulch beds. Enclaves, islands, and riparian corridors of wildland vegetation and ornamental vegetation are also interspersed with structures and subdivisions throughout the County. These create significant opportunities for wildfires to ignite, establish, and destroy structures.

Numerous residential communities throughout the County have varying degrees of structure ignitability vulnerabilities to wildfire, including:

- + Roofing Roof construction and maintenance is a key factor influencing structure loss in wildfire. Vulnerability is not just related to roofing material, but also to design, construction details, condition, and whether the roof is clear of burnable material (e.g., pine needles and other debris). Older homes in the Tuolumne County have more vulnerable roofing materials and areas with overhanging vegetation were observed to have more vegetative debris on roofs.
- Garages Gaps at the top, bottom and edges of garage doors allow firebrands to enter. Garages often contain combustible materials that enhance ignition potential. Garages also usually have vents at various locations, especially if the garage contains a gas furnace or hot water heater. These vents can be easy entry points for embers.
- + Siding Combustible siding can provide a pathway for flames to reach vulnerable portions of a structure, such as eaves or windows. Siding is especially vulnerable when in close proximity to combustible materials (e.g., vegetation, wooden decks, and fences, stacked firewood). Combustible siding in close proximity to vegetation was observed in the county, often in combination with other vulnerabilities (see below).





Figure 52. Tuolumne County houses with combustible wood siding, near vegetation

Vents – Soffit vents in eaves are an easy entry point into a structure for wind-driven embers during a wildfire. Attic fires are not easily detected from the outside and structures have been lost when fire personnel have left the scene unaware that a fire has ignited in the attic.

- Windows Unprotected, single pane, and plastic/vinyl framed windows can be an entry point for fire. Windows broken by airborne materials or cracked by thermal expansion during a wildfire provide access for materials in the structure to be ignited. Older homes with single pane windows were frequently observed, which have higher risk of cracking and falling out, particularly when combustible materials are directly underneath them.
- + Nooks and Crannies Cracks, horizontal surfaces, grooves, inside corners, and roof valleys are areas where combustible vegetative debris (e.g., pine needles, bird nests) collect over time. Embers can land on this debris and ignite it. These areas can also be a collection point for multiple embers, which creates a larger ignition threat to the underlying or adjacent material.
- Crawlspace Vents If not adequately screened, these areas, not just vents under a structure but also those under decks and other attachments, are difficult to protect. Much like vents in the attic, firebrands enter these areas and ignite combustible materials underneath a structure or attachment.
- + Wood Fences Wood fences act as a fuel source that can carry fire to a structure. Wooden fences attached to homes present a major threat to the structure. Wooden fences, including attached to structures, were observed throughout the county.
- + Wood Decks Decks act as a source of fuel that is attached or directly adjacent to structures. When ignited by wildfire the radiant and convective heat output



Figure 53. Unprotected windows with vegetation directly underneath



Figure 54. Wooden fences which can bring fire to a structure

ignited by wildfire the radiant and convective heat output of decks can ignite structures. In addition, most decks are adjacent to large windows or glass sliding doors and the heat from a deck fire can cause the glass to fail allowing the wildfire to enter a structure. Wood decks, often adjacent to sliding doors and/or with combustible materials or vegetation under them, were found throughout the Planning Area.



Figure 55. Combustible decks in proximity to vegetation

Landscape Vegetation/Debris – Combustible landscaping and other fuel loads such as firewood or debris piled near a structure pose a hazard and potential ignition source to the structure if ignited by embers, direct flaming from surrounding vegetation or hot gases. Structures are more susceptible to ignition when exposed to radiant and convective heat from burning material. Many of the neighborhoods in the county with lower housing density have significant combustible materials in the landscaping near the structure.



Figure 56. Tuolumne County homes with landscape vegetation and debris

+ Defensible space is the space between a structure and the wildland or neighboring structures that, under normal conditions, creates a sufficient buffer to modify or arrest the spread of a wildfire to a structure. Defensible space can protect a structure from direct flame impingement, radiant heat, and reduce exposure to burning embers and is essential for structure survivability during wildfires. Refer to Section 6.2.2 for details. Wildfire will continue to threaten the communities throughout Tuolumne County. However, residents and homeowners can and should take proactive measures to mitigate this threat. Current land use planning, zoning regulations, and codes adopted by the State of California and the various fire agencies in the County provide the regulatory basis for preparedness, but these alone will not protect life safety and other community values.

# 5.3.4 Community Input on Hazards and Risks

As part of the CWPP process, a community poll was administered from August 14<sup>th</sup>, 2023 through September 8<sup>th</sup>, 2023. The intent of the digital poll was to understand the experiences, perceptions, needs and concerns of local residents, as well as agencies, organizations, and other interested parties to past and future wildland fire threats in and around the County. Additionally, the poll



Figure 57. Structure spacing in Tuolumne County. Some defensible space is well maintained, some has significant vegetative fuels.

was intended to gather broader and more nuanced information to better tailor community-based activities, educational programs, services, policies, and other action items that not only help mitigate wildland fire risks but are also locally relevant, inclusive, and sustainable. Full digital poll results are available in Appendix G.

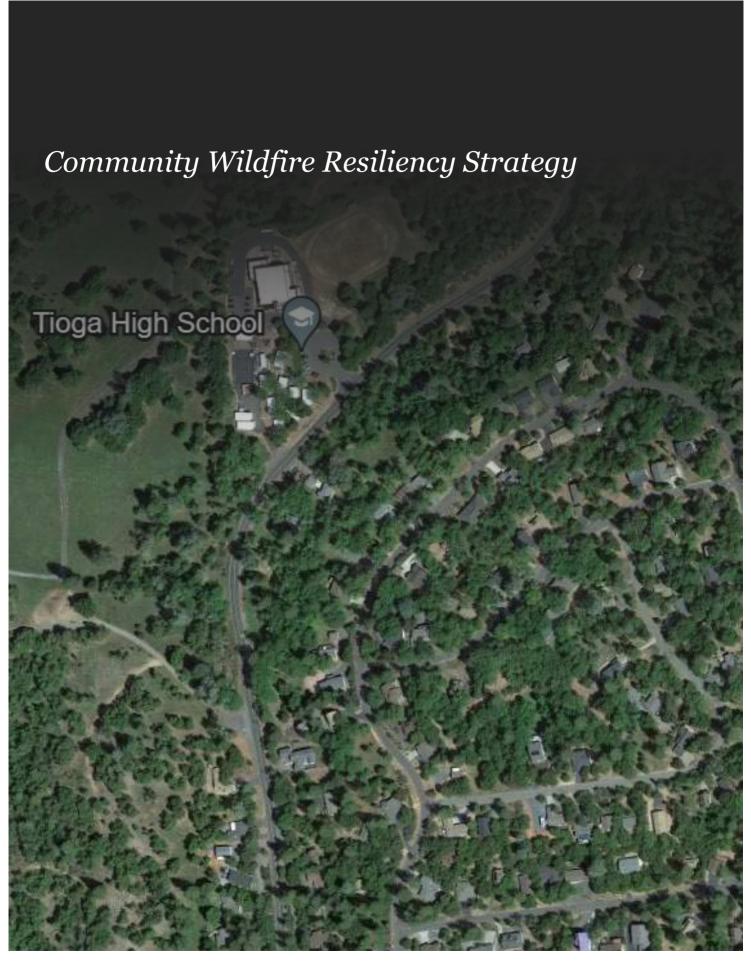
Approximately 37 households responded to the digital poll, along with 12+ agencies and organizations. This survey provided a forum for stakeholders to express their biggest wildfire-related concerns, what they are currently doing to increase wildfire resiliency, and what opportunities the CWPP should consider as action items. Additionally, four separate general public workshops were held near the start of the CWPP development process, along with a Stakeholder Working Group Workshop (held on June 12, 2023). The workshops overall had approximately 50-75 attendees represented from various agencies, organizations, interested parties and general public across the County (e.g., CAL FIRE, HOAs, Stanislaus NF, BLM, OES, City of Sonora, Tuolumne Fire Safe Council). The workshops included a breakout session where facilitated groups discussed concerns, recommendations, and improvements.

The following are key findings from both the digital poll and the stakeholder workshops:

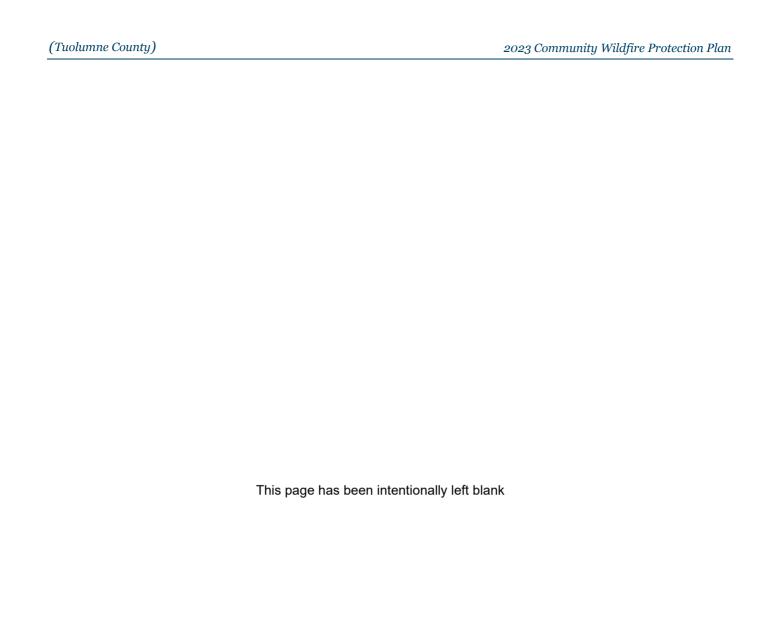
- + When respondents and attendees were prompted to describe their major concerns, common themes observed were:
  - o Limited egress routes, evacuation information, and shelter-in-place information.
  - Lack of mitigation measures taken on vacant/undeveloped lots of land.
  - Risks from uninformed visitors.
  - Means of communication and reliability in an emergency.
  - o Long-term funding and breaks in wildfire funding streams.
  - o Insurance & cost of undertaking treatments.
- + When respondents and attendees were prompted to describe opportunities and strategies as action items in the CWPP, common themes observed were:

- Establish more fuel break areas & provide more vegetation management at open spaces, along roads, etc.
- o Improve evacuation/egress routes, emergency communications, create resources for the elderly to help them evacuate.
- o Assist property owners with property hardening/fuels reduction.
- o Improve education throughout the county.
- o Put pressure/consequences on vacant lot/vacation homeowners who do not maintain their properties.

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# 6.0 Community Wildfire Resiliency Strategy

While wildfires are part of the natural landscape and cannot be completely eliminated, their devastating impacts to community assets, environment, social infrastructure, and local economies can be reduced through the collective action of all Stakeholders, both government and non-government. As wildfires have been increasing in frequency, scale, and severity over the past two decades, traditional approaches to mitigating wildfire risk alone – e.g., government policies, programs, planning codes, zoning regulations and firefighting operations, vegetation management – are no longer sufficient. The complexity and breadth of impacts highlight the need to take a more comprehensive and proactive approach to managing those risks. Resiliency to wildfires means engaging and collaborating across the "whole" community, across all scales and sectors to more holistically build individual and community-level capacities to prevent/mitigate, prepare, respond to and recovery from a wildfire incident.

As such, a Community Wildfire Resiliency Strategy and Action Recommendations have been developed to help mitigate the hazards and risks of wildfires in the Planning Area for the next 5-10 years. This is based on the results of the fire hazard, risk, and vulnerability analyses in Chapters 3.0 – 5.0 and the conceptual framework for fire adapted communities (FAC). Fire adapted communities is a general framework to address a broad range of individual and societal capacities to build community wildfire resilience, which is a major goal of this CWPP.

Figure 58 shows the key components of the Community Wildfire Resiliency Strategy for Tuolumne County based on the FAC framework. Additional information for the FAC framework can be found in the following links: https://www.fs.usda.gov/managing-land/fire/fac and https://fireadaptednetwork.org/.



Figure 58. Key Components of Community Wildfire Resiliency Strategy for Tuolumne County

For this CWPP, the key components of the strategy include protecting life safety, property, critical infrastructure, as well as a fuels mitigation strategy, early warning detection, public notification and communications,

evacuation preparedness and public education. These strategic components are described in the following sections and consist of existing, planned, and proposed activities that are considered essential for increasing wildfire resiliency in the County. Where areas of improvement are considered needed, they are indicated in the sections below and summarized in more detail in the Action Recommendations section (Section 8.0).

#### 6.1 PROTECTING LIFE SAFETY

The Fire Safe Council, County OES, and other key federal, state, and local stakeholders' first priority is life safety of residents and first responders.

# 6.1.1 Public Safety

As with any natural hazard, minimizing the risk of wildfire threats to public safety necessitates a comprehensive approach from prevention and mitigation to preparedness, response, and recovery. Collectively, the wildfire resiliency strategy and proposed action items described in this plan aim to help reduce the potential risk to human life – both for the general public and first responses. At a minimum, individual community members can become aware and actively engaged in understanding the various wildfire hazards and risks that may impact where they live and work, and take the necessary steps to prepare themselves, their homes, and their family members to minimize risk. The educational information and resources provided by the Fire Safe Council, County OES, CAL FIRE and other fire agencies in the County are available to aid individuals and community groups in this effort, such as "Ready-Set-Go". See Section 6.8.

These informational materials cover the key concepts of fire life-safety for residents:

- (1) Prevent ignition Reducing ignition sources and fire hazards in and around your property
- (2) **Control ignition** In the event fire occurs, minimize the potential for fire spread and growth (e.g., structural hardening provisions, vegetation management, defensible space)
- (3) **Notification and Communication** Knowing and being familiar with public notifications systems and their limitations and signing up for county emergency alert systems.
- (4) Evacuation Be familiar with evacuation routes from your home and/or place of work; be familiar with any publicly available evacuation centers/shelter-in-place facilities (if provided); be prepared using Ready-Set-Go program

Oftentimes in wildfire situations, it is extremely unsafe and/or impossible for firefighters, let alone the general public, to safely defend structures. Therefore, structures and other values must be able to survive on their own. Fighting wildfires and protecting structures are extremely complex and dangerous. It is highly recommended that the general public evacuate when directed to do so.

# 6.1.2 Firefighter Safety

There are many factors that affect the ability of firefighters to protect structures and other community assets. Firefighters arriving on scene quickly perform an assessment or "triage" to determine whether a structure or asset is safely defendable. Prior to engaging in structure defense activities, firefighters look for access and egress issues, whether a structure or improvement has characteristics of vulnerability, hazardous material issues, adequate water sources, adequate defensible space, and whether the defensible space provides them safe operational space. State law for defensible space, Public Resources Code (PRC) 4291 and Government Code Sections 51175-51189, require that any property within a designated Fire Hazard Severity Zone within State Responsibility Areas or within the Local Responsibility Areas Very High Fire Hazard Severity Zones,

Wildland Urban Interface Areas (WUIs), and any property as determined by the Fire Department, requires 100-feet of maintained defensible space from all sides of any structure, but not beyond the property line (also refer to City of Sonora Ordinance No. 8.12 and Tuolumne County Ordinance No. 8.14). Research suggests that even the 100-feet of defensible space may not be sufficient for firefighters to engage in structure defense safely (See Section 5.3.2 for more details).

Guidelines established for wildfire safety zones can enhance safe operational space for firefighters and the public. However, the additional element of burning structures and other "non-native" fuels can significantly increase fire intensities that can threaten the life safety of firefighters and the public. Safe separation distance (SSD) calculations can provide a better estimate for whether a structure can be defended with lower risk of thermal injury. This distance is oftentimes greater than 100 feet. Onsite consultation with the TFSC, CAL FIRE, Tuolumne County Fire, Sonora Fire or any other fire agency in the County is recommended to determine whether the clearance around a structure or other improvement is sufficient to provide a safer structure defense environment.

#### 6.2 PROPERTY PROTECTION

Most actions to increase the resiliency of a structure or property to wildfires are categorized into two groups:

- 1. **Structural hardening** Mitigation actions associated with the structure from top of the building down to the foundation.
- 2. **Defensible space** Mitigations actions associated with natural and man-made features anywhere from 0 ft to 100 feet plus from the structure.

In general, the primary responsibility for protecting a structure from wildfires is with the property-owner.

# 6.2.1 Structural Hardening

As highlighted in Section 5.3.3, structures can be compromised by fire through numerous pathways. There are many parts of a structure that are vulnerable to ignition, such as roofing, siding, and vents, among others. Structural hardening is the term used to broadly describe any actions that are done to the structure to protect these vulnerable areas from ignition. Structural hardening adds another layer of passive fire protection in addition to vegetation management and defensible space measures. See Section 6.2.2 for defensible space guidance.

In the event of a fast-moving, large-scale wildfire, firefighting resources may be quickly overwhelmed. This means that active structure defense by firefighters may not be available for most structures or considered unsafe for a variety of factors (e.g., intensity of the fire, weather conditions, local topography, access issues, lack of water supplies etc.). Thus, the survivability of a structure in a major wildfire event can depend on where the property or structure is situated on the local topography, the presence and condition of structural hardening provisions, condition of defensible space and proximity to other combustible fuels/structures in the built environment.

Several guidance documents and technical resources are available to provide property owners with best practices to further increase the resiliency of new properties or developments to wildfires. See below.

Tuolumne County Guidance (Accessed at <a href="https://www.tuolumnecounty.ca.gov/982/Building-and-Safety-Information-Page">https://www.tuolumnecounty.ca.gov/982/Building-and-Safety-Information-Page</a>)

Wildland Urban Interface Requirements Handout

# Twain Harte Community Services District Guidance (Accessed at <a href="https://www.twainhartecsd.com/be-prepared-for-the-wildland-fire-season">https://www.twainhartecsd.com/be-prepared-for-the-wildland-fire-season</a>)

Twain Harte Ready Set Go Action Guide

# Mi-Wuk Sugar Pine Protection District Guidance (Accessed at <a href="https://www.mwspfire.us/resource-links">https://www.mwspfire.us/resource-links</a>)

Chimney/Vent Maintenance Guidance

# Full-Scale Research on Wildfire Resiliency of Joints and Building Detailing

- Insurance Institute for Business & Home Safety (IBHS) Full-Scale Fire Testing https://ibhs.org/risk-research/wildfire/
- Fire Safety Research Institute (FSRI) <a href="https://fsri.org/about">https://fsri.org/about</a>
- National Institute of Standards and Testing (NIST) <a href="https://www.nist.gov/fire">https://www.nist.gov/fire</a>

# Design Guidance for New and Existing Construction

- FEMA Marshall Fire MAT Products <a href="https://www.fema.gov/emergency-managers/risk-management/building-science/mitigation-assessment-team">https://www.fema.gov/emergency-managers/risk-management/building-science/mitigation-assessment-team</a>
- SFPE Foundation Virtual Handbook on WUI Risk Assessments <a href="https://www.sfpe.org/wuihandbook/home">https://www.sfpe.org/wuihandbook/home</a>
- University of Nevada, Reno Wildfire Home Retrofit Guide https://extension.unr.edu/publication.aspx?PublD=3810
- Maranghides, A., et al, WUI Structure/Parcel/Community Fire Hazard Mitigation Methodology <a href="https://www.nist.gov/el/fire-research-division-73300/wildland-urban-interface-fire-73305/hazard-mitigation-methodology-1">https://www.nist.gov/el/fire-research-division-73300/wildland-urban-interface-fire-73305/hazard-mitigation-methodology-1</a>

#### **Databases for Fire-Listed Products and Assemblies**

- FM Approvals, Approval Guide <a href="https://www.approvalguide.com/">https://www.approvalguide.com/</a>
- Intertek Directory of Building Products <a href="https://bpdirectory.intertek.com/pages/DLP">https://bpdirectory.intertek.com/pages/DLP</a> Search.aspx
- UL Product iQ <a href="https://productiq.ulprospector.com/en">https://productiq.ulprospector.com/en</a>
- CAL FIRE Building Materials Listings <a href="https://osfm.fire.ca.gov/divisions/fire-engineering-and-investigations/building-materials-listing/bml-search-building-materials-listing/">https://osfm.fire.ca.gov/divisions/fire-engineering-and-investigations/building-materials-listing/bml-search-building-materials-listing/</a>

In addition to new construction, the guidance documents and technical resources listed above can also provide helpful recommendations to retrofit existing properties for increased resiliency to wildfires. Table 22 provides further guidance on mitigation actions that can enhance protection of life safety and improve the survivability of existing structures in the community.

Table 22. Structural Hardening Measures for Existing Properties

Structural	Mitigation Measures
Component	Millyation measures
Roof	Replace wood-shake or shingle roofs with a Class-A material (Ordinance 2019-0056)
	suitable for extreme fire exposure. Plug openings in roofing materials, such as the open
	ends of barrel tiles, to prevent ember entry and debris accumulation. Regardless of the
	type of roof, keep it free of bird's nests, fallen leaves, needles and branches.
Chimneys	Screen chimney and stovepipe openings with an approved spark arrestor cap with a 5/8-
	inch screen.
Eaves	Cover the underside of the eaves with a soffit, or box in the eaves, which will reduce the
	ember threat. Enclose eaves with fiber cement board or 5/8-inch thick, high-grade
	plywood. If enclosing the eaves is not possible, fill gaps under open eaves with caulk.
Exterior	Noncombustible siding materials (e.g., stucco, brick, cement board, and steel) are better
Siding	choices. If using noncombustible siding materials is not feasible, keep siding in good
	condition and replace materials in poor condition.
Windows	Single-pane windows and large windows are particularly vulnerable in older homes built
and	prior to current fire codes. Recommend installing windows that are at least double-glazed
Skylights	and that utilize tempered glass for the exterior pane. The type of window frame (e.g.,
	wood, aluminum, or vinyl) is not as critical; however, vinyl frames can melt in extreme heat
	and should have metal reinforcements. Keep skylights free of leaves and other debris and
	remove overhanging branches. If using skylights in the WUI, they must be flat skylights
Vents	constructed of double-pane glass and must be kept free of vegetation.  All vent openings should be covered with 1/8-inch or smaller wire mesh. Another option is
Vents	to install ember-resistant vents. Do not permanently cover vents, as they play a critical role
	in preventing wood rot. In the WUI, roof gutters shall be provided with the means to
	prevent accumulation of leaves, needles, and debris.
Rain Gutters	Always keep rain gutters free of bird's nests, leaves, needles, and other debris. Roof
	gutters shall be provided with a means to prevent accumulation of leaves, needles, and
	debris. Check and clean them several times during the year.
Decks	Keep all deck materials in good condition. Consider using fire-resistant rated materials or
	heavy timber construction. Routinely remove combustible debris (e.g., pine needles,
	leaves, twigs, and weeds) from the gaps between deck boards and under the deck.
	Enclosing the sides of the deck may reduce this type of maintenance. Do not store
	combustible material under the deck.
Combustible	Keep the porch, deck, and other areas of the home free of flammable materials (e.g.,
Items	baskets, newspapers, pine needles, and debris). Keep firewood, bales of hay or straw, and
	other combustible/flammable materials at least 30-feet away from a structure.
Residential	Automatic residential fire Sprinkler Systems are required in all new residential structures.
Fire	An automatic residential fire sprinkler system is not required for additions or alterations to
Sprinkler	existing building that are not already provided with an automatic residential sprinkler
Systems	system. Annual maintenance service or inspection of these systems is strongly
D ( )	recommended to ensure operability.
Detached	All detached accessory structures should ideally follow the same provisions as the main
accessory	structure. Detached accessory structures should be constructed of non-combustible
structures	materials or of ignition-resistant materials.

More detailed information on reducing structural ignitability can be found in Chapter 7A of the California Building Code (Ordinance 2019-0056), Public Resources Code 4291, and Chapter 49, of the California Fire

Code. Utilize versions adopted and amended by jurisdiction (e.g., Sonora, Tuolumne County) as applicable.

# 6.2.2 Defensible Space

Defensible space is an area – either natural or man-made within the perimeter of a parcel – where basic wildfire prevention practices and measures are implemented and maintained. These measures include but are not limited to removing brush, flammable vegetation, or combustible growth within 0 feet to 100 feet of a building or structure as measured from the eaves, porches, decks and balconies to the property line. These measures provide the key point of defense from an approaching wildfire or an escaping structure fire (Tuolumne County Hazardous Vegetation Ordinance 8.14, 2022 and City of Sonora Ordinance No. 8.12). Defensible space, coupled with structural hardening (Section 6.2.1 above), is essential to increasing a structure's likelihood of surviving a wildfire.

Defensible space is generally subdivided into three zones, whereby the highest priorities and most restrictive measures are required for the area closest to the structure. CAL FIRE defines the three zones as follows (See Figure 59):

- Zone 0 or "Immediate Zone", "Ember-Resistance Zone", or "Noncombustible Zone" (0–5 feet). Zone 0 is considered the most important and includes areas immediately surrounding a structure, as well as areas under any attached decks or overhangs.
- Zone 1, "Intermediate Zone", or "Lean, Clean and Green" (5–30 feet). Zone 1 adds a defensible zone that extends from Zone 0 to Zone 2. The goal of this area is to reduce the connectivity between garden beds, shrubs, and trees; removing lower branches of trees and shrubs; and creating areas of irrigated and mowed grass or hardscape between lush vegetation islands so that wildfire does not burn to the house or into the crown of trees. Plants should be properly irrigated and maintained to remove dead/dry material (Valachovic, et al., 2021). This

designation also applies to the area within 10 feet of driveways, access roads, or public roads adjacent to the property.

Zone 2, "Extended Zone" or "Reduce Fuel Zone" (30– 100 feet). The goal of Zone 2 is to create a fuel break that interrupts the continuous vegetative fuel path of a wildfire, minimize flame length, and keep fires on the ground by reducing ladder fuels and crown clustering.



Figure 59. Defensible Space Zones (Valachovic, et al., 2021)

Reach out to your local Firewise Community for information on availability of Parcel Level Risk Assessments (aka Home Ignition Zone Assessments) in your neighborhood. The list of Firewise Community contacts can be accessed at <a href="https://tuolumnefiresafe.org/firewise/communities/">https://tuolumnefiresafe.org/firewise/communities/</a>.

The Twain Harte Community Services District conducts defensible space assessments but only annually for vacant properties.

The Sonora City Fire Department conducts defensible space inspections annually.

Mi-Wuk Sugar Pine Protection District conducts volunteer home inspections. For more information: https://www.mwspfire.us/mi-wuk-sugar-pine-protection-district-property-inspections

Table 23 below details basic recommendations for each defensible space zone. This table does contain some County- and Services District-specific requirements, and thus is not intended to be a complete list. Consult with the local fire department or Authority-Having-Jurisdiction (AHJ) for more detailed guidance.

Table 23. Defensible Space Mitigation Measures.

	able 23. Defensible Space Mitigation Measures.					
Hazard Mitigation Zone	Mitigation Measures					
Zone 0 (0 – 5 ft)	<ul> <li>Use hard surfaces, such as concrete or noncombustible rock mulch around the home.</li> <li>Clean roof and gutters of dead leaves, debris, and pine needles.</li> <li>Store firewood and other combustible materials away from the home, garage, or attached deck.</li> <li>Trim back touching or overhanging branches from the roof to a distance of at least 10 feet.</li> <li>Avoid anything combustible in this area, including woody plants, mulch, woodpiles, combustible trellises, and stored items. This is an excellent location for walkways, or hardscaping with pavers, rock mulch, decomposed granite, or pea gravel. This should include a six-inch noncombustible zone between the ground and the start of the building's exterior siding.</li> <li>Herbaceous non-woody ground cover should not exceed 3-inches high.</li> <li>In general, plants should have clearance 2 times their height from other plants and exterior openings.</li> <li>Use non-combustible pots and planting boxes at the ground level.</li> <li>Remove artificial or synthetic grass; they should not be located in this zone.</li> </ul>					
Zone 1 (5 – 30 ft)	<ul> <li>Use non-wood, low-growing herbaceous vegetation. Succulent plants and ground covers are good choices.</li> <li>Create vegetation groups, or "islands" to break up continuous fuels around the home</li> <li>Remove "ladder fuels" to create a separation between low-level vegetation and tree branches to keep fire from climbing trees.</li> <li>Remove leaf and needle debris from the yard.</li> <li>Keep grass and wildflowers under 4 inches in height.</li> <li>Move trailers/recreational vehicles, storage sheds and other combustible structures out of the zone and over 30 feet from the home. If unable to move, create defensible space around them.</li> </ul>					

Hazard Mitigation Zone	Mitigation Measures
Zone 2 (30 – 100 ft+)	<ul> <li>Create and maintain a minimum of 10 feet between the tops of trees.</li> <li>Remove "ladder fuels" to create a separation between low-level vegetation and tree branches to keep fire from climbing trees.</li> <li>Remove dead trees and shrubs.</li> </ul>

More detailed information on defensible space can be found in Public Resources Code 4291, and Chapter 49, of the California Fire Code. Utilize versions adopted and amended by jurisdiction (e.g., Sonora, Tuolumne County) as applicable.

# **Additional Details on Tuolumne County Regulations**

Assembly Bill 3074. Assembly Bill 3074 became law in January 2021, with local authorities needed to amend and adopt by January 2023. This bill requires landowners in Very High Fire Hazard Severity zones to use more intense fuel reductions between 5 and 30 feet around the structure, and to create an ember-resistant zone within 5 feet of the structure, based on regulations promulgated by the State Board of Forestry and Fire Protection, <a href="https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill\_id=201920200AB3074">https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill\_id=201920200AB3074</a>. Tuolumne County will comply with all state legislation.

# 6.2.3 Communal Defensible Space

Mitigating risks within the Home Ignition Zone (HIZ) is important but requires a joint effort if a neighbor's structure or residence is closer than the full 100- and in some cases 200-foot distance (as determined by local

fire authority). Figure 61 depicts a representative example of neighboring homes with overlapping defensible space zones. Whether these property-owners properly maintain their defensible space, their activities or lack of activity can influence the survivability of a neighbor's property. Closely spaced homes and smaller parcels (i.e., smaller than 100 feet in all directions) can cause an overlap issue. Risk reduction efforts by all neighbors are beneficial to multiple properties. This concept is referred to as communal defensible space and is one of the main drivers for the establishment of Firewise Communities. For more information on Firewise Communities, refer to Section 6.8.2.

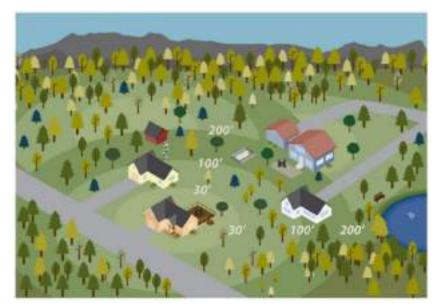


Figure 60. Communal Defensible Space or Home Ignition Zone Overlap (courtesy: www.firewise.org).

In most urban and suburban residential neighborhoods, many property owners will have difficulty establishing the required 100' of defensible space within their individual property lines. Establishing high quality defensible space regardless of the parcel size or ownership should be a priority for all residents of the Planning Area.

However, in realty, achieving appropriate defensible space may require a combination of strategies as follows:

Communal Defensible Space: Where adjacent landowners design and implement fuel treatments to protect groups of homes or structures. Treatments are designed to consider how vegetation and topography affect fire behavior regardless of property boundaries. When combined with structural hardening, the development of Communal Defensible Space is the best practice to reduce damage and loss from wildfire within the Planning Area.

**Top priority:** Numerous properties across the County have overlapping defensible space zones necessitating public education, guidance, and resources to undertake communal defensible space actions.

- Work with neighbors and other adjacent property owners to ensure that common defensible space considerations are implemented between and adjacent to structures on both properties.
- Prioritizing hardening measures on the sides of the home with insufficient separation to adjacent properties (i.e., vent covers, replace combustible siding, remove combustible non-vegetative features, etc.).
- Provide structural hardening measures for the entire home (e.g., upgrading to a Class A roof).
   Refer to "Structural Hardening" section above.
- 4. Prioritize the reduction of receptive fuel beds around the entire home from ember attack.



Figure 61. Examples of additional structural hardening and defensible space features where 30 feet of setback to the property line is not feasible (FEMA).

In some circumstances, structures may not be able to achieve 30 feet of setback to other structures. See Figure 61. In these instances, property owners are encouraged to consider the following strategies:

- Install solid, noncombustible property line walls or fences to minimize ember transmission and heat transfer.
- Install 5-10 feet of hardscaping and/or noncombustible landscaping around the home.
   Note: Where hardscaping is introduced, ensure proper drainage is provided.
- Prioritize localized structural hardening measures on the side of the structure with less than 30 feet of setback.
- Provide additional structural hardening such as installing or upgrading exterior walls, windows, vents, and under-eaves areas of the home to be fire-resistance rated.

Refer to FEMA's recently published facts sheets on defensible space and home hardening for more details.

<a href="https://www.fema.gov/sites/default/files/documents/fema\_marshall-fire-mat-homeowners-guide-defensible-space.pdf">https://www.fema.gov/sites/default/files/documents/fema\_marshall-fire-mat-homeowners-guide-defensible-space.pdf</a>

• <a href="https://www.fema.gov/sites/default/files/documents/fema">https://www.fema.gov/sites/default/files/documents/fema</a> marshall-fire-mat-decreasing-structure-fire-spread.pdf.

#### 6.3 CRITICAL INFRASTRUCTURE PROTECTION

The protection of critical infrastructure (e.g., communication systems, water supplies/infrastructure, electrical power infrastructure) from wildfire hazards, as well as limiting the potential source of wildfire ignitions due to some of these features, is an important planning consideration where relevant to development of a community wildfire resiliency strategy.

The following guidance and best practices (Sections 6.3.1 through 6.3.3) should be considered in the community wildfire resiliency strategy. Critical infrastructure may span across multiple jurisdictions and may have multiple responsible entities (e.g., public utilities, city, county). Coordinate with all responsible parties.

#### 6.3.1 Water Infrastructure

Wildfire can affect water infrastructure in a variety of ways. Operations during wildfire scenarios, water quality, recovery of communities, etc. can all be impacted by a wildfire. It is imperative that the authorities with the responsibility of maintaining water infrastructure take actions to maintain operations during a wildfire wherever possible, and work towards restoration of services in a timely manner to facilitate overall community recovery efforts. There are several proactive actions that can be taken as part of a community wildfire resiliency strategy to aid these efforts.

The University of California Agriculture and Natural Resources (UC ANR), California Institute for Water Resources and the Luskin Center for Innovation (LCI) at the University of California, Los Angeles (UCLA) produced a detailed <a href="report">report</a> (<a href="https://innovation.luskin.ucla.edu/wp-content/uploads/2021/12/Wildfire-and-Water-Supply-in-California.pdf">report</a> (<a href="https://innovation.ucla.edu/wp-content/uploads/2021/12/Wildfire-and-water-Buter

# **Top Priorities for Water Infrastructure:**

- Invest in debris management basins.
- + Plan for treatment technologies and techniques to protect water systems for varied wildfire impact and contamination scenarios.
- + Proactively invest (i.e., forest restoration projects) to help avoid accumulation of reservoir cleanup costs.
- + Invest in backup power supply to maintain operation of treatment facilities and pump stations during an emergency.
- + Invest in offsite operation of water systems to reduce risk to water system employees and maintain water operations for emergency use.
- Develop specific wildfire mitigation plans that include local or regional partnerships with surrounding water systems or water wholesalers with inter-tying supply connections

Additional guidance focused on water infrastructure related specifically to fire-protection equipment can be obtained from FEMA documentation:

- + As a minimum, 30 feet of brush clearance should be maintained around water infrastructure components that are critical fire protection equipment, such as water storage. This distance may vary pending review and discussion with the local fire department. Refer to NFPA 1 and local ordinances for detail.
- + Minimum water storage requirements should be considered to provide protection for dwellings and other structures where adequate public/private water supply is not available. Property owners are encouraged to consult with the local fire department for further guidance.



Figure 62. Providing appropriate vegetation clearance around critical water infrastructure and associated equipment is key for increasing wildfire resiliency.

# 6.3.2 Communication Systems

The preservation of communication systems during a wildfire emergency is vital to the safety of residents and first responders. As such, actions should be taken to protect this important infrastructure in the event of a wildfire. There are some protective measures that can be taken to protect communication systems such as communication towers and associated equipment:

 Provide 30 feet of hardscaping or brush clearance around communication towers and associated equipment (Refer to the photo below for a bad example of hardscaping and clearance around communication towers).

#### 6.3.3 Electrical Infrastructure

Electrical utilities are not only important to maintain in a wildfire as critical infrastructure and lifeline facilities, but they can also pose a wildfire hazard or ignition sources themselves. While wildfire mitigation and protection of investor-owned electrical utility infrastructure is the responsibility of the electrical corporation that owns and/or operates it (e.g., PG&E) and is subject to the requirements of the California Public Utilities Commissions (CPUC) and Office of Energy Infrastructure Safety (OEIS), other electrical systems and infrastructure also require protection and wildfire safety measures. The following are general actions that can be taken to protect electrical infrastructure:



Figure 63. Appropriate clearance around critical communication infrastructure is essential for agency and public communication and messaging during incidents, particularly as COMMS equipment are typically located in high fire hazard topographies.

- + Where possible, place all electrical distribution equipment in conduit underground.
- Regular vegetation maintenance should be planned to maintain appropriate clearances, and should take into consideration species' growth rates, trim cycle, and line sway (NFPA 1, Chapter 17, Office of Energy Infrastructure WMP Guidelines, CPUC General Orders)

+ Maintain a combustible free zone around poles and towers of not less than 10 feet in each direction. For distribution lines, vegetation clearances are defined as a function of line voltage and time of trimming (e.g., a 4160V line requires a minimum of 4 feet clearance, so trimming requirements are triggered when vegetation is 4 feet from the line and must be trimmed to 6 feet clearance, to allow for growth in between trimming cycles).

Pacific Gas & Electric (PG&E), the main investor-owned utility providing electricity to the area, is required to maintain a Wildfire Mitigation Plan (WMP). Refer to PG&E's WMP and website for details. <a href="https://www.pge.com/en\_US/safety/emergency-preparedness/natural-disaster/wildfires/wildfire-mitigation-plan.page?WT.mc\_id=Vanity\_wildfire-mitigation-plan.">https://www.pge.com/en\_US/safety/emergency-preparedness/natural-disaster/wildfires/wildfire-mitigation-plan.page?WT.mc\_id=Vanity\_wildfire-mitigation-plan.

See Section 8 for recommendation actions to increase the resiliency of electrical infrastructure to wildfires.

#### 6.3.4 Road Infrastructure

Physical resiliency of road infrastructure to wildfire exposure and post-fire debris flows is critical to protecting the transportation network throughout the county not only for access/egress during a wildfire, but also as a lifeline

facility for maintaining local/regional economies and livelihoods in the County. A wildfire exposure and post-fire debris flow assessment of the road infrastructure across the County should be undertaken to better understand and mitigate against any physical threats to the road infrastructure to wildfires.

**Top Priority:** A wildfire exposure and post-fire debris flow assessment should be undertaken across the County to better understand and mitigate any physical threats to the road

Roadside fuel treatments are a key mitigation strategy to help reduce structural damage to the road network particularly for bridges and overpasses that are of combustible construction or have limited inherent fire resistance (e.g., steel structures), but also to maintain the roadways free of extreme fire conditions such that they are useable. Roadside fuel treatments are discussed further in the next section.

#### 6.4 FUELS MITIGATION STRATEGY

Wildfires have been a significant component of Northern California landscape for thousands of years, and no amount of manipulation and management of the land will likely eliminate their presence. Focusing fire mitigation

efforts on individual structures and communities where social costs are highest has the potential to increase cost savings, promote success in preventing community losses through increased efficiency of firefighting resources, and reduce impacts on native plant communities that are more fire resistant than non-native invasive plant species and serve as a source of biological and genetic floral diversity (Lombardo, 2012).

Fuel treatment, also referred to as vegetation management, is the act of removing or manipulating vegetation to reduce fire intensity, therefore increasing the probability that values at risk will be unaffected in a wildland fire. Fuel removal generally occurs through the use of prescribed fire, grazing or the physical cutting and hauling away of vegetative matter.

Top Priority: . Focusing fire mitigation efforts on individual structures and communities where social costs are highest has the potential to increase cost savings, promote success in preventing community losses through increased efficiency of firefighting resources, and reduce impacts on native plant communities that are more fire resistant than non-native invasive plant species and serve as a source of biological and genetic floral diversity (Lombardo, 2012).

Modifying fuels by chipping, mastication or weed whipping can also reduce fire behavior by creating a less flammable fuel arrangement.

This section summarizes the fuels treatment strategy for the Planning Area and is based on the need to provide enhanced wildfire protection for the community, while also protecting recreational, biological, and cultural resources. This strategy provides broad direction on where and how to manipulate vegetation to reduce wildfire hazard.

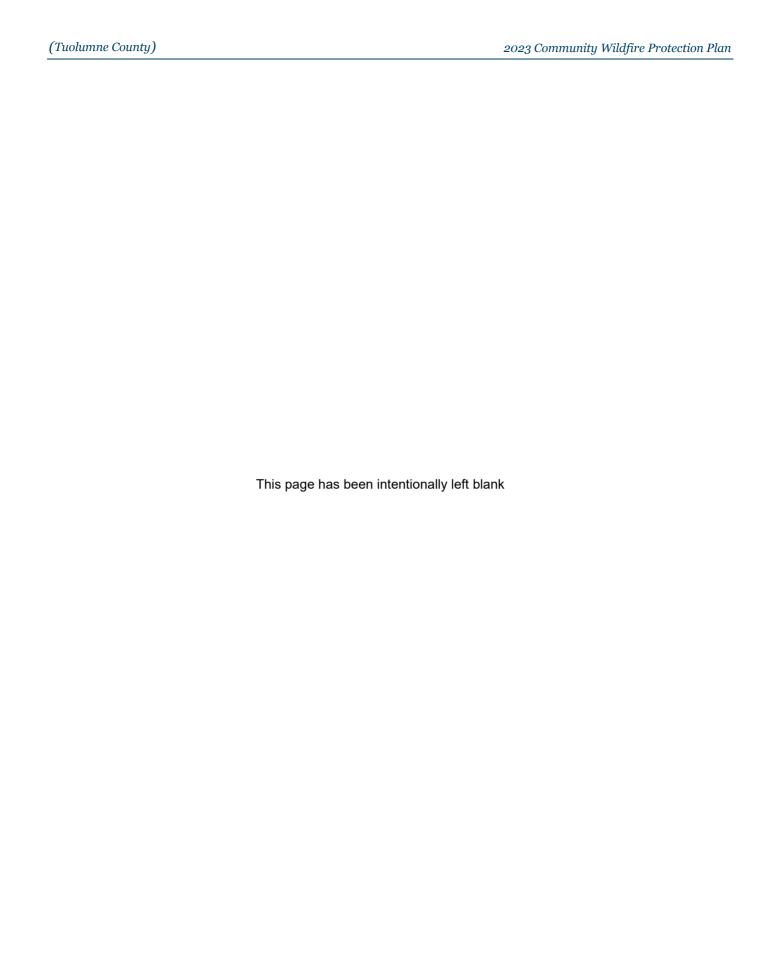
Note: While the county and local agencies (e.g., CAL FIRE, Tuolumne County Fire, Sonora Fire, and other fire agencies) play an important role in fuel mitigation, the greatest responsibility for improvements in the protection of the community rests with individual property-owners. The development of adequate defensible space and structural hardening are common needs in most of the locations evaluated for this plan and are a priority (Refer to Section 6.2 for more details). Thus, the actions laid out in this document utilize an integrated approach involving multiple agencies and residents to increase the overall fire resilience of the local communities.

# 6.4.1 Existing, Planned and Proposed Fuel Treatment Activities

There are currently several existing, planned, and proposed landscape-level fuel treatment projects and activities within the Planning Area that are managed by various agencies. See Figure 64 and Table 24 for details. This is by no means an exhaustive list, but it provides a starting point for a more targeted fuel treatment program that can expand over time. In addition, treatment planning should include guidance from the County Hazardous Vegetation Management Ordinance (2022) for the removal of hazardous vegetation situated in the unincorporated areas of the county. The County has also recently developed a fuels treatment dashboard that tracks and displays fuel treatments essential to reducing the unwanted consequences of wildfire. See Appendix E for Prescriptive Guidelines and Best Management Practices for Fuel Treatments.

Table 24. Existing and proposed fuel treatments

County Wide			
Status	Treatment Type	Acres	Percent
Completed	Fuel Break	5781	0.4%
Completed	Fuel Reduction	76212	5.2%
Completed	Prescribed Burn	53071	3.6%
Completed	Roadside	6428	0.4%
Completed	Unknown	291	0.0%
Proposed	Fuel Break	19348	1.3%
Proposed	Fuel Reduction	39771	2.7%
Proposed	Prescribed Burn	1064	0.1%
Proposed	Roadside	673	0.0%
Proposed	Unknown	31751	2.2%
Total Completed	N/A	141783	9.7%
Total Proposed	N/A	92606	6.4%
All Treatments	N/A	234389	16.1%
County Area	N/A	1457542	100.0%



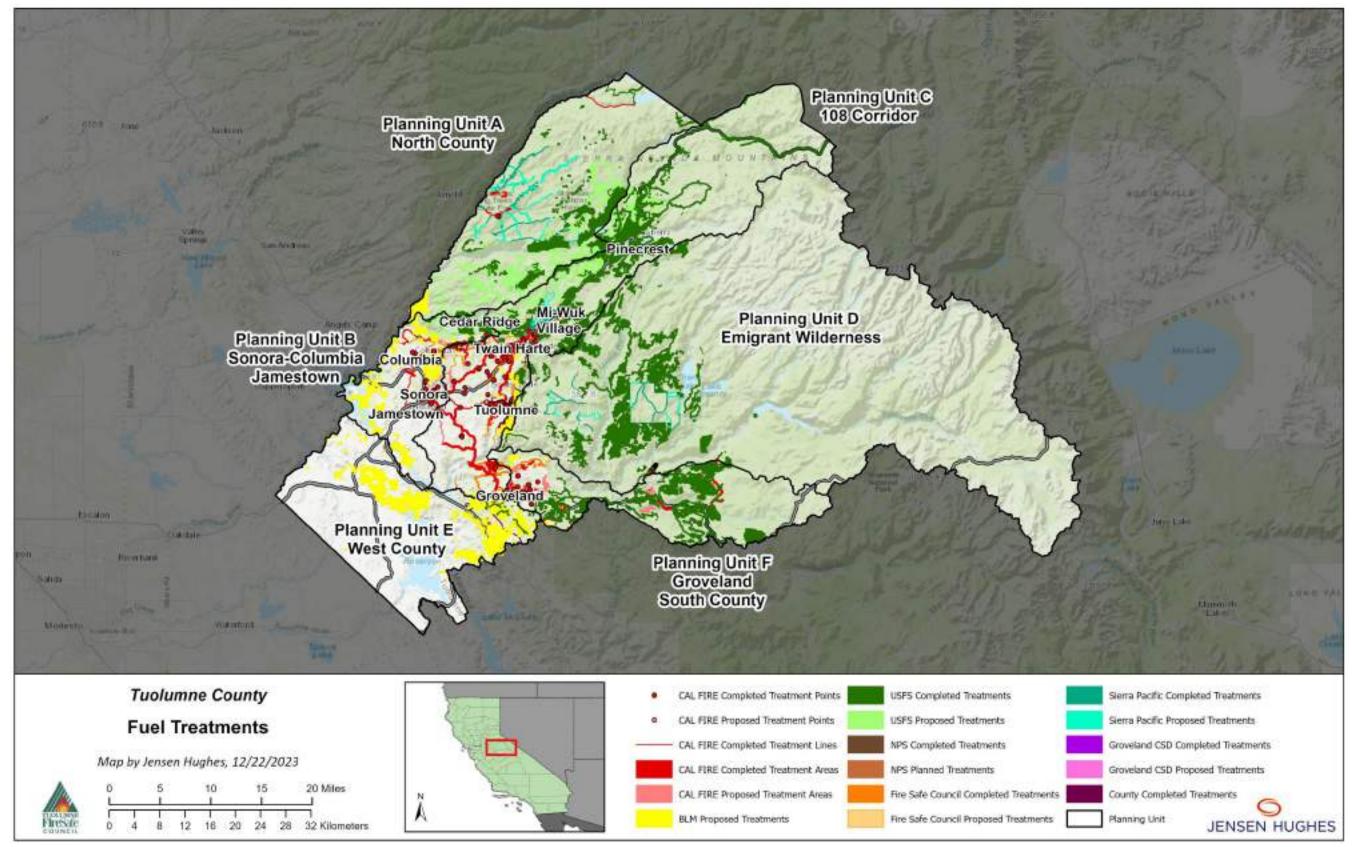


Figure 64. Range of Completed and Proposed Fuel Treatments by various agencies across the County.

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#### 6.4.2 Recommended Fuel Treatment Activities

In addition to the existing, planned, and proposed treatments already identified by various County stakeholders, additional recommended fuel treatments are proposed based on the hazard and risk analysis undertaken in this report. The basis for these recommendations and the underlying key assumptions are described below.

#### 6.4.2.1 Basis for Recommended Treatments

The primary basis for treatments is to work towards meeting the goals and objectives of the CWPP by strategically focusing on areas that impact life safety, WUI treatments, values/assets at risk, and enhancing and maintaining healthy and fire resilient landscapes.

The fire environment can become quite variable once a fire grows beyond the immediate area of its origin. Different areas of the fire may be burning in different fire environments, such as different fuelbed structure, slope steepness, moisture content, wind speed, wind direction, etc. The result of such fire environment heterogeneity is that, even if each discrete section of the fire front spreads as a simple ellipse, the overall fire shape can be quite complex, especially when influenced by spot fires and barriers to fire spread (Scott, 2012).

Thus, fuel treatment planning needs to address the complexity and variability associated with the fire environment and the high valued resources and assets (HVRAs) impacted from future wildfire. For fuels treatment planning, the science supports focusing on the likelihood of fire starting, the fire behavior characteristics associated with a potential fire displayed by fire intensity level (flame length) or crown fire activity and to a lesser extent ember spotting potential, spotting distance, and fire spread rates.

Fire Intensity Level is the primary concern because it affects resistance to control and operation strategies and tactics. Fireline intensity is the product of spread rate and the heat per unit area released during flaming front. Consequently, fuel conditions and topography are important to determine the location of fuel treatments, by manipulating the vegetation through fuel treatments, reduced fire behavior characteristics will increase the suppression effectiveness of firefighting resources and reduce the potential impacts to HVRAS.

# 6.4.2.2 Key Assumptions

The following key assumptions were used to determine recommended, future hazardous fuels treatments:

- + Units are designed to meet the intent of Healthy Forest Restoration Act (HFRA) and National Cohesive Fire Strategy. Specifically, to achieve:
  - **Community Wildfire Risk Reduction**: Reduce wildfire risk to communities and other at risk Federal land.
  - **Prioritize Treatments** Prioritize landscapes through collaborative process for all agencies (including Federal Ownership)
  - **Resilient Landscapes** Ensure landscapes across all jurisdictions are resilient to related disturbances in accordance with management objectives.
  - **Fire Adapted Communities** Fire adapted communities is a general framework to address a broad range of individual and society level capacities to build community wildfire resilience, where human populations and infrastructure can withstand a wildfire without loss of life or property.

- Safe, Effective, Risk-Based Wildfire Response All jurisdictions participate in making and implementing safe, effective, risk-based wildfire management decisions.
- + Units are independent of current and proposed treatment units. They are informed by the Exposure to Primary HVRAS (Integrated Hazard Analysis), Flame Lengths, Potential Loss Analysis, and FHSZ.
- + Climatology associated with high to extreme fuel moisture and weather conditions that have historically influenced fire behavior throughout the year were used in the fire behavior model inputs.
- + Where feasible or fuel conditions are hazardous, treatment units are strategically delineated to provide contiguous boundaries to reduce fire behavior characteristics and increase operational effectiveness.
- + Units are located on Non-Federal lands except for providing continuous unit boundaries in checkerboard ownership. No units were proposed in FPU D because of Federal ownership.
- Units are broadly geographically defined and may be modified to meet implementation standards and feasibility.
- + Example prescriptions are provided as a starting point and should be informed by latest vegetation and fuel information specific to each unit.

#### 6.4.2.3 Recommended Fuel Treatments

Based on the assumptions described above, Figure 65 illustrates the additional recommended fuel treatments across the County. More detailed maps at the sub-county or FPU level are provided in Appendix C.

Note: Refer to Appendix C for recommended fuel treatments at sub-county levels (i.e., fire planning units or FPUs).

(Tuolumne County)

2023 Community Wildfire Protection Plan

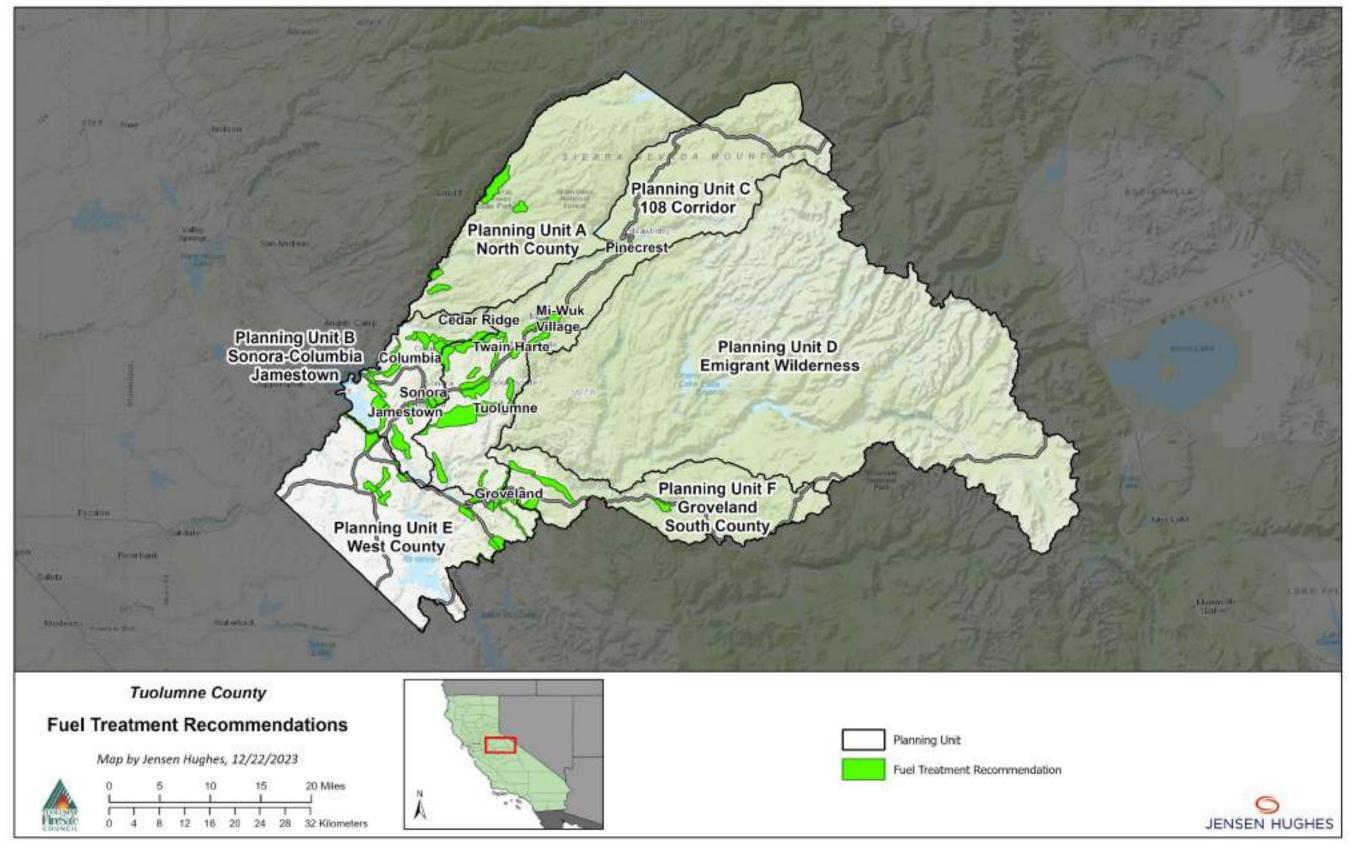


Figure 65. Additional Recommended Fuel Treatments based on the Hazard and Risk Analysis in the Report.

(Tuolumne County)

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### 6.4.2.4 Fuel Breaks and Vegetation Management

Fuel breaks are strategically placed landscape vegetation treatments that provide a potential control point for wildfires. There are several opportunities to develop and or maintain existing fuel breaks within the Planning Area, particularly in locations where recent wildfire disturbances have occurred in the landscape (e.g., Rim Fire). Refer to Tuolumne County Hazardous Vegetation Ordinance No. 8.14 for more information on County requirements. Available at: <a href="https://www.tuolumnecounty.ca.gov/DocumentCenter/View/23951/Chapter-814-Hazardous-Vegetation-">https://www.tuolumnecounty.ca.gov/DocumentCenter/View/23951/Chapter-814-Hazardous-Vegetation-</a>

 $\underline{Management\#:} \sim : text = The \%20 purpose \%20 of \%20 the \%20 ordinance, property \%2C \%20 natural \%20 resources \%20 and \%20 the$ 

#### 6.4.2.5 Roadside Fuel Treatments

Roadside fuel treatments are designed to moderate fire intensity adjacent to roads and driveways thereby providing safer operational space for firefighters, improving access/egress for firefighting equipment, and providing safer evacuation routes for residents and visitors during a wildfire event. Roadside or driveway fuel treatments range from the centerline of a road or driveway up to 100' on either side with "feathered", gradient fuel treatments softening any appearance of vegetated walls. Standards for roadsides incorporate trailheads,

reducing highly ignitable fuels in undeveloped parking areas. See Figure 67 for example near Cedar Ridge.

Currently, the Planning Area does not appear to have an ongoing program to help facilitate and/or manage roadside clearance systematically and collaboratively to meet Local and/or State standards. To help inform a more comprehensive roadside fuel treatment workplan and timeline, an inventory of public/private roads and driveways that do not meet standards for vegetation clearance should be completed. This is especially important as many communities lack alternative egress routes. As funding becomes available to treat these areas, they can be performed to the prescriptive standards. See Appendix E for Prescriptive Guidelines and Best Management Practices for Roadside Fuel Treatments.



Figure 66. Sample roadside fuel treatments (thinning and clearance of understory) near Cedar Ridge

#### 6.4.3 Prioritization of Fuel Treatments

To assure the continued viability of past hazard mitigation efforts, maintenance of existing fuel treatments should be the top priority for CALFIRE, Tuolumne County Fire, City of Sonora, local fire agencies, Tuolumne Fire Safe Council, and other land resources managers across the County. Without maintenance, these

treatments will decrease in both magnitude and effectiveness, eventually blending back into the landscape. Only through reoccurring maintenance will these fuel treatment projects remain viable wildfire mitigations features for the community. A second level priority for work is the implementation of roadside fuel treatments that promote safe access and egress for residents and emergency personnel (as indicated in the section above). Roadside rightsof-way managed by other agencies (e.g., Caltrans) should be identified and transmitted to agency representatives to ensure that required vegetation management of roadways occur. By holding jurisdictional agencies accountable for right-of-way management, Tuolumne County, City of Sonora, and Fire agency funds can be directed toward other important work.

**Top Priority:** To assure the continued viability of past hazard mitigation efforts, maintenance of existing fuel treatments should be the top priority for CALFIRE, Tuolumne County Fire, City of Sonora, local fire agencies, Tuolumne Fire Safe Council, and other land resources managers across the County.

**Second Level Priority**: To prepare an inventory of public/private roads and driveways that do not meet standards for vegetation clearance and prepare a prioritized roadside fuel treatments plan to promote safe access and egress for

Note: New fuel treatment recommendations have not been identified or prioritized at stand level.

To rank fuel treatments, wildfire managers need to know the potential likelihood and intensity of fires across large landscapes. At the County level, prioritization can be determined by the Integrated Hazard ranking for each FPU. When this ranking is paired with other spatial data such as HVRAs (high valued resources and assets), it can provide a more detailed relative risk and prioritization for each FPU.

Note: Refer to Appendix C for exposure analysis and fuel treatments at the sub-county level (i.e., fire planning units). Table 25 provides a ranking of the six FPUs according to the amount of acreage and percentage of area in middle to highest Integrated Hazard zones. As seen in the table below, FPU A North County ranks the highest, followed by FPU C SR 108 Corridor, FPU D Emigrant, FPU E West County, FPU B for Sonora, Jamestown, and Columbia and finally FPU F for Groveland. However, if we consider ranking based on acreage of land in the WUI (interface, intermix and influence zones), then the rankings provide some additional nuance. *Note: As indicated above, County Stakeholders should evaluate the prioritization of fuel treatments based on an agreed set of criteria that combines both hazard levels and risk to HVRAs.* 

Table 25. Ranking of Fire Planning Units by Integrated Hazard

#### FIRE PLANNING UNIT A - NORTH COUNTY

Integrated Hazard (IH)	Acres	% Percent	Ranking of FPU by Acres in mid- highest IH	Ranking of FPU by Acreage of Land in WUI
Lowest	21,961	12.4%		
Lower	20,754	11.7%	<del></del>	
Middle	39,944	22.1%		6
Higher	50,373	28.5%		6
Highest	44,553	25.2%	<del></del>	
Total =	176,685			

### FIRE PLANNING UNIT B - SONORA, COLUMBIA, JAMESTOWN

Integrated Hazar (IH)	rd Acres	% Percent	Ranking of FPU by Acres in mid- highest IH	Ranking of FPU by Acreage of Land in WUI	
Lowest	11,117	19.1%			
Lower	14,443	24.9%			
Middle	19,057	32.8%	5	2	
Higher	10,258	17.7%	3	3	
Highest	3,218	5.5%			
	tal = 58,093				

Integrated Hazard	Acres	% Percent	Ranking of FPU	Ranking of FPU
(IH)			by Acres in mid- highest IH	by Acreage of Land in WUI
Lowest	70,234	31.3%		
Lower	54,736	24.4%		
Middle	51,428	22.9%	2	1
Higher	33,072	14.7%	2	•
Highest	15,002	6.7%		
Total =	58,093			
E PLANNING UNIT D – E	MIGRANT			
Integrated Hazard	Acres	% Percent	Ranking of FPU	Ranking of FPU
(IH)			by Acres in mid- highest IH	by Acreage of Land in WUI
Lowest	219,962	46.2%		
Lower	177,671	37.3%	•••	
Middle	52,567	11.0%	··· <b>3</b>	5
Higher	24,009	5.0%	3	3
Highest	1,614	0.3%	•••	
Total =	475,823		•••	
E PLANNING UNIT E – W	EST COUNTY			
Integrated Hazard	Acres	% Percent	Ranking of FPU	Ranking of FPU
(IH)			by Acres in mid- highest IH	by Acreage of Land in WUI
Lowest	15,540	11.1%		
Lower	47,364	33.7%	•••	
Middle	60,087	42.8%	<b>4</b>	2
Higher	10,455	7.4%	··· <b>4</b>	2
Highest	6,968	5.0%	···	

FIRE PLANNING	LINIT F _	GROVEL	VND.	HTIIO2	COLINTY
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Integrated Hazard (IH)	Acres	% Percent	Ranking of FPU by Acres in mid- highest IH	Ranking of FPU by Acreage of Land in WUI
Lowest	46,795	45.4%		
Lower	43,477	42.2%		
Middle	8,864	8.6%	6	4
Higher	3,416	3.3%	· ·	4
Highest	451	0.4%		
Total =	103,002		•	

### 6.4.4 Fuel Treatment Prescriptive Guidelines

See Appendix E for guidance.

#### 6.5 WILDFIRE DETECTION SYSYTEMS

Wildfires in Tuolumne County are currently detected and reported using a variety of methods – public reporting, fire service personnel observations, monitoring cameras, and infrared technologies. Unlike interior building fires where fire is oftentimes detected using devices such as smoke-, heat- or flame-detectors, sprinkler waterflow switches, pull stations, etc., most wildland fires are still detected and reported by human observations.

 Public Reporting – Public wildfire reports have resulted in immeasurable reductions to impacts on lifesafety, property, natural environment resources and services, fire suppression costs, and many other community assets/values.



- Lookout Towers Visual observation of wildfires via lookout towers is a more traditional method of wildfire detection that is still employed in the County. Fire personnel are assigned the duty to look for fire from atop a fire lookout tower. The towers are used in remote areas, normally on mountain tops with high elevation and a good view of the surrounding terrain, to spot smoke caused by a wildfire.
- Air Patrols Air patrols over remote areas of the County during periods of high fire danger or following lightning activity do not appear to be a current strategy for wildfire detection.
- + Infrared Technologies Once a wildfire has occurred, County fire uses ground personnel and aircraft with thermal imaging technology to assist in fire operations. Thermal imaging is utilized for detecting hot spots and areas of residual fire on larger fires during mop up, boundary establishment, fire mapping and fire progression.
- Monitoring Cameras ALERTWildfire is a program developed and operated through a partnership between the University of Nevada Reno, University of California San Diego, and the University of Oregon. It provides public access to a state-of-the-art camera network that assists first responders and the public with information about current weather and fire conditions. Live feeds can be accessed at the ALERTCalifornia website: https://alertca.live/.

#### 6.6 PUBLIC NOTIFICATION AND COMMUNICATION

Public notification systems and communication strategies are an evolving process. It benefits greatly from the investment of resources into the pre-, during- and post-fire stages, particularly during and after fire incidents to monitor and take stock of both shortcomings and successes in the effectiveness of communications in reaching intended audiences. During an event, having a single source of truth is both strategic from the perspective of communications clarity as well as for minimizing resource strain. Further, in all communications phases, employing an active and reliable backchannel for communications and operations is one of the most valuable investments that can be made to improve communications in real-time as well as in the future.

Given Tuolumne County's vulnerable and remote populations combined with limited public communications infrastructure, the imperative is that no audience is left behind. There should be a reliable method for reaching

**Top Priority:** Additional technologies, physical infrastructure, detailed analysis/design and enhancements to practices and procedures for public communication and messaging will need to be further developed and implemented to increase the physical resiliency of emergency communication infrastructure to wildfires, as well as to ensure complete, consistent, timely, and effective emergency messaging.

everyone, and ideally multiple methods that allow for a quick and coordinated response in the event of a time-sensitive event. The more redundancy that can be built into reaching all audiences, the more investment that can be made in the infrastructure to do so, and the more that those resources can be front-loaded in anticipation of an event, the more successful communications will be in achieving its goals in the case of an emergency.

As experienced in recent wildfires and indicated in public workshops, digital polling and a recent high-level public communications and messaging evaluation conducted as part of the Tuolumne County Evacuation Needs Assessment and Communication Strategies Report (accessible at <a href="https://www.tuolumnecountytransportationcouncil.org/evacuationneedsassessmentstudy">https://www.tuolumnecountytransportationcouncil.org/evacuationneedsassessmentstudy</a>), additional technologies, physical infrastructure, detailed analysis and enhancements to practices and procedures of public communication and messaging will need to be further developed and implemented to increase the physical resiliency of communication infrastructure to wildfires, as well as to ensure complete, consistent, timely, and effective emergency messaging. Refer to Section 8 for recommended actions.

Currently, the County has a variety of public notification and communication systems to help inform the public of a wildfire incident such as area notification systems, social media, radio/TV broadcasting, door-to-door communications, etc.). These existing systems and technologies are identified and described in the sections below.

## 6.6.1 Area Notification Systems

### The Everbridge® Citizen Alert System

Everbridge is contracted by the County to allow immediate mass distribution of critical information and instructions in case of large-scale disasters, such as earthquakes, wildfires, major road closures, evacuations, or other catastrophic incidents.

All residents and visitors are able to receive alerts issued by the Tuolumne County Sheriff's Office of imminent threats and emergency warnings via the Everbridge Citizen Alert system. The system has the option to enter one or multiple addresses that any registrant requests in the event of an emergency (e.g., primary residence, vacation property, child's school, daycare facilities, pet sitter, etc.). The system also allows for multiple methods of notification – home or work phones, or email addresses to receive timesensitive emergency messages on multiple devices, no matter where you are.



Visit here to register: https://member.everbridge.net/1332612387832200/login

Note: This system is separate from the County's traffic and emergency alerts, which are used for lane closures and low-level emergencies.

## + Notify Me®

Tuolumne County provides an alert center that enables residents and visitors to subscribe to a number of emergency event alerts (e.g., emergency alerts via Everbridge, press releases, public health) in Tuolumne County.

Link to subscribe: https://www.tuolumnecounty.ca.gov/list.aspx

### + Outdoor Sirens

There are several outdoor audible alert sirens that have been placed on existing features within communities. These sirens may be used by emergency responders to notify residents and visitors of an evacuation. These sirens are meant to notify those who are outdoors in the immediate location of the sirens. Due to various weather and topographic conditions, the audible coverage area of the sirens is limited and therefore may not be heard by everyone. Sirens primarily provide audible alerts, and generally do not provide intelligible instructions. Further instruction should be obtained via one of the many other notification portals provided by the County (local radio stations and authorized official social media) or as indicated in this CWPP. Current locations



An emergency alert siren installed in the Strawberry/Cold Springs area. Source: Tuolumne County Sheriff's Office

include Groveland, Twain Harte, Tuolumne, Cold Springs, and Strawberry.

#### National Weather Service

The NWS transmits continuous weather information on 146.425 and 146.525 MHz frequencies. NWS severe weather broadcasts are preceded with a 1050 Hz tone that activates weather monitor receivers equipped with decoders. The NWS can also access the National Warning System to announce severe weather information.

### Integrated Public Alert and Warning System (IPAWS)

IPAWS is a FEMA communications system made accessible to federal, state, local, tribal, and territorial (FSLTT) officials for warning the public of an imminent threat and/or public safety incident and providing information on corresponding protective actions. CA County of Tuolumne is an Alerting Authority under this program. <a href="https://www.fema.gov/emergency-managers/practitioners/integrated-public-alert-warning-system/public">https://www.fema.gov/emergency-managers/practitioners/integrated-public-alert-warning-system/public</a>

#### Neighborhood Radio Watch

Due to potential for land lines and mobile phone infrastructure failure during a wildfire event, several neighborhood-based radio watch groups have been established throughout the County. To enable local area or county-wide communications without physical infrastructure, residents can participate with Family Radio (FRS), General Mobile Radio (GMRS), or Ham Radio. Information and links to these groups can be found at: https://tcares.net/neighborhood-radio-watch-gmrs-frs/

#### 6.6.2 Social Media and Media Programs

#### 6.6.2.1 Social Media

Tuolumne County is actively connected with social network programs including Facebook, Twitter (now known as X), and Instagram. Local agencies use social media in an effort to keep stakeholders up to date on events, advisories, and alerts. Table 26 summarizes some of the primary social network links for emergency preparedness in Tuolumne County.

Table 26. Social Media and Media Programs

Source	Weblink
<b>Tuolumne County</b>	
Tuolumne County Facebook	https://www.facebook.com/tuolumnecountygovernment
Tuolumne County Twitter	https://twitter.com/TuolumneCountyC
Tuolumne County OES Facebook	https://www.facebook.com/TuolumneCountyOES/
Tuolumne County Fire Facebook	https://www.facebook.com/people/Tuolumne-County-Fire- Department/100066498952885/
Tuolumne County Fire Department Twitter	https://twitter.com/tuolumnecofire
Tuolumne County Fire Department Instagram	https://www.instagram.com/tuolumnecountyfire/?hl=en

Source	Weblink
Tuolumne County Sheriff Facebook	https://www.facebook.com/tuolumnecountysheriff
Tuolumne County Sheriff Twitter	https://twitter.com/TuolumneSheriff
Tuolumne County Sheriff Instagram	https://www.instagram.com/tuolumnesheriff/?hl=en
Tuolumne County Animal Control	https://www.facebook.com/tuolumnecountyanimalcontrol
CAL FIRE	
CAL FIRE Tuolumne-Calaveras Unit Facebook	https://www.facebook.com/CALFIRETCU
CAL FIRE TCU Twitter	https://twitter.com/CALFIRETCU
City of Sonora	
City of Sonora Police Department Facebook	https://www.facebook.com/sonorapolicedepartment/
City of Sonora Police Department Twitter	https://twitter.com/i/flow/login?redirect_after_login=%2FSonora
City of Sonora Facebook	https://www.facebook.com/cityofsonora1/
Independent Entities	
My Mother Lode*	https://www.mymotherlode.com/

<sup>\*</sup> Provides information on evacuation advisories, warnings, and orders for Calaveras and Tuolumne counties.

## 6.6.2.2 Tuolumne County Radio Broadcast

Tuolumne County recommends the following radio broadcasts for updated emergency information:

- Country KKBN 93.5 FM
- + KVML News Talk AM 1450 / FM 102.7
- + STAR KZSQ 92.7 FM
- + KOSO 93.1 FM (Modesto-Local EAS Station)

#### 6.6.2.3 Public Access Televisions

Residents of Tuolumne County can view local government proceedings and community programming on the Access Tuolumne TV Channel, which can be accessed on Comcast Channel 8, Roku, or AppleTV. The County OES will send information to be displayed on this channel where relevant.

#### 6.7 EVACUATION

Tuolumne County has major access and egress challenges which can impact emergency response and public evacuation capabilities. These challenges include the limited number of routes which traverse the County; narrow, winding, and/or steep roads; vegetation growth encroaching on roads; and complicated public and private road networks. This environment is made more complex by topography driven communication challenges, high numbers of visitors, and vulnerable populations and communities.

The Tuolumne County Transportation Council (TCTC) produced an Evacuation Needs Assessment and Communication Strategies Report in 2023 which includes more detailed information about challenges and opportunities related to evacuation in the County. Tuolumne County OES is working on, through a grant from the California Fire Safe Council, an Evacuation Planning Study for all residents and visitors. (https://www.tuolumnecountytransportationcouncil.org/evacuationneedsassessmentstudy).

### 6.7.1 Before a Wildfire Event

Prior to a wildfire event, a variety of preparatory policies, pre-disaster communication strategies, and wildfire hazard mitigations may help reduce the size and impact of an evacuation. Parts of Tuolumne County have policies around closing roads or prohibiting street parking on red flag warning days, which could be expanded to other areas of the County. Maintaining road and shoulder vegetation management and clearance programs, particularly for secondary roads, can both reduce wildfire impacts and keep evacuation routes open during an event. The potentially visitor population in parts of Tuolumne County, particularly during summer weekends, makes preparatory planning and strategizing especially important.

Pre-disaster communications can help residents and visitors prepare for an evacuation and develop an evacuation plan. Residents and visitors can prepare for an evacuation by developing an individualized evacuation plan which includes a packing list, different route options, and options for where they will go. For additional guidance for individuals and families see information from Tuolumne County Office of Emergency Services (<a href="https://www.tuolumnecounty.ca.gov/1524/Office-of-Emergency-Services">https://www.tuolumnecounty.ca.gov/1524/Office-of-Emergency-Services</a>) and MyMotherLode.com (<a href="https://www.mymotherlode.com/community/fire/evacuation-guidelines-tuolumne-county-residents">https://www.mymotherlode.com/community/fire/evacuation-guidelines-tuolumne-county-residents</a>). There are a variety of improvements to planning and communication, as well as infrastructure, which could further improve pre-wildfire evacuation preparations. See Section 8 for recommended actions.

### 6.7.2 During a Wildfire Event

The Tuolumne County Sheriff's Office or local Law Enforcement agencies are the authority to order an evacuation during a wildfire event. This decision is made in consultation with the Incident Commander for the emergency. California law authorizes law enforcement to restrict access to any area where a menace to public health or safety exists due to a calamity such as flood, storm, fire, earthquake, explosion, accident, or other disaster. Refusal to comply is a misdemeanor (Penal Code 409.5).

#### 6.7.2.1 Real-Time Evacuation Information

Tuolumne County notifies the community of emergency alerts via the Everbridge Emergency Alert Notification System. Refer to Tuolumne County Office of Emergency Services for additional information and to register for alerts (https://www.tuolumnecounty.ca.gov/1170/Emergency-Alerts). Because no single method of notification will accomplish complete public notification, additional communication methods which may be employed by TC Sheriff, City of Sonora, TC OES, CAL FIRE, and other emergency response and law enforcement entities include:

- Emergency Alert System (EAS) supported by the National Weather Service broadcast
- + Radio and television announcements.

Residents are encouraged to listen to one of the following radio stations during emergency situations.

- KKBN 93.5 FM
- KVML 1450 AM
- KZSQ 92.7 FM
- KOSO 93.1 FM (Modesto-Local EAS Station)
- Door-to-door notifications
- + Social media, such as X, Facebook, and Instagram
- + Phone hotline: (209) 533-5151 (only answered during a county emergency)

In the event of power outages, additional notification strategies may include:

- + County phone hotline and/or electrical utility hotline
- + Radio PSA
- + Flyers for in-person distribution
- + Press releases to the media
- + Loudspeakers in vehicles
- Deployment of Information Stations (i.e., large wooden sandwich boards with posted information at preidentified locations, Temporary Refuge Areas and additional locations identified during the event)

## 6.7.2.2 Potential Access/Egress Routes

Tuolumne County has three major access/egress routes that transect and extend out of the County – SR-108, SR-120, and SR-49. Additional routes may be identified as evacuation routes within Tuolumne County.

It is important to note that during a wildfire event fire behavior and road conditions may necessitate changes to evacuation routes. It is recommended that everyone in the community become familiar with the preferred evacuation routes, identify potential alternatives should fire behavior and/or road conditions require a change, and stay connected with emergency notification systems for instructions.

### 6.7.2.3 Potential Evacuation Issues

Outlined below are some issues that may be encountered during an evacuation and should be considered by emergency operations planning staff responsible for evacuation planning:

- + Residents and business-owners may not have established evacuation preparedness plans.
- + Residents and business-owners may choose not to evacuate but to stay and defend their homes/businesses or decide to shelter-in-place until the fire danger passes. These residents and business-owners can put their lives at risk as well as those of emergency personnel.
- + Individuals often delay their evacuation with the intent of defending their property, sheltering-in-place, or are slow to leave their homes due to packing personal items. This delay jeopardizes their life safety.

- + Research in social behavior during wildfire evacuations indicates that people tend to take multiple vehicles when evacuating. This can introduce additional demands on the transit networks and should be considered as part of an evacuation management plan. This assumption is included in ongoing evacuation modeling work being undertaken.
- Vulnerable populations and/or individuals with limited mobility may be less able to respond to, cope with, or recover from wildfire.

Research in social behavior during wildfire evacuations indicates that people tend to take multiple vehicles when evacuating. This can introduce unnecessary demands on the transit network and impacting life safety.

- + Visitors to Tuolumne County (and those passing through the County) introduce significant traffic loads to the already limited road capacities, are unlikely to be familiar with secondary roads, and should be included in evacuation planning efforts.
- + Electric vehicles can pose an evacuation challenge if they're not sufficiently charged, as this can increase delays in evacuating or result in being stranded in a place of risk. Consideration of this should be part of evacuation planning for households and the community.
- + Evacuating pets, service animals, and large animals pose significant problems since panicked animals behave unpredictably and may refuse to respond to normal handling approaches.

#### 6.8 PUBLIC EDUCATION AND AWARENESS

Community collaboration and engagement is central to any effective emergency preparedness program. The challenge for Tuolumne County and other communities is how to engage the "whole" community to effect change at the individual and community level in a locally relevant and sustainable way. Communicating accurate and timely information before, during and after a wildfire is a challenge that these communities are addressing through a variety of programs before an event escalates.

The following is a list of preparedness actions and measures at the County and Regional levels.

## 6.8.1 County | Regional Programs

Wildfire Preparedness | Tuolumne County Office of Emergency Services (OES)

The "Wildfire Preparedness" page on the Tuolumne County Office of Emergency Services website has information on life and property protection and evacuations available for residents. <a href="https://www.tuolumnecounty.ca.gov/1162/Wildfire-Preparedness">https://www.tuolumnecounty.ca.gov/1162/Wildfire-Preparedness</a>

+ Create Your Evacuation Plan! | Tuolumne County Office of Emergency Services (OES)

The "Create Your Own Evacuation Plan!" link on the Tuolumne County Office of Emergency Services website has information for residents to prepare for emergency events. https://www.tuolumnecounty.ca.gov/1163/Create-Your-Plan

Tuolumne County OES serves as the coordinator for all Emergency Services and will stand up an Emergency Operations Center and Public Information line in the event of a emergency such as a wildfire and work collaboratively with other agencies. Tuolumne County OES staff create educational opportunities by presenting preparedness to all community groups and various organizations such as HOA's, schools, non-profits, seasonal camps etc.

CAL FIRE & County Resource Links

Included on the Tuolumne County OES evacuation planning page is several links to CAL FIRE and County Resources.

- CAL FIRE Resources:
  - Fire Safety Homeowner Checklist
  - READY, SET, GO! Wildfire Action Plan
  - Are You Ready? Defensible Space Guide
  - Are You Set? Emergency Kit Guide
  - Go Early! Evacuation Guide
- o County Resources:
  - Link to register for Emergency Alert System. https://member.everbridge.net/1332612387832200/login
- Child Evacuation Preparedness

Additional information on child evacuation preparedness is provided via links to Ready.gov resources.

Animal Evacuation Preparedness

Tuolumne County Animal Control has developed information for livestock and small animals including dogs, cats, birds, hamsters, and reptiles, which are linked on this page. General information available from FEMA and CAL FIRE is also linked.

### PGE Wildfire Safety Information | Tuolumne County Office of Emergency Services (OES)

The Tuolumne County OES website includes a page dedicated to PGE Wildfire Safety Information. This includes a key for PG&E 7-Day PSPS potential, PG&E geographic zone map, and various links to additional PG&E resources. <a href="https://www.tuolumnecounty.ca.gov/1167/PGE-Wildfire-Safety-Information">https://www.tuolumnecounty.ca.gov/1167/PGE-Wildfire-Safety-Information</a>

#### + GIS System Program

Tuolumne County maintains a Geographic Information System (GIS) program that provides a variety of functions within Tuolumne County government as well as the public. <a href="https://www.tuolumnecounty.ca.gov/385/GIS">https://www.tuolumnecounty.ca.gov/385/GIS</a>

Several live maps relevant to wildfire safety and preparedness are accessible to the public as part of this program:

- Fire Incident Information Map
- Road Closure Map
- Current Power Outage Map
- Wildfire Preparedness Community Map

#### Fire Safe Council

Fire Safe Councils are grassroots, community-led organizations that mobilize and empower residents to protect their homes, communities, and environments from catastrophic wildfire. Throughout California FSCs educate homeowners about community wildfire preparedness activities, typically working directly

with local fire officials to design and implement projects that increase the wildfire preparedness and response efforts. Tuolumne County has one Fire Safe Council registered in the program called Tuolumne Fire Safe Council (TFSC). <a href="https://tuolumnefiresafe.org/">https://tuolumnefiresafe.org/</a>

The Tuolumne County Fire Safe Council is the main sponsor of this CWPP, and has a website dedicated to public outreach/education about the CWPP. This website contains a variety of wildfire safety/preparedness information and informs residents about the CWPP development process. <a href="https://cwpp.tuolumnefiresafe.org/">https://cwpp.tuolumnefiresafe.org/</a>

## + Wildfire Preparedness Town Hall

On April 29<sup>th</sup>, 2021, Tuolumne County Office of Emergency Services held a Wildfire Preparedness Town Hall. All PowerPoint presentations and Q&A have been maintained on the Tuolumne County OES website. This includes presentations from Tuolumne OES, Tuolumne-Calaveras Unit Department of Forestry, American Red Cross, Tuolumne County Animal Control, and the Sheriff's office. https://www.tuolumnecounty.ca.gov/1361/Wildfire-Preparedness-Town-Hall. Another Town Hall was

held in 2023 and this is anticipated to be a standing annual coordination meeting.

#### + Team ELITE

Team ELITE (Evacuation of Livestock In Tuolumne Emergencies) is a group of disaster service volunteers that assists Animal Control in removing livestock from dangerous situations including but not limited to fires, flooding, trailer rollover, or precarious situations in which an animal is stuck or in danger. https://www.teameliteevacuations.com/

#### + American Red Cross - California Gold Country Region

The California Gold Country Region of the American Red Cross seeks to help people prevent, prepare for, and respond to natural and human-caused disasters through the immediate mobilization of people and resources and the provision of community, workplace, and school-based training. In addition to disaster relief, the Region delivers Community-Disaster Education, First Aid/CPR, and other types of life-saving health & safety training to thousands of people across our region to help people prevent, prepare, and respond to emergencies. American Red Cross California Gold Country Region website is available at https://www.redcross.org/local/california/gold-country.html

## + Tuolumne County Alliance for Resources and Environment (TuCARE)

TCARES maintains a Community Wildfire Protection Fund (CWPF), which was established in partnership with the Sonora Area Foundation that is designed to provide fast and highly efficient funding for large and small vegetation management projects on private lands throughout the county, particularly in high fire hazard areas. <a href="https://tucare.com/community-wildfire-protection-fund/">https://tucare.com/community-wildfire-protection-fund/</a>



#### + Tuolumne County Amateur Radio Emergency Service (TCARES)

TCARES is a nationwide organization of licensed radio amateurs who have volunteered their expertise and equipment to provide emergency communications whenever disaster strikes. ARES is organized by the American Radio Relay League and has ARES members on the county and state level. For more information: <a href="https://tcares.net/about-tuolumne-county-amateur-radio-emergency-services/">https://tcares.net/about-tuolumne-county-amateur-radio-emergency-services/</a>

## MyMotherLode.com Fire Information – Living with Fire

MyMotherLode.com maintains a fire information webpage that contains links to local wildfire preparedness information, as well as a series of articles written by Bill Frost, Past Natural Resource Advisor, UC Cooperative Extension and Mark Hicks, Past Project Manager, El Dorado County Resource Conservation District. This article series, "Living with Fire", details topics such as fire safe zones, fuel reduction, and vegetation management. This webpage can be accessed at <a href="https://www.mymotherlode.com/community/fire/living-with-fire">https://www.mymotherlode.com/community/fire/living-with-fire</a>

#### Yosemite Stanislaus Solutions

Yosemite Stanislaus Solutions is a collaborative group with the goal of restoring and maintaining healthy forests and watersheds, fire-safe communities, and sustainable local economies using a science-based approach. The YSS website contains a variety of resources, including educational information about the Rim Fire, and documentation on the group's efforts, such as fuels reduction projects. https://yosemitestanislaussolutions.com/

#### 6.8.2 Local | Neighborhood Programs

#### + Firewise Communities

The Firewise USA Program encourages local solutions for safety by involving homeowners in taking individual responsibility for preparing their homes for the risk of wildfire. The program provides resources to help homeowners learn how to adapt to living with wildfire while encouraging and empowering neighbors to work together to reduce their wildfire risk and prevent losses. Tuolumne County is home to 18 recognized Firewise Communities. https://tuolumnefiresafe.org/firewise/communities/



## Community Emergency Response Team (CERT)

Community Emergency Response Training (CERT) is a 36-hour course designed for the average citizen so that they can be of help to their neighborhood or business where they work in times of a disaster.

The CERT program was developed in 1985 by the Los Angeles City Fire Department to provide basic training in safety and lifesaving skills to the general public. It has since been adopted by and enhanced by the Federal Emergency Management Agency (FEMA) and the National Fire Academy.

There are five official FEMA/ Cal OES official programs within the county: Tuolumne Me-Wuk Tribal CERT, Twain Harte Area CERT, Groveland Area CERT, Columbia Area CERT, and Tuolumne County CERT. https://www.tuolumnecounty.ca.gov/1558/CERT---Community-Emergency-Response-Team



### + City of Sonora Fire Department Defensible Space Program

The Sonora Fire Department webpage contains a link to the City of Sonora Defensible Space Program, which details requirements and recommendations in regard to defensible space. <a href="https://sonoraca.com/city-services/departments/fire-department/">https://sonoraca.com/city-services/departments/fire-department/</a>

#### + Pine Mountain Lake Association

The Pine Mountain Lake Association has published several resources available to residents. This includes a Ready-Set-Go Guide accessed at: <a href="https://www.pinemountainlake.com/wp-content/uploads/2020/11/PML-Emergency-Preparedness FINAL.pdf">https://www.pinemountainlake.com/wp-content/uploads/2020/11/PML-Emergency-Preparedness FINAL.pdf</a> and evacuation maps accessed at: <a href="https://www.pinemountainlake.com/wp-content/uploads/2023/03/PML-Evacuation-Maps.pdf">https://www.pinemountainlake.com/wp-content/uploads/2023/03/PML-Evacuation-Maps.pdf</a>

### 6.8.2.1 Community Chipping Program

Tuolumne County has three public, fee-based, green waste disposal sites: Cal Sierra Earth Resource Facility (Cammage Rd., Sonora), Wise Wood Works/GreenWorks – Eagle Ridge site (Eagle Ridge Dr., Sonora), and Wise Wood Works – Plainview site (SR-108, Twain Harte). Some communities have their own disposal sites (e.g., Pine Mountain Lake, Sierra Park). The City of Sonora typically hosts two, fee-based, Green Waste Disposal Days per year. More information is available here:

https://www.mymotherlode.com/community/fire/chipping-garden-debris-disposal.

#### 6.9 FISCAL RESOURCES

Fiscal resources, budgetary constraints and a broad range of federal, state, and local stakeholders may make it difficult for to implement recommendations found in this plan. However, working together as a collaboration of stakeholders and other interested parties across the County through a variety of sources (public, private, volunteer, non-profit, etc.) will be essential. Establishing local priorities for available staffing and funding while

still seeking additional funding sources will allow stakeholders countywide to continue enhancing wildfire protection for the residents, businesses, visitors, and other stakeholders in the Planning Area.

## 6.9.1 Potential Grant Funding Sources

Implementation funding may come from a variety of sources. The most common source for large projects is through federal, state, and local grant sources. This list below represents some of the more common grant sources used for wildfire related projects and activities, but is not intended to be all inclusive).

#### + Fire Service Grants and Funding (AFG)

Provides direct assistance on a competitive basis to fire departments of a State or tribal nation for protecting the health and safety of the public and firefighting personnel against fire and fire-related hazards.

### Fire Service Grants and Funding (AFGP)

Through the Federal Emergency Management Agency's Assistance to Firefighters Grant Program (AFGP), career and volunteer fire departments and other eligible organizations can receive funding through three different grants to enhance a fire department's organization's ability to protect the health and safety of the public first responders and to increase or maintain the number of trained, "front-line" firefighters available in communities.

### + Staffing for Adequate Fire & Emergency Response Grant (SAFER)

The Staffing for Adequate Fire and Emergency Response Grant (SAFER) was created by FEMA to provide funding directly to fire departments and volunteer firefighter interest organizations to help them increase or maintain the number of trained, "front line" firefighters available in their communities. The goal of SAFER is to enhance the local fire departments' abilities to comply with staffing, response and operational standards established by the National Fire Protection Association (NFPA 1710 and/or NFPA 1720).

### + Fire Prevention & Safety Grants (FP&S)

The Fire Prevention and Safety (FP&S) Grants are part of the Assistance to Firefighters Grants (AFG) and support projects that enhance the safety of the public and firefighters from fire and related hazards. The primary goal of this grant program is to reduce injury and prevent death among high-risk populations. In 2005, Congress reauthorized funding for FP&S and expanded the eligible uses of funds to include Firefighter Safety Research and Development.

https://www.fema.gov/grants/preparedness/firefighters/safety-awards

#### + Building Resilient Infrastructure and Communities (BRIC)

Authorized by Section 203 of the Stafford Act, Building Resilient Infrastructure and Communities (BRIC) will support states, local communities, tribes, and territories as they undertake hazard mitigation projects, reducing the risks they face from disasters and natural hazards. BRIC is a new FEMA pre-disaster hazard mitigation program that replaces the existing Pre-Disaster Mitigation (PDM) program. The BRIC program aims to categorically shift the federal focus away from reactive disaster spending and toward research-supported, proactive investment in community resilience. FEMA anticipates BRIC funding projects that demonstrate innovative approaches to partnerships, such as shared funding mechanisms, and/or project design. <a href="https://www.fema.gov/grants/mitigation/building-resilient-infrastructure-communities">https://www.fema.gov/grants/mitigation/building-resilient-infrastructure-communities</a>

### + CAL FIRE Grant Program(s)

CAL FIRE offers a number of grant opportunities that can be used to fund various action items and initiatives developed as part of this CWPP. A full description of these grants can be found here: https://www.fire.ca.gov/grants/

- California Climate Investments (CCI) Forest Health Program
- California Climate Investments (CCI) Urban & Community Forestry Grant Program
- o California Climate Investments (CCI) Fire Prevention
- California Forest Improvement Program (CFIP)
- Volunteer Fire Assistance

### + California Fire Safe Council, USFS State Fire Assistance (SFA) Grant Program

Funding is provided through a master grant to California Fire Safe Council (CFSC) by the U.S. Forest Service to administer the Grants Clearinghouse program, with CFSC issuing sub-awards to successful applicants to support fire risk reduction activities by landowners in at-risk communities to restore and maintain resilient landscapes and create fire adapted communities. Funds should be utilized in the following categories: Hazardous fuels reduction and maintenance projects on non-federal land; Community Wildfire Protection Plans (CWPP) and other community hazard mitigation and planning; and Prevention and mitigation education and outreach opportunities for landowners and residents in at-risk communities

#### + Sustainable Transportation Planning Grants

The California Department of Transportation (Caltrans) provides two planning grant programs that could be used to support any transit system wildfire evacuation studies and/or evacuation planning.

- Sustainable Communities Grants to encourage local and regional planning that furthers state goals, including, but not limited to, the goals and best practices cited in the Regional Transportation Plan Guidelines adopted by the California Transportation Commission.
- Strategic Partnerships Grants to identify and address statewide, interregional, or regional transportation deficiencies on the State highway system in partnership with Caltrans. A sub-category funds transit-focused planning projects that address multimodal transportation deficiencies.

#### + CAL OES Hazard Mitigation Grant Program (HMGP)

Hazard Mitigation Grant Program (HMGP) funds plans and projects that reduce the effects of future natural disasters. In California, these funds are administered by the CAL OES HMGP Unit. Eligible sub-applicants include state agencies, local governments, special districts, and some private non-profits.



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# 7.0 Monitoring

A CWPP's strength depends on collaboration, its relevance, and its ability to guide actions on the ground. This CWPP provides a foundation to guide residents, fire agencies and fire collaborators, such as Fire Safe Councils, in wildfire protection activities that are based on current policy, stakeholder input, science-based wildfire assessments, and mitigation recommendations found in the Action Recommendations.

An effective CWPP depends on continued multi-agency cooperation for fire protection planning within the overall Planning Area. Monitoring and tracking of planning efforts provides an opportunity to evaluate the success of this plan in reducing wildfire risk. The plan should not end with its adoption, but should evolve through collaborative planning and implementation, while adapting strategies based on lessons learned.

#### 7.1 CWPP MONITORING

The Tuolumne Fire Safe Council in coordination with members from the CWPP Steering Group conduct a review of this plan at a minimum of 5-year intervals to ensure its relevance. Significant changes in policy, budget, or environmental conditions may require a more frequent review.

The Action Plan portion of this document has been developed as a "tear out" with a simple project tracking mechanism built in. Identified actions can be assigned to responsible individuals with target completion dates. The Action Plan provides the opportunity to track accomplishments for reporting and accountability purposes and should be reviewed and updated annually to measure accomplishments or to realign priorities as conditions warrant.

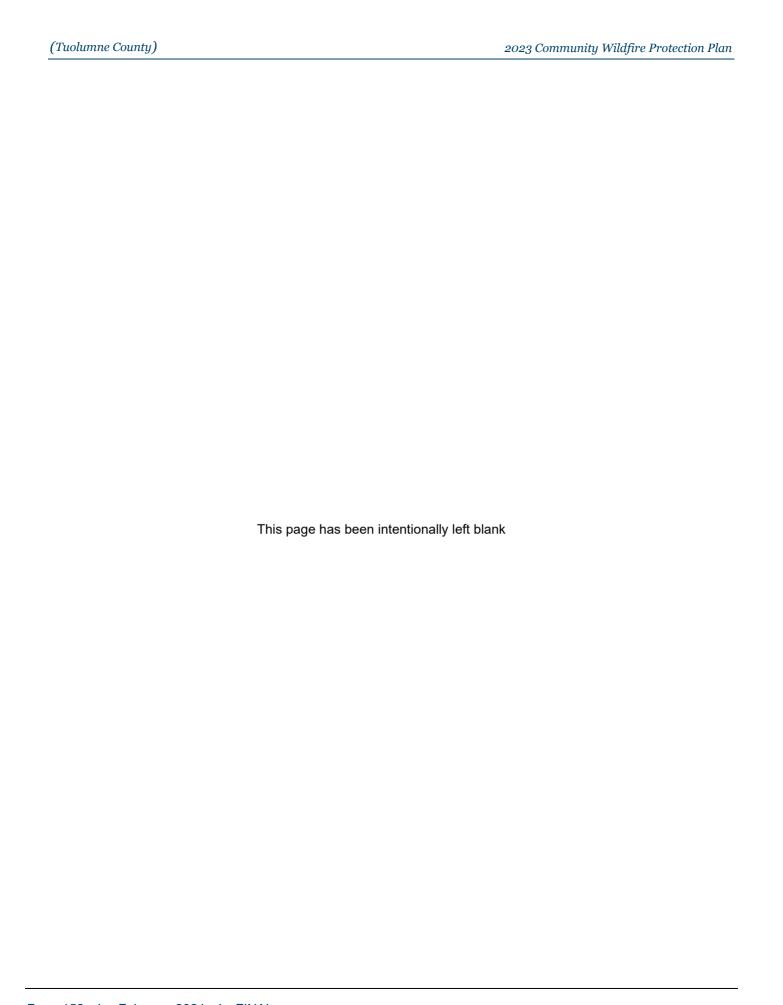
#### 7.2 FUEL TREATMENT MONITORING AND MAINTENANCE

The pace and scale of treatment necessary to meet the CWPP goals and strategic plan should consider a phased implementation approach. The current completed and proposed treatments and the exposure analysis for Integrated Hazard provide the basis for future treatment planning. The completed and proposed acres are identified for each FPU see Appendix C for Tables and Figures.

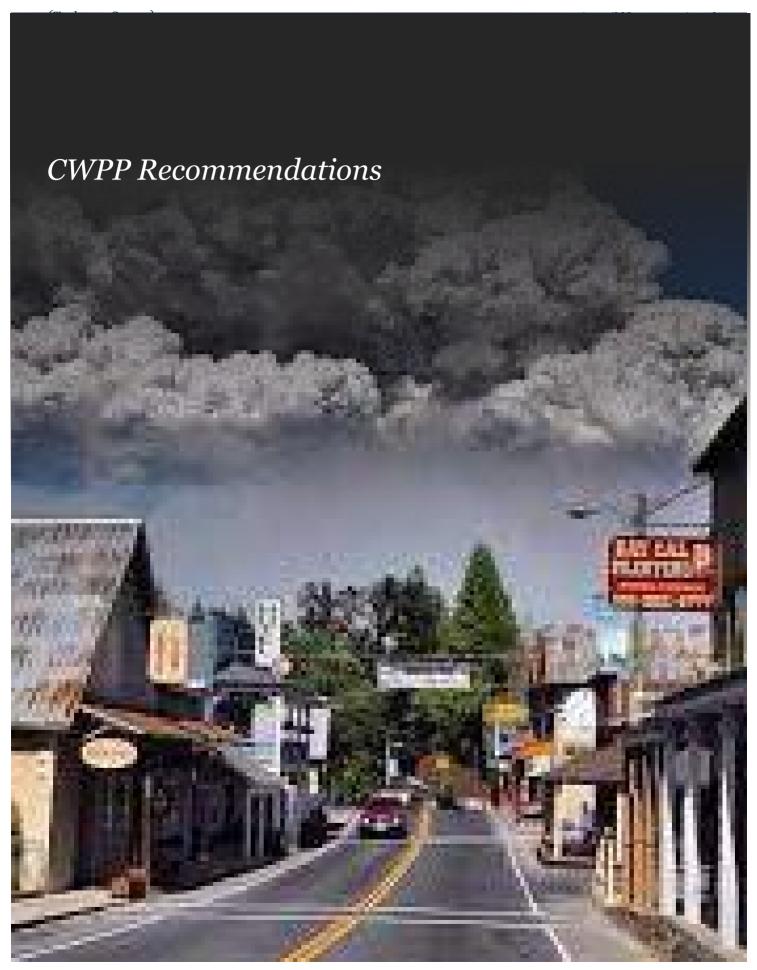
Implementation activities should consider a project specific Implementation Plan developed through a collaborative process. The purpose of the Implementation Plan is to ensure projects are responsive to the current conditions. The implementation plan should also include a process for engaging local agencies, collaborative groups, tribes, and the public throughout the implementation process. Implementation should be phased in with a goal of treating priority acres annually. Implementation can include the following activities:

- + New and maintenance treatment units are based on a collaborative developed prioritization criterion.
- + Finalize the treatment type for hazardous fuels units.
- Implement treatments.
- Monitor treatment effectiveness.

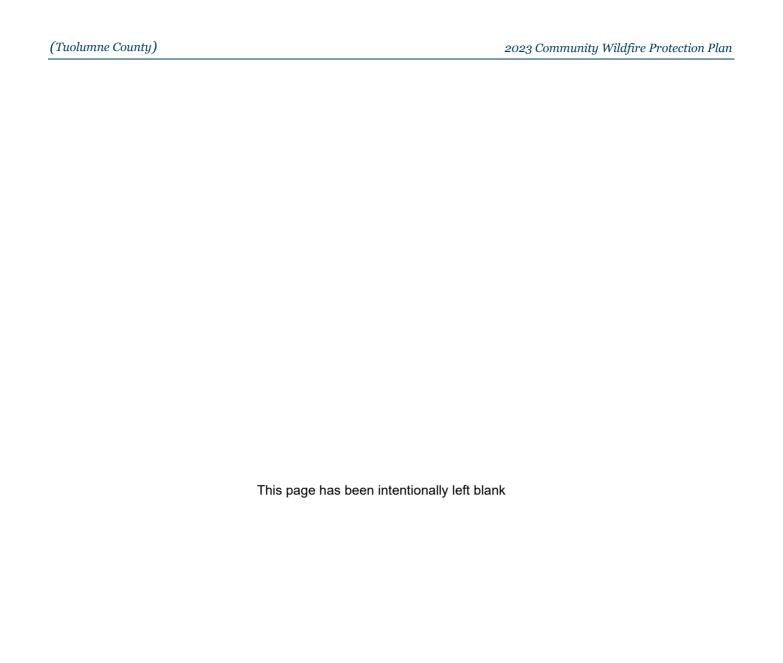
Additionally, the Implementation Plan will allow for treatments to respond to monitoring. All treatment units throughout the project area should be monitored and documented prior to and after implementation. Monitoring could include pre and post treatment photos, pre and post ocular estimation of fuel loading, and if resource objectives have been met with regards to course woody debris, and overall change in surface fuel modification.



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## 8.0 CWPP Action Recommendations

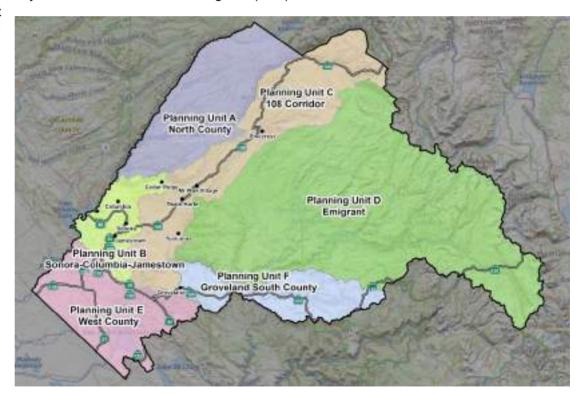
This section provides Action Recommendations for the countywide CWPP for Tuolumne County. It is a collection of county and sub-county level recommendations and priorities that can be taken by property owners, agencies, and jurisdictional land management agencies to increase the fire resiliency of local communities. Due to the scale of the CWPP and associated analysis presented in this report, the Action Recommendations is primarily focused on countywide activities to help inform the development of large-scale projects that will involve coordination and collaboration across multiple stakeholders to complete. Some additional actions are designed to focus on the first 100-feet of a value at risk and/or human-scale initiatives. The Action Recommendations is intended to provide relevant state, county, and local stakeholders with a guiding tool to inform and direct future projects and actions in reducing wildfire hazards and risks at various scales. The tool is also intended to provide a method to systematically monitor, track and evaluate progress on individual projects and overall CWPP programmatic goals, while also providing a form of accountability.

The Action Recommendations has been organized by county-wide actions and Fire Planning Unit (FPU) level actions. The six FPUs for the CWPP were

identified by the CWPP Steering Committee at the start of the development process to allow interested parties at a more localized level to focus efforts on their specific subregion and community. The six FPUs are as follows:

- FPU A North County
- FPU B Sonora, Columbia, and Jamestown
- FPU C SR 108 Corridor
- + FPU D Emigrant
- + FPU E West County
- + FPU F Groveland South County

No single individual, group or agency is responsible for enacting the recommendations or projects identified in the Action Recommendations. While funding and staffing could be an issue in achieving on-the-ground results, using a collaborative approach, multiple agencies and interested parties can come together to address fire hazard concerns across the County more effectively and efficiently.



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Section 8.1 provides recommended actions at the county-level, while Section 8.2 – Section 8.7 provide recommended actions at the FPU level. *Note:* These items were developed from results of public polling, stakeholder input, wildfire hazard and risk assessments in the CWPP, public workshops, Core Group meetings, existing reports, and documents. This list of actionable items is intended to assist with decision-making, project tracking, accountability, and planning outcomes for this Plan.

### 8.1 RECOMMENDED ACTIONS - COUNTYWIDE

Table 27. Countywide Recommendations / Draft Actions

Countywide Recommendations						
Objective	Action	Number	Responsible Entities	Target Date	Status	
A. Codes and Enforcement  Keep local codes, standards, and guidance documents up to date with the latest developments in wildfire	Review recently published wildfire risk mitigation recommendation reports, testing and research (e.g., FEMA, NIST, IBHS), and update local codes, standards, and guidance, as needed.	CW-1				
resiliency research (Serving Goal #1 in Table 1)	Undertake public education to encourage the importance of maintaining the "emberresistant zone" (0-5 feet from a structure) free of any combustible fuels. Relevant agencies should consider providing local guidance on how homeowners should interpret PRC 4291 for existing conditions.	CW-2	TFSC County Fire CAL FIRE City of Sonora			
	Seek funding to expand resources for inspecting and enforcing current Fire Safety and Hazardous Vegetation Management ordinances for all parcels.	CW-3	County Fire CAL FIRE City of Sonora BOS Fire Safety Advisory			

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	Countywide Recommendations					
	Ensure that relevant codes, standards, and local ordinances are up-to-date, consistent (as appropriate) and easily accessible to residents. User-friendliness could be improved via a county jurisdictional map, flow diagram of where to go for relevant information, and descriptions to assist in understanding what regulations and planning information are relevant to specific properties.	CW-4	County CDD County Fire City of Sonora			
B. Fuels Mitigation  Manage landscape vegetation to promote the return of fire resilient species and lower densities.  (Serving Goals #1 - #4 in Table 1)	Undertake prioritized fuel modification and reduction to reduce vegetation density and dead fuel loadings and establish and maintain fuel breaks. Use locally appropriate methods for removal of vegetation. Provide incentives for reducing density and reducing/eliminating less resilient species. Consider implementing fuel reduction recommendations identified in section 6.4.2.1 within each FPU.	CW-5	Property Owners  Public Land Management Agencies  TFSC  Others (collaborative prioritization, e.g., Tree Mortality Task Force)			
	Undertake a study to Identify and provide recommendations for mitigating common ignition sources across the County. This will include common sources of ignition in both the public and private sectors and developing strategies for reducing the number and frequency of ignitions. Recommendations and collaboration efforts should be tailored for the appropriate	CW-6	Fire Agencies Utilities			

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Countywide Recommendations				
audience (e.g., electrical utilities, homeowners, private industry)				
Work with Caltrans and private road associations to remove overgrown fuels along all primary and secondary roadways, including the removal of non-fire-resistant plant species.  Priorities should be placed on primary access/egress routes throughout the County, in highly populated neighborhoods, and in neighborhoods with only one access/egress route.	CW-7	Caltrans Maintenance Division		
A study should be conducted countywide to identify critical fuel breaks and landscape fuel treatments that could be targeted for immediate maintenance. This should be used to prioritize the maintenance of resilient landscapes, key fuel breaks, and long-term recovery. Following a fire, projections of future risk should be updated based on burned areas.	CW-8			
Undertake a county-specific study to evaluate the long-term impacts of climate change at the landscape and potentially stand-level to help support planning and prioritization of landscape-level fuels mitigation projects in the future.	CW-9			
Develop guidelines for landowners that will educate them regarding the proper vegetation density and species composition on lands in the County's lower elevation vegetation types,	CW-10			

	Countywide Recommendations					
		particularly the chaparral/oak and transitional pine belts.				
C.	Property Protection (Defensible Space): Improve fuel treatment strategies for defensible space around structures	Seek funding to facilitate community green waste disposal programs throughout the County, including procuring and maintaining shared equipment across the County, with a focus on underserved and resource-limited communities.	CW-11	TFSC		
	(Serving Goals #1, #2 and #4 in Table 1)	Develop localized list(s) of high-hazard species (e.g., invasive, non-drought resistant, flammable species) and guidance on methods for removal or maintenance within the defensible space zones. Provide education and awareness materials and activities on best practices, and incentivize the removal of these species (i.e., expand prescribed grazing initiatives).	CW-12	County AG. Master Gardeners		
		Provide community workshops, informational videos, demonstration landscapes and other educational methods to increase the general public's understanding of best practices around fire-resistant and drought-resistant plant species, and best practices for landscaping and maintenance.	CW-13			
		Incentivize and encourage property-owners and residents to establish and maintain defensible space and roadside fuel treatments along private roads/driveways. Incentives could	CW-14			

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	Countywide Recommen	dations		
	include tax breaks, cost sharing, provisions for physical assistance and/or insurance incentives.			
	Encourage adjacent landowners to work together to achieve "communal defensible space" where overlapping defensible space zones occur. The intent is for adjacent property owners to design and implement fuel treatments to protect homes collectively.	CW-15		
D. Property Protection (Home Hardening) – Improve Hardening of Existing Building Stock  There are large percentage of structures in the County, in high fire prone areas, that that were built prior to WUI construction standards. While the cost of retrofitting existing structures can be significant, it is one of the	Train a cadre of volunteers (e.g., homeowners, design professionals, fire safe councils, Firewise communities) to conduct voluntary home ignition zone assessments to provide education and support for residents. Possible training could include NFPA's "Assessing Structure Ignition Potential from Wildfire" course or equivalent. The intent is to assist others in meeting or exceeding the defensible space and home hardening requirements of State, County and Local codes and ordinances. Refer to CW-37 for complementary action.	CW-16	TFSC	
most effective methods to Increasing structure survivability in a wildfire. (Serving Goal #4 in Table 1)	Provide funding and assistance to property- owners to retrofit existing structures to current WUI building construction standards. Prioritize providing financial resources and other assistance to vulnerable populations (e.g., elderly, fixed- income, low-income). Develop clear program guidelines, criteria, and management strategies.	CW-17		

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Countywide Recommen	dations		
Research opportunities to incentivize property- owners to harden homes through tax breaks, cost sharing and/or insurance incentives. Educate property owners on available incentives	CW-18		
and insurance carrier discounts.			
Develop criteria to assess "defensible homes" (e.g., maintained defensible space, driveway clearance, turnaround space) and provide signage to homes indicating criteria are satisfied.	CW-19	TC Fire	
Develop standardized signage that identifies residences with static water sources that can be used during suppression operations should the pressurized system fail. Provide signage free to residents willing to install the identification. Include in pre-fire planning with CAL FIRE.	CW-20		
Establish improved communications with Homeowners' Associations concerning wildfire mitigation actions – both home hardening and defensible space. HOAs may have funds to undertake actions within their area of authority, but need technical guidance from the TFSC, TC-OES, County Fire and/or CAL FIRE.	CW-21	TFSC TC-OES County Fire CAL FIRE	
Develop public/private partnerships with utility providers to fund community-scale wildfire mitigations.	CW-22		
Examples may include:			
Funding to support home hardening			
Homeowner self-assessments			

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	Countywide Recommen	dations		
	Demonstration projects focused on home hardening and defensible space			
	Conduct (and update over time) a detailed study to understand parcel and neighborhood level WUI risk across the County. In addition to wildfire hazard and exposure, the study should consider socio-economic vulnerabilities, home hardening and defensible space deficiencies, and access/egress limitations.	CW-23		
	The study should identify and prioritize communities for directing mitigation funding, education, and other resources.			
	Assess barriers to shifting public expectations of vegetation density, screening, "forest setting", privacy, naturalness, etc. Coordinate and collaborate across relevant wildfire safety stakeholders (e.g., CALFIRE, local fire agencies, TC-OES, fire safe council) for this action.			
	Work with insurance industry and California Insurance Commissioner's office to recognize risk reduction efforts at landscape, parcel and neighborhood-scales in insurance coverage, premiums, and deductibles. Coordinate and collaborate with county and local stakeholders, subject matter experts, and academics to systematically identify and quantify the risk reducing measures at various scales to help support insurance needs.	CW-24	Tuolumne County	
E. Wildfire Resiliency of Critical Infrastructure	Work to develop agreements with jurisdictional agencies and private landowners to establish and maintain <b>fuel treatments</b> along <b>major routes</b> and	CW-25		

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	Countywide Recommen	dations		
(Serving Goals #1 and #4 in Table 1)	roadways, with a primary focus on access/egress-constrained communities.			
	Fire Water Draft Points – Water resource managers, in partnership with relevant County stakeholders, should identify, map, and prioritize all available water draft-points to provide greater sources and volumes of water for fire suppression. This should assist fire protection agencies with additional pre-planned encroachments for staging equipment and accessing water along the raw water ditches, while also reduce fire suppression water demands on the potable water system.	CW-26	Tuolumne Utility District, Tuolumne County Fire, Water Districts	
	Conduct a study to evaluate the wildfire resiliency of critical infrastructure and facilities across the county (e.g., water infrastructure, communications systems, public communication systems, electrical infrastructure, undergrounding). Prioritize and implement resiliency improvements, including undergrounding of utility lines. Coordinate and collaborate with relevant fire, law enforcement, government, private sector, and other subject matter experts to ensure programs, policies and systems are evaluated, designed, and maintained for quality, fire resistance, durability, functionality, efficiency, and sustainability.	CW-27	Utilities	

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		Countywide Recommen	dations		
F.	Public Notification and Communication  (Serving Goals #1 and #4 in Table 1)	Conduct a study to analyze, design, install, monitor, and maintain enhancements and redundancies to current emergency communication systems such as generator backups, increased cellular coverage via traditional cell towers, repeaters, and other technologies to improve communications, particularly in populated "dead zones" in the County.  Enforce requirements for providers to maintain generators and power backups.	CW-28	TC-OES TC Sheriff City of Sonora	
		Seek funding to expand the training and use of local radio systems or other distributed technologies (e.g., NOAA weather transceivers, HAM/GMRS radios) to community groups such as CERT members, Fire Safe Councils, Firewise Communities, and HOAs, particularly where cellular communication is poor or vulnerable to wildfire.	CW-29	TC-OES	
		Work with emergency responders and other government agencies (e.g., Fire, Law Enforcement, TC-OES) in the County to conduct a detailed study of the current public emergency communication systems and messaging policies, protocols, and procedures. This should include evaluation of the range of target audiences (e.g., residents, visitors, limited English proficiency, elderly, secondary homeowners), associated emergency communication needs and messaging, and	CW-30	TC-OES TC Sheriff City of Sonora	

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		Countywide Recommen	dations		
		engagement tactics. Build off the emergency communications guidance provided in the recent TCTC Wildfire Evacuation study and OES Evacuation Planning study to develop enhancements. The intent is to provide more reliable, timely, informative, and consistent information during/after a major wildfire incident. This may also include the need for training/drills.			
G.	Evacuation Planning and Preparedness  (Serving Goals #1, #2 and #4 in Table 1)	Review the need for conducting a wildfire vulnerability and evacuation assessment every 5 years to identify limited access/egress routes, quantify evacuation capacities, survey residents and stakeholders, and identify and prioritize improvements to ensure life safety of the public and emergency responders in the event of a major wildfire in the County. At a minimum the need for a new analysis should be reviewed every 5 years, but formally conducted every 10 years at a minimum. The reviews and updates should coincide with the reviews and updates for the countywide CWPP.  Review recommendations in recent countywide wildfire evacuation efforts and other planning documents and coordinate/collaborate with relevant local and state agencies on identifying priority projects and funding needs.	CW-31	TC-OES TC-GIS TC-EMS County Fire CAL FIRE County Sheriff City of Sonora	
		Continue ongoing efforts with Tuolumne County OES, Fire, CAL FIRE, Sheriff's Department, TC-GIS, and the TC Superintendent of Schools, to support efforts for evacuation planning for	CW-32	TC - OES	

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Countywide Recommen	dations		
private/public schools, retreats, resorts, organizational camps, and nursing homes to support site-specific evacuation planning actions, particularly the protocols, procedures, and resource needs to safely manage children/students in the absence of parents or guardians.			
Develop alternative evacuation planning methods that can be provided in community maps. Assure that residents and visitors are aware of access/egress options, the evacuation notification process, and that evacuation routes and specifics will be unique to each emergency.	CW-33	TC OES	
Post directional signage at the intersection of SR-120/SR-108 and major travel routes identifying directions and destinations to assist tourists and other transient visitors in the event of an emergency. Signage along secondary routes pointing towards major routes is also recommended.	CW-34	TC Public Works, Caltrans	
Support development of a program to identify and address evacuation needs and resources for vulnerable populations at local levels across the County.	CW-35	TC OES	
Develop a plan to identify specific areas and communities where secondary means of egress are needed to increase evacuation capacity and access for first responders in a	CW-36	TC-OES, TC-GIS, TC-Fire City of Sonora	

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		Countywide Recommen	dations		
		wildfire. Construct and maintain secondary egress routes for constrained communities.			
		Develop a multi-agency tabletop exercise to address evacuation traffic flow bottlenecks.	CW-37	TC-OES, TC-GIS, TC-Fire, TC-Sheriff City of Sonora	
H.	Public Education and Awareness  Educate the public on how to mitigate wildfire hazards and risks, as well as appropriately preparing and responding to wildfires.	Establish a countywide sponsored Home Ignition Zone assessment program where residents can request assistance from the trained assessors (See CW-15) to get detailed, individualized information on home hardening techniques, defensible space, and fire safe landscaping.	CW-38		
	A challenge for all communities is how to generate interest and maximize awareness of the wildfire threat and encourage participation in preparing for a wildfire at an individual and community level. Public education is critical to community preparedness and citizens need to know where to obtain accurate information before, during and after an event occurs.	Seek funding to create a "one-stop shop" website for local guidance and best practices for wildfire safety. This should focus on practical guidance that is local to the County and subregions. This may include information on structural hardening and retrofitting, recommended plant lists, landscape design and maintenance, defensible space, evacuation preparedness, and post-fire effects due to flooding and soil erosion. Provide links to other materials that individuals may want to reference (e.g., IBHS fire testing, FEMA guidance). Refer to CW-4 for recommendations on providing pertinent codes and standards and planning information for the public.	CW-39	TFSC Fire Sheriff OES Utilities	

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		Countywide Recommen	dations		
	(Serving Goals #1, #2 and #4 in Table 1)	Review and refresh public outreach materials for community workshops, "conversations", informational videos, demonstrations, and other interactive educational outreach to increase the general public's understanding and capacity to prepare for, respond to and recover from wildfires in the County.	CW-40	TC-OES, TC- Fire	
		Translate public education and communication materials on wildfire preparedness, planning and response into different languages for foreign visitors	CW-41	TC-OES Federal, State, and Local Agencies	
1.	Increase Community and Regional Partnerships, Collaboration and Coordination  (Serving Goal #3 in Table 1)	Establish and maintain a spatial database of all wildfire mitigation programs and initiatives (such as all existing, planned and completed fuel treatments across the County) that CWPP stakeholders and interested parties can readily use as a common repository and tool for ongoing coordination and collaboration. Include other entities within and adjacent to the County that should also be coordinating their efforts. A data management strategy should be developed to establish appropriate protocols, such as public vs private facing data, access and update permissions, and frequency of updates.	CW-42	TC-GIS TC-OES	
		Annual CWPP Strategic Meeting – Establish a CWPP Working Group of key stakeholders in the County to meet at minimum on an annual basis to review the CWPP document to develop and	CW-43	TFSC	

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Countywide Recommen	dations		
coordinate on strategic planning and priorities for the upcoming year.			
The Working Group should determine a meeting schedule for monitoring and tracking progress on specific projects, coordination, and collaboration needs (including neighboring counties), and other CWPP programmatic objectives.			
Support and increase participation and engagement with the Tuolumne Fire Safe Council.	CW-44		
Encourage, promote, assist, and organize the establishment of grassroots, community wildfire mitigation and preparedness organizations (including via marketing, outreach, and recruitment efforts). Provide support to these organizations (e.g., GIS support).	CW-45	TFSC TC-OES	
Coordinate with relevant state and local partners on updating the countywide Emergency Operations Plan Update	CW-46	TC-OES	
Coordinate with relevant state and local partners on updating the Hazard Mitigation Plan and ensuring that the countywide CWPP is included in the update.	CW-47	TC-OES	
Coordinate with appropriate tribal governments on new and updated hazard mitigation-related documents and plans.	CW-48	TC-OES	
Emergency Response Training, Drills and Exercises. Schedule wildfire-focused emergency response training, drills and exercises that are	CW-49	TC-OES TC Sheriff TC-Fire	

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	Countywide Recommen	dations		
	required by regulations, policies and/or best practices. This should include and be coordinated with state/county/local agencies, private entities, community groups, and other public entities (e.g., electrical utilities, water utilities). These exercises should be used as opportunities for lessonslearned, improvements, and other feedback.		TC- EMS City of Sonora	
	Improve the cost-efficiency of fuel reduction and fuel maintenance through:	CW-50		
	<ul> <li>Forest residue product and bioenergy supply chain facilitation</li> <li>Agroforestry workforce capacity improvement</li> <li>Ecosystem service market and risk reduction market development/support</li> <li>Creation of voluntary private landowner land management cohorts to increase economy of scale for WUI private land maintenance.</li> </ul>			
J. Emergency Response  Reduce and Stabilize Fire Response Times to FPPA Rural Standards	Identify necessary fire station locations and staffing based on the outcomes of Tuolumne County Fire's Standards of Coverage evaluation	CW-51	TC Fire	
(Serving Goals #1 in Table 1)				

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# 8.2 RECOMMENDED ACTIONS – FIRE PLANNING UNIT A (FPU A)

Table 28 contains more local level actions that have been identified specific to Fire Planning Unit A.

# Fire Planning Unit A

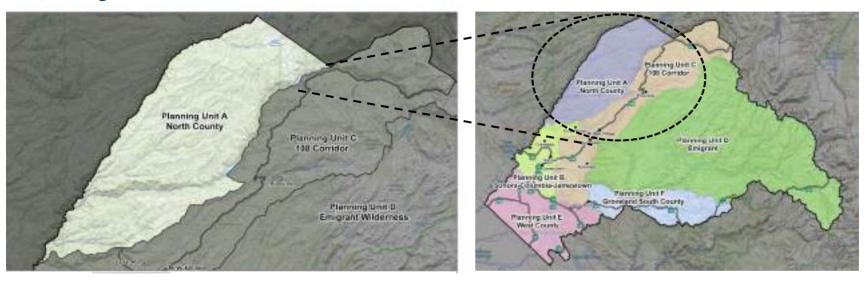


Table 28. Recommended Actions for Fire Planning Unit A (FPU A) - North County

Recommended Actions by Fire Planning Units							
1. FPU A – North County							
Objective	Action	Tracking Number	Responsible Entities	Target Date	Status		
E. Wildfire Resiliency of Critical Infrastructure  (Serving Goals #1 and #4 in	Conduct a study on potential post-wildfire secondary hazards' (e.g., flooding, landslides, debris flows, soil instability) impacts to watershed resources and infrastructure and to identify	A-1					
Table 1)	mitigation activities to increase resiliency of these assets to future fires. Implement identified activities.						

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G.	Evacuation Planning and Preparedness  (Serving Goals #1, #2 and #4 in Table 1)	Review existing public alert protocols and evacuation procedures for recreational users, residents, and other tourist activities in the area.	A-2		
H.	Public Education and Awareness (Serving Goals #1, #2 and #4 in Table 1)	Update public education and communications on wildfire preparedness, planning and response in different languages for foreign visitors traveling through the County and into the Forest	A-3		
I.	Increase Community and Regional Partnerships, Collaboration and Coordination (Serving Goal #3 in Table 1)	Coordinate and collaborate across relevant federal, state, and local entities (e.g., Stanislaus NF, CAL FIRE, other private and public organizations) on vegetation treatment projects and infrastructure hardening activities to address joint needs and concerns.	A-4		

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# 8.3 RECOMMENDED ACTIONS – FIRE PLANNING UNIT B (FPU B)

# **Fire Planning Unit B**

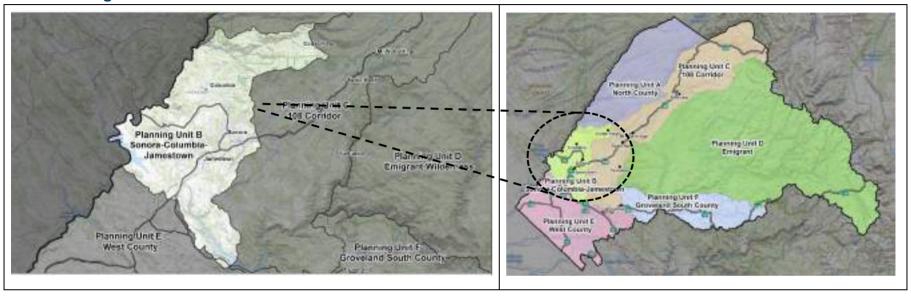


Table 29. Recommended Actions for Fire Planning Unit B (FPU B) – Sonora, Columbia, and Jamestown

Recommended Actions by Fire Planning Units							
2. FPU B – Sonora, Columbia,	2. FPU B – Sonora, Columbia, and Jamestown						
Objective	Objective Action Tracking Responsible Target Date Status Number Entities						

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	Property Protection (Defensible Space): Property Protection (Home Hardening) – Improve Hardening of Existing Building Stock (Serving Goals #1, #2 and #4 in Table 1)	Research grant funding and assistance to property-owners to help retrofit existing structures and defensible space to current WUI building construction standards, defensible space requirements and best practices. A focus on providing financial resources and other assistance particularly for vulnerable populations (e.g., elderly, fixed-income, low-income) should be a priority. Refer to CW-16 for countywide action.	B-1		
		Seek grant funding <b>opportunities for green waste disposal, i</b> ncluding necessary chipping/ mastication equipment, public education, and promotion.	B-2		
E.	Wildfire Resiliency of Critical Infrastructure (Serving Goals #1 and #4 in Table 1)	Work to develop agreements and strategies with jurisdictional agencies and private landowners to establish fuel treatment zones along identified major routes and roadways which serve access constrained communities.	B-3		
G.	Evacuation Planning and Preparedness  (Serving Goals #1, #2 and #4 in Table 1)	Review existing public alert protocols and evacuation procedures (Refer to related evacuation preparedness county-wide actions for additional detail)	B-4		

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H. Public Education and Awareness  (Serving Goals #1, #2 and #4 in Table 1)	Provide local level community workshops, "conversations", informational videos, demonstrations, and other methods to increase public education, awareness, and guidance on a range of wildfire safety topics at the parcel and neighborhood scales. Topics may include:  • Home hardening  • Defensible space  • Native, fire-resistant, drought-resistant plants, landscaping, and maintenance practices  • Community Defensible Space where adjacent landowners design and implement fuel treatments to protect groups of homes.  • Evacuation planning and preparedness	B-5		
	Establish minimum requirements for vacation rentals, hotels, and other hospitality facilities to provide site specific guidance and information to guests to increase awareness on how to respond in the event of a major wildfire (e.g., where to go to get additional information, location of primary egress routes, locations of resiliency centers). This ordinance should be consistent across the County.	B-6		

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# 8.4 RECOMMENDED ACTIONS – FIRE PLANNING UNIT C (FPU C)

# **Fire Planning Unit C**

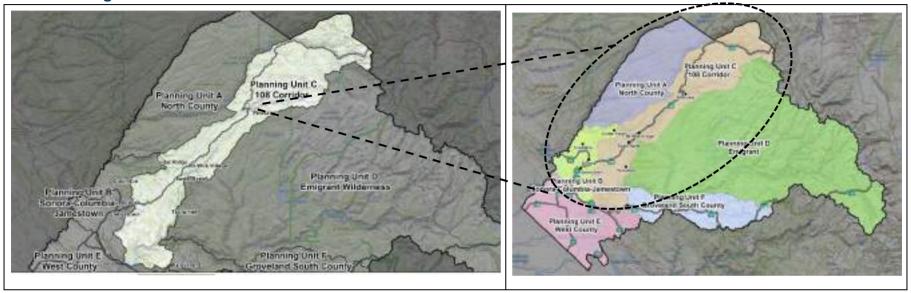


Table 30. Recommended Actions for Fire Planning Unit C (FPU C) - SR 108 Corridor

Recommended Actions by Fire Planning Units							
3. FPU C – SR 108 Corridor							
Objective	Action	Tracking Number	Responsible Entities	Target Date	Status		
C. Property Protection (Defensible Space):  Improve fuel treatment strategies for defensible space around structures  (Serving Goals #1, #2 and #4 in Table 1)	Continue ongoing inspections of vacant lots to ensure property owners are following the vegetation management ordinances and best practices. Where inspections are not currently conducted, develop an inspections program and associated vegetation management guidelines for homeowners.	C-1	Twain Harte Fire				

D. Property Protection (Home Hardening) – Improve Hardening of Existing Building Stock  (Serving Goals #1, #2 and #4 in Table 1)	Provide funding and assistance to property- owners to help retrofit existing structures and defensible space to current WUI building construction standards. A focus on providing financial resources and other assistance particularly for vulnerable populations (e.g., elderly, fixed-income, low-income) should be a priority. Refer to CW-16 for countywide action	C-2		
E. Wildfire Resiliency of Critical Infrastructure  (Serving Goals #1 and #4 in Table 1)	Continue vegetation management practices for the Donnells, Beardsley, Sand Bar, Tulloch, and other recreational areas. Increase coordination and collaboration with relevant local, county and state fire agencies on vegetation management projects and other wildfire resiliency priorities to ensure resiliency of critical water and communication infrastructure and facilities.	C-3	Tri-Dam PG&E USFS	
	Continue Hazardous Fuels Reduction projects for all THCSD infrastructure. This program evaluates potential Wildland Fire threats to department infrastructure and implements work orders to reduce or eliminate wildland fire risk by reducing fuel loading.	C-4	Twain Harte Fire	
	Continue annual reviews and updates to the Emergency Action Plan in the Strawberry area.	C-5	Tri-Dam, PG&E, USFS	
	Conduct routine (weekly) inspections of Tri-Dam facilities to mitigate wildfire hazards and risks.  Verify appropriate protocols are established to coordinate with relevant local agencies on mitigating any major wildfire/fire hazards or risks.	C-6	Tri-Dam PG&E USFS	

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G.	Evacuation Planning and Preparedness  (Serving Goals #1, #2 and #4 in Table 1)	Conduct a more granular level evacuation study to identify specific areas and communities where secondary means of egress are needed to increase evacuation capacity and access for first responders in a wildfire.	C-7	County, USFS, TC- Fire	
H.	Public Education and Awareness  (Serving Goals #1, #2 and #4 in Table 1)	Provide community workshops, "conversations", informational videos, demonstrations, and other methods to increase public education, awareness, and guidance on a range of wildfire safety topics at the parcel and neighborhood scales. Topics may include:  • Home hardening • Defensible space • Native, fire-resistant, drought-resistant plants, landscaping, and maintenance practices • Community Defensible Space where adjacent landowners design and implement fuel treatments to protect groups of homes. • Evacuation planning and preparedness	C-8		
		Update public education and communications on wildfire preparedness, planning and response in different languages for foreign visitors traveling into and through the County, particularly along this corridor.	C-9		

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	Establish minimum requirements for vacation rentals, hotels, and other hospitality facilities to provide site specific guidance and information to guests to increase awareness on how to respond in the event of a major wildfire (e.g., where to go to get additional information, location of primary egress routes, locations of resiliency centers). This ordinance should be consistent across the County.	C-10	Tuolumne County USFS	
Increase Community and Regional Partnerships, Collaboration and Coordination	Coordinate and collaborate with USFS to address any joint concerns with forest management, roads, etc.	C-11	Tri-Dam USFS	
(Serving Goal #3 in Table 1)	Complete development of Emergency Preparedness Plan (EPP) for Twain Harte	C-12	Twain Harte	

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# 8.5 RECOMMENDED ACTIONS – FIRE PLANNING UNIT D (FPU D)

# **Fire Planning Unit D**

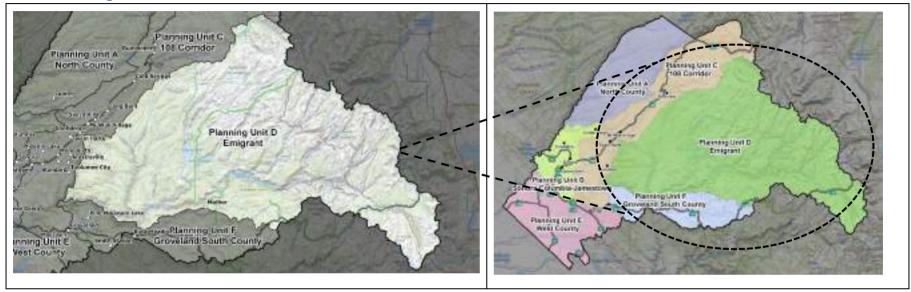


Table 31. Recommended Actions for Fire Planning Unit D (FPU D) – Emigrant

	Recommended Actions by Fire Planning Units						
4	. FPU D – Emigrant						
0	bjective	Action	Tracking Number	Responsible Entities	Target Date	Status	
I.	Increase Community and Regional Partnerships, Collaboration and Coordination  (Serving Goal #3 in Table 1)	Coordinate and collaborate across relevant federal, state, and local entities (e.g., National Park Service, CALFIRE, other private and public organizations) on vegetation treatment projects and infrastructure hardening activities to address joint needs and concerns	D-1				

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E.	Wildfire Resiliency of Critical Infrastructure (Serving Goals #1 and #4 in Table 1)	Conduct a study on potential post-wildfire secondary hazards' (e.g., flooding, landslides, debris flows, soil instability) impacts to watershed resources and infrastructure and to identify mitigation activities to increase resiliency of these assets to future fires. Implement identified activities.	D-2		
G.	Evacuation Planning and Preparedness  (Serving Goals #1, #2 and #4 in Table 1)	Review existing public alert protocols and evacuation procedures for recreational users, secondary homeowners, vacationers, and other transient populations.	D-3		
H.	Public Education and Awareness (Serving Goals #1, #2 and #4 in Table 1)	Update <b>public education and communications</b> on wildfire preparedness, planning and response in <b>different languages for foreign visitors</b> traveling through the County and into the National Park.	D-4		
		Establish minimum requirements for vacation rentals, hotels, and other hospitality facilities to provide site specific guidance and information to guests to increase awareness on how to respond in the event of a major wildfire (e.g., where to go to get additional information, location of primary egress routes, locations of resiliency centers), This ordinance should be consistent across the County.	D-5		

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# 8.6 RECOMMENDED ACTIONS – FIRE PLANNING UNIT E (FPU E)

# **Fire Planning Unit E**

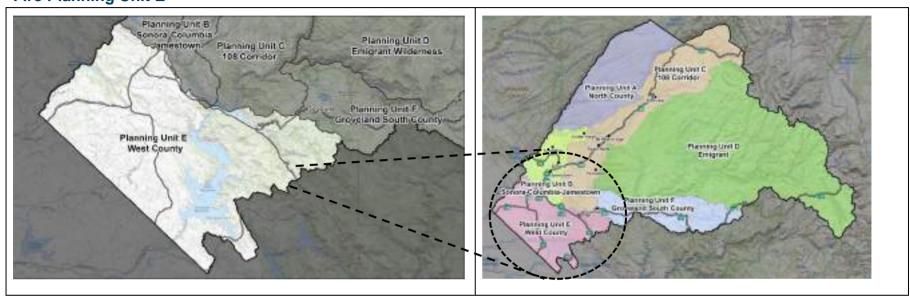


Table 32. Recommended Actions for Fire Planning Unit E (FPU E) – West County

	Recommended Actions by Fire Planning Units						
5.	FPU E – West County						
Ok	ojective	Action	Tracking Number	Responsible Entities	Target Date	Status	
H.	Public Education and Awareness	Update public education and communications on wildfire preparedness, planning and response in	E-1				
	(Serving Goals #1, #2 and #4 in Table 1)	different languages for foreign visitors traveling through the County and into the National Park.					
	in Table 1)	through the County and into the National Park.					

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l.	Increase Community and Regional Partnerships, Collaboration and Coordination (Serving Goal #3 in Table 1)	Coordinate and collaborate across relevant federal, state, and local entities (e.g., CALFIRE, other private and public organizations) on vegetation treatment projects and infrastructure hardening activities to address joint needs and concerns, especially around Priest Grade and Moccasin area.	E-2				
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# 8.7 RECOMMENDED ACTIONS – FIRE PLANNING UNIT F (FPU F)

# Fire Planning Unit F

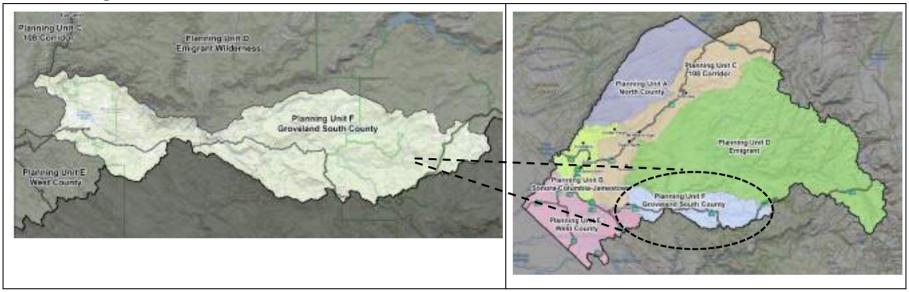


Table 33. Recommended Actions for Fire Planning Unit F (FPU F) – West County

	Recommended Actions by Fire Planning Units						
6. FPU F – Groveland South C	6. FPU F – Groveland South County						
Objective	Action	Tracking Number	Responsible Entities	Target Date	Status		
C. Property Protection (Defensible Space):	Identify and prioritize high hazard fuel load areas surrounding the Groveland/Big Oak Flat area,	F-1	CAL FIRE Groveland				
D. Property Protection (Home Hardening) – Improve	particularly near communities and other development.		Community Services TFSC				

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	Hardening of Existing Building Stock  (Serving Goals #1, #2 and #4 in Table 1)	Provide funding and assistance to propertyowners to help retrofit existing structures and defensible space to current WUI building construction standards. A focus on providing financial resources and other assistance particularly for vulnerable populations (e.g., elderly, fixed-income, low-income) should be a priority. Refer to CW-18 for countywide action.	F-2		
E.	Wildfire Resiliency of Critical Infrastructure (Serving Goals #1 and #4 in Table 1)	Improve Community Ingress and Egress – Develop a study for constructing a new road or improving existing road(s) for ingress and egress between Groveland and Sonora. Acquire funding and rights-of-way to develop the road.	F-3		
		Emergency communications – Work with consultants on how to build a resilient communications network for the community	F-4		
H.	Public Education and Awareness  (Serving Goals #1, #2 and #4 in Table 1)	Develop a multi-media education and outreach program to inform second homeowners and rental guests/tourists of specific, local wildfire dangers as well as safe practices inside and outside the home	F-5		
		Establish minimum requirements for vacation rentals, hotels, and other hospitality facilities to provide site specific guidance and information to guests to increase awareness on how to respond in the event of a major wildfire (e.g., where to go to get additional information, location of primary egress routes, locations of resiliency centers). This ordinance should be consistent across the County.	F-6		

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		Provide local level community workshops, "conversations", informational videos, demonstrations, and other methods targeted specifically at South County and the Groveland area to increase public education, awareness, and guidance on a range of wildfire safety topics at the parcel and neighborhood scales. Topics may include:	F-7		
		Home hardening			
		Defensible space			
		<ul> <li>Native, fire-resistant, drought-resistant plants, landscaping, and maintenance practices</li> </ul>			
		<ul> <li>Community Defensible Space where adjacent landowners design and implement fuel treatments to protect groups of homes.</li> </ul>			
		Evacuation planning and preparedness			
I.	Increase Community and Regional Partnerships, Collaboration and Coordination  (Serving Goal #3 in Table 1)	Increase coordination and collaboration of local, county and state fire agencies, emergency operations, as well as private entities on vegetation management projects and other wildfire resiliency measures and priorities to ensure resiliency of critical infrastructure and facilities (e.g., water services, communication systems, road networks).	F-8		
	Emergency Response: Reduce and Stabilize Fire Response Times to FPPA Rural Standards erving Goals #1 in Table 1)	Identify necessary fire station locations and staffing based on the outcomes of the Tuolumne County Fire's Standards of Coverage evaluation	F-9		

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# Appendix A Glossary

The following provides terms or words found in or relating to this plan (additional terms are available at http://www.nwcg.gov/glossary):

- + **1-Hour Timelag Fuels (a.k.a., one-hour fuels):** Fuels consisting of dead herbaceous plants and roundwood less than about ¼ inch (6.4 mm) in diameter. Also included is the uppermost layer of needles or leaves on the forest floor.
- + **10-Hour Timelag Fuels (a.k.a. ten-hour fuels):** Dead fuels consisting of roundwood ¼ to I inch (0.6 to 2.5 cm) in diameter and, very roughly, the layer of litter extending from immediately below the surface to ¾ inch (1.9 cm) below the surface.
- + **100-Hour Timelag Fuels (a.k.a., hundred-hour fuels):** Dead fuels consisting of roundwood in the size range of 1 to 3 inches (2.5 to 7.6 cm) in diameter and very roughly the layer of litter extending from approximately <sup>3</sup>/<sub>4</sub> of an inch (1.9 cm) to 4 inches (10 cm) below the surface.
- + **1,000-Hour Timelag Fuels (a.k.a., thousand-hour fuels):** Dead fuels consisting of roundwood 3 to 8 inches in diameter and the layer of the forest floor more than 4 inches below the surface.
- + **Active Crown Fire:** A fire in which a solid flame develops in the crowns of trees, but the surface and crown phases advance as a linked unit dependent on each other.
- + Aspect: Direction a slope faces.
- + **Canopy Spacing:** The distance from the edge of one tree canopy to another. Crown spacing varies from open (with 10 feet or more of space between tree canopies) to closed (where trees may be growing in very close proximity with little space between them).
- + **Crown Fire:** A fire that advances from top to top of trees or shrubs more or less independent of a surface fire. Crown fires are sometimes classed as running or dependent to distinguish the degree of independence from the surface fire.
- + **Dead Fuels**: Fuels with no living tissue in which moisture content is governed almost entirely by atmospheric moisture (relative humidity and precipitation), dry-bulb temperature, and solar radiation.
- + **Direct Attack:** A method of fire suppression where actions are taken directly along the fire's edge. In a direct attack, burning fuel is treated directly, by wetting, smothering, or chemically quenching the fire or by physically separating burning from unburned fuel.
- + Fire Apparatus Access Roads The means for emergency apparatus to access a facility or structure for emergency purposes. Roadways must extend to within 150 feet of all portions of the exterior of the first floor of any structure and must meet specified criteria for width, pavement characteristics, roadway gradient, turning radius, etc. Fire apparatus access roads are also referred to as fire lanes.
- + *Fire Behavior:* The manner in which a fire reacts to the influences of fuel, weather, and topography.
- + **Fire Frequency:** Temporal fire occurrence described as a number of fires occurring within a defined area within a given time period.
- + Fire Intensity: A general term relating to the heat energy released by a fire.
- Fire Lane Identification Signs or curb markings that allow fire apparatus access roads to be readily recognized so that they will remain unobstructed and available for emergency use at all times.

- + Fire Potential: The likelihood of a wildland fire event measured in terms of anticipated occurrence of fire(s) and management's capability to respond. Fire potential is influenced by a sum of factors that includes fuel conditions (fuel dryness and/or other inputs), ignition triggers, significant weather triggers, and resource capability.
- + **Fire Regime:** The characterization of fire's role in a particular ecosystem, usually characteristic of particular vegetation and climatic regime, and typically a combination of fire return interval and fire intensity (i.e., high frequency, low intensity/low frequency, high intensity).
- + Fire Return Interval: The length of time between fires on a particular area of land
- + Fire Weather: Weather conditions that influence fire ignition, behavior, and suppression.
- + **Flame Length:** The distance from the base to the tip of the flaming front. Flame length is directly correlated with fire intensity.
- + **Flaming Front:** The zone of a moving fire where combustion is primarily flaming. Behind this flaming zone combustion is primarily glowing. Light fuels typically have a shallow flaming front, whereas heavy fuels have a deeper front.
- + **Fuel:** Any combustible material, which includes but is not limited to living or dead vegetation, human-built structures, and chemicals that will ignite and burn.
- + **Fuelbed:** An array of fuels usually constructed with specific loading, depth, and particle size to meet experimental requirements; also, commonly used to describe the fuel composition.
- + Fuel Loading: The amount of fuel present expressed quantitatively in terms of weight of fuel per unit area.
- + **Fuel Model:** Mathematical descriptions of fuel properties (e.g., fuel load and fuel depth) that are used as inputs to calculations of fire danger indices and fire behavior potential.
- + **Fuel Moisture Content:** The quantity of moisture in fuels expressed as a percentage of the weight when thoroughly dried at 212 degrees Fahrenheit.
- + **Fuel Type:** An identifiable association of fuel elements of a distinctive plant species, form, size, arrangement, or other characteristics that will cause a predictable rate of fire spread or difficulty of control under specified weather conditions.
- + Gates and Barriers Devices that restrict pedestrian and vehicle ingress and egress to and from a facility.
- + Gate and Barrier Locks Devices that are installed on gates and barriers to secure a property or facility.
- + Goals: A goal is a broad statement of what you wish to accomplish, an indication of program intentions.
- + **Ground Fire:** Fire that consumes the organic material beneath the surface litter ground, such as a peat fire.
- + Hose Pull The effective distance (150 feet is standard) that firefighters can drag a hose from fire apparatus to attack a fire. Hose pull is measured along a simulated path of travel accounting for obstructions and not "as the crow flies."
- + *Intensity:* The level of heat radiated from the active flaming front of a fire, measured in British thermal units (BTUs) per foot.
- + Ladder Fuels: Fuels that provide vertical continuity between strata, thereby allowing fire to carry from surface fuels into the crowns of trees or shrubs with relative ease. Ladder fuels help initiate and ensure the continuation of crowning.

- + **Local Responsibility Area (LRA)** Land where a city/county has primary financial responsibility for the prevention and suppression of wildland fires. LRA land is generally located within city boundaries.
- + **Live Fuels:** Living plants, such as trees, grasses, and shrubs, in which the seasonal moisture content cycle is controlled largely by internal physiological mechanisms, rather than by external weather influences.
- + **Mid-flame Windspeed:** The speed of the wind measured at the midpoint of the flames, considered to be most representative of the speed of the wind that is affecting fire behavior.
- + **Objectives:** They contribute to the fulfillment of specified goals and are measurable, defined, and specific.
- + **Passive Crown Fire:** Also called torching or candling. A fire in the crowns of trees in which single trees or groups of trees torch, ignited by the passing front of the fire.
- + **Safety Zone:** A preplanned area of sufficient size and suitable location in the wildland expected to prevent injury to fire personnel without using fire shelters.
- + **Red Flag Warning:** Term used by fire weather forecasters to alert forecast users to an ongoing or imminent critical fire weather pattern.
- Riparian: Situated or taking place along or near the bank of a watercourse.
- + **Spotting:** Refers to the behavior of a fire producing sparks or embers that are carried by the wind and start new fires beyond the zone of direct ignition by the main fire.
- + **State Responsibility Area (SRA)** Land where the State of California (i.e. CAL FIRE) has primary financial responsibility for the prevention and suppression of wildland fires. All SRA land is located within County unincorporated areas; SRA does not include lands within city boundaries or in federal ownership
- + Strategy: The general plan or direction selected to accomplish incident objectives.
- + **Surface Fire:** Fire that burns loose debris on the surface, which includes dead branches, leaves, and low vegetation.
- + **Surface Fuels:** Fuels lying on or near the surface of the ground, consisting of leaf and needle litter, dead branch material, downed logs, bark, tree cones, and low stature living plants.
- + **Topography:** Referred to as "terrain." The term also refers to parameters of the "lay of the land" that influence fire behavior and spread. Key elements are slope (in percent), aspect (the direction a slope faces), elevation, and specific terrain features such as canyons, saddles, "chimneys," and chutes.
- + **Understory:** Term for the area of a forest which grows at the lowest height level below the forest canopy. Plants in the understory consist of a mixture of seedlings and saplings of canopy trees together with understory shrubs and herbs.
- + Values at Risk: People, property, ecological elements, and other human and other intrinsic values within the City. Values at Risk are identified by stakeholders as important to the way of life in the City and are particularly susceptible to damage from undesirable fire outcomes.
- + Very High Fire Hazard Severity Zone (VHFHSZ) A designated area in which the type and condition of vegetation, topography, fire history, and other relevant factors increase the possibility of uncontrollable wildland fire. Structures within a VHFHSZ require special construction features to protect against wildfire hazards; please consult with the local building department and refer to CBC Chapter 7A for specific requirements
- + Wildland Fire Environment: The surrounding conditions, influences, and modifying forces of fuels, topography, and weather that determine wildfire behavior.

+ Wildfire Risk Area – Land that is covered with vegetation, which is so situated or is of such an inaccessible location that a fire originating upon it would present an abnormally difficult job of suppression or would result in great or unusual damage through fire, or such areas designated by the fire code official. For purposes of this document, Wildfire Risk Area includes Very High Fire Hazard Severity Zones (see above), Wildland-Urban Interfaces (WUI), and similarly hazardous areas

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# Appendix B Relevant Federal, State and Local Regulations & Policies

This appendix provides a detailed list and summary of the federal, state, county, and city level policies and regulations that pertain to this CWPP.

#### **B.1 FEDERAL LEVEL POLICY**

## + Disaster Mitigation Act (2000-present)

Section 104 of the Disaster Mitigation Act of 2000 (Public Law 106-390) enacted Section 322 - Mitigation Planning of the Robert T. Stafford Disaster Relief and Emergency Assistance Act - that created incentives for state and local entities to coordinate hazard mitigation planning and implementation efforts and is an important source of funding for fuels mitigation efforts through federal hazard mitigation grants.

## + National Fire Plan (NFP) 2000

In 2000, dry climatic conditions resulted in a historic number of wildland fires within the United States (mainly the Western U.S.) It is estimated that 7.2 million acres, nearly double the 10-year average burned. Costs in damages including fire suppression activities were approximately 2.1 billion dollars. Congressional direction called for substantial new appropriations for wildland fire management. This resulted in action plans, interagency strategies, and the Western Governor's Association's, "A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment - A 10-Year Comprehensive Strategy - Implementation Plan". This collectively became known as the National Fire Plan. This plan places a priority on collaborative work within communities to reduce their risk from large-scale wildfires.

# National Cohesive Wildland Fire Management Strategy (2009)

The National Cohesive Wildland Fire Management Strategy is a strategic push to work collaboratively among all stakeholders and across all landscapes, using best science, to make meaningful progress towards the three goals: resilient landscapes, fire adapted communities, and safe and effective wildfire response. Its vision is to safely and effectively extinguish wildfire when needed; use wildfire where allowable; manage our natural resources; and as a nation, to live with wildland fire.

#### + National Fire Protection Association

The NFPA maintains numerous codes and standards that provide direction on development in the WUI including:

- o NFPA 1, Fire Code, Chapter 17
- NFPA 1140, Standard for Wildland Fire Protection NFPA 1140 is a combination of Standards NFPA 1051 (Standard for Wildland Firefighting Personnel Professional Qualifications), NFPA 1141 (Standard for Fire Protection Infrastructure for Land Development in Wildland, Rural, and Suburban Areas), NFPA 1143 (Standard for Wildland Fire Management), and NFPA 1144 (Standard for Reducing Structure Ignition Hazards from Wildland Fire).

#### National Incident Management System (NIMS)

 NIMS provides a systematic, proactive approach to guide government agencies, nongovernmental organizations, and the private sector to work together to prevent, respond to, recover from, and mitigate the effects of incidents, regardless of cause, size, location, or complexity, in order to reduce the loss of life and property and harm to the environment. The NIMS improves a community's ability to prepare for and respond to potential incidents and hazard scenarios.

#### **B.2 STATE LEVEL POLICY**

### + California Strategic Fire Plan 2018

The Strategic Fire Plan is one of the preeminent policies specified by the Board of Forestry and Fire Protection's (Board). The Board has adopted these Plans since the 1930s and periodically updates them to reflect current and anticipated needs. Over time, as the environmental, social, and economic landscape of California's wildlands has changed, the Board has evolved the Strategic Fire Plan to better respond to these changes and to provide CAL FIRE with appropriate guidance "...for adequate statewide fire protection of state responsibility areas" (PRC § 4130). This 2018 Plan reflects CAL FIRE's focus on (1) fire prevention and suppression activities to protect lives, property, and ecosystem services, and (2) natural resource management to maintain the state's forests as a resilient carbon sink to meet California's climate change goals and to serve as important habitat for adaptation and mitigation. This Plan is set to be updated in 2024.

## + California State Multi-Hazard Mitigation Plan (Version 2018)

The purpose of the State Multi-Hazard Mitigation Plan (SHMP) is to significantly reduce deaths, injuries, and other losses attributed to both natural and human-caused hazards in California. The SHMP provides guidance for hazard mitigation activities emphasizing partnerships among local, state, and federal agencies as well as the private sector.

## + California's Wildfire and Forest Resilience Action Plan (2021)

This plan was created by the California Forest Management Task Force (established in 2018) and strategically accelerates efforts to restore the health and resilience of California forests, grasslands, and natural places, improve the fire safety of California communities, and sustain the economic vitality of rural forested areas. This plan integrates recommendations from existing state and federal plans regarding forest health and the wildfire crisis.

#### + Public Resource Code Sections 4125-4137 - Fire Protection Responsibilities

This policy defines suppression and prevention roles and responsibilities of agencies within and across administrative boundaries. Fire protection responsibility area designations directly correlate to specific financial responsibility for wildfire prevention and suppression actions. Area mutual aid agreements and assistance agreements are reviewed on a regular (annual) basis, to ensure accuracy in updates and procedures.

### + Public Resource Code Sections 4201-4204 - Fire Hazard Severity Zones

Requires CAL FIRE to classify lands within State Responsibility Areas in accordance with the severity of fire hazard present for the purpose of identifying measures to be taken to slow wildfire rates of spread and to reduce the potential intensity of uncontrolled fires that threaten to destroy resources, life, or property. These measures are part of an overall strategy to implement community adaptability in the wildfire environment.

#### Public Resources Code Section 4290

This statute, effective January 1, 2019, sets rules and regulations for the perimeters and access to all residential, commercial, and industrial building construction within state responsibility areas approved after January 1, 1991, and within lands classified and designated as very high fire hazard severity zones. Regulations include: (1) Road standards for fire equipment access; (2) Standards for signs identifying

streets, roads, and buildings; (3) Minimum private water supply reserves for emergency fire use; and (4) Fuel breaks and greenbelts.

#### + Public Resources Code Section 4291 and California Code of Regulations (CCR) 1299.1

A state law, effective in January 2019, this section requires 100-foot defensible space clearance around homes and structures for wildfire protection, but not beyond the property line. The code applies to all lands that have flammable vegetation. The regulations include several requirements for how the vegetation surrounding buildings and structures should be managed to create defensible space.

# + Public Resources Code 4292-93, 4296 and 14 CCR 1256: Fire Prevention for Electrical Utilities

These statutes and regulations address the vegetation clearance standards for electrical utilities. They include the standards for clearing around energy lines and conductors such as power line hardware and power poles. These regulations are critical to wildland fire safety because of the substantial number of power lines in wildlands, the historic source of fire ignitions associated with power lines, and the extensive damage that results from wildfires caused by power lines in severe wind conditions.

#### + Public Resource Code Section 4296.5 - Railroads - CCR 1290 Railroad Right-Of-Ways

Established in 1999, this code empowers the Board Director to adopt regulations establishing fire prevention and hazard reduction standards that any Railroad Corporation or person owning a Railroad in this state must abide by. The resulting formulated PRC 4296.5 regulations are found in the California Code of Regulations (CCR's), Title 14; Article 2; Sections 1290 through 1295.

#### + Public Resource Code Section 4421-4446 - Prohibited Activities

This series of codes specifies the prohibited human actions regarding setting fire or causing fire to be set to any forest, brush, or other flammable material which is on any land that is not his own, or under his legal control, without the permission of the owner, lessee, or agent of the owner or lessee of the land. Proper burn permitting needs are identified. Prohibited actions involving use of noncompliant industrial and/or mechanical equipment is also cited.

#### + Public Resources Code 4741 - Wildland Fire Prevention and Vegetation Management

In accordance with policies established by The Board, CAL FIRE shall assist local governments in preventing future wildland fire and vegetation management problems by making its wildland fire prevention and vegetation management expertise available to local governments to the extent possible within the department's budgetary limitations. Department of Forestry recommendations shall be advisory in nature and local governments shall not be required to follow such recommendations.

### + California Code of Regulations Title 24

California's building regulations and standards are contained within Title 24 of the California Code of Regulations (CCR) published by the California Building Standards Commission. These are regulations passed by California agencies charged with enforcing the state's various laws and requirements for builders and property owners. Title 24 includes all regulations for how buildings are designed and constructed and are intended to ensure the maximum structural integrity and safety of private and public buildings. It contains requirements for the structural, mechanical, electrical and plumbing systems, and requires measures for energy conservation, green design, construction and maintenance, fire and life safety, and accessibility.

## + 2022 California Fire Code

This code establishes regulations affecting or relating to structures, processes, premises and safeguards regarding residences and historic buildings. The code includes: 1) hazards of fire and explosion arising from the storage, handling or use of structures, materials or devices; 2) conditions hazardous to life, property or public welfare in the occupancy of structures or premises; 3) fire hazards in the structure or on the premises from occupancy or operation; 4) matters related to the construction, extension, repair, alteration or removal of fire suppression or alarm systems; and 5) conditions affecting the safety of fire fighters and emergency responders during emergency operations.

## + California Building Code 2022 Chapter 7A (includes section 705A – roofing)

Establishes minimum standards for the protection of life and property by increasing the ability of a building located in any FHSZ within SRA or any WUI Fire Area to resist the intrusion of flames or burning embers projected by a vegetation fire and contributes to a systematic reduction in conflagration losses.

# + California Residential Code 2021 Chapter 3 Building Planning, Section R337 Material and Construction Methods for Exterior Wildfire Exposure

Establishes minimum standards for the protection of life and property by increasing the ability of a building located in any Fire Hazard Severity Zone within State Responsibility Areas or any Wildland-Urban Interface Fire Area to resist the intrusion of flame or burning embers projected by a vegetation fire and contributes to a systematic reduction in conflagration losses.

## + Government Code 51175-51189: Chapter 6.8 - Very High Fire Hazard Severity Zones

This code defines Very High Fire Hazard Severity Zones (VHFHSZ) and designates lands considered by the State to be a very high fire hazard. The purpose of this chapter is to classify lands in the state in accordance with whether a very high fire hazard is present so that public officials are able to identify measures that will retard the rate of spread, and reduce the potential intensity, of uncontrolled fires that threaten to destroy resources, life, or property, and to require that those measures be taken. For more detail and a discussion regarding wildland fire hazard severity in general and VHFHSZ's specifically, see Section 5.1.

# + Government Code 51189: WUI Building Standards (referenced from Ch. 6.8 in paragraph above, for emphasis)

This code directs the Office of the State Fire Marshal to create building standards for wildland fire resistance. The code includes measures that increase the likelihood of a structure withstanding intrusion by fire (such as building design and construction requirements that use fire-resistant building materials) and provides protection of structure projections (such as porches, decks, balconies and eaves) and structure openings (such as attics, eave vents, and windows). For more detail and further discussion on WUI building standards, see Section 5.4.

#### + Government Code 65302.5: General Plan Fire Safety Element Review

This statute requires the Board to provide recommendations to a local jurisdiction's General Plan fire safety element at the time that the General Plan is amended. While not a direct and binding fire prevention requirement for individuals, General Plans that adopt the Board's recommendations will include goals and policies that provide for contemporary fire prevention standards for the jurisdiction.

# + California Health and Safety Code: DIVISION 12. Fires and Fire Protection; Chapter 1 Liability in Relation to Fires; Section 13000

Every person is guilty of a misdemeanor who allows a fire kindled or attended by him to escape from his control or to spread to the lands of any person other than the builder of the fire without using every reasonable and proper precaution to prevent the fire from escaping.

## + California Environmental Quality Act (CEQA)

The 1970 CEQA has evolved into one of the most prominent components of community planning in California. It requires state and local agencies to follow a protocol of analysis and public disclosure of environmental impacts in proposed projects and to include feasible measures to mitigate those impacts. Any proposed hazardous fuel treatment project recommended in this CWPP must comply with CEQA regulations.

## + California Civil Code 1103.C.3 : Law Governing Natural Hazard Disclosure

This code deals with the Transfer of Real Property and the Disclosure of Natural and Environmental Hazards: Article (3) states "A transferor of real property that is located within a very high fire hazard severity zone, designated pursuant to Section 51178 of the Government Code, shall disclose to any prospective transferee the fact that the property is located within a very high fire hazard severity zone and is subject to the requirements of Section 51182 of the Government Code". Details go on to include information regarding property transferor, information regarding agency, county assessor and map documentation.

## + California Emergency Services Act - Chapter 7, Section 8550-8551 (CESA)

The CESA ensures preparations within California will be adequate to deal with natural, manmade, or warcaused emergencies. It declares it necessary to give the Governor, chief executives and governing bodies of political subdivisions of the state emergency powers to provide for state assistance in the organization and maintenance of emergency programs The Act created the Office of Emergency Services, within the office of the Governor, and gave it the powers and duties to (1) provide for the assignment of functions to state entities to be performed during an emergency and for the coordination and direction of the emergency actions of those entities; (2) provide for the rendering of mutual aid by the state government and all its departments and agencies and by the political subdivisions of the state in carrying out the purposes of this chapter; and (3) authorizes the establishment of organizations and directing actions necessary to protect the health and safety and preserve the lives and property of the people of the state.

It further declared the purpose of Chapter 7 and the policy of the state that all emergency services functions of the state be coordinated, as far as possible, with the comparable functions of its political subdivisions, of the federal government including its various departments and agencies, of other states, and of private agencies of every type, to the end that the most effective use may be made of all manpower, resources, and facilities for dealing with any emergency that may occur.

### + California Regional Water Quality Board

The California State Water Resources Control Board (Board) has jurisdiction throughout California. Created by the State Legislature in 1967, the Board protects water quality by setting statewide policy, coordinating and supporting the Regional Water Board efforts, and reviewing petitions that contest Regional Board actions. There are nine regional water quality control boards that exercise rulemaking and regulatory activities by basins. (All proposed mitigation projects must adhere to CEQA regulations in planning and implementation phases. Primary concerns associated with wildland fire hazard mitigation actions involve addressing project design/engineering to reduce potential slope erosion or excess runoff during rain events.

#### + California Air Resources Board

The California Air Resources Board is responsible to reduce air pollution and protect public health. Their role is to set the state's air quality standards at levels to protect public health, identify and measure pollutants, research the cause and effect of air pollution problems and potential solutions, develop and adopt specific rules and regulations needed to achieve healthful air quality and lead California's efforts to

reduce climate-changing emissions through measures that promote a more energy-efficient and resilient economy.

# + SB 160 - Emergency Services. Cultural Competence. Chapter 402, 2019

Measure requires cities and counties to integrate cultural competency in the next regular update to their emergency plan. It requires city and county local emergency managers to incorporate cultural competence into emergency plans, upon its next update, and at a minimum, describe how all cultural populations within its jurisdiction are served by emergency notifications, evacuations, sheltering, mitigation, prevention, planning, and preparedness. It requires cities and counties, when updating emergency plans, to provide a forum for community engagement in geographically diverse locations to engage with culturally diverse communities.

#### + SB 167 - Electrical Corporations. Wildfire Mitigation Plans. Chapter 403, 2019

Measure requires each electrical corporation, as part of submitting their wildfire mitigation plans to the CPUC, to additionally include the impacts on customers who are receiving medical baseline allowances as part of their protocols related to mitigating the public safety impacts of disabling reclosers and deenergizing portions of the electrical distribution system.

## + SB 190 - Fire Safety. Building Standards. Defensible Space Program. Chapter 404, 2019

Measure requires the SFM to develop both a model defensible space program and a WUI Fire Safety Building Standards Compliance training manual. It requires the SFM; to develop a model defensible space program for use by a city or county in the enforcement of existing defensible space provisions in law and consult with representatives from local, state, and federal fire services, local governments, building officials, utility companies, the building industry, and the environmental community. If a defensible space program is adopted, the local agency for enforcement of this program must have the authority to recover the actual cost of abatement and must have the authority to place it as a special assessment or lien on the property. In addition, it requires the SFM to develop, and update on a regular basis, a WUI products handbook listing products and construction systems that comply with the WUI Fire Safety building standards for: Exterior wall siding and sheathing; Exterior windows; Under eaves, including eave and cornice vents; Decking; Treated lumber and ignition-resistant materials; and Wood shakes and shingles roofing materials.

# + SB 465 - Property Assessed Clean Energy Program. Wildfire Safety Improvements. Chapter 837, 2018

Measure expands, until January 1, 2029, Property Assessed Clean Energy (PACE) financing to allow cities and counties in very high fire hazard severity zones to authorize contractual assessments for property owners to finance wildfire safety improvements. Eligible wildfire safety improvements are improvements identified by CAL FIRE that can be fixed to an existing residential, commercial, industrial, agricultural or other building or structure, including ember-resistant roofs, dual-paned windows, driveways, and various ignition-resistant products such as walls, decks, and patio covers. This measure outlines a procedure to be taken by the local agency before PACE financing can be used for wildfire improvements.

# + SB 560 - Wildfire Mitigation Plans. Deenergizing of Electrical Lines. Notifications. Mobile Telephony Service Providers. Chapter 410, 2019

Measure requires public and private utilities to notify all public safety offices, critical first responders, health care facilities, and operators of telecommunications infrastructure with premises within the footprint of potential deenergization for a given event. This measure also requires telecommunications providers to designate points of contact within the company to receive notifications from public and

private utilities in anticipation of possible deenergization events and to notify stakeholders, such as public safety offices and emergency response offices, about the impacts to communications capabilities during such events.

+ SB 670 -Telecommunications. Community Isolation Outage. Notification. Chapter 412, 2019

Measure requires telecommunications providers to notify the Governor's Office of Emergency Services (CalOES) whenever there is an outage limiting the ability for customers to make 911 calls or receive emergency notifications within 60 minutes of discovering the outage. It also requires CalOES to notify the affected county office(s) of emergency services, the sheriff of any county, and any public safety answering point affected by the outage.

+ SB 901 - Wildfires. Chapter 626, 2018

Measure provides numerous changes concerning wildfire prevention and recovery. These include changes to: forest management and fuel reduction; mutual aid; wildfire mitigation planning by electric utilities; cost recovery for wildfire-related damages; funding opportunities from the Greenhouse Gas Reduction Fund (GGRF) for forest health; fire prevention and fuel reduction projects; a \$200 million annual appropriation for forest health and fire prevention programs; and comprehensive streamlining of landscape and forestry management practices to enhance fire prevention activities.

+ SB 979: Water Quality, Supply, and Infrastructure Improvement Act of 2014: Protecting Rivers, Lakes, Streams, Coastal Waters, and Watersheds

This Act is a useful reference during planning and implementation of fuel treatment projects to reduce wildfire risk, because it can help to ensure those projects account for the protection and restoration of California's rivers, lakes, streams and watersheds, protect watersheds tributary to water storage facilities, and promote watershed health. It also determines priorities for water security, climate, and drought preparation.

+ SB 1260 - Fire Prevention and Protection. Prescribed Burns. Chapter 624, 2018

This measure is an omnibus fire prevention and forestry management bill with the intent of promoting long-term forest health and wildfire resiliency. It makes various changes related to local fire planning, prescribed fire requirements, and broader fire prevention efforts.

+ AB 836 -Wildfire Smoke Clean Air Centers for Vulnerable Populations Incentive Pilot Program. Chapter 393, 2019

Measure establishes the Wildfire Smoke Clean Air Centers for Vulnerable Populations Incentive Pilot Program. The grant program creates a network of clean air centers by providing funding to public facilities for smoke-protective filtration systems. The grant program prioritizes applications for projects located in a documented high smoke exposure area to mitigate the adverse public health impacts that result from wildfires and other smoke events. This measure sunsets on January 1, 2025.

- + AB 1054 Chapter 79 Public utilities: wildfires and employee protection.
  - Existing law authorizes the commission, in a proceeding on an application by an electrical corporation to recover costs and expenses arising from a catastrophic wildfire occurring on or after January 1, 2019, to allow cost recovery if the costs and expenses are just and reasonable, after consideration of the conduct of the utility, including consideration of specified factors.
  - This bill would establish the California Wildfire Safety Advisory Board consisting of 7 members appointed by the Governor, Speaker of the Assembly, and Senate Committee on Rules, as provided, who would serve 4-year staggered terms. The bill would require the board, among

other actions, to advise and make recommendations related to wildfire safety to the Wildfire Safety Division or, on and after July 1, 2021, the Office of Energy Infrastructure Safety, as established pursuant to AB 111 or SB 111 of the 2019–20 Regular Session.

# + AB 1877 - Office of Emergency Services. Communications. Notifications. Translation. Chapter 630, 2018

Measure requires the California Office of Emergency Services (CalOES) and the governing body of each political subdivision of the state to translate to the public any emergency communication into the most commonly spoken language other than English in the impacted county or counties. The measure authorizes CalOES to require a city, county, or city and county to translate emergency notifications as a condition of approving its application to receive any voluntary grant funds in connection to emergency management performance.

## + AB 1956 - Fire Prevention Activities. Local Assistance Grant Program. Chapter 632, 2018

The measure establishes a local assistance grant program through CAL FIRE to improve fire prevention in California and ensure that fire prevention activities happen year-round. This bill also requires local agencies, resource conservation districts, fire safety councils, the California Conservation Corps, certified local conservation corps, University of California (UC) Cooperative Extension, Native American tribes, and qualified nonprofit organizations to be eligible for grants.

#### + AB 2911 - Fire Safety. Chapter 641, 2018

Measure makes changes to fire safety planning efforts, defensible space requirements, and electrical transmission or distribution lines' vegetation clearance requirements with the intent to improve the fire safety of California communities. Specifically, this measure:

- Requires a local agency to transmit a copy of its adopted ordinance designating very high fire hazard severity (VHFHS) zones to the Board of Forestry and Fire Protection (Board);
- Removes exemptions from requirement that a local agency designate, by ordinance, very high fire hazard severity zones in its jurisdiction within 120 days of receiving recommendations from the director of CAL FIRE;
- Requires the State Fire Marshal (SFM), in consultation with CAL FIRE and the Director of Housing and Community Development (HCD) to recommend building standards that provide for comprehensive site and structure fire risk reduction to protect structures from fire risk;
- Requires the SFM, in consultation with CAL FIRE and HCD to develop a list of low-cost retrofits that provide for comprehensive site and structure fire risk reduction to protect structures from fire risk;
- Requires CAL FIRE to incorporate the list in its fire prevention education and outreach efforts;
- Requires, before July 1, 2020, the Office of Planning and Research to update the guidance document entitled "Fire Hazard Planning General Plan Technical Advice Series" and update not less than once every eight years;
- Authorizes the Board, within 15 days of receipt of notification that its fire prevention recommendations will not be accepted by the local government, to request a consultation, prior to approval of the draft element or amendment, conducted in person, electronically, or by phone;
- Requires on or before July 1, 2021, and every five years thereafter, the Board, in consultation
  with the SFM, to survey local governments to identify existing subdivisions in SRA or VHFHS
  zones without a secondary egress route that are at significant fire risk; and
- Authorizes owners of any electrical transmission or distribution line to traverse land as necessary,
   regardless of land ownership or permission from the owner, after providing notice and an

opportunity to be heard to the land owner, to prune trees to maintain and to abate, by pruning or removal, any hazardous, dead, rotten, diseased, or structurally defective live trees.

#### + 2019 California Green Innovation Index, 11th Edition

The California Green Innovation Index is produced by Next 10 and tracks the state's progress in reducing greenhouse gas emissions, encouraging technological and business innovation, and growing businesses and jobs that enable the transition to a more resource-efficient economy. Next 10 is an independent, nonpartisan organization that educates, engages, and empowers Californians to improve the state's future.

#### **B.3 COUNTY LEVEL POLICY AND REGULATIONS**

## + Visit Tuolumne County 2019-2020 Annual Report

The Visit Tuolumne 2019-2020 Annual Report contains a summary of statistics and programs related to tourism. Within the report, there are details of 2019 overall tourism stats, highlights, marketing programs, social media & digital content initiatives, media relations, travel trade and meetings, strategic marketing, international representation, industry associations, crisis communication & response, visitors, membership, and community, and future planning.

## + CAL FIRE Tuolumne-Calaveras Unit Strategic Fire Plan - 2020

The CAL FIRE Tuolumne-Calaveras Unit Strategic Fire Plan provides a comprehensive framework of how the Tuolumne-Calaveras Unit will assess current and anticipated hazards/risks, develop objectives to mitigate those hazards/risks, establish benchmarks for success, develop strategies to meet objectives, implementation of these strategies, and facilitate a monitoring system to ensure the plan remains connected to the needs of the Unit and stakeholders. Section I of the plan includes a Unit overview, Section II details collaboration between community/agencies/fire safe councils, and Section III provides information on the Unit values. Section IV includes pre-fire management strategies, and Section V details Unit pre-fire management tactics. Appendices include information on pre-fire projects, Unit goals and objectives, and ignition tables and charts. This Plan is updated yearly.

#### + CAL FIRE / Tuolumne County Fire Department 2021-2025 Strategic Plan

The CAL FIRE / Tuolumne County Fire Department 2021-2025 Strategic Plan contains a series of goals and objectives designed to meet the challenges associated with providing an emergency response delivery system that not only makes up for current deficiencies but also evolves to meet changes in its demographics, society, economy, and climate. The following goals are identified in this Plan: stabilize funding to maintain an appropriate level of service, increase operational efficiency, provide exceptional public safety and emergency service, and strengthen community relationships and enhance community resilience. Each of these goals have several objectives associated with them, which are further detailed in the Plan.

# + County of Tuolumne Office of Emergency Services, Evacuation Guidelines for Tuolumne County Residents

The Evacuation Guidelines for Tuolumne County Residents contains several resources on evacuation information. Within these guidelines, details of types of evacuations, where to get evacuation information, and an evacuation checklist are included. Accessible at: <a href="https://www.tuolumnecounty.ca.gov/DocumentCenter/View/13426/Tuolumne-County-Evacuation-Plan-Pamphlet">https://www.tuolumnecounty.ca.gov/DocumentCenter/View/13426/Tuolumne-County-Evacuation-Plan-Pamphlet</a>

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# + Kittelson & Associates & Jensen Hughes, Tuolumne County Evacuation Needs Assessment and Communication Strategies - 2023

The Tuolumne County Evacuation Needs Assessment and Communication Strategies study identifies locations and communities at a higher risk from wildfire and strategies to improve evacuation operations and communication. The report is structured in three sections: potential wildfire risk, roadway evacuation needs assessment, and communication strategies. Appendices contain information regarding the following: Tuolumne County fire risk evaluation, wildfire risk analysis and design fire scenarios, identification of roadway network deficiencies, strategies for increasing capacity and efficiency, vulnerable populations and vulnerable communities-strategies for evacuation, shelter-in-place emergency planning considerations, communications strategy, and community engagement strategy.

The Tuolumne County Evacuation Needs Assessment and Communications Strategies study was developed by Kittelson & Associates, Inc., Jensen Hughes, and Dr. Stephen Wong (University of Alberta) in collaboration with the Tuolumne County Transportation Council, Tuolumne County Office of Emergency Services, and local stakeholders.

#### + Tuolumne County CWPP - 2004

The 2004 Tuolumne County CWPP was the first developed for the area. It includes information on prefire management, characteristics of the County, a discussion of stakeholders, fuels, weather, level of service, and assets at risk, fire safe council and strategic groups plans, and discussion of institutional issues related to CWPP implementation.

# + Emergency Operations Plan for Tuolumne County - 2023

The Emergency Operations Plan for Tuolumne County clearly delineates the County's procedures and policies when responding to a significant disaster. The plan outlines the operational area response in greater detail for the following emergencies: extreme weather, flood/dam failure, geological event (earthquake/volcano), hazardous materials, terrorism/civil disturbance, extreme events/weather, transportation accident/multi-casualty incident, and wildland fire. The plan is organized into three parts: the basic plan, hazard specific plans, and support materials. Examples of support materials detailed are key contact lists, job action sheets, and emergency alerting system and sample messages. A 2024 Update to this Plan is in review at the time of the drafting of this document.

#### + Tuolumne County Multi-Jurisdictional Hazard Mitigation Plan - 2018 Update

The Tuolumne County Multi-Jurisdictional Hazard Mitigation Plan was first developed in 2004 and has received two updates (2013 and 2017). This entails adopting, implementing, assigning responsibility, monitoring, and reviewing this hazard mitigation plan over time, to ensure the goals and objectives are being achieved and the plan remains a relevant document. The goal of this plan is to arrive at practical, meaningful, attainable and cost-effective mitigation solutions to minimize each jurisdiction's vulnerability to the identified hazards and ultimately reduce both human and financial losses subsequent to a disaster.

## + Tuolumne County Community General Plan - Public Safety Element

The Public Safety Element of the Tuolumne County Community General Plan relates local safety planning to County land use decisions. It focuses mainly on fire, but also addresses other public safety issues relevant to Tuolumne County, including emergency services, crime, and hazardous waste. The Safety Element's purpose is to reduce death, injuries, property damage, and the economic and social dislocation resulting from natural hazards, thereby improving the quality of life within the County.

#### + Tuolumne County Ordinance Code Chapter 8.14, Title 15

Chapter 8.14 of the Tuolumne County Ordinance Code, also known as the County Hazardous Vegetation Management Ordinance, provides requirements for the removal of hazardous vegetation situated in the unincorporated areas of the county so as to reduce the potential for fire and to promote the safety and welfare of the community.

Title 15 of the Tuolumne County Ordinance Code includes local buildings & construction ordinances, as well as amendments to building and fire codes.

# **B.4 CITY | COMMUNITY LEVEL POLICY**

## + Pacific Gas and Electric Company (PG&E) 2021 Wildfire Mitigation Plan Report

The 2021 Plan continues many of the actions undertaken in PG&E's 2019 and 2020 WMPs. It includes a focus on more precise, technology-based approaches to measure and mitigate wildfire risk, lessons learned implementing the 2020 WMP, and feedback received from the Wildfire Safety Division, PG&E's Federal Monitor, and others as to areas that can be improved and gaps that should be addressed.

This Plan has three overarching goals: reducing wildfire ignition risk, enhancing wildfire risk situational awareness, and reducing the impact of PSPS events.

#### + Greater Tuolumne City CWPP - 2004

The Greater Tuolumne County CWPP is a collaborative planning effort between Highway 108 Fire Safe Council and State, Federal, and Native American Partners. This Plan describes the measures necessary to reduce the risk of catastrophic fire and restore healthy forest ecological conditions on Stanislaus National Forest lands, and Bureau of Land Management lands adjacent to the following properties:

- Tuolumne City with 724 homes
- Ponderosa Hills Arastraville with 306 homes
- Tuolumne Band of Me-Wuk Rancheria with 72 homes
- Mira Monte Subdivision with 27 homes
- o Muller Subdivision with 38 homes

# + NDRC Fuel Breaks Project, Environmental Assessment Determinations and Compliance Findings for HUD-assisted Projects - 2020

The NDRC Fuel Breaks Project consists of expanding a series of shaded fuel breaks in Tuolumne County on federal lands, private lands, and lands controlled by State and local agencies. The project is a collaborative effort under the oversight of the State of California Department of Housing and Community Development and Sierra Nevada Conservancy. It is part of the Community Watershed Resilience Program, which consists of three interconnected sets of activities in Tuolumne County for resilient recovery from the 2013 Rim Fire.

This document evaluates the impacts that this project may have on the environment, and its compliance with specific authorities and factors.

#### + City of Sonora Defensible Space Ordinance No. 835

The City of Sonora Defensible Space Ordinance contains requirements of fuel modification measures to create defensible space around all buildings, structures, dwellings and property lines as identified.

## + Emergency Operations Plan for the City of Sonora - 2014

The Emergency Operations Plan for the City of Sonora clearly delineates the City's procedures and policies when responding to a significant disaster. The plan outlines the operational area response in greater detail for the following emergencies: extreme weather, flood/dam failure, geological event (earthquake/volcano), hazardous materials, terrorism/civil disturbance, extreme events/weather, transportation accident/multi-casualty incident, and wildland fire. The plan is organized into three parts: the basic plan, hazard specific plans, and support materials. Examples of support materials detailed are key contact lists, job action sheets, and emergency alerting system and sample messages.

## + Twaine Harte Community Services District, Ordinance No. 30-01, THCSD Fire Code

Ordinance No. 30-01 contains Twaine Harte Community Services District amendments to the California Building Code.

#### + Mi-Wuk Sugar Pine Fire Protection District Strategic Plan - 2017

The Mi-Wuk Sugar Pine Fire Protection District Strategic Plan identifies three key strategic priorities for the future, as well as a goal and objectives to accompany each priority:

- o Fiscal Planning: The fire district will develop and implement a process for long term fiscal planning looking forward 3-5 years. The process will assess future revenue and expense, using best available history and projections and allowing for unanticipated deviations. The process will be used to inform the budgeting and planning process for the current and future budget years.
- o Operational Integration: The fire district will explore options for functional and operational integration with other public agencies and move forward where indicated.
- o The Fleet: The Fire District will develop and implement a fleet plan that will provide for the maintenance and replacement of the fleet in a manner that meets the needs of the district and complies, to the extent possible, with external guidelines and requirements.

The plan includes goals and objectives for each of these strategic priorities, as well as a process for ongoing review and periodic adjustment of the priorities and the plan.

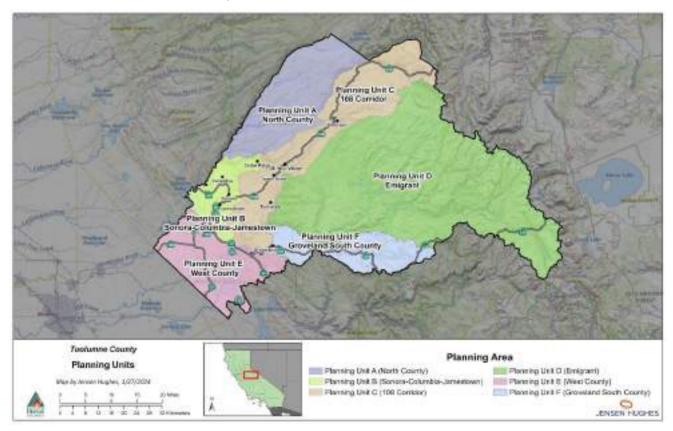
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# Appendix C Fire Planning Unit Strategies

As indicated in the main body of the report, an Exposure Analysis was developed to evaluate the threat of wildfire from the current hazardous fuel conditions that could potentially impact high valued resources and assets (HVRAs) at risk. Integrated Hazard was used to quantify fire exposure within each Fire Planning Unit (FPU). The threat of wildfires from outside the County are not addressed in the analysis, but the Integrated Hazard displays areas near the County boundaries that are classified for lowest to highest fire behavior characteristics. See Table 19, in the main body of the report, for explanation of integrated hazard.

The primary purpose of developing FPUs in fire management planning is to assist in organizing information on complex landscapes. FPUs divide the County into smaller geographic areas used to describe wildfire exposure to communities. The following figure indicates the FPUs that were identified by the Steering Committee for the purpose of subdividing the county for the CWPP.

- + FPU A North County
- + FPU B Sonora, Columbia, and Jamestown
- + FPU C SR 108 Corridor
- + FPU D Emigrant
- FPU E West County
- + FPU F Groveland South County



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#### C.1 FIRE PLANNING UNIT #A - NORTH COUNTY

## **C.1.1** General Description

FPU A is in the northern portion of the County and is approximately 176,000 acres. The west side of the unit follows the Calaveras County boundary along the North Fork of the Stanislaus River. The boundary continues to the north along the north fork of the Stanislaus River and follows the County boundary to the southeast crossing Utica Reservoir and Spicer Meadow Reservoir to the Middle Fork Stanislaus River. The boundary continues to the southwest following the Middle Fork Stanislaus River crossing Donnell Lake and Beardsley Reservoir Dam and turns to the southeast intersecting Forest Route 4N39 to Forest Route 4N42. The boundary continues west along the ridge to Crandall Peak and continues to the southwest following Grant Ridge to Forest Route 3N44 Poderosa Way. The boundary follows Ponderosa Way to the north to the ridge and abruptly turns to the southwest to confluence of the Stanislaus River and the South Fork Stanislaus River.

The primary vegetation type is Sierra Mixed Conifer with heavier fuel loading associated with the timber understory fuel models. See *Figure 67* for fuel models across FPU A. During the fire season, the steep Stanislaus River corridors align with the southwest prevailing wind to significantly increase wind speed and fire behavior characteristics. There have been several large fires within the last 30 years. This has slightly reduced the hazard rating and exposure impact on values within the fire perimeters.

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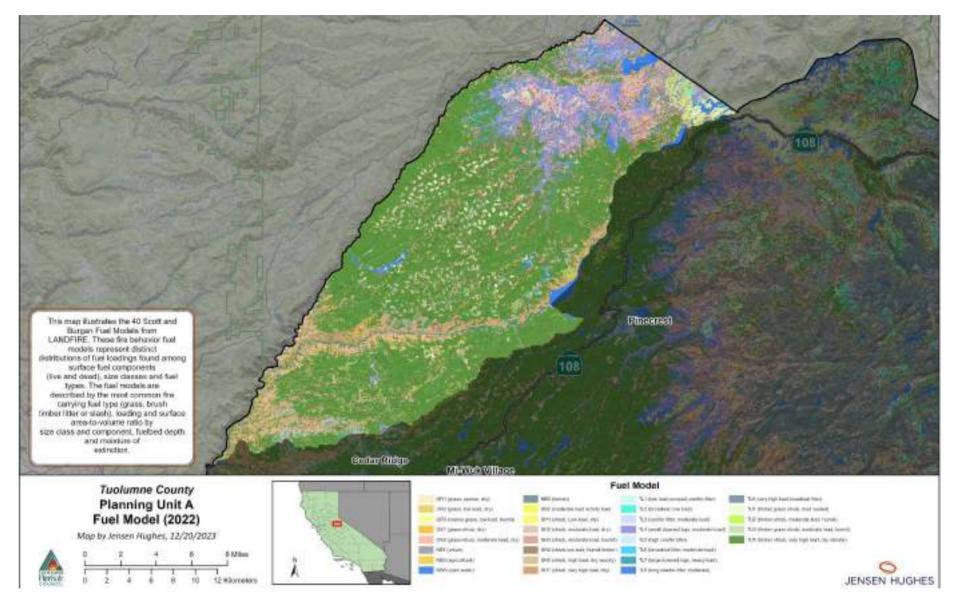


Figure 67. Fuel Models in FPU A

#### **C.1.2** Exposure Analysis

Approximately 16 percent of the FPU is owned by private land timber companies and a significant portion is administered by the Stanislaus National Forest. There is only one WUI Zone within the FPU. See The Wildland-Urban Influence Zone is located adjacent to the Stanislaus River and there is one community (Jupiter) at risk. The remainder of the FPU has a high hazard rating with approximately 76 percent in middle to highest rating.

The exposure to the WUI Influence Zone is rated as high with 85 percent of the area having a middle to highest rating and 53 percent of this area having higher to highest hazard rating. Exposure to private land also has a high hazard rating with 85 percent of the area having a middle to high rating and 60 percent having higher to highest rating prescribed fire activities and considered as significant issues for developing wildland fire suppression alternatives. (Table 34).

Table 34. FPU A exposure by hazard level acres and percent.

FPU A	J A		WUI Influe	nce Zone	Private Land		
Hazard Level	Acres	Percent	Acres	Percent	Acres	Percent	
Lowest	21,961	12%	114	4%	2,056	4%	
Lower	20,754	12%	340	11%	5,608	10%	
Middle	39,044	22%	949	32%	13,757	25%	
Higher	50,373	29%	779	26%	18,789	34%	
Highest	44,553	25%	799	27%	14,289	26%	
Total	176,685	100%	2,980	100%	54,498	100%	

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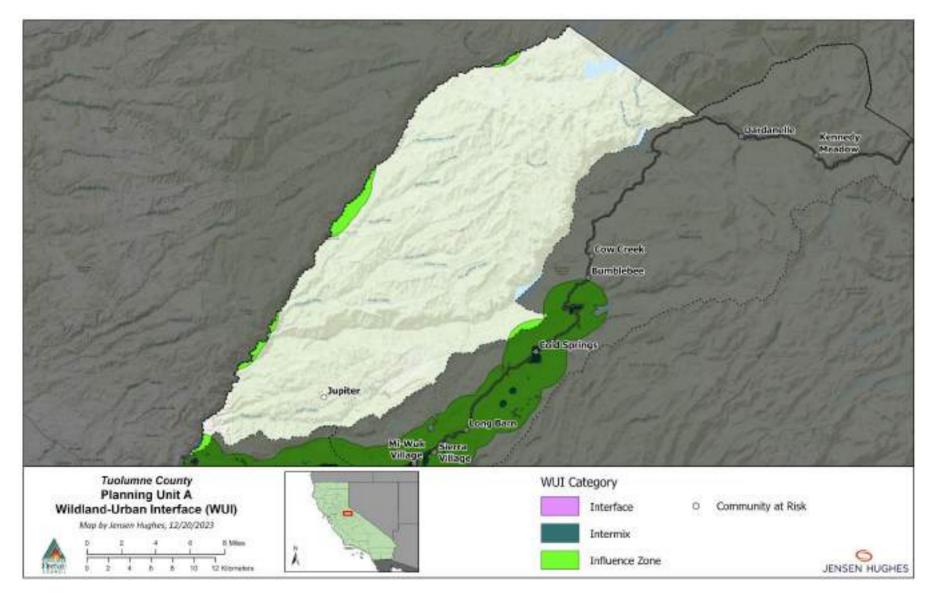


Figure 68. Wildland Urban Interface (WUI) Areas in FPU

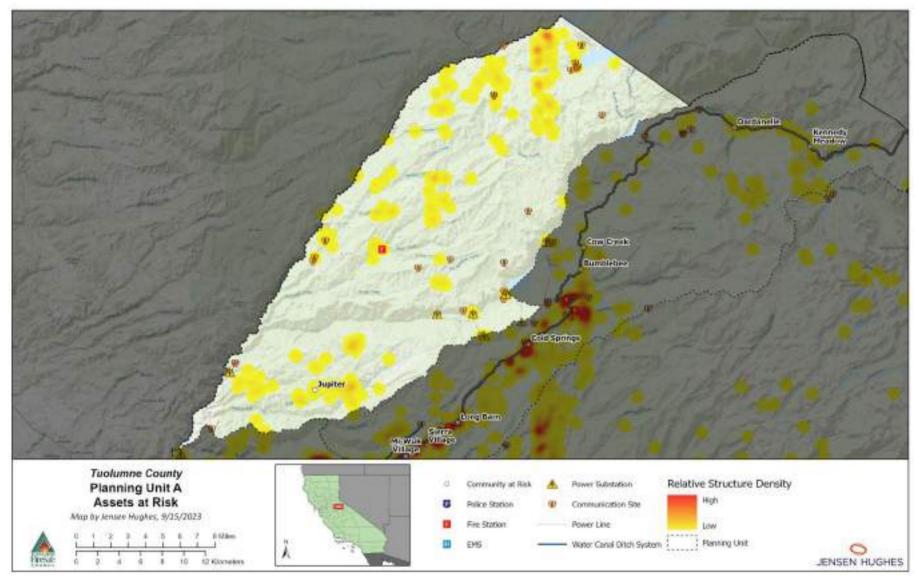


Figure 69. Assets at Risk in FPU A

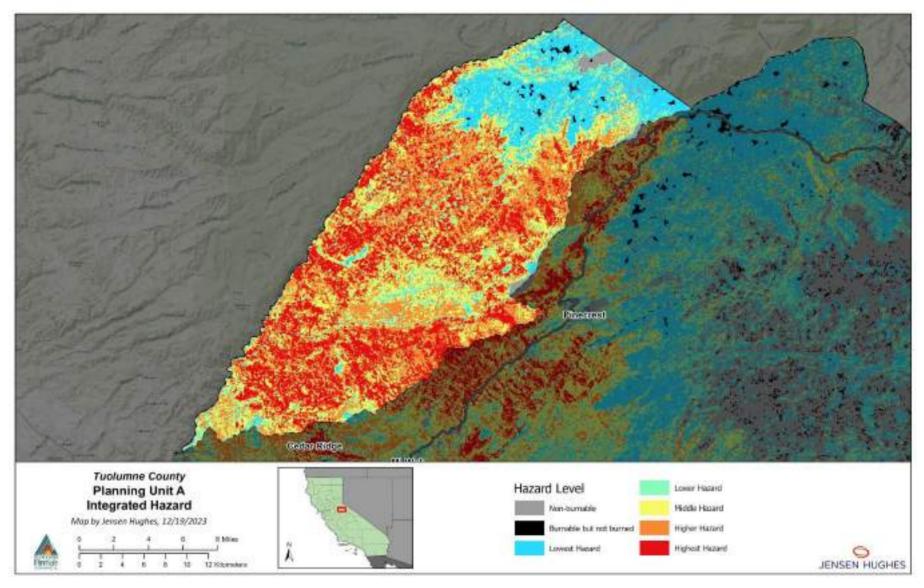


Figure 70. Integrated Hazard for FPU A

# C.1.3 Existing, Proposed and Recommended Fuel Treatments

	FPU A		
Status	Treatment Type	Acres	Percent
Completed	Fuel Break	1,577	1%
Completed	Fuel Reduction	5,295	3%
Completed	Prescribed Burn	8,696	5%
Proposed	Fuel Break	7,997	4%
Proposed	Fuel Reduction	21,452	12%
Proposed	Unknown	1,841	1%
Total Completed	N/A	15,568	9%
Total Proposed	N/A	31,290	17%
All Treatments	N/A	46,858	26%
FPU Area	N/A	182,198	100%

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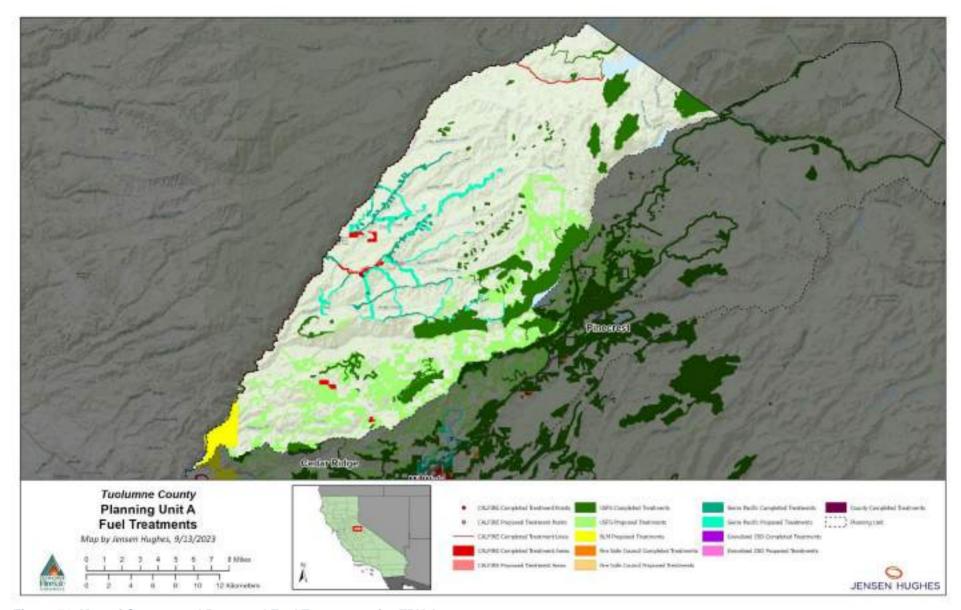


Figure 71. Map of Current and Proposed Fuel Treatments for FPU A

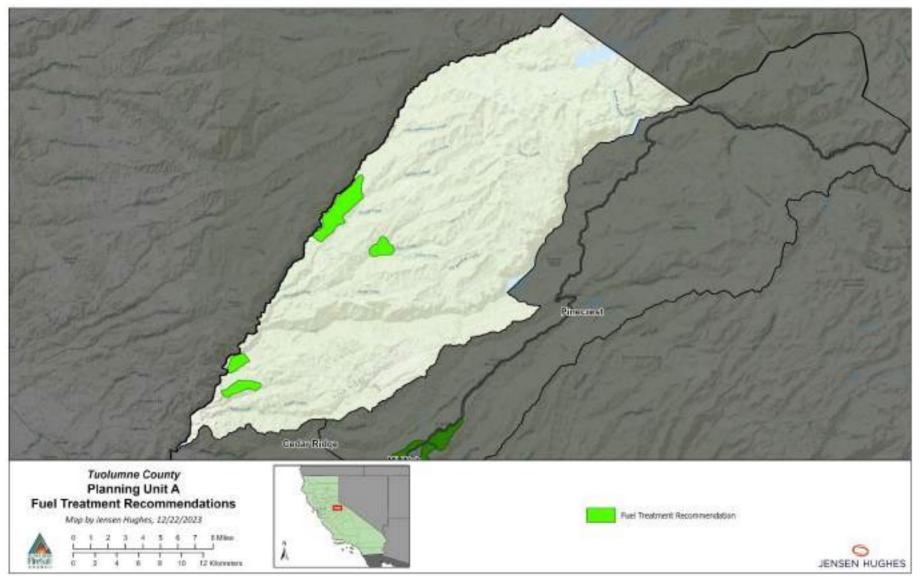


Figure 72. Map of Recommended Fuel Treatments for FPU A

#### C.2 FIRE PLANNING UNIT #B - SONORA, COLUMBIA, JAMESTOWN

#### C.2.1 General Description

FPU B is in the southwest portion of the County with approximately 58,000 acres. This unit borders FPU A on the north following Grant Ridge Road before going south to confluence of Deer Creek and the South Fork of the Stanislaus River. The boundary continues for a short distance to a major ridge that runs toward the southeast to Elizabeth Peak. The boundary continues to the south following ridgetops before intersecting Lyons Bald Mountain Road and Highway 108. From Highway 108 the boundary continues southwest intersecting Mountain Springs Golf Club to Page Mountain. From Page Mountain, the boundary continues to follow the ridge west of Kanaka Creek and then extends south to the bridge on Highway 120. From there the boundary goes north along Highway 120 and State Highway 49 before intersecting Highway 108 in the Table Mountains. From the Table Mountains the boundary goes northwest to Tuolumne and Calaveras County line. The boundary continues to the north in New Meadows Lake and crosses State Highway 49 to the FPU A boundary.

The primary vegetation types are grassland and montane hardwood conifer with lighter fuel loading and are associated with the grass, shrub, and timber litter fuel models. There is also an increase of non-burnable urban fuels within the FPU. See *Figure 73* for fuel models across FPU B. During the fire season, the lower foothills are susceptible to northwest winds and as the elevation increases the prevailing wind switches from the southwest. The wind direction and alignment with slope will increase fire behavior characteristics. Even though this FPU has a high fire occurrence, only a few large fires have occurred. This is the most densely populated and economical area of the County that would be affected by wildfire. Priority rankings of treatments and mitigation measures at the County level should be discussed with all relevant stakeholders and agree on an appropriate ranking system.

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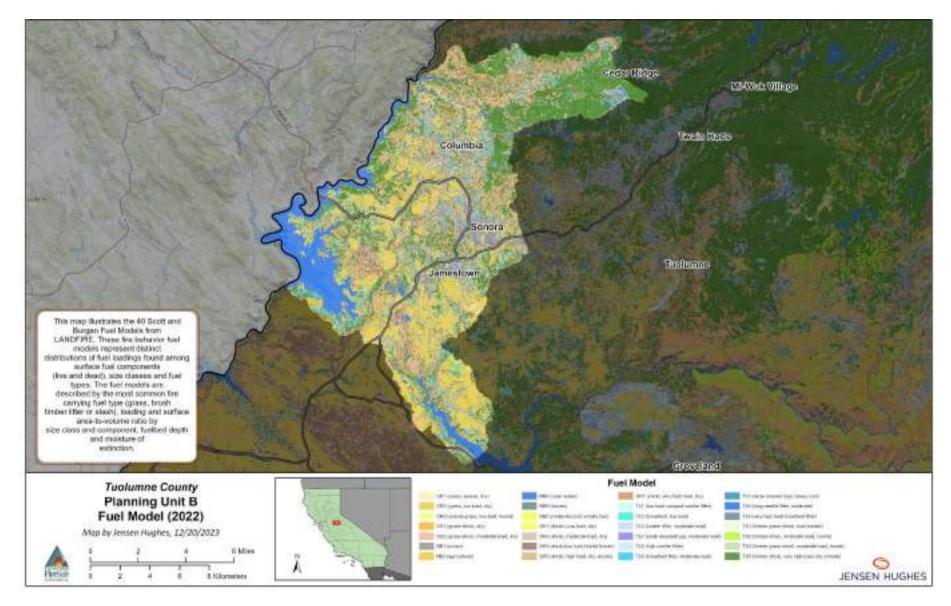


Figure 73. Fuel Models in FPU B

#### C.2.2 Exposure Analysis

This FPU is dominated by exposure to HVRAs. See Figure 75. The FPU has a high percentage of the area in Interface zones and private land. See Figure 74. A majority of the FPU is private ownership, local public ownership, Bureau of Land Management (BLM) and a minor portion in the north is administered by the Stanislaus National Forest. There are five communities at risk containing most of the population within the County. The five communities include Columbia, Jamestown, Sonora, Stent and Tuttletown. These urban areas have numerous primary HVRAs that contribute to a significant percentage of the area classified in WUI Zones. The Wildland-Urban Interface Zone is located adjacent to the communities and has approximately 26 percent classified as middle to higher exposure hazard.

The Wildland Interface Intermix Zone has approximately 40 percent of the area classified as middle to highest exposure to HVRAs. The Wildland Urban Influence Zone has approximately 59 percent with a middle to highest exposure hazard. Exposure to private land also has a middle to highest hazard rating of 52 percent (Table 35). The overall exposure to the WUI zones, private land and corresponding primary HVRAs have a high complexity rating regarding fire suppression operations, evacuation planning, and hazard fuels treatments. Therefore, fuel treatments should prioritize those lands with a middle to high exposure hazard.

Table 35. FPU B exposure by hazard level acres and percent.

FPU B			WUI II	nterface one		ntermix one		ifluence one	Privat	e Land
Hazard Level	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent
Lowest	11,117	19%	446	40%	1,938	31%	7,240	17%	8,024	22%
Lower	14,443	25%	374	34%	1,745	28%	10,420	24%	9,976	27%
Middle	19,057	33%	264	24%	1,849	30%	14,982	35%	12,692	35%
Higher	10,258	18%	20	2%	500	8%	7,938	18%	4,644	13%
Highest	3,218	6%	4	0%	144	2%	2,808	6%	1,451	4%
Total	58,093	100%	1,109	100%	6,177	100%	43,388	100%	36,786	100%

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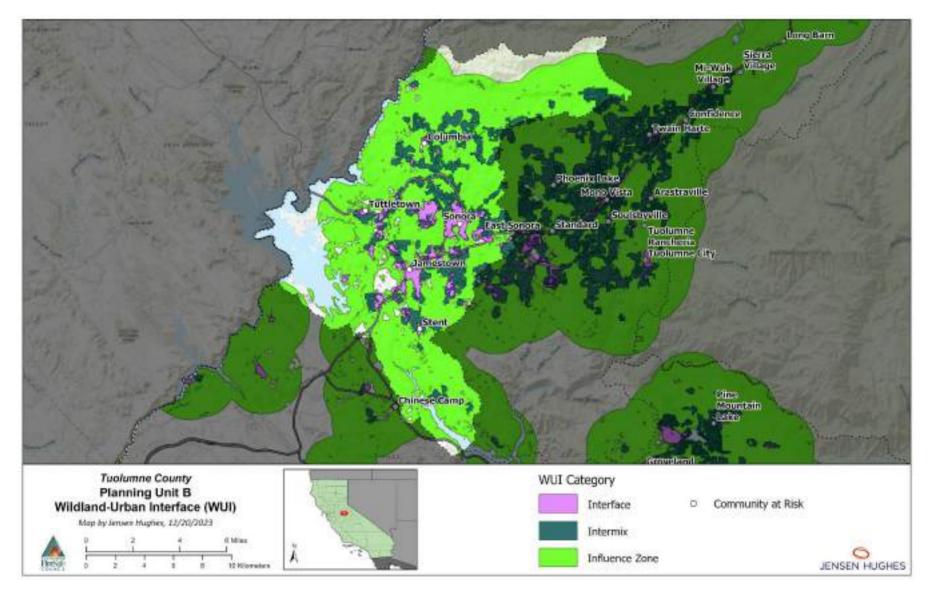


Figure 74. Wildland Urban Interface (WUI) Areas in FPU B

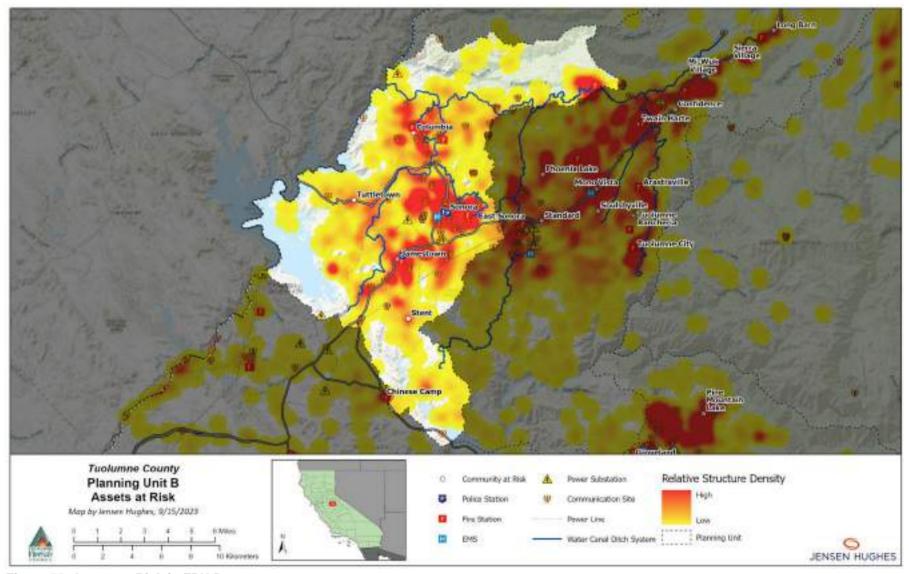


Figure 75. Assets at Risk in FPU B

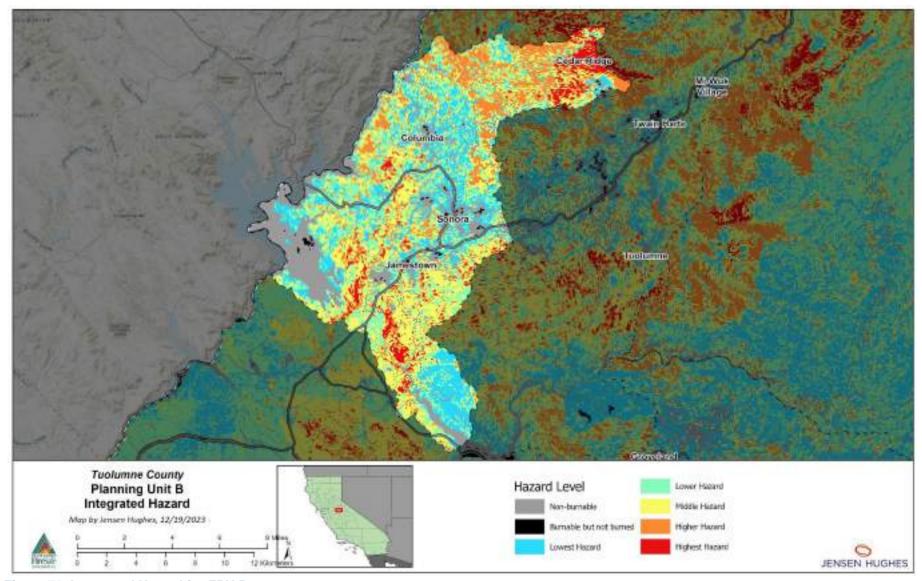


Figure 76. Integrated Hazard for FPU B

# **C.2.3** Existing and Planning Fuel Treatments

FPU B							
Status	Treatment Type	Acres	Percent				
Completed	Fuel Break	386	1%				
Completed	Fuel Reduction	2,736	4%				
Completed	Prescribed Burn	195	0%				
Completed	Roadside	1,213	2%				
Proposed	Fuel Reduction	2,005	3%				
Proposed	Roadside	99	0%				
Proposed	Unknown	8,818	13%				
Total Completed	N/A	4,531	6%				
Total Proposed	N/A	10,922	16%				
All Treatments	N/A	15,452	22%				
FPU Area	N/A	69,909	100%				

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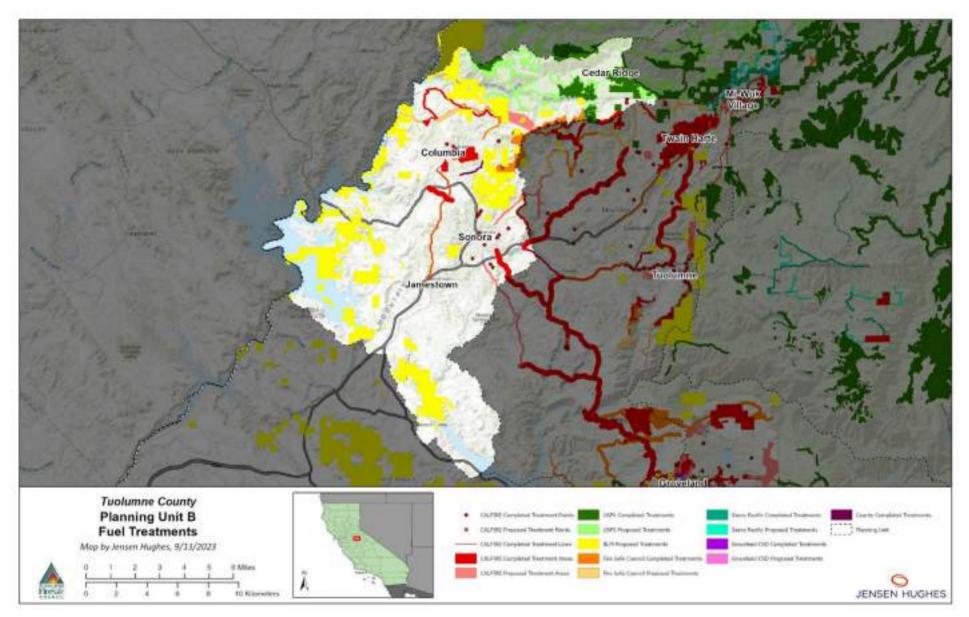


Figure 77. Map of Current and Proposed Fuel Treatments for FPU B

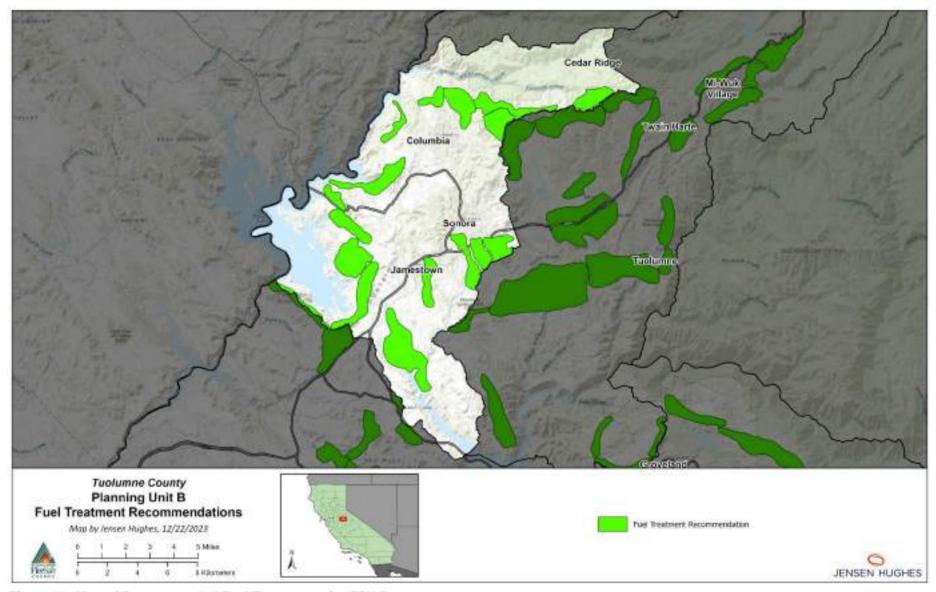


Figure 78. Map of Recommended Fuel Treatments for FPU B

#### C.3 FIRE PLANNING UNIT #C - SR 108 CORRIDOR

#### C.3.1 General Description

This FPU has one of the primary transportation routes (Highway 108) in the County. It is located east of FPU A and B, and it is approximately 224,472 acres. The northern boundary starts at the intersection of FPU A and the Middle Fork Stanislaus River following the county line northeast and then to the south to the intersection of Leavitt Peak. From Leavitt Peak the boundary follows the ridge to the west and southwest to the intersection of Kennedy Creek and the Middle Fork Stanislaus River. From there it follows the ridge to the south and southeast to East Flange Rock before proceeding on the ridge toward the headwaters of Piute Creek. The boundary continues to the west and southwest following the primary ridge to Burst Rock. From there, the boundary goes to Dodge Ridge and continues to the south to Summitt Ridge and Mount Lewis to the west. From Mount Lewis, it follows prominent terrain features to the south to the North Fork Tuolumne River and eventually goes to confluence with the Tuolumne River. The boundary follows the Tuolumne River for a short distance before going to the east and southeast to Jones Hill. From Jones Hill the boundary goes to the southwest ridge to Tip Top Peak and continues to the west to Highway 120 and FPU B intersection.

The primary vegetation types are correlated to elevation with grassland, montane hardwood conifer in the lower elevations and sierran mixed conifer in the middle to upper elevations. In general, there is lighter fuel loading in the lower elevations and heavier fuel loading in the higher elevations. There is also an increase of non-burnable fuels in the upper elevations. See *Figure 79* for fuel models across FPU C. During the fire season, the lower foothills are susceptible to northwest winds and as the elevation increases the prevailing wind switches to the southwest. Under high to extreme weather conditions, the wind direction and alignment with the South Stanislaus River and North Fork Tuolumne River will increase fire behavior characteristics. There have been several large fires through this FPU with the most recent Donnell Fire burning within the last five years.

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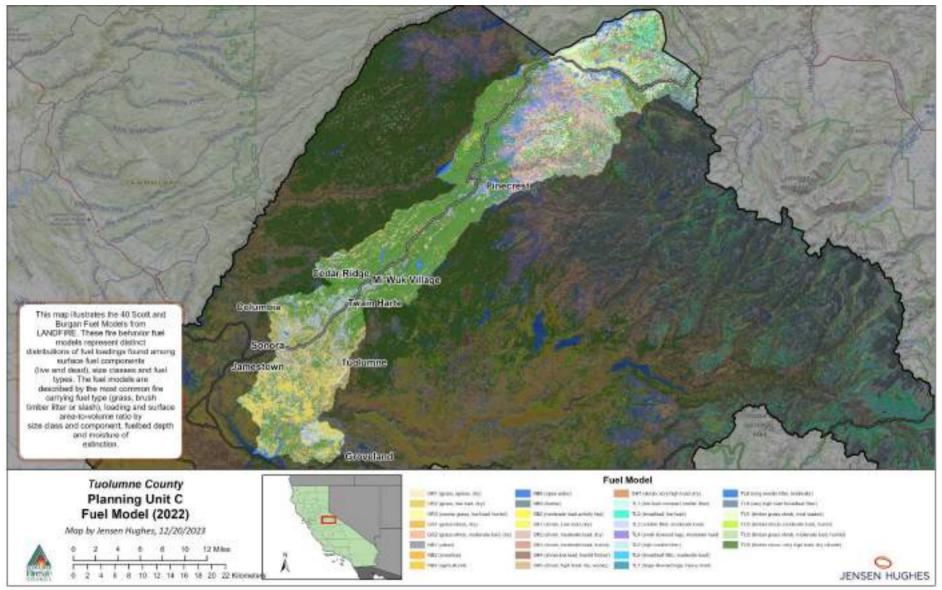


Figure 79. Fuel Models in FPU C

#### C.3.2 Exposure Analysis

This FPU has a high percentage exposure to HVRAs with an increased area associated with the Interface zones and private land. The FPU is a mixture of private, local public ownership, BLM, and the Stanislaus National Forest. There are 18 communities dispersed along Highway 108 corridor. Tuolumne City is in the lower elevations, Twain Harte and Mi Wuk Village are in the middle elevations, and Dardanelle and Kennedy Meadow are in the higher elevations with other communities dispersed throughout the FPU. These urban areas have numerous primary HVRAs that contribute to a significant percentage of the area classified in WUI Zones.

The Wildland-Urban Interface Zone is the smallest size and is located adjacent to the communities and has approximately 43 percent classified as middle to higher exposure hazard. The Wildland Interface Intermix Zone has approximately 43 percent of the area classified as middle to highest exposure to HVRAs. The Wildland Urban Influence Zone is the largest zone and has approximately 67 percent with a middle to highest exposure hazard. Exposure to private land also has a middle to highest hazard rating of 53 percent (Table 36). Current fuel treatments that the Forest Service has completed are not reflected in this analysis and would affect the exposure near Highway 108. The overall exposure to the WUI zones, private land and corresponding primary HVRAs have a high complexity rating regarding fire suppression operations, evacuation planning, and hazard fuels treatments. Future fuel treatments should prioritize those lands with a middle to high exposure hazard.

Table 36. FPU C exposure by hazard level acres and percent.

FPU C				terface ne	WUI Ir Zo	ntermix ne	WUI In Zo	fluence ne	Privat	e Land
Hazard Level	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent
Lowest	70,234	31%	96	25%	3,501	27%	8,631	12%	13,995	20%
Lower	54,736	24%	122	32%	3,853	30%	15,770	22%	18,594	27%
Middle	51,428	23%	146	38%	3,727	29%	26,012	36%	23,826	34%
Higher	33,072	15%	14	4%	1,569	12%	16,241	22%	10,772	15%
Highest	15,002	7%	4	1%	284	2%	6,401	9%	2,866	4%
Total	224,472	100%	382	100%	12,934	100%	73,055	100%	70,054	100%

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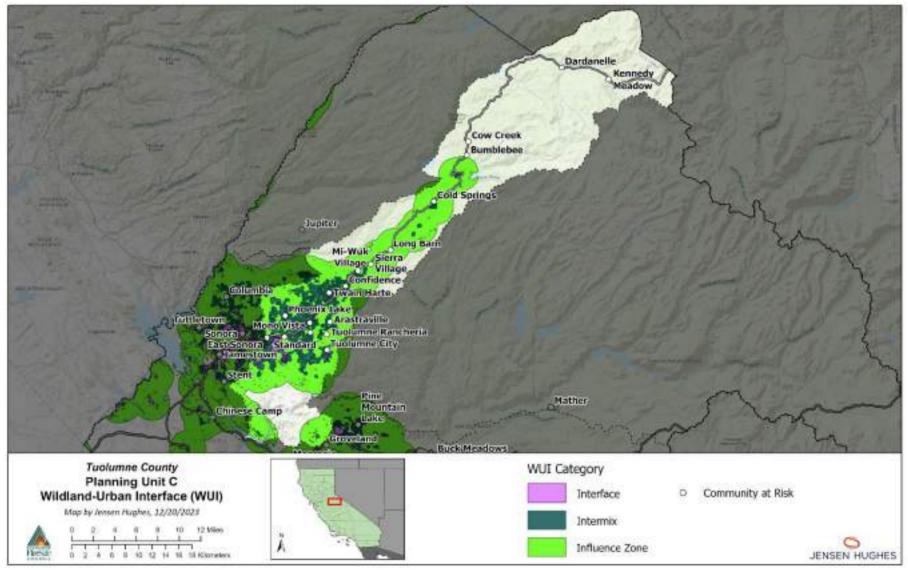


Figure 80. Wildland Urban Interface (WUI) Areas in FPU C

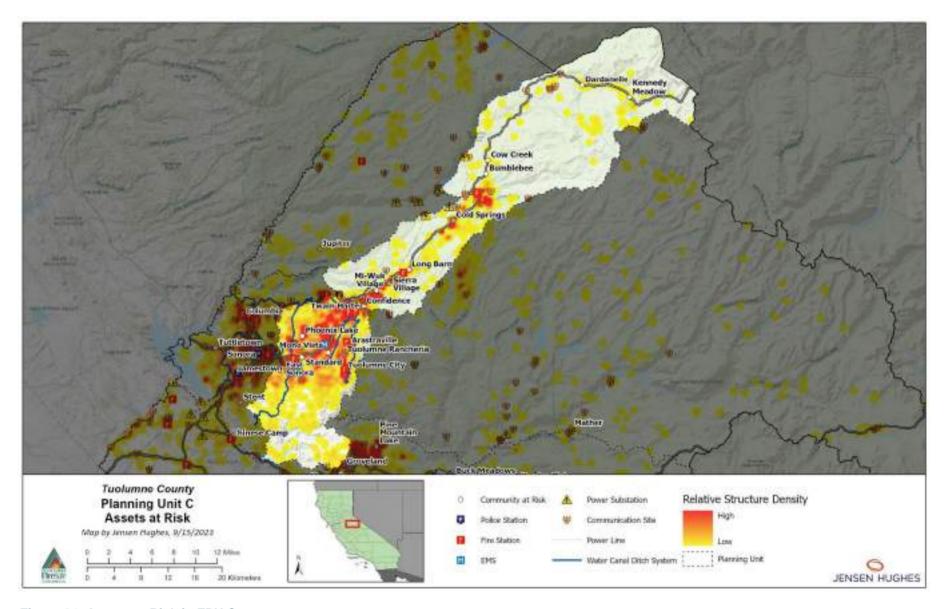


Figure 81. Assets at Risk in FPU C

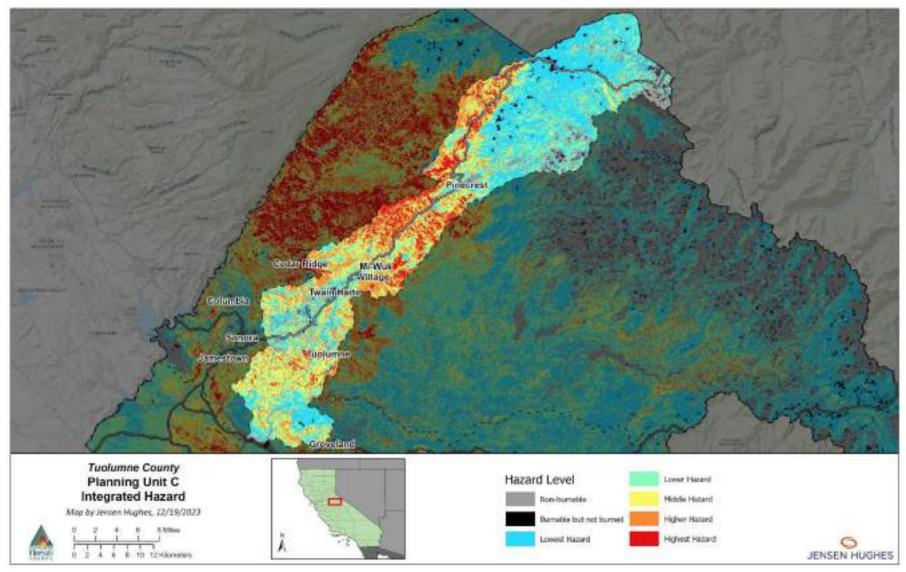


Figure 82. Integrated Hazard for FPU C

# C.3.3 Existing and Proposed Fuel Treatments for FPU C

	FPU C		
Status	Treatment Type	Acres	Percent
Completed	Fuel Break	1,701	1%
Completed	Fuel Reduction	29,436	12%
Completed	Prescribed Burn	13,627	5%
Completed	Roadside	3,887	2%
Completed	Unknown	33	0%
Proposed	Fuel Break	8,757	3%
Proposed	Fuel Reduction	15,733	6%
Proposed	Roadside	574	0%
Proposed	Unknown	569	0%
Total Completed	N/A	48,684	19%
Total Proposed	N/A	25,633	10%
All Treatments	N/A	74,317	29%
FPU Area	N/A	254,799	100%

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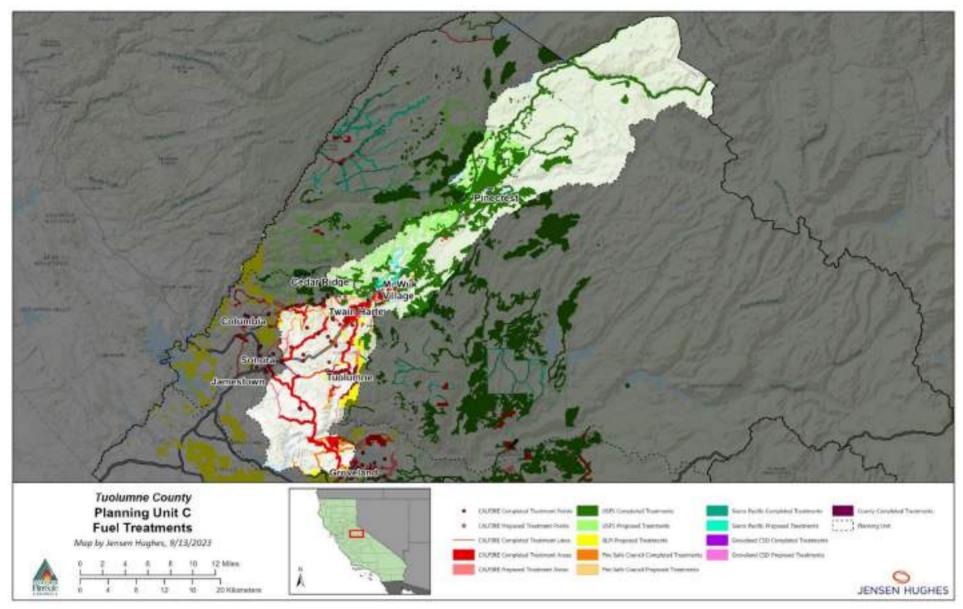


Figure 83. Map of Current and Proposed Treatments for FPU C

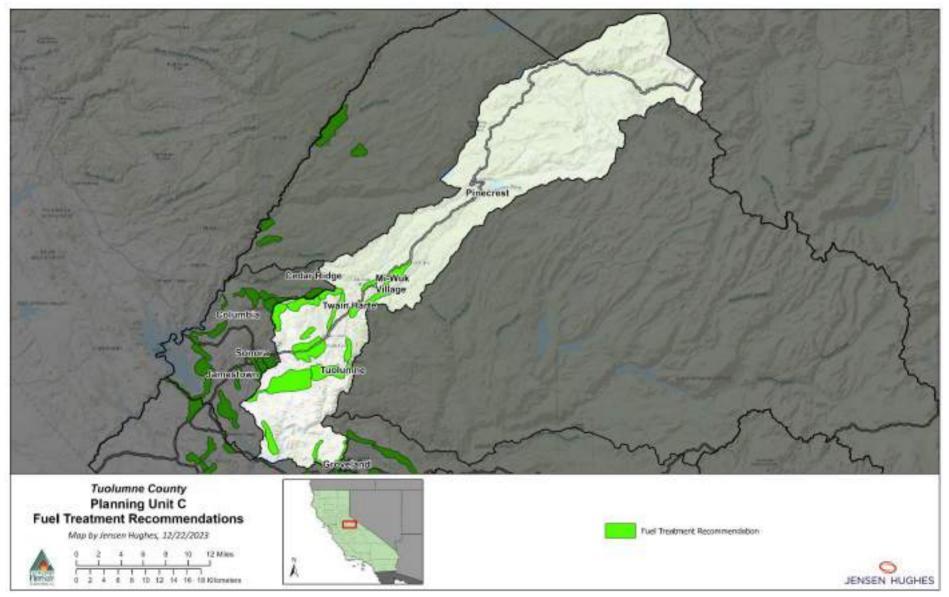


Figure 84. Map of Recommended Fuel Treatments for FPU C

#### C.4 FIRE PLANNING UNIT #D - EMIGRANT

#### C.4.1 General Description

The Emigrant Wilderness and Yosemite National Park make up a significant portion of this FPU. It is located east of FPU C and is the largest FPU at approximately 475,823 acres in size. The northern boundary starts at the intersection of FPU C and Leavitt Peak. It follows the Tuolumne and Mono County boundary to the southeast to Mount Gibbs. From Mount Gibbs, the boundary follows the County line to the south and west to Madera County intersection. The boundary continues to follow the Tuolumne and Madera County line to the north where it intersects the Mariposa County line. It continues to the north following Tuolumne and Mariposa County to Tioga Road. From Tioga Road, the boundary continues to the northwest to the intersection of FPU F. It continues to the west and southwest following Gravel Range west of the Middle Tuolumne River before going north crossing the Tuolumne River to Jawbone Ridge and Road NF-1N09 to the west to the Tuolumne River. The boundary continues to follow the Tuolumne River to the North Fork Tuolumne River and FPU C intersection.

The primary vegetation types are correlated to elevation and the extensive number of acres burned over the last 3 decades with grassland, montane hardwood conifer, sierran mixed conifer and unburnable acres throughout. See *Figure 85* for fuel models across FPU D. The Rim Fire (2017) burned over 250,000 acres that created conditions that favor lighter fuel loadings but those areas that haven't burned contain high fuel loads. This FPU has the most non-burnable fuels (rock and water) throughout the County. During the fire season, the prevailing wind is from the southwest. Under high to extreme weather conditions, the wind direction and alignment with the Tuolumne River drainages will increase fire behavior characteristics. There have been several large fires in the southern and middle portion of the FPU over the last 30 years.

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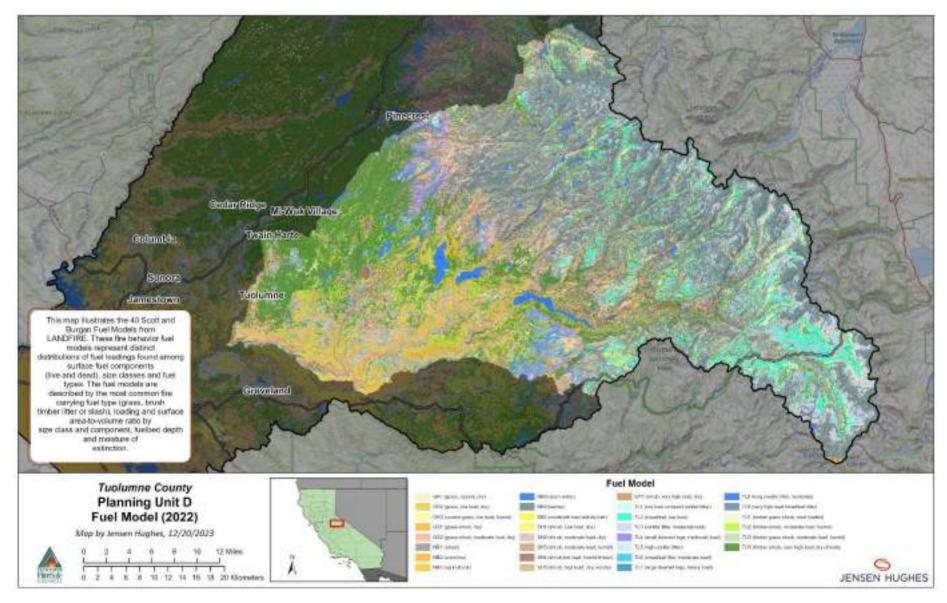


Figure 85. Fuel Models in FPU D

#### C.4.2 Exposure Analysis

There is a low percentage of exposure to HVRAs within the FPU with a small percent of the area in the WUI Influence zone, private land, and one community (Mather) at risk. Most of this FPU is designated as wilderness and is administered by the Stanislaus National Forest and Yosemite National Park. The Wildland-Urban Interface Zone is the smallest size and is located adjacent to the communities and has approximately 70 percent classified as middle to higher exposure hazard. Exposure to private land also has a middle to highest hazard rating of 25 percent (Table 37). There have been several large fires over the last 30 years that contribute to a lower exposure to HVRAs within the FPU. Future fuel treatments should prioritize the private lands, the community of Mathers, and the WUI Influence Zone with a middle to high exposure hazard. In addition to those areas, exposure to Highway 120 should be a priority for treatment of hazardous fuels.

Table 37. FPU D exposure by hazard level acres and percent.

FPU D			WUI Infl	uence Zone	Privat	e Land
Hazard Level	Acres	Percent	Acres	Percent	Acres	Percent
Lowest	219,962	46%	501	9%	10,005	32%
Lower	177,671	37%	1,110	21%	12,735	41%
Middle	52,567	11%	1,597	30%	5,419	17%
Higher	24,009	5%	2,107	40%	2,761	9%
Highest	1,614	0%	17	0%	124	0%
Total	475,823	100%	5,332	100%	31,044	100%

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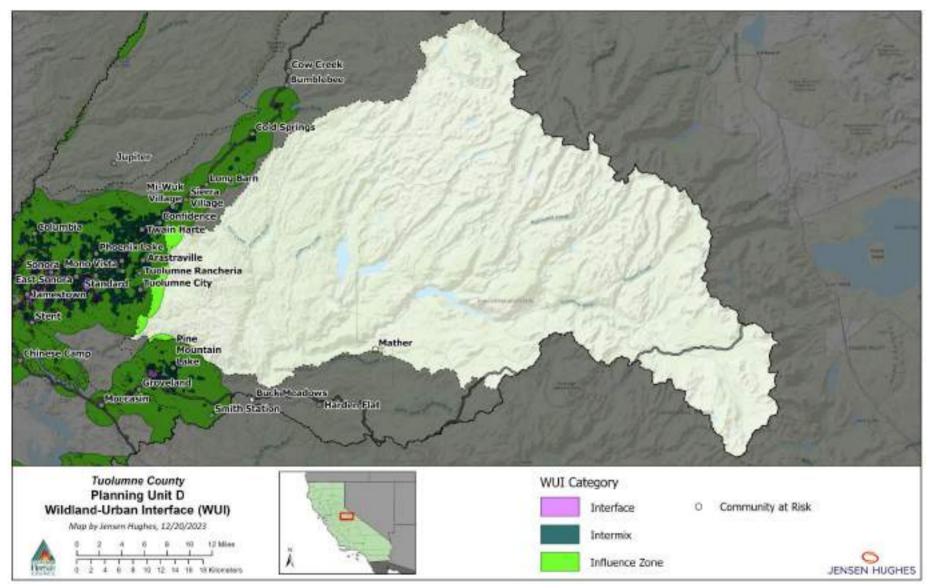


Figure 86. Wildland Urban Interface (WUI) Areas in FPU D

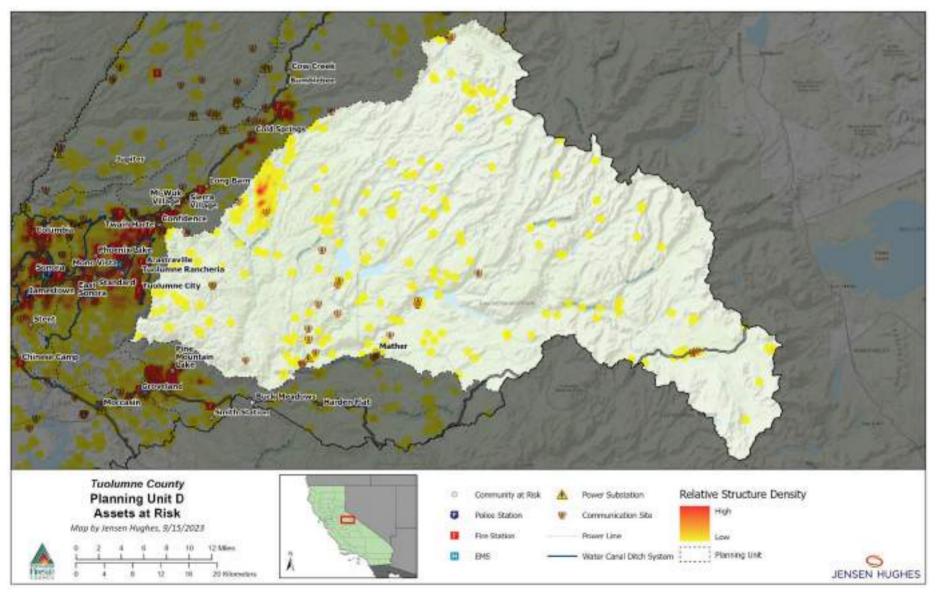


Figure 87. Assets at Risk in FPU D

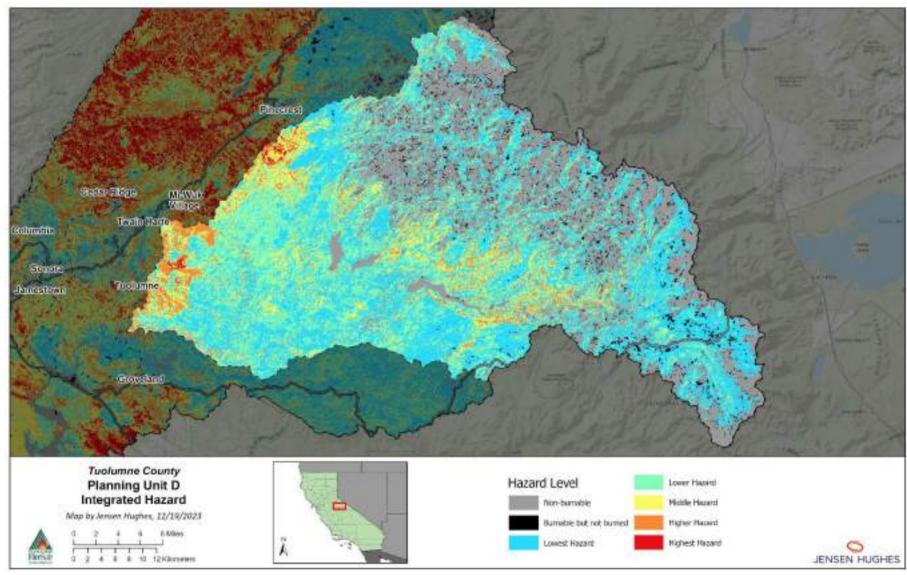


Figure 88. Integrated Hazard for FPU D

## C.4.3 Existing and Proposed Fuel Treatments for FPU D

	FPU D		
Status	Treatment Type	Acres	Percent
Completed	Fuel Break	1,190	0%
Completed	Fuel Reduction	21,211	3%
Completed	Prescribed Burn	20,683	3%
Proposed	Fuel Break	1,375	0%
Total Completed	N/A	43,084	6%
Total Proposed	N/A	1,375	0%
All Treatments	N/A	44,459	6%
FPU Area	N/A	686,951	100%

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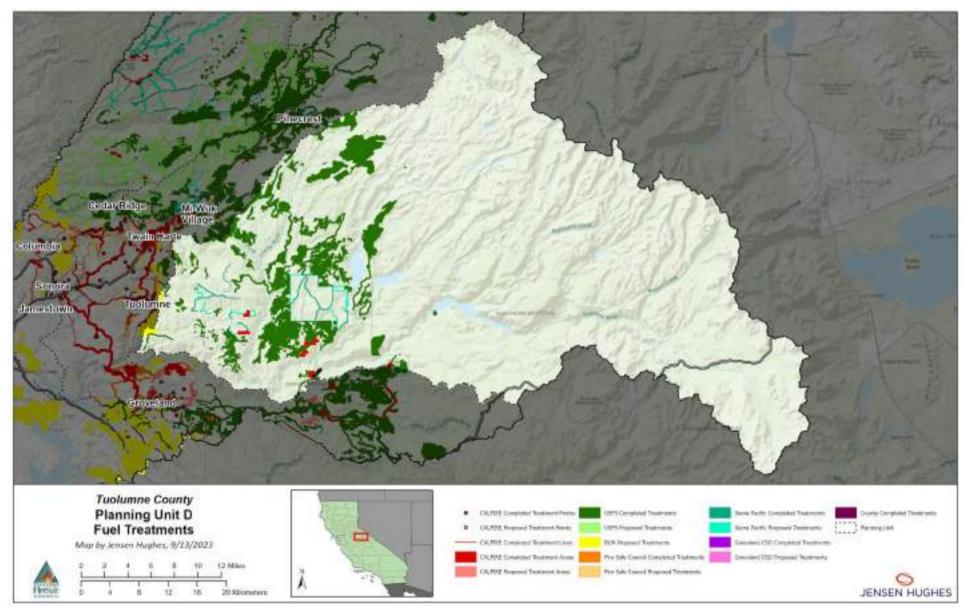


Figure 89. Map of Current and Proposed Treatments for FPU D

There are no recommended fuel treatments for FPU D.

Figure 90. Map of Recommended Fuel Treatments for FPU D

#### C.5 FIRE PLANNING UNIT #E - WEST COUNTY

#### C.5.1 General Description

FPU E east boundary follows the western boundaries of FPUs B, C, and F and is approximately 140,415 acres in size. The boundary follows the Tuolumne and Mariposa County line starting at the intersection of Boneyard Road and South Ponderosa Way. The boundary continues to the west and south intersecting Highway 132 and Merced Falls Road. The boundary turns north at the intersection of Stanislaus and Merced Counties. It continues to follow the Stanislaus and Tuolumne boundary to the northwest to the intersection of Calaveras County and follows the Stanislaus River to the Northeast to the intersection of FPU A at New Melones Lake.

With lower elevations, the primary vegetation types are annual and perennial grassland, mixed chaparral, and montane hardwood-conifer. Most of the fuels are light grass or grass shrub, but the chaparral vegetation types have heavier fuel loading in the shrub fuels. Non-burnable fuels are associated with water or urban areas. See *Figure 91* for fuel models across FPU E. During the fire season, this area is susceptible to northwest winds. Under high to extreme weather and low fuel moisture conditions, the grass and shrub fuel types can demonstrate rapid rates of spread and high to extreme flame lengths. There have been numerous large fires through this FPU with the most recent Moc Fire (2020) burning within the last five years. Most large fires will have a short-term reduction in hazard in the vegetation and fuel types.

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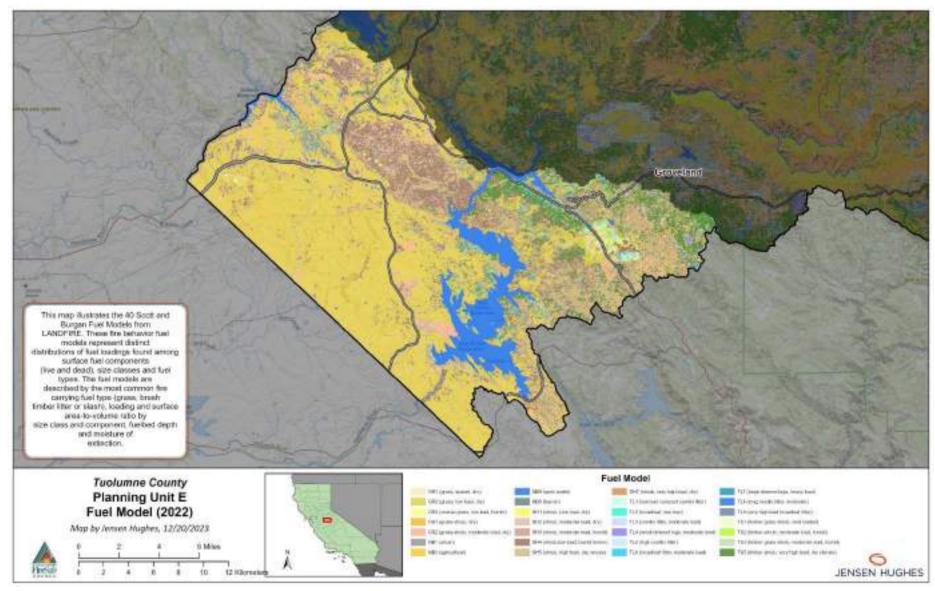


Figure 91. Fuel Models in FPU E

#### C.5.2 Exposure Analysis

This FPU has a high percentage of the area in WUI zones and private land and has high exposure to HVRAs. The FPU is a mixture of private, local public ownership and BLM. There are 3 communities at risk Chinese Camp, Lake Don Pedro, and Moccasin. Primary travel highways 108 and 120 are in the north and east portion of the county. The urban areas have numerous primary HVRAs that contribute to a significant percentage of the area classified in WUI Zones. The Wildland-Urban Interface Zone is the smallest size (120 acres) and is located adjacent to the communities and has approximately 20 percent classified as middle to higher exposure hazard. The Wildland Interface Intermix Zone has approximately 44 percent of the area classified as middle to highest exposure to HVRAs. The Wildland Urban Influence Zone is the largest zone and has approximately 51 percent with a middle to highest exposure hazard. Exposure to private land also has a middle to highest hazard rating of 52 percent (Table 38). There are numerous ranches and other private ownership that are dependent on grass within the FPU. By grazing these areas, grass fuels are reduced and therefore reduce potential fire behavior and exposure. As the elevation increases, shrub and timber understory fuels contribute to increased exposure to the WUI zones and evacuation planning. Future fuel treatments should prioritize those lands with a middle to high exposure hazard.

Table 38. FPU E exposure by hazard level acres and percent.

FPU E				nterface one		Intermix one		nfluence one	Privat	e Land
Hazard Level	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent
Lowest	15,540	11%	36	33%	191	22%	7,516	14%	12,075	11%
Lower	47,364	34%	52	48%	291	34%	18,415	34%	39,156	37%
Middle	60,087	43%	20	19%	348	41%	20,238	37%	48,266	45%
Higher	10,455	7%	1	1%	26	3%	5,605	10%	4,427	4%
Highest	6,968	5%	-	0%	2	0%	2,348	4%	3,214	3%
Total	140,415	100%	109	100%	858	100%	54,123	100%	107,138	100%

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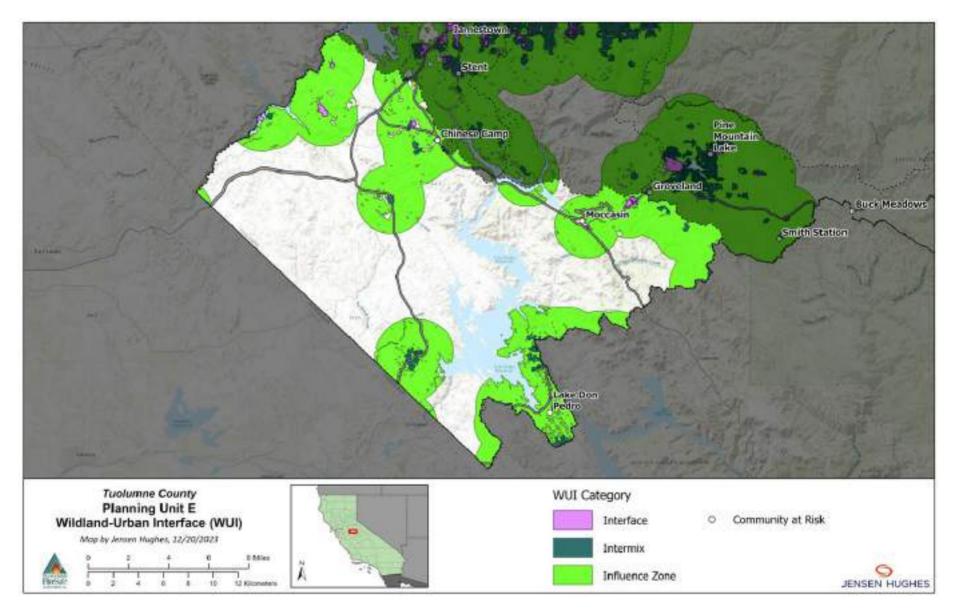


Figure 92. Wildland Urban Interface (WUI) Areas in FPU E

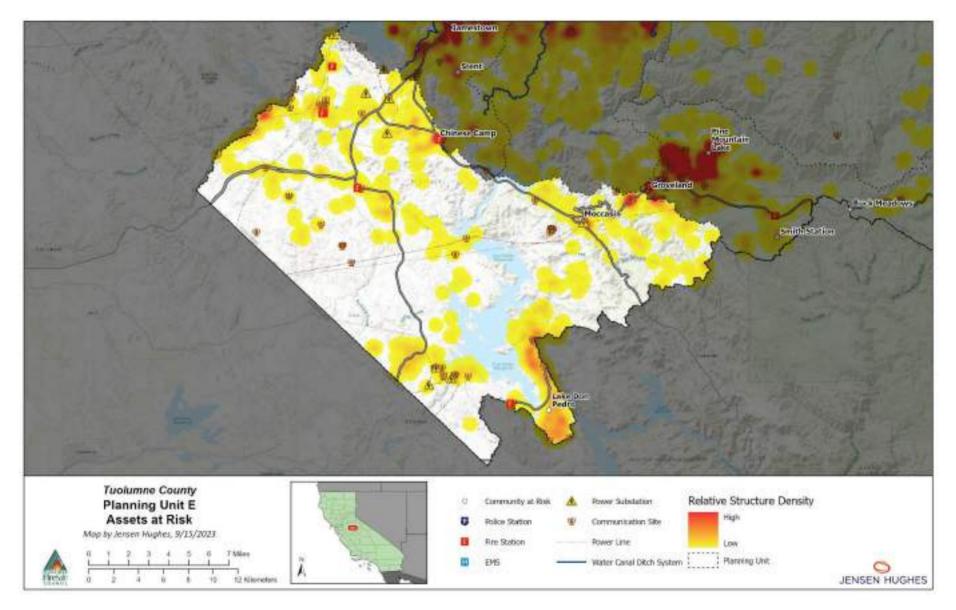


Figure 93. Assets at Risk in FPU E

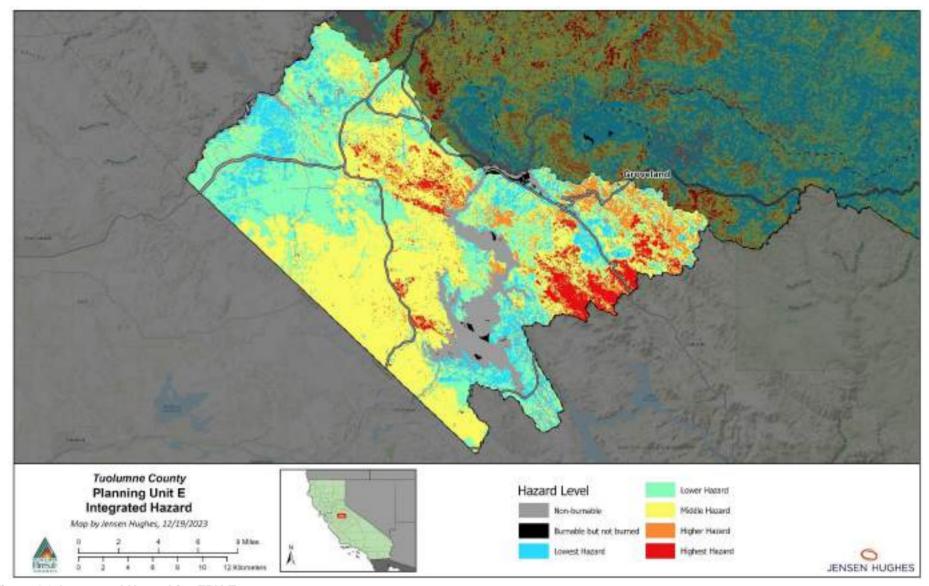


Figure 94. Integrated Hazard for FPU E

### C.5.3 Existing and Proposed Fuel Treatments for FPU E

	FPU E		
Status	Treatment Type	Acres	Percent
Completed	Fuel Reduction	672	0%
Completed	Prescribed Burn	143	0%
Completed	Roadside	391	0%
Proposed	Fuel Break	1,220	1%
Proposed	Unknown	19,766	13%
Total Completed	N/A	1,206	1%
Total Proposed	N/A	20,986	13%
All Treatments	N/A	22,192	14%
FPU Area	N/A	156,288	100%

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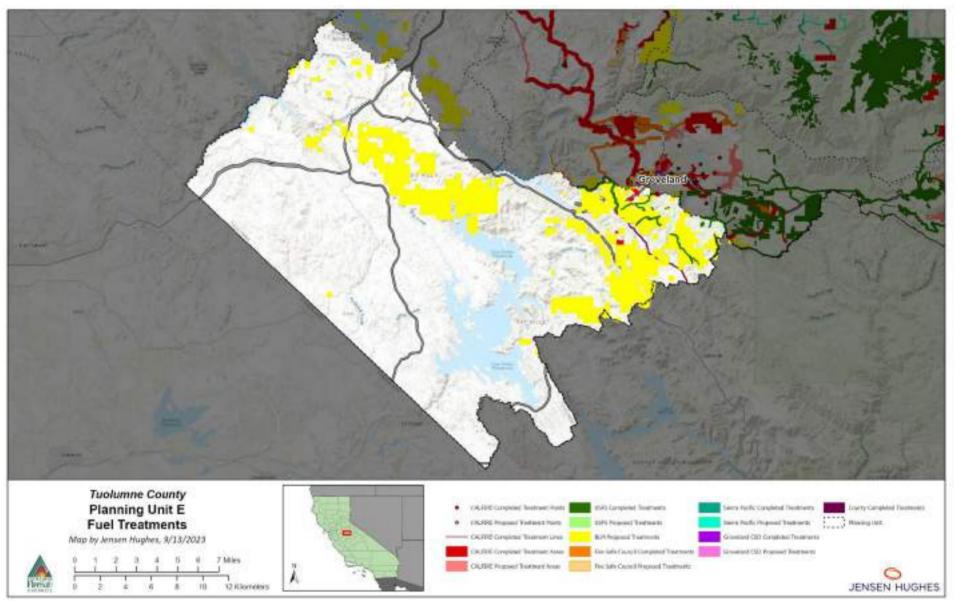


Figure 95. Map of Current and Proposed Treatments for FPU E

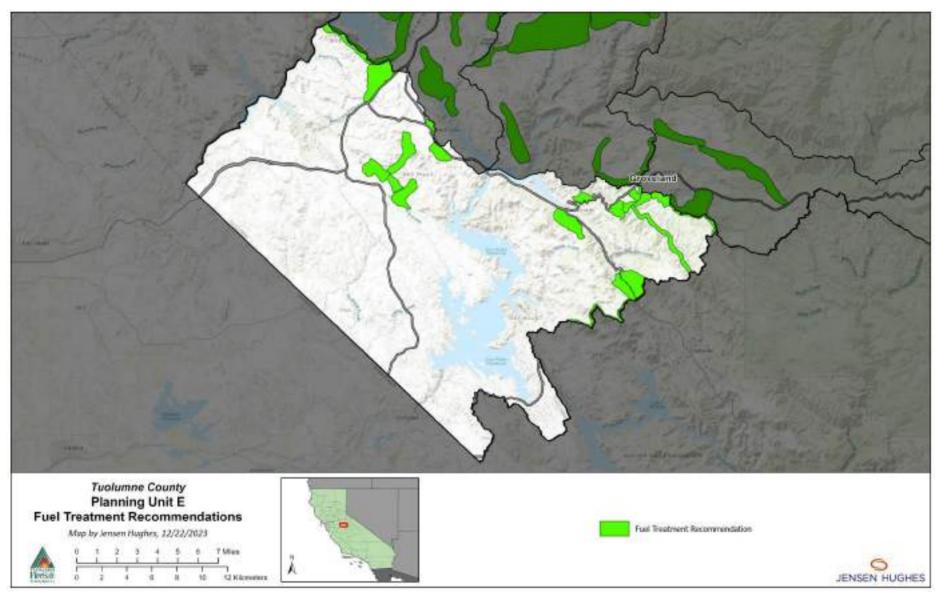


Figure 96. Map of Recommended Fuel Treatments for FPU E

#### C.6 FIRE PLANNING UNIT #F - GROVELAND SOUTH COUNTY

#### C.6.1 General Description

FPU F west boundary follows the eastern boundaries of FPU's C and E, and the north boundary follows the southern boundary of FPU D. This FPU is approximately 103,002 acres in size. The northeastern boundary starts at the intersection of FPU D and the Tuolumne and Mariposa County line. The boundary follows the Tuolumne and Mariposa County line to the west where it intersects FPU E at South Ponderosa Way and Boneyard Road.

The primary vegetation types are chaparral, pine, and montane hardwood-conifer. Most of the fuels are grass and shrub types but within the pine and montane conifer timber litter fuel types increase. Non-burnable fuels are associated with water or urban areas. See *Figure 97* for fuel models across FPU F. During the fire season, this area has southwest winds but in lower elevations northwest are frequent. Under high to extreme weather and low fuel moisture conditions, the grass and shrub fuel types can demonstrate rapid rates of spread and high to extreme flame lengths. The terrain within the South Fork Tuolumne River allows for wind and slope alignment, increasing fire spread and intensity. There have been numerous large fires through this FPU with the most recent Rim Fire (2017) burning a large percent of the FPU. Most large fires will have a short-term reduction in hazard in the vegetation and fuel types.

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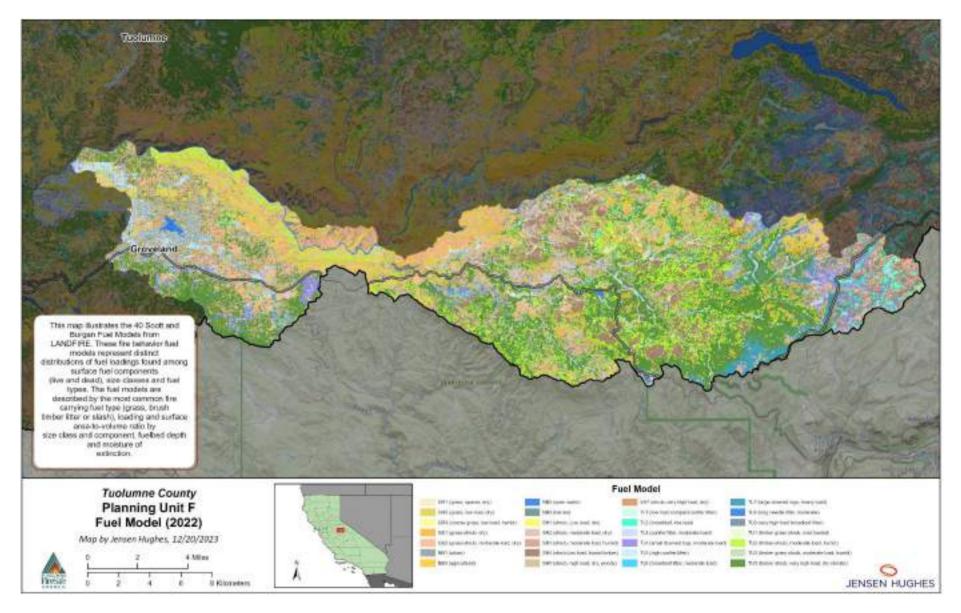


Figure 97. Fuel Models in FPU F

#### C.6.2 Exposure Analysis

The FPU is a mixture of private, local public ownership, BLM, Stanislaus National Forest, and Yosemite National Park. The FPU has a moderate percentage of the area in WUI zones and private land. There are 5 communities at risk (Buck Meadows, Groveland, Harden Flat, Pine Mountain Lake and Smith Station). Highway 120 runs through this FPU and is a primary travel route to Yosemite and this travel corridor has several primary HVRAs that contribute to a moderate percentage of the area classified in WUI Zones. The Wildland-Urban Interface Zone is the smallest size (255 acres) and is located adjacent to the communities and has approximately 3 percent classified as middle to higher exposure hazard. The Wildland Interface Intermix Zone has approximately 9 percent of the area classified as middle to highest exposure to HVRAs. The Wildland Urban Influence Zone is the largest zone and has approximately 32 percent with a middle to highest exposure hazard. Exposure to private land also has a middle to highest hazard rating of 22 percent (Table 39). As the elevation increases, shrub and timber understory fuels contribute to increased exposure to the WUI zones and evacuation planning. Future fuel treatments should prioritize restoration of those acres with middle to high exposure, and they should also focus on maintaining areas that have lower hazards.

Table 39. FPU F exposure by hazard level acres and percent.

FPU F				iterface one		ntermix one		fluence one	Privat	e Land
Hazard Level	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent
Lowest	46,795	45%	230	90%	1,021	65%	8,907	39%	7,241	48%
Lower	43,477	42%	17	7%	397	25%	6,589	29%	4,484	30%
Middle	8,864	9%	8	3%	106	7%	4,670	20%	2,163	14%
Higher	3,416	3%	-	0%	37	2%	2,260	10%	989	7%
Highest	451	0%	-	0%	-	0%	435	2%	95	1%
Total	103,002	100%	255	100%	1,561	100%	22,861	100%	14,972	100%

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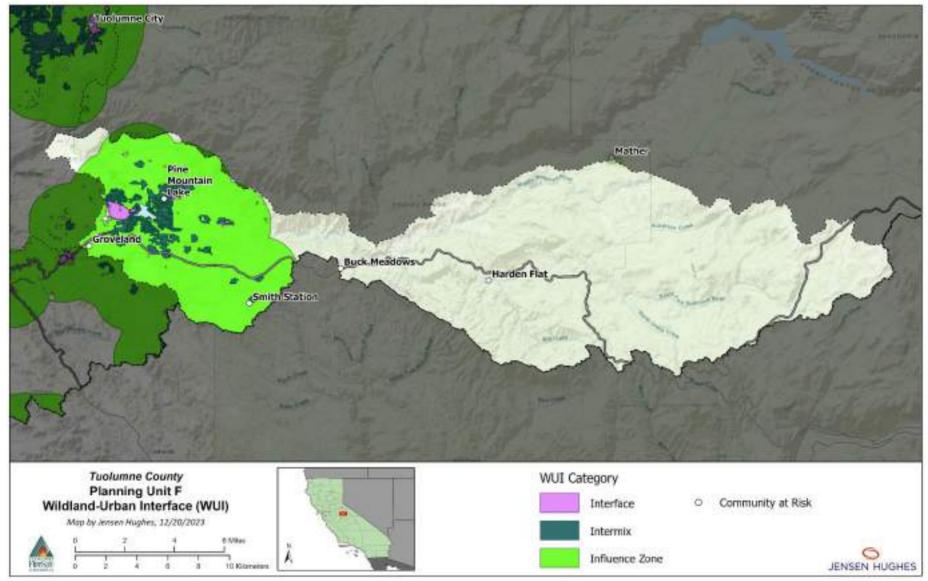


Figure 98. Wildland Urban Interface (WUI) Areas in FPU F

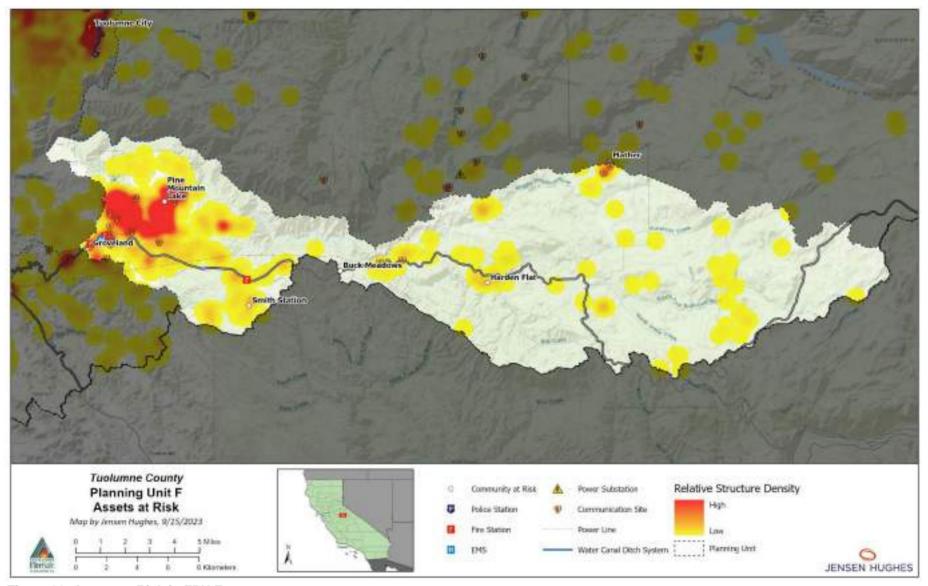


Figure 99. Assets at Risk in FPU F

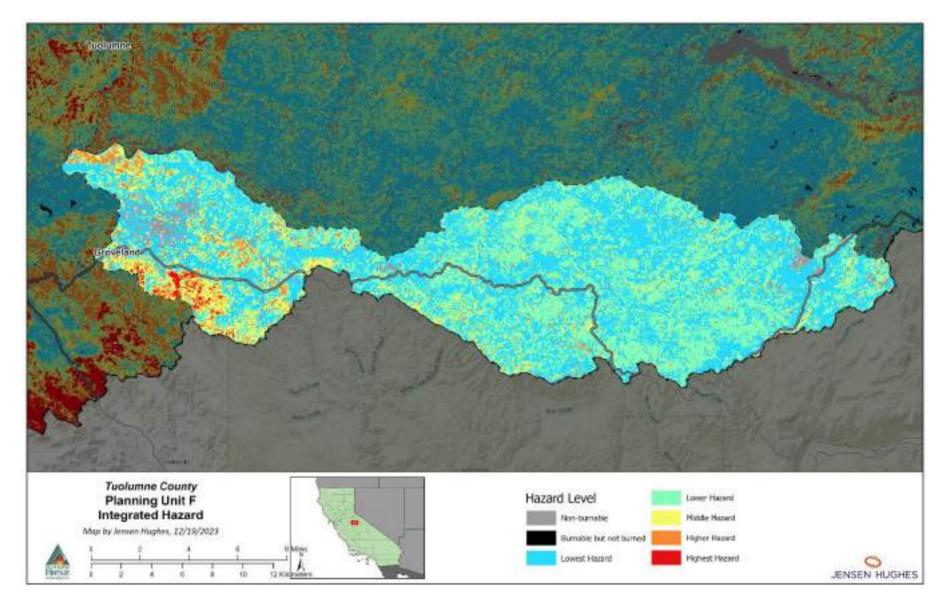


Figure 100. Integrated Hazard for FPU F

## C.6.3 Existing and Proposed Fuel Treatments for FPU F

	FPU F		
Status	Treatment Type	Acres	Percent
Completed	Fuel Break	926	1%
Completed	Fuel Reduction	16,862	16%
Completed	Prescribed Burn	9,728	9%
Completed	Roadside	936	1%
Completed	Unknown	258	0%
Proposed	Fuel Reduction	581	1%
Proposed	Prescribed Burn	1,064	1%
Proposed	Unknown	757	1%
Total Completed	N/A	28,710	27%
Total Proposed	N/A	2,401	2%
All Treatments	N/A	31,112	29%
FPU Area	N/A	107,397	100%

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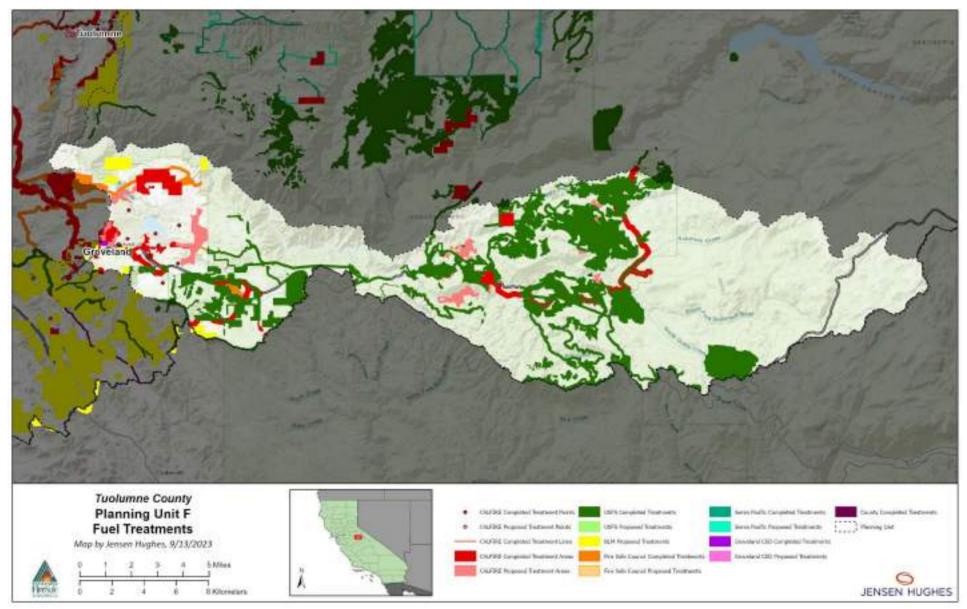


Figure 101. Map of Current and Proposed Fuel Treatments for FPU F

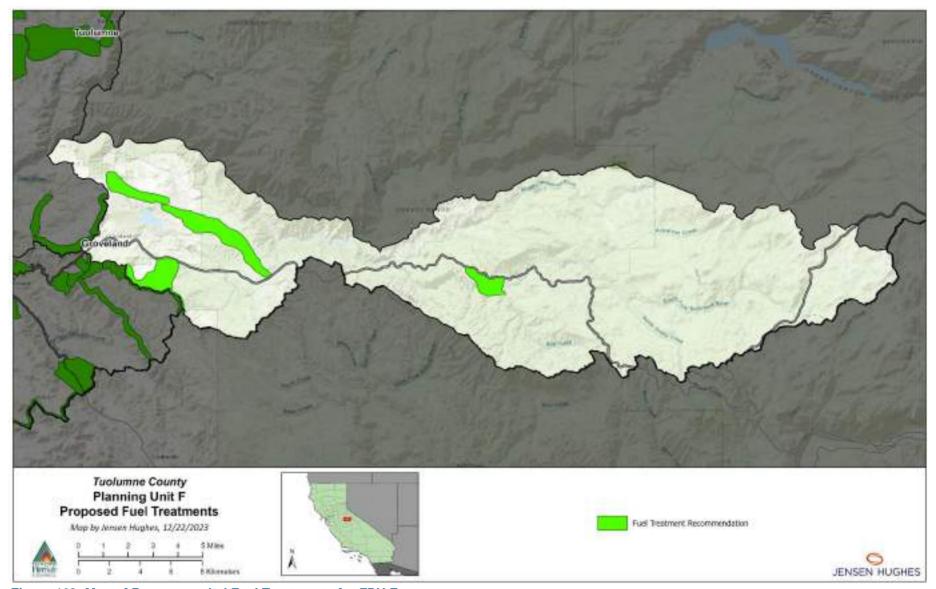


Figure 102. Map of Recommended Fuel Treatments for FPU F

## Appendix D Firefighting Capacity and Fire Behavior Correlation

Evaluating the effectiveness of firefighting resources against wildfire is a complex matter. On the same wildland fire there are locations where firefighters can be successful in defending structures or securing portions of the fire's perimeter, while at the same moment in time firefighters elsewhere on the fire are being over matched by the intensity and rate of spread of the fire. Elements such as the alignment of the fire spread (head or flacking fire versus backing fire) can significantly change the fireline intensity faced by firefighters. Other elements which can influence firefighter success include assess, topography, the ability to secure a safe operational space, and the availability of aerial resources to support ground operations.

A common standard used to evaluate the potential of firefighting resources to succeed on the fire ground are fire suppression interpretations based on flame length found in the Wildland Fire Incident Management Field Guide (NWCG, 2014). Generally, these interpretations evaluate what type of firefighting resources would be required to successfully suppress the head of a wildland fire based on the observed fire length (Table 40). Since flame lengths can be directly related to potential firefighting success, these breakpoints are used for classifying modeled fire behavior throughout the CWPP.

Table 40. Suppression capabilities based on flame lengths found at the flaming front of a wildfire

	<u> </u>	
Flame Lengths (feet)	Fireline Intensity (BTU/foot/Second)	Interpretation
0-4	0-100	Fires can be generally attacked at the head or flanks by persons using hand tools. Handlines should hold the fire
4-8	100-500	Fires are too intense for direct attack at the head of the fire by persons with hand tools. Handlines cannot be relied upon to hold the fire. Equipment such as dozers, engines and retardant aircraft can be effective.
8-11	500-1,000	Fires may present serious control problems – torching out, crowning and spotting. Control efforts at the head of the fire will probably be ineffective.
11+	1,000+	Crowning, spotting and major fire runs are common. Control efforts at the head of the fire are ineffective.

**Caution:** These are not guidelines to personnel safety; fires can be dangerous at any level of intensity; Wilson (1977) has shown that most fatalities occur on small fires or isolated sections of large fires. Source: NWCG Fireline Handbook, Appendix B, Fire Behavior, April 2006

The classifications in Table 40 provide insights into resource capabilities but can be misinterpreted if applied out of context. For example, 8-foot flame lengths can be successfully suppressed by engine crews using hose lays, if they are able to approach the fire from a direction where convective and radiant heat are focused away from the firefighter. The same 8-foot flame length will likely overwhelm firefighters positioned in a manner where they are receiving large portions of the heat flux from the fire. This can be the case where firefighters are performing structure defense or attempting a frontal assault on the advancing fire front. It has been found that convective energy transferred by wind gusts, fire whirls, or air turbulence can significantly increase the total heat transfer to the firefighter and increase the required safety zone size necessary to engage the fire (Butler, Cohen, 1998).

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## Appendix E Fuel Treatment Prescriptive Guidelines and Techniques

This appendix provides fuel treatment prescriptions and guidelines to assist the County and property-owners in implementing fuel treatments. This prescriptive guidance incorporates fire behavior assessment factors and best management practices (BMPs) for achievable wildfire hazard mitigation actions. Understanding and working within BMP standards will help minimize impacts to surrounding natural resources.

#### **E.1 FUEL TREATMENT TYPES**

#### E.1.1 Prescribed Fire (Broadcast and Underburn)

The initial entry of prescribed fire (broadcast or underburn) is designed to interrupt horizontal and vertical continuity of dead and live fuels within the treatment areas. The objective would be to achieve an overall 40 to 60 percent reduction of predicted fireline intensities. This treatment can be an initial entry or a follow up to a mechanical treatment. Prescribed burning near or adjacent to Class One Airsheds must follow national and state requirements and reporting procedures.

#### E.1.2 Grazing

Grazing of domestic livestock such as sheep, goats and cattle can be an efficient and cost-effective means to control grasses and brush and can greatly benefit soil health and the ecosystem. Grazing animals can browse noxious plants that are difficult to manage and greatly reduce fuels on slopes too steep for easy maintenance.

#### E.1.3 Mechanical or Hand Treatments

#### E.1.3.1 Mastication

Treatment through mastication is intended to reduce flame lengths to four feet or less to reduce rate of spread by a minimum of 50 percent from the existing condition. Smaller diameter standing brush and trees should be masticated throughout the treatment areas. The fuel bed depth of masticated material should be kept at depths that don't increase flame lengths following treatment. No mastication should occur on slopes greater than 40 percent unless the masticating head can reach fuels on steeper slopes. Masticated material may be treated with prescribed fire after treatment to reduce dead fuel loading or to control sprouting of shrub species within the treatment areas.

Masticated fuelbeds are different than the natural (timber and shrub) fuelbeds (Kane and others 2009). In some cases, the fragmentation of material can increase the surface fuel loadings requiring an additional treatment of the fuels to reduce the overall hazard (flame length and scorch heights). Prescribed fire treatments such as broadcast, or underburning will further reduce the overall hazard. The two indicators for prescribed fire treatments are an increase in fuel loading and fuel bed depth (Knapp and others 2008). Prescribed fire treatments could be necessary when masticated fuels are characterized by fuel bed depths that are greater than 1 feet and fuel loadings in the less than 3-inch size class that are representative of the slash blowdown fuel models (Scott and Burgan 2005) identified in the table below.

Fuel Model	F	Fuel Load (t/ac)				
Code	1-hr	10-hr	100-hr	(ft)		
SB2	4.5	4.25	4	1		
SB3	5.5	2.75	3	1.2		

#### E.1.3.2 Mechanical or Hand Thinning

Treatment through thinning and brush cutting is intended to reduce flame lengths to four feet or less. Conifer stands would be thinned from below, removing smaller trees to create a random spacing pattern. Thinning from below would occur to retain a high percentage of canopy closure. All shrubs would be removed from the base of the tree (conifer or oak). Woody material that is removed from site may be utilized as firewood, timber, or biomass for energy production. Public fuelwood collection may occur when appropriate.

Piles from initial treatment activities (i.e., thinning or brush cutting) should be kept at manageable size to reduce impacts to soils and adjacent vegetation. Piles should be clear of the bole of the nearest tree and would be located outside of the dripline of retained trees where feasible. Fire from ignited piles may be allowed to creep through the adjacent understory fuels within the treatment areas; however, these understory fuels would not be directly ignited as part of the pile burning operation.

#### E.1.4 Roads and Fuel Breaks

Removing vegetation for road maintenance includes the need for fuels reduction along roadways to provide safe escape routes during emergencies. A combination of mechanical, hand thinning, and prescribed fire treatments will depend on the current vegetation and fuel conditions. Additional maintenance activities could include removing roadside brush (e.g., mowing, chipping, hand cut, lop and scatter, pile and burn) and repairing water bars; grading; cleaning ditches and culverts; and removing small trees or brush and limbs that interfere with traffic and/or visible sight distance around curves.

#### **E.2 ROADSIDE FUEL TREATMENT PRESCRIPTIVE GUIDELINES**

The following table describes the intensity levels for roadside and driveway fuel treatments:

Table 41. Roadside Fuel Treatment Prescriptive Guidelines

	ruer Treatment Frescriptive Guidennes
Location →	Primary Zone (A)
	(10' minimum; up to 50')
Fuel Type -	(distance varies with terrain & accessibility)
Grass/ Forbs	Reduce fuel depth to less than 2-inch.
Surface dead/down material	Remove all large (>3-inches diameter) dead/down material.
Chaparral/Shrub	Remove all chaparral/shrub vegetation within this zone. Retain the root system to provide for soil stabilization
Trees Overstory (without chaparral/shrub understory)	Prune all trees to 6-feet or ½ of the live crown height, whichever is less. Remove dead standing trees and branches extending over roadways to a minimum height of 13 feet 6 inches.
Trees Overstory	Thinning specifications, same as Trees Overstory (without understory), but remove

Location →	Primary Zone (A) (10' minimum; up to 50')
Fuel Type -	(distance varies with terrain & accessibility)
(with chaparral/shrub understory)	all understory chaparral/shrubs below trees in this zone.

#### **E.3 VEGETATION/FUEL TREATMENT PRESCRIPTIVE GUIDELINES**

The following table describes prescriptive guidelines for vegetation management in the HIZ.

Table 42. Vegetation Management Prescriptive Guidelines

Location →	Primary Defense Zone (A) (0 – 30' from a structure)	Fuel Reduction Zone (B) (30' – 100' from a structure)	Fuel Reduction Zone (C) (100' and greater from a structure)
Fuel Type <sup>–</sup>	Based on California Public R Recomme	esources Code 4291 and HIZ endations	Based on Firefighter Safety
Grass/ Forbs	Reduce fuel depth to 2-inches maximum.	Reduce grass height to 4" or less. Longer grass in discontinuous open areas is acceptable.	Treatment may not be needed.
Surface Dead/Down Material	Remove all dead/down materials.	Reduce dead/down flammable material to < 3" depth	Reduce heavier pockets of dead/down flammable material to < 5" depth.
Chaparral/ Shrub	Remove all but individual specimen chaparral plants. Individual ornamental/native shrubs should be spaced at a minimum 2x shrub height.	Remove up to 75 percent of chaparral vegetation. Allow for intermittent small pockets or clumps of chaparral/shrub vegetation. Pockets and clumps of chaparral remaining should be healthy, all dead material removed and limbed to 1/3 height of chaparral crown.	Less intensive chaparral/shrub vegetation removal with up to 30 foot for spacing of pockets and clumps of chaparral and shrubs. The remaining pockets and clumps of chaparral should be healthy, all dead material removed.
Trees Overstory (without chaparral/shrub understory)	Thin smaller trees leaving larger trees (>than 6-inches DBH) at 10-20 ft crown spacing limb/prune lower branches 6-feet above grade level, or lower 1/3 of tree height on smaller trees.  Remove dead standing trees.	Thin smaller trees leaving larger trees (> than 6-inches DBH) at approximately 10 foot crown spacing; limb/prune lower branches 6-feet up, or lower 1/3 of tree height on smaller trees; remove all broken limbs and dead material.	Limb and prune lower branches of larger trees up to 6-feet and remove all broken limbs and dead material.
Trees Overstory	Thinning specifications: the same as Overstory without	Thinning specifications are the same as Trees Overstory	Thinning specifications are the same as Trees Overstory

Location →	Primary Defense Zone (A) (0 – 30' from a structure)	Fuel Reduction Zone (B) (30' – 100' from a structure)	Fuel Reduction Zone (C) (100' and greater from a structure)
(with chaparral/shrub understory)	Chaparral /shrub understory Zone A. Understory: remove chaparral/shrub; limb/prune healthy ornamental shrubs to 1/3 of shrub height, maintain spacing between shrubs.	without Chaparral/shrub understory (Zone B). Understory: occasional less dense chaparral/shrub or small tree clump in openings is acceptable.	without chaparral/shrub understory in Zone C. Understory specifications are the same as Chaparral/shrub in Zone C except the pockets and clumps are limited to tree openings (non-canopy).

#### **E.4 IMPLEMENTATION GUIDELINES FOR FUEL TREATMENTS**

The following describes possible restrictions to implement fuel treatments:

#### **Noxious Weeds**

- + To limit the spread and establishment of invasive plant species (e.g., noxious weeds) into project areas, all off-road equipment used during project implementation will be washed free of invasive exotic weeds and seeds before entering project areas. If any equipment works in an area where weeds occur, it will be washed to remove weed propagules prior to entering other work locations.
- + All equipment staging areas will be located away from known areas with noxious weed occurrences and outside of riparian habitat area.

#### **Cultural Resources**

+ Any known cultural resources within the proposed treatment area will be protected. If any sensitive cultural resources are found, work will stop, and a qualified Archaeologist will be notified.

#### **Soil and Watershed**

- + Every effort should be made to minimize damage to the soil surface in order to reduce potential for erosion and sediment transport due to project implementation activities.
- + No mechanical equipment use on slopes greater than 30 percent with following exception: Mastication can occur on slopes greater than 30 percent where the equipment is operating on slopes less than 30 percent and accessing steeper slopes with a boom arm.
- + Chipped or masticated material may be "blown" back onto the slope where feasible to enhance soil coverage.

#### **Tree Removal**

+ All live tree removal will be in compliance with County Native Tree Protection requirements.

#### E.5 RECOMMENDED BEST MANAGEMENT PRACTICES (BMP'S)

- + CEQA may be required prior to implementation of all site-specific projects.
- + Shrubs will vary in size randomly scattered across the project area. Chipped material should not exceed 4-inches in depth.
- + Boundaries between treatment levels will maintain free-form shapes and feathered edges that replicate natural patterns; avoid straight lines by scalloping and feathering along edges of vegetation. The feathering of edges includes undulating edges horizontally and diverse heights of the brush retained on site.
- + Precautions will be taken to prevent scarring of trees or retained shrubs by equipment.

- Signs should be posted warning the public of potential hazards during fuel treatment activities.
- + Environmentally Sensitive Habitat Areas (ESHA) will be marked on the project area maps.
- + Known landslide and unstable areas should be avoided as vegetation treatment activities may result in increased potential for mass wasting and erosion.
- + Heavy equipment should not work on slopes greater than 30%. Movement of any heavy equipment across slopes should be minimized. Heavy equipment will not be used in any ESHA areas.
- When operating equipment off of roadways the use of rubber tracked equipment, with a low ground pressure coefficient, is preferred.
- + When treating herbaceous/grass fuels; mowing or weed whipping is the preferred over discing to limit soil disturbance.
- + Required riparian zone setbacks will be identified, mapped and flagged prior to project implementation work.
- + Any project generated vegetation debris shall be removed from the stream course.
- + Water bars and other erosion control structures will be located where necessary to limit erosion and associated run-off causing sediment movement into stream courses.
- + No servicing or refueling of equipment will occur on site. Operators must remove residues, waste oil, engine coolants, and other harmful materials from all worksites. Spill containment will be established prior to any on-site servicing or refueling, even in approved on-site service locations.

#### E.6 FUEL TREATMENT IMPLEMENTATION TIMING

Typically, only the use of prescribed fire, mastication or crushing to eliminate standing chaparral and timbered forest requires a consideration of how individual species will recover following a treatment.

- + Herbaceous vegetation/Grass Herbaceous fuels are most effectively treated following curing of the individual plants. When cured, these grass-like fuels have dispersed their seeds, helping to assure their continued presences as part of the landscape. Treating herbaceous fuels after they have cured also minimizes regrowth following treatment. When looking to eliminate non-native herbaceous fuels, treating this vegetation before it has set seed will, over time, help to reduce the abundance of a species on the landscape. Herbicides can also be effective in killing targeted non-native species before they sow seed. However, the use of herbicides can be controversial and require an impact analysis following California Environmental Quality Act (CEQA) or National Environmental Policy Act (NEPA) protocols.
  - Where conditions allow, mowing or weed-whipping herbaceous fuels before seeds are sown can also be effective at eliminating target species. However, treating these fuels before they are fully cured will require a second treatment to address the fire hazard associated with regrowth
- + Native Oak Trees The County has a native oak tree protection ordinance which provides direction regarding the maintenance and removal of native oak tree species that has at least one trunk measuring six inches or more in diameter, or a combination of any two trunks measuring a total of eight inches or more in diameter, measured at four and one-half feet above natural grade.

Three exemptions to the ordinance are listed as part of the Local Implementation Plan:

Native trees destroyed or damaged by a natural disaster. A damaged tree shall be exempt only if the general health of the tree is so poor that efforts to ensure its long-term health and survival are unlikely to be successful as determined by an arborist report and confirmed by the County biologist after a site inspection of the tree. Native trees that constitute an imminent public health and safety hazard due to the risk of falling where
the structural instability cannot be remedied as determined by a licensed arborist's report and confirmed
by the County biologist after a site inspection of the tree.

Property owners are advised to contact the County prior to undertaking any maintenance or removal actions which may involve native oak trees species.

+ Chaparral – Treatments involving chaparral species traditionally focus on thinning dense stands of the vegetation or removing brush species to meet defensible space requirements of PRC 4291. Hand removal of chapparal is not time sensitive regarding species response, as most chaparral species will sprout from the underground root structure. To eliminate a chaparral species from a treatment zone, the use of herbicides to kill regrowth or grubbing out the root structure is required. Both treatments required attention over time to fully eliminate chaparral from the desired area.

Property owners are advised to contact the City or County before undertaking any chaparral removal outside of the defensible space zones as define in California Public Resources Code 4291.

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## Appendix F General Public Workshops

The following is a sample agenda provided as part of the 1<sup>st</sup> round of public workshops held in Twain Harte, Groveland, and Sonora.

## Workshop Agenda

Meeting Title:	Tuolumne County CWPP General Public Workshop North County	
Date/Time:	Friday, July 21st, 2023   5:30 p.m. – 8:00 p.m. (PDT)	

Time	Description
5:30 p.m. – 5:45 p.m.	Introduction What is a CWPP? Presentation by Tuolumne FSC
5:45 p.m. – 5:55 p.m.	CWPP Development Process Presentation by Jensen Hughes
5:55 p.m. – 6:25 p.m.	Preliminary Hazard and Risk Assessment Presentation by Jensen Hughes (5:55 p.m. – 6:10 p.m.) Q&A (6:10 p.m. – 6:25 p.m.)
6:25 p.m. – 7:20 p.m.	Breakout Session Key Topics: (1) Concerns (2) Opportunities & Improvements
7:20 p.m. – 7:30 p.m.	BREAK Set-up for Reporting Out
7:30 p.m. – 7:55 p.m.	Reporting Out Groups present (~ 5 min each)
7:55 p.m. – 8:00 p.m.	Closing Remarks

A copy of the full presentation is available through the Tuolumne Fire Safe Council. Contact information is provided below.



# Tuolumne Fire Safe Council Contact Info

info@tuolumnefiresafe.org cwpp@tuolumnefiresafe.org

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## Appendix G Results of Public Digital Polling

All raw responses/comments can be provided by request to the Fire Safe Council.

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