

Alpine County Wildfire Risk Mitigation Plan

February 2021

Alpine County

Wildfire Risk Mitigation Plan

February 2021

Prepared for:

Alpine County Community Development Department
50 Diamond Valley Road
Markleeville, CA 96120
530-694-1371
zwood@alpinecountyca.gov

Prepared by:

Scott Conway; Jason Moghaddas, RPF
Spatial Informatics Group
2529 Yolanda Ct.
Pleasanton, CA 94566

Tania Treis
Panorama Environmental, Inc.
717 Market Street, Suite 650
San Francisco, CA 94103
650-373-1200

Cover Photo Credit: (Monti, 2020; Paulus, 2020)

TABLE OF CONTENTS

Table of Contents

Acronyms and Abbreviations	v
1 Introduction	1
1.1 Background	1-1
1.2 Goals and Objectives.....	1-2
1.3 Scope of Wildfire Risk Mitigation Plan.....	1-2
1.4 Existing Fuel Management Planning, Projects, and Regional Capabilities	1-4
1.5 Plan Development Process	1-6
2 Technical Analyses	2-1
2.1 Key Terms	2-1
2.2 Introduction	2-1
2.3 Fire Hazard Analysis.....	2-2
2.4 Susceptibility Analysis – HVRA Analysis	2-29
2.5 Wildfire Risk Assessment.....	2-36
3 Wildfire Risk Mitigation Projects	3-1
3.1 Development and Prioritization of Potential Projects	3-1
3.2 Projects Included in the WRMP by Tier.....	3-2
3.3 Environmental Review Considerations for Risk Mitigation Projects	3-20
4 Implementation Plan	4-1
4.1 Methods and Tools	4-1
4.2 Project 1: Markleevillage.....	4-6
4.3 Project 2: Manzanita	4-6
4.4 Project 3: Bear Valley.....	4-7
4.5 Environmental Considerations and Review	4-8
4.6 Estimated Cost and Funding Sources	4-1
4.7 Implementation of Other Projects Identified in the WRMP	4-6
5 Community Access Risk Assessment	5-1
5.1 Ingress/Egress and Community Evacuation Area Identification.....	5-1
5.2 Community Access Risk Report.....	5-5

TABLE OF CONTENTS

6	References.....	6-1
----------	------------------------	------------

List of Tables

Table ES-1	HVRA Accounting for Alpine County	6
Table ES-2	Typical Vegetation Treatments	10
Table 2-1	Aspect Data for Alpine County by Percent.....	2-6
Table 2-2	Elevation Data for Alpine County by Percent.....	2-7
Table 2-3	Slope Data for Alpine County by Percent	2-8
Table 2-4	Land Cover Types within Alpine County Planning Areas	2-10
Table 2-5	Vegetation Condition Class Definitions.....	2-12
Table 2-6	Fuel Model Type by Percent.....	2-14
Table 2-7	Stand Heights by Percent.....	2-15
Table 2-8	Canopy Cover by Percent.....	2-16
Table 2-9	Canopy Bulk Density by Percent.....	2-17
Table 2-10	Canopy Base Height by Percent	2-18
Table 2-11	Spatial Distribution of Flame Length Classes.....	2-24
Table 2-12	Percent of Each Classification of Integrated Hazard.....	2-27
Table 2-13	HVRA Accounting for Alpine County	2-31
Table 2-14	Results of Surveys Determining Response to Wildfire	2-34
Table 2-15	Results of Surveys Determining Relative Importance	2-35
Table 2-16	Additional Filter by Slope.....	2-38
Table 2-17	Additional Filter by Land Ownership.....	2-38
Table 2-18	Areas of Risk and Acres of Opportunity by Land Management or Ownership.....	2-50
Table 3-1	Projects Included in the Wildfire Risk Mitigation Plan by Tier.....	3-4
Table 3-2	Options for Project Environmental Review under CEQA	3-20
Table 4-1	Personnel Needed to Implement Treatment Methods	4-5
Table 4-2	Potential Special Status Species Found in Alpine County.....	4-1
Table 4-3	Estimates of Cost by Treatment Types.....	4-1
Table 4-4	Potential Grant Opportunities for Fuel Management Projects	4-3
Table 4-5	Development of Future Projects.....	4-7
Table 4-6	Outreach Actions and Timing	4-9
Table 5-1	Safety Zone Rules for Safe Separation Distances	5-4
Table 5-2	Acres of the Highest 50 th Percentile Risk around Ingress and Egress Routes	5-5

List of Figures

Figure 1-1	Land Ownership and Communities in Alpine County	1-3
Figure 1-2	Summary of WRMP Development Process.....	1-6
Figure 2-1	Components of Wildfire Risk Analysis	2-2
Figure 2-2	Fire Behavior Modeling Workflow	2-4
Figure 2-3	Aspect Data for Alpine County from LANDFIRE.....	2-6
Figure 2-4	Elevation Data for Alpine County from LANDFIRE.....	2-7
Figure 2-5	Slope Data for Alpine County from LANDFIRE	2-8
Figure 2-6	Existing Vegetation Types in Alpine County	2-9

TABLE OF CONTENTS

Figure 2-7	Majority Vegetation Cover in Alpine County	2-9
Figure 2-8	Existing Vegetation Condition Classes	2-11
Figure 2-9	Fuel Load Model Types in Alpine County	2-14
Figure 2-10	Stand Heights in Alpine County	2-15
Figure 2-11	Canopy Cover in Alpine County	2-16
Figure 2-12	Canopy Bulk Density in Alpine County	2-17
Figure 2-13	Canopy Base Height	2-18
Figure 2-14	Surface Fire Behavior Characteristics Chart	2-22
Figure 2-15	Integrated Hazard Classification Chart	2-23
Figure 2-16	Modeled Flame Lengths in Alpine County	2-25
Figure 2-17	Modeled Fire Probability in Alpine County	2-26
Figure 2-18	Modeled Integrated Hazard for Alpine County	2-28
Figure 2-19	Location and Extent of HVRAs in Alpine County	2-32
Figure 2-20	HVRA Raster Layer Example for Bear Valley Planning Area	2-33
Figure 2-21	Countywide Areas of Moderate to Highest Wildfire Risk	2-40
Figure 2-22	Areas of Moderate to Highest Wildfire Risk for Markleeville	2-41
Figure 2-23	Opportunities in Alpine County for Prescribed Fire within the HVRAs	2-42
Figure 2-24	Opportunities for Prescribed Fire in Markleeville within the HVRAs	2-43
Figure 2-25	Countywide Wildfire Risk Output After Workflow with Prescribed Fire Opportunities	2-44
Figure 2-26	Markleeville Wildfire Risk Output After Workflow with Prescribed Fire Opportunities	2-45
Figure 2-27	Bear Valley Wildfire Risk Output After Workflow with Prescribed Fire Opportunities	2-46
Figure 2-28	Kirkwood Wildfire Risk Output After Workflow with Prescribed Fire Opportunities	2-47
Figure 2-29	Woodfords Wildfire Risk Output After Workflow with Prescribed Fire Opportunities	2-48
Figure 2-30	Hung-A-Lel-Ti Wildfire Risk Output After Workflow with Prescribed Fire Opportunities	2-49
Figure 3-1	Index of Project Maps in WRMP	3-9
Figure 3-2	Mesa Vista Project Area (Tier 1, Project 5)	3-10
Figure 3-3	Hung-a-Lel-Ti Project Area (Tier 3, Project 6)	3-11
Figure 3-4	Manzanita Project Area (Tier 1, Project 2 and Tier 3, Project 9)	3-12
Figure 3-5	Turtle Rock Park Project Area (Tier 3, Project 7)	3-13
Figure 3-6	Grover Hot Springs Project Area (Tier 2, Project 4)	3-14
Figure 3-7	Markleevillage Project Area (Tier 1, Project 1)	3-15
Figure 3-8	Bear Valley Project Area (Tier 1, Project 3)	3-16
Figure 3-9	Lake Alpine Project Area (Tier 3, Project 10)	3-17
Figure 3-10	Diamond Valley Project Area (Tier 3, Project 11)	3-18
Figure 3-11	Highway 89 Project Area (Tier 3, Project 12)	3-19
Figure 4-1	Rotary Masticator	4-2
Figure 4-2	Hand Thinning with Chainsaw	4-3
Figure 4-3	Pile Burn	4-4
Figure 5-1	Designated Safety Zones and Areas in Alpine County	5-2
Figure 5-2	Woodfords Area Designated Safety Zones	5-3

TABLE OF CONTENTS

Figure 5-3	Locations in Markleeville Where Highest Risk Overlaps with Emergency Access Routes and Safety	5-7
Figure 5-4	Locations in Bear Valley Where Highest Risk Overlaps with Emergency Access Routes and Safety	5-8
Figure 5-5	Locations in Hung-A-Lel-Ti Where Highest Risk Overlaps with Emergency Access Routes and Safety	5-9

List of Appendices

Appendix A	Community and Stakeholder Input Report
Appendix B	IFTDSS Current Conditions Report
Appendix C	Response Function Survey
Appendix D	Relative Importance Survey

ACRONYMS AND ABBREVIATIONS

Acronyms and Abbreviations

A

ABC	Alpine Biomass Collaborative
AFSC	Alpine Fire Safe Council

B

BLM	Bureau of Land Management
BRIC	Building Resilient Infrastructure Communities

C

CAL FIRE	California Department of Forestry and Fire Protection
CalOES	California Office of Emergency Services
CalVTP	California Vegetation Treatment Program
CAR	Community-at-Risk
CCI	California Climate Investments
CEQA	California Environmental Quality Act
CWPP	Community Wildfire Protection Plan

D

dbh	diameter at breast height
-----	---------------------------

E

EIR	Environmental Impact Report
-----	-----------------------------

F

FEMA	Federal Emergency Management Agency
FY	Fiscal Year

G

GIS	Geographic Information System
-----	-------------------------------

ACRONYMS AND ABBREVIATIONS

H

HVRA High Valued Resources and Assets

I

IFTDSS Interagency Fuel Treatment Decision Support System

IS/MND Initial Study/Mitigated Negative Declaration

L

LANDFIRE Landscape Fire and Resource Management Planning Tools

LHMP Local Hazard Mitigation Plan

M

MTT Minimum Travel Time

N

NEPA National Environmental Policy Act

R

RAWS Remote Automatic Weather Stations

RPF Registered Professional Forester

T

THP Timber Harvest Plan

U

U.S. United States

USFS United States Forest Service

V

VTP Vegetation Treatment Plan

W

WRMP Alpine County Wildfire Risk Mitigation Plan

WUI wildland urban interface

ACRONYMS AND ABBREVIATIONS

This page is intentionally left blank.

ES Executive Summary

ES.1 Overview

Alpine County applied for and was awarded a California Department of Forestry and Fire Protection (CAL FIRE) Community Fire Prevention Grant in the amount of \$223,756 to create the Alpine County Wildfire Risk Mitigation Plan (WRMP or plan). The goal of the WRMP is to reduce wildfire risk in Alpine County and to protect important resources throughout the County. The WRMP identifies up to 12 fuels reduction projects that can be implemented over the next 10 years, with three top priority projects to be implemented in the next two years. The WRMP is a County-wide effort that encompasses all communities within Alpine County.

ES.2 Fire Behavior Modeling

ES.1.1 Overview of Modeling

Wildfire modeling is a field of computational science that uses numerical simulations to predict fire behavior. Wildfire modeling attempts to reproduce fire behavior characteristics like how quickly a fire can spread, in which directions it may spread, and how much heat it may generate given the conditions of the fuels, land, and predicted weather. Fire behavior modeling also looks at whether a fire would transition from the ground surface to tree crowns, which is much more dangerous. Once fire behavior is estimated through modeling, an assessment of fire hazards to surrounding life and property can be made and modifications can be made to the vegetation to reduce the exposure of important human values to that hazard, known as vegetation treatments or prescriptions.

The factors that influence fire behavior serve as the key inputs in modeling efforts. These factors include:

- **Landscape:** Topography factors influence wildfires. Orientation toward the sun, which influences the amount of energy received from the sun, and the slope (fire spreads faster uphill) influence fire behavior. Fire can accelerate in narrow canyons and it can be slowed down or stopped by barriers such as creeks and roads.
- **Fuels:** Fuels include anything that can burn. In wildland areas, fuels are primarily comprised of vegetation. Dead trees with low moisture ignite more easily and burn faster than live trees with higher moisture. Leaf litter and dried twigs and branches also ignite easier and burn faster.
- **Weather:** Weather influences fire through wind and moisture. Wind can increase the spread of fire in the direction of the wind, wind speed can accelerate spread,

EXECUTIVE SUMMARY

and higher temperatures can result in a fire burning faster, as can low humidity and low precipitation.

Outputs of fire behavior modeling can include different parameters, but for the WRMP, modeling focused on burn probability and fire intensity at 97th percentile weather (described further in Section 2.3). Burn probability is the likelihood that a wildfire will burn a given point or area over a specified period. Flame length can be used as a proxy for fire intensity, where flame length is the height of the flames, with taller flame lengths indicating a higher intensity fire. Generally, if flame lengths are less than 4 feet, then fire can be effectively controlled with professional suppression resources. Flame lengths between 4 and 8 feet require multiple, more specific types and numbers of professionally trained firefighting resources and suppression success goes down. Flame lengths greater than 8 feet generally prevent firefighters and resources from directly attacking the fire front because the fire is too intense. Many times, this scenario results in more land being burned and unfortunate effects on property and even life. Vegetation treatments should be identified to reduce undesirable fire intensities when flame lengths exceed 4 feet, so that fire fighters have the highest probability of safely controlling a wildland fire under most weather conditions.

ES.1.2 Model Used for WRMP Analysis

The wildfire analysis for the WRMP was accomplished through development and implementation of a tailored, spatially dependent fire modeling framework that utilized industry standard probabilistic fire models designed specifically for land management. The modeling exercise was undertaken by Fire Ecologist, Scott Conway, of Spatial Informatics Group (SIG).

The Interagency Fuel Treatment Decision Support System (IFTDSS) fire behavior modeling program was used to understand the existing fire hazard throughout Alpine County. IFTDSS utilizes two imbedded models, FlamMap and Minimum Travel Time. IFTDSS is a web-based application designed to make fuels treatment planning and analysis more efficient and effective. IFTDSS provides access to data and models through one simple user interface. IFTDSS is designed to address the planning needs of users with a variety of skills, backgrounds, and needs. A simple and intuitive interface provides the ability to model fire behavior across an area of interest under several weather conditions and to easily generate downloadable maps, graphs, and tables of model results. The application provides a step by step process for testing a variety of fuels treatment impacts (thin, clear cut, prescribed burn) on fire behavior and comparing results to determine the modeled treatment to best achieve desired results in terms of reduced fire behavior potential. It can be used at a variety of scales from local to landscape level (US Department of Interior, 2020).

The methods chosen to model the fire behavior within and around Alpine County took advantage of several best in class, comprehensive datasets, modeling technologies, and systems to quantify the vegetation and fuels consistently and appropriately across the County. The modeling protocol was based off *A Wildfire Risk Assessment Framework for Land and Resource*

EXECUTIVE SUMMARY

Managers (Scott, Thompson, & Calkin, 2013). The methodology was approved by the steering committee in November 2019. The modeling workflow is shown in Figure 2-2, included in Section 2.3.1.

ES.1.3 Model Inputs

The Landscape Fire and Resource Management Planning Tools (LANDFIRE) was used for the inputs for landscape and fuels, that is, topography and vegetation cover types. LANDFIRE is a shared program between the wildland fire management programs of the U.S. Forest Service (USFS) and U.S. Department of the Interior. The datasets in LANDFIRE for topography and vegetation are based on remote sensing data.

For all topography, vegetation, and fuels analysis, the project took advantage of comprehensive, yet explicit (30-meter squared resolution) LANDFIRE data through IFTDSS. The Remote Automatic Weather Stations (RAWS) provided the inputs for weather. The RAWS system is a network of automated weather stations run by the USFS and Bureau of Land Management (BLM) and monitored by the National Interagency Fire Center, mainly to observe potential wildfire conditions (Desert Research Institute, 2020). This analysis utilized 97th percentile historical weather (average wind speed, average wind direction, dead and live fuel moistures) to analyze fire behavior. Percentiles are based on a scale of 0 to 100 and are used to sort and rank a collection of data. For wildfire, when values at the upper end of the scale occur, complex fires are expected, where initial attack may often fail. The 97th percentile is often termed “the worst-case scenario” (US Department of Interior, 2020). These are the days where weather conditions are greatest for wildfire ignition and spread.

Modeling conditions at the 97th percentile fire weather for the County was chosen not to serve as an understanding of the very worst-case fire effects are, but to determine how the current vegetation and fuels environment react to what is considered a threshold for problem fires. Choosing percentile weather removes subjectivity and thus bias as the calculation is run directly from the data. This process is objective and has become the industry standard for everything from determining national fire danger ratings to, as in this case, estimating hazard. The team analyzed the weather outputs, compared them to their respective knowledge base, and determined they were indeed in the threshold range of problem fire weather for Alpine County.

ES.1.4 Current Condition Modeling Results/Outputs

Overview

The results of the fire behavior modeling indicated that numerous areas throughout Alpine County could benefit from some form of vegetation treatment to reduce fire hazard, particularly within the eastern portion of the county.

Fire Intensity

Frontal fire intensity is a valid measure of forest fire behavior that is solely a physical attribute of the fire itself. It is defined as the energy output rate per unit length of fire front and is directly

EXECUTIVE SUMMARY

related to flame size. Flame length was focused on to quantify fire intensity for this study because of the direct correlation to suppression resources and effectiveness.

The IFTDSS (with FlamMap) model indicated approximately 20 percent of the county exhibited flame lengths greater than 4 feet. Under current conditions, as modeled, Alpine County would likely exhibit high intensity fire in many areas and put some homes and infrastructure at risk because suppression resources would have trouble safely directly attacking the fire and direct suppression effectiveness might be limited during the first burn period.

Fire Probability

Fire probability quantifies the relative likelihood of a fire occurring under a fixed set of weather and fuel moisture conditions (US Department of Interior, 2020). Within the minimum travel time model, randomly located ignition points are used to simulate fires. Ignitions are only located and retained on burnable fuels, if an ignition is located on a non-burnable fuel it is discarded. The number of ignitions is determined by IFTDSS to most efficiently produce outputs for the user.

$$\text{Burn Probability} = \text{number of times burned} / \text{total number of ignitions}$$

The wildfire behavior modeling results indicated that the eastern portion of the County generally has much higher probabilities of fire occurrence than the west side. This condition is most likely due to the prevailing winds under the critical fire weather scenario and more continuous fuels that blanket the lower elevations of eastern Alpine County.

Integrated Hazard

The term “hazard” is used by the wildland fire community to define a variety of conditions or situations where damage to assets by fire is being evaluated. The integrated hazard combines fire intensity (determined by proxy with flame length) and burn probability. Burn probabilities were calculated using Minimum Travel Time in IFTDSS.

Figure 2-18, included in Section 2.3.5, highlights areas where there is a high fire intensity that overlaps with a high fire probability and thus, a high integrated hazard. Although some areas are considered low hazard, much of the area has elevated hazard numbers, which creates undesirable exposure to the surrounding homes and infrastructure.

ES.2 Susceptibility Analysis – HVRA Analysis

ES.2.1 Overview of HVRA Analysis

Knowing where wildfires are probable and the intensity at which they might burn gives the critical information needed to understand and address possible impacts to High Valued Resources and Assets (HVRAs). HVRAs are valued elements of the man-made and natural environment. The identification and characterization of HVRAs in Alpine County was a time consuming but critical step in the risk assessment process. Three primary characteristics must

EXECUTIVE SUMMARY

be determined for each HVRA identified: spatial extent (mapping), response to wildfire (benefit or loss), and relative importance (Scott, Thompson, & Calkin, 2013).

ES.2.2 Methods

Determination of Spatial Extent of HVRAs

For use in wildfire risk calculations, spatial HVRA data must be in raster format. To effectively evaluate and apply any HVRA dataset, it is imperative to work with the spatial data in a geographic information system (GIS), and not solely rely on map products. The raster data should match the extent, cell size, and coordinate system of the fire modeling landscape. The compilation of HVRA data entails collecting data from various sources. A variety of regional or national data sources tend to be a good starting place when developing and accounting for HVRAs. Local data sources are often the most up-to-date and reflect local knowledge of the landscape. Local data can be used to refine the regional or national datasets.

The spatial extent of HVRAs within Alpine County were defined using industry standard buffers based on the types of HVRA that occur in Alpine County. The location and spatial extent of HVRAs were reviewed by the steering committee and a select group of additional community stakeholders.

Calculation of HVRA Response to Wildfire

The response function framework requires quantifying the relationship between HVRA value and wildfire intensity (measured by flame length). HVRA response is related to fire intensity because it is the best fire characteristic available associated with fire effects. This approach quantifies net value change (NVC) to a given HVRA as the percentage change in the initial resource value resulting from a fire at a given intensity. Response functions address relative, rather than absolute change in resource or asset value and represent both beneficial and adverse effects to the HVRA (Scott, Thompson, & Calkin, 2013).

The project steering committee and a select group of additional community stakeholders were invited to respond to a questionnaire regarding each HVRA's response to wildfire. Survey responses were then reviewed during a steering committee meeting, during which all steering committee members agreed on each HVRA's response to wildfire. The HVRA Wildfire Response Questionnaire is provided in Appendix C.

Calculation of HVRA Relative Importance

Balancing competing or conflicting land and resource management objectives is a significant challenge to land and resource management planners. It is also difficult to articulate quantitative weights establishing the relative importance of HVRAs. Relative importance helps understand risk in areas where multiple HVRAs overlap and allows for comparing risks across different spatial areas that house different HVRAs. Using relative importance scores allows for summarization and visualization of risks in a single metric. If assessment results are to ultimately be used for planning mitigation treatments and strategies, then prioritization decisions that integrate all HVRAs will still ultimately need to be made. Articulating relative

EXECUTIVE SUMMARY

importance scores and how objectives are balanced makes this decision explicit rather than implicit and increases the overall transparency of decision processes (Marcot, 2012).

The project steering committee and a select group of additional community stakeholders were invited to respond to a questionnaire regarding each HVRA's relative importance. Survey responses were then reviewed during a steering committee meeting, during which all steering committee members developed a relative importance ranking of the HVRAs within the County. The Relative Importance Questionnaire is provided in Appendix D.

ES.2.3 Results of HVRA Characterization

Spatial Extent of HVRAs

HVRA accounting began with the Alpine County GIS database and was augmented through collaboration with the project steering committee. Table ES-1 shows the HVRAs that were selected while Figure 2-19 (included in Section 2.4.3) shows locations and extent of each HVRA.

Table ES-1 HVRA Accounting for Alpine County

HVRA Category	Buffer Extent
Residential Structures	100 feet
Education Facilities (Daycares/Schools)	100 feet
Recreation Facilities – campgrounds, RV parks (non-ski areas)	25 feet
Business and Public Structures	100 feet
Places of Worship	100 feet
Non-habitable Structures (barns/sheds)	100 feet
Health and Elder Care Facilities	100 feet
High Hazard Buildings	250 feet
Airport/Helibase	250 feet
Communication Infrastructure (cell towers, microwave towers, etc.)	200 feet
Potable Water Storage (e.g., tanks); Snow-making Infrastructure	100 feet
Major/Minor Evacuation Corridors (ingress and egress routes)	300 feet
Community Evacuation/Refuge/Safe Zones/ Areas	250 feet
Cemeteries or Significant Resource Buildings/Areas	100 feet
Watersheds of Special Significance	25 feet
WUI Defense	0.25 mile
Ski Area Terrain	No Buffer

EXECUTIVE SUMMARY

HVRA Calculated Response to Wildfire

A total of six responses to the HVRA Response Function Questionnaire were received. Responses included an Alpine County resident, USFS staff, Alpine County staff, and CAL FIRE staff. Surveys limited responses to between negative 3 and positive 3 points and were then averaged across surveys. Results then went into risk calculation as the response function (RF) as a normalized value percent change. For example, negative 3.0 = 100% value loss where a positive 1.0 = 33% value gained. Response to wildfire survey results are shown in Table 2-14, provided in Section 2.4.3.

HVRA Calculated Relative Importance

A total of eight responses to the HVRA Relative Importance Questionnaire were received. Responses included an Alpine County resident, USFS staff, Alpine County staff, and CAL FIRE, Bear Valley Water District staff, and Fire Safe Council member. Each rating category had a potential ranking from 1-10; 10 being the highest score. The average score for all surveys by category is shown in Table 2-15 (provided in Section 2.4.3) and the total score is the sum of those averaged scores.

ES.3 Wildfire Risk Assessment

ES.3.1 Overview of Risk Assessment

Wildfire risk is the compilation of the integrated hazards (fire likelihood and intensity) with the susceptibility of the HVRAs identified. Fire hazard outputs can be valuable when trying to understand the patterns of potentially high severity fire across large landscapes; however, these outputs often display an overwhelming amount of information. First, there may simply be too much hazard for an entity to deal given their available resources. Second, even if resources to reduce all fire intensities were available, then hazard provides little insight into where you should go first. A wildfire risk assessment can be extremely valuable for an entity that has limited resources to implement as it allows them to prioritize treatments.

ES.3.2 Methods

Methods of Determining Wildfire Risk

Exposure Analysis of HVRAs

Exposure analysis is the characterization of wildfire likelihood and intensity where HVRAs occur and was performed within a GIS using one of several geospatial techniques that identify or summarize the wildfire hazard characteristics of all pixels where an HVRA is mapped.

Effects Analysis on HVRAs

Effects analysis integrates wildfire hazard (likelihood and intensity) and HVRA vulnerability (exposure and susceptibility), producing a comprehensive measure of wildfire risk. Wildfire risk is quantified as the weighted expectation of net value change, where *NVC* is expressed in

EXECUTIVE SUMMARY

relative terms on a percentage basis, as defined by expert-based loss/benefit functions (for example, complete loss = -100 percent).

Methods for Project Development Based on Wildfire Risk

Wildfire Risk Compilation

Compiling the total negative net value change of each pixel within the study area in a GIS raster format is required to appropriately organize results of the effects analysis. The results highlight which pixels, compared to others, have the highest net value change and thus, the highest amount of risk to fire during extreme fire weather scenarios. This information, in and of itself, can highlight what areas should be focused on first for treatments provided scale limitations are considered.

Opportunities for Treatment Compilation

Areas or pixels that exhibit a positive value change to the effects of fire during extreme fire weather scenarios, could still benefit from treatment. In fact, these “opportunity” areas could have beneficial fire prescribed across many areas within the project area that would not only enhance the value of a particular HVRA, but also keep it and the surrounding area from moving towards conditions that would result in a modeled net value loss in the future as vegetation grows and fuels accumulate. These identified opportunity areas would most likely be treated with low intensity prescribed fire during times of the year when the potential for high severity fire is very low.

Project Developer

Even with the comprehensive and relatively high-fidelity risk and opportunity data across the project area, some additional filters and workflows were needed to improve results and further facilitate efficient and effective decision-making. Risk and opportunity data from the wildfire risk assessment were refined using a project-specific workflow. Additional filters by slope and by land ownership were used to further divide information into meaningful results.

Section 2.5.3 presents the results of the risk calculations and processes. The results are presented in maps showing the areas of moderate, high, very high, and highest risk.

ES.3.3 Results of Wildfire Risk Assessment

Wildfire Risk Maps

Although HVRAAs are well distributed across the county, considerably more and higher risk is on the east side. County-wide risk is shown in Figure 2-21. This higher risk is mostly due to the higher fire probabilities shown and explained in Figure 2-17. To effectively evaluate and apply any risk and opportunity dataset, it is imperative to work with the spatial data in a GIS and not solely rely on map products.

Project Development Outputs

Opportunities for Prescribed Fire

Based on the wildfire risk assessment, areas of the HVRAs where opportunities to control and reduce fuels through prescribed fire were also identified. The suitability of an area for prescribed fire is assessed based on whether fire in that area would have a net positive outcome, such as areas of HVRAs where there were not structures, infrastructure, or any other features that could be negatively affected by fire. The suitability was estimated by calculating the net value change that is expected when a typical pixel in the area burns. Prescribed fire in these areas would serve to further protect the HVRAs that fall within the moderate to highest wildfire risk categories.

Project Developer Workflow Results

The project developer workflow and filters were applied to risk and opportunity outputs to help focus areas for project development coalesced by ownership and by treatment type to make the data actionable. Figure 2-25 shows that output County-wide and Figure 2-26 through Figure 2-30 zooms into each of the five planning areas for a view of what the processed wildfire risks with prescribed fire opportunities looks like at an appropriate scale to inform decisions.

ES.4 Wildfire Risk Mitigation Plan

ES.4.1 Development and Prioritization of Potential Projects

The modeling efforts to assess wildfire risks across Alpine County assisted the team in defining where fire hazard areas occur, and which resources and assets are at moderate to highest risk. County staff and the steering committee were tapped for their knowledge of recently completed projects or projects underway in the County, as well as areas of particular concern based on their understanding of fire response and evacuation procedures, and on-the-ground conditions.

The roster of projects focused on Markleeville, Woodfords, Hung-a-Lel-Ti, and Bear Valley. Project boundaries were drawn up based on parcels, and with the grouping of adjacent projects, a total of 12 total projects were identified. Once the projects were identified by geographic area, qualitative criteria were considered to prioritize the projects into three tiers (Tier 1 or highest priority, Tier 2 or moderate priority, and Tier 3 or lower priority), and to identify the three projects in Tier 1 that would move forward for detailed definition and environmental review.

ES.4.2 Summary of Projects

Table 3-1 provides an overview of the 12 projects and 23 subprojects that were identified for inclusion in this WRMP. The table is followed by maps depicting the locations of the projects. The project boundaries are largely based on parcel boundaries; however, preliminary project boundaries were delineated regardless of land ownership.

The Tier 1 projects are carried forward with detailed implementation plans and environmental review, described in Chapter 5. Implementation of other projects in Tier 2 and Tier 3 would

EXECUTIVE SUMMARY

require supplemental implementation plans in the future. The process for implementing the Tier 2 and Tier 3 projects, as well as prescribed burning across larger HVRA areas is described in Section 4.7.

The three projects moving forward for detailed definition are Bear Valley, Manzanita, and Markleevillage. These projects were prioritized primarily because they provide protection to communities at the highest wildfire risk (Markleevillage in Markleeville); protects a larger community in combination with high wildfire risk (Manzanita community in Woodfords); and provides protection to a considerable number of higher density homes and infrastructure that can build off of existing work for greater benefit even though the overall wildfire risk is lower in this area (Bear Valley).

ES.4.3 Types of Vegetation Management Treatments

Areas with high fire hazard are mitigated through modifications to the live vegetation and removal of dead fuels onsite to reduce the risks. Fuels is the parameter for which the landowner has control, since neither weather nor topography can be altered. The modification of vegetation to reduce a fire’s potential is typically called a “method” or “treatment.” Several methods or treatments are available in vegetation management practice. Table ES-2 summarizes the methods available for implementation of the three Tier 1 projects that would also apply to the Tier 2 and Tier 3 projects identified in this plan. Other projects in this plan could also be implemented; however, would require an additional planning process to better define the projects and to conduct the environmental review.

Table ES-2 Typical Vegetation Treatments

Treatment Activity	Description	Method of Application
Mechanical (Mastication)	Use of motorized equipment to cut, uproot, crush/compact, or chop existing vegetation. Used on slopes from 0 to 30 percent only.	Mastication, chipping, piling; often combined with pile burning (if allowed)
Manual Treatment	Use of hand tools and hand-operated power tools to cut, clear, or prune herbaceous or woody species.	Hand pull and grub, thin, prune, hand pile; often combined with pile burning (if allowed)
Pile Burn	Use of fire to remove cut or dead vegetative material where chipping, hauling, or decomposition are not feasible. Piles can be constructed of dry vegetative material, covered, and burned.	Hand pile, ignition devices

Chapter 3 also identifies large areas of opportunity for prescribed fire across multiple land ownerships. Prescribed fire activities could be implemented in accordance with a pre-written plan (Burn Plan) that identifies land management goals and specific fire use strategies to safely achieve those goals, with prior approval by the applicable regulatory agencies.

EXECUTIVE SUMMARY

ES.4.4 Environmental Review

Implementation of the WRMP has the potential to impact environmental resources. Projects carried out or approved by the County that occur on private land would require review under the California Environmental Quality Act (CEQA). Projects that the County completes on federal land (e.g., Bureau of Land Management, United States Forest Service) would require review under the National Environmental Policy Act (NEPA) in addition to CEQA review.

Biological and cultural resource assessments are required to ensure that the WRMP projects do not significantly impact biological and cultural resources. General protection measures for biological and cultural resources are identified in the WRMP and would be applied to all projects, as appropriate.

ES.4.5 Estimated Costs

The cost of implementing the WRMP projects varies depending on the size of the project and treatment method used. From a cost perspective, prescribed burning is the most cost-effective way to treat large areas; however, prescribed burning can only be implemented under very specific weather, land development, and topography conditions. None of the Tier 1 projects propose prescribed burning. The cost of mastication is generally higher per acre than prescribed burning but lower than hand thinning methods. Mastication could be used as an alternative to prescribed burning and can also be used in areas where prescribed burning would not be possible. Estimated costs of each treatment type, as well as a list of potential funding sources are provided in Section 4.6 of the WRMP.

ES.4.6 Future Project Implementation

The WRMP includes defined activities that would occur during implementation of the Tier 1 projects. Extensive planning and public outreach has occurred in preparation of defining the Tier 1 projects. Future Tier 2 and Tier 3 projects would require additional definition of project boundaries, treatment methods, and public outreach. Environmental review would be required for future projects. The type and level of environmental review would be determined based on future project boundaries, land ownership, treatment methods, and potential environmental impacts.

ES.5 Community Access Risk Assessment

ES.5.1 Ingress/Egress Identification

Alpine County's population is focused in the five communities of Woodfords, Hung-A-Lel-Ti, Markleeville, Kirkwood, and Bear Valley. During the HRVA characterization and analysis, Alpine County officials helped identify and designate primary and secondary ingress and egress routes, and constraints to access for vulnerable communities.

Grover Hot Springs, Shay Creek, and Markleevillage share Hot Springs Road as a single ingress/egress route; however, options for feasible secondary evacuation routes are constrained

EXECUTIVE SUMMARY

by terrain and significant distances to a higher functional class route. Similarly, the Sherman Acres, Old and New Bear Valley subdivisions, and Bear Valley Mountain Resort have single access to the State highway system. All of the communities discussed above are surrounded by mountainous terrain. The most feasible secondary access alternatives would need to parallel the primary evacuation route, due to site constraints, and would not create safer evacuation conditions; therefore, vegetation management efforts along ingress and egress routes is especially important for adequate emergency response and evacuation.

ES.5.3 Community Evacuation Areas Identification

During the HRVA characterization and analysis, Alpine County officials and the Steering Committee helped identify community evacuation areas or refuge areas. Community evacuation areas are zones where emergency service vehicles and personnel can stage for an incident. These zones can also serve as a rendezvous point for the public or, potentially, a safety zone from fire when egress is compromised.

Evacuation zones are even more important in areas where ingress/egress infrastructure is limited. The Hot Springs Road corridor, Sherman Acres, Old and New Bear Valley subdivisions, and Bear Valley Mountain Resort are lacking secondary access routes. Since establishing secondary ingress and egress to vulnerable communities is not feasible, establishment of pre-incident evacuation zones that meet minimum safe separation distances is recommended. Potential evacuation zones identified as HVRAs during the wildfire hazard and risk assessments include:

- Turtle Rock Park;
- Diamond Valley Elementary School;
- Grover Hot Springs State Park; and
- Bear Valley Library and parking lot.

ES.5.4 Community Access Risk Report

Analysis shows that about 832 acres surrounding major ingress and egress routes are at risk. This means that during a critical wildfire incident, portions of the major emergency routes do not have the appropriate clearance of vegetation and fuels around the road for traffic to safely pass if fire impacted those areas during critical fire weather. About 1,868 acres surrounding minor ingress and egress routes are shown to have at least some risk. Like major routes, this means that areas do not have sufficient vegetation and fuel clearance adjacent to routes so that traffic can safely pass. Finally, community evacuation areas might be vegetation and fuels free within the zone, but the WRMP fire hazard analysis shows that about 150 acres surrounding those areas exhibit high enough fire hazard that, during a critical wildfire incident, fire could compromise the effectiveness of those evacuation areas. Vegetation management efforts focused on treatment of the area surrounding major emergency routes and evacuation areas are recommended.

1 Introduction

1.1 Background

1.1.1 Fire Hazards and History in Alpine County

Alpine County, located in the Sierra Nevada, is largely comprised of vast areas of undeveloped land across different topographies. Wildland fires within the wildland urban interface (WUI), where development is interspersed with wildlands, pose the greatest threat to lives and property. Four major wildfires have occurred in Alpine County since 1981. In 1984, the Indian Creek Fire burned approximately 6,000 acres of forest in Alpine County (17,000 acres total) near Indian Creek on the East Slope. In 1986, a fire burned 2,000-3,000 acres of wildland plus two structures near Fredericksburg and in 1987 the Acorn Fire burned 6,000 acres and 26 structures near Woodfords. In 2015, the Washington Fire consumed approximately 18,000 acres south of Markleeville and came within two miles of the town of Markleeville, prompting evacuations and significant coordinated response from local, State, and federal firefighting agencies. Fortunately, none of these fires resulted in loss of life (C.G. Celio & Sons Co., 2018).

1.1.2 Grant for Fire Hazard Mitigation Planning

CAL FIRE awarded \$43 million in Local Fire Prevention Grants to various entities across the state in April 2019. These grants fund 66 local fire prevention projects. The Fire Prevention Grants are meant to enable local organizations, like fire safe councils, to implement activities that address the risk of wildfire and reduce wildfire potential to communities. The awarded projects all meet the goals and objectives of California's Strategic Fire Plan adopted in 2018, as well as the recommendations of CAL FIRE's "Community Wildfire Prevention & Mitigation Report" to Governor Gavin Newsom submitted in April 2019. Most of the award funding is provided by the Greenhouse Gas Reduction Fund for California Climate Investments (CCI).

Fuels reduction projects to reduce the risk of wildland fire are a high priority in Alpine County and several have been undertaken or are ongoing, including neighborhood fire breaks and larger scale fuels reduction projects on federal lands. Approximately 1,780 residential units are in Alpine County; over 1,200 of these are in high or very high wildfire hazard severity zones (C.G. Celio & Sons Co., 2018). Key planning areas include Woodfords, Markleeville, Bear Valley, and Kirkwood. Community Wildfire Protection Plans have been defined for the east and west County. The Alpine Biomass Collaborative additionally, is an important collaborative group within the County to share information regarding ongoing fuels projects.

In order to build off of the existing work underway and to expedite the County's ability to protect its communities in the face of increasing catastrophic wildland fires across California,

1 INTRODUCTION

Alpine County applied for and was awarded a CAL FIRE Community Fire Prevention Grant in the amount of \$223,756 to create the Alpine County Wildfire Risk Mitigation Plan.

1.2 Goals and Objectives

The goal of the WRMP is to reduce wildfire risk in Alpine County and to protect important resources throughout the county. The objectives of the plan are to:

- Assess the risks of fire within the WUI,
- Identify opportunities to mitigate risks to protect communities through fuel treatments, and
- Define up to three specific projects in enough detail to perform environmental review and prepare for funding and implementation.

1.3 Scope of Wildfire Risk Mitigation Plan

1.3.1 Overview

The WRMP addresses the entirety of Alpine County, but through a defined process of wildfire risk assessment, focuses in on key areas where wildfire hazards generate risks to life, property, and important resources. Alpine County encompasses over 476,000 acres of land yet has the smallest population of any county in the state with just over 1,175 people per the 2010 census (U.S. Census Bureau, 2011). The planning effort to prepare the WRMP was agnostic to land ownership, but inherently focused on the WUI and the five major areas of population, where the greatest risks to life and property are located.

1.3.2 Location Map of Planning Areas

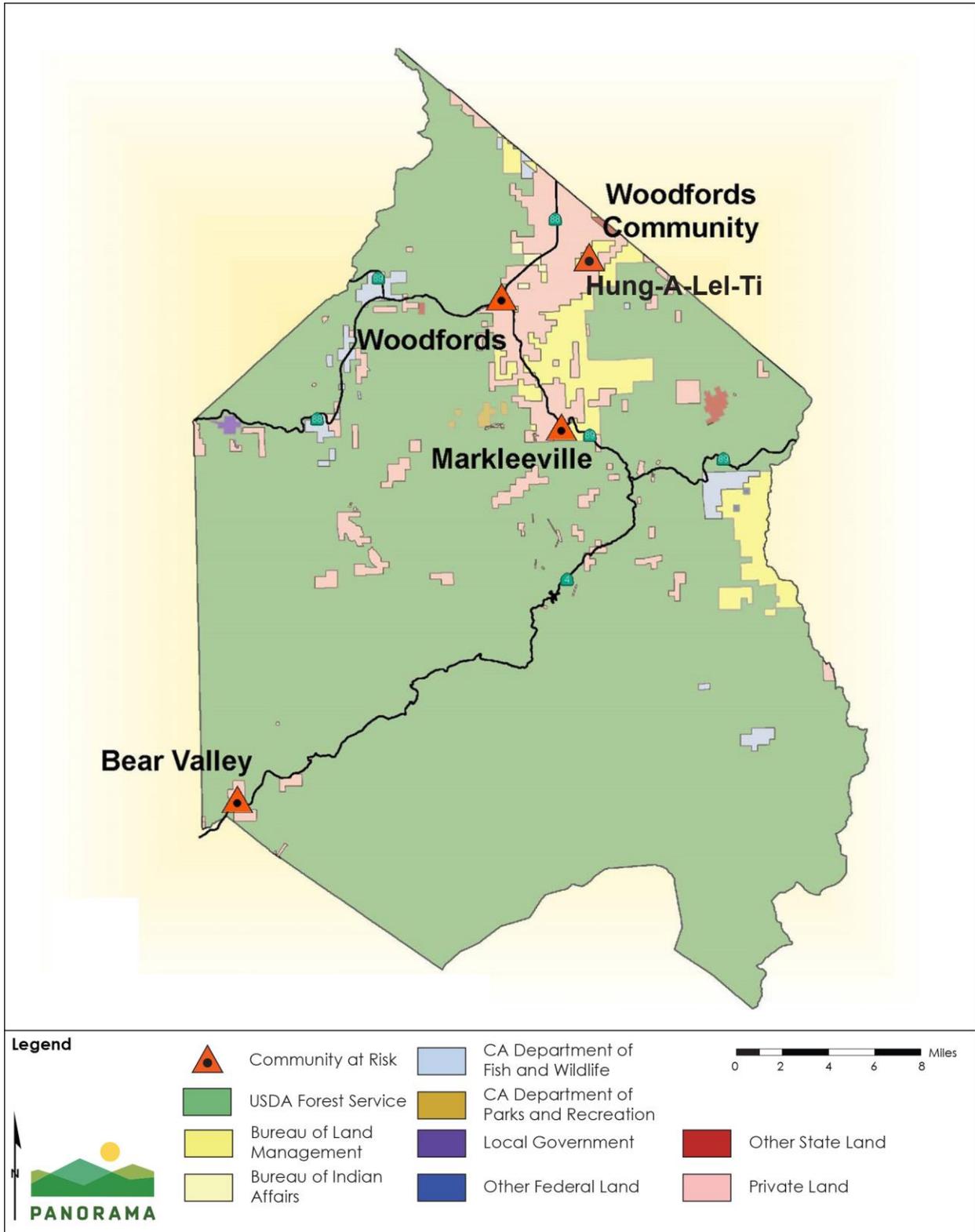
Figure 1-1 shows the land ownership across Alpine County. Approximately 95 percent of the land is in public ownership, with the vast majority managed by the United States Forest Service (USFS). Additional lands are focused on five key community areas, including Woodfords, Hung-a-Lel-Ti, Markleeville, Kirkwood, and Bear Valley. The United States (U.S.) Department of the Interior, Bureau of Land Management (BLM) also manages a considerable amount of land abutting private land in the Woodfords and Markleeville areas.

The population of the county is focused into the following five planning areas (C.G. Celio & Sons Co., 2018):

- **Woodfords Planning Area:** There is a long history of wildfire in this area with the Woodfords community, with four major wildfires occurring since 1981. In 1984, the Indian Creek Fire burned approximately 6,000 acres near Indian Creek, only to be followed by a 2,000-acre fire near Fredericksburg in 1986 and then the Acorn Fire in 1987, which burned nearly 6,000 acres and twenty-six homes. Woodfords is

1 INTRODUCTION

Figure 1-1 Land Ownership and Communities in Alpine County



1 INTRODUCTION

listed on the Federal Register as a community threatened by wildfire. Eastern Alpine Fire and Rescue and the USFS provide wildland fire protection.

- **Hung-a-Lel-Ti Area:** This community is near Woodfords and is the community of the Southern Band of the Washoe Tribe of Indians. Fire hazards are similar to those described for Woodfords.
- **Markleeville Planning Area:** Some large wildfires have burned in this area, most recently the Washington Fire south of Markleeville, which consumed 18,000 acres, and fuel loadings remain high. The Washington Fire burned within 2 miles of the town of Markleeville, prompting evacuations and significant coordinated response from local, State, and federal firefighting agencies. Markleeville is listed on the Federal Register as a community threatened by wildfire. Eastern Alpine Fire and Rescue and the USFS provide wildland fire protection.
- **Bear Valley Planning Area:** This area has little wildland interface issues given its elevation and relatively wet climate. Bear Valley is, however, listed on the Federal Register as a community at risk for wildfire. The community is geographically isolated from the rest of the County much of the year. Bear Valley provides its own fire protection.
- **Kirkwood Planning Area:** This area has a small area of wildland interface, however, the assets at risk are significant due to the value of the homes and infrastructure.

1.4 Existing Fuel Management Planning, Projects, and Regional Capabilities

1.4.1 Alpine Fire Safe Council

The Alpine Fire Safe Council (AFSC) was established in 2003 through a cooperative effort of the Alpine County Board of Supervisors and the Alpine County Resource Advisory Committee. The mission of the AFSC is to provide community leadership, resources, and a forum to improve wildfire preparedness in Alpine County. The AFSC provides educational material to the community, facilitated the Fire Services Plan Ad-Hoc Committee that prepared the 2005 Eastern Alpine County Fire Services Plan, and encouraged various planning efforts at the County to support public safety and fire ordinances (C.G. Celio & Sons Co., 2018).

In 2018, the AFSC published the Alpine County Community Wildfire Protection Plan (CWPP), which served as a major reference and resource in preparation of this WRMP. The CWPP is a roadmap for the community to reduce wildfire hazards and risks. It outlines the risks and hazards and provides specific recommendations and projects to address risks. This WRMP built off the recommendations provided in the CWPP for fuel reduction projects.

The AFSC has also implemented several fuel reduction projects throughout the County, including the Diamond Valley Road spur shaded fuelbreak in 2019 and Alpine Village projects in 2020. Additional AFSC efforts include coordinating a reflective address marker program to

1 INTRODUCTION

provide improved visibility and recognition for emergency personnel and advocating for fire safe development standards within the County.

1.4.2 Alpine Biomass Collaborative

The Alpine Biomass Collaborative (ABC), formerly known as the Alpine Biomass Committee, is a collaborative group in Alpine County whose mission statement is “Unifying partners to promote forest and watershed health, and local economic development.” The ABC believes that by improving forest and watershed health, the risk of catastrophic wildfire can be reduced, and the local economy will benefit by using local labor to implement these efforts. Historically, there has been little coordination between the different land managers and non-government organizations in Alpine County and the ABC recognizes the importance of coordinated planning efforts to ensure successful project outcomes (Alpine Biomass Collaborative, 2020).

In 2016, the ABC received a \$12,000 Capacity Building grant from the National Forest Foundation to begin forest and watershed health improvement efforts. The ABC does not conduct any projects on its own accord; its role is to help other organizations maximize the impact of their forest and watershed health projects. The ABC assists with facilitation between the National Park Service, BLM, USFS, Alpine Watershed Group, Hung-A-Lel-Ti Washoe Community, and other local and federal organizations. The ABC has received support from the Amador-Calaveras Consensus Group, the Sierra Institute, Calaveras Health Impact Product Solutions, and the Sierra Nevada Conservancy (Alpine Biomass Collaborative, 2020).

1.4.3 US Forest Service Work and Other Federal Projects

Alpine County includes four national forests managed by the USFS: Stanislaus, El Dorado, Lake Tahoe Basin Management Unit, and Humboldt-Toiyabe, as well as other federally managed lands. Federal agencies such as the USFS and BLM implement forest planning and management projects throughout Alpine County. The BLM Carson City District has implemented several fuels treatment projects near the Markleeville and Turtle Rock Park communities along Highway 89. The projects, implemented between 1997-2011, include mechanical fuels treatment techniques and prescribed burning. One project is located along Hot Springs Road, north of Markleevillage, and another project is located along Poor Boy Road, south of Markleeville. Various smaller projects are located along the western edge of Indian Creek Reservoir, along Airport Road, and immediately south of Turtle Rock Park.

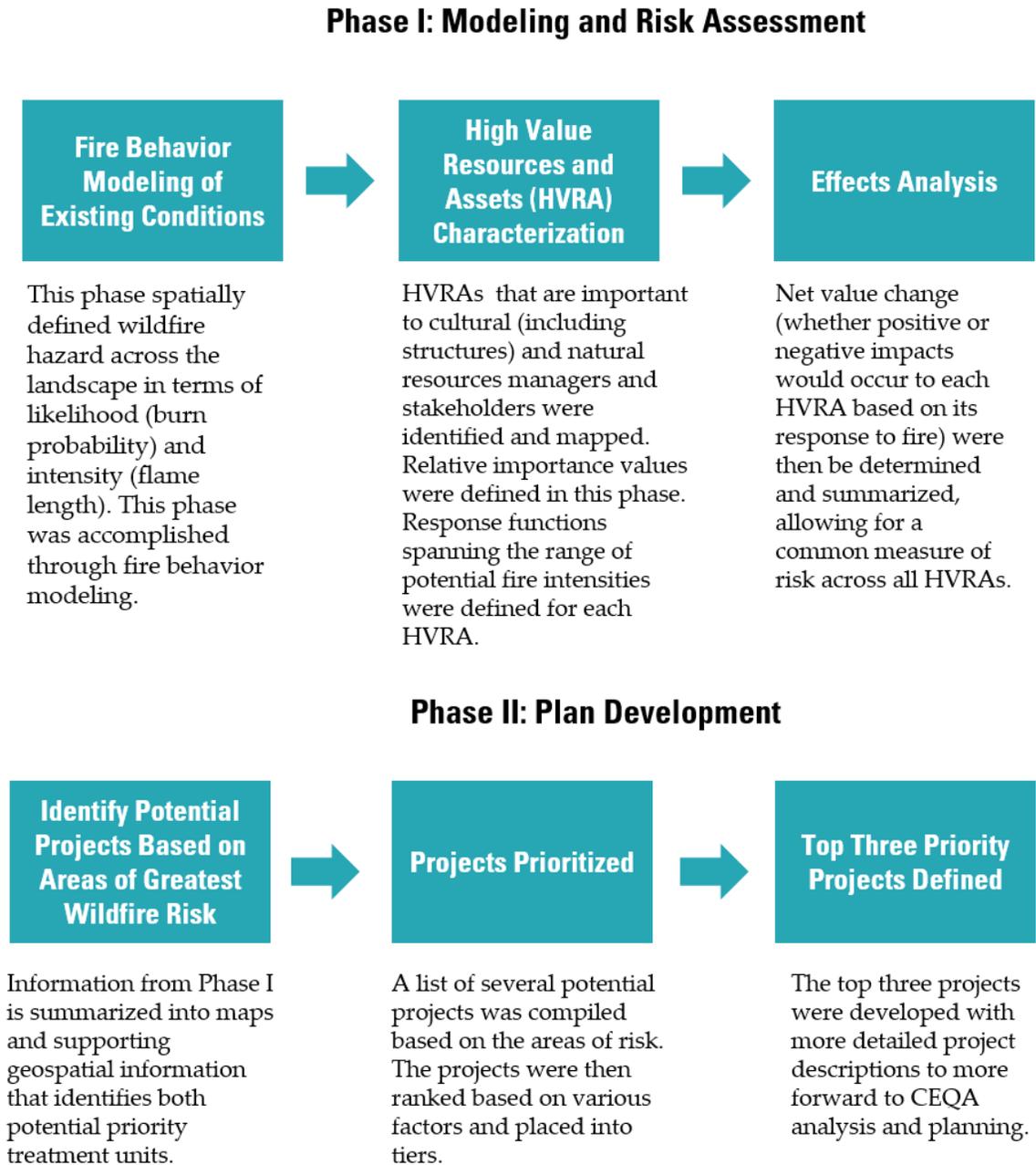
The Humboldt-Toiyabe National Forest continues to implement within several active project areas, treating approximately 200 acres per year in Eastern Alpine County. These projects all have a fuels reduction and vegetation management emphasis, including hand thinning, mechanical thinning, and prescribed fire treatments. Active projects in the greater Markleeville area are: Manzanita Hazardous Fuels Reduction Project, Markleevillage Hazardous Fuels Reduction Project, Monitor Pass Habitat Improvement Project, and West Carson Watershed Habitat Improvement Project (USFS, 2010; USFS, 2013).

1.5 Plan Development Process

1.5.1 Plan Development Process

This WRMP has been developed following the process shown in Figure 1-2. Phase I is described in detail in Chapter 2. Phase II is described in Chapters 3 and 4. A community access risk assessment was also performed, and the results are presented in Chapter 5.

Figure 1-2 Summary of WRMP Development Process



1 INTRODUCTION

1.5.2 Roles of Steering Committee in Plan Development

The County coordinated a steering committee of individuals to advise on WRMP development.¹ The committee members included individuals from:

- Humboldt-Toiyabe National Forest – Carson Ranger District: Annabelle Monti
- Stanislaus National Forest – Calaveras Ranger District: Kellin Brown
- Alpine Fire Safe Council: Kris Hartnett
- Alpine Biomass Collaborative: Michael Barton
- Eastern Alpine Fire and Rescue: Terry Hughes
- Alpine County Community Development Department: Zach Wood and Debbie Burkett
- CAL FIRE Amador El Dorado Unit: Mike Deacon

An initial kick-off meeting was held with the steering committee, as well as several check in points throughout Phase I and Phase II to receive feedback and to assist and direct the decision-making process as the development of the plan progressed.

1.5.3 Community Participation

WRMP Development Process

The County prioritized community participation in the development of the WRMP. The County held two public workshops to obtain public input on the components of the plan and methodology for prioritizing projects. The first public meetings and workshops were held on February 25, 2020, in Markleeville and February 26, 2020 in Bear Valley. The meetings included a presentation to introduce the WRMP effort, to give an overview of existing activities, to introduce the methods of wildfire risk assessment being undertaken, and to identify the process by which projects will be determined. The meeting included a question and answers session and breakout stations where individuals could ask questions or provide input on specific aspects of the process. A second workshop was held on April 28, 2020 via videoconference. This workshop focused on presenting results of modeling with a focus on candidate project locations, prioritization, and next steps in the project implementation process. Appendix A includes the Community and Stakeholder Input Report.

The County will also hold a CEQA workshop to inform the public of the potential impacts from implementation of the plan during the CEQA document public review period.

¹ Matthew Hilden (Stanislaus National Forest – Calaveras Ranger District) and Brian Peters (Alpine County Community Development Department) participated in the WRMP preparation process but retired prior to the WRMP publication.

1 INTRODUCTION

Partnerships to Achieve Project Success

The WRMP had been developed to consider wildfire risk across Alpine County, regardless of landowner. The County recognizes that projects to be implemented on private land require significant engagement and participation of private landowners. Section 3 of this WRMP identifies a list of candidate projects throughout Alpine County. Many of the candidate projects include privately owned land. Projects that include a majority of private land, including private subdivided lots, would not be viable without participation from the hundreds of property owners within the project boundaries.

The County has a longstanding commitment to working with federal, State, and local government agencies, non-governmental organizations, and private property owners to reduce wildfire risk and protect important resources throughout Alpine County. Non-governmental organizations, including the Alpine Fire Safe Council and Alpine Biomass Collaborative have been instrumental in communicating the WRMP goals and objectives to the public and cultivating support for the WRMP. Participation from all agencies, organizations, and the public is greatly appreciated.

2 Technical Analyses

2.1 Key Terms

Several key terms are used throughout this section. The following terms that are used in this guide are defined as follows (Scott, Thompson, & Calkin, 2013):

- **High Valued Resources and Assets (HVRAs):** are simply valued elements of the manmade and natural environment.
- **Hazard:** a physical situation with the potential to cause damage to HVRAs, resulting in loss or benefit
- **Risk:** The likelihood, intensity, and susceptibility to effects of wildfires on HVRAs
- **Exposure analysis:** an analysis that explores the potential spatial interactions of HVRAs with risk factors- fire likelihood and fire intensity- without considering how these factors affect HVRA value.
- **Effects analysis:** explores the response of HVRAs to varying levels of these risk factors. Fire effects are often expressed as a percentage loss of value for a given intensity level.
- **Expected net value change:** a measure of wildfire risk to resources and assets that forms the basis for the quantitative wildfire risk assessment process.

2.2 Introduction

The fundamental need driving fuel treatment efforts, and pre-suppression fire management in general, is the need to reduce risk. Developing an optimal fuel treatment scenario can be initiated by developing a clear, baseline understanding of how wildfire risk is distributed across the landscape to be managed. The understanding of the wildfire risk is established by a quantitative, spatially explicit, landscape-scale wildfire risk assessment. A wildfire risk assessment most directly complements the larger goal of prioritizing fuel treatments by providing the means to quantitatively compare fuel treatment alternatives.

There are three main components of wildfire risk: likelihood, intensity, and susceptibility to effects. Knowing where wildfires are probable and the intensity at which they might burn gives the critical information needed to understand and address possible impacts (effects) to HVRAs. Wildfire likelihood, intensity, and effects to HVRAs (susceptibility) may be integrated and quantified in a single expression of net value change, which can be translated into the overall risk while also highlighting opportunities where fire can safely be returned to the landscape without known unintended consequences. Figure 2-1 highlights the three key pieces of information needed before risk can be quantified.

2 TECHNICAL ANALYSES

Figure 2-1 Components of Wildfire Risk Analysis



Fire hazard analysis outputs can also serve as likelihood (fire probability) and intensity (flame length) risk analysis inputs. An additional analysis workflow is required to assess **susceptibility** to characterize wildfire risk, which begins with HVRA identification and characterization. **Susceptibility** is determined through several steps, including HRVA characterization, an exposure analysis, and an effects analysis.

Finally, project development is determined from risk compilation, opportunity compilation, and the reduction of noise in the data to ultimately develop projects. Each step is described in the following sections.

2.3 Fire Hazard Analysis

2.3.1 Method Overview

Wildfire modeling is a field of computational science that uses numerical simulations to predict fire behavior. Wildfire modeling attempts to reproduce fire behavior characteristics like how quickly a fire can spread, in which directions it may spread, and how much heat it may generate given the conditions of the fuels, land, and predicted weather. Fire behavior modeling also looks at whether a fire would transition from the ground surface to tree crowns, which is much more dangerous. Once fire behavior is estimated through modeling, an assessment of fire hazards to surrounding life and property can be made in a risk assessment.

The factors that influence fire behavior serve as the key inputs in modeling efforts. These factors include:

- **Landscape:** Topography factors influence wildfires. Orientation toward the sun, which influences the amount of energy received from the sun, and the slope (fire spreads faster uphill) influence fire behavior. Fire can accelerate in narrow canyons and it can be slowed down or stopped by barriers such as creeks and roads.

2 TECHNICAL ANALYSES

- **Fuels:** Fuels include anything that can burn. In wildland areas, fuels are primarily comprised of vegetation. Dead trees with low moisture ignite more easily and burn faster than live trees with higher moisture. Leaf litter and dried twigs and branches also ignite easier and burn faster.
- **Weather:** Weather influences fire through wind and moisture. Wind can increase the spread of fire in the direction of the wind, wind speed can accelerate spread, and higher temperatures can result in a fire burning faster, as can low humidity and low precipitation.

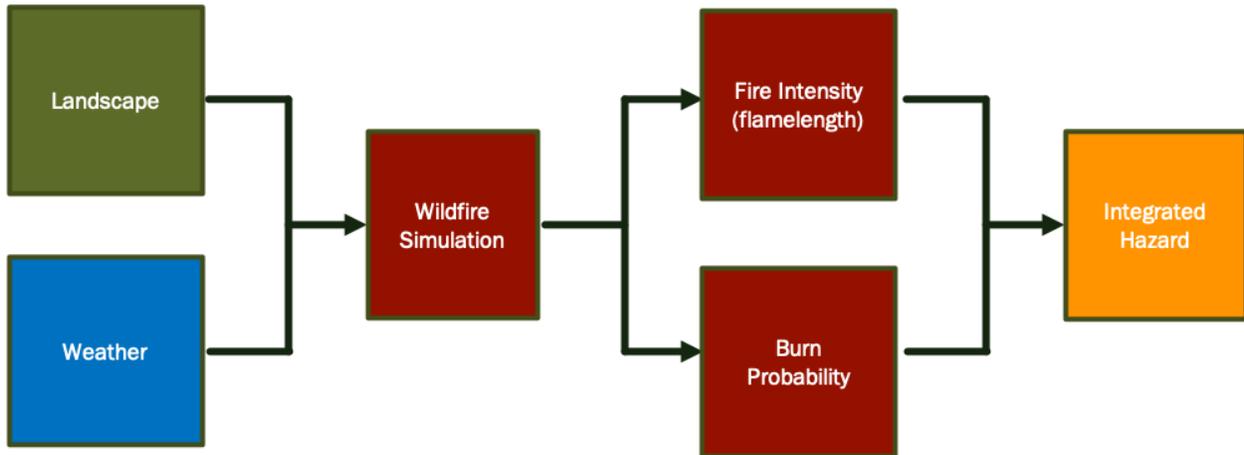
Outputs of fire behavior modeling can include different parameters, but for this project modeling focused on burn probability and fire intensity at 97th percentile weather (described below). Burn probability is the likelihood that a wildfire will burn a given point or area over a specified period. Flame length can be used as a proxy for fire intensity, where flame length is the height of the flames, with taller flame lengths indicating a higher intensity fire. Generally, if flame lengths are less than 4 feet, then fire can be effectively controlled with professional suppression resources. Flame lengths between 4 and 8 feet require multiple, more specific types and numbers of professionally trained firefighting resources and suppression success goes down. Flame lengths greater than 8 feet generally prevent firefighters and resources from directly attacking the fire front because the fire is too intense. Many times, this scenario results in more land being burned and unfortunate effects on property and even life. Vegetation treatments should be identified to reduce undesirable fire intensities when flame lengths exceed 4 feet, so that fire fighters have the highest probability of safely controlling a wildland fire under most weather conditions.

For Alpine County, this analysis was accomplished through development and implementation of a tailored, spatially dependent fire modeling framework that utilized industry standard probabilistic fire models designed specifically for land management. The modeling exercise was undertaken by Fire Ecologist, Scott Conway, of Spatial Informatics Group (SIG).

The methods chosen to model the fire behavior within and around Alpine County took advantage of several best in class, comprehensive datasets, modeling technologies, and systems to quantify the vegetation and fuels consistently and appropriately across the County. The modeling protocol was based off *A Wildlife Risk Assessment Framework for Land and Resource Managers* (Scott, Thompson, & Calkin, 2013). The methodology was approved by the steering committee in November 2019. The modeling workflow is shown the figure, below.

2 TECHNICAL ANALYSES

Figure 2-2 Fire Behavior Modeling Workflow



2.3.2 Model Inputs

Overview

The Landscape Fire and Resource Management Planning Tools (LANDFIRE) was used for the inputs for landscape and fuels, that is, topography and vegetation cover types. LANDFIRE is a shared program between the wildland fire management programs of the USFS and U.S. Department of the Interior. The datasets in LANDFIRE for topography and vegetation are based on remote sensing data.

For all topography, vegetation, and fuels analysis, the project took advantage of comprehensive, yet explicit (30-meter squared resolution) LANDFIRE data through the Interagency Fuel Treatment Decision Support System (IFTDSS). IFTDSS is a web-based application designed to make fuels treatment planning and analysis more efficient and effective. IFTDSS provides access to data and models through one simple user interface. It is available to all interested users, regardless of agency or organizational affiliation. IFTDSS is designed to address the planning needs of users with a variety of skills, backgrounds, and needs. A simple and intuitive interface provides the ability to model fire behavior across an area of interest under several weather conditions and to easily generate downloadable maps, graphs, and tables of model results. The application provides a step by step process for testing a variety of fuels treatment impacts (thin, clear cut, prescribed burn) on fire behavior and comparing results to determine the modeled treatment to best achieve desired results in terms of reduced fire behavior potential. It can be used at a variety of scales from local to landscape level (US Department of Interior, 2020).

LANDFIRE is a shared program between the wildland fire management programs of the USFS and U.S. Department of the Interior, providing landscape scale geo-spatial products to support cross-boundary planning, management, and operations. LANDFIRE vegetation products describe the following elements: Existing Vegetation Type, Existing Vegetation Canopy Cover,

2 TECHNICAL ANALYSES

and Existing Vegetation Height. These layers are created using predictive landscape models based on extensive field-referenced data, satellite imagery and biophysical gradient layers using classification and regression trees. LANDFIRE fuel products describe the composition and characteristics of surface and canopy fuel, which provide consistent fuel information to support fire planning, analysis, and budgeting to evaluate fire management alternatives that supplement strategic and tactical planning for fire operations (LANDFIRE, 2020). Although there are other high-fidelity datasets that can augment or replace LANDFIRE data, there was no other data source that has recently and consistently mapped all Alpine County. Therefore, LANDFIRE is the primary data source for analysis.

See Appendix B, the Alpine County Auto 97 Current Condition Report, for more in-depth and comprehensive analysis of the current conditions utilized from IFTDSS tools.

Landscape Inputs from LANDFIRE

Topography

Alpine County is characterized by complex and diverse topographic conditions, including rugged peaks and ridges, deep canyons, mountain meadows, and numerous streams and lakes. Elevations range from just over 4,500 feet to well over 11,000 feet. These dynamic physical conditions create a variety of vegetation conditions. Aspect and elevation data from LANDFIRE are shown in the following figures.

Vegetation

Many vegetation types are found across Alpine County (Figure 2-6). The majority cover types and their distribution across Alpine County are presented in Figure 2-7. The land cover types found within the planning areas are identified in Table 2-4.

Figure 2-3 Aspect Data for Alpine County from LANDFIRE

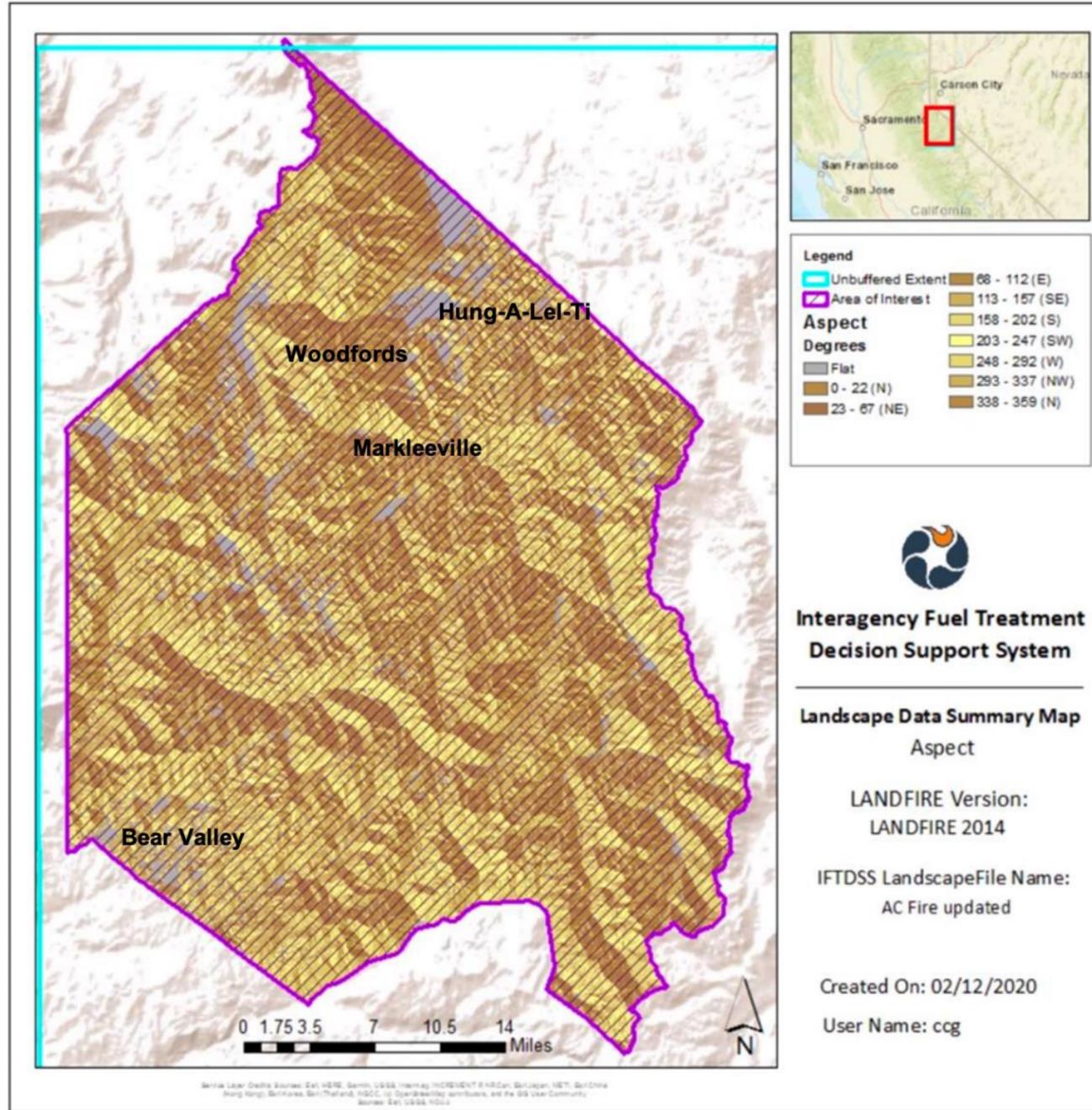
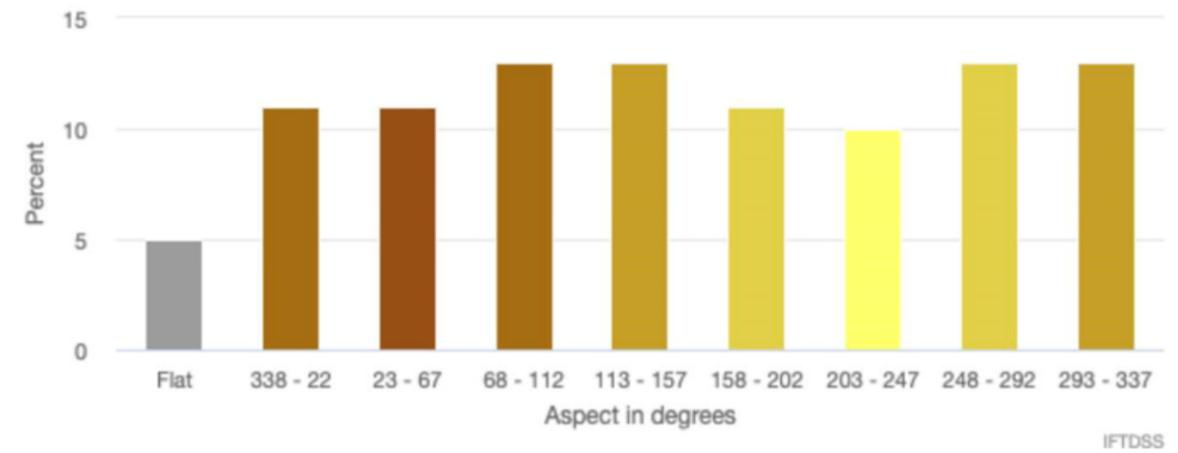


Table 2-1 Aspect Data for Alpine County by Percent



Source: (US Department of Interior, 2020)

Source: (LANDFIRE, 2020)

2 TECHNICAL ANALYSES

Figure 2-4 Elevation Data for Alpine County from LANDFIRE

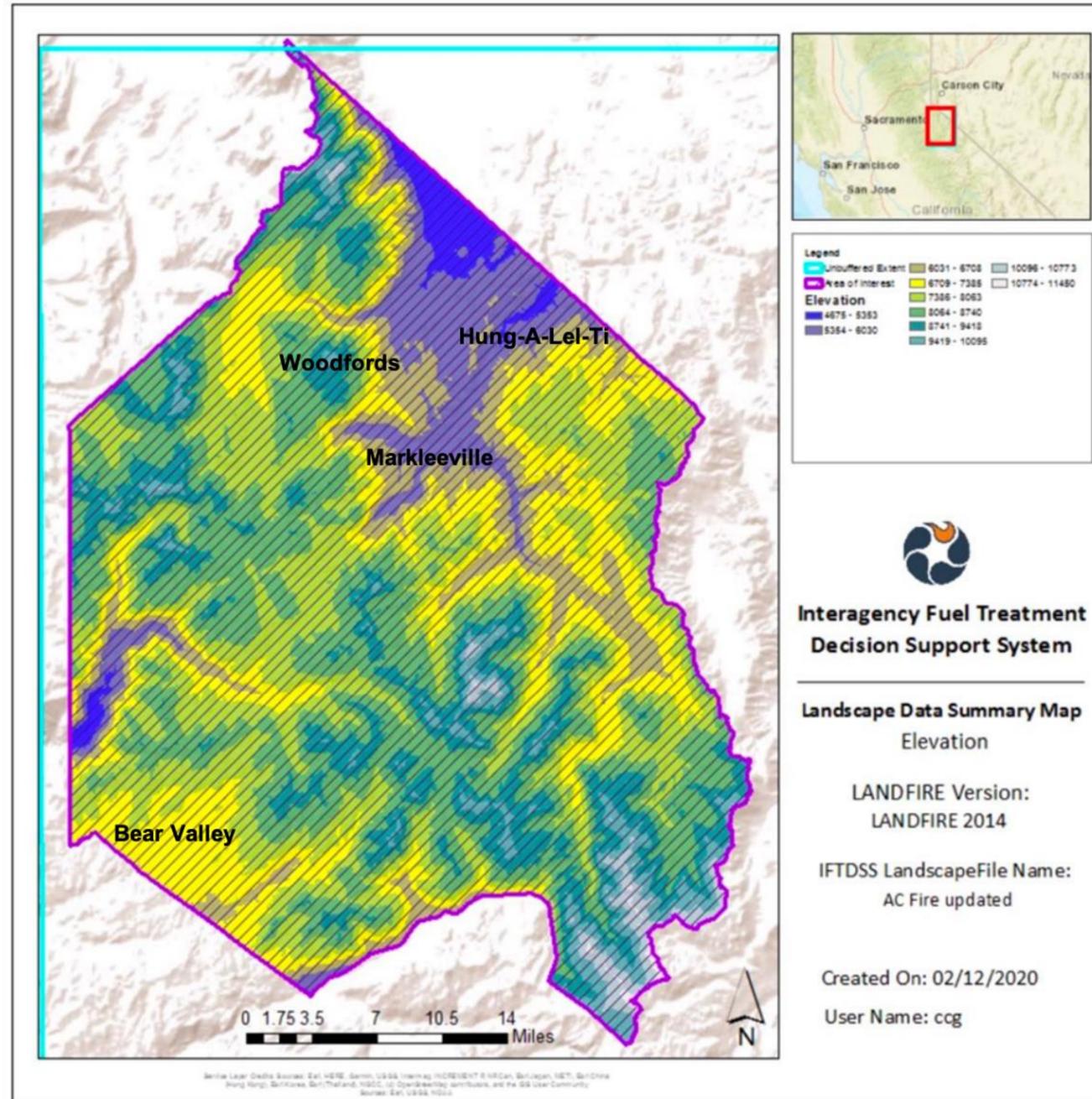
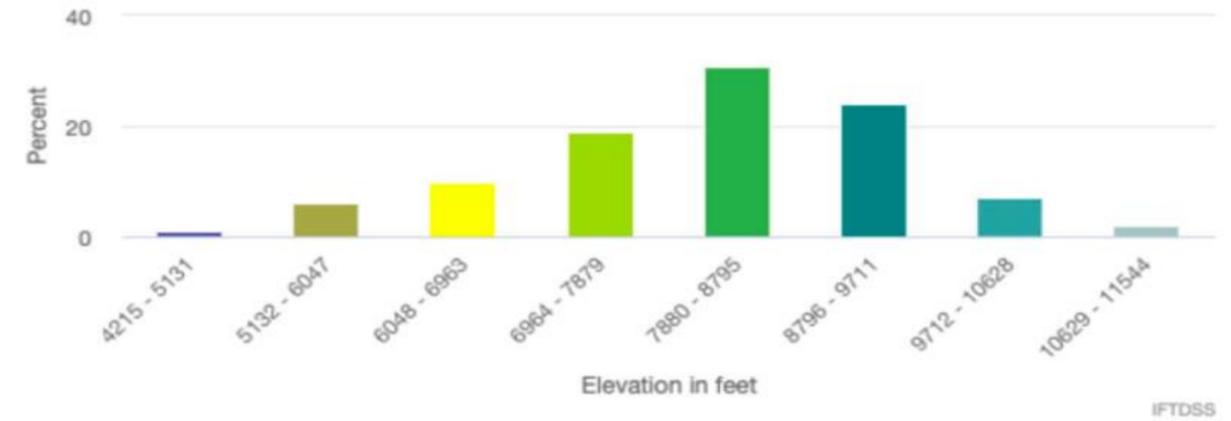


Table 2-2 Elevation Data for Alpine County by Percent



Source: (US Department of Interior, 2020)

Source: (LANDFIRE, 2020)

2 TECHNICAL ANALYSES

Figure 2-5 Slope Data for Alpine County from LANDFIRE

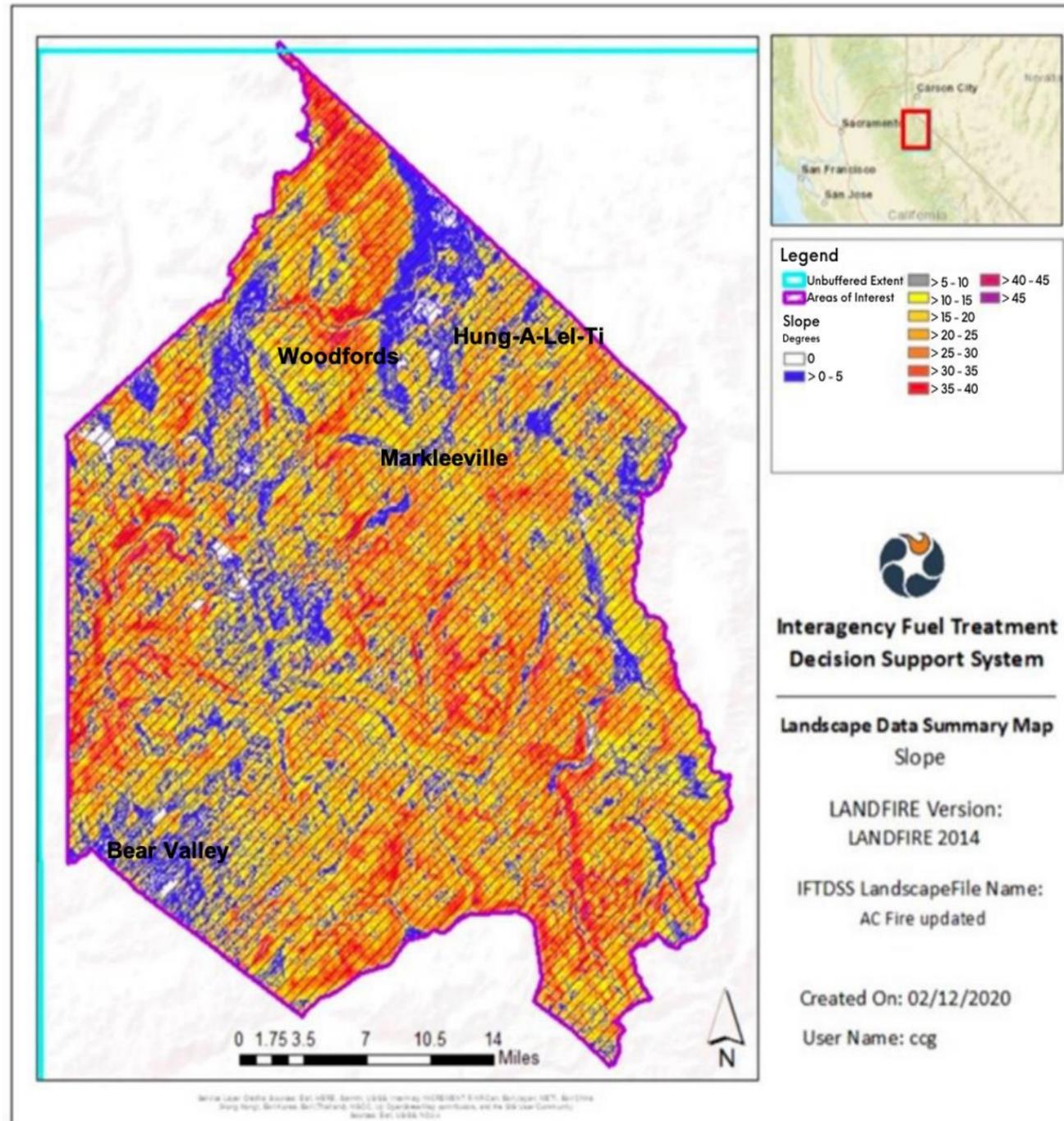
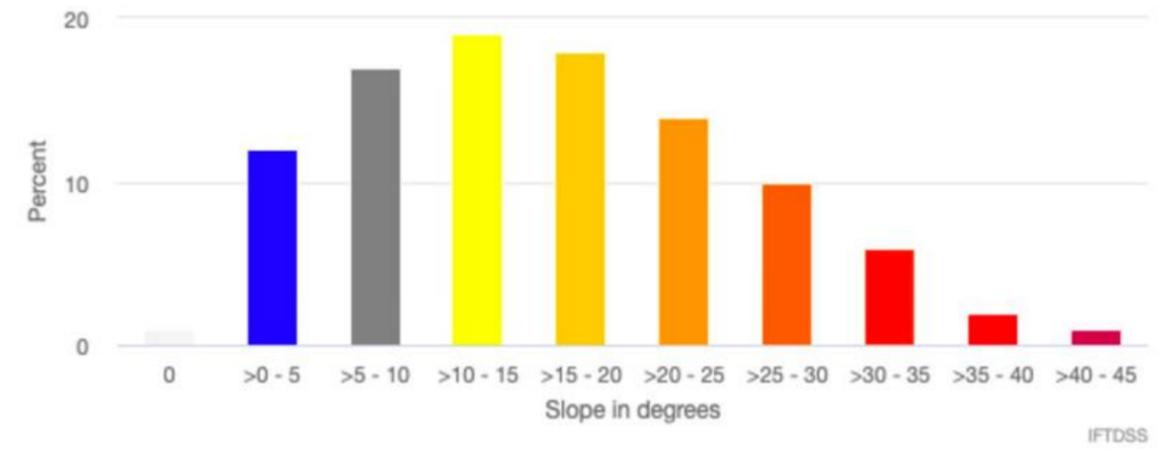


Table 2-3 Slope Data for Alpine County by Percent



Source: (US Department of Interior, 2020)

Source: (LANDFIRE, 2020)

2 TECHNICAL ANALYSES

Figure 2-6 Existing Vegetation Types in Alpine County

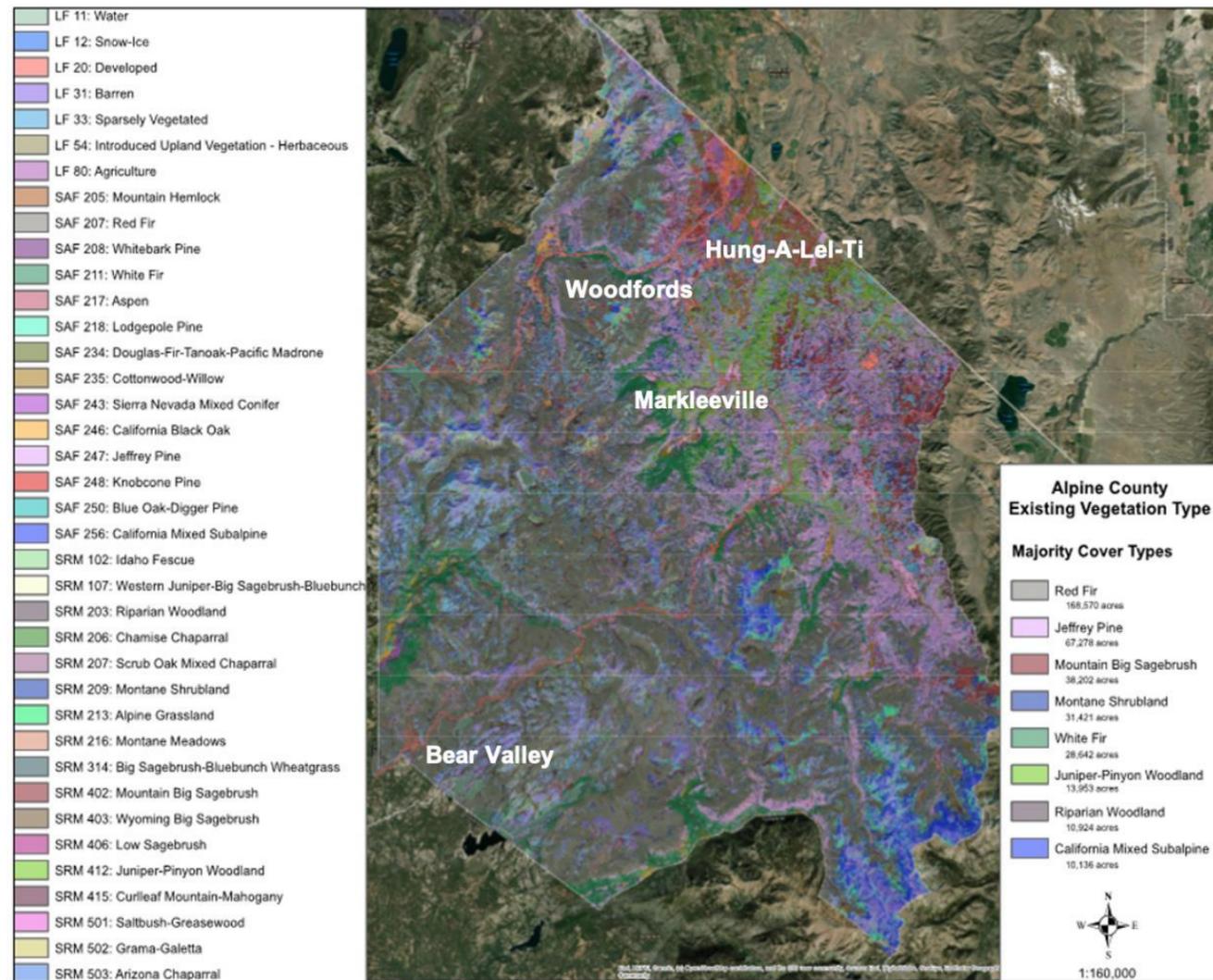
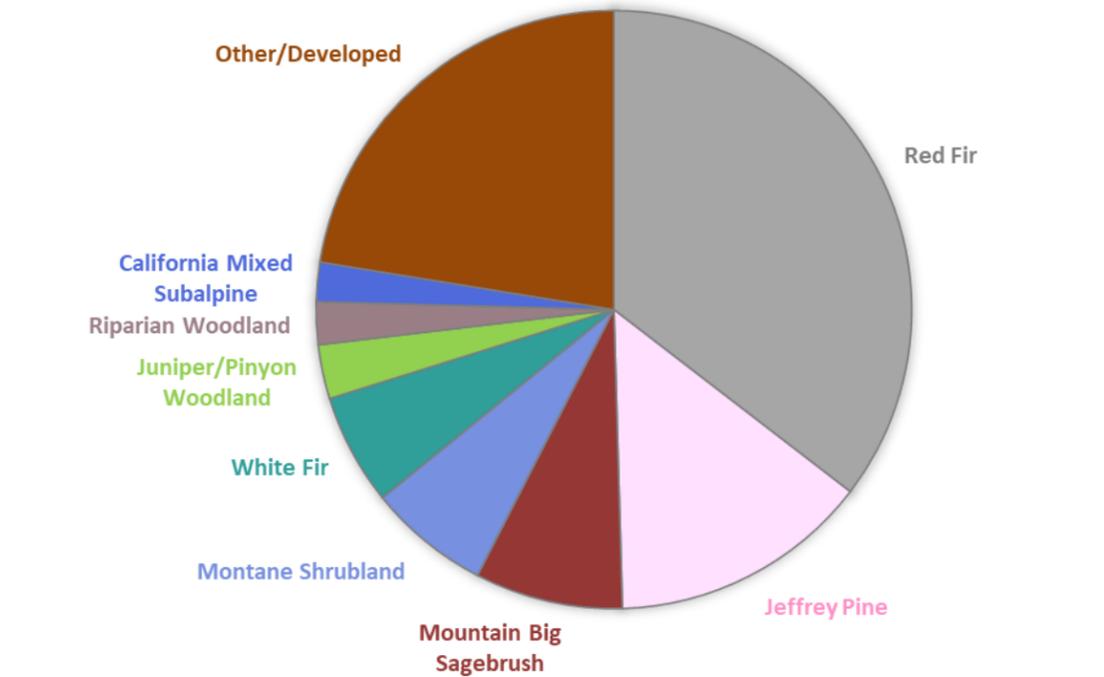


Figure 2-7 Majority Vegetation Cover in Alpine County



Source: (LANDFIRE, 2020)

2 TECHNICAL ANALYSES

Table 2-4 Land Cover Types within Alpine County Planning Areas

Planning Area	Majority Vegetation Cover Type	Burn Probability	Integrated Hazard
Woodfords	Jeffrey Pine/ Montane Shrubland	Higher	Higher Hazard
Hung-a-Lel-Ti	Developed	Moderate	Middle Hazard
Markleeville	Jeffrey Pine	Higher	Higher Hazard
Bear Valley	Sierra Nevada Mixed Conifer/ Chamise Chaparral/ Lodgepole Pine/ Montane Meadow	Lower	Lower Hazard
Kirkwood	Red Fir	Lowest	Lower Hazard

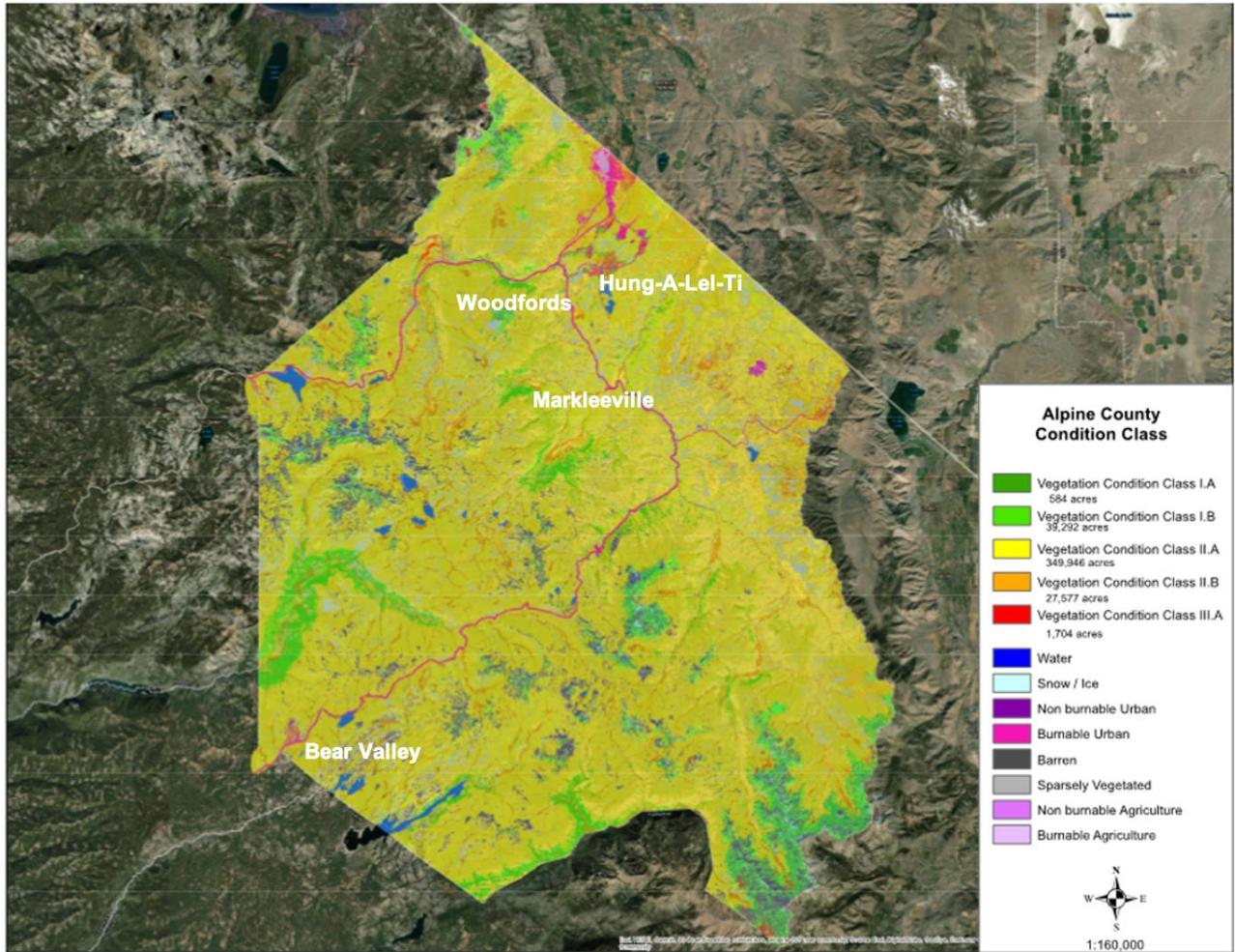
The vegetation cover types throughout Alpine County evolved with low, middle, and higher severity fire. Jeffrey pine is primarily associated with the Woodfords and Markleeville planning areas and Jeffrey pine cover types evolved with higher severity fire. Developed cover type evolved with middle severity hazard and is primarily associated with the Hung-a-Lel-Ti planning area. The Bear Valley planning area primarily features Sierra Nevada Mixed Conifer, Chamise Chaparral, Lodgepole Pine, and Montane Meadow vegetation cover type which have evolved with a lower severity fire. Red fir is primarily associated with the Kirkwood planning areas and evolved with lower severity fire. Fire suppression policies, however, have all but eliminated this periodic disturbance at low and mixed severities. The result is a departure from the historic and natural range of variation measured from reference conditions and has led to an unnatural and undesirable vegetation densities and accumulation of fuels in many areas. Vegetation condition class, shown on Figure 2-8 exhibit how much and where departure has occurred.

Vegetation condition classes reflect the current conditions’ degree of departure from modeled reference conditions (Table 2-5). Vegetation condition class assessments measure departure in two main components of ecosystems: 1) fire regime (fire frequency and severity) and 2) associated vegetation. Managers can use the departure and condition class data to document possible changes to key ecosystem components (Schmidt, Menakis, Hardy, Hann, & Bunnell, 2002). Examples include vegetation characteristics (species composition, structural stage, stand age, canopy closure, and mosaic pattern); fuel composition; fire frequency, severity, and pattern; and other associated disturbances, such as insect and disease mortality, grazing, and drought. Common causes of departure include advanced succession, effective fire suppression, timber harvesting, livestock grazing, introduction and establishment of exotic plant species, and introduced insects and disease (Barrett, et al., 2010).

The majority of Alpine County is in the vegetation condition class II.A at almost 370,000 acres (Figure 2-8). Vegetation class II.A indicates that the landscape is moderately departed from reference conditions and will have elevated vegetation densities and fuel accumulation that might exhibit undesirable fire intensities in many places across the county, including populated WUI communities.

2 TECHNICAL ANALYSES

Figure 2-8 Existing Vegetation Condition Classes



Source: (LANDFIRE, 2020)

2 TECHNICAL ANALYSES

Table 2-5 Vegetation Condition Class Definitions

Condition Class	Vegetation Departure from Reference Conditions ^a	Definition
Class I.A	0-16%	No or very low departure from reference conditions. The vegetation and fuels are within the natural range of variability and fire would behave and have similar effects as pre-settlement landscape fire.
Class I.B	17-33%	Low departure from reference conditions. The vegetation and fuels are slightly departed from the natural range of variability and fire behavior would be slightly elevated compared to pre-settlement fire.
Class II.A	34-50%	Moderate departure from reference conditions. The vegetation and fuels are moderately departed from the natural range of variability and fire behavior would be moderately elevated compared to pre-settlement fire.
Class II.B	51-66%	Moderate to high departure from reference conditions. The vegetation and fuels are moderately to highly departed from the natural range of variability and fire behavior would be elevated compared to pre-settlement fire.
Class III.A	67-83%	High departure from reference conditions. The vegetation and fuels are highly departed from the natural range of variability and fire behavior would be highly elevated compared to pre-settlement fire.
Class III.B	84-100%	Very high departure from reference conditions. The vegetation and fuels are significantly departed from the natural range of variability and fire behavior would be significantly elevated compared to pre-settlement fire.

Notes:

^a Reference conditions describe historical seral stages², vegetation patterns, and fire regimes. Vegetation Condition Class used reference conditions to define pre-settlement landscapes. These became the baseline against which current conditions were compared.

Source: (LANDFIRE, 2020)

Fuels

Fuels are any materials that can burn from leaf litter to timber. Fuel characteristics include:

- Subsurface fuels - roots, peat, and decomposed organic matter

² Stages of secondary successional development of plant communities which occur during ecological succession from bare ground to the climax stage (USDA, 2012).

2 TECHNICAL ANALYSES

- Surface fuels - include needles, twigs, brush, leaves, small trees, and logging slash
- Aerial fuels - include brush over 6 feet, leaves/needles on trees, etc. Air is able to circulate between the fuel and the ground. This allows the fire to burn at a rapid rate. The rate is dependent on the proximity to other aerial fuels, winds, and environment

Fuels can be classified as light (grasses, forbs), medium (light brush and small trees), heavy (dense brush, timber, and hardwoods), and slash (residue on floor). Although fuel conditions in much of the county might exhibit moderate fire severities under a variety of weather conditions, approximately 50,000 acres have an undesirable mix of high surface fuel loads, dense canopies with a lot of bulk, and tall stands with short base heights that will most likely translate to higher severity fire under severe fire weather conditions (Idaho State University, 2020).

The following figures and tables highlight the vegetation densities and fuel loads that exist across Alpine County.

2 TECHNICAL ANALYSES

Figure 2-9 Fuel Load Model Types in Alpine County

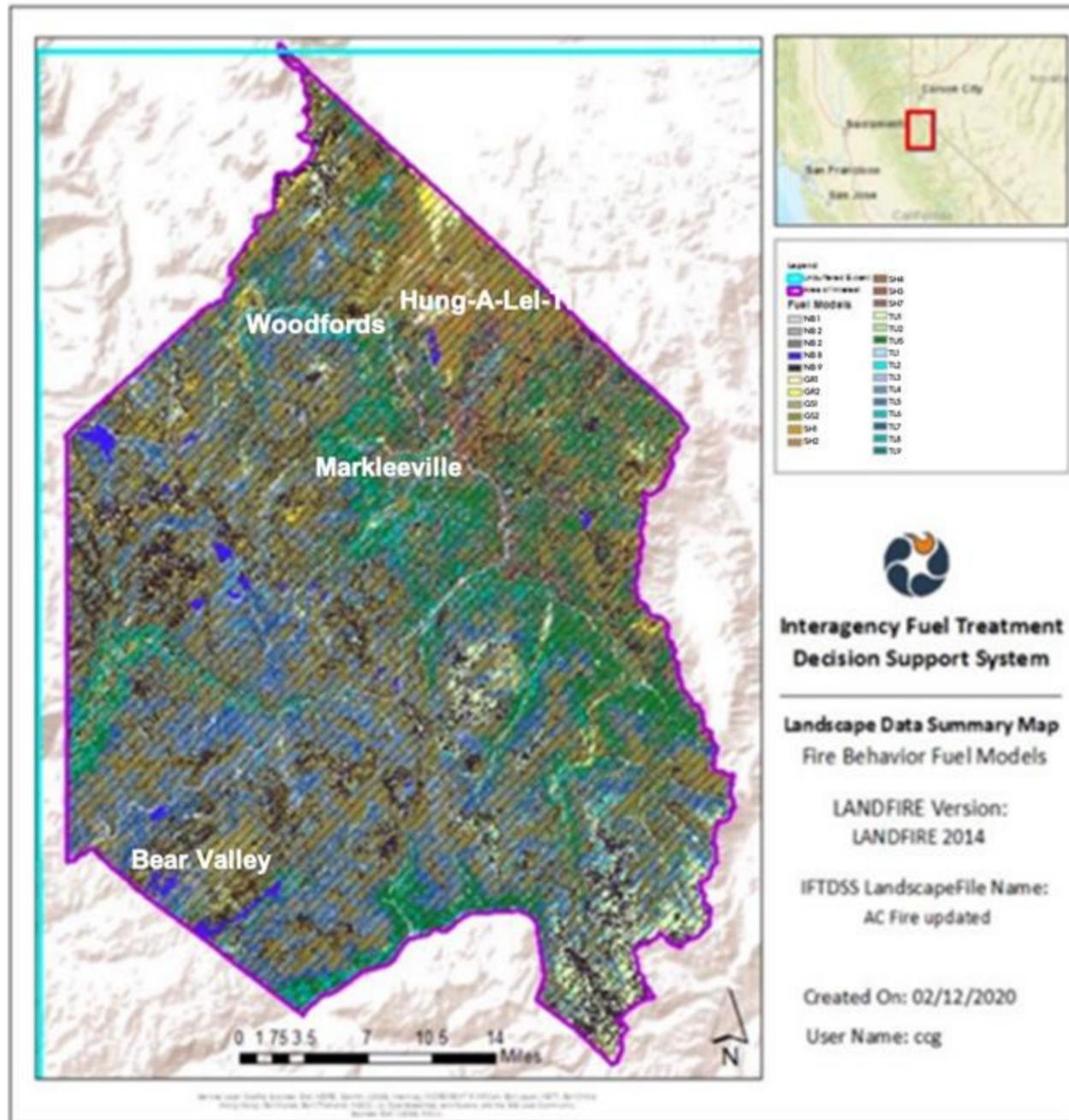
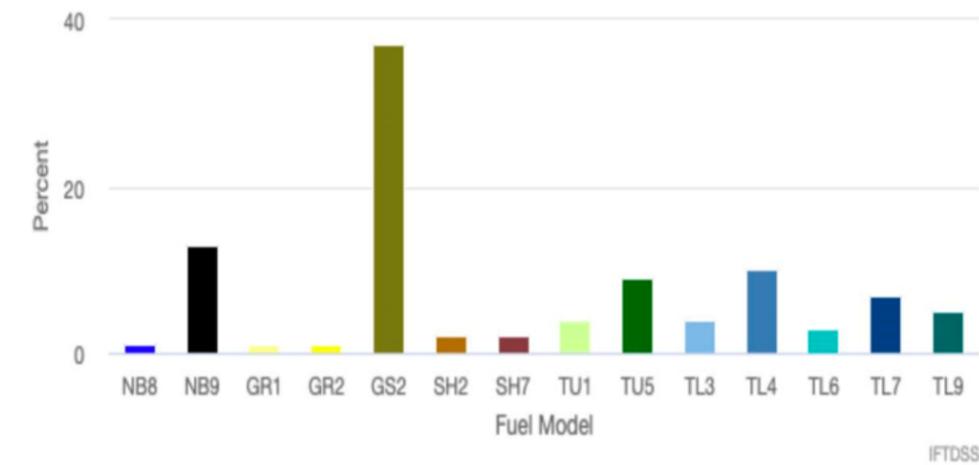


Table 2-6 Fuel Model Type by Percent



GR1: Short, Sparse, Dry Climate Grass	TU5: Very High Load, Dry Climate Timber-Shrub
GR2: Low Load, Dry Climate Grass	TL3: Moderate Load Conifer Litter
GS2: Moderate Load, Dry Climate Grass-Shrub	TL4: Small downed logs
SH2: Moderate Load Dry Climate Shrub	TL6: Moderate load broadleaf litter
SH7: Very High Load, Dry Climate Shrub	TL7: Large Downed Logs
TU1: Low Load Dry Climate Timber-Grass-Shrub	TL9: Very high load broadleaf litter

Source: (US Department of Interior, 2020)

Source: (LANDFIRE, 2020)

2 TECHNICAL ANALYSES

Figure 2-10 Stand Heights in Alpine County

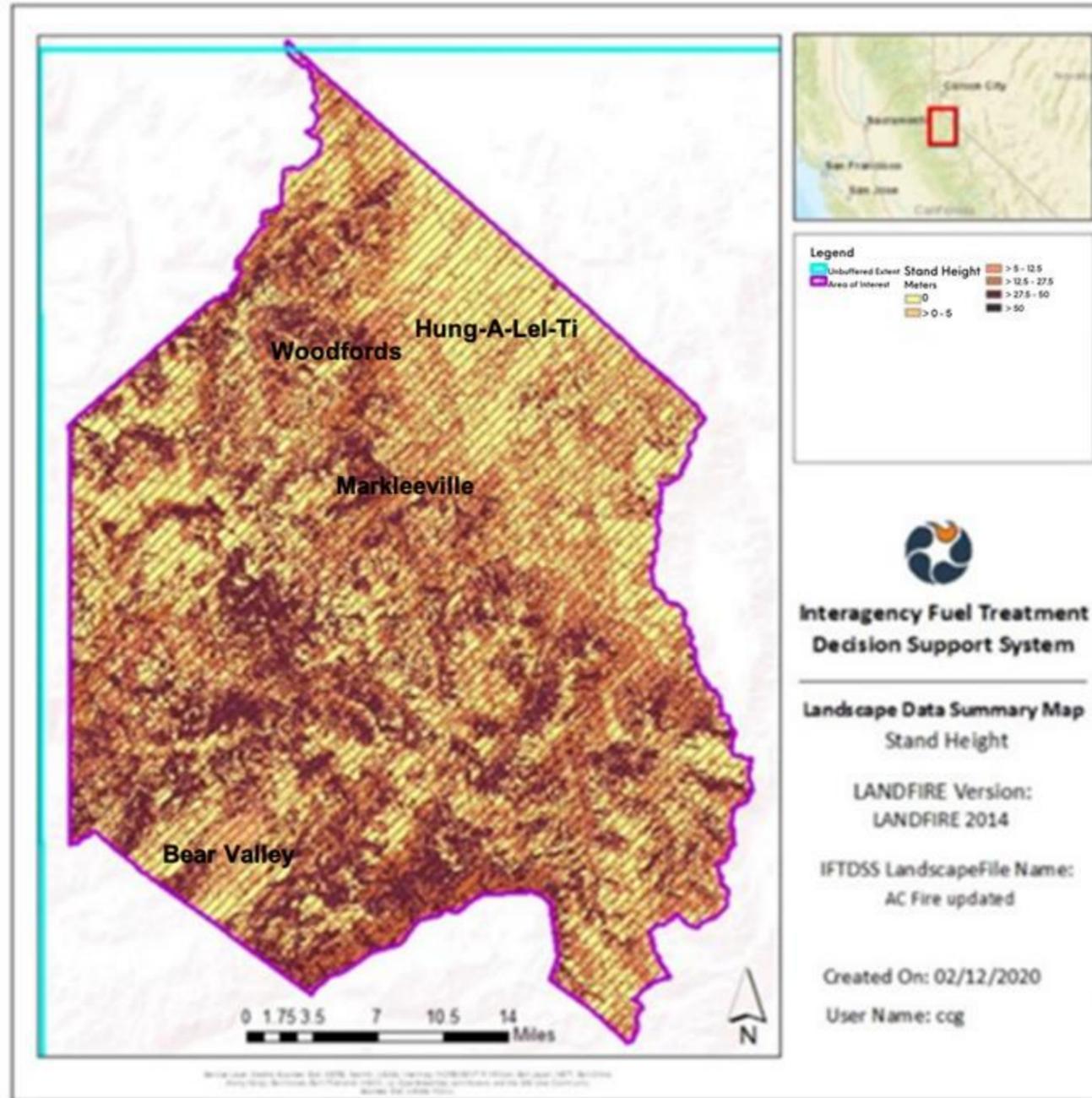
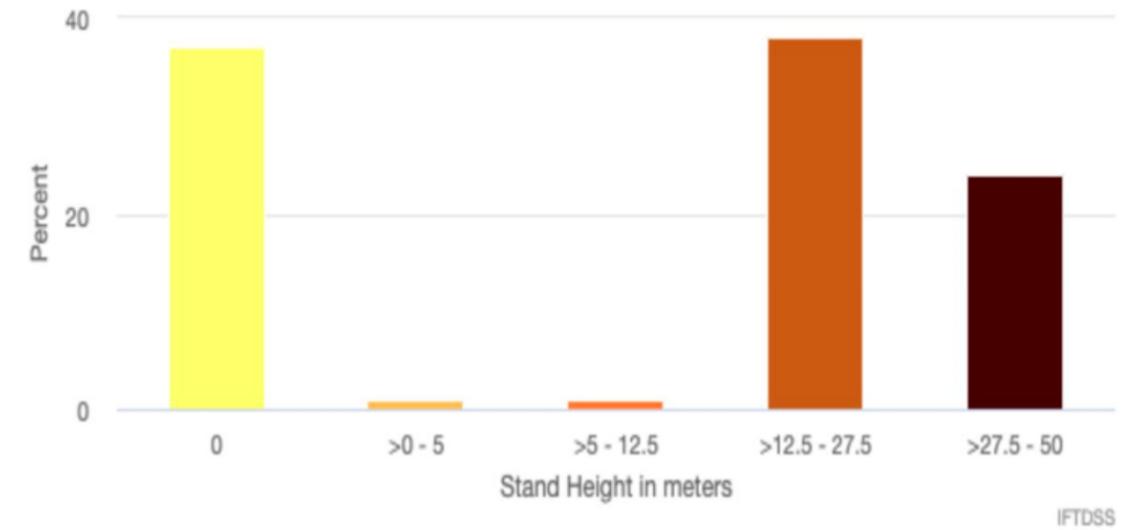


Table 2-7 Stand Heights by Percent



Source: (US Department of Interior, 2020)

Source: (LANDFIRE, 2020)

Figure 2-11 Canopy Cover in Alpine County

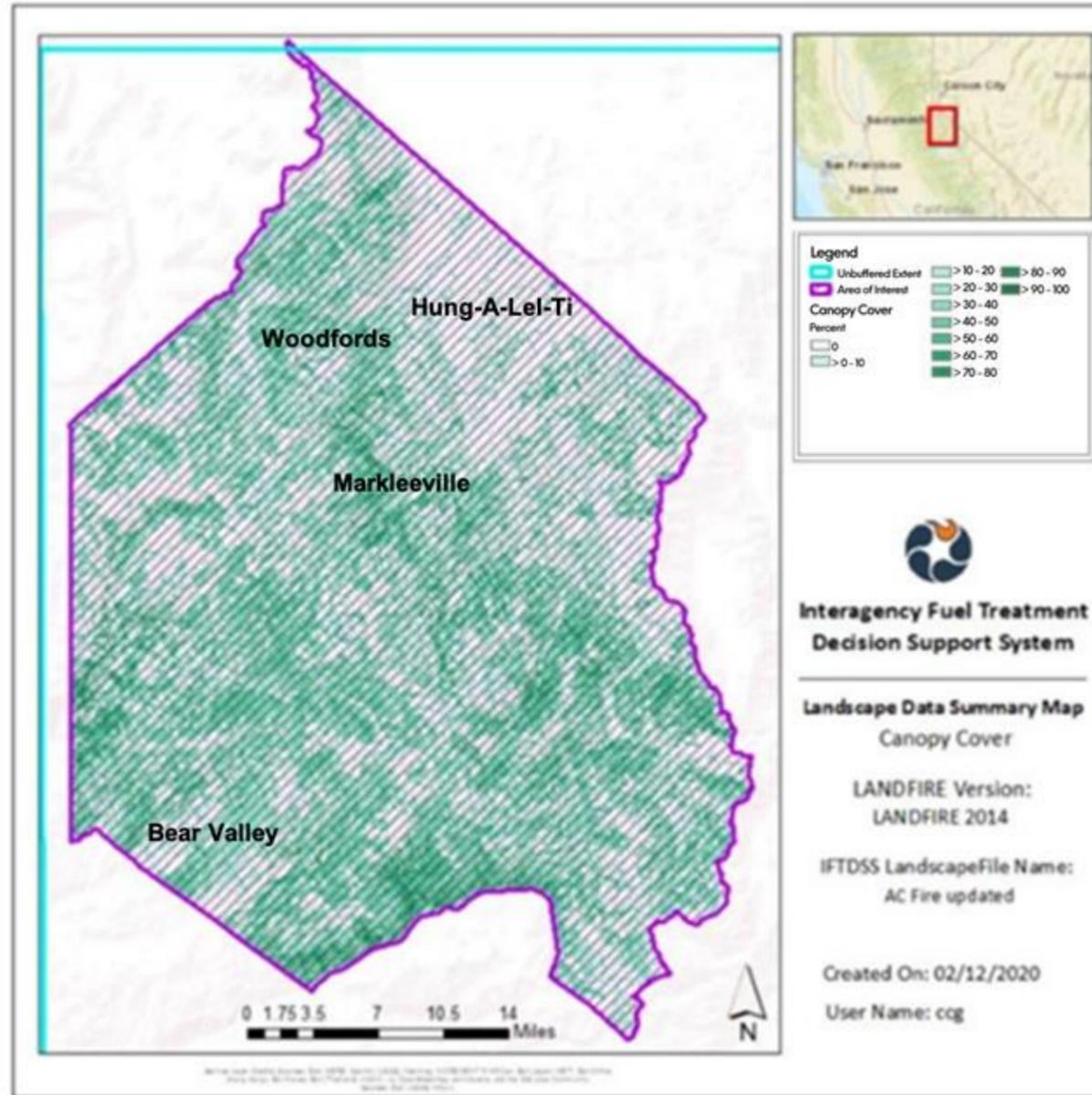
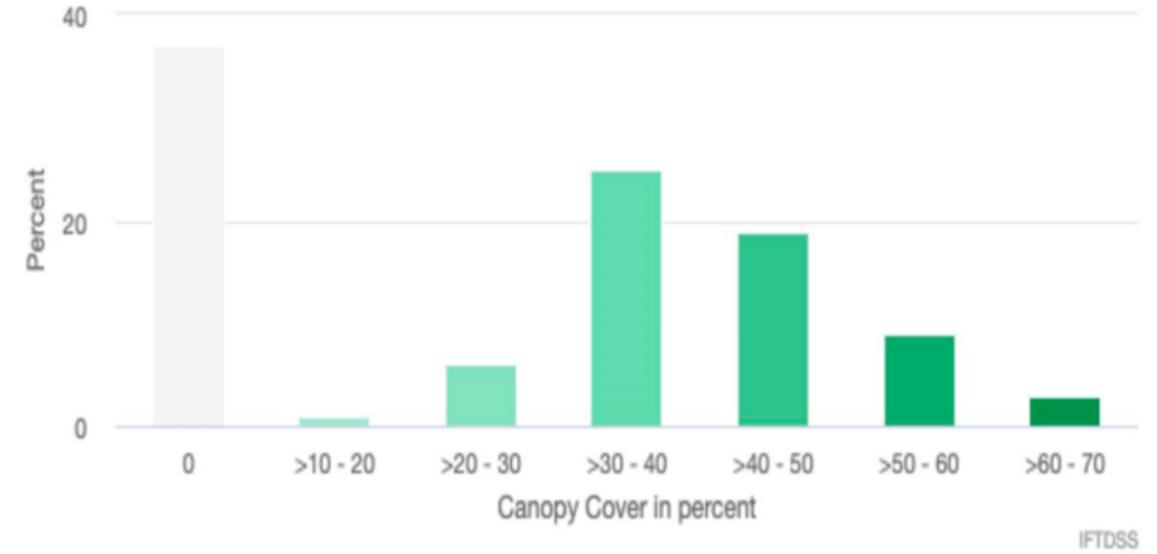


Table 2-8 Canopy Cover by Percent

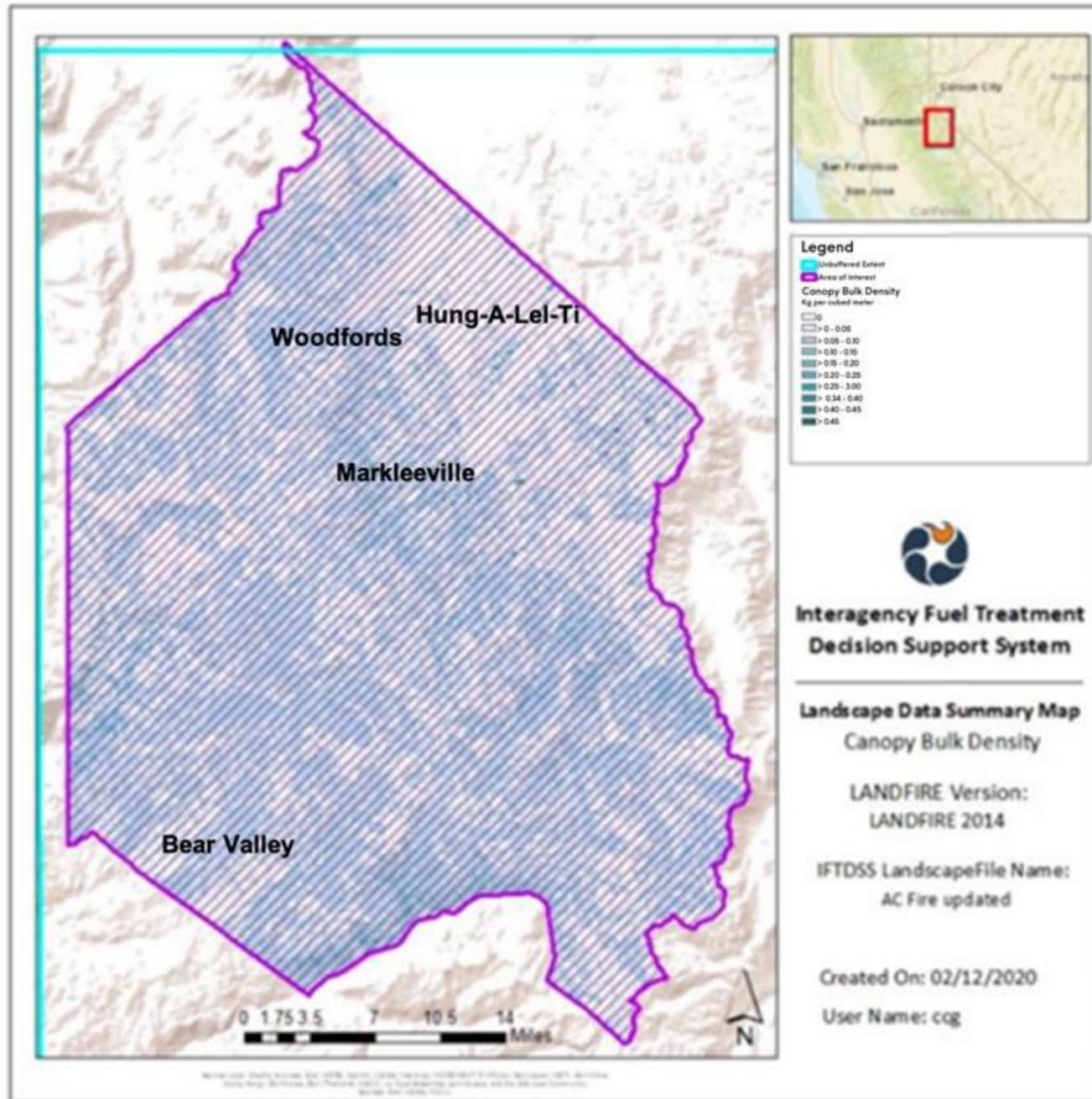


Source: (US Department of Interior, 2020)

Source: (LANDFIRE, 2020)

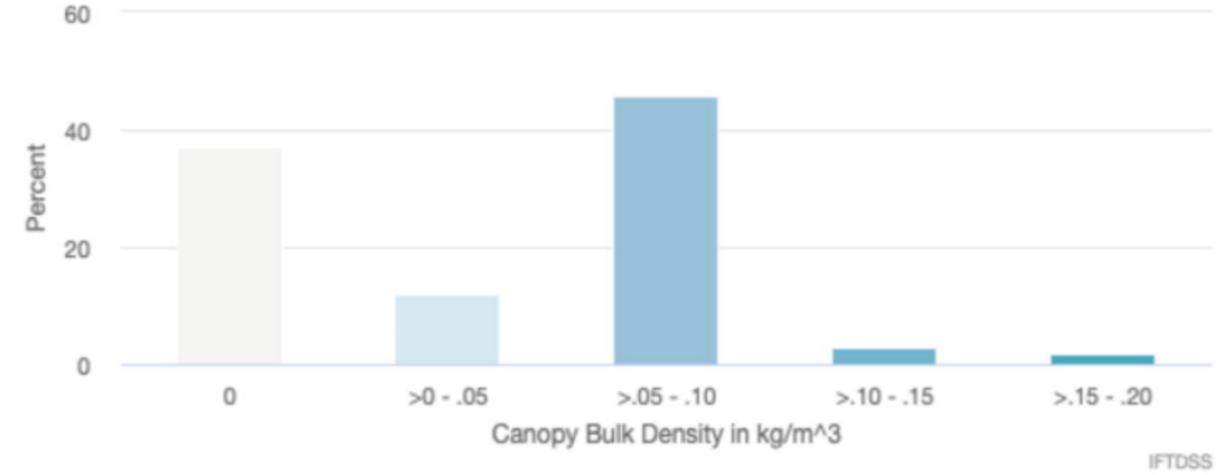
2 TECHNICAL ANALYSES

Figure 2-12 Canopy Bulk Density in Alpine County



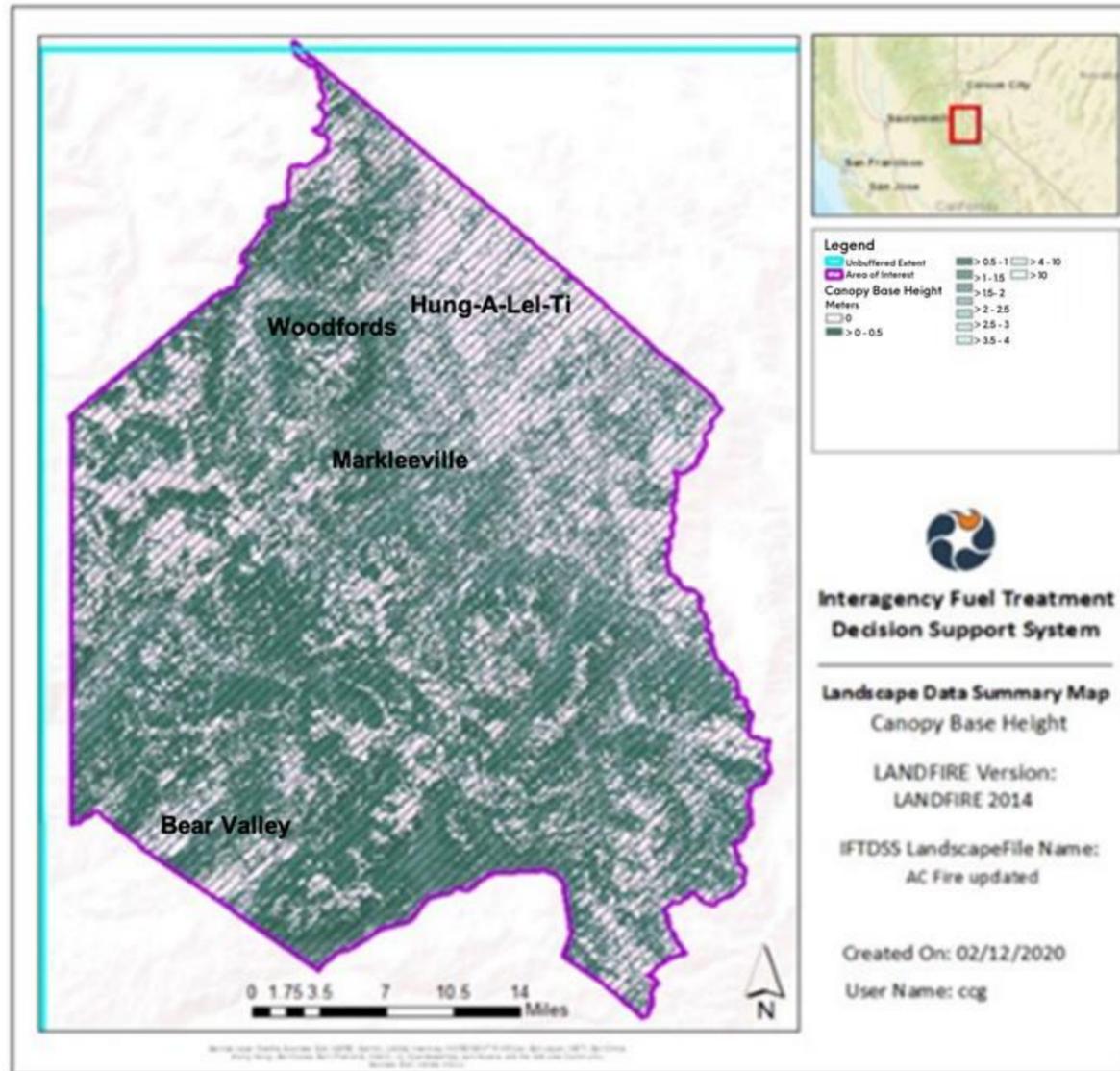
Source: (LANDFIRE, 2020)

Table 2-9 Canopy Bulk Density by Percent



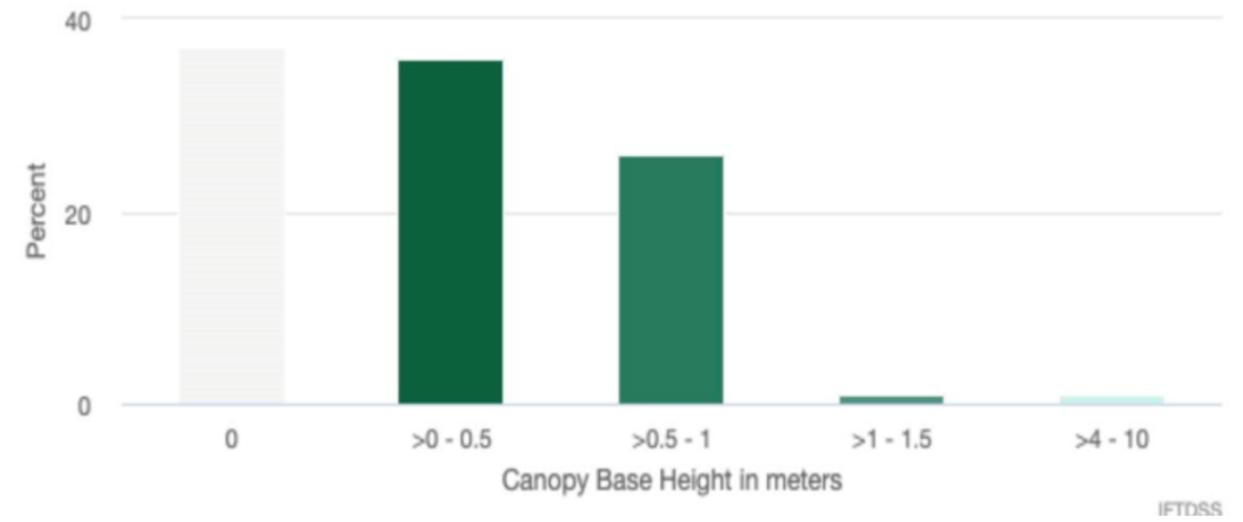
Source: (US Department of Interior, 2020)

Figure 2-13 Canopy Base Height



Source: (LANDFIRE, 2020)

Table 2-10 Canopy Base Height by Percent



Source: (US Department of Interior, 2020)

2 TECHNICAL ANALYSES

Weather Inputs from Remote Automated Weather System (RAWS)

The Remote Automatic Weather Stations (RAWS) system is a network of automated weather stations run by the USFS and BLM and monitored by the National Interagency Fire Center, mainly to observe potential wildfire conditions (Desert Research Institute, 2020).

This analysis utilized 97th percentile historical weather (average wind speed, average wind direction, dead and live fuel moistures) to analyze fire behavior. Percentiles are based on a scale of 0 to 100 and are used to sort and rank a collection of data. For wildfire, when values at the upper end of the scale occur, complex fires are expected, where initial attack may often fail. The 97th percentile is often termed “the worst-case scenario” (US Department of Interior, 2020).

Modeling conditions at the 97th percentile fire weather for the County was chosen not to serve as an understanding of the very worst-case fire effects are, but to determine how the current vegetation and fuels environment react to what is considered a threshold for problem fires. Choosing percentile weather removes subjectivity and thus bias as the calculation is run directly from the data. This process is objective and has become the industry standard for everything from determining national fire danger ratings to, as in this case, estimating hazard. The team analyzed the weather outputs, compared them to their respective knowledge base, and determined they were indeed in the threshold range of problem fire weather for Alpine County.

The data from RAWS is as follows:

- Calculated 97th Percentile Model Weather Parameters:
 - Run Date: February 12, 2020 11:58:38 PM
 - Wind Type: Gridded Winds
 - Wind Speed: 14 mph
 - Wind Direction: 225 degrees
 - Crown Fire Method: Scott/Reinhardt
 - Foliar Moisture: 100
 - Conditioning: On - Extreme – Northern Sierra Nevada
 - Conditioning start: 1300, August 11, 2012
 - Conditioning end: 1500, August 17, 2012
 - Station Name: Markleeville
 - Station Observation Start Date: May 13, 1985
 - Station Observation End Date: October 4, 2016
 - Station Elevation: 5,501
 - Station Aspect: 8
 - Station Latitude: 38.69
 - Station Longitude: 119.77
- Fuel Moisture:
 - 1 Hour Fuel Moisture: 2 %
 - 10 Hour Fuel Moisture: 2 %
 - 100 Hour Moisture: 4 %
 - Live Herbaceous Moisture: 78 %

2 TECHNICAL ANALYSES

- Live Woody Moisture: 101 %

2.3.3 Fire Model

FlamMap Basic

The fire model used was FlamMap Basic with Minimum Travel Time (MTT) embedded. FlamMap is a fire analysis desktop application that runs in a 64-bit Windows Operating System environment, or in this case, the IFTDSS system. It can simulate potential fire behavior characteristics (spread rate, flame length, fireline intensity, etc.), fire growth and spread, and conditional burn probabilities under constant environmental conditions (weather and fuel moisture) (USDA - U.S. Forest Service, 2020b).

FlamMap Basic is a spatially dependent, deterministic model that incorporates several established fire model base algorithms including:

- Rothermel's 1972 surface fire model
- Van Wagner's 1977 crown fire initiation model
- Rothermel's 1991 crown fire spread model
- Nelson's 2000 dead fuel moisture model

Outputs are generally in the form of raster maps of potential fire behavior characteristics (such as spread rate, flame length, fireline intensity, and crown fire activity) and environmental conditions (dead fuel moistures, mid-flame wind speeds, and solar irradiance) over an entire landscape. These raster maps show fire behavior and environmental conditions for one instant in time and can be viewed in FlamMap or exported for use in a GIS or word processor, or in this case packaged as an IFTDSS report.

FlamMap Basic is an ideal model to use for pre and post fuel treatment evolution by “showing the expected change in fire behavior based on how the surface fuel models and/or canopy characteristics will change as a result of the fuel treatment” when all other variables remain constant (WFDSS, 2020). The FlamMap Basic outputs, also known as Landscape Fire Behavior in IFTDSS, are highlighted in Appendix B appendices for the current condition.

Minimum Travel Time

MTT is a spatially dependent, stochastic model that “computes fire growth between the cell corners, holding all environmental conditions constant in time (Finney, 2006; Stratton, 2009). Fire growth is computed under the same assumptions as FlamMap Basic fire behavior. It also enables end-users to create all the necessary results and files from multiple ignition simulations (burn probabilities, fire perimeters, flame length probabilities, fire size list). MTT results can be used both for fuel management planning and for single event fire propagation (spread and intensity)” (Kalabokidis, et al., 2013).

The MTT outputs, also known as Landscape Burn Probability in IFTDSS are described in the results section. The combination or “integration” of two primary Landscape Burn Probability outputs, conditional flame length and fire probability, create “Integrated Hazard.” Integrated

2 TECHNICAL ANALYSES

Hazard helps to better understand exposure of assets by incorporating variability through the modeled ignition of thousands of fires. The inherent variability of stochastic models, however, makes it difficult to measure the absolute change in specific areas, and therefore, it is difficult to successfully quantify effects of proposed treatments without additional information, like what FlamMap Basic provides.

Scale

Although the majority of the vegetation and fuel inputs are at a resolution of 30 square meters, this size of the analysis area, at 723 square miles, makes processing prohibitive to model at that same resolution. Instead, the scale of this analysis will transition to a 90 square meter pixel, or about 2 acres in size. The scale will still provide sufficient resolution to do county-wide analysis but will not be appropriate for making management decisions at or below 90 square meters. However, it is understood that coupling results with field verification and augmentation will maximize the effectiveness of this exercise.

2.3.4 Outputs

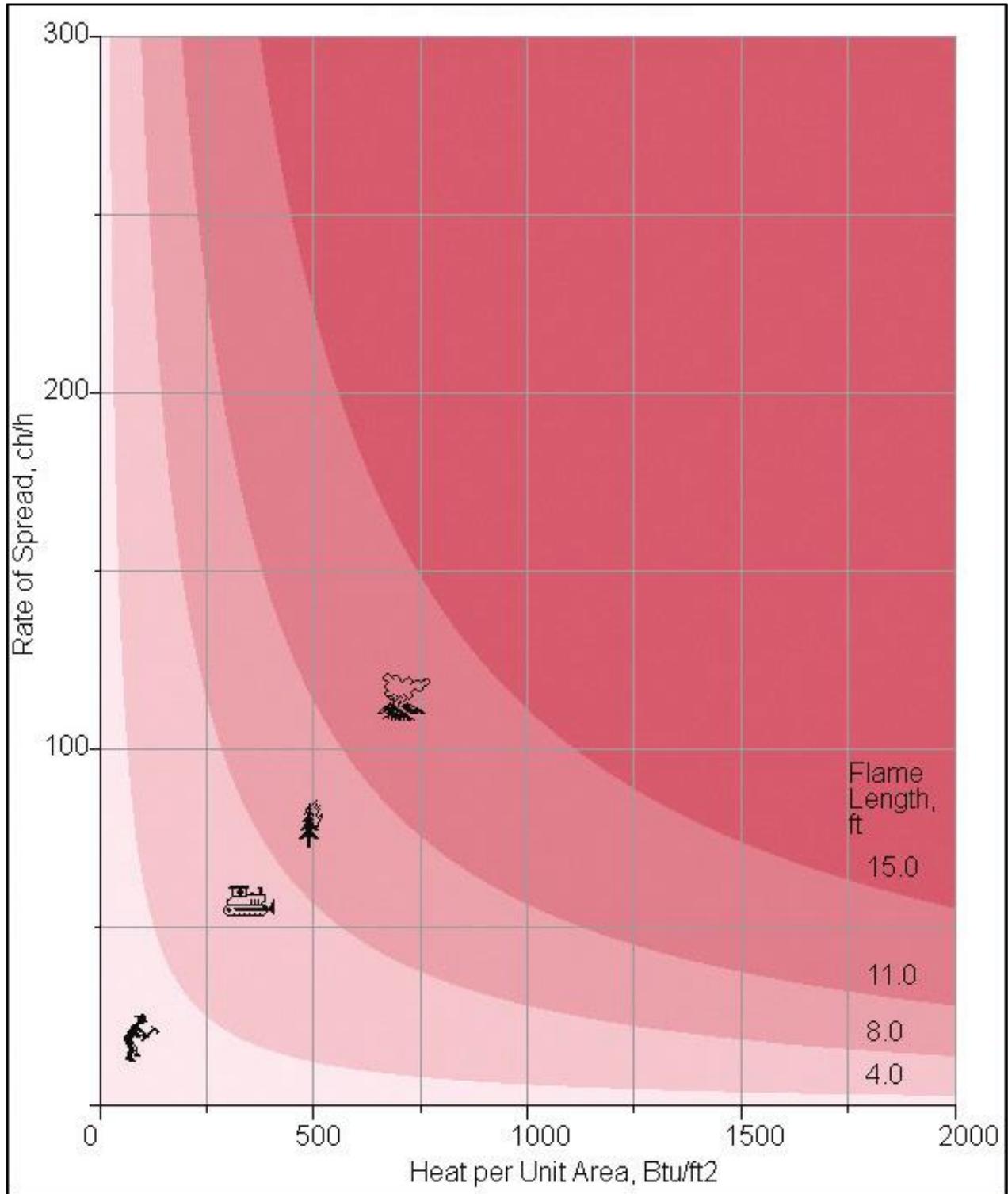
Fire Intensity

Frontal fire intensity is a valid measure of forest fire behavior that is solely a physical attribute of the fire itself. It is defined as the energy output rate per unit length of fire front and is directly related to flame size. Numerically, it is equal to the product of net heat of combustion, quantity of fuel consumed in the active combustion zone, and a spreading fire's linear rate of advance. This concept of fire intensity provides a quantitative basis for fire description useful in evaluating the impact of fire on forest ecosystems (Alexander, 1982).

Flame length was focused on to quantify fire intensity for this study because of the direct correlation to suppression resources and effectiveness. "The flame length of a spreading surface fire within the flaming front is measured from midway in the active flaming combustion zone to the average tip of the flames." Figure 2-14 shows surface fire behavior fire characteristics (US Department of Interior, 2020). Generally, if flame lengths are less than 4 feet, then fire can be effectively controlled with professional suppression resources. Flame lengths between 4 and 8 feet require multiple, more specific types and numbers of professionally trained firefighting resources; suppression success goes down. Flame lengths greater than 8 feet generally removes resources from directly attacking the fire front. When flame lengths are modeled to exceed 4 feet, effort should be made to closely examine and prescribe treatment to reduce undesirable fire intensities. All proposed projects within the County should also be maintained after development such that, on average, flame lengths remain below 4 feet when anthropogenic assets are in close proximity. Natural resource areas might be more nuanced where some pockets of higher fire behaviors are not only acceptable but desired when life and property cannot be threatened.

2 TECHNICAL ANALYSES

Figure 2-14 Surface Fire Behavior Characteristics Chart



2 TECHNICAL ANALYSES

Fire Probability

Fire probability quantifies the relative likelihood of a fire occurring under a fixed set of weather and fuel moisture conditions (US Department of Interior, 2020). Within the minimum travel time model, randomly located ignition points are used to simulate fires. Ignitions are only located and retained on burnable fuels, if an ignition is located on a non-burnable fuel it is discarded. The number of ignitions is determined by IFTDSS to most efficiently produce outputs for the user.

$$\text{Burn Probability} = \text{number of times burned} / \text{total number of ignitions}$$

For example, if the model ran 17,000 times and a pixel burned 1,462 times it would have burn probability of 0.086, (1,462/17,000 = 0.086). If a pixel burned 17,000 times in 17,000 fire simulations, it would have burn probability of 1.0, (17,000/17,000 = 1.0). If a pixel never burned during those 17,000 fire simulations, it would have a burn probability of 0 (0/17,000 = 0).

Integrated Hazard

The term “hazard” is used by the wildland fire community to define a variety of conditions or situations where damage to assets by fire is being evaluated. Hazard is quantified and categorized in IFTDSS using the FlamMap and Minimum Travel Time models evaluating (US Department of Interior, 2020):

- The probability of a fire occurring at a specific point under a specified set of conditions (burn probability)
- The intensity at a specific point given a fire occurs (flame length)

“Integrated Hazard” in IFTDSS then combines these two important measures into a single value that can be easily understood and mapped. Figure 2-15 shows the integrated hazard classification chart, where flame length classes are combined burn probability categories. Although high flame lengths will always be correlated to higher hazard, the relative classification of burn probabilities means there is no absolute set of integrated hazard heuristics. The value results are relative to only the area analyzed.

Figure 2-15 Integrated Hazard Classification Chart

		Burn Probability Classes				
		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
Cond. Flame Length Classes	> 12 ft					
	> 8 - 12 ft					
	> 6 - 8 ft					
	> 4 - 6 ft					
	> 2 - 4 ft					
	> 0 - 2 ft					
		Lowest Hazard	Lower Hazard	Middle Hazard	Higher Hazard	Highest Hazard

Source: DOI 2020

2 TECHNICAL ANALYSES

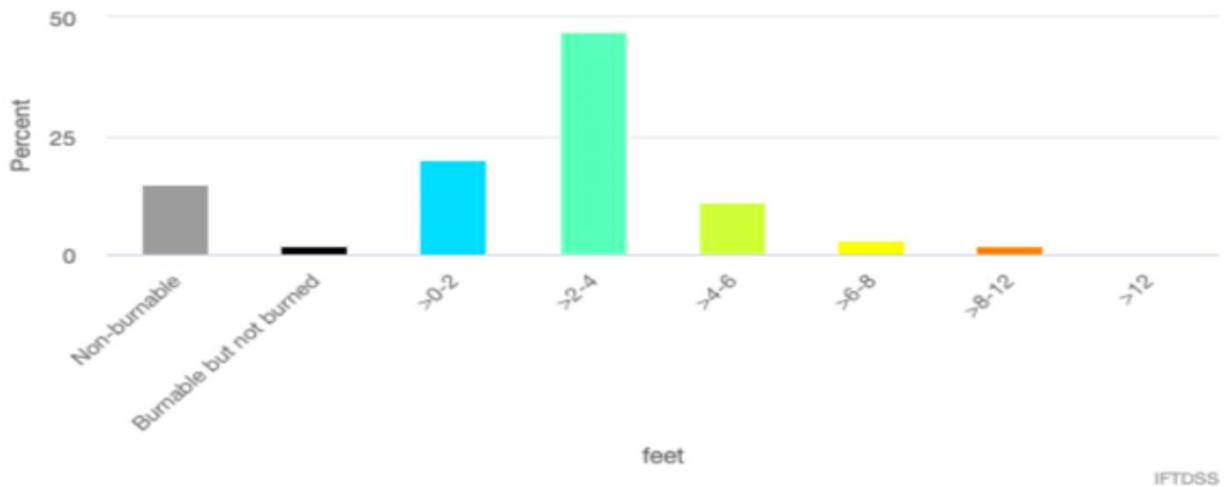
2.3.5 Results of Wildfire Behavior Modeling

Fire Intensity

Figure 2-16 shows the predicted size and location of flame lengths that could occur within Alpine County under existing conditions. Table 2-11 quantifies spatial distribution across a set of flame length classes. Approximately 20 percent of the county is exhibiting flame lengths greater than 4 feet.

It is apparent that under current conditions, as modeled, Alpine County would likely exhibit high intensity fire in many areas and put some homes and infrastructure at risk because suppression resources would have trouble safely directly attacking the fire and direct suppression effectiveness might be limited during the first burn period.

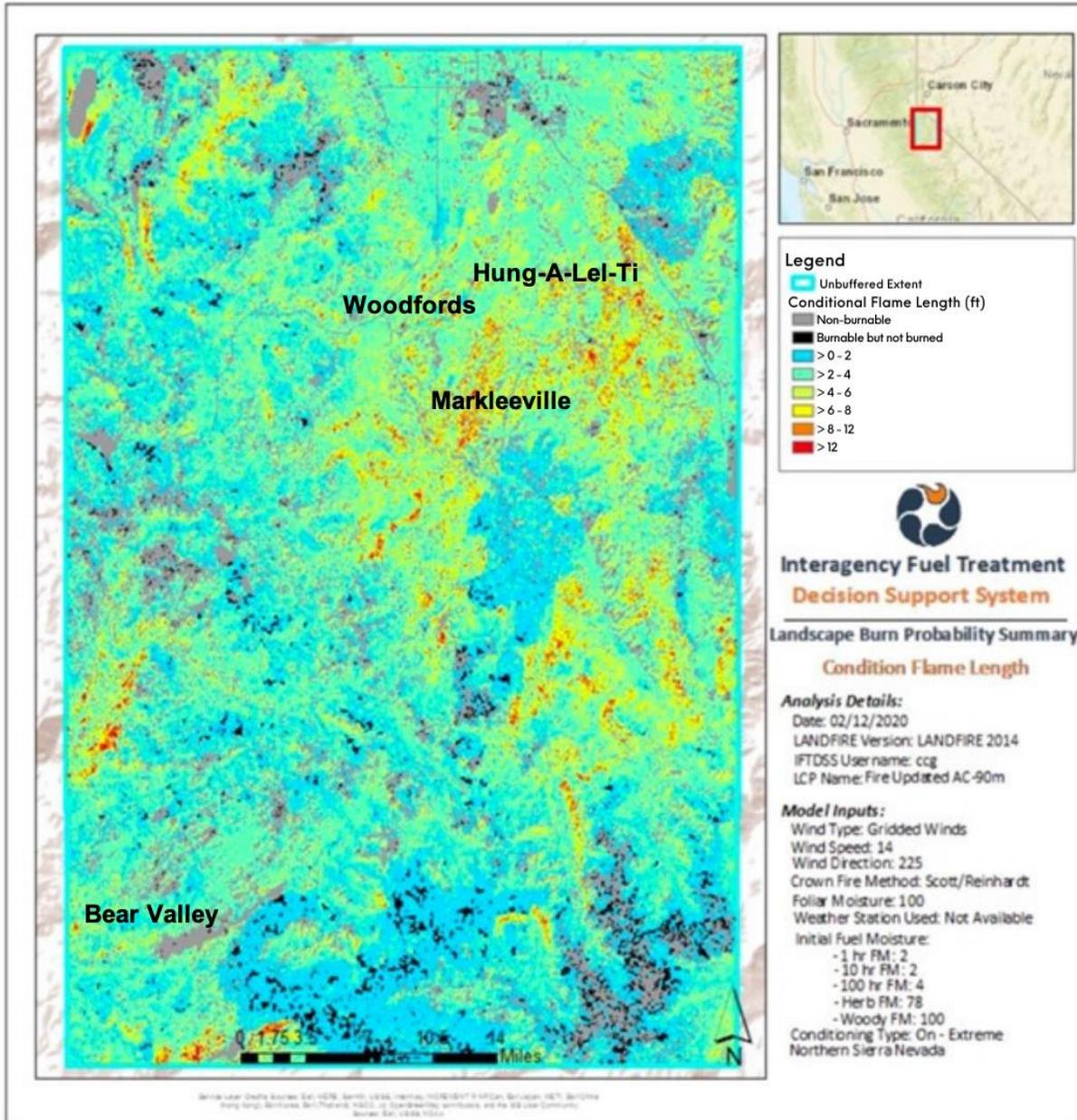
Table 2-11 Spatial Distribution of Flame Length Classes



Source: (US Department of Interior, 2020)

2 TECHNICAL ANALYSES

Figure 2-16 Modeled Flame Lengths in Alpine County



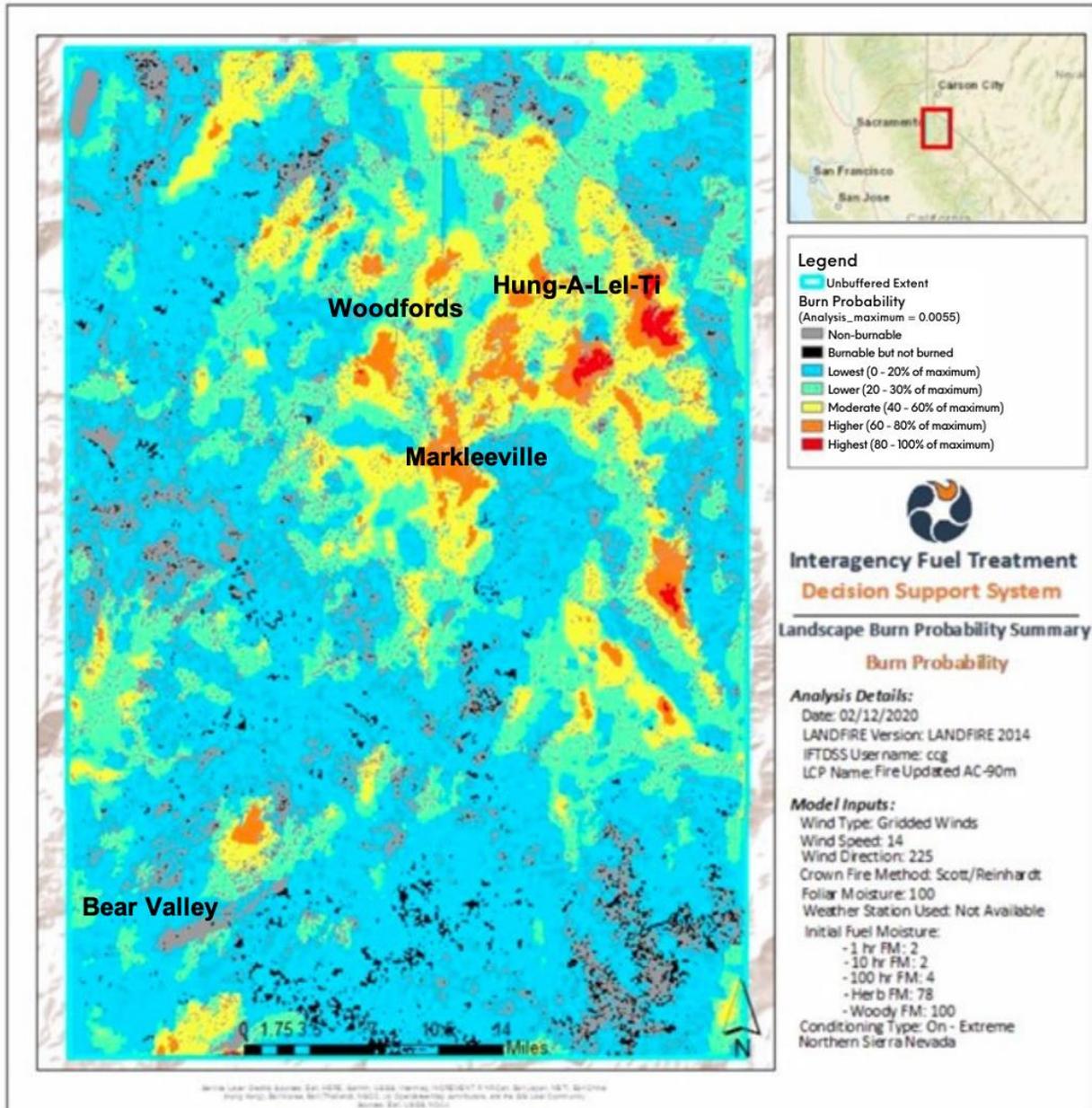
Source: (LANDFIRE, 2020)

2 TECHNICAL ANALYSES

Fire Probability

Figure 2-17 shows where fires will most likely occur across the county. The eastern portion of the county generally has much higher probabilities than the west side. This condition is most likely due to the prevailing winds under the critical fire weather scenario and more continuous fuels that blanket the lower elevations of eastern Alpine County.

Figure 2-17 Modeled Fire Probability in Alpine County



Source: (LANDFIRE, 2020)

2 TECHNICAL ANALYSES

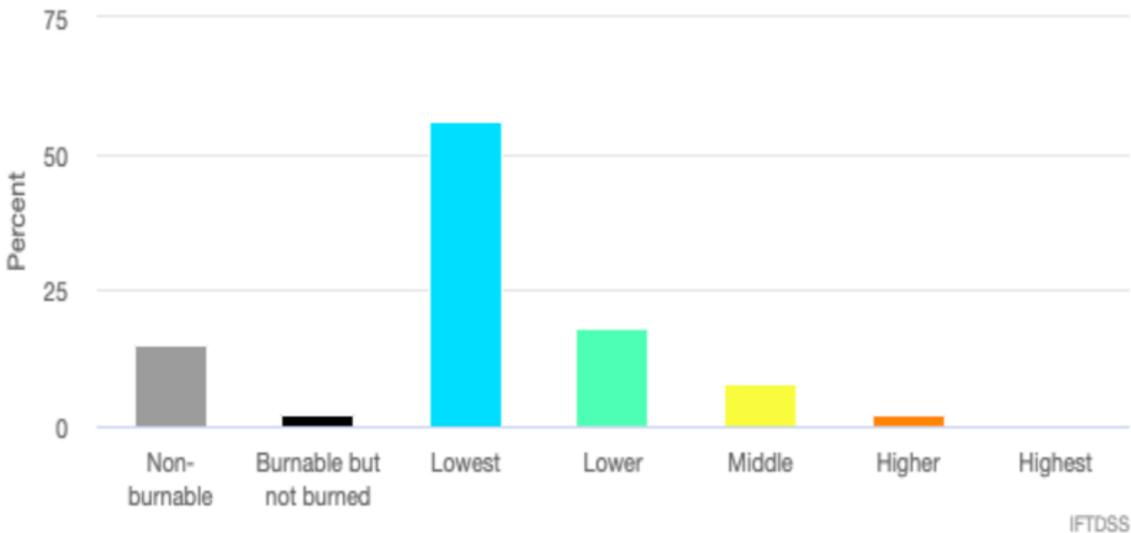
Integrated Hazard

Current condition integrated hazard inputs were modeled with the weather with just over 70,000 random ignitions occurring within a burn period of 12 hours with a 20 percent spotting probability within the county and a buffered analysis extent. Figure 2-18 highlights areas where there is a high fire intensity that overlaps with a high fire probability. Although some areas are considered low hazard, much of the area has elevated hazard numbers, which creates undesirable exposure to the surrounding homes and infrastructure.

Table 2-12 shows the percent of each class of integrated hazard. While the largest percentage of land is in the lowest and lower categories, the middle, higher, and highest areas still represent over 50,000 acres of land. Treating this much landscape would cost between \$75 and \$175 million, depending on the treatment methods used.

Hazard outputs can be valuable when trying to understand the patterns of potentially high severity fire across large landscapes; however, these outputs often display an overwhelming amount of information. First, there may simply be too much hazard for an entity to deal given their available resources. Second, even if resources to reduce all fire intensities were available, then hazard provides little insight into where you should go first. The next step was to conduct the wildfire risk assessment. This risk assessment can be extremely valuable for an entity that has limited resources to implement as it allows them to prioritize treatments.

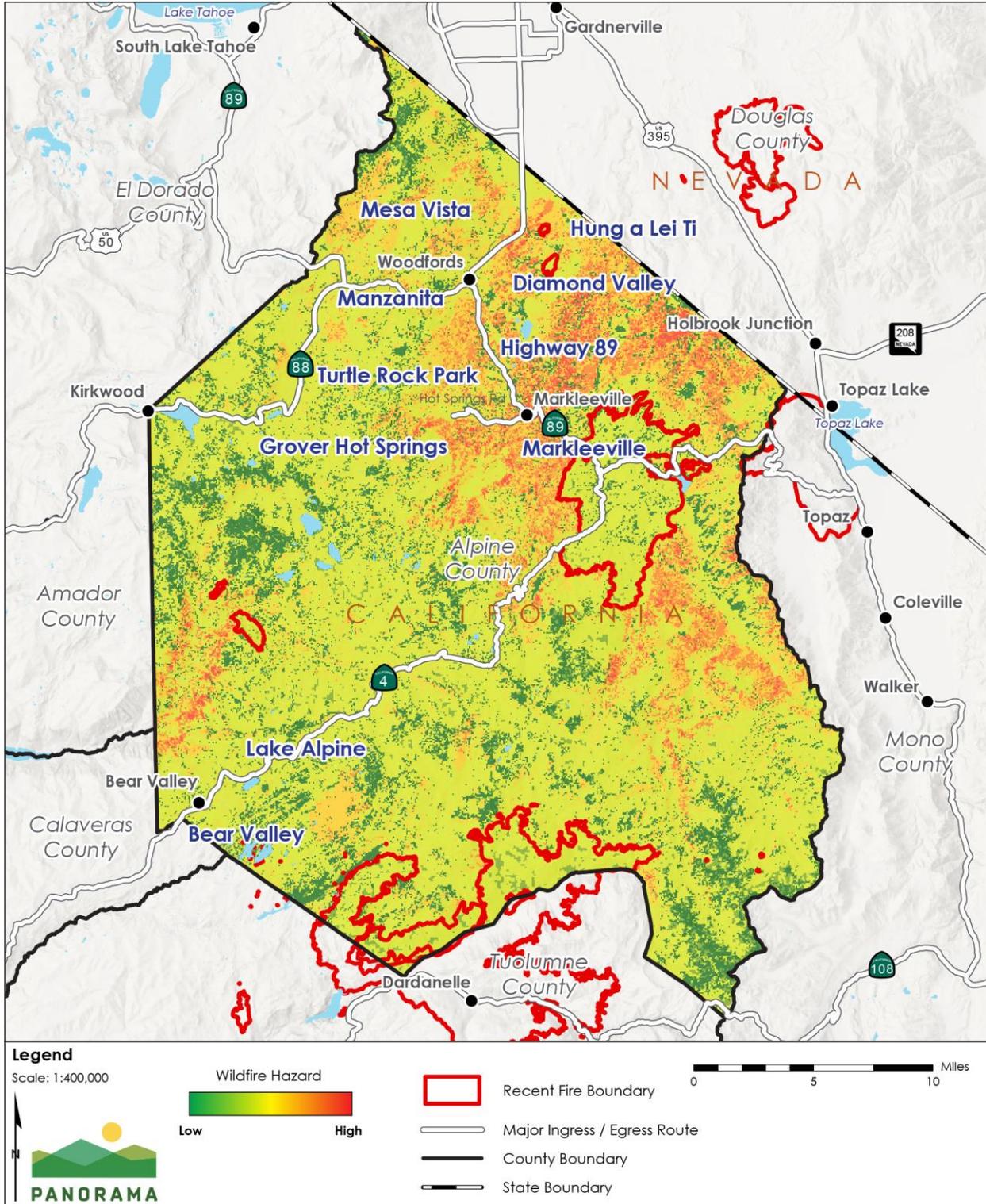
Table 2-12 Percent of Each Classification of Integrated Hazard



Source: (US Department of Interior, 2020)

2 TECHNICAL ANALYSES

Figure 2-18 Modeled Integrated Hazard for Alpine County



2.4 Susceptibility Analysis – HVRA Analysis

2.4.1 Introduction

The identification and characterization of HVRA in Alpine County was a time consuming but critical step in the risk assessment process. Three primary characteristics must be determined for each HVRA identified: spatial extent (mapping), response to wildfire (benefit or loss), and relative importance (Scott, Thompson, & Calkin, 2013).

2.4.2 Methods

Determination of Spatial Extent of HVRA

For use in wildfire risk calculations, spatial HVRA data must be in raster format. To effectively evaluate and apply any HVRA dataset, it is imperative to work with the spatial data in a GIS, and not solely rely on map products. The raster data should match the extent, cell size, and coordinate system of the fire modeling landscape. Any number of geoprocessing tasks are required, such as: converting feature class data (points, lines, or polygons) to raster format, re-sampling existing raster-format data to a different cell size, or re-projecting to a different coordinate system. Due to limitations on the spatial accuracy in HVRA mapping and fire modeling, it may be necessary to include a small buffer around point and line features to ensure they are adequately represented in the assessment. It may be undesirable for a point HVRA (e.g., a communication site) to be mapped to a single grid cell, especially if the accuracy of the point is small compared to the cell size. Including a buffer size will increase the exposure of the HVRA to wildfire as measured by expected area burned, but otherwise the buffer simply increases the sample size for estimating fire behavior and effects (Scott, Thompson, & Calkin, 2013). The compilation of HVRA data entails collecting data from various sources. A variety of regional or national data sources tend to be a good starting place when developing and accounting for HVRA. Local data sources are often the most up-to-date and reflect local knowledge of the landscape. Local data can be used to refine the regional or national datasets.

The spatial extent of HVRA within Alpine County were defined using industry standard buffers based on the types of HVRA that occur in Alpine County. The location and spatial extent of HVRA were reviewed by the steering committee and a select group of additional community stakeholders.

Calculation of HVRA Response to Wildfire

The response function framework requires quantifying the relationship between HVRA value and wildfire intensity (measured by flame length). HVRA response is related to fire intensity because it is the best fire characteristic available associated with fire effects. This approach quantifies net value change (NVC) to a given HVRA as the percentage change in the initial resource value resulting from a fire at a given intensity. Response functions address relative, rather than absolute change in resource or asset value and represent both beneficial and adverse effects to the HVRA (Scott, Thompson, & Calkin, 2013).

2 TECHNICAL ANALYSES

The project steering committee and a select group of additional community stakeholders were invited to respond to a questionnaire regarding each HVRA's response to wildfire. Survey responses were then reviewed during a steering committee meeting, during which all steering committee members agreed on each HVRA's response to wildfire. The HVRA Wildfire Response Questionnaire is provided in Appendix C.

Calculation of HVRA Relative Importance

Balancing competing or conflicting land and resource management objectives is a significant challenge to land and resource management planners. It is also difficult to articulate quantitative weights establishing the relative importance of HVRAs. Understanding relative importance is not necessary when assessing wildfire risk to a single HVRA such as municipal watersheds or the WUI. It is only when attempting to combine the risk to multiple overlapping HVRAs, or when comparing risk among several HVRAs, that the issue of weighting arises. The task can be avoided altogether by assuming that each pixel of each HVRA is of equal value, or weight. With that assumption, however, over-mapping an HVRA will overstate its risk, and extensive HVRAs will always be shown to have greater effects than HVRAs that cover a small amount of land area. There are some major tradeoffs to consider before avoiding the step of articulating relative importance. Relative importance helps understand risk in areas where multiple HVRAs overlap and allows for comparing risks across different spatial areas that house different HVRAs. Using relative importance scores helps to address all these questions and allows for summarization and visualization of risks in a single metric. If assessment results are to ultimately be used for planning mitigation treatments and strategies, then prioritization decisions that integrate all HVRAs will still ultimately need to be made. Articulating relative importance scores and how objectives are balanced makes this decision explicit rather than implicit and increases the overall transparency of decision processes (Marcot, 2012).

The project steering committee and a select group of additional community stakeholders were invited to respond to a questionnaire regarding each HVRA's relative importance. Survey responses were then reviewed during a steering committee meeting, during which all steering committee members developed a relative importance ranking of the HVRAs within the county. The Relative Importance Questionnaire is provided in Appendix D.

2.4.3 Results of HVRA Characterization

Spatial Extent of HVRAs

HVRA accounting began with the Alpine County GIS database and was augmented through collaboration with the project steering committee. Table 2-13 shows the HVRAs that were selected while Figure 2-19 shows locations and extent of each HVRA. Figure 2-20 is a more detailed look at Bear Valley as an example of the specificity in the HVRA raster layer that was developed.

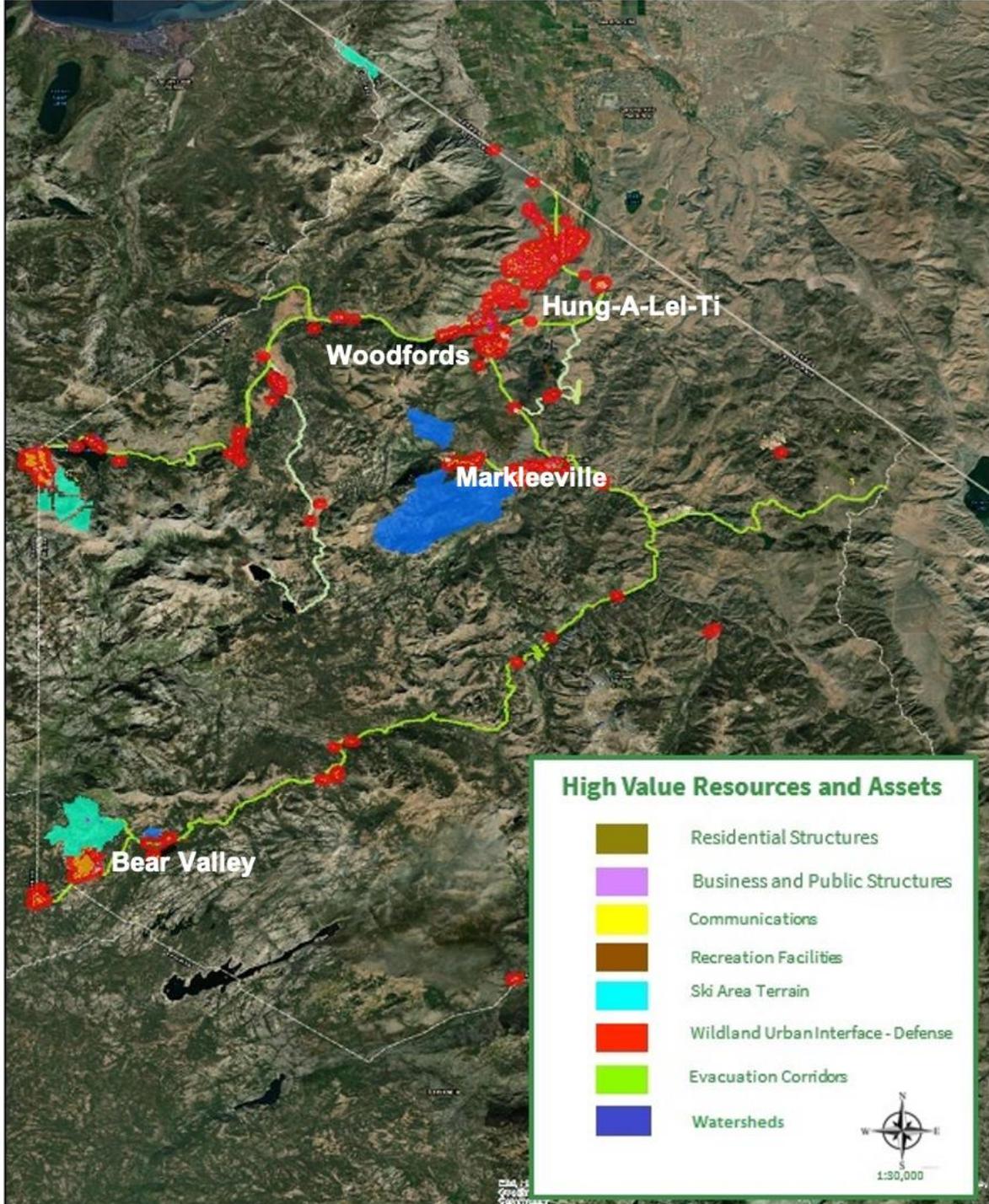
2 TECHNICAL ANALYSES

Table 2-13 HVRA Accounting for Alpine County

HVRA Category	Buffer Extent
Residential Structures	100 feet
Education Facilities (Daycares/Schools)	100 feet
Recreation Facilities – campgrounds, RV parks (non-ski areas)	25 feet
Business and Public Structures	100 feet
Places of Worship	100 feet
Non-habitable Structures (barns/sheds)	100 feet
Health and Elder Care Facilities	100 feet
High Hazard Buildings	250 feet
Airport/Helibase	250 feet
Communication Infrastructure (cell towers, microwave towers, etc.)	200 feet
Potable Water Storage (e.g., tanks); Snow-making Infrastructure	100 feet
Major/Minor Evacuation Corridors (ingress and egress routes)	300 feet
Community Evacuation/Refuge/Safe Zones/ Areas	250 feet
Cemeteries or Significant Resource Buildings/Areas	100 feet
Watersheds of Special Significance	25 feet
WUI Defense	0.25 mile
Ski Area Terrain	No Buffer

2 TECHNICAL ANALYSES

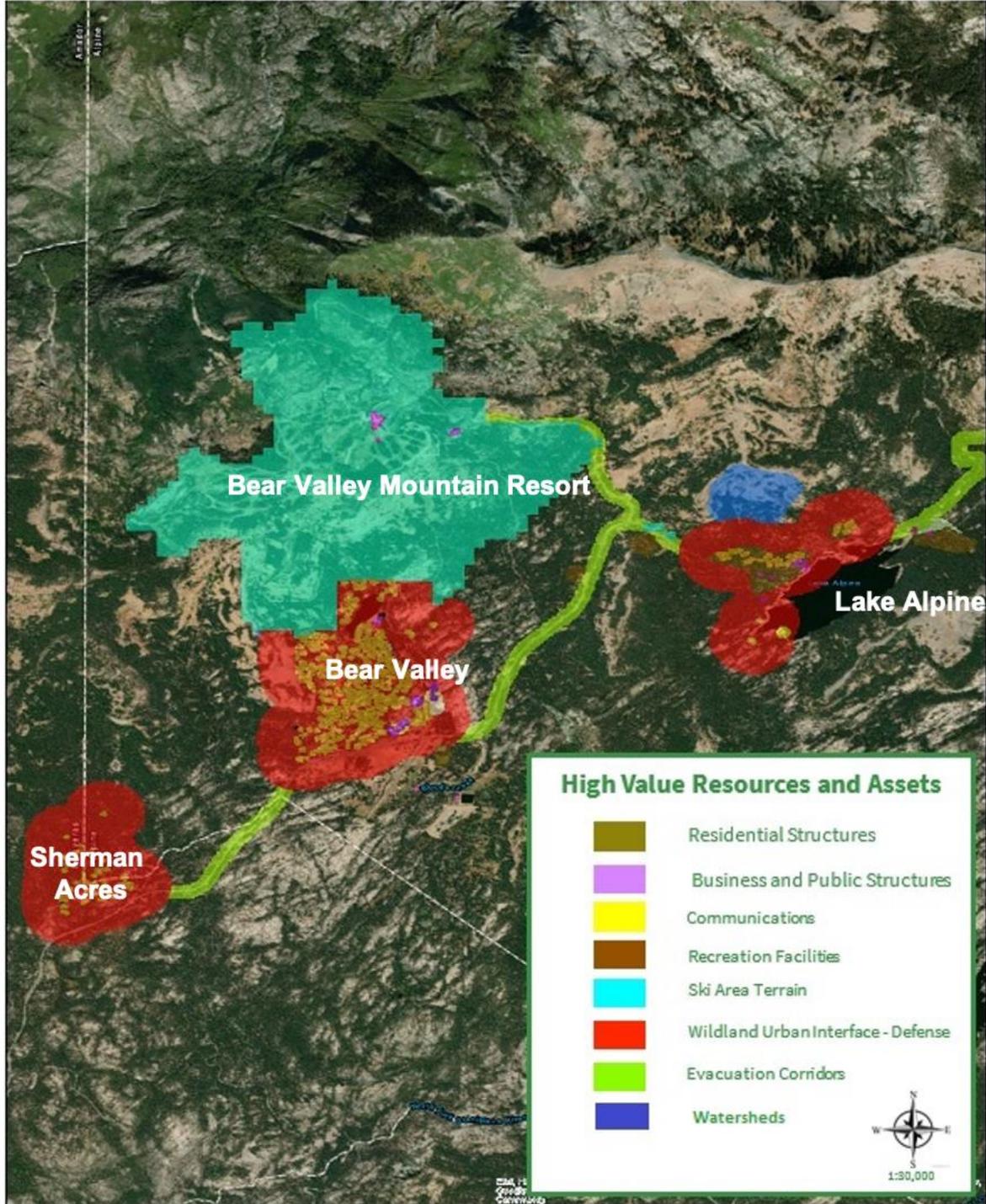
Figure 2-19 Location and Extent of HVRAs in Alpine County



Source: (LANDFIRE, 2020)

2 TECHNICAL ANALYSES

Figure 2-20 HVRA Raster Layer Example for Bear Valley Planning Area



Source: (LANDFIRE, 2020)

2 TECHNICAL ANALYSES

HVRA Calculated Response to Wildfire

Response to wildfire survey results are shown in Table 2-14. A total of six responses to the HVRA Response Function Questionnaire were received. Responses included an Alpine County resident, USFS staff, Alpine County staff, and CAL FIRE staff. Surveys limited responses to between negative 3 and positive 3 points and were then averaged across surveys.

Results then went into risk calculation as the response function (RF) as a normalized value percent change. For example, negative 3.0 = 100% value loss where a positive 1.0 = 33% value gained. The response function survey template is available as Appendix C.

Table 2-14 Results of Surveys Determining Response to Wildfire

HVRA	Flame Length 0-2 feet	Flame Length 2-4 feet	Flame Length 4-6 feet	Flame Length 6-8 feet	Flame Length 8-12 feet	Flame Length 12+ feet
Residential Structures	Neg 1.17	Neg 2.17	Neg 2.67	Neg 3.00	Neg 3.00	Neg 3.00
Education Facilities (Daycare/Schools/Colleges)	Neg 1.17	Neg 2.33	Neg 2.67	Neg 3.00	Neg 3.00	Neg 3.00
Recreational Facilities – Campgrounds, RV Parks (Non-ski Area)	Neg 0.50	Neg 1.50	Neg 2.33	Neg 2.83	Neg 2.83	Neg 2.83
Business and Public Structures	Neg 1.17	Neg 2.17	Neg 2.50	Neg 3.00	Neg 3.00	Neg 3.00
Places of Worship	Neg 1.17	Neg 2.17	Neg 2.67	Neg 3.00	Neg 3.00	Neg 3.00
Non-Habitable/Unknown Structures (Barns/Sheds)	Neg 0.67	Neg 1.83	Neg 2.50	Neg 2.83	Neg 2.83	Neg 3.00
Health and Elder Care Facilities	Neg 1.33	Neg 2.67	Neg 2.67	Neg 3.00	Neg 3.00	Neg 3.00
High Hazard Buildings	Neg 1.80	Neg 2.40	Neg 2.80	Neg 3.00	Neg 3.00	Neg 3.00
Airport/Helibase	0.00	Neg 0.67	Neg 2.00	Neg 2.83	Neg 3.00	Neg 3.00
Communication Infrastructure (Cell Towers, Microwave Towers, etc.)	Neg 0.83	Neg 1.83	Neg 2.50	Neg 2.83	Neg 3.00	Neg 3.00
Potable Water Storage (E.g. Tanks); Snow Making Infrastructure	Neg 0.17	Neg 1.33	Neg 2.33	Neg 2.83	Neg 3.00	Neg 3.00
Major Evacuation Corridors (Ingress and Egress Routes)	Pos 0.40	0.00	Neg 1.40	Neg 1.80	Neg 2.40	Neg 2.80
Minor Evacuation Corridors (Ingress and Egress Routes)	Post 0.50	Neg 0.17	Neg 1.33	Neg 1.83	Neg 2.50	Neg 2.83

2 TECHNICAL ANALYSES

HVRA	Flame Length 0-2 feet	Flame Length 2-4 feet	Flame Length 4-6 feet	Flame Length 6-8 feet	Flame Length 8-12 feet	Flame Length 12+ feet
Community Evacuation/ Refuge/Safe Zones/Areas	Neg 0.17	Neg 0.83	Neg 1.83	Neg 2.17	Neg 2.50	Neg 2.50
Cemeteries or Significant Resource Buildings/Areas	Neg 0.50	Neg 1.33	Neg 2.17	Neg 2.67	Neg 3.00	Neg 3.00
Watersheds of Special Significance	Pos 2.50	Pos 1.67	Pos 0.67	Neg 1.17	Neg 2.17	Neg 2.67
WUI Defense	Pos 2.00	Pos 1.33	Neg 0.17	Neg 1.00	Neg 2.17	Neg 2.67
Ski Area Terrain	Pos 1.50	Post 0.83	Neg 0.50	Neg 1.50	Neg 2.33	Neg 2.83

HVRA Calculated Relative Importance

Relative Importance survey results are shown in Table 2-15. A total of eight responses to the HVRA Relative Importance Questionnaire were received. Responses included an Alpine County resident, USFS staff, Alpine County staff, and CAL FIRE, Bear Valley Water District staff, and Fire Safe Council member. Each rating category had a potential ranking from 1-10; 10 being the highest score. The average score for all surveys by category is shown below and the total score is the sum of those averaged scores. The relative importance survey template is available as Appendix D.

Table 2-15 Results of Surveys Determining Relative Importance

HVRA	Uniqueness/Rarity/ Endemism	Replaceability	Safety/Critical Infrastructure	Total Score
Residential Structures	2.13	3.63	3.25	9.01
Education Facilities (Daycare/Schools/Colleges)	2.63	4.38	3.5	10.51
Recreational Facilities – Campgrounds, RV Parks (Non-ski Area)	3.25	3.63	2.38	9.26
Business and Public Structures	2.63	4.00	4.00	10.63
Places of Worship	2.13	3.67	2.71	8.51
Non Habitable/Unknown Structures (Barns/Sheds)	1.71	2.57	1.71	5.99
Health and Elder Care Facilities	2.17	4.00	4.14	10.31
High Hazard Buildings	3.00	3.83	3.33	10.16
Airport/Helibase	2.57	3.00	4.00	9.57
Communication Infrastructure (Cell Towers, Microwave Towers, etc.)	3.13	3.88	4.50	11.51

2 TECHNICAL ANALYSES

HVRA	Uniqueness/Rarity/ Endemism	Replaceability	Safety/Critical Infrastructure	Total Score
Potable Water Storage (E.g. Tanks); Snow Making Infrastructure	3.13	4.13	4.50	11.76
Major Evacuation Corridors (Ingress and Egress Routes)	3.13	4.00	4.25	11.38
Minor Evacuation Corridors (Ingress and Egress Routes)	2.88	3.13	3.88	9.89
Community Evacuation/ Refuge/Safe Zones/Areas	3.25	2.86	4.13	10.24
Cemeteries or Significant Resource Buildings/Areas	3.25	4.50	n/a	7.75
Watersheds of Special Significance	3.25	4.00	n/a	7.25
WUI Defense	5.00	5.00	n/a	10.00
Ski Area Terrain	3.14	4.00	n/a	7.14

2.5 Wildfire Risk Assessment

2.5.1 Introduction

Wildfire risk is the compilation of the integrated hazards (fire likelihood and intensity) with the susceptibility of the HVRAs identified.

2.5.2 Methods

Methods of Determining Wildfire Risk

Exposure Analysis of HVRAs

Exposure analysis is the characterization of wildfire likelihood and intensity where HVRAs occur and was performed within a GIS using one of several geospatial techniques that identify or summarize the wildfire hazard characteristics of all pixels where an HVRA is mapped.

Equation 1 provides the formula that was used for calculating $E(NVC_j)_k$, the expected net value change or exposure to HVRA j on landscape pixel k . BP_k is the probability of pixel k burning at what flame length class (CFL_k) multiplied by RF_{jk} the response function for HVRA j on pixel k .

Equation 1

$$E(NVC_j)_k = \sum BP_k * CFL_k * RF_{jk}$$

2 TECHNICAL ANALYSES

Effects Analysis on HVRAs

Effects analysis integrates wildfire hazard (likelihood and intensity) and HVRA vulnerability (exposure and susceptibility), producing a comprehensive measure of wildfire risk. Wildfire risk is quantified as the weighted expectation of net value change, where *NVC* is expressed in relative terms on a percentage basis, as defined by expert-based loss/benefit functions (for example, complete loss = -100 percent). **Equation 2** displays how to calculate risk across HVRAs for a given landscape pixel *k*. Expected net value change across all HVRAs and the entire landscape can be derived through **Equation 3**.

Equation 2

$$E(NVC)_k = \sum_j E(NVC_j)_k * RI_j$$

Equation 3

$$E(NVC) = \sum_k E(NVC)_k$$

Methods for Project Development Based on Wildfire Risk

Wildfire Risk Compilation

Compiling the total negative net value change of each pixel within the study area in a GIS raster format is required to appropriately organize results of the effects analysis. Considering each pixel of negative value is cumulative based on the above equations and is relative to other pixels within the project area, the results highlight which pixels, compared to others, have the highest net value change and thus, the highest amount of risk to fire during extreme fire weather scenarios. This information, in and of itself, can highlight what areas should be focused on first for treatments provided scale limitations are considered. Decisions on risk in areas less than 90-meter square area is not supported by this data and must be further evaluated with field visits.

Opportunities for Treatment Compilation

Areas or pixels that exhibit a positive value change to the effects of fire during extreme fire weather scenarios, could still benefit from treatment. In fact, these “opportunity” areas could have beneficial fire prescribed across many areas within the project area that would not only enhance the value of a particular HVRA, but also keep it and the surrounding area from moving towards conditions that would result in a modeled net value loss in the future as vegetation grows and fuels accumulate. These identified opportunity areas would most likely be treated with low intensity prescribed fire during times of the year when the potential for high severity fire is very low. It is understood that the more positive net value change value per pixel, the higher the opportunity which would translate to a higher priority implementation project area. Like the risk compilation, however, decisions on opportunity in areas less than a 90-meter square area is not supported by this data and should be further evaluated with field visits.

2 TECHNICAL ANALYSES

Project Developer

Even with the comprehensive and relatively high-fidelity risk and opportunity data across the project area, some additional filters and workflows were needed to improve results and further facilitate efficient and effective decision-making. Outputs from models that deal with a large amount of data may also produce additional meaningless information, often referred to as “noise,” which can negatively affect the results of a data analysis and skew conclusions. Risk and opportunity data from the wildfire risk assessment were refined using a project-specific workflow intended to better contrast useful data from the noise. Additional filters identified in Table 2-16 and Table 2-17 were used to further divide information into meaningful polygons.

The following section presents the results of the risk calculations and processes. The results are presented in maps showing the areas of moderate, high, very high, and highest risk.

Table 2-16 Additional Filter by Slope

Slope Percent Break	Explanation
0-35%	All treatment methods available
35-75%	Too steep for most mechanical treatment methods; majority of area can only be treated manually
>75%	Too steep for all mechanical and most manual treatment; aerial prescribed fire treatment only

Table 2-17 Additional Filter by Land Ownership

Ownership Group	Notes
United States Forest Service	Designated by forest (e.g., Humboldt-Toiyabe vs Stanislaus) and land designation (e.g., wilderness)
Bureau of Land Management	Sierra Front Field Office
Bureau of Indian Affairs	Western Nevada Agency – Woodfords Community
Alpine County	n/a
NGO/Service Districts/Pacific Gas & Electric	Designated by entity
State of California	Designated by entity (e.g., State parks)
Private	Individual parcels were lumped together unless they were > 2 acres

2 TECHNICAL ANALYSES

2.5.3 Results of Wildfire Risk Assessment

Wildfire Risk Maps

County-wide risk is shown in Figure 2-21. Although HVRAs are well distributed across the county, considerably more and higher risk is on the east side. This higher risk is mostly due to the higher fire probabilities shown and explained in Figure 2-17. Figure 2-22 is zoomed into the Markleeville area that highlights an area where risk exists at its highest while covering a relatively moderate amount of area. To effectively evaluate and apply any risk and opportunity dataset it is imperative to work with the spatial data in a GIS and not solely rely on map products.

Project Development Outputs

Opportunities for Prescribed Fire

Based on the wildfire risk assessment, areas of the HVRAs were opportunities to control and reduce fuels through prescribed fire were also identified. The suitability of an area for prescribed fire is assessed based on whether fire in that area would have a net positive outcome, such as areas of HVRAs where there were not structures, infrastructure, or any other features that could be negatively affected by fire. The suitability was estimated by calculating the net value change that is expected when a typical pixel in the area burns. Figure 2-23 shows the additional areas within the overall HVRA areas where there is an opportunity to put prescribed fire on the landscape. Figure 2-24 highlights what the prescribed fire opportunities look like at a smaller scale in the Markleeville HVRA area. Prescribed fire in these areas would serve to further protect the HVRAs that fall within the moderate to highest wildfire risk categories.

Project Developer Workflow Results

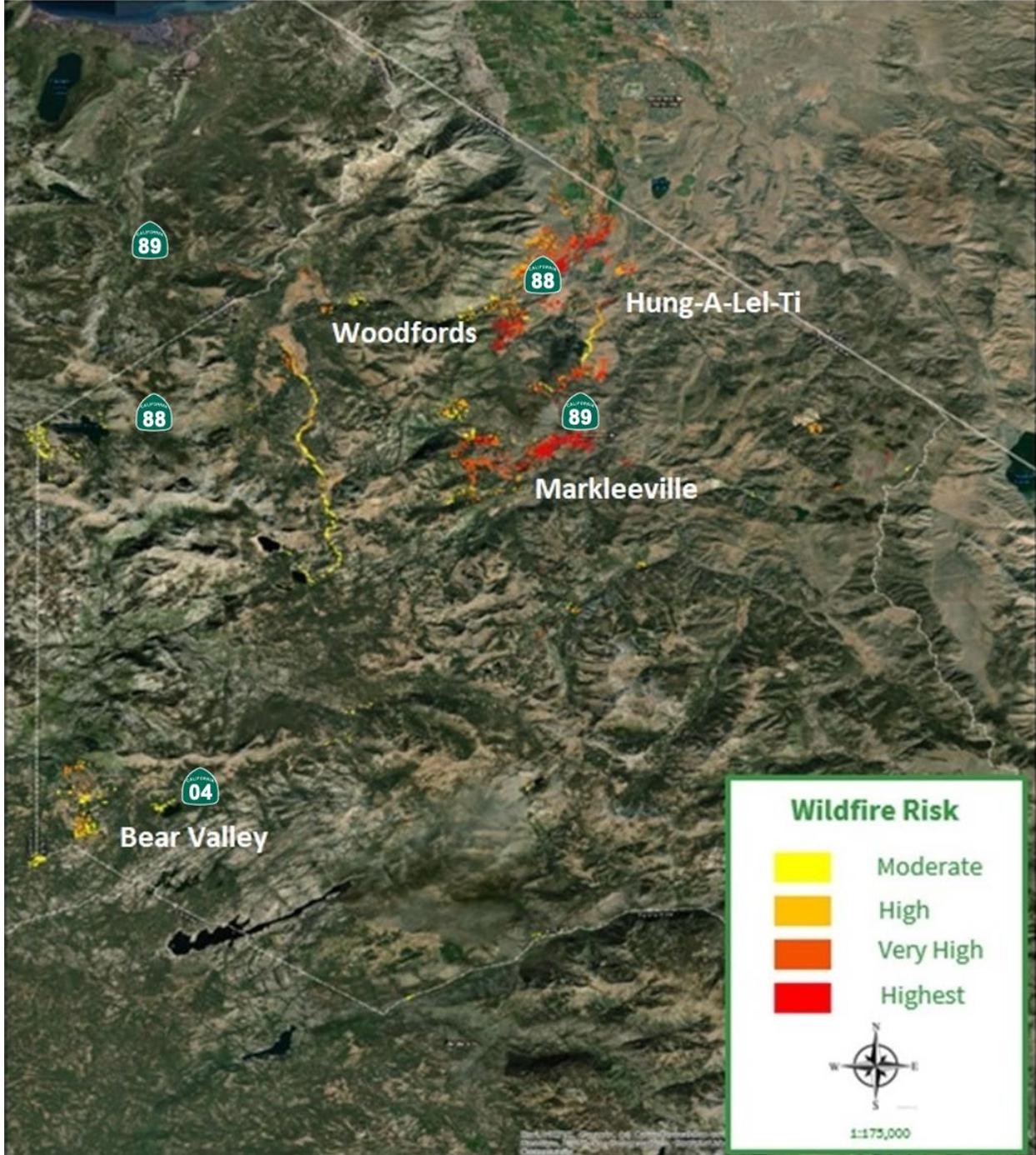
The project developer workflow and filters were applied to risk and opportunity outputs to help focus areas for project development coalesced by ownership and by treatment type to make the data actionable. The following process was part of the workflow:

- Remove the noise
 - Drop areas < 2 acres in size
- Package by 25% risk categories
- Break up by slope
 - < 35%
 - $\geq 35\%$ & $< 75\%$
 - $\geq 75\%$
- Break up by ownership: USFS, BLM, Bureau of Indian Affairs, County, Non-Government Organization/Service District/PG&E, State, and Private

Figure 2-25 shows that output County-wide and Figure 2-26 through Figure 2-30 zooms into each of the five planning areas for a view of what the processed wildfire risks with prescribed fire opportunities looks like at an appropriate scale to inform decisions. Table 2-18 lays out land ownership of risk and opportunity.

2 TECHNICAL ANALYSES

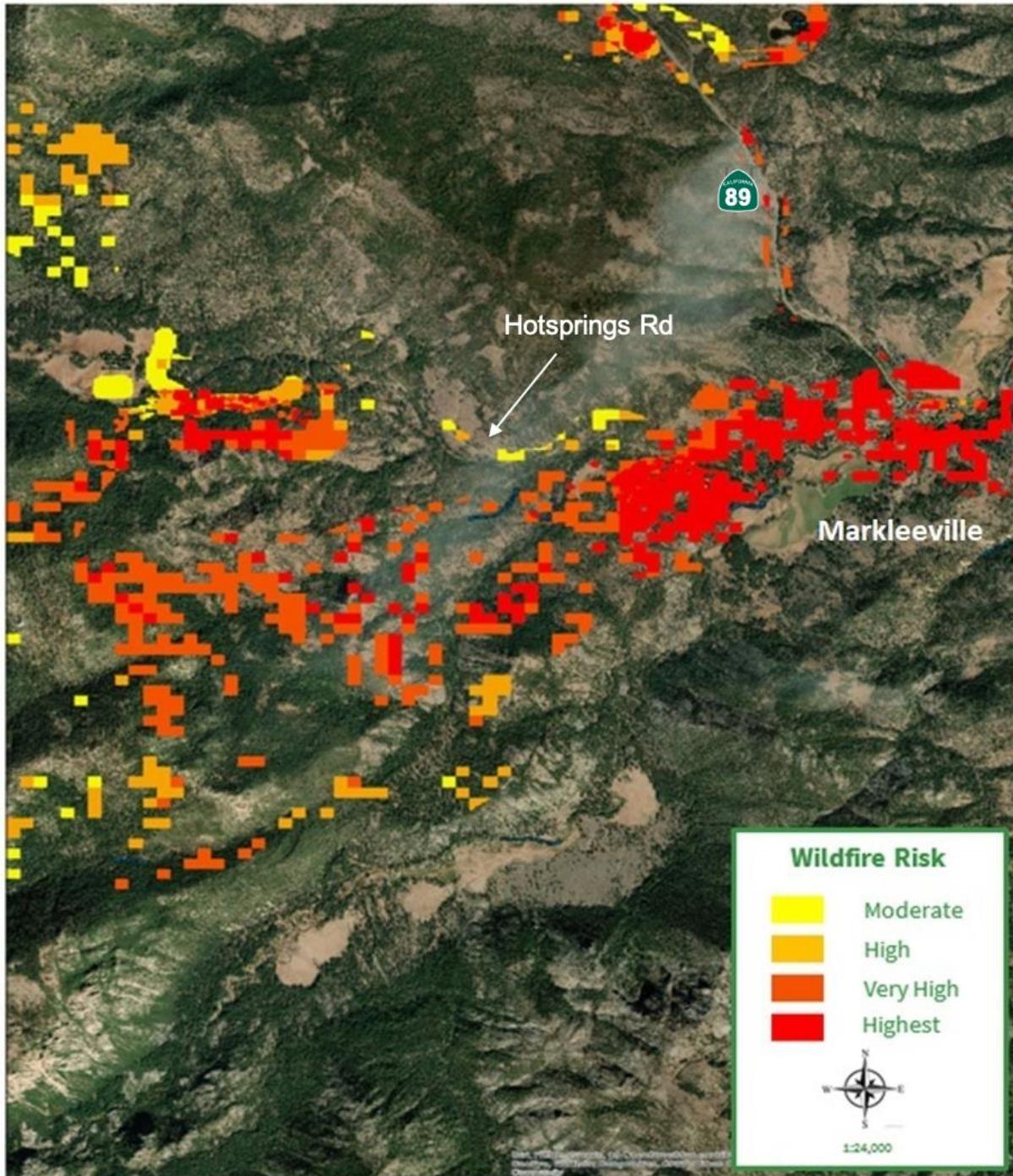
Figure 2-21 Countywide Areas of Moderate to Highest Wildfire Risk



Source: (LANDFIRE, 2020)

2 TECHNICAL ANALYSES

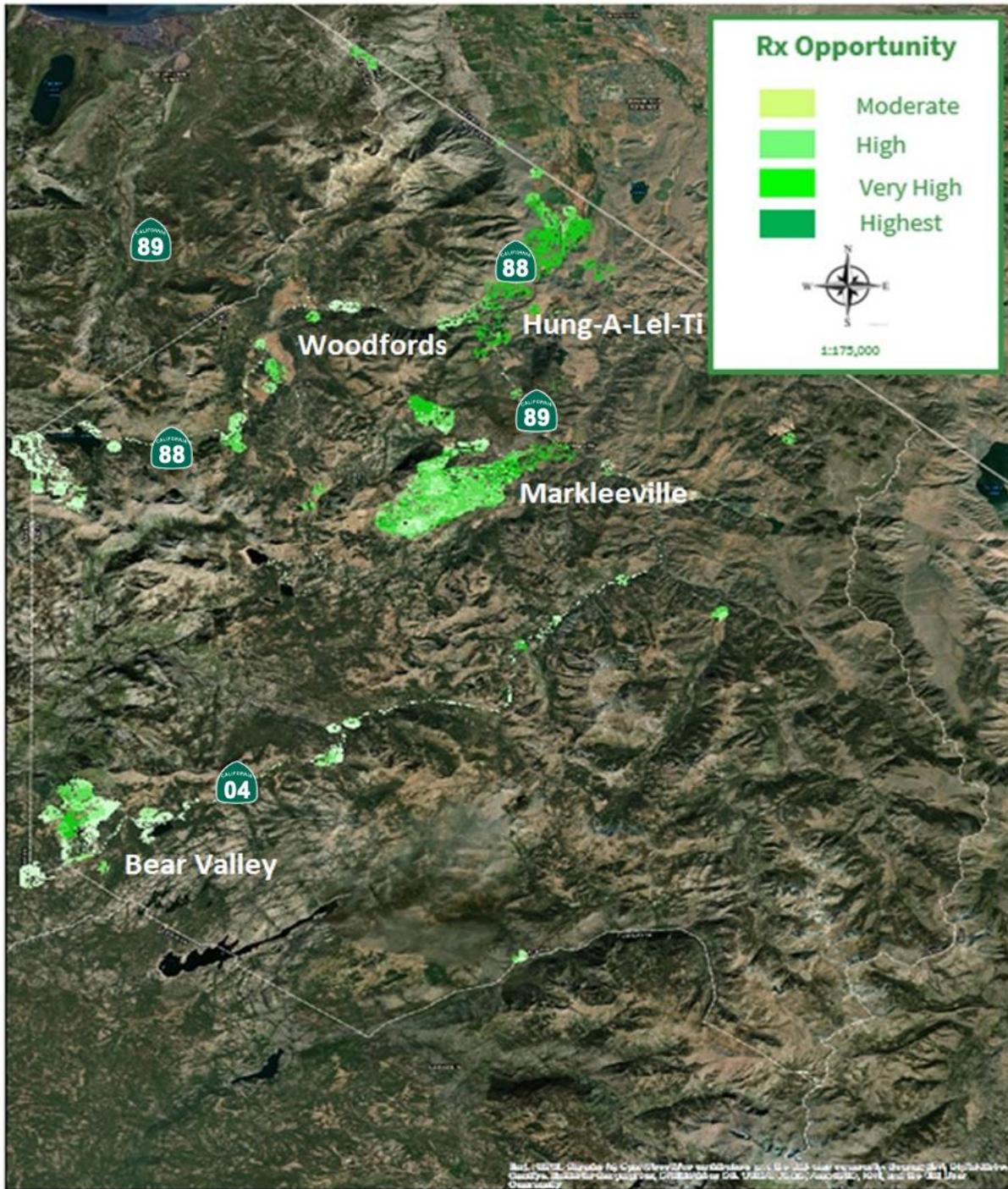
Figure 2-22 Areas of Moderate to Highest Wildfire Risk for Markleeville



Source: (LANDFIRE, 2020)

2 TECHNICAL ANALYSES

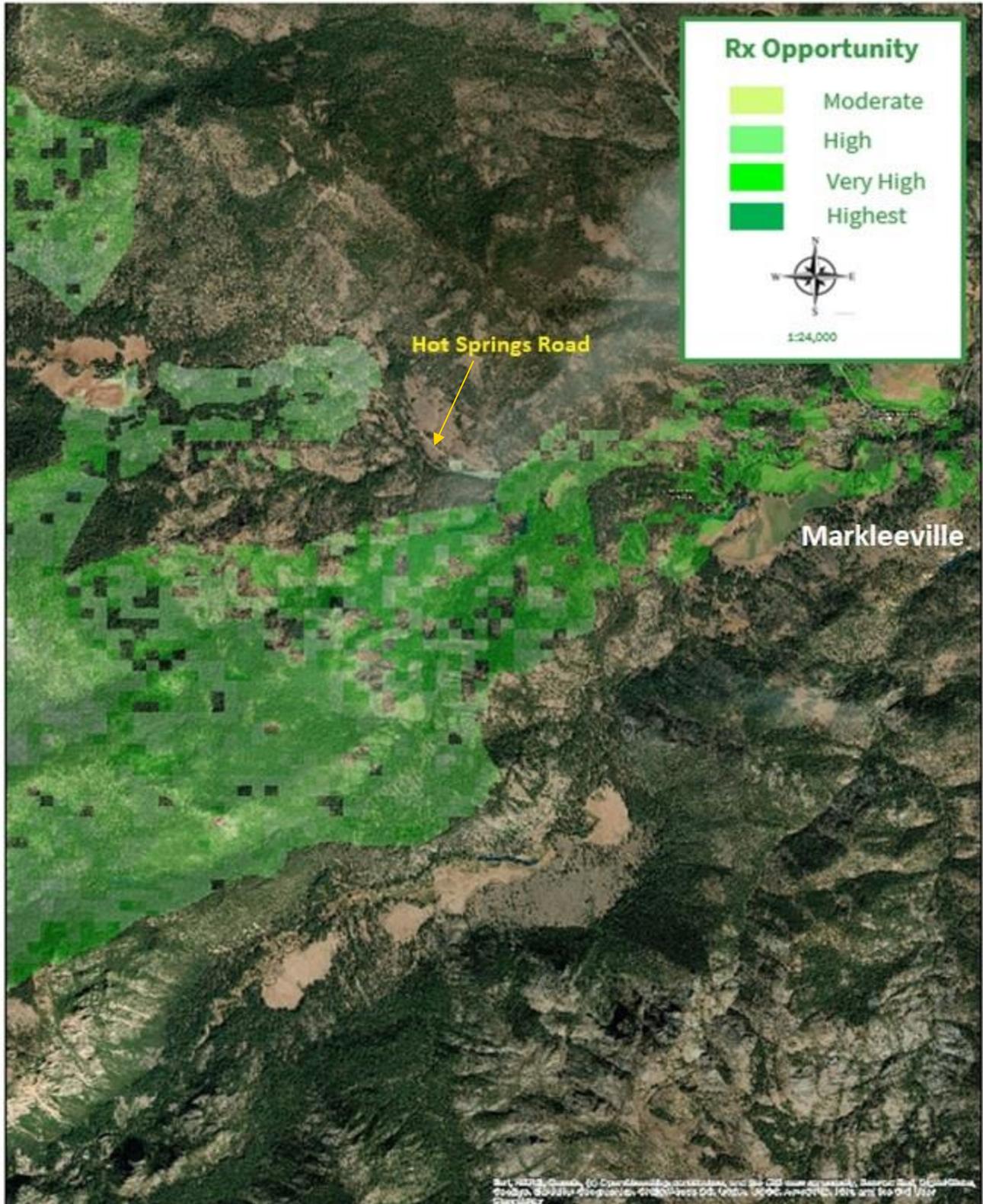
Figure 2-23 Opportunities in Alpine County for Prescribed Fire within the HVRAs



Source: (LANDFIRE, 2020)

2 TECHNICAL ANALYSES

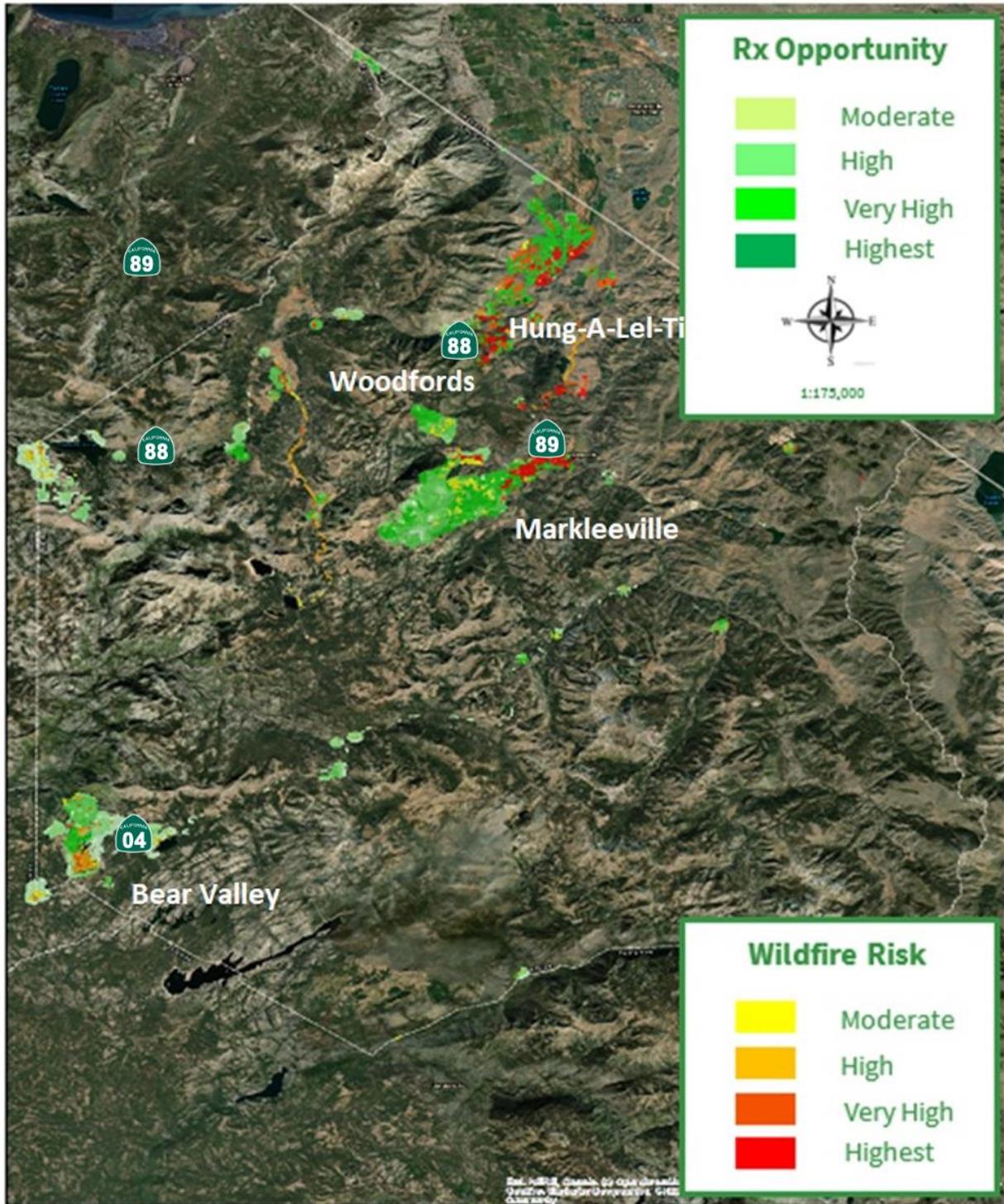
Figure 2-24 Opportunities for Prescribed Fire in Markleeville within the HVRAs



Source: (LANDFIRE, 2020)

2 TECHNICAL ANALYSES

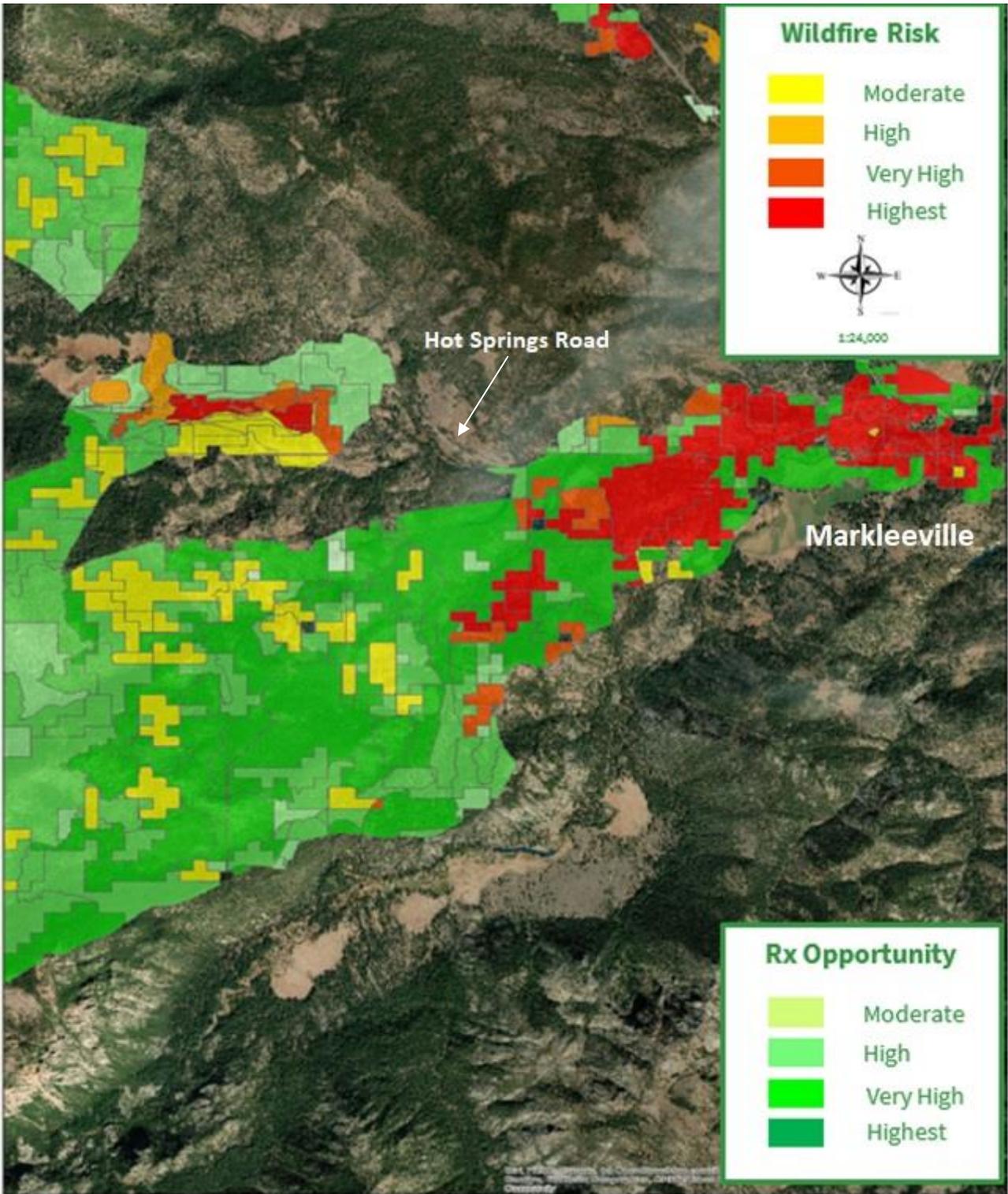
Figure 2-25 Countywide Wildfire Risk Output After Workflow with Prescribed Fire Opportunities



Source: (LANDFIRE, 2020)

2 TECHNICAL ANALYSES

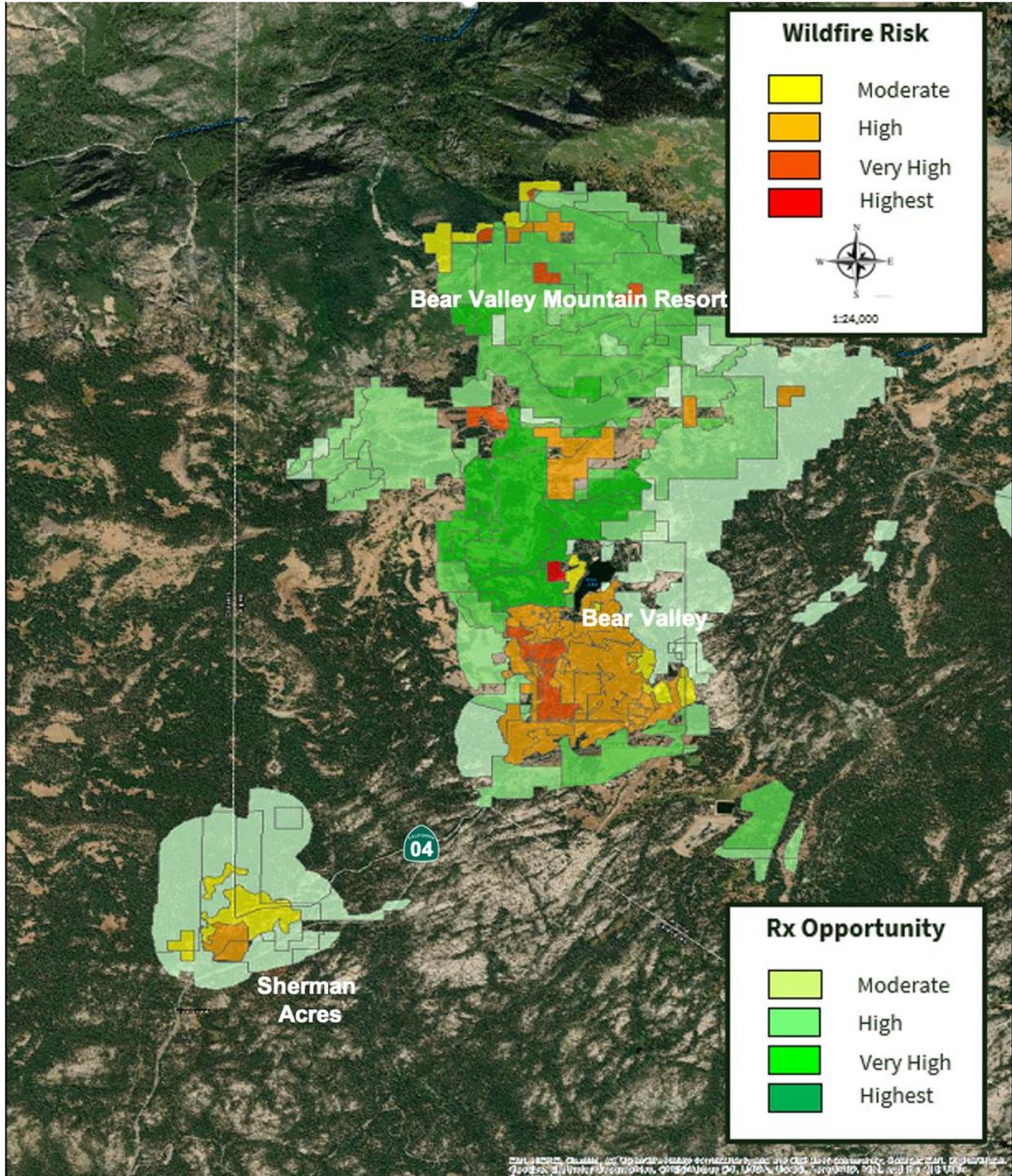
Figure 2-26 Markleeville Wildfire Risk Output After Workflow with Prescribed Fire Opportunities



Source: (LANDFIRE, 2020)

2 TECHNICAL ANALYSES

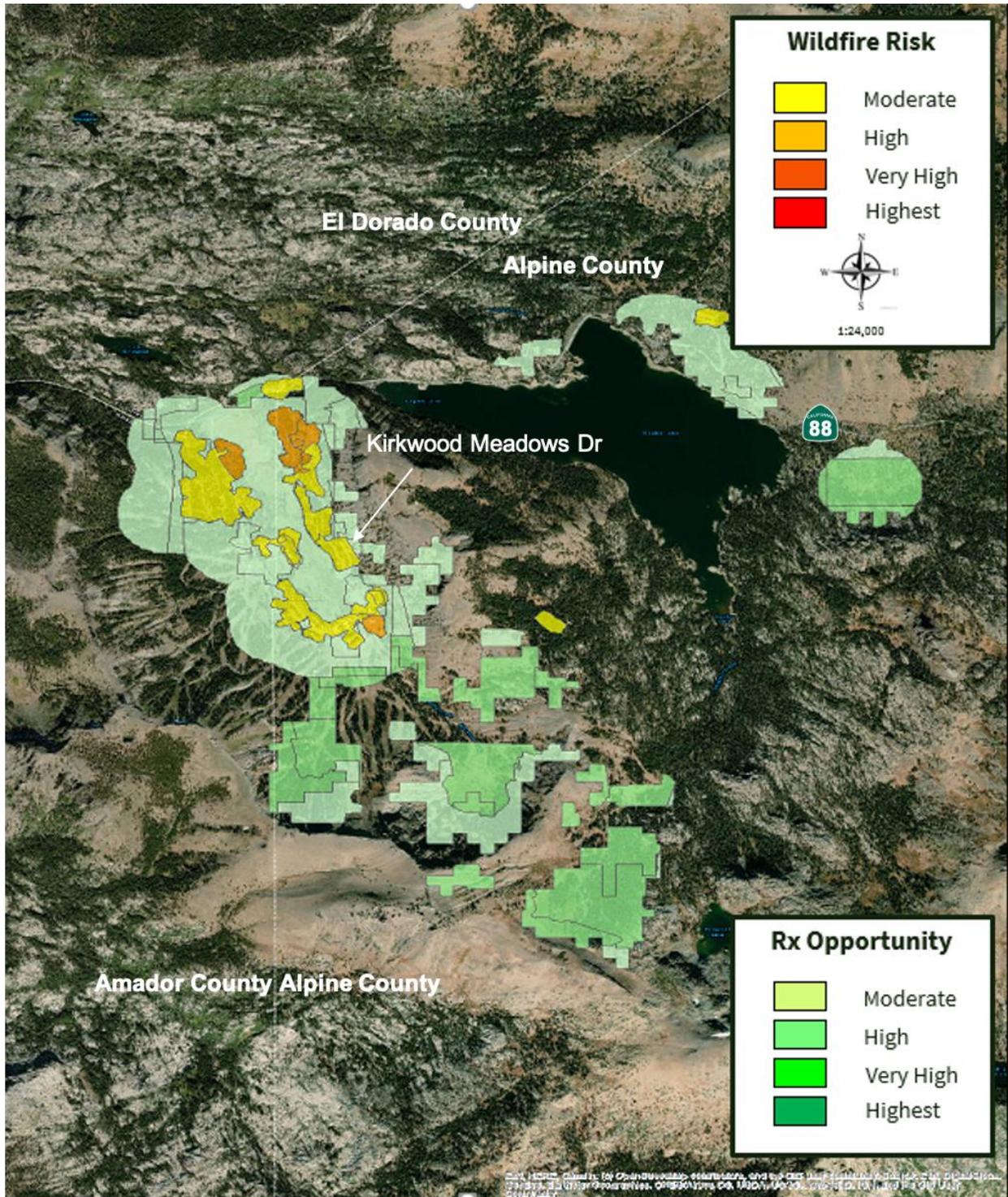
Figure 2-27 Bear Valley Wildfire Risk Output After Workflow with Prescribed Fire Opportunities



Source: (LANDFIRE, 2020)

2 TECHNICAL ANALYSES

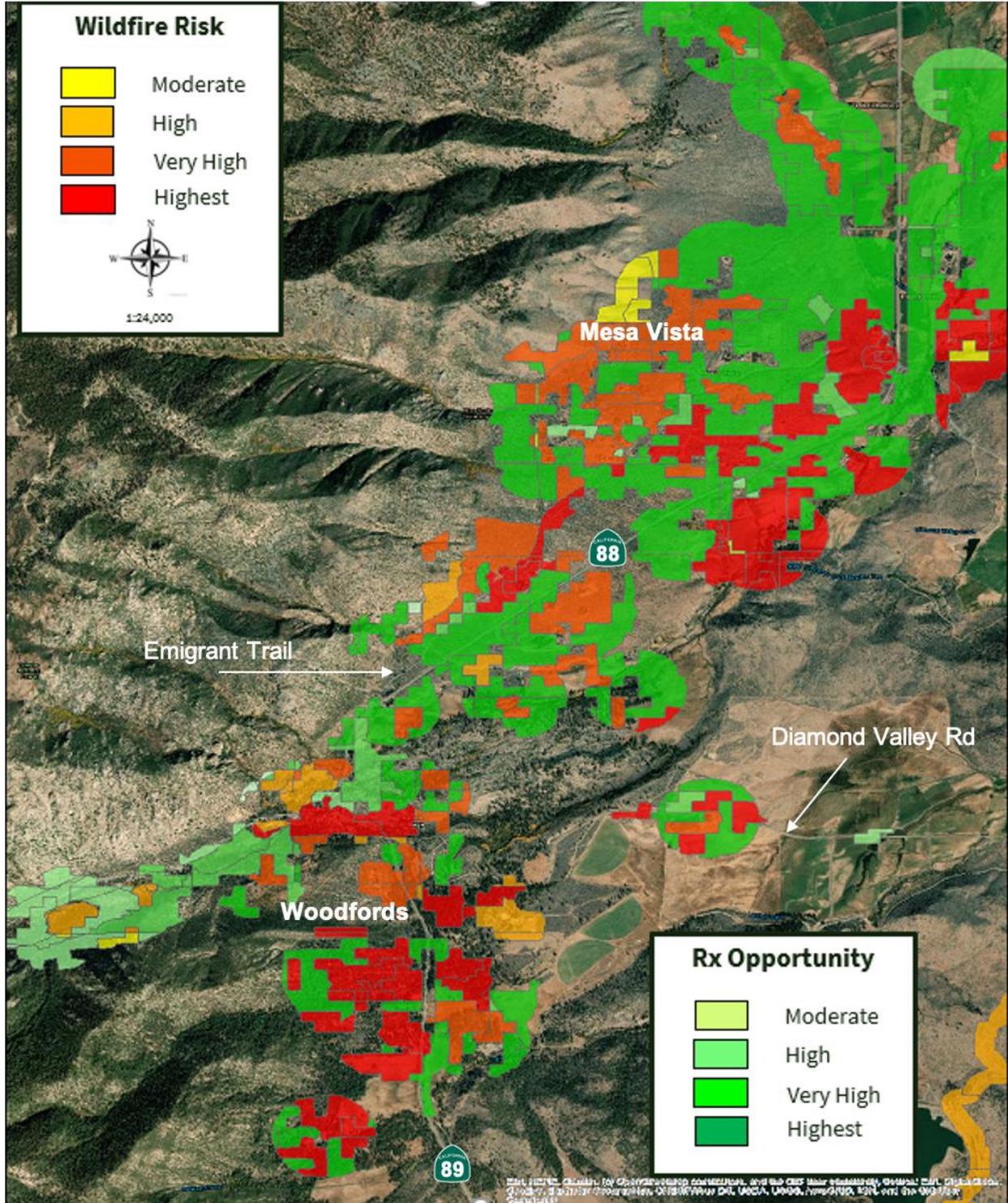
Figure 2-28 Kirkwood Wildfire Risk Output After Workflow with Prescribed Fire Opportunities



Source: (LANDFIRE, 2020)

2 TECHNICAL ANALYSES

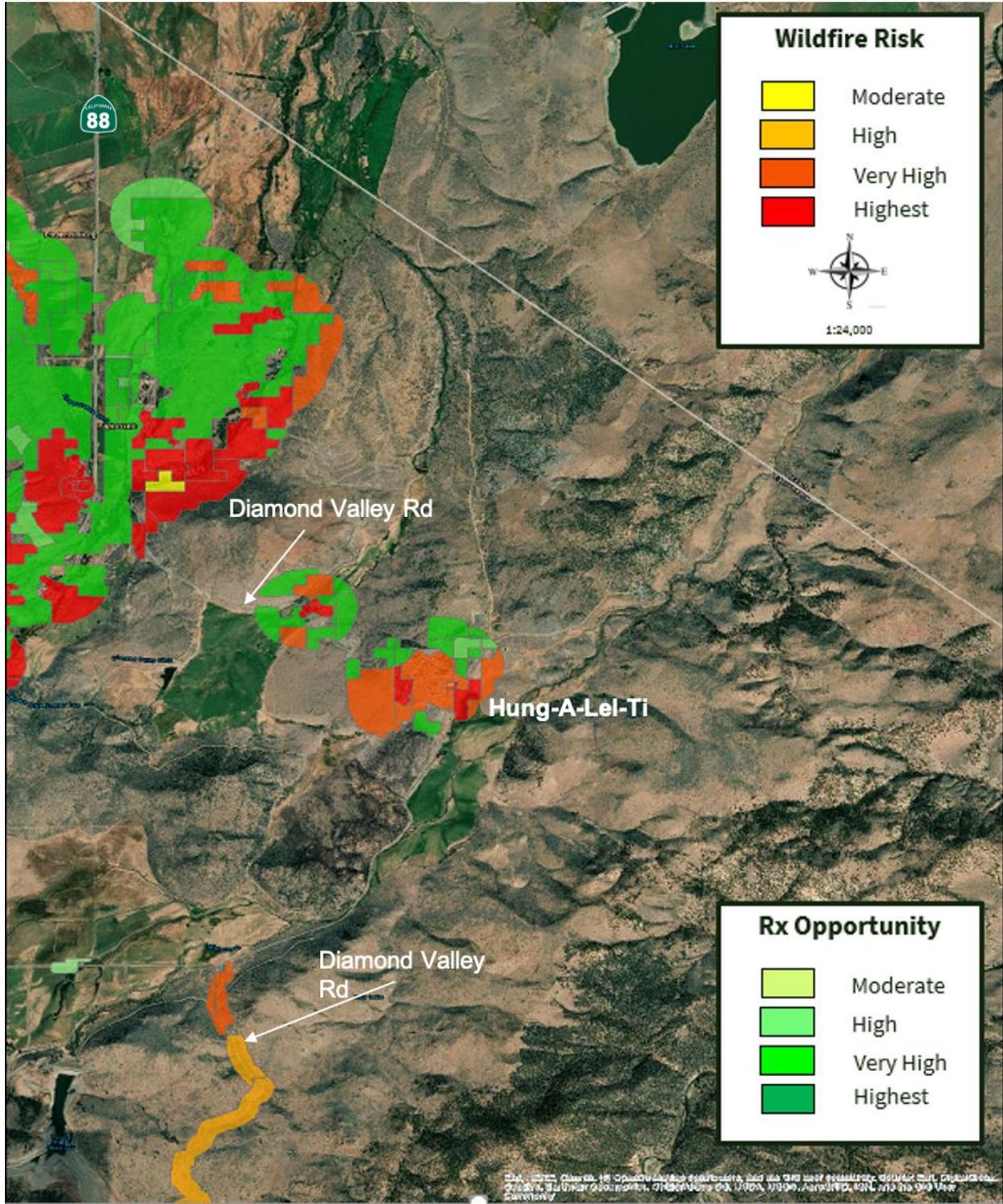
Figure 2-29 Woodfords Wildfire Risk Output After Workflow with Prescribed Fire Opportunities



Source: (LANDFIRE, 2020)

2 TECHNICAL ANALYSES

Figure 2-30 Hung-A-Lel-Ti Wildfire Risk Output After Workflow with Prescribed Fire Opportunities



2 TECHNICAL ANALYSES

Table 2-18 Areas of Risk and Acres of Opportunity by Land Management or Ownership

Ownership Group	Acres of Risk	Acres of Opportunity (including prescribed fire)
United States Forest Service	2,087	10,455
Bureau of Land Management	378	137
Bureau of Indian Affairs	207	203
Alpine County	168	36
NGO/Service Districts/Pacific Gas & Electric	80	192
State of California	76	215
Private	2,598	3,957
Unknown	16	47
Totals	5,610	15,242

3 Wildfire Risk Mitigation Projects

3.1 Development and Prioritization of Potential Projects

The modeling efforts to assess wildfire risks across Alpine County assisted the team in defining where fire hazard areas occur, and which resources and assets are at moderate to highest risk. The information allowed the team to focus in on specific areas where projects could be developed to mitigate the risks. County staff and the steering committee were tapped for their knowledge of recently completed projects or projects underway in the County, as well as areas of particular concern based on their understanding of fire response and evacuation procedures, and on-the-ground conditions.

The land ownerships with the majority of the acres at risk included lands managed by the USFS at 1,403 acres (Humboldt-Toiyabe NF = 1,155 acres; Stanislaus NF = 230 acres; Eldorado NF = 18 acres) and private land at 2,598 acres (see Table 5-2). Areas within USFS ownership at highest risk, primarily on the east side of the County, are already being treated or are planned for near-term treatment by the USFS (Annabelle Monti, pers. Comm., 2020). The roster of projects defined for the mitigation program, therefore, did not include lands within USFS ownership. The wildfire risk assessment also demonstrated that the Kirkwood planning area had the least risks of the five planning areas within the WUI, with few areas in moderate and very limited areas in high wildfire risk. The roster of projects, therefore, focused on Markleeville, Woodfords, Hung-a-Lel-Ti, and Bear Valley. Project boundaries were drawn up, based on parcels, for 23 projects with an additional three projects identified but not mapped. While 23 projects were identified, several are adjacent to each other and could be grouped into a single project. With the grouping of adjacent projects, a total of 12 total projects were identified.

Once the projects were identified by geographic area, qualitative criteria were considered to prioritize the projects into three tiers (Tier 1 or highest priority, Tier 2 or moderate priority, and Tier 3 or lower priority), and to identify the three projects in Tier 1 that would move forward for detailed definition and environmental review. The criteria included:

- Degree of wildfire risk
- Project size and ability to implement
- Land ownership and likelihood to obtain permission to perform work: Is the landowner likely to approve the work and interested in the projects
- Feasibility of completing environmental review under existing constraints (i.e., grant timeframe, grant funds)
- Consistency with the CWPP: Is the project or area identified as a key area in the CWPP?

3 WILDFIRE RISK MITIGATION PROJECTS

3.2 Projects Included in the WRMP by Tier

3.2.1 Summary of All Projects

Table 3-1 provides an overview of the 12 projects and 23 subprojects that were identified for inclusion in this WRMP. The table is followed by maps depicting the locations of the projects. The project boundaries are largely based on parcel boundaries; however, preliminary project boundaries were delineated regardless of land ownership.

The Tier 1 projects are carried forward with detailed implementation plans and environmental review, described in Chapter 4. Implementation of other projects in Tier 2 and Tier 3 would require supplemental implementation plans in the future. The process for implementing the Tier 2 and Tier 3 projects, as well as prescribed burning across larger HVRA areas is described in Section 4.7.

3.2.2 Summary of the Tier 1 Projects for Detailed Definition and Environmental Analysis

The three projects moving forward for detailed definition are shown below. These projects were prioritized primarily because they provide protection to communities at the highest wildfire risk (Markleevillage in Markleeville); protects a larger community in combination with high wildfire risk (Manzanita community in Woodfords); and provides protection to a considerable number of higher density homes and infrastructure that can build off of existing work for greater benefit even though the overall wildfire risk is lower in this area (Bear Valley). The Grover Hot Springs area also ranked highly, as the first project under Tier 2. This project could also reasonably be developed in the future following additional definition and environmental review.

Project 1: Markleevillage (Subprojects MV1, MV2, MV3, MV4, MV5, and MV6)	
Size: 300 acres	
Goal: WUI protection and evacuation corridor protection	
Benefits: Addressing the area with the highest wildfire risks in the County	
Land Ownership: Private	
CWPP Projects: Markleeville Priority 1, 3, and 4	

3 WILDFIRE RISK MITIGATION PROJECTS

Project 2: Manzanita (Subprojects MV1, MV2, MV3, MV4, MV5, and MV6)

Size: 430 acres

Goal: WUI protection

Benefits: Protection of the Manzanita community

Land Ownership: Private

CWPP Projects: Woodfords/Upper Manzanita Priority 1



Project 3: Bear Valley (Subproject BV1)

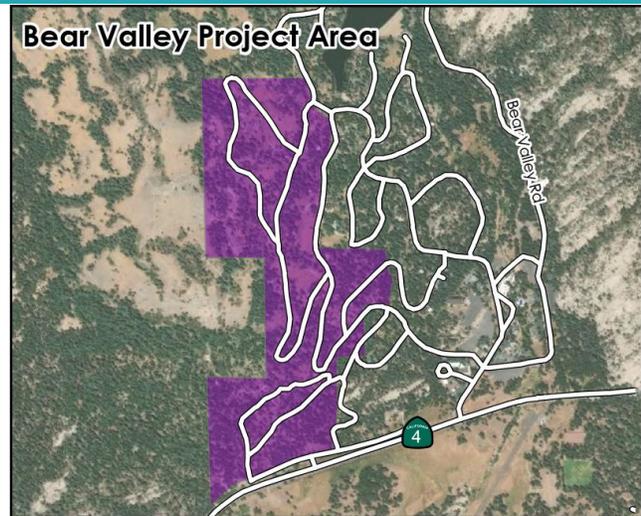
Size: 130 acres

Goal: WUI protection and defensible space

Benefits: Community protection building on USFS, County, and resident work

Land Ownership: Private

CWPP Projects: Bear Valley Priority 1, 2, 3



3 WILDFIRE RISK MITIGATION PROJECTS

Table 3-1 Projects Included in the Wildfire Risk Mitigation Plan by Tier

Project #	Sub-Project ID	Project Location and Summary	Potential Treatment Types and Methods	Estimated Project Size	Landowner Type(s)		Likelihood of Receiving Landowner Permission	Anticipated Environmental Review ¹	Environmental Review Considerations	CWPP Consistency
					Public	Private				
Tier 1 Priority Projects (Highest Priority)										
1	MV1	Saw Mill Road Community protection south of Hot Springs Road and west of Pleasant Valley Road	<ul style="list-style-type: none"> • WUI fuel treatment • Mechanical • Hand tools 	118 acres	No	Yes -Single landowner	Feasible	CEQA – Portions are covered by CALVTP EIR Treatment of entire area may require additional CEQA review for work in meadow. CalVTP Project Specific Assessment could be used for all other areas.	<ul style="list-style-type: none"> • Majority of the area is covered by the CalVTP EIR. Large meadow is excluded from VTP EIR treatment area. 	<ul style="list-style-type: none"> • Part of Markleeville Priority 3 – Land Co-op
	MV2	Pleasant Valley Road - East Defensible space and emergency access south of Hot Springs Road and east of Pleasant Valley Road	<ul style="list-style-type: none"> • WUI fuel treatment • Mechanical • Hand tools 	75 acres	No	Yes – Multiple landowners	Multiple private landowners could be a challenge for conducting studies/surveys and project implementation	CEQA – CalVTP Project Specific Assessment	<ul style="list-style-type: none"> • CalVTP identifies fuel break opportunity near Pleasant Valley Road 	<ul style="list-style-type: none"> • Markleeville Priority 4 residential treatment
	MV3	Pleasant Valley Road - South Community protection for community east of Pleasant Valley Road	<ul style="list-style-type: none"> • WUI fuel treatment • Fuel break • Mechanical • Hand tools 	39 acres	No	Yes - Single landowner	Feasible	CEQA – CalVTP Project Specific Assessment	<ul style="list-style-type: none"> • Entire area covered by the CalVTP EIR 	<ul style="list-style-type: none"> • No, not included with Priority 3 Co-op
	MV4	Hot Springs Road - West Emergency access protection on Hot Springs Road; community protection for community east of Pleasant Valley Road	<ul style="list-style-type: none"> • WUI fuel treatment • Mechanical • Hand tools 	47 acres	No	Yes - Single landowner	Feasible	CEQA – CalVTP Project Specific Assessment	<ul style="list-style-type: none"> • Entire area covered by the CalVTP EIR 	<ul style="list-style-type: none"> • Markleeville Priority 1 and 3
	MV5	Hot Springs Road to Markleeville (North) Emergency access protection north of Hot Springs Road west of Markleeville	<ul style="list-style-type: none"> • WUI fuel treatment • Mechanical • Hand tools 	10 acres	No	Yes – Single landowner	Feasible	CEQA – CalVTP Project Specific Assessment	<ul style="list-style-type: none"> • Entire area covered by the CalVTP EIR 	<ul style="list-style-type: none"> • Markleeville Priority 1 and 3
	MV6	Hot Springs Road to Markleeville (South) Emergency access protection south of Hot Springs Road west of Markleeville	<ul style="list-style-type: none"> • WUI fuel treatment • Mechanical • Hand tools 	7 acres	No	Yes – Single landowner	Feasible	CEQA – Portions are covered by CALVTP EIR Treatment of entire area requires additional CEQA review for work adjacent to Pleasant Valley Creek. CalVTP Project Specific Assessment could be used for all other areas.	<ul style="list-style-type: none"> • CalVTP excludes the area adjacent to Pleasant Valley Creek 	<ul style="list-style-type: none"> • Markleeville Priority 1, not included in Priority 3 land co-op

3 WILDFIRE RISK MITIGATION PROJECTS

Project #	Sub-Project ID	Project Location and Summary	Potential Treatment Types and Methods	Estimated Project Size	Landowner Type(s)		Likelihood of Receiving Landowner Permission	Anticipated Environmental Review ¹	Environmental Review Considerations	CWPP Consistency
					Public	Private				
2	MZ1	Manzanita Emergency access protection along Highway 89 and community protection for Sierra Pines Mobile Home Park	<ul style="list-style-type: none"> • WUI fuel reduction • Fuel breaks • Mechanical • Hand tools 	658 acres	No	Yes – Single landowner	Feasible	CEQA – CalVTP Project Specific Assessment	<ul style="list-style-type: none"> • CalVTP identifies fuel break opportunities along Randall Creek • CalVTP excludes some of the meadows in the area from treatment 	<ul style="list-style-type: none"> • Not included in Woodfords\Upper Manzanita Priority 1 project
	MZ2	Manzanita Community protection for Sierra Pines Mobile Home Park	<ul style="list-style-type: none"> • WUI fuel reduction • Fuel breaks • Mechanical • Hand tools 	71 acres	No	Yes – Single landowner	Feasible	CEQA – CalVTP Project Specific Assessment	<ul style="list-style-type: none"> • Entire area covered by the CalVTP EIR • CalVTP identifies fuel break opportunities along Scott Creek and with topography in the area 	<ul style="list-style-type: none"> • No included in Woodfords\Upper Manzanita Priority 1 project
	MZ3	Manzanita Community protection for Sierra Pines Mobile Home Park	<ul style="list-style-type: none"> • WUI fuel reduction • Fuel breaks • Mechanical • Hand tools 	39 acres	No	Yes – Single landowner	Feasible	CEQA – CalVTP Project Specific Assessment	<ul style="list-style-type: none"> • Entire area covered by the CalVTP EIR • CalVTP identifies fuel break opportunities along Scott Creek and with topography in the area 	<ul style="list-style-type: none"> • Woodfords\Upper Manzanita Priority 1 project
	MZ5	Manzanita Community protection for Sierra Pines Mobile Home Park	<ul style="list-style-type: none"> • WUI fuel reduction • Fuel breaks • Mechanical • Hand tools 	108 acres	No	Yes – Single landowner	Feasible	CEQA – CalVTP Project Specific Assessment	<ul style="list-style-type: none"> • Entire area covered by the CalVTP EIR • CalVTP identifies fuel break opportunities within the parcel as well as just north of the northern property along existing fuel break 	<ul style="list-style-type: none"> • Woodfords\Upper Manzanita Priority 1 project
3	BV2	Bear Valley Defensible space and community protection for Bear Valley community; Emergency access to Highway 4	<ul style="list-style-type: none"> • Defensible space • WUI fuels reduction • Mechanical • Hand tools 	130 acres	No	Yes – Multiple landowners	Multiple private landowners could be a challenge for conducting studies/surveys and project implementation	CEQA – project-specific CEQA document	<ul style="list-style-type: none"> • The majority of the area is not covered by the CalVTP 	<ul style="list-style-type: none"> • Consistent with BV Projects 1,2,3
Tier 2 Priority Projects (Moderate Priority)										
4	GHS1	Grover Hot Springs State Park Protection of Grover Hot Springs campground and emergency access protection on Hot Springs Road.	<ul style="list-style-type: none"> • Ecological restoration • Fuel break • Mechanical • Hand tools • Prescribed burn 	339 acres	Yes – State of California	No	Feasible	CEQA – CalVTP Project Specific Assessment	<ul style="list-style-type: none"> • Entire area covered by the CalVTP EIR 	<ul style="list-style-type: none"> • Markleeville Priority 1 is roadway access treatments • Markleeville Priority 5 is alternate routes and evac sites like Grover Meadow pg 115

3 WILDFIRE RISK MITIGATION PROJECTS

Project #	Sub-Project ID	Project Location and Summary	Potential Treatment Types and Methods	Estimated Project Size	Landowner Type(s)		Likelihood of Receiving Landowner Permission	Anticipated Environmental Review ¹	Environmental Review Considerations	CWPP Consistency
					Public	Private				
	GHS2	Shay Creek Subdivision Defensible space protection of the Shay Creek subdivision and emergency access on Hot Springs Road.	<ul style="list-style-type: none"> Ecological restoration WUI fuel treatment Mechanical Hand tools 	77 acres	No	Yes – Multiple landowners	<ul style="list-style-type: none"> Multiple private landowners could be a challenge for conducting studies/surveys and project implementation 	<ul style="list-style-type: none"> CEQA – CalVTP Project Specific Assessment Project could qualify for Class 4 Exemption (CEQA Guidelines Section 15304 Minor Alterations to Land) 	<ul style="list-style-type: none"> Entire area covered by the CalVTP EIR 	<ul style="list-style-type: none"> Assume Priority 1 roadway access treatments are consistent even if they don't describe Shay Creek
	GHS3	Hot Springs Road near Shay Creek Road Emergency access protection on Hot Springs Road, east of Shay Creek Road.	<ul style="list-style-type: none"> WUI fuel treatment Mechanical Hand tools Prescribed burn 	8 acres	Yes – State of California	No	Feasible	<ul style="list-style-type: none"> CEQA – The project will require evaluation under a project-specific CEQA document. Project could qualify for Class 4 Exemption (CEQA Guidelines Section 15304 Minor Alterations to Land). 	<ul style="list-style-type: none"> The area is not included in the CalVTP analysis area but the omission may be due to a mapping error. The case can be made for treating it as a CalVTP-covered area (within SRA) Land use within the project boundary includes year-round workforce housing; therefore, the area is considered higher priority 	<ul style="list-style-type: none"> Markleeville Priority 1 and 5 projects
5	MS1	Mesa Vista Community protection for Mesa Vista	<ul style="list-style-type: none"> WUI fuels reduction Mechanical Hand tools Prescribed burn 	66 acres	No	Yes -Washo Tribe	Feasible	<ul style="list-style-type: none"> NEPA – Categorical Exclusion CEQA – project-specific CEQA document necessary 	<ul style="list-style-type: none"> Area not included in the CalVTP BIA NEPA Categorical Exclusion² available 	<ul style="list-style-type: none"> Woodfords\Mesa Vista Brush Treatment- Priority 4, 100 ac
	MS2	Mesa Vista Community protection for Mesa Vista; Emergency access protection of Emigrant Trail and Highway 88	<ul style="list-style-type: none"> WUI fuels reduction Mechanical Hand tools 	282 acres	Yes -BIA	Yes -Washo Tribe	Feasible	<ul style="list-style-type: none"> NEPA – Categorical Exclusion CEQA – project-specific CEQA document necessary. 	<ul style="list-style-type: none"> Area not included in the CalVTP BIA NEPA Categorical Exclusion² available 	<ul style="list-style-type: none"> Woodfords\Mesa Vista Brush Treatment – Priority 4 100ac
Tier 3 Priority Projects (Lower Priority)										
6	HLT1	Hung-A-Lel-Ti Community protection for Hung-a-Lel-Ti and emergency access on Diamond Valley Road	<ul style="list-style-type: none"> WUI fuels reduction Mechanical Hand tools Prescribed burn * 	78 acres	Yes -BIA	No	Feasible	<ul style="list-style-type: none"> NEPA – Categorical Exclusion CEQA – project-specific CEQA document necessary. Project could qualify for Class 4 Exemption (CEQA Guidelines Section 15304 Minor Alterations to Land) 	<ul style="list-style-type: none"> Area not included in the CalVTP BIA NEPA Categorical Exclusion² available CEQA Class 4 Exemption may apply * Prescribed burn outside of 100' buffer of structures 	<ul style="list-style-type: none"> No recommended project

3 WILDFIRE RISK MITIGATION PROJECTS

Project #	Sub-Project ID	Project Location and Summary	Potential Treatment Types and Methods	Estimated Project Size	Landowner Type(s)		Likelihood of Receiving Landowner Permission	Anticipated Environmental Review ¹	Environmental Review Considerations	CWPP Consistency
					Public	Private				
7	TRP1	Turtle Rock Park Emergency access protection along Highway 89	<ul style="list-style-type: none"> Ecological restoration Mechanical Hand tools Prescribed burn 	126 acres	Yes – Alpine County	No	Feasible	CEQA – CalVTP Project Specific Assessment	<ul style="list-style-type: none"> Majority of area covered by CalVTP EIR Developed areas (parking lots) were excluded from CalVTP EIR treatable area CalVTP identifies opportunity for fuelbreak on the western edge of the polygon extending west along Millberry Creek 	<ul style="list-style-type: none"> No, pg 65 sect 8.3 recognizes BLM treatments adjacent to TRP
8	BV1	Bear Valley Defensible space and community protection for Bear Valley community at Bear Lake; Emergency access protection on Bear Valley Road	<ul style="list-style-type: none"> Defensible space WUI fuels reduction Mechanical Hand tools 	18 acres	No	Yes – Multiple landowners	Feasible	CEQA – project-specific CEQA document. Project could qualify for Class 4 Exemption (CEQA Guidelines Section 15304 Minor Alterations to Land)	<ul style="list-style-type: none"> None of the area is covered by the CalVTP Multiple private landowners could be a challenge for conducting studies/surveys and project implementation 	<ul style="list-style-type: none"> Consistent with BV Projects 1,2,3
	BV3	Bear Valley Defensible space and community protection for Bear Valley community; Emergency access to Highway 4	<ul style="list-style-type: none"> Defensible space WUI fuels reduction Mechanical Hand tools 	185 acres	Yes – State or County	Yes – Multiple landowners	Feasible	<ul style="list-style-type: none"> CEQA – project-specific CEQA document using CalVTP. Project could qualify for Class 4 Exemption (CEQA Guidelines Section 15304 Minor Alterations to Land) 	<ul style="list-style-type: none"> Multiple private landowners could be a challenge for conducting studies/surveys and project implementation CalVTP covers area along Creekside Drive 	<ul style="list-style-type: none"> Consistent with BV Projects 1,2,3
9	MZ4	Manzanita Emergency access protection along Highway 89 and defensible space for Sierra Pines Mobile Home Park	<ul style="list-style-type: none"> WUI fuel reduction Fuel breaks Mechanical Hand tools 	17 acres	No	Yes - Single landowner	Current landowner is not interested in wildfire mitigation projects on property at the time of WRMP development	<ul style="list-style-type: none"> CEQA – CalVTP Project Specific Assessment. Project could qualify for Class 4 Exemption (CEQA Guidelines Section 15304 Minor Alterations to Land) 	<ul style="list-style-type: none"> Entire area covered by the CalVTP EIR CalVTP identifies fuel break opportunities along Scott Creek and with topography in the area 	<ul style="list-style-type: none"> Woodfords\Upper Manzanita Priority 1 project
	MZ6	Manzanita Emergency access protection along Highway 89 and defensible space for Sierra Pines Mobile Home Park	<ul style="list-style-type: none"> WUI fuel reduction Fuel breaks Mechanical Hand tools 	79 acres	No	Yes – Multiple landowners	Current landowners are generally not interested in wildfire mitigation projects on property at the time of WRMP development	<ul style="list-style-type: none"> CEQA – CalVTP Project Specific Assessment Project could qualify for Class 4 Exemption (CEQA Guidelines Section 15304 Minor Alterations to Land) 	<ul style="list-style-type: none"> Entire area covered by the CalVTP EIR CalVTP identifies fuel break opportunities along Scott Creek Multiple private landowners could be a challenge for conducting studies/surveys and project implementation 	<ul style="list-style-type: none"> Woodfords\Upper Manzanita Priority 1 project Identifies poor defensible space and difficult emergency access along Manzanita Lane and Hawkins Ranch Road
10	LA1	Lake Alpine Protection of recreational uses and emergency access	<ul style="list-style-type: none"> Ecological restoration Mechanical Hand tools Prescribed burn 	449 acres	Yes – USFS	Yes - PG&E	Feasible	NEPA – CE or EA CEQA – project-specific CEQA document necessary tiering off CalVTP	<ul style="list-style-type: none"> PG&E-owned land covered by CalVTP NEPA required for work on USFS land 	<ul style="list-style-type: none"> No CWPP project, reference on pg 133 to 2013 timber stand project

3 WILDFIRE RISK MITIGATION PROJECTS

Project #	Sub-Project ID	Project Location and Summary	Potential Treatment Types and Methods	Estimated Project Size	Landowner Type(s)		Likelihood of Receiving Landowner Permission	Anticipated Environmental Review ¹	Environmental Review Considerations	CWPP Consistency
					Public	Private				
11	DV1	Diamond Valley Triangle Protection of County services and Diamond Valley School	<ul style="list-style-type: none"> • WUI fuel reduction • Fuel breaks • Mechanical • Hand tools 	73 acres	Yes – Alpine County	No	Feasible	CEQA – project-specific CEQA document.	<ul style="list-style-type: none"> • Alpine Fire Safe Council Phase 2 project. AFSC completed Phase 1 project to the west, adjacent to Highway 89. • Area is not covered by the CalVTP 	<ul style="list-style-type: none"> • Woodfords\Upper Manzanita Priority 2 project
	DV2	Washoe Cemetery Protection of cemetery, Woodfords residences, and County services	<ul style="list-style-type: none"> • WUI fuel reduction • Ecological restoration • Fuel breaks • Mechanical • Hand tools • Prescribed burn 	77 acres	Yes – Alpine County, BIA	No	Feasible	CEQA – CalVTP Project Specific Assessment	<ul style="list-style-type: none"> • Entire area covered by the CalVTP EIR 	<ul style="list-style-type: none"> • Not specifically identified in CWPP but project consistent with Manzanita Fuels Treatment (Priority 1 Project) and Diamond Valley Triangle Fuels Treatment (Priority 2 Project) • CWPP identifies the area as a completed project
12	HWY1	Highway 89 North of Turtle Rock Park Emergency access protection along Highway 89	<ul style="list-style-type: none"> • Ecological restoration • Mechanical • Hand tools 	36 acres	No	Yes	Unknown	CEQA – project-specific CEQA document	<ul style="list-style-type: none"> • Area is not covered by the CalVTP 	<ul style="list-style-type: none"> • Not specifically identified in CWPP but project is consistent with goals for maintaining emergency access

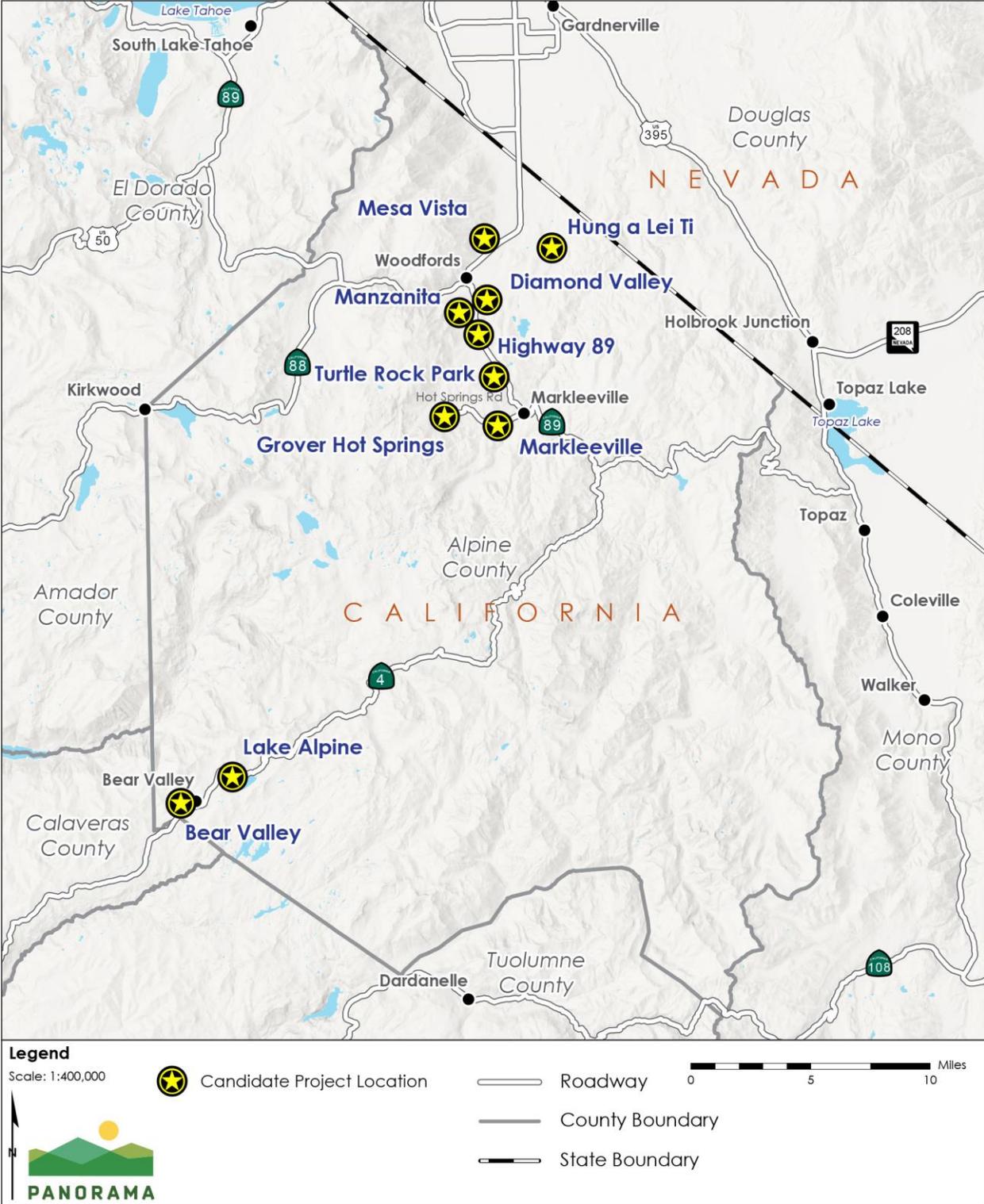
Notes:

¹ CalVTP Project Specific Assessment - Assessment checklist would be completed to determine if the project is consistent with the CalVTP EIR. If the checklist indicates that there would be a potentially new or more severe impact, then additional CEQA review would be required. The checklist could be used to prepare tiered CEQA review with additional evaluation for areas of new or more severe impact. Public review and comment periods would be necessary in accordance with CEQA. See Section 3.3 for more details on the Cal VTP EIR and CEQA review.

² Department of Interior Categorical Exclusion (k) Hazardous Fuels Reduction; or Bureau of Indian Affairs Categorical Exclusion H. Forestry (9)

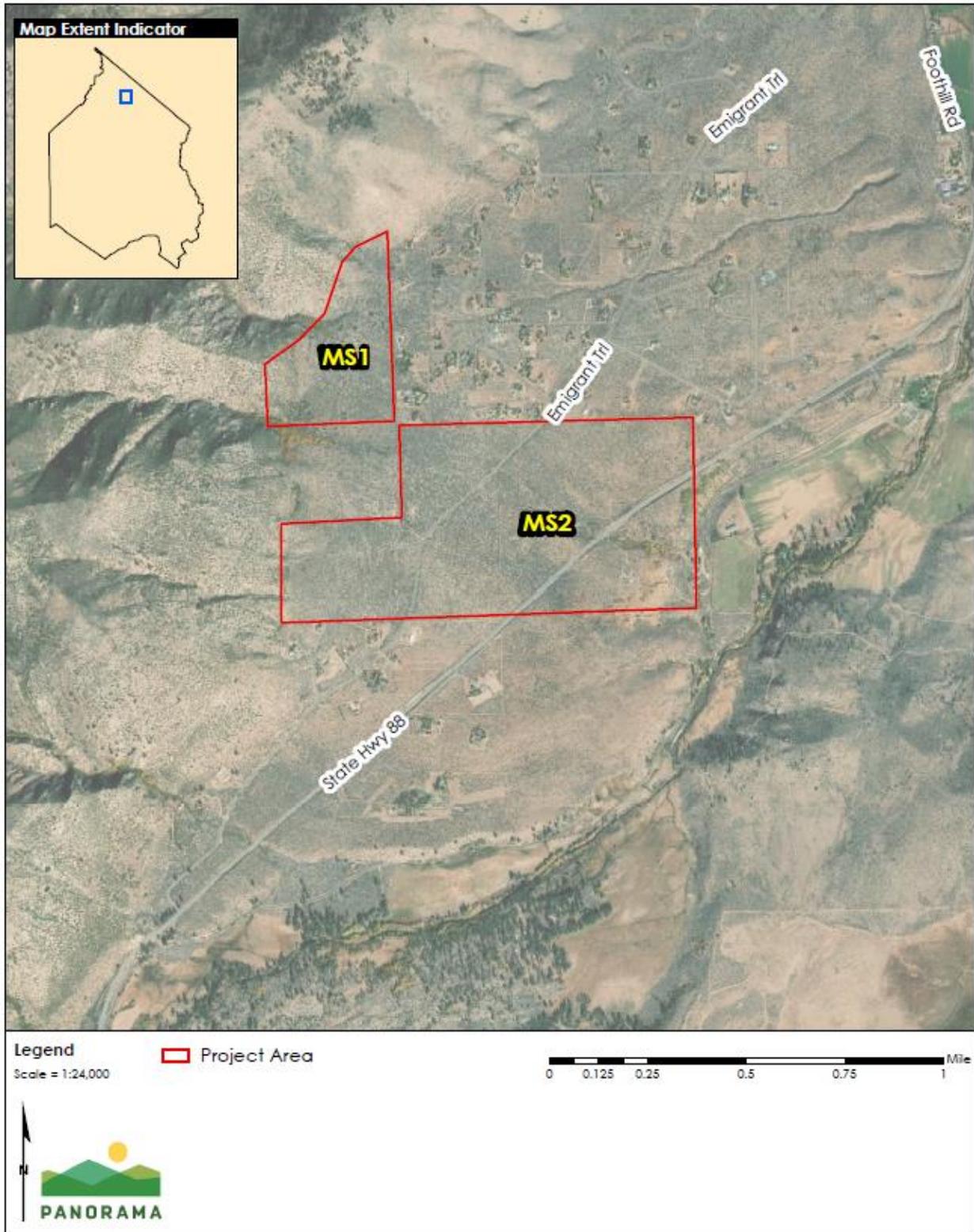
3 WILDFIRE RISK MITIGATION PROJECTS

Figure 3-1 Index of Project Maps in WRMP



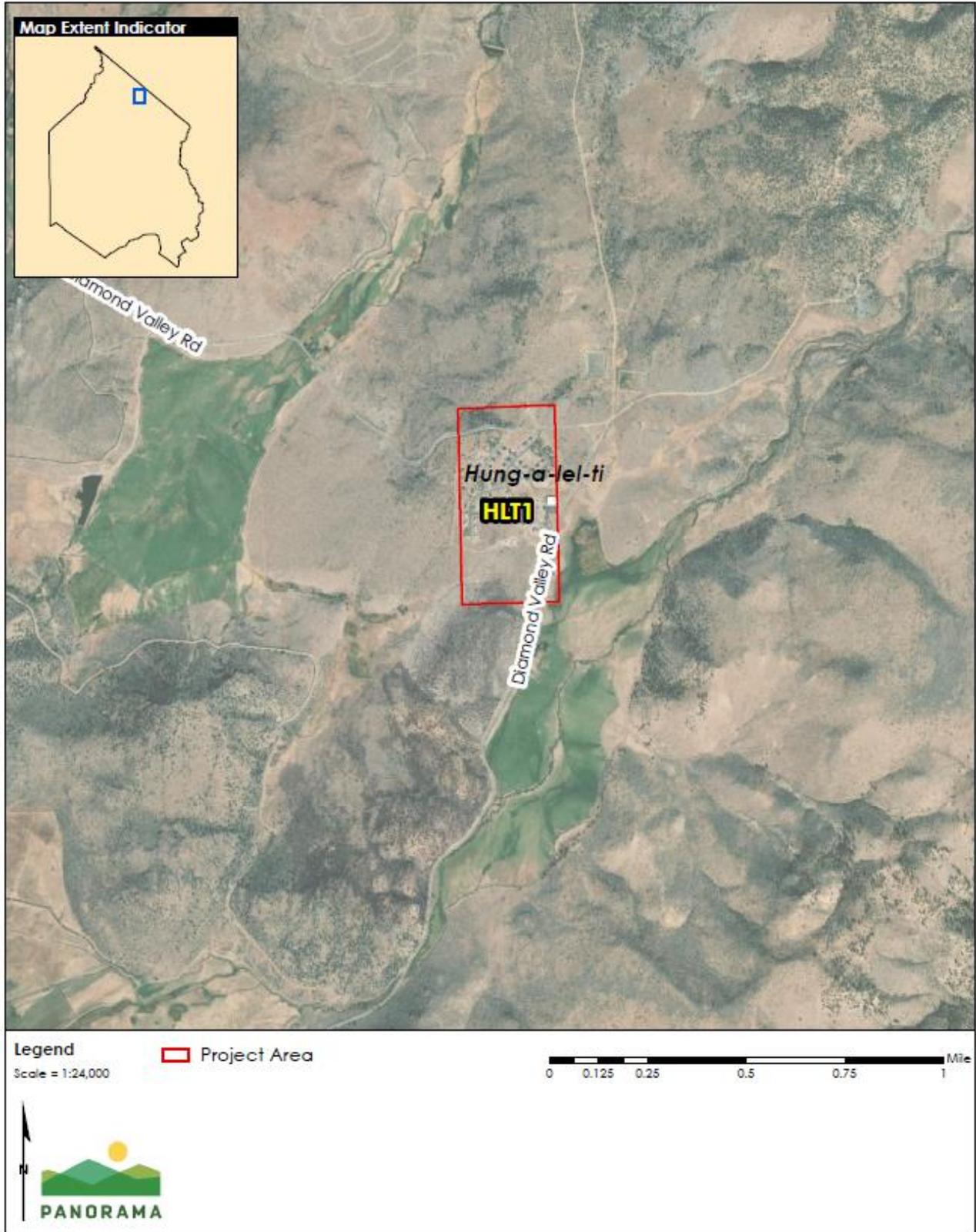
3 WILDFIRE RISK MITIGATION PROJECTS

Figure 3-2 Mesa Vista Project Area (Tier 1, Project 5)



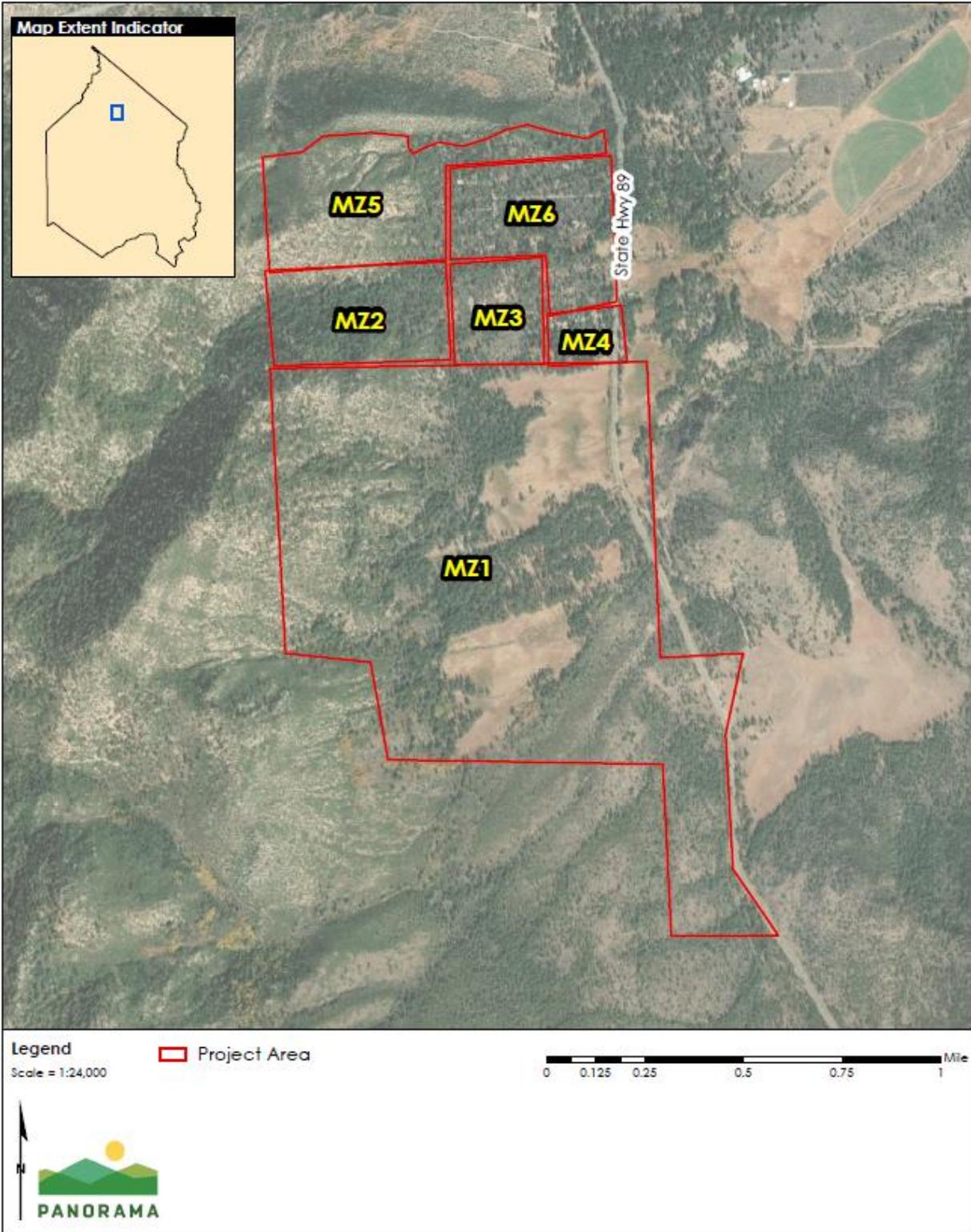
3 WILDFIRE RISK MITIGATION PROJECTS

Figure 3-3 Hung-a-Lel-Ti Project Area (Tier 3, Project 6)



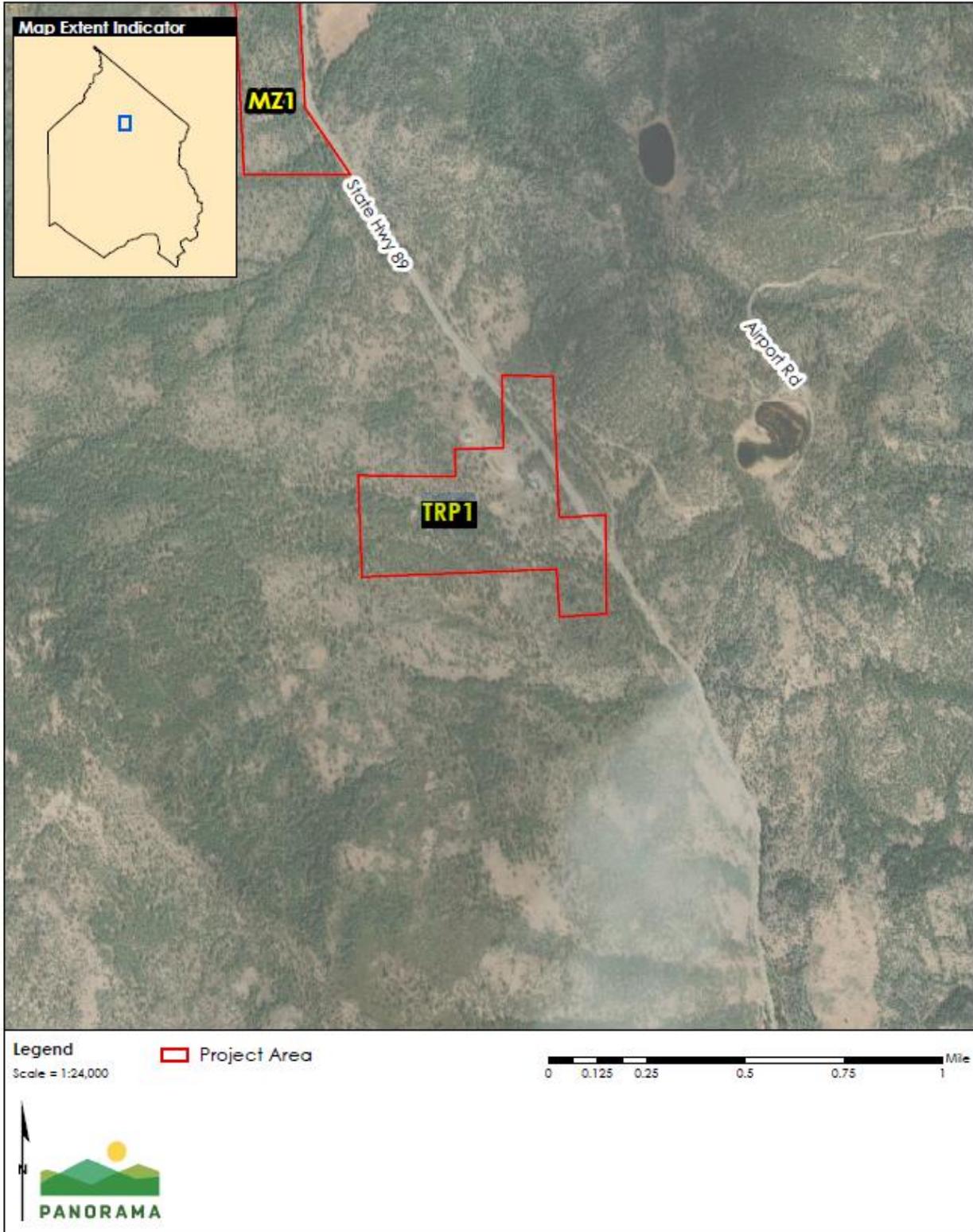
3 WILDFIRE RISK MITIGATION PROJECTS

Figure 3-4 Manzanita Project Area (Tier 1, Project 2 and Tier 3, Project 9)



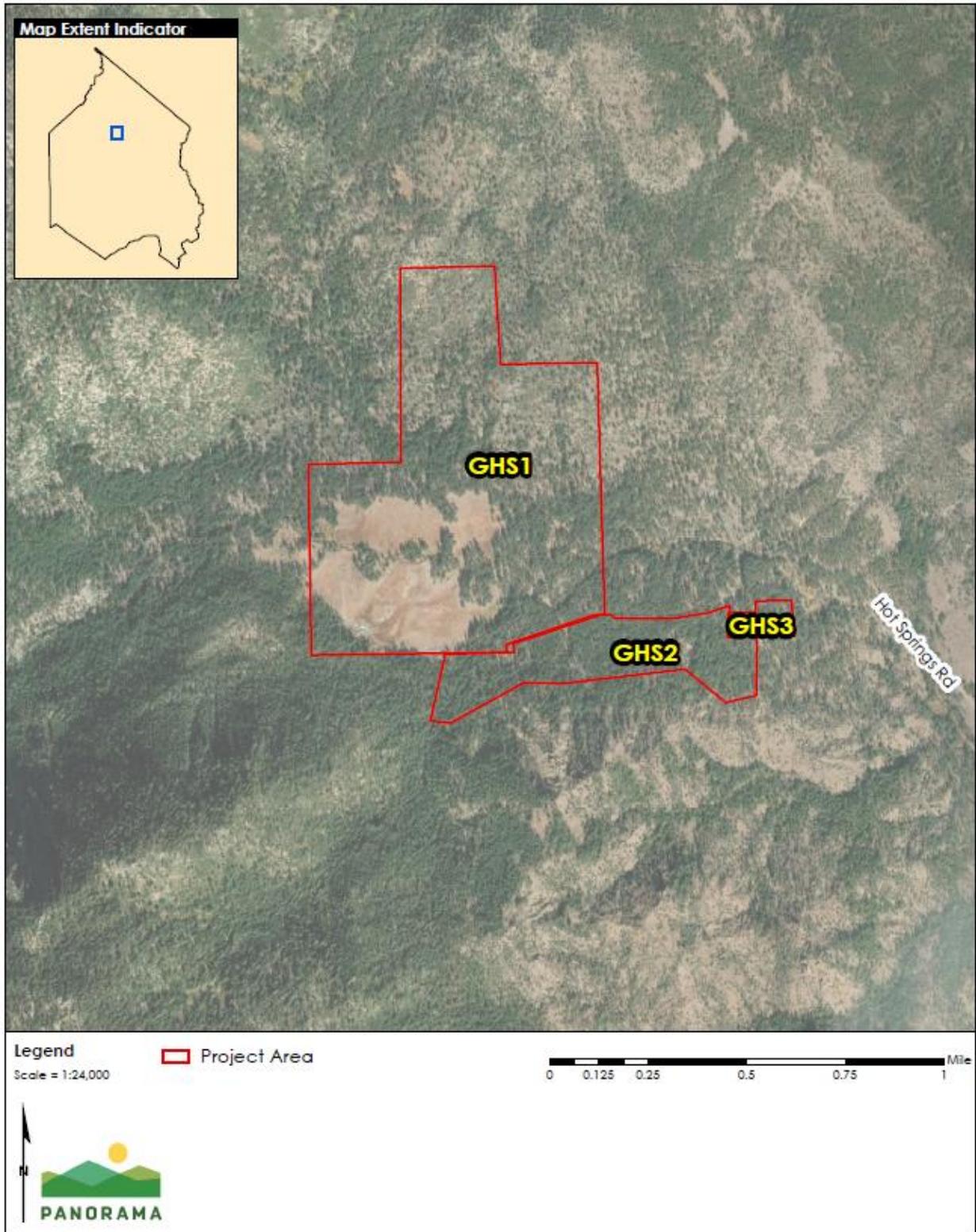
3 WILDFIRE RISK MITIGATION PROJECTS

Figure 3-5 Turtle Rock Park Project Area (Tier 3, Project 7)



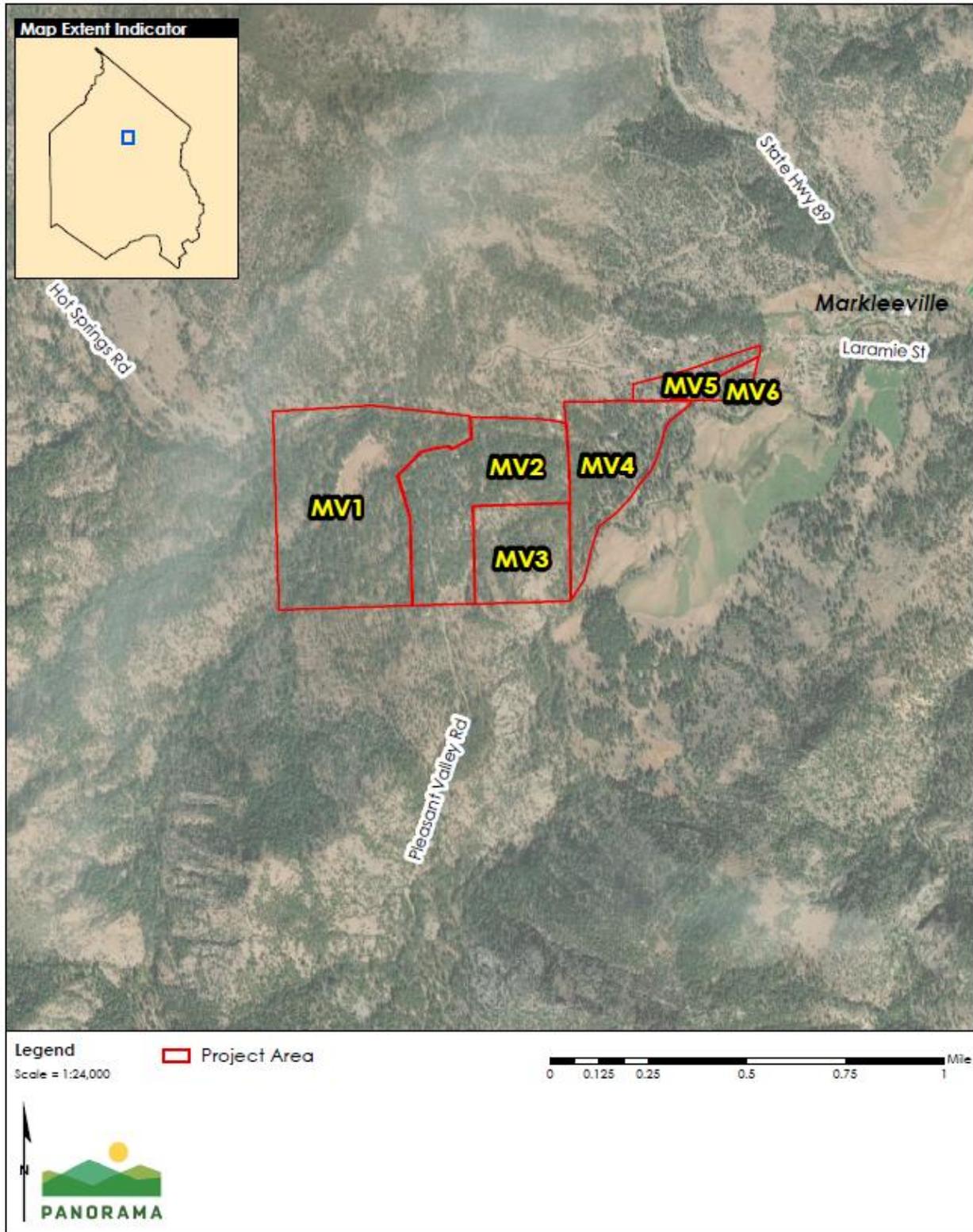
3 WILDFIRE RISK MITIGATION PROJECTS

Figure 3-6 Grover Hot Springs Project Area (Tier 2, Project 4)



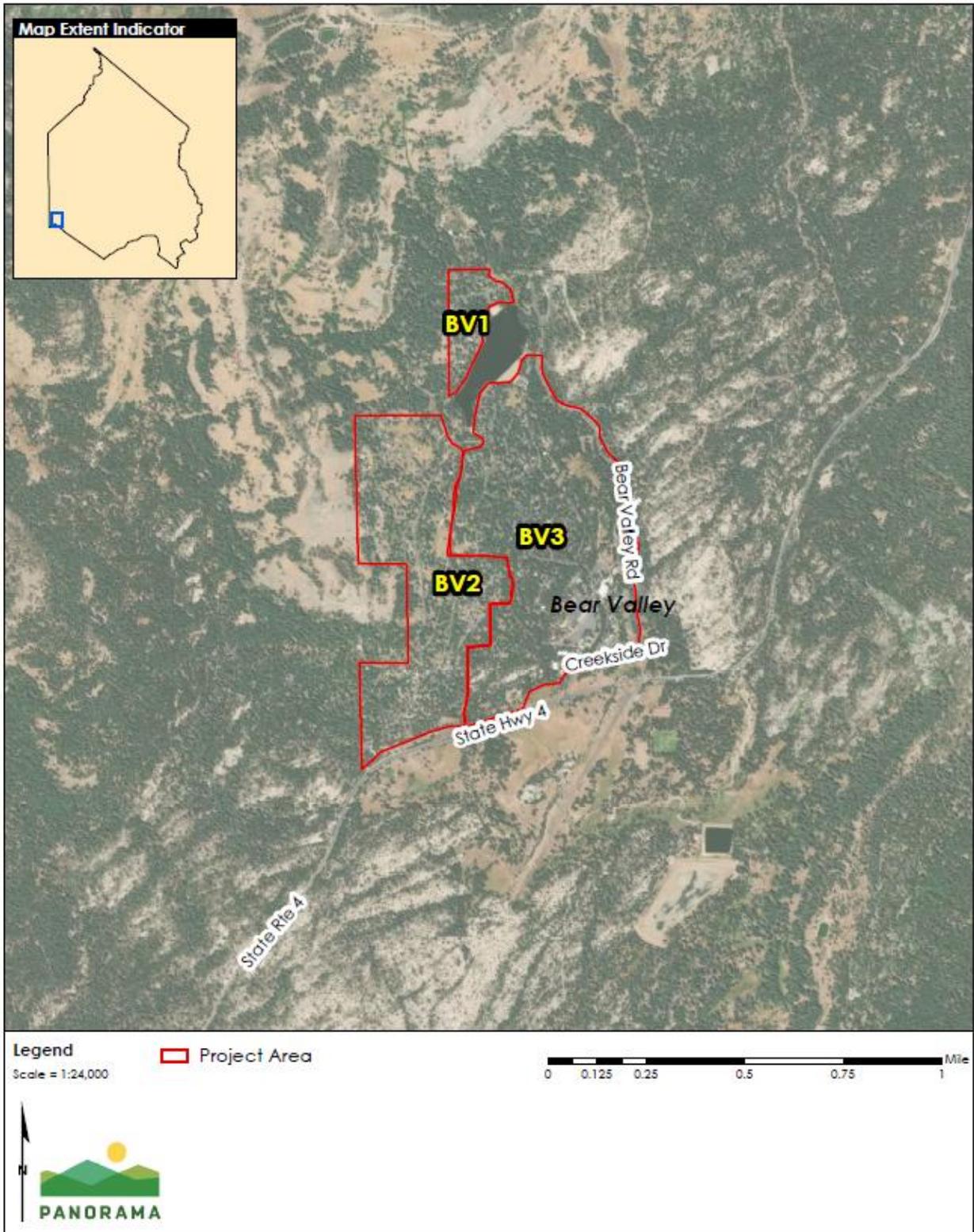
3 WILDFIRE RISK MITIGATION PROJECTS

Figure 3-7 Markleevillage Project Area (Tier 1, Project 1)



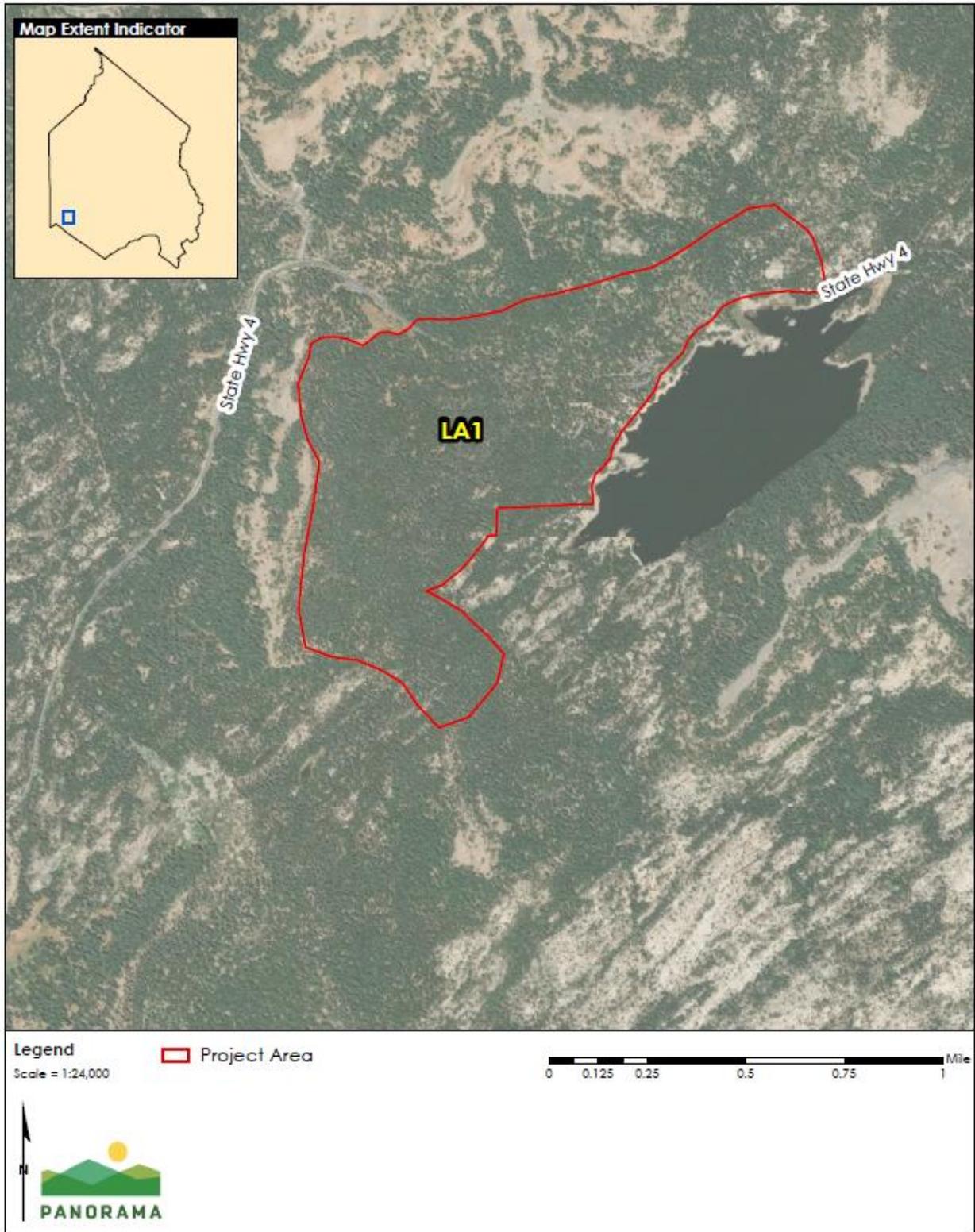
3 WILDFIRE RISK MITIGATION PROJECTS

Figure 3-8 Bear Valley Project Area (Tier 1, Project 3)



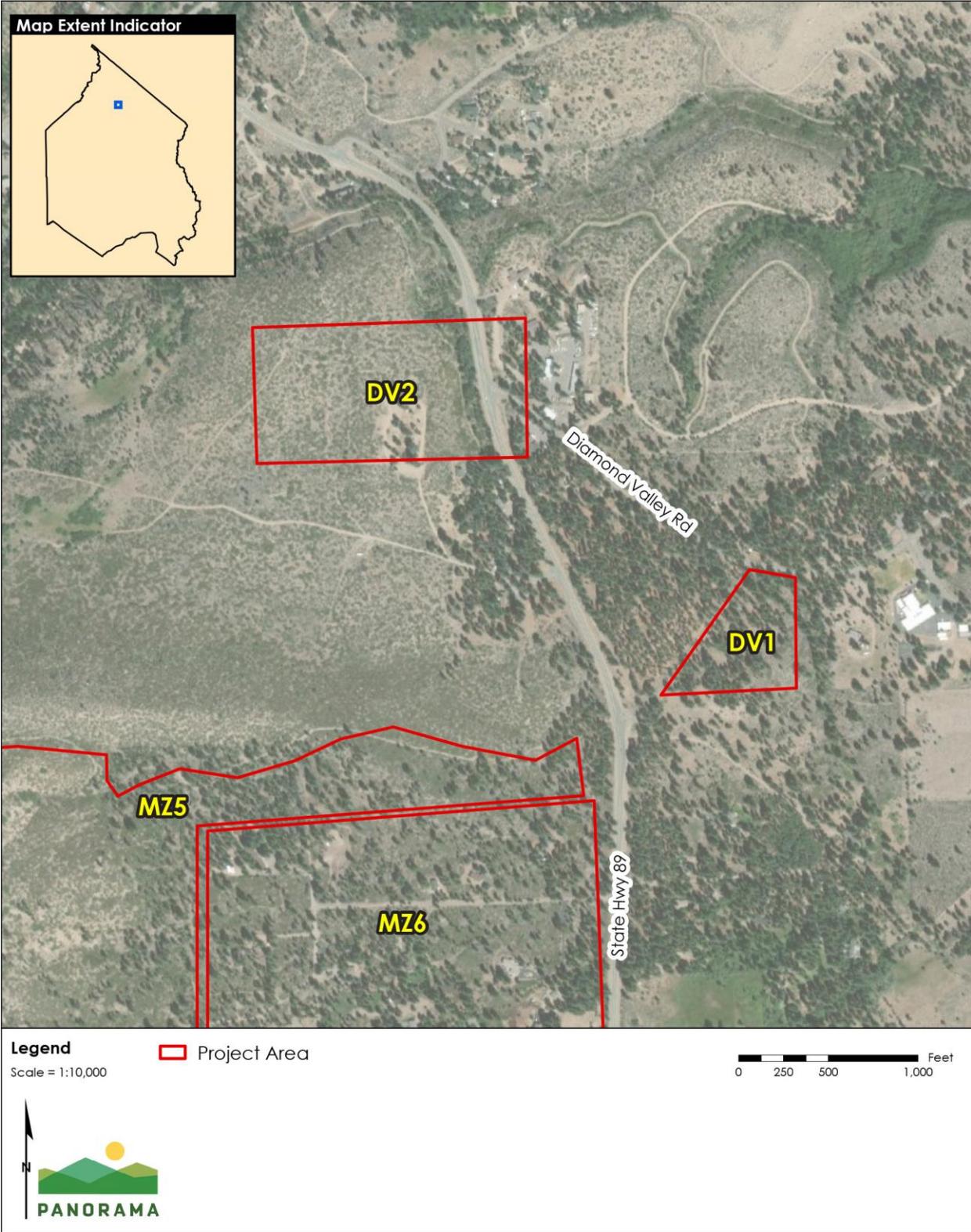
3 WILDFIRE RISK MITIGATION PROJECTS

Figure 3-9 Lake Alpine Project Area (Tier 3, Project 10)



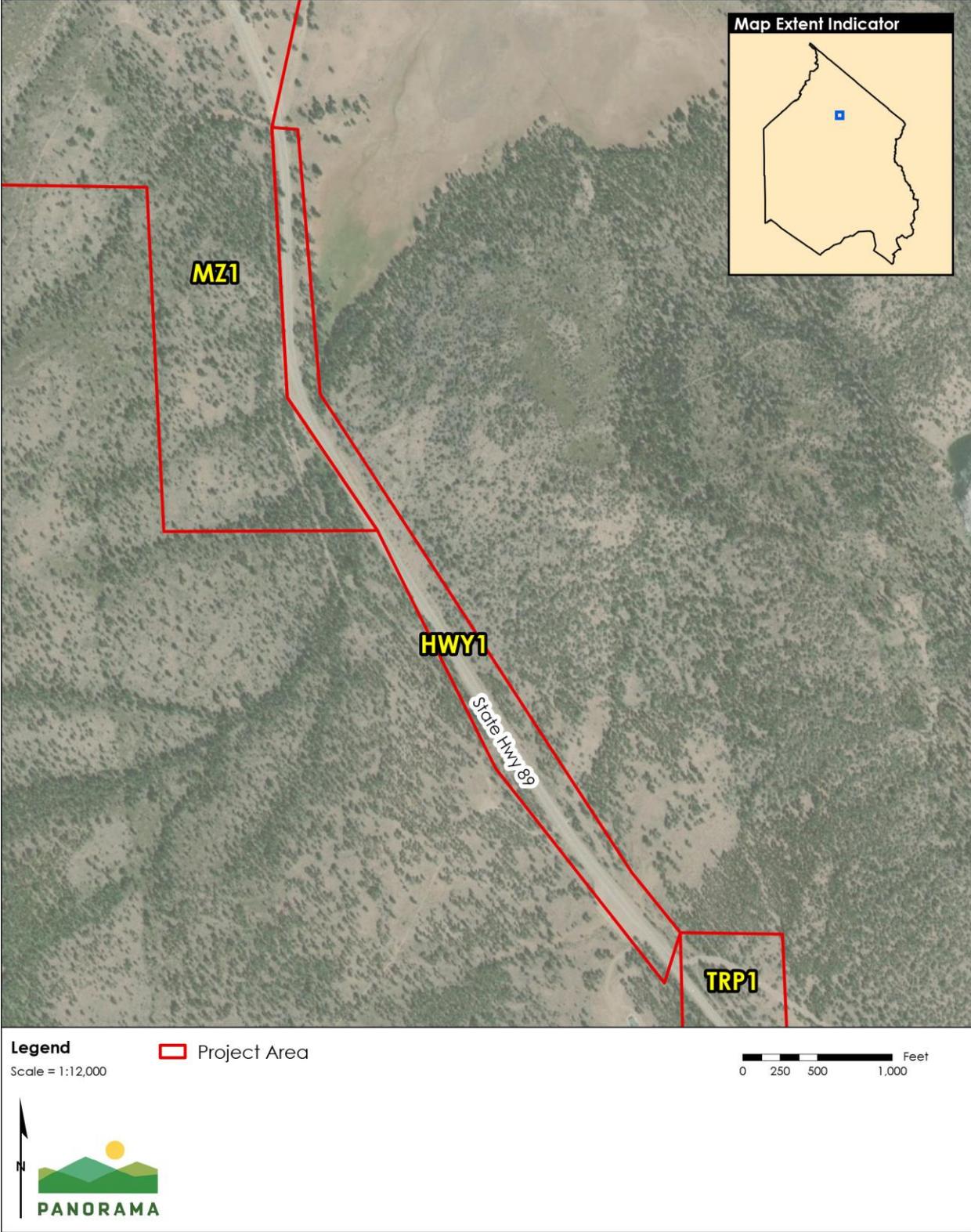
3 WILDFIRE RISK MITIGATION PROJECTS

Figure 3-10 Diamond Valley Project Area (Tier 3, Project 11)



3 WILDFIRE RISK MITIGATION PROJECTS

Figure 3-11 Highway 89 Project Area (Tier 3, Project 12)



3.3 Environmental Review Considerations for Risk Mitigation Projects

Projects undertaken by the County or utilizing State or federal funding sources will be subject to environmental review under the California Environmental Quality Act (CEQA) or through the California Forest Practice Rules (Title 14CCR1038(i)). Table 3-2 summarizes the options for environmental review, depending on the project type, location, and environmental resources present. For projects where timber would be harvested and sold or bartered, the project review would be subject to the California Forest Practice Rules and a Timber Harvest Plan or Exemption.

Other key avenues for review include under a currently certified Programmatic Environmental Impact Report (EIR) by CAL FIRE called the Vegetation Treatment Plan (VTP) EIR. This document was certified in December of 2019 and covers many different types of forest management and fuel reduction projects on public and private lands. The VTP EIR does not cover every area within Alpine County, but where the area is covered, a process has been laid out, known as a Project Specific Analysis, to identify how the project can be assessed and coverage documented. The VTP EIR includes mitigation, where if applicable, must be implemented to ensure coverage under the program. Other avenues, if utilizing State funding but if material will not be harvested, is to complete an Initial Study and Mitigated Negative Declaration (IS/MND) or a project specific EIR under CEQA, with the County as the lead agency.

The three Tier 1 projects defined in greater detail in Chapter 4 are all being addressed through a CEQA IS/MND, with the County as lead agency.

Table 3-2 Options for Project Environmental Review under CEQA

CEQA Vehicle	Applicable Land	Other Parameters to Determine Applicability
CAL FIRE Forest Fire Prevention Exemption ¹	Timberland in areas that are moderate, high, or very high CAL FIRE Hazard Severity Mapping ²	<ul style="list-style-type: none"> Limited to maximum 300-acre area Only trees <30 inches in diameter at stump height³ may be harvested Trees between 30 – 36 inches in diameter at stump height³ may be removed for the purpose of road construction/reconstruction when no other feasible option exists for road activities Notice of Exemption must be prepared, signed, and submitted by a Registered Professional Forester (RPF) Work must be completed within 1 year of filing the exemption with CAL FIRE. If burning slash for disposal, burning must be completed within 2 years of filing the exemption.

3 WILDFIRE RISK MITIGATION PROJECTS

CEQA Vehicle	Applicable Land	Other Parameters to Determine Applicability
Timber Harvest Plan (THP) CEQA Exemption ⁵	Private timberland used for forest logging operations.	<ul style="list-style-type: none"> • Prepared by RPFs • Notice of Intent to Harvest Timber (Notice of Intent) must be prepared by a RPF if: <ul style="list-style-type: none"> – (1) any proposed Plan boundary lies within 300 feet of any property not owned by the Timberland owner – (2) any Plan amendment that changes a Plan boundary so that the new boundary lies within three hundred (300) feet of property not owned by the Timberland owner, or – (3) any Plan amendment changes the silvicultural method if a Notice of Intent was required for the Plan by condition (1) or (2) above or, – (4) any overhead electrical power line, except a line from a transformer to a service panel, is present within the Plan area or within two hundred (200) feet outside the Plan boundary, or – (5) any Plan amendment changes a Plan boundary so that any overhead electrical power line, except a line from a transformer to a service panel, is within the new boundary or is within two-hundred (200) feet outside the new Plan boundary.
Modified THP	Private timberland used for forest logging operations.	<ul style="list-style-type: none"> • On an ownership of 160 acres, or a quarter (1/4) section or less of Timberland • No more than 70 percent of any existing tree canopy layer is to be harvested on parcels 40 acres or less, and not more than 50 percent on parcels 41-160 acres or a quarter (1/4) section • Clearcutting and shelterwood removal, as defined in 14 CCR §§ 913.1(b) and (d) [933.1(b) and (d), and 953.1(b) and (d)] shall not be used
Modified THP for Fuel Hazard Reduction	Private timberland used for forest logging operations.	<ul style="list-style-type: none"> • Project area not to exceed 2,500 acres • An average of at least 40 percent of the existing overstory tree canopy shall be retained • No operations shall occur in areas having average slopes greater than 50 percent based upon sample areas that are 20 acres in size, and no tractor operations in areas with high or extreme erosion hazard ratings
California Vegetation Treatment Program (CalVTP) EIR Project Specific Analysis	Land identified as treatable area in the CalVTP ⁴	<ul style="list-style-type: none"> • Projects with new impacts that were not analyzed in the CalVTP EIR require additional CEQA review • Projects with more severe impacts than those analyzed in the CalVTP EIR require additional CEQA review

3 WILDFIRE RISK MITIGATION PROJECTS

CEQA Vehicle	Applicable Land	Other Parameters to Determine Applicability
Limited Suspension of Requirements of CEQA pursuant to Governor’s Proclamation of a State of Emergency (October 20, 2015) ⁶	Land identified as high-hazard zone pursuant to Directive 1 of the Proclamation	<ul style="list-style-type: none"> • Project must be necessary to protect public health and safety • Project involves removal of dead/dying trees that threaten residences, critical community infrastructure, roads and other excavation corridors • Work is completed in accordance with the Guidelines for High Hazard Zone Tree Removal ⁷
Senate Bill 901	Federal lands where NEPA review for projects to reduce the risk of high-severity wildfire has been completed	<ul style="list-style-type: none"> • CEQA would not apply to prescribed fire, thinning, or fuel reduction projects undertaken on federal lands to reduce the risk of high-severity wildfire • SB 901 exemption expires January 1, 2023

1. <https://www.fire.ca.gov/media/10411/forest-fire-prevention-exemption-form.pdf>
2. <https://osfm.fire.ca.gov/divisions/wildfire-planning-engineering/wildland-hazards-building-codes/fire-hazard-severity-zones-maps/>
3. Diameter at stump height is measured at 8 inches above ground level
4. CalVTP Treatable Area: <https://calfire-forestry.maps.arcgis.com/apps/webappviewer/index.html?id=78782787ae4d459e8cb313141a5c41be>
5. 14 CCR § 1031-1052. Timber Harvesting Plan: [https://govt.westlaw.com/calregs/Browse/Home/California/CaliforniaCodeofRegulations?guid=I96E74730D48211DEBC02831C6D6C108E&originationContext=documenttoc&transitionType=Default&contextData=\(sc.Default\)](https://govt.westlaw.com/calregs/Browse/Home/California/CaliforniaCodeofRegulations?guid=I96E74730D48211DEBC02831C6D6C108E&originationContext=documenttoc&transitionType=Default&contextData=(sc.Default))
6. Governor’s October 30, 2015 Proclamation of a State of Emergency: https://www.gov.ca.gov/docs/10.30.15_Tree_Mortality_State_of_Emergency.pdf
7. Guidelines for High Hazard Zone Tree Removal: http://www.fire.ca.gov/treetaskforce/downloads/Draft_Tree_Removal_Guidelines_3-1-16.pdf

4 Implementation Plan

4.1 Methods and Tools

4.1.1 Overview

The fuel treatment strategies to be implemented on the three, Tier 1 priority projects include a combination of fuel reduction methods depending on the location, facility access, slope, and types of vegetation. Based on these considerations, the County in consultation with a RPF, developed the approach to reducing fuel loads. Fuel treatment methods to be implemented include mastication and hand thinning. Pile burn may be implemented as a method of fuels disposal. The logging and selling of material are not currently proposed under any priority project.

If logging were to be considered for future fuels reduction projects, the County would prepare a THP or THP Exemption with an RPF. All project activities would occur in a manner consistent with the California Forest Practice Rules. Each of the currently proposed treatment methods for the three priority projects are described here.

4.1.2 Methods

Mastication

Mastication is the main type of mechanical treatment method that would be implemented under the project. Mastication is implemented using a mastication head attached to an excavator, small tractor, or other type of machine. The mastication head is used to chip or shred ladder fuels from brush and small trees (up to 12 inches diameter at breast height [dbh]) in place. Shredded material is either incorporated into the duff layer during operations, left on site, or reduced using a prescribed burn following post-treatment evaluation. Mastication is typically implemented in areas of high brush cover or that need ladder fuel treatment where biomass removal is not feasible.

Mastication would be used for larger scale vegetation removal activities. Mastication requires heavy machinery and would only be implemented in areas of relatively flat, accessible ground. Operations with a traditional masticator generally would not occur on slopes over 30 percent.

4 IMPLEMENTATION PLAN

Figure 4-1 Rotary Masticator



Photo source: (Spatial Informatics Group, 2020)

Equipment used for mastication may include:

- Excavator, small tractor, or similar machine
- Mechanical mastication head
- Chipper

Hand Thinning

Implementation of hand thinning treatment methods under the project would require the use of powered and non-powered hand tools. Powered hand thinning treatment is completed by an individual or teams using chainsaws, with cut material either chipped, hauled, or piled and burned. Chipping can be done using several types of machines that are both hand- or machine-fed.

Hand thinning methods would be used for thinning stands of small-diameter trees and shrubs and for limbing trees up to a height of 10 feet above the ground surface. Hand thinning is typically used on trees up to 9 inches in diameter, but most effective for trees up to 6 inches in diameter or shrubs. Hand thinning treatments could be used in areas with up to 80 percent

4 IMPLEMENTATION PLAN

slope. Hand thinning would be the only method implemented in treatment areas that occur within 100 feet of homes or structures.

Hand tools would be brought to the project site and removed daily. Equipment used for hand thinning treatment methods may include:

- Powered hand tools: brushcutters (metal blade), string trimmers (monofilament plastic line), chainsaws, power pole saws, hedge trimmers
- Non-powered hand tools: loppers, hand pruners, hand saws, hatchets, pulaskis, machetes, brush hooks, brush axes

Figure 4-2 Hand Thinning with Chainsaw



Photo source: (Spatial Informatics Group, 2020)

Pile Burn

Pile burning may be used to remove cut or dead vegetative material where chipping, hauling, or decomposition are not feasible. Piles can be constructed of dry vegetative material, covered, and burned. Piles could vary in size from 5 to 10 feet in diameter and 4 to 6 feet in height.

4 IMPLEMENTATION PLAN

Figure 4-3 Pile Burn



Photo source: (Spatial Informatics Group, 2020)

Equipment used for pile burn activities may include:

- Approved ignition devices
- Fire hose/water truck
- Hand tools

4.1.3 Access and Staging/Landing

Access to conduct project activities would be entirely from existing roads and trails and no street or lane closures would occur during project implementation. No new permanent access roads are included as part of the project to implement fuel treatment activities. In some cases, access to work sites would not be accessible directly from maintained trails and roads and would be achieved by creating temporary, overland access roads, which include foot trails or using former trails that have grown over and can be cleared for access. Sensitive habitats, creeks, and wetlands would be avoided. Clearing of temporary access roads would not occur when soils are wet. The temporary access roads would not be graded or scraped. Temporary

4 IMPLEMENTATION PLAN

access roads would be rehabilitated following use, which involves decompacting soils, distributing surrounding litter/duff back on-site, and obscuring entrance points with brush.

All existing roads within the project boundary may be used for project access. Staging activities would occur on treated land within the project boundary near an access point. Staging activities would include overnight storage of mechanical equipment, placement of material piles, and other specific actions for each project site. The expected size of staging areas for equipment storage would be relatively small and would be up to approximately 0.1-acre area. Product material piles would be left in place within the project boundary or adjacent to existing roads if eligible for a local chipping program. Product material would not be stored in wetlands, creeks, drainages, or associated riparian habitats. Erosion and drainage control would be installed as needed.

4.1.4 Personnel to Complete Work

Personnel needed to conduct project activities varies depending upon the project site, activities, treatment methods, and the timing of implementation. The work crew would arrive by van with equipment and supplies delivered by heavy truck. Work crews would be comprised of local personnel who commute to the project site daily.

The number of workers by treatment method is summarized in Table 4-1. The scale of the project activities that would be completed would depend on landowner compliance, funding, and other resource availability. Up to 30 workers, not including additional required pile burn contingency resources, may be conducting fuel treatment activities at a single site.

Table 4-1 Personnel Needed to Implement Treatment Methods

Treatment Method	Crew Size (Average)	Crew Size (Minimum and Maximum)
Mastication	5	2-10
Hand thinning	5	2-10
Pile burning	15	10-30

4.1.5 Timing

Implementation of the activities outlined in the fuel treatment projects would begin after funding is secured. Construction would occur up to 7 days per week. Work activities would take place during daylight hours between the hours of 8:00 a.m. and 6:00 p.m. Monday through Friday, and between 9:00 a.m. and 3 p.m. on Saturday and Sunday. Activities would occur as weather and site conditions permit over the project implementation timeline. Project activities would likely be conducted June through October, due to limitations from the snow season, site access abilities, species protection requirements, permitting and/or landowner restrictions, and official fire season. Project activities would not occur on red flag warning days.

The phasing of project activities will be based on weather conditions and contractor commitments to be determined as part of the contracting process. For purposes of evaluation it

4 IMPLEMENTATION PLAN

is assumed that fuel treatment activities would occur sequentially on a single site over a period of five months (June-October) each year of 2022-2024, depending on project funding. Implementation of treatment activities may occur simultaneously at the various project areas, requiring several work crews to be operating at different project areas at the same time.

4.2 Project 1: Markleevillage

4.2.1 Description and Location

The Markleevillage project site includes fuel treatment on 300 acres south of Hot Springs Road along Sawmill Road and Pleasant Valley Road. Mastication and hand thinning fuel treatment methods would be implemented throughout the treatment area. Hand thinning only would be implemented in the central region of the site surrounding Pleasant Valley Road. Only hand tools would be used during activities that occur within 100 feet of homes or structures. Mastication would be conducted in most of the site with slopes up to 30 percent. Brush and trees less than 10 inches dbh would be mechanically masticated. All existing woody fuel would be masticated concurrently with treatment of standing fuel ladder vegetation. Steep inclusions over 30 percent would not be treated by mastication. All live and dead vegetation less than 10 inches dbh would be cut, as well as most dead trees over 10 inches dbh. Tree limbs would be removed up to a height of 10 feet above ground surface. Approximately 90 percent of the shrubs would be treated. Mastication may be implemented where feasible, materials could be dispersed by lopping and scattering although the preference will be for small hand pile disposal through pile burning.

4.2.2 Access and Personnel

Main access roads to conduct the work would include Hot Springs Road, Pleasant Valley Road, and Sawmill Road. Staging would be within the project footprint. Given the size of the project, approximately 10 crew members are expected on-site but up to 30 may be needed while pile burning.

4.2.3 Timing

Timing for implementation would be as identified in Section 4.1.5. Work would likely occur in June to October, with a goal of commencing in 2022.

4.3 Project 2: Manzanita

4.3.1 Description and Location

The Manzanita project site includes fuel treatment on 460 acres of open space east of Manzanita Lane and south of Zellmer Lane. The fuel treatment activities would include mastication and hand thinning methods. Only hand tools would be used during activities that occur within 100 feet of homes or structures. Mastication would be conducted only in the northern portion of the

4 IMPLEMENTATION PLAN

site in areas with slope up to 30 percent. Brush and trees less than 10 inches dbh would be mechanically masticated. All existing woody fuel would be masticated concurrently with treatment of standing fuel ladder vegetation. Steep inclusions over 30 percent would not be treated by mastication. All live and dead vegetation less than 10 inches dbh would be cut and as well as most dead trees over 10 dbh in diameter. Tree limbs would be removed up to a height of 10 feet above ground surface. Approximately 90 percent of the shrubs would be treated. Chipping may be implemented where feasible and materials could be dispersed by lopping and scattering although the preference will be for small hand pile disposal through pile burning.

4.3.2 Access and Personnel

Access would occur via SR 89 and private driveways. Staging would be within the project footprint. Given the size of the project, approximately 10 crew members are expected on-site but up to 30 may be needed while pile burning.

4.3.3 Timing

Timing for implementation would be as identified in Section 4.1.5. Work would likely occur in June to October, with a goal of commencing in 2022 or 2023.

4.4 Project 3: Bear Valley

4.4.1 Description and Location

The Bear Valley project site includes fuel treatment on 130 acres surrounding Quaking Aspen Road, Bloods Ridge Road, and Alpine Way. The fuel treatment would include hand thinning methods within the entire 130-acre area. Fuel reduction activities will be targeted in areas where excess wildfire fuel buildup has occurred. Landscaping will not be altered during these fuel treatment activities. All live and dead target vegetation less than 10 inches dbh would be cut. Tree limbs would be removed up to a height of 10 feet above ground surface. Approximately 90 percent of the shrubs would be treated. Chipping may be implemented where feasible, otherwise materials will be dispersed by lopping and scattering. No pile burns would be conducted at the Bear Valley site. All work at the Bear Valley treatment area must be done by hand crews due to the slope and inaccessibility of the terrain.

4.4.2 Access and Personnel

Main access roads to conduct the work would include Bear Valley Road, Quaking Aspen Road, Bloods Ridge Road, and Immigrant Road/Alpine Way. Staging would be within the project footprint. Given the size of the project, approximately 10 crew members are expected on-site.

4.4.3 Timing

Timing for implementation would be as identified in Section 4.1.5. Work would likely occur in June to October, with a goal of commencing between 2022 and 2024.

4.5 Environmental Considerations and Review

4.5.1 Biological Resources

Potential Concerns

Biological resources may occur in any of the three project areas and could be negatively impacted by implementation of project activities. Key resources include potential special status plants, listed wildlife species, nesting birds, and aquatic or riparian habitats. Table 4-2 identifies the types of special status species known to occur in the region.

Protection Measures

Prior to implementation of the projects, biological field reconnaissance surveys would be conducted to gain a more complete understanding of the potential resources present and to develop project-specific measures to minimize or avoid impacts. Nesting birds may be the biggest concern.

For all activities that could result in potential noise and other land disturbances that could affect nesting birds (e.g., tree removal, mowing during nesting season, mastication, chipping), treatment sites should be surveyed to evaluate the potential for nesting birds. Trees should be removed outside the nesting season for migratory birds and raptors (typically March through August). If activities that could disturb nesting birds are performed during the nesting season (generally if work is performed from March 1 to August 30), then preconstruction nesting surveys would be performed and any active nests and a buffer area around the nest avoided until the young have fledged. If other species such as amphibians could occur in project areas, a biologist should be on-site to check areas prior to work and to ensure that any individuals found are avoided.

4 IMPLEMENTATION PLAN

Table 4-2 Potential Special Status Species Found in Alpine County

Common Name	Scientific Name	Status	General Habitat Description
Insects			
Western bumble bee	<i>Bombus occidentalis</i>	USFS sensitive SC	Typically inhabit sandy soil, dunes, and grasslands between 0 and 9,000 feet elevation.
Mono checkerspot butterfly	<i>Euphydryas editha monoensis</i>	USFS sensitive	Found in relatively wet meadow and coniferous forest in the Eastern Sierra Nevada and western Great Basin.
Fish			
Lahontan cutthroat trout	<i>Oncorhynchus clarkii henshawi</i>	FT	Cool, well-oxygenated streams that are free of other salmonids. Elevation range between 5,250 and 9,300 feet.
Mountain sucker	<i>Catostomus platyrhynchus</i>	SSC	Found in rivers in the Sierra Nevada from Mono County north to Lake Tahoe and Truckee River.
Mountain whitefish	<i>Prosopium williamsoni</i>	SSC	Found in rivers in Eastern Sierra Nevada from Mono County north to Lake Tahoe and Truckee River.
Lahontan Lake tui chub	<i>Siphateles bicolor pectinifer</i>	SSC	Found in the Lahontan Basin, including Lake Tahoe and Pyramid Lake.
Amphibians			
Yosemite toad	<i>Anaxyrus canorus</i>	FT, USFS sensitive SSC	Restricted to central high Sierra Nevada. Prefers mountain, alpine meadow, lodgepole pine, successional stages of mixed conifer, Jeffrey pine, and red fir typically at elevations between 4,000 to 11,200 feet.
Sierra Nevada yellow-legged frog	<i>Rana sierrae</i>	FE, USFS sensitive ST, CDFW watchlist	Associated with streams, lakes, and ponds in montane riparian, lodgepole pine, subalpine conifer, and wet meadows. Breeds in shallow water in low gradient perennial streams and lakes.
Foothill yellow-legged frog	<i>Rana boylei</i>	USFS sensitive, BLM sensitive SC, SSC	Found in usually subalpine to alpine ponds, streams, and adjacent meadows.
Southern long-toed salamander	<i>Ambystoma macrodactylum sigillatum</i>	SSC	Inhabit submerged shoreline areas of small lakes, seasonal ponds, and vernal pools.

4 IMPLEMENTATION PLAN

Common Name	Scientific Name	Status	General Habitat Description
Northern leopard frog	<i>Lithobates pipiens</i>	SSC	Found in a variety of aquatic habitats ranging from low elevation irrigation ditches to subalpine lakes.
Birds			
Great gray owl	<i>Strix nebulosa</i>	USFS sensitive SE	Found in mixed conifer or red fir forest habitat, in or on edges of meadows. Requires large diameter snags in a forest with high canopy closure.
Willow flycatcher	<i>Empidonax traillii</i>	FE, USFS sensitive, BCC SE	Found nesting in extensive willow riparian scrub stands, often near wet meadow habitat.
Bald eagle	<i>Haliaeetus leucocephalus</i>	Federally delisted, BLM sensitive, USFS sensitive, BCC SE, FP	Typically found nesting in large trees, often pines, often within 1 mile of water.
Northern goshawk	<i>Accipiter gentilis</i>	BLM sensitive, USFS sensitive SSC	Found nesting in expansive stands of relatively closed coniferous forest in elevation ranging 1,000 to 10,800 feet.
Black swift	<i>Cypseloides niger</i>	BCC SSC	Typically nests near water on steep canyon walls, usually in close proximity to a waterfall.
Yellow-headed blackbird	<i>Xanthocephalus xanthocephalus</i>	SSC	Typically nests at lakeshores and other large freshwater emergent marsh habitats. May nest in open riparian delta habitat at lakes.
Sharp-shinned hawk	<i>Accipiter striatus</i>	WL	Found nesting in mixed coniferous or hardwood forest, sometimes in tree clumps in scrub habitat.
American peregrine falcon	<i>Falco peregrinus anatum</i>	Federally delisted, BCC State delisted, FP	Found nesting on cliffs and sometimes urban structures including high-rise buildings.
Osprey	<i>Pandion haliaetus</i>	WL	Nests in large trees; forages at aquatic and riverine habitats.

4 IMPLEMENTATION PLAN

Common Name	Scientific Name	Status	General Habitat Description
Mammals			
Fisher – west coast DPS	<i>Pekania pennanti</i>	BLM sensitive, USFS sensitive ST, SSC	Typically found in intermediate to large-tree stages of coniferous forests and deciduous-riparian areas with high percent canopy closure. This species uses cavities, snags, logs and rocky areas for cover and denning. This species requires large areas of mature dense forest.
California wolverine	<i>Gulo gulo</i>	Proposed FT, USFS sensitive ST, FP	Found in many remote habitats, particularly in high elevation Sierra Nevada and northern Coast Ranges.
Sierra Nevada red fox	<i>Vulpes vulpes necator</i>	FC, USFS sensitive ST	Typically inhabit forest and forest gaps in high elevation central Sierra Nevada. Recent sightings indicate may use lower elevations in Eastern Sierra Nevada.
Sierra Nevada mountain beaver	<i>Aplodontia rufa californica</i>	SSC	Found in burrow systems along streams in coniferous riparian forest with areas of dense scrub and understory herbs.
Western white-tailed jackrabbit	<i>Lepus townsendii townsendii</i>	SSC	Typical habitats include sagebrush scrub and open coniferous forest in elevations ranging 6,400-11,000 feet.
Sierra marten	<i>Martes caurina sierrae</i>	USFS sensitive	Found in closed-canopy forest with snags and downed tree boles, usually old growth coniferous, in the Cascades and Sierra Nevada ranges.
Fringed myotis	<i>Myotis thysanodes</i>	BLM sensitive, USFS sensitive	Typically found in roosts and nursery colonies in caves, mines, sometimes abandoned buildings, and forages over meadow, scrub vegetation or water.
American badger	<i>Taxidea taxus</i>	SSC	Found in a variety of relatively dry and open scrub, forest and grassland habitats.
Spotted bat	<i>Euderma maculatum</i>	SSC	Roost and natal colonies occur in crevices and caves; typically forages at lakeside and riverine habitats.
Plants			
Hall's meadow hawksbeard	<i>Crepis runcinate</i> ssp. <i>Halli</i>	2B.2	Found in moist, alkaline valley bottoms at elevations between 375 – 2,100 feet.

4 IMPLEMENTATION PLAN

Common Name	Scientific Name	Status	General Habitat Description
Mountain bent grass	<i>Agrostis humilis</i>	2B.3	Typically found in open alpine slopes, subalpine meadows, and sometimes openings in coniferous forest
Upswept moonwort	<i>Botrychium ascendens</i>	USFS sensitive 2B.3	Found in seeps, moist meadows and shaded to open subalpine forest.
Scalloped moonwort	<i>Botrychium crenulatum</i>	USFS sensitive 2B.2	Typically found in seeps, moist and shaded stream margins.
Mingan moonwort	<i>Botrychium minganense</i>	USFS sensitive 2B.2	Found in seeps and moist soil at partly to deeply shaded forest and meadow margins.
Davy's sedge	<i>Carex davyi</i>	1B.3	Found in meadows, often moist slopes in subalpine and upper montane coniferous forest.
Porcupine sedge	<i>Carex hystericina</i>	2B.1	Typically found within perennially wet soil at marshes and swamps.
Mud sedge	<i>Carex limosa</i>	2B.2	Found in bogs, including floating sphagnum bogs.
Liddon's sedge	<i>Carex petasata</i>	2B.3	Found in upland broadleaf and coniferous forests, pinyon-juniper woodland, and meadows.
Western valley sedge	<i>Carex vallicola</i>	2B.3	Found in moist forested slopes and scrub at margins of meadows.
Alpine dusty maidens	<i>Chaenactis douglasii</i> var. <i>alpina</i>	2B.3	Typically found in alpine forest and meadows, and open areas including talus and crevices.
Fell-fields claytonia	<i>Claytonia megarhiza</i>	2B.3	Found in alpine boulder fields, rock crevices, and gravelly subalpine forest.
Great Basin claytonia	<i>Claytonia umbellate</i>	2B.3	Typically found in rocky subalpine coniferous forest, including talus and crevices.
Fiddleleaf hawksbeard	<i>Crepis runcinata</i>	2B.2	Found in moist meadow margin, usually alkaline clays.
Subalpine cryptantha	<i>Cryptantha crymophila</i>	1B.3	Found in subalpine coniferous forest, often in volcanic soil in forest gaps and scree.
Tahoe draba	<i>Draba asterophora</i>	USFS sensitive 1B.2	Typically found in alpine rocks and scree, and crevices.
Tall draba	<i>Draba praealta</i>	2B.3	Found in subalpine and alpine meadows and seeps.

4 IMPLEMENTATION PLAN

Common Name	Scientific Name	Status	General Habitat Description
Scribner's wheat grass	<i>Elymus scribneri</i>	2B.3	Typically inhabit alpine fellfields and scree.
Subalpine fireweed	<i>Epilobium howellii</i>	4.3	Found near lake shores, wet meadows and seeps.
Marsh willowherb	<i>Epilobium palustre</i>	2B.3	Found near lake shores and marshy areas in wet meadows.
Jack's wild buckwheat	<i>Eriogonum luteolum</i> var. <i>saltuarium</i>	USFS sensitive 1B.2	Typically found in upland woodlands and coniferous forest, sandy soil, and sometimes disturbed habitat.
Carson Valley monkeyflower	<i>Erythranthe carsonensis</i>	1B.1	Typically found within sagebrush scrub and bitterbrush scrub, and often moist soil.
Robbins' pondweed	<i>Potamogeton robbinsii</i>	2B.3	Found in perennial aquatic habitats, marshes, and lake margins.
Water bulrush	<i>Schoenoplectus subterminalis</i>	2B.3	Found within aquatic habitats at lake margins and bogs.
Cream-flowered bladderwort	<i>Utricularia ochroleuca</i>	2B.2	Typically found in bogs, wet meadows and seeps and in acidic habitat.
Golden violet	<i>Viola purpurea</i> ssp. <i>aurea</i>	2B.2	Found in pinyon-juniper woodland, sagebrush scrub, and often sandy habitats.
Blandow's bog moss	<i>Helodium blandowii</i>	USFS sensitive 2B.3	Typically found along lake shores and streambanks.
Tahoe yellow cress	<i>Rorippa subumbellata</i>	USFS sensitive SE 1B.1	Typically found within sandy lake margins at Lake Tahoe.
Galena Creek rockcress	<i>Arabis rigidissima</i> var. <i>demote</i>	USFS sensitive 1B.2	Typically found in partial shade in subalpine red fir or white pine forest.
Bolander's candlemoss	<i>Bruchia bolanderi</i>	USFS sensitive 4.2	Found in moist grassy areas, recently eroded banks of streams, trailside, and often shaded habitats.
Blandow's bog moss	<i>Helodium blandowii</i>	USFS sensitive 2B.3	Typically found along lake shores and streambanks.
Broad-nerved hump moss	<i>Meesia uliginosa</i>	USFS sensitive 2B.2	Typically found along lake shores, streambanks, and wet meadows.

4 IMPLEMENTATION PLAN

Common Name	Scientific Name	Status	General Habitat Description
Three-bracted onion	<i>Allium tribracteatum</i>	USFS sensitive 1B.2	Found in coniferous forest, meadows, often openings at ridgelines, and volcanic soil.
Western goblin	<i>Botrychium montanum</i>	USFS sensitive 2B.1	Found at least seasonally moist soil at seeps and streambanks in shaded forest.
Male fern	<i>Dryopteris filix-mas</i>	2B.3	Typically found in granite cliffs with deep crevices.
Stebbins' lomatium	<i>Lomatium stebbinsii</i>	USFS sensitive 1B.1	Found in openings at ridgelines in coniferous forest, volcanic soil, and often seasonally moist clay.
Mollusks			
Great Basin rams-horn	<i>Helisoma newberryi</i>	USFS sensitive	Found in mud substrate in large lakes and slow-flowing rivers.
Aquatic felt lichen	<i>Peltigera gowardii</i>	USFS sensitive 4.2	Typically found in submerged rocks or streamside, possibly open sunny meadows.
Bryophytes			
Holzinger's orthotrichum moss	<i>Orthotrichum holzingeri</i>	1B.3	Found within perennial streams, on shaded streamside rocks or in-stream boulders.

4 IMPLEMENTATION PLAN

Common Name	Scientific Name	Status	General Habitat Description
-------------	-----------------	--------	-----------------------------

Notes:

Potential species search based on CNDDDB and U.S. Fish and Wildlife Service (USFWS) species lists for the Heenan Lake, Wolf Creek, Markleeville, Carson Pass, Pacific Valley, Ebbetts Pass, Carters Station, Freel Peak, Minden, South Lake Tahoe, Tamarack, Mokelumne Peak, Bear River Reservoir, Calaveras Dome, Boards Crossing, Liberty Hill, Donnell Lake, Spicer Meadows Reservoir, Pacific Valley, and Woodfords quadrangles.

Abbreviations:

Federal: USFWS listings under the Endangered Species Act

FT: Federally listed as threatened	FC-T: Federal candidate – threatened
FE: Federally listed as endangered	FC-E: Federal candidate – endangered
FC: Federal candidate	BCC = Birds of Conservation Concern

State: California Department of Fish and Wildlife (CDFW) listings under the California Endangered Species Act

ST: State listed as threatened	SSC: CDFW Species of Special Concern
SE: State listed as endangered	FP: Fully Protected
SC: State candidate	

California Native Plant Society (CNPS) listings

1B: Rare and endangered in California and elsewhere
 2B: Rare, threatened or endangered in California, but more common elsewhere
 4: Watchlist species of limited distribution Threat Code extensions:

- .1 – Seriously endangered in California (over 80% of occurrences threatened / high degree and immediacy of threat)
- .2 – Fairly endangered in California (20-80% of occurrences threatened)
- .3 – Not very endangered in California (< 20% of occ’s threatened or no current threats known).

4 IMPLEMENTATION PLAN

4.5.2 Cultural Resources

Archaeological resources can be impacted by use of heavy equipment and any activity that results in ground disturbance. A cultural resources survey would be required prior to performing work, with identification of the appropriate measure to address and protect any resources discovered. Measures would likely include avoidance with an appropriate buffer given the resources or use of hand tools only, around the resource.

4.5.3 Fire Protection and Safety

While the purpose of the work is to reduce wildfire risks, conducting the work brings personnel and equipment into the WUI. Fire protection would be ensured through the requirement that all personnel are trained in fire protection safety and that they always maintain firefighting equipment on their person or vehicles. Special precautions would also apply, including obtaining the appropriate approvals, for pile burning.

4.6 Estimated Cost and Funding Sources

4.6.1 Estimated Costs

The following table summarizes estimates of costs by types of treatments. These costs are rough estimates based on input from a few different Bay Area jurisdictions that implement similar treatments in similar landscapes. These are only meant to be estimates and costs may deviate depending on individual site conditions, contracted labor, demand, and other factors.

Table 4-3 Estimates of Cost by Treatment Types

Treatment Type	Estimated Costs per Acre
Mastication and mechanical removal and pile burning	\$1,500 to \$3,500 per acre
Hand thinning	\$3,500 to \$5,000 per acre
Prescribed burning	\$1,500/acre

Very rough estimates of costs per project are as follows, based on an average cost of \$3,500 an acre per project.

- **Markleevillage:** \$1,050,000
- **Manzanita:** \$1,610,000
- **Bear Valley:** \$455,000

Costs presented here are not meant to be a binding bid price but a rough ballpark estimate. Pricing of actual work will be specific to the time and location of the work. Additionally, estimated treatment acreage within each project area includes acreage of existing roads, landscaped yards, maintained defensible space, and structures; the amount of actual acreage to be treated within each project is expected to be reduced during project implementation to avoid areas that would not receive treatment. Treatment of acreage on private property would be

4 IMPLEMENTATION PLAN

determined in consultation with the landowner and documented through a memorandum of understanding or similar agreement. Actual costs should be determined by obtaining detailed estimates from prospective contractors.

4.6.2 Potential Funding Sources

Funding sources are available at the regional, State, and even federal level. Opportunities will likely vary by year, depending upon the financial conditions at the time of application. Most grants are competitive and have varying qualifications. A summary of grant programs available is provided in the table, below.

4 IMPLEMENTATION PLAN

Table 4-4 Potential Grant Opportunities for Fuel Management Projects

Type of Grant	Grant Issuing Agency	Grant/Program	Summary of Qualifying Projects	Funding
Applicable to Wildland Fire Planning and Fire Modeling/ Implementation	CAL FIRE	California Climate Investments (CCI) Fire Prevention Grant Program	Qualifying projects and activities include those related to hazardous fuel reduction and removal of dead, dying, or diseased trees, fire prevention planning, and fire prevention education.	Funding was eliminated for the Fiscal Year (FY) 2020-21 cycle. It may be available again in future years.
Forest Management	CAL FIRE	California Forest Improvement Grant Program	Projects are non-commercial operations typically used to modify sub-merchantable trees or ones with no commercial value. Technical and financial assistance for planning, reforestation and resource management investments that improve the quality and value of forestland. If a new Forest Management Plan is needed, then the program can provide cost share funding for its completion by a private Registered Professional Forester. Funding provided by the Wildfire Resiliency Program Block Grant (Prop 68).	Competitive Grant Cost sharing 75/25 (90/10 under some circumstances); no cost sharing with any other federal grant for the same acreage/area (Natural Resources Conservation Service, USDA, likely USFS). This is landowner cost sharing.
Fuel Management	CAL FIRE	California Climate Investments (CCI) Forest Health Grant Program	Qualifying projects must: Focus on large, landscape-scale forestlands composed of one or more landowners, which may cover multiple jurisdictions. Large landscapes usually mean sub-watersheds, firesheds, or larger logical management units. Maintain a net reduction of established greenhouse gas emissions levels as calculated by the California Air Resources Board's methodology and testing. Be designed to ensure the project benefits are as permanent as possible. Types of activities may include: Forest fuels reduction; Prescribed fire; Pest management; Reforestation; Biomass utilization; Conservation easements and/or land acquisition through the Forest Legacy Program; Research as a component, or stand-alone through the Forest Research Program.	Competitive grant

4 IMPLEMENTATION PLAN

Type of Grant	Grant Issuing Agency	Grant/Program	Summary of Qualifying Projects	Funding
Local Hazard Mitigation Plan (LHMP) and Implementation of Fuel Management Projects	FEMA/Cal OES	Hazard Mitigation Grant Program 404	<p>Provides funding for long-term hazard mitigation measures following major disaster declarations. Funding is available to implement projects in accordance with State, territorial, federally recognized tribal, and local priorities. Subapplicants must be tribes, state agencies, tribal agencies, local governments (city, county, special districts), and some private nonprofits. Must have a FEMA-approved and locally-adopted LHMP or be part of Multi-Jurisdictional Hazard Mitigation Plan. Eligible planning activities include new or updates to plan, Safety Element, Community Wildfire and Flood Protection Plan, General Plan, Plan annex for climate adaptation, etc.</p> <p>Priority given to impacted counties with disaster declarations. Non-impacted counties can apply under Priority 3, Hazard Mitigation Planning, and Priority 4, Post Fire Mitigation Activities for the 2020 grant. A Cal OES/FEMA-approved LHMP is required prior to requesting funding for a wildland fire/veg management planning activity or implementation activity. Can also apply for LHMP funding. Note that implementation projects are preferred.</p>	Yes, 75/25 (monetary caps as well)
LHMP and Implementation of Fuel Management Projects	FEMA/Cal OES	BRIC (Building Resilient Infrastructure Communities) (previously called the Pre-Disaster Mitigation Grant)	<p>Provides funding to develop a new or updated FEMA-approved and locally-adopted LHMP, and implementation of hazard mitigation projects. Provides funds on an annual basis for hazard mitigation planning and the implementation of mitigation projects. FEMA provides funding for measures to reduce or eliminate overall risk from natural hazards.</p> <p>A Cal OES/FEMA-approved LHMP is required prior to requesting funding for a wildland fire/veg management planning activity or implementation activity. Can also apply for LHMP funding. Note that implementation projects are preferred.</p>	Yes, 75/25

4 IMPLEMENTATION PLAN

Type of Grant	Grant Issuing Agency	Grant/Program	Summary of Qualifying Projects	Funding
Implementation of fuel management projects in CWPP	California Fire Safe Council; State Fire Assistance Program; U.S. Forest Service, Pacific Southwest Region	Under the terms of Grant number 18-DG-11052012-134	Projects must be in the wildland urban interface (WUI) and protecting an officially designated Community-at-Risk (CAR). Programs, projects, or activities must address areas identified and prioritized in a CWPP or equivalent document.	Yes, 50/50 (monetary cap of \$200k per org)

4.7 Implementation of Other Projects Identified in the WRMP

4.7.1 Vegetation Treatment Methods

The implementation for the three Tier 1 projects describes several methods and techniques that would also apply to the Tier 2 and Tier 3 projects identified in this plan. Other projects in this plan could also be implemented; however, would require an additional planning process to better define the projects and to conduct the environmental review.

Chapter 3 also identifies large areas of opportunity for prescribed fire across multiple land ownerships. Prescribed fire is a land management tool that can be used to:

- Restore fire to the landscape, simulating prior natural processes,
- Reduce unnaturally high accumulations of vegetation,
- Decrease the risk and severity of unwanted wildland fires in the future,
- Lessen the potential loss of life and property,
- Control many undesirable plant species, plant diseases, and pest insects,
- Create and enhance wildlife habitat and increase availability of forage,
- Promote the growth of native trees, wildflowers and other plants, and
- Expose mineral-rich soil and recycle plant nutrients back to the soil.

Prescribed fire activities could be implemented in accordance with a pre-written plan (Burn Plan) that identifies land management goals and specific fire use strategies to safely achieve those goals, with prior approval by the applicable regulatory agencies. Burn Plans address characteristics of the land being treated (like topography and vegetation type) and include carefully defined and required parameters to initiate a prescribed fire for temperature, humidity, wind, moisture of the vegetation, and conditions for the dispersal of smoke. The Burn Plans also specify how the fire will be applied, by whom, and what fire control people and equipment must be on-scene before the burn can commence. After the Burn Plan is complete and conditions are right, a prescribed burn can proceed under the supervision of a qualified Burn Boss. Low intensity fire is skillfully applied to selectively burn fuels like dead wood, brush, forest understories, and grassland. Prescribed burning project may also require environmental review either under CEQA, NEPA, or both.

4.7.2 Development of Future Projects

Table 4-5 defines the general procedure the County would use to determine the prioritization, size and scope of future projects completed under the WRMP. Participation from private landowners is vital to the success of future projects, and is discussed in detail in Section 4.7.3.

4 IMPLEMENTATION PLAN

Table 4-5 Development of Future Projects

Phase	Description
1. Prioritize Future Projects	The County will prioritize future projects based on wildfire risk as well as the level of property owner engagement and likely participation in the project activities. Private landowner participation is essential to the viability of many Tier 2 and Tier 3 projects because the majority of land to be treated occurs on privately owned parcels. If two projects have a similar level of wildfire risk, the amount of private landowner participation will influence the County’s prioritization of the projects.
2. Define Project Boundaries	Project treatment areas and boundaries will be developed based on project funding, the vegetation type and density, and participation of landowners.
3. Complete Environmental Resource Surveys	The County will hire experienced biological and cultural resource consultants to complete resource assessments within the project areas. Resource assessments will include records searches, literature reviews, agency and tribal consultation, and surveys of the project areas by personnel on foot. Right of entry to private parcels will be critical for completing this phase of project implementation.
4. Refine Project Boundaries to Avoid Environmentally Sensitive Areas	The County will refine the project boundaries based on information obtained during the records searches, literature reviews, agency and tribal consultation, and surveys. Areas where resources may be negatively affected by project activities would be avoided during project implementation.
5. Define Location of Specific Treatment Methods within Project Boundary	The County will develop a plan that identifies treatment methods to be used within the project boundary. Treatment methods will be determined in consideration of project-specific objectives, as well as site conditions, including topography, accessibility, vegetation community and habitat type, and residential density. The plan will be discussed with all participating landowners and agreements will be documented with a memorandum of understanding or similar agreement between the County and landowners.
6. Ensure Consistency with WRMP CEQA Documentation	The County will complete an Initial Study checklist to determine if the impacts considered in the WRMP Initial Study/Mitigated Negative Declaration and required mitigation measures adequately address and mitigate impacts of the future project to a less than significant level. If the future project does not result in new effects or require new mitigation measures, the County can approve the activity as being within the scope of the project covered by the WRMP Initial Study/Mitigated Negative Declaration and no new environmental document would be required (CEQA Guidelines, Section 15168). If the future project is not consistent with the WRMP Initial Study/Mitigated Negative Declaration, then the County may consider other CEQA compliance options identified in Table 4-1 of this WRMP.

4.7.3 Community Participation in Projects

Overview of Outreach Efforts

The County completed significant outreach and coordination efforts with private landowners within the Tier 1 project boundaries. Private landowner participation was required to obtain right-of-entry onto private parcels to conduct biological and cultural resource surveys. Additional outreach will be necessary to coordinate project implementation on private land. Future Tier 2 and Tier 3 projects will require similar participation from private landowners, as

4 IMPLEMENTATION PLAN

many of the Tier 2 and Tier 3 projects occur on private land. A volunteer community organizer will be identified for each project area. The community organizer will be responsible for assisting the County with organizing private landowner outreach to increase participation in the projects. The community organizer will be the point of contact for the County during the development of future projects within the Tier 2 and Tier 3 project areas. A community outreach procedure has been defined Table 4-6 and will be used to complete landowner outreach within Tier 2 and Tier 3 project areas.

Landowner Participation During Environmental Review

The County has prepared an environmental compliance document pursuant to CEQA for this WRMP. Biological and cultural resource surveys must be completed on all land that would be treated as part of the WRMP, as described in Phase 3 in Table 4-5. Surveys were completed for the Tier 1 projects during the preparation of the WRMP. Biological and cultural resource surveys would be required during the definition of future projects (e.g., Tier 2 and Tier 3 projects). Private landowners must opt-in to future projects and agree to have their land surveyed for resources.

The County and Steering Committee, particularly members from local non-governmental organizations, will be the main parties responsible for outreach to private landowners. The County has developed a Right of Entry Agreement and Frequently Asked Questions (FAQ) sheet to help educate landowners about the project activities that would be conducted on private property during the environmental review phase of the project. Table 4-6 identifies the County's outreach actions toward obtaining right-of-entry onto private landowners' parcels and the timing of each action. The optimal time to conduct biological surveys within Alpine County is from late June to late August, depending on snow melt and late spring precipitation conditions. The timing in Table 4-6 is developed with the assumption that a target survey date is July 1.

Landowner Participation in Definition of Treatment Methods

The County would meet with landowners to discuss the potential treatment methods that landowners would approve for use on their property, as described in Phase 5 in Table 4-5. The goal of public outreach would be to obtain agreements with private landowners to complete vegetation treatment activities on 100 percent of the landowners' parcel that opted into the environmental resource survey phase of the projects. Outreach for the purpose of defining the treatment methods could be completed at the same time as the environmental resource survey phase (Phase 3, described above).

If landowner outreach for the purpose of defining treatment methods is completed after the environmental resource survey phase (Phase 3), the County would conduct the outreach via community workshop or meeting, email or phone conversations, or one-on-one discussions with landowners.

Treatment methods that are approved on each parcel would be documented through a memorandum of understanding or similar agreement between the County and landowner.

4 IMPLEMENTATION PLAN

Table 4-6 Outreach Actions and Timing

Action	Responsibility	Timing
Environmental Review/Surveys		
<p>Mail Right of Entry Agreement and FAQ Mail the outreach letter, FAQ and Right of Entry Agreement to landowners within the project boundary using first class mail.</p>	County	January
<p>Activate Phone Trees Activate neighborhood phone trees within the project area communities to try to get landowner participation up to 80 percent.</p>	County, Community Organizer, and Steering Committee	May
<p>Target Specific Landowners Coordinate with Community Organizers, Steering Committee, and local non-governmental organizations to spread the word to targeted landowners through the Alpine Fire Safe Council, Alpine Biomass Collaborative, and Bear Valley Residents Incorporated Homeowners Association.</p>	Steering Committee and Community Organizer	May 15 -June 1
<p>Certified Mail to Large Landowners Mail the Right of Entry Agreement and FAQ via certified mail to large landowners within project areas who are unresponsive to previous outreach attempts.</p>	County	June 1
Definition of Treatment Methods per Parcel		
<p>Community Workshop or Meeting The County will hold a community workshop with landowners within a specific project area to be treated. The workshop/meeting would be held in person or via web conference platform (e.g., Zoom). Email and first class mail correspondence would be used to inform landowners of the workshop/meeting.</p>	County, Community Organizer, and Steering Committee	Concurrently with outreach actions above, or prior to Phase 6
<p>Targeted Phone Calls and Emails The County would conduct targeted outreach to landowners that were present at the Community Workshop/Meeting. One-on-one meetings may be necessary to discuss parcel-specific treatment methods.</p>	County, Community Organizer, and Steering Committee	Concurrently with outreach actions above, or prior to Phase 6

5 Community Access Risk Assessment

5.1 Ingress/Egress and Community Evacuation Area Identification

Alpine County's population is focused in the five communities of Woodfords, Hung-A-Lel-Ti, Markleeville, Kirkwood, and Bear Valley. During the HRVA characterization and analysis, Alpine County officials helped identify and designate primary ingress and egress routes, secondary ingress and egress routes, and community evacuation areas or refuge areas. As part of the risk assessment completed for the WRMP, the County reviewed constraints to access and adequate evacuation areas for vulnerable communities.

5.1.1 Ingress/Egress

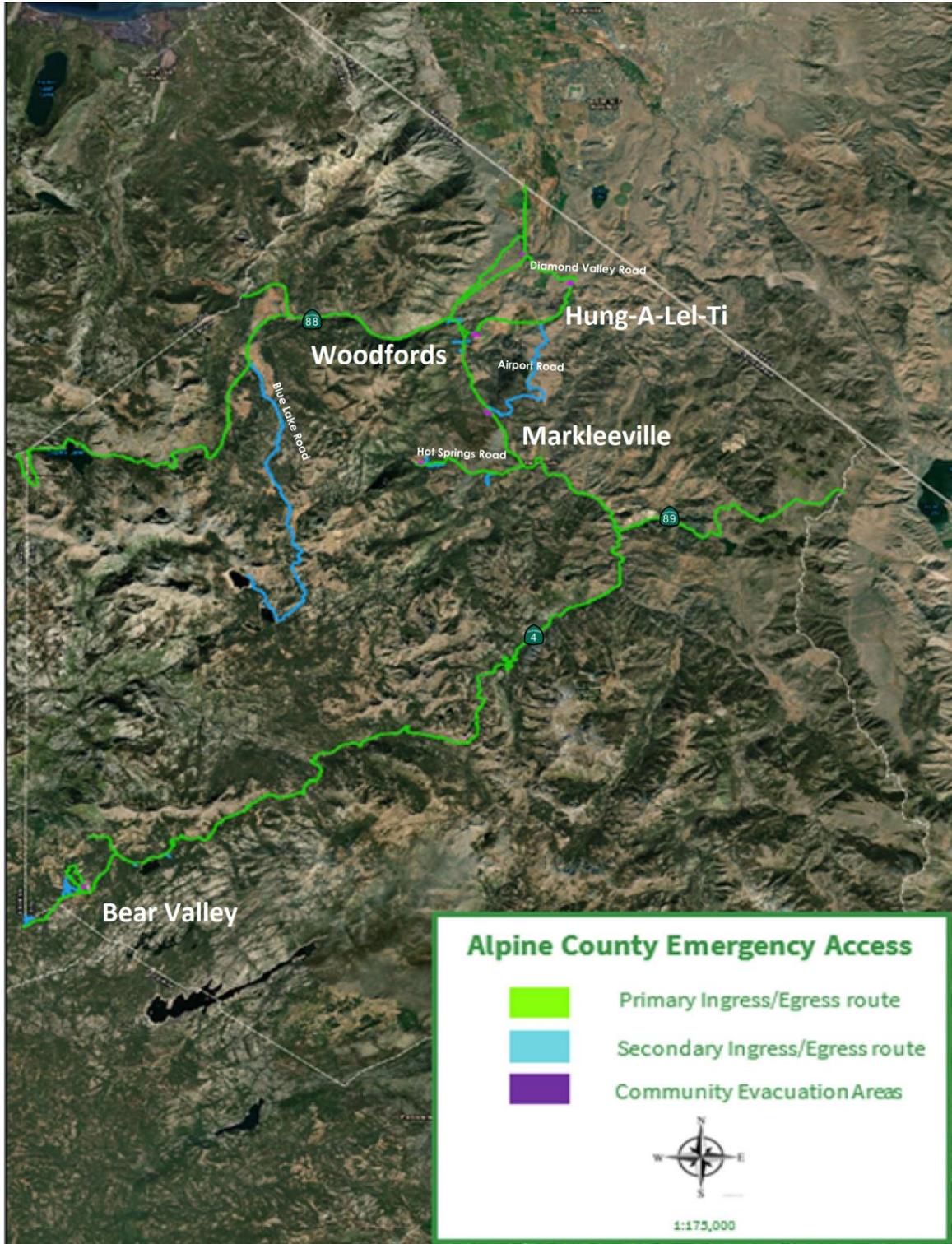
Primary ingress and egress routes are generally major highways and roadways that can facilitate the movement of many emergency vehicles into an incident while moving much of the public out of harm's way. Secondary routes are generally understood as alternate routes if primary routes become inundated with traffic or access is blocked. It should be noted that traffic flow modeling was not performed to determine ingress/egress capacity. Designation was performed by County staff with knowledge of the County highway and road system and what those routes could most likely support during an incident.

Figure 5-1 highlights where ingress and egress routes have been designated by Alpine County officials. Figure 5-2 focuses on access in Woodfords as an example of what these emergency assets look like at a smaller scale. Grover Hot Springs, Shay Creek, and Markleevillage share Hot Springs Road as a single ingress/egress route; however, options for feasible secondary evacuation routes are constrained by terrain and significant distances to a higher functional class route. Similarly, the Sherman Acres, Old and New Bear Valley subdivisions, and Bear Valley Mountain Resort have single access to the State highway system. All of the communities discussed above are surrounded by mountainous terrain. The most feasible secondary access alternatives would need to parallel the primary evacuation route, due to site constraints, and would not create safer evacuation conditions.

Since establishing secondary ingress and egress to vulnerable communities is not feasible, due to site constraints, the recommended mitigation action to provide emergency egress is to ensure adequate vegetation setbacks from roads are established and maintained. Vegetation management along access routes is discussed further in Section 5.2.

5 COMMUNITY ACCESS RISK ASSESSMENT

Figure 5-1 Designated Safety Zones and Areas in Alpine County



5 COMMUNITY ACCESS RISK ASSESSMENT

Figure 5-2 Woodfords Area Designated Safety Zones



5 COMMUNITY ACCESS RISK ASSESSMENT

5.1.2 Community Evacuation Areas

Community evacuation areas are zones where emergency service vehicles and personnel can stage for an incident. These zones can also serve as a rendezvous point for the public. There is a possibility these areas can be used as a safety zone from fire when egress is compromised; however, it is important to recognize that dynamic fire conditions may render these areas unsafe at times of an incident for some or all vehicles and people that occupy that space. Table 5-1 shows the latest safety zone rules from the Joint Fire Science Program (Butler, 2014).

Table 5-1 Safety Zone Rules for Safe Separation Distances

Calculating a Safe Separation Distance (SSD)			
SSD = 8 * Slope wind Factor * Height of the surrounding vegetation			
SLOPE-WIND FACTOR			
Wind Speed	Flat 0% Slope	20% Slope	>30% Slope
Light 0-10 mph	1	2	3
Moderate 11-20 mph	2	3	5
Strong > 20 mph	3	5	6

Notes

1. For a 20-person crew, add 10 feet of radius and for a vehicle add another 5 feet of radius.
2. The area in red requires large natural openings or construction by mechanized equipment.
3. The proposed rule is to be used for flat ground rather than the existing flame height rule.
4. Also consider additional lookouts on the ground and in the air to monitor fire activity with early egress to escape routes and safety zones.
5. At 30% or greater slopes, hot gases tend to stay close to the ground.

As an example of how the Safe Separation Distance calculation works on a community evacuation area, the Turtle Rock Park evacuation area, at almost 9 acres (with HVRA buffer), has flat slopes and surrounding vegetation heights of about less than 2 feet. Calculating with 97th percentile winds averaging 14 mph, the area could safely hold up to approximately 60 people and 30 vehicles if centered in the safety zone near one another. If winds increased or vegetation was higher at the time of the scenario, the amount of people that could safely take refuge there would be many fewer. Establishing evacuation zones is a critical component of a larger fire response strategy. These zones provide the public important pre-incident preparation information, ensure non-local emergency response units are using known and

approved road systems during an emergency, and help focus limited fuel reduction resources on making and maintaining low severity fire conditions surrounding strategic roadways and safety zones.

Evacuation zones are even more important in areas where ingress/egress infrastructure is limited. The Hot Springs Road corridor, Sherman Acres, Old and New Bear Valley subdivisions, and Bear Valley Mountain Resort are lacking secondary access routes. Since establishing secondary ingress and egress to vulnerable communities is not feasible, as stated above, establishment of pre-incident evacuation zones that meet the minimum safe separation distances is recommended. Potential evacuation zones identified as HVRAs during the wildfire hazard and risk assessments include:

- Turtle Rock Park;
- Diamond Valley Elementary School;

5 COMMUNITY ACCESS RISK ASSESSMENT

- Grover Hot Springs State Park; and
- Bear Valley Library and parking lot.

Vegetation conditions near the potential evacuation zones should be reviewed regularly by the County and appropriate safe separation distances should be maintained around the zones.

5.2 Community Access Risk Report

Analysis shows that about 832 acres surrounding major ingress and egress routes are at risk. This means that during a critical wildfire incident, portions of the major emergency routes do not have the appropriate clearance of vegetation and fuels around the road for traffic to safely pass if fire impacted those areas during critical fire weather. About 1,868 acres surrounding minor ingress and egress routes are shown to have at least some risk. Like major routes, this means that areas do not have sufficient vegetation and fuel clearance adjacent to routes so that traffic can safely pass. Finally, community evacuation areas might be vegetation and fuels free within the zone, but analysis shows that about 150 acres surrounding those areas exhibit high enough fire hazard that, during a critical wildfire incident, fire could compromise the effectiveness of those evacuation areas. Vegetation management efforts focused on treatment of the area surrounding major emergency routes and evacuation areas are recommended. To triage the highest risk areas surrounding emergency routes and evacuation areas, Table 5-2 identifies the land ownership that is in the 50 percentile highest risk categories for a specified emergency access area.

Table 5-2 Acreages of the Highest 50th Percentile Risk around Ingress and Egress Routes

Land Ownership	Major Emergency Routes	Minor Emergency Routes	Community Evacuation Areas	Total
United States Forest Service	21.2 acres	149.3 acres	2.5 acres	173.0 acres
Bureau of Land Management	1.4 acres	303.3 acres	0 acres	304.7 acres
Bureau of Indian Affairs	65.4 acres	0 acres	20.3 acres	85.7 acres
Alpine County	22.3 acres	42.8 acres	21.4 acres	86.5 acres
NGO/Service Districts/Pacific Gas & Electric	28.2 acres	6.8 acres	4.2 acres	39.2 acres
State of California	3.4 acres	3.1 acres	0 acres	6.5 acres
Private	285.6 acres	456.0 acres	16.4 acres	758.0 acres
Unknown	0 acres	0 acres	0 acres	0 acres
Totals	427.5 acres	961.3 acres	64.8 acres	1,453.6 acres

5 COMMUNITY ACCESS RISK ASSESSMENT

Figure 5-3 through Figure 5-5 show how areas of high wildfire risk overlap with emergency assets for the communities of Markleeville, Bear Valley, and Hung-A-Lel-Ti. Figure 5-3 to Figure 5-5 show example areas where the highest risk overlaps with emergency access routes and safety zones.³ The Tier 1 Markleevillage project would partially address the fuel loading that occurs along Hot Springs Road. Additional fuels reduction along Hot Springs Road and other critical access routes within the county could be completed as future projects. Environmental review for these projects may be streamlined by using the CalVTP or CEQA Statutory⁴ or Categorical Exemptions.⁵

³ To effectively evaluate and apply the emergency access dataset it is imperative to work with the spatial data in a GIS and not solely rely on map products.

⁴ Section 15269(b) of the CEQA Guidelines specifies that the Emergency Projects exemption applies to “emergency repairs to publicly or privately-owned service facilities necessary to maintain service essential to the public health, safety or welfare.” Section 15269(c) of the CEQA Guidelines specifies that the CEQA statutory exemption for emergency projects exempts specific actions necessary to prevent or mitigate an emergency, including where “fire or catastrophic risk mitigation or modifications to improve facility integrity are proposed for existing facilities in response to an emergency at a similar existing facility.”

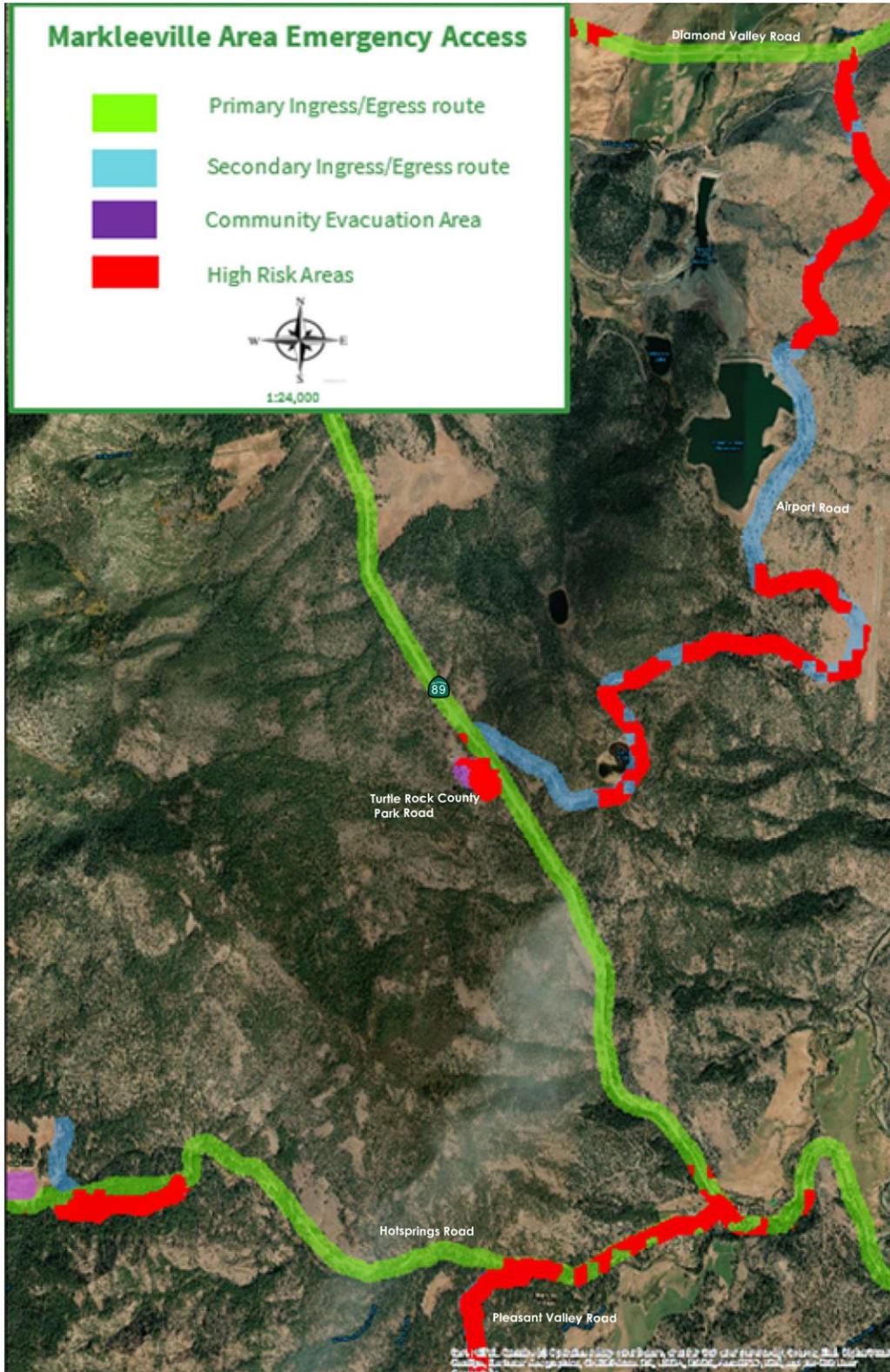
Class 1 Categorical Exemption under Article 19 (Categorical Exemptions) of the State CEQA Guidelines.

⁵ 15301 Existing Facilities. Class 1 consists of the operation, repair, maintenance, permitting, leasing, licensing, or minor alteration of existing public or private structures, facilities, mechanical equipment, or topographical features, involving negligible or no expansion of existing or former use. The types of “existing facilities” itemized below are not intended to be all-inclusive of the types of projects which might fall within Class 1. The key consideration is whether the project involves negligible or no expansion of use.

15301(c) consists of “Existing highways and streets, sidewalks, gutters, bicycle and pedestrian trails, and similar facilities (this includes road grading for the purpose of public safety, and other alterations such as the addition of bicycle facilities, including but not limited to bicycle parking, bicycle-share facilities and bicycle lanes, transit improvements such as bus lanes, pedestrian crossings, street trees, and other similar alterations that do not create additional automobile lanes). Under this exemption, maintenance of existing streets is authorized for the purpose of public safety.

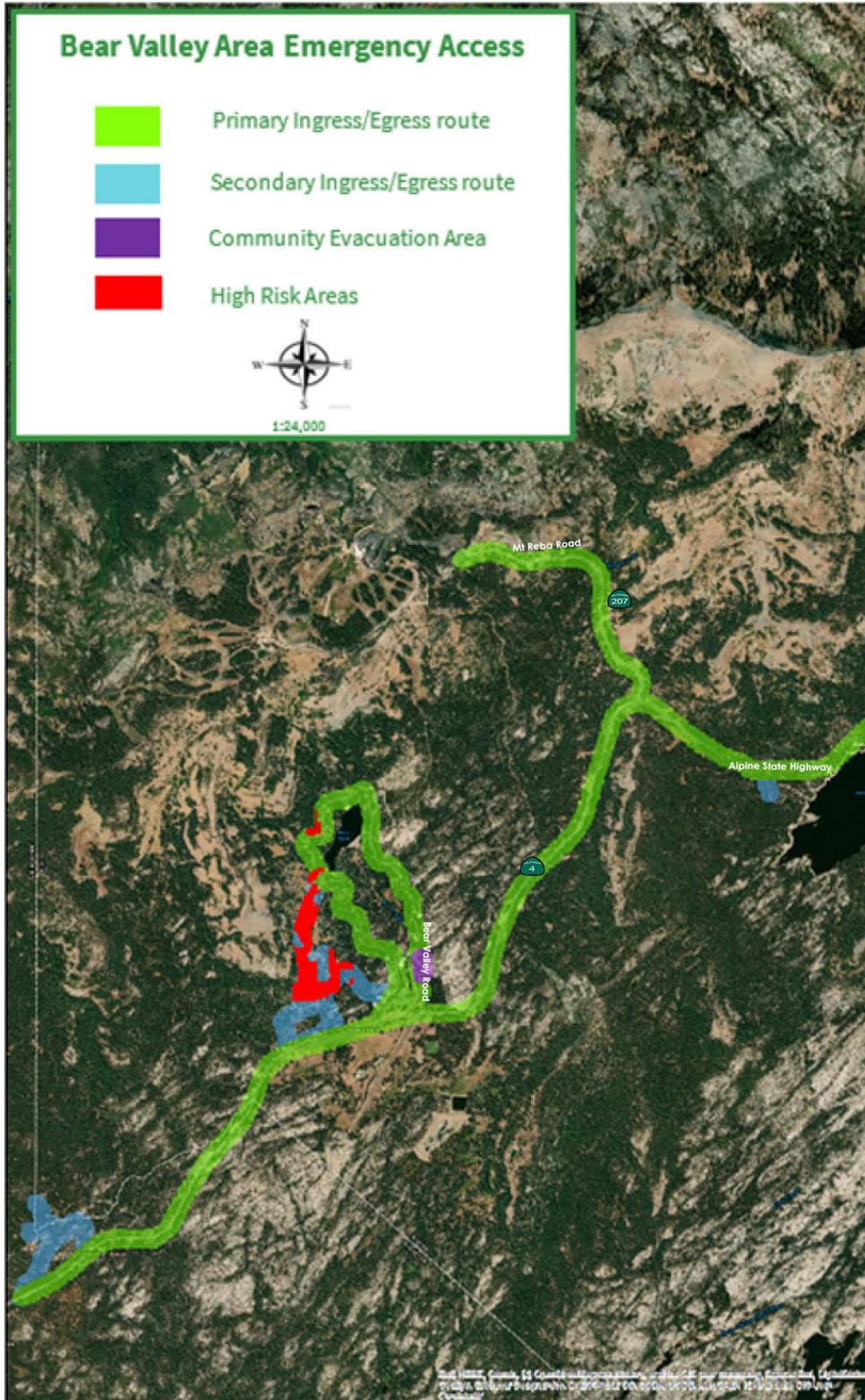
5 COMMUNITY ACCESS RISK ASSESSMENT

Figure 5-3 Locations in Markleeville Where Highest Risk Overlaps with Emergency Access Routes and Safety



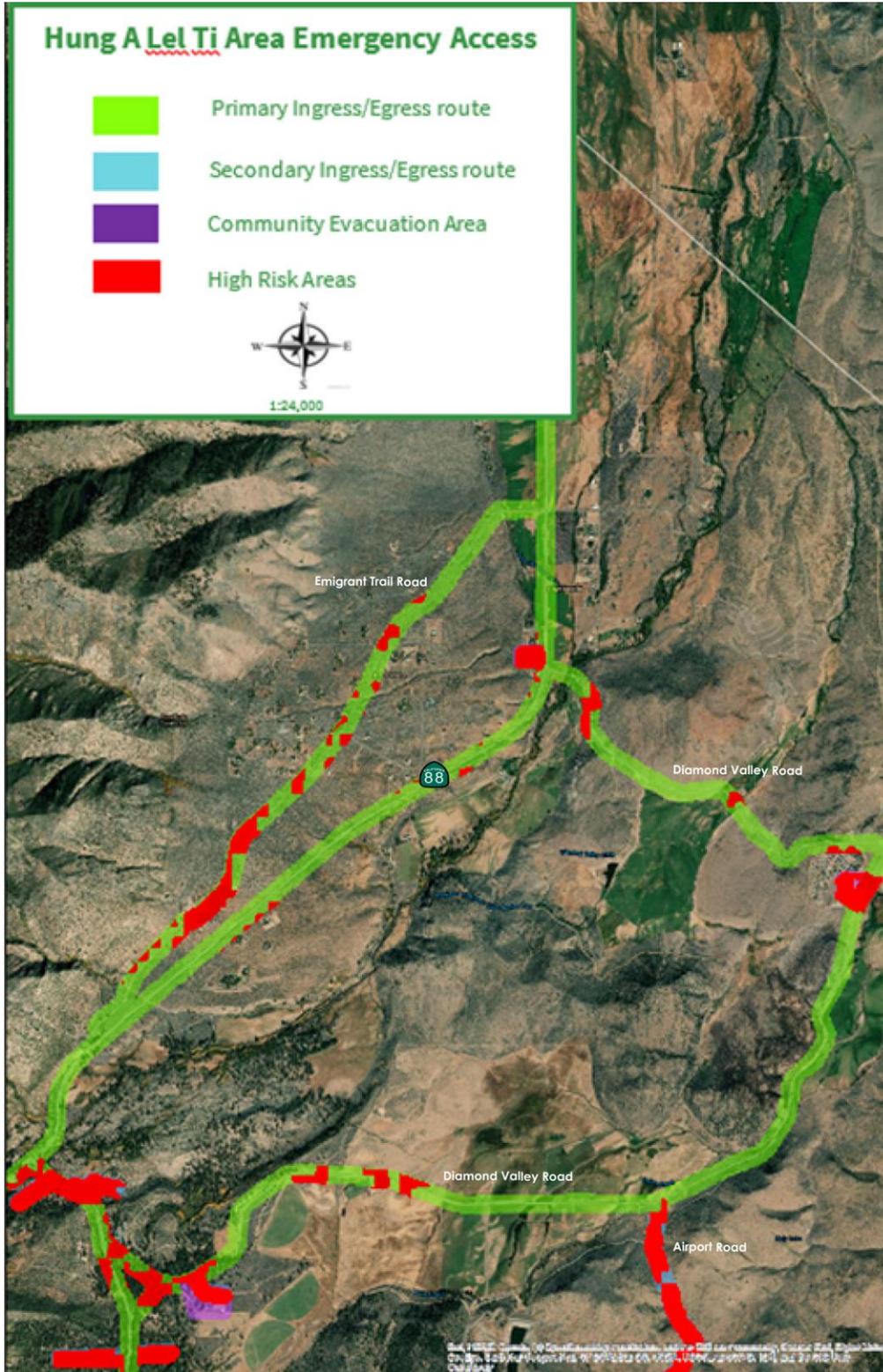
5 COMMUNITY ACCESS RISK ASSESSMENT

Figure 5-4 Locations in Bear Valley Where Highest Risk Overlaps with Emergency Access Routes and Safety



5 COMMUNITY ACCESS RISK ASSESSMENT

Figure 5-5 Locations in Hung-A-Lel-Ti Where Highest Risk Overlaps with Emergency Access Routes and Safety



6 References

- Alexander, M. E. (1982). Calculating and interpreting forest fire intensities. *Canadian Journal of Botany*, 347-357.
- Alpine Biomass Collaborative. (2020). *About Us*. Retrieved from <https://alpinebiomasscommittee.wordpress.com/about/>
- Barrett, S., Havlina, D., Jones, J., Hann, W., Frame, C., Hamilton, D., . . . Hutter, L. (2010). Interagency Fire Regime Condition Class Guidebook. *Version 3.0*.
- Butler, B. (2014). Wildland firefighter safety zones: a review of past science and summary of future needs. *International Journal of Wildland Fire*, 23, 295-308.
- C.G. Celio & Sons Co. (2018). *Alpine County Community Wildfire Protection Plan*. Markleeville: Alpine County Fire Safe Council.
- Desert Research Institute. (2020, March 7). *RAWS USA Climate Archive*. Retrieved from <https://raws.dri.edu/>
- Finney, M. (2006). A computational method for optimizing fuel treatment locations. *Fuels Management* (pp. 28-30). Portland: U.S. Department of Agriculture, Rocky Mountain Research Station.
- Idaho State University. (2020). Retrieved from Geospatial Training and Analysis Cooperative Wildand Fires: http://geology.isu.edu/wapi/geostac/Field_Exercise/wildfire/fuel.htm
- Kalabokidis, K., Athanasis, N., Palaiologou, P., Vasilakos, C., Finney, M., & Ager, A. (2013). Minimum travel time algorithm for fire behavior and burn probability in a parallel computing environment. *Advances in Forest Fire Research*, 882-891.
- LANDFIRE. (2020, March 7). *LANDFIRE*. Retrieved from www.landfire.gov
- Marcot, B. G. (2012). Recent advances in applying decision science to managing national forests. *Forest Ecology and Management*, 123-132.
- Monti, A. (2020). Photographs. *Received via electronic mail*.
- Paulus, J. (2020). Photographs. *Received via electronic mail*.
- Schmidt, K. M., Menakis, J. P., Hardy, C. C., Hann, W. J., & Bunnell, D. L. (2002). Development of coarse-scale spatial data for wildland fire and fuel management. *Gen. Tech. Rep.*

6 REFERENCES

- RMRS-GTR-87. Fort Collins, CO: USDA Forest Service, Rocky Mountain Research Station.
- Scott, J. H., Thompson, M. P., & Calkin, a. D. (2013). *A Wildfire Risk Assessment Framework for Land and Resource Management*. Rocky Mountain Research Station: USDA and USFS.
- Spatial Informatics Group. (2020).
- Stratton, R. D. (2009). *Guidebook on LANDFIRE fuels data acquisition, critique, modification, maintenance, and model calibration*. Fort Collins, CO: USDA, Forest Service, Rocky Mountain Research Station.
- U.S. Census Bureau. (2011, November 4). *Data derived from Population Estimates, Census of Population and Housing, Small Area Income and Poverty Estimates, State and County Housing Unit Estimates, County Business Patterns, Nonemployer Statistics, Economic Census, Survey of Business Owners, Buil*. Retrieved from State and County Quick Facts: <https://web.archive.org/web/20110606203601/http://quickfacts.census.gov/qfd/states/06/06003.html>
- US Department of Interior. (2020, February 20). *Interagency Fuel Treatment Decision Support System*. Retrieved from www.iftdss.firenet.gov
- USDA - U.S. Forest Service. (2020b, March 7). *FlamMap*. Retrieved from Fire, Fuel, Smoke Science Program Rocky Mountain Research Station: firelab.org/project/flammap
- USDA. (2012, November). *A Stage Is A Stage Is A Stage...Or Is It? Successional Stages, Structural Stages, Seral Stages*.
- USFS. (2010). *Humboldt-Toiyabe National Forest Project Archive*. Retrieved from <https://www.fs.usda.gov/wps/portal/fsinternet/cs/projects/htnf/landmanagement/projects?sortBy=3&archive=1>
- USFS. (2013). *Manzanita Fuels Reduction and Ecosystem Management Project*. Retrieved from <https://www.fs.usda.gov/project/?project=42142>
- WFDSS. (2020). *Wildland Fire Decision Support Tools*. USGS.

APPENDICES

Appendix A	Community and Stakeholder Input Report
Appendix B	IFTDSS Current Conditions Report
Appendix C	Response Function Survey
Appendix D	Relative Importance Survey

APPENDIX A

Community and Stakeholder Input Report



Alpine County Wildfire Risk Mitigation Plan Community and Stakeholder Input Report

June 2020

717 Market Street, Suite 650
San Francisco, CA 94103
650-373-1200
www.panoramaenv.com



Alpine County

Wildfire Risk Mitigation Plan

Community and Stakeholder Input Report

June 2020

Prepared for:

Alpine County Community Development Department
50 Diamond Valley Road
Markleeville, CA 96120
530-694-1361
bpeters@alpinecountyca.gov

Prepared by:

Panorama Environmental, Inc.
717 Market Street, Suite 650
San Francisco, CA 94103
650-373-1200
tania.treis@panoramaenv.com

TABLE OF CONTENTS

Table of Contents

1	Introduction	1
1.1	Overview of the Alpine County Wildfire Risk Mitigation Plan	1
1.2	Purpose of this Community and Stakeholder Input Report.....	2
2	Outreach Process	3
2.1	Public Meetings/Workshops	3
2.2	Outreach Materials.....	4
3	Participants	5
3.1	Key Stakeholders	5
3.2	Stakeholder Map.....	5
4	Public and Stakeholder Input	7
4.1	Key Input.....	7
4.2	Integration of Input.....	8

List of Tables

Table 1	Key Stakeholders	5
Table 2	Summary of Comments	7

List of Figures

Figure 1	Stakeholder Map.....	6
----------	----------------------	---

List of Appendices

Appendix A	Public Workshop #1 Flyer
Appendix B	Information Sheets

TABLE OF CONTENTS

This page is intentionally left blank.

1 Introduction

1.1 Overview of the Alpine County Wildfire Risk Mitigation Plan

Alpine County is located between Mono, Tuolumne, and El Dorado counties in the Sierra Nevada in northern California. The northeastern boundary of Alpine County shares its border with the state of Nevada. Fuels reduction projects to reduce the risk of wildland fire are a high priority in Alpine County (County) and several have been undertaken or are ongoing, including neighborhood fire breaks and larger scale fuels reduction projects on federal lands.

Approximately 1,780 residential units are in the County; over 1,200 of these are in high or very high wildfire hazard severity zones. Key planning areas include Woodford, Markleeville, Bear Valley, and Kirkwood. A Community Wildfire Protection Plan (CWPP) was completed for the east and west slope communities in Alpine County in 2018.

Alpine County has prepared a Wildfire Risk Mitigation Plan (WRMP or plan), under a Fire Prevention Grant received from the California Department of Forestry and Fire Protection (CAL FIRE). The WRMP is a county-wide plan that will build off existing fire hardening efforts in the County and expedite the process of implementing projects to protect communities. The purpose of the WRMP is to enable the County to implement activities that address the risk of wildfire and that can reduce wildfires that could impact communities.

The WRMP was prepared by:

- Identifying the important resources and assets within the County,
- Identifying the high fire hazard areas using modeling techniques, and
- Defining and prioritizing projects to implement that will protect the most at-risk resources.

The County evaluated eight candidate fuel treatment projects during development of the WRMP. The Bear Valley, Manzanita, and Markleevillage project areas were identified as the top three priority fuel treatment projects and have been prioritized for environmental review in 2020-2021. The Bear Valley project would impact approximately 130 acres; the Manzanita project would impact approximately 430 acres; and the Markleevillage project would impact approximately 300 acres. Several types of fuel treatment methods may be implemented in the project areas, including mechanical methods, hand thinning, and prescribed burn. Fuel treatments implemented within each priority project area will be given a higher priority if they:

- Are within initial attack areas of local fire stations or relevant air tanker bases,
- Can be safely accessed via road,
- Provide an enhancement of rate of fireline construction or fire-retardant penetration through the canopy, and

1 INTRODUCTION

- Provide measurable direct and in-direct benefit to resources at risk such as structures, infrastructure, water resources, and other important features.

Locating treatments where they may be utilized strategically during extended suppression efforts will also be considered.

1.2 Purpose of this Community and Stakeholder Input Report

The County prepared a detailed Community and Stakeholder Public Involvement Plan (CSPiP) prior to preparing the WRMP. The CSPiP defined the procedures that the County would implement to provide community members, agencies, jurisdictions, organizations, and other stakeholders with a valuable opportunity to participate in the creation of the WRMP, particularly in the locations and types of treatments that were identified for the three projects, and the analysis of the WRMP through environmental review process.

This Community and Stakeholder Input Report (CSIR or report) summarizes the public and stakeholder outreach that was conducted throughout development of the WRMP. This report includes a description of the public outreach process and activities, the participants, and the outreach materials. A summary of the comments and concerns raised during the WRMP public workshops and integration of public input is included in section 4.

2 Outreach Process

2.1 Public Meetings/Workshops

The County emphasized the importance of public involvement throughout the development of the WRMP and provided several opportunities for the public and key stakeholders to provide input. The County held two initial public workshops in February to introduce the public to the need for the WRMP, areas of wildfire risk, and how the WRMP would be developed. One meeting was held in Markleeville (eastern Alpine County) and one meeting was held in Bear Valley (western Alpine County) to ensure all interested parties had the opportunity to participate in the workshops and provide feedback. The County held an additional web-based public workshop in April via Zoom meeting to present the results of the planning effort.

2.1.1 Notification

In order to involve the public in the development of the WRMP, appropriate notice of the public workshops was provided through several outreach methods. The County established an initial project mailing list with key stakeholders identified in the CSPIP. Notification postcards were distributed to all interested parties on the project mailing list to announce the public workshops for the WRMP. The postcards were generally mailed 2-3 weeks prior to each public workshop. The County included notification of the February and April public workshops online on the plan webpage. Prior to the second workshop in April, a reminder message was also sent via email to previous workshop attendees who signed up for the email list.

2.1.2 Workshop Format and Content

The February public workshops included a presentation from the County followed by an open house where attendees could look at poster boards on various topics associated with wildland fire and ask questions. Online access to the workshops was also available through the virtual conferencing tool GoToMeeting. This discussion-based workshop format encouraged public participation and provided opportunities for feedback. The first public workshops in February provided an introduction to the public on the need for wildfire mitigation work and areas of wildfire risk (education on wildfire), the background on the grant, and why and how the WRMP would be developed.

The second public workshop was held in April using an online web-meeting platform due to public health concerns and state-wide restrictions on public gatherings as a result of COVID-19. The April public workshop was held online via Zoom and included a virtual presentation with an open question and answer session at the end of the meeting. The April workshop summarized the candidate project locations, the results of the planning effort, and the three

2 OUTREACH PROCESS

priority projects that the County identified. Discussion topics from the February and April public workshops are summarized in Section 4.

2.2 Outreach Materials

The County prepared various public outreach materials to inform the public of the project and ways of participating in the project. Outreach materials are briefly described below and the printed outreach materials are provided in the appendices attached to this report. The following outreach materials were developed to inform and engage the public during the development of the WRMP and public workshops:

- **Project webpage.** The County created a project webpage to provide information about the WRMP and public involvement opportunities. All outreach and informational materials were posted on the plan webpage. The WRMP webpage can be viewed here:
<http://www.alpinecountyca.gov/index.aspx?NID=504&ART=1744&ADMIN=1>
- **Public workshop #1 flyer (Appendix A).** The County developed and distributed a notification flyer for the February public workshops.
- **Information sheets (Appendix B).** The County developed two information sheets with key, concise information about the WRMP that were distributed during the public workshops. The first information sheet was developed and distributed for the February public workshops, and the second sheet was revised for the second public workshop in April.

3 Participants

3.1 Key Stakeholders

The County identified key stakeholders who may be interested in the development of the WRMP when preparing the CSPIP. These stakeholders received the public workshop notification postcards and a reminder message via email prior to the April public workshop. The key stakeholders who participated in the public workshops are identified in Table 1.

Table 1 Key Stakeholders

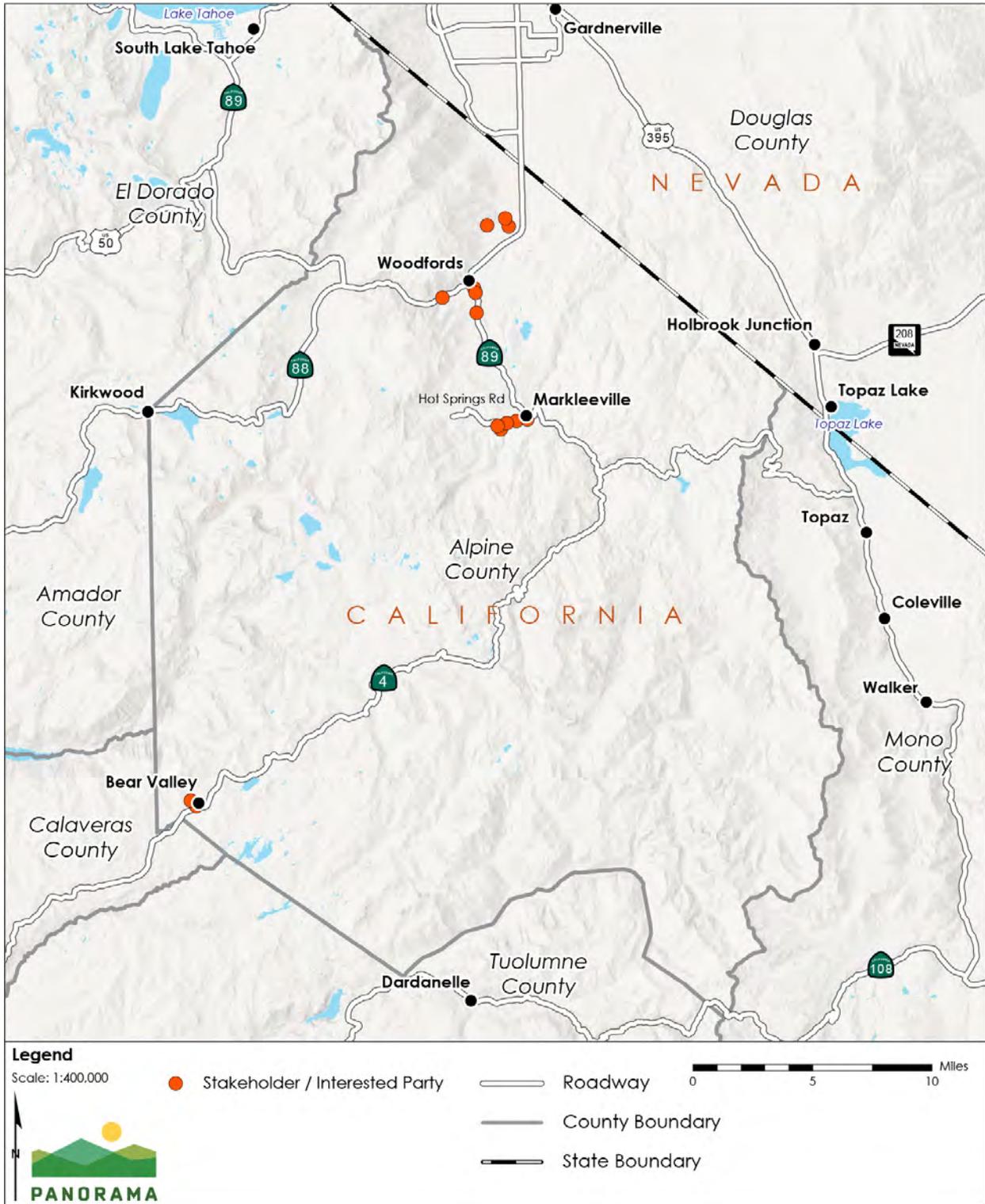
Stakeholder Name	Contact Name, Position
CAL FIRE Amador El Dorado Unit	Mike Deacon, Battalion Chief
Humboldt-Toiyabe National Forest	Mike Wilde, Fire Management Officer
Bureau of Land Management	Keith Barker, Fire Ecologist
Alpine County Board of Supervisors	Don Jardin, Supervisor District 1 Terry Woodrow – Vice Chair, Supervisor District 4 David Griffith, Supervisor District 5
Alpine County Fire Safe Council	Kris Hartnett, Chair
Alpine Biomass Collaborative	Michael Barton
Bear Valley Public Safety	Tim Bottomley, Battalion Chief
East Alpine Fire and Rescue	Terry Hughes, Administrator

3.2 Stakeholder Map

Upon identification of key stakeholders in the WRMP, the County developed a stakeholder map based on the locations of the stakeholders as well as participants from the public workshops (Figure 1). The stakeholder map identifies the areas of the County where the majority of participants and commenters on the WRMP reside to determine key geographic areas of interest in the County. Data from the initial project mailing list and comment tracking sheet were used to develop the stakeholder map.

3 PARTICIPANTS

Figure 1 Stakeholder Map



4 Public and Stakeholder Input

4.1 Key Input

Workshop participants raised various questions and comments during the public workshops in February and April 2020. All comments received during the public workshops were documented in a web-based comment tracking system using Google Sheets. The comment tracking system was used to ensure that public and stakeholder comments were incorporated into the plan or environmental review. A total of 35 comments were received during the meetings. Several comments addressed the sources of funding for project implementation, landowner responsibilities and home hardening techniques, and methods used to identify and prioritize projects. Table 2 summarizes the questions and comments from the public workshops.

Table 2 Summary of Comments

Date Received	Topic	Comment Summary
February Workshops		
2/25/2020	Funding/Approval	<ul style="list-style-type: none"> • Commenter expressed concern about other groups that may be applying for grants that could compete with Alpine County • Question about which grants will be used for the project implementation and impact with federal agencies • Commenter inquired about other uses of the grant funding
2/25/2020	Support Project	<ul style="list-style-type: none"> • Comments supporting effort to evaluate projects at the landscape level and prioritize project areas • Support for Markeleevillage project
2/25/2020	WRMP Development	<ul style="list-style-type: none"> • Question about how evacuation routes play into the WRMP development and factor into the prioritization • Various comments about future projects and prioritization • Commenter expressed interest in learning more about prescribed fire statistics in future plans and presentations
2/25/2020	Home Hardening	<ul style="list-style-type: none"> • Questions about fuels treatment and home hardening techniques for individual landowners • Questions about funding for landowners
2/25/2020	Fire Modeling	<ul style="list-style-type: none"> • Question regarding helicopters and fire suppression capabilities • Questions about wind and weather-related factors taken into consideration in fire hazard modeling • Questions about additional implications of the fire hazard and risk modeling results

4 PUBLIC AND STAKEHOLDER INPUT

Date Received	Topic	Comment Summary
2/25/2020	State Parks	<ul style="list-style-type: none"> Comments about current work and visitation in nearby State Parks
2/26/2020	Other Fuels Work	<ul style="list-style-type: none"> Comments that Caltrans has been doing a lot of roadside fuel reduction work state-wide Commenter provided a recommendation to review the Bear Valley Stickers Report
April Workshop		
4/28/2020	Project Implementation	<ul style="list-style-type: none"> Several commenters inquired about project schedule and timing of environmental review Commenter asked about process for acquiring landowner permission prior to project implementation
4/28/2020	WRMP Development	<ul style="list-style-type: none"> Commenter inquired about candidate project rankings
4/28/2020	Support Project	<ul style="list-style-type: none"> Several members of the public expressed gratitude for the project and the team's efforts on the WRMP
4/28/2020	Other Fuels Work	<ul style="list-style-type: none"> Commenter asked about coordination with BLM and their fuels work in the area

4.2 Integration of Input

Questions and comments received during the public workshops were addressed by the County during the workshops and documented for comment tracking purposes. The County's public involvement effort allowed public input to be received and integrated during the development of the WRMP. All comments will be considered by the County Board when making a decision on whether to approve the WRMP. Additionally, all comments related to environmental concerns or California Environmental Quality Act (CEQA) topics will be addressed in the CEQA document prepared for the WRMP.

APPENDICES

Appendix A	Public Workshop #1 Flyer
Appendix B	Information Sheets

APPENDIX A

Public Workshop #1 Flyer

Alpine County Wildfire Risk Mitigation Plan (WRMP)



PLAN HIGHLIGHTS

The process of preparing the WRMP includes:

- ◆ Identifying the important resources and assets within the County,
- ◆ Identifying the high fire hazard areas using modeling techniques, and
- ◆ Defining and prioritizing projects that will protect the most at-risk resources.

OVERVIEW Alpine County is preparing a Wildfire Risk Mitigation Plan (WRMP) under a Fire Prevention Grant received from the California Department of Forestry and Fire Protection (CAL FIRE). The WRMP will enable the County to implement activities that address the risk of wildfire and that can reduce wildfires that could impact communities. The top three priority on-the-ground fuel treatment projects will be identified. For each project, a general fuel treatment and an initial set of mechanical (saw-log removal, biomass removal, mastication, chipping, or hand thinning) or prescribed fire (under burning or pile burning) treatments will be defined in the WRMP.

PUBLIC WORKSHOPS The County is holding workshops in February to introduce the public to the need for the WRMP, areas of wildfire risk, and how the WRMP is being developed. The February workshops will include two meetings, one in eastern Alpine County and one in Bear Valley. A single follow-up workshop will be held in April to present the results of the planning effort and up to three priority projects defined in the WRMP. Remote (web-based) access will be available for all workshops. Online attendees will be able to view and participate in the workshops on a computer, tablet, or mobile device. Visit the webpage below for more information about online meeting attendance.

February 25, 2020
Alpine County Administration Building
99 Water Street
Markleeville
5:00 PM

February 26, 2020
Bear Valley Library
367 Creekside Drive
Bear Valley
4:00 PM

For more information about the WRMP, please visit: <http://www.alpinecountyca.gov/index.aspx?NID=504>
Submit any questions or comments on the WRMP to: zwood@alpinecountyca.gov

APPENDIX B

Information Sheets

Alpine County Wildfire Risk Mitigation Plan

Information Sheet



SUMMARY & OBJECTIVES

Alpine County is preparing a Wildfire Risk Mitigation Plan (WRMP) to reduce wildfire risk throughout the County. The WRMP is a County-wide effort that encompasses all communities within Alpine County. The goal of the WRMP is to reduce wildfire risks and protect important resources throughout the County. It will enable the County to implement activities that address the risk of wildfire and that can reduce wildfires that could impact communities.

The WRMP will be prepared by:

- ◆ Identifying the important resources and assets within the County,
- ◆ Identifying the high fire hazard areas using modeling techniques, and
- ◆ Defining and prioritizing projects to implement that will protect the most at-risk resources.

The WRMP will identify three priority fuel treatment projects based on the level of fire hazard and the risk to important resources within the County (see types of fuel treatment methods on the other side of this page). For each project, a general fuel treatment and an initial set of mechanical or prescribed fire treatments will be defined.

WILDFIRE DEFINITIONS

Hazard: A process, a phenomenon or a human activity that may cause loss of life, injury, or other health impacts, property damage, social and economic disruption, or environmental degradation.

Wildfire hazard: Computed as potential fire behavior or fuel physical and chemical properties.

Wildfire risk: The likelihood of wildfire occurring, associated fire behavior, and impacts of the fire.

Risk mitigation: Risk mitigation is achieved when any of the wildfire risk parameters (likelihood, behavior and/or impacts) are reduced.



For more information, please visit: <http://www.alpinecountyca.gov/index.aspx?NID=504>

Submit any questions or comments on the WRMP to: zwood@alpinecountyca.gov

Alpine County Wildfire Risk Mitigation Plan

Information Sheet

CURRENT PLANNING EFFORTS

Fuel reduction projects to reduce the risk of wildfire are a high priority in Alpine County and the WRMP will build off of established projects and plans in the County. Several fuel reduction projects have been undertaken or are ongoing throughout the County, including neighborhood fire breaks and larger scale fuels reduction projects on federal lands. Alpine Biomass Collaborative, U.S. Forest Service, and other organizations currently implement fuel reduction projects in Alpine County.

ASSETS & WILDFIRE RISK MODELING

The County identified important resources, environmental concerns, and High Valued Resources and Assets (HVRAs) to protect in the WRMP. The County used data from LANDFIRE and the fire modeling tool FLAMMAP to model fire hazards, and then mapped the proximity of high fire hazard areas to important resources.

The relative risk to any residents, infrastructure, or other assets within the County will be determined by combining outputs from the fire modeling and the economic and ecological values of each identified at-risk asset. The results of this risk assessment will help determine the priority projects that will be defined in the WRMP and possibly implemented.

NEXT STEPS

The County will incorporate public and stakeholder feedback and use the results of the risk analysis assessment to identify the priority fuel treatment projects. A follow-up workshop will be held in April to present the results.

FUEL TREATMENT METHODS

MECHANICAL

- ◆ Used for larger scale vegetation removal projects and maintenance tasks
- ◆ Requires heavy machinery
- ◆ Only used in areas with a slope up to 35%
- ◆ Two Main Types:
 - ⇒ Mechanical thinning/ whole-tree harvest
 - ⇒ Mastication



HAND THINNING

- ◆ Used for thinning stands of small-diameter trees and shrubs
- ◆ Can be used in areas with up to 80% slope
- ◆ Requires hand tools
 - ⇒ Powered: chainsaws and brush cutters
 - ⇒ Non-powered: loppers, hand saws



PRESCRIBED BURN

- ◆ Burning of ladder fuels in a predetermined area under the supervision of trained fire personnel



Alpine County Wildfire Risk Mitigation Plan

Priority Projects

Alpine County is preparing a Wildfire Risk Mitigation Plan (WRMP) to reduce wildfire risk throughout the county. The WRMP is a county-wide effort that encompasses all communities within Alpine County.

The goal of the WRMP is to reduce wildfire risks and protect important resources throughout the county. It will enable the County to implement activities that address the risk of wildfire and that can reduce wildfires that could impact communities.

Preparation of the WRMP includes:

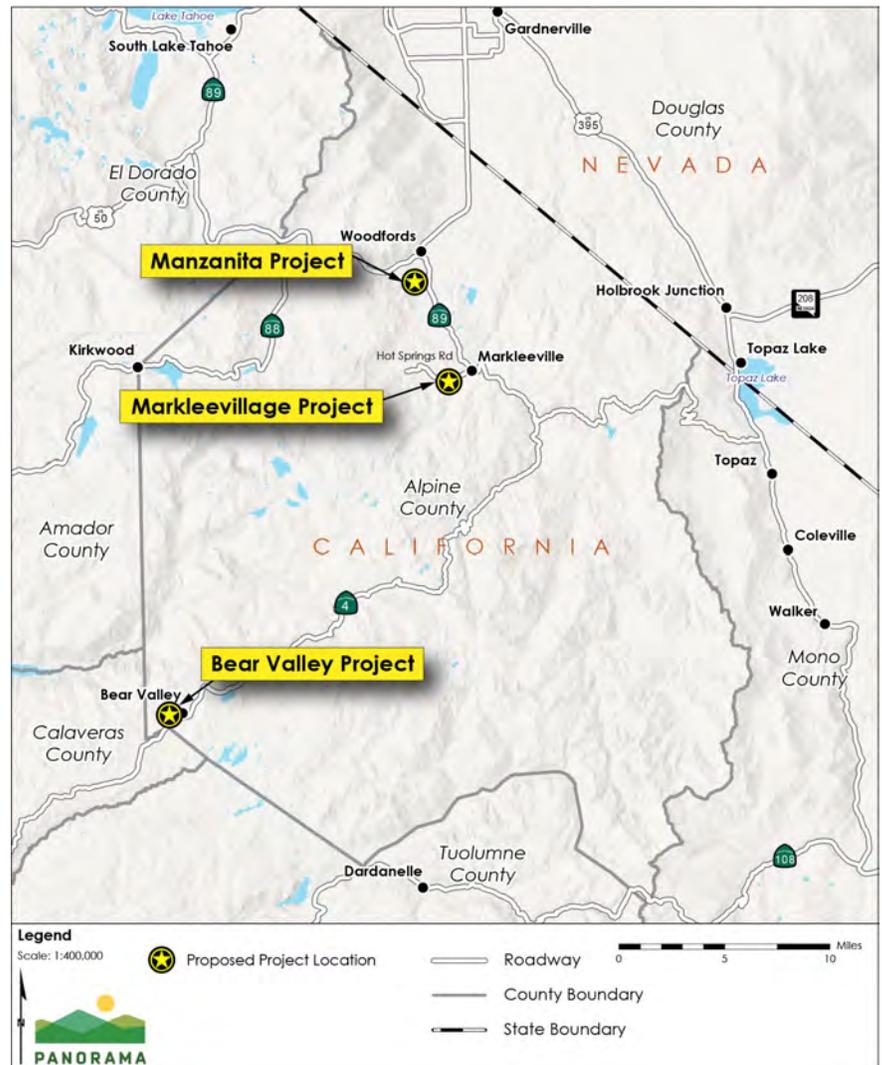
- ◆ Identifying important resources and assets within the county
- ◆ Identifying the high fire hazard areas using modeling techniques
- ◆ Defining and prioritizing projects to implement that will protect the most at-risk resources

Three fuel treatment projects identified in the WRMP have been prioritized for environmental review in

2020-2021. The projects were prioritized based on the level of fire hazard and risk to important resources and assets within Alpine County. The County will define fuel treatments for each proposed priority project in Spring 2020 and conduct the environmental review of the priority projects in Summer—Fall 2020.

The priority project boundaries and types of fuel treatment methods that may be implemented in the project areas are described on the other side of this flyer.

PROPOSED PRIORITY PROJECT LOCATIONS



For more information, please visit: <http://www.alpinecountyca.gov/index.aspx?NID=504>

Submit any questions or comments on the WRMP to: zwood@alpinecountyca.gov

Alpine County Wildfire Risk Mitigation Plan

Priority Projects

POTENTIAL FUEL TREATMENT METHODS

Several fuel treatment methods may be implemented in the three priority project areas (right). All proposed treatment methods would be discussed with nearby landowners prior to implementation as part of the project definition.

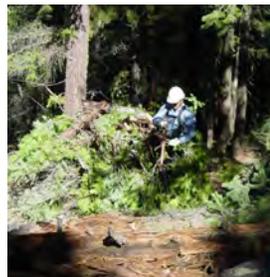
Mechanical:

- ◆ Used for larger scale vegetation removal projects and maintenance tasks
- ◆ Requires heavy machinery
- ◆ Only used in areas with a slope up to 35%
- ◆ Two Main Types:
 - ⇒ Mechanical thinning/ whole-tree harvest
 - ⇒ Mastication



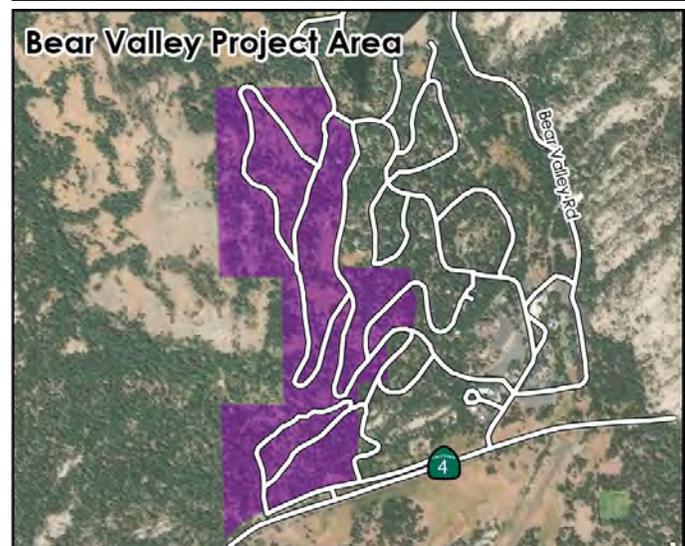
Hand Thinning:

- ◆ Used for thinning stands of small-diameter trees and shrubs
- ◆ Can be used in areas with up to 80% slope
- ◆ Requires hand tools
 - ⇒ Powered: chainsaws and brush cutters
 - ⇒ Non-powered: loppers, hand saws



Prescribed Burn:

- ◆ Burning of ladder fuels or slash piles in a predetermined area under the supervision of trained fire personnel
- ◆ Prescribed burn is not appropriate to implement in close proximity to residences



APPENDIX B

IFTDSS Current Conditions Report



Report: Auto97th
Landfire Version: LANDFIRE 2016
Landscape Name: AC_2016
Landscape Acres: 774,723

Prepared for: Scott Conway
10/6/2020, 11:02:12 AM

Model Parameters

Run Name: AC_2016 - Auto97th

Model Type: Landscape Fire Behavior

Run Date: Jan 30, 2020 3:22:34 PM

Wind Type: Gridded Winds

Wind Speed: 14 mph

Wind Direction: 225 deg

Crown Fire Method: Scott/Reinhardt

Foliar Moisture: 100

Conditioning: On - Extreme - Northern Sierra Nevada

Conditioning start: , NaN/NaN/NaN

Days conditioned:

Conditioning start: 1300, 8/11/2012

Conditioning end:1500, 8/17/2012

Station Name: MARKLEEVILLE

Station Observation Start Date: May 13, 1985 12:00:00 AM

Station Observation End Date: Oct 4, 2016 12:00:00 AM

Station Elevation: 5501

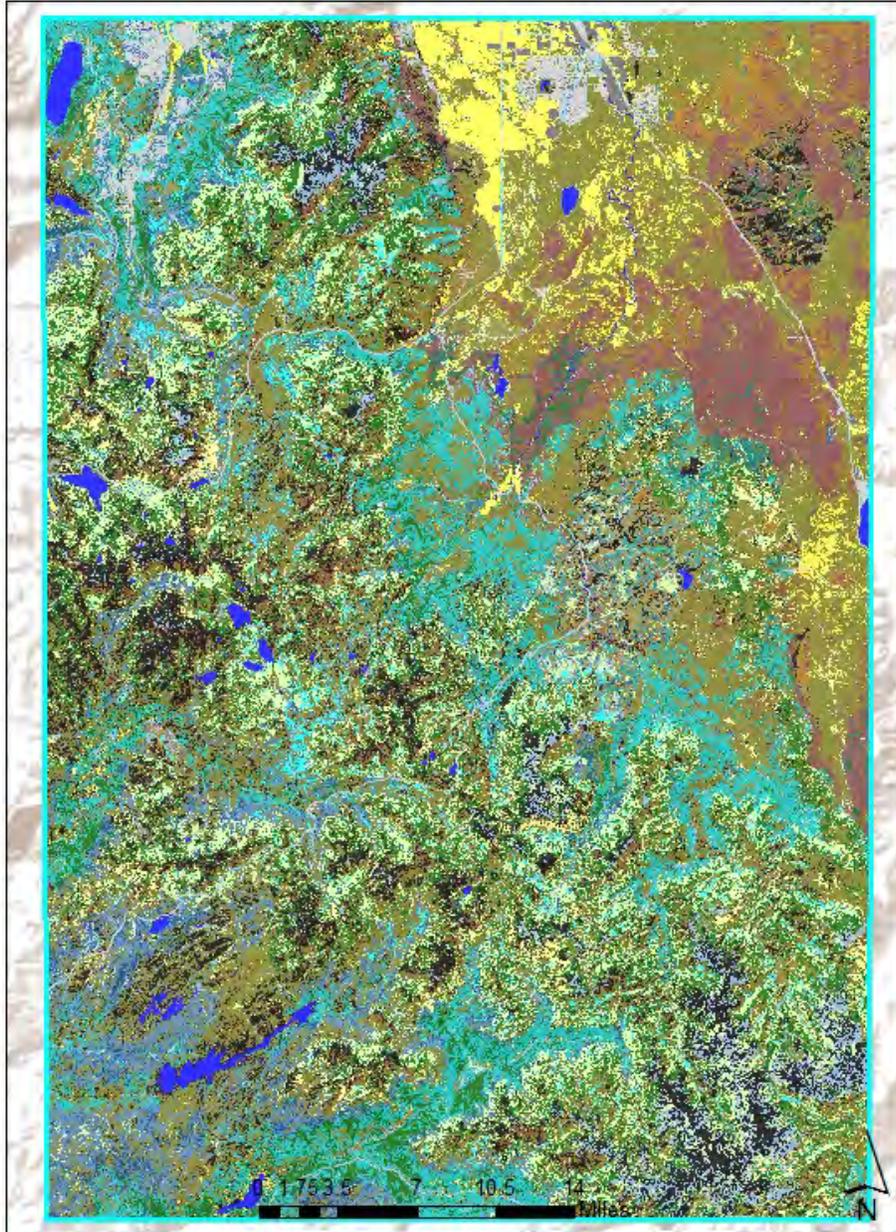
Station Aspect: 8

Station Latitude: 38.6849999

Station Longitude: 119.7683333

Fuel Model	1 Hr Fuel Moisture	10 Hr Fuel Moisture	100 Hr Fuel Moisture	Live Herbaceous Fuel Moisture	Live Woody Fuel Moisture
All	2	2	4	78	101

Fuel Model (FBFM)



Legend

Unbuffered Point	SH5
Fuel Models	SH7
NS1	TU1
NS2	TU2
NS3	TU3
NS4	TL1
SP1	TL2
SP2	TL3
SP3	TL4
SP4	TL5
SH1	TL6
SH2	TL7
SH3	TL8
SH4	SH2



Interagency Fuel Treatment Decision Support System

Landscape Data Summary Map Fire Behavior Fuel Models

LANDFIRE Version:
LANDFIRE 2016

IFTDSS LandscapeFile Name:
AC 2016

Created On: 01/30/2020

User Name: ccg

Map data derived from the NAD 83 datum. All data is in the NAD 83 datum. The map is a projection of the NAD 83 datum. The map is a projection of the NAD 83 datum. The map is a projection of the NAD 83 datum.

Fuel Model (FBFM)

Fuel Model Data Summary within "AC_2016" Landscape

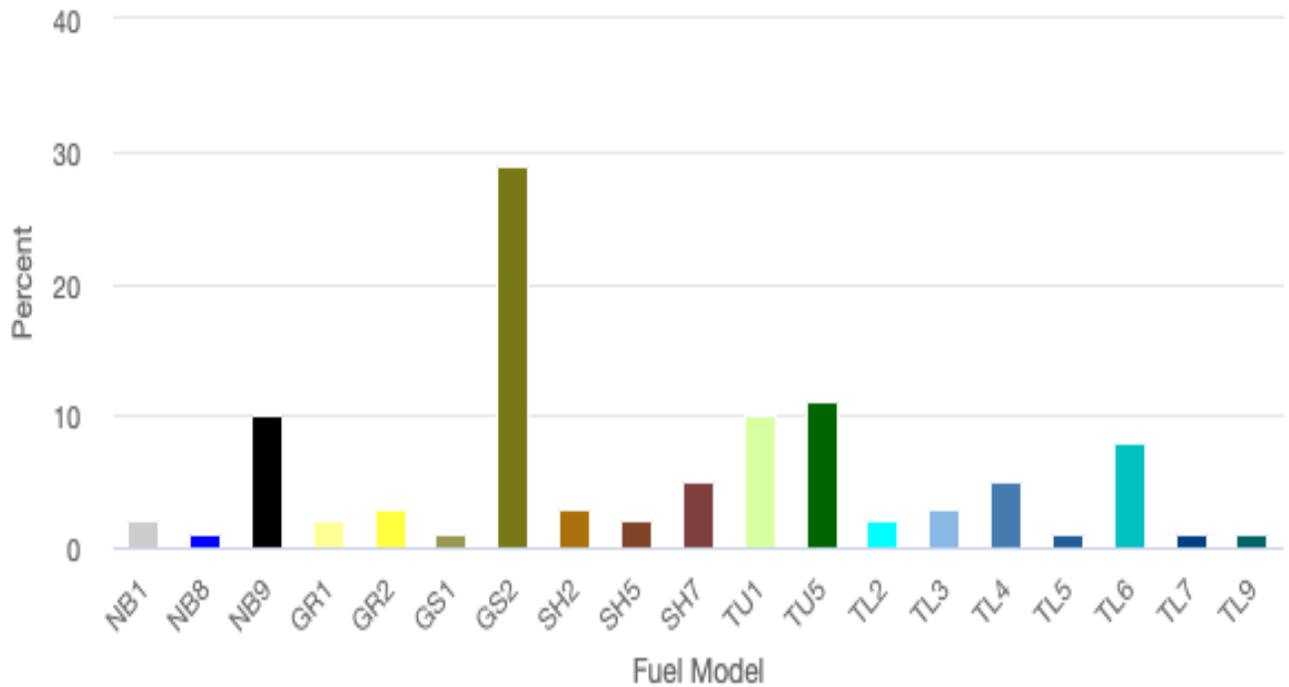
Source Landscape Name: AC_2016

Landfire Version: LANDFIRE 2016

Source Landscape Acres: 774,723

Model Name: AC_2016 - Auto97th

Distribution under 1% not shown

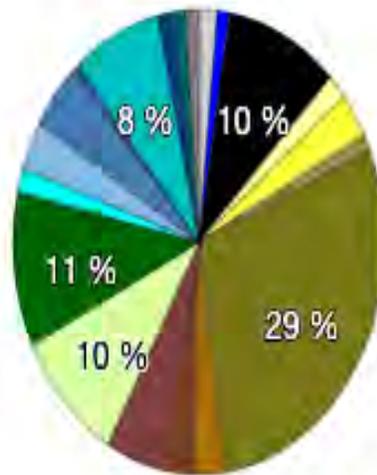


IFTDSS

Fuel Model (FBFM)

Fuel Model Data Summary within "AC_2016" Landscape

Source Landscape Name: AC_2016
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 774,723
Model Name: AC_2016 - Auto97th



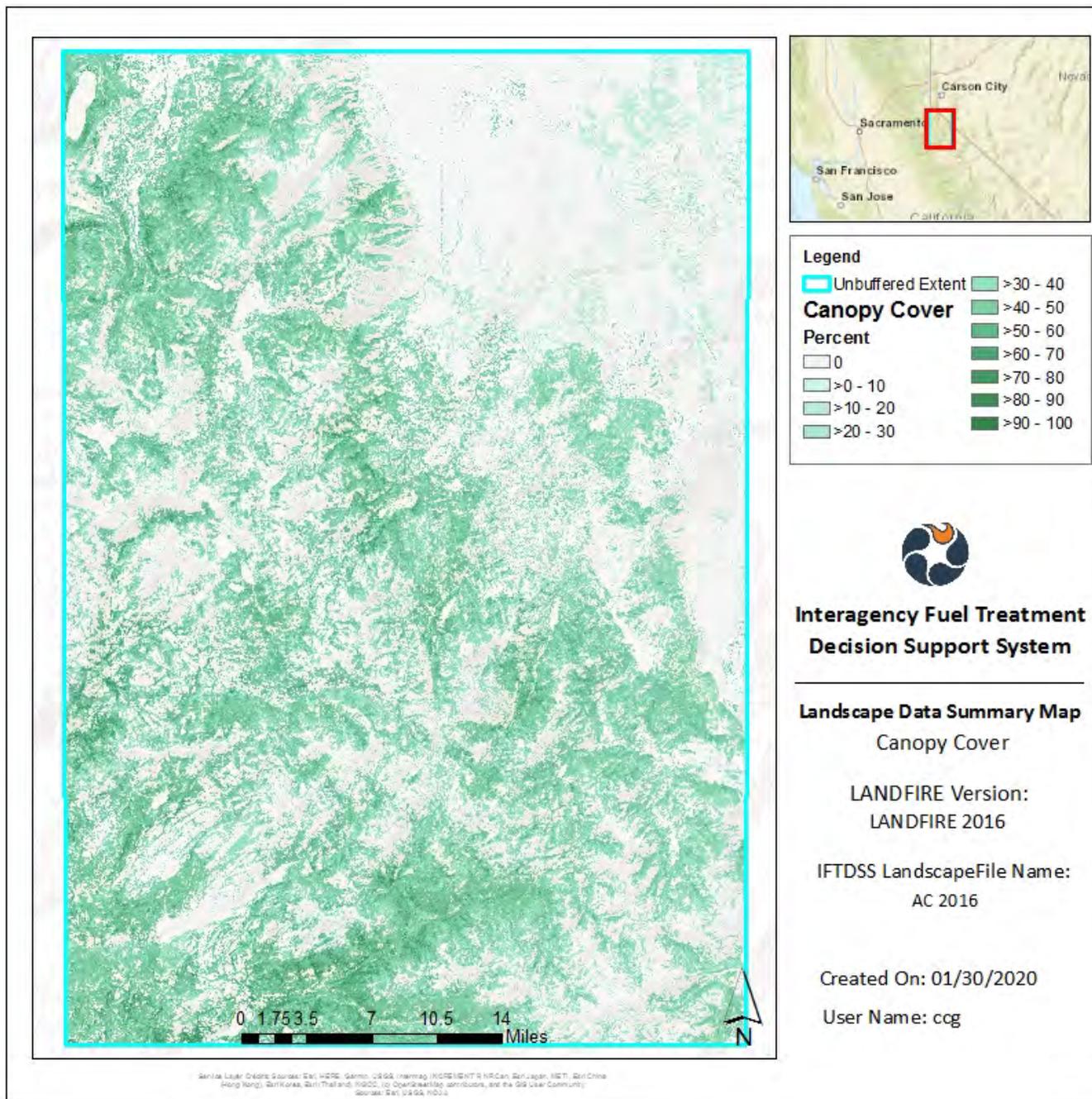
- | | | | | | | |
|-----|-----|-----|-----|-----|-------|-----|
| NB1 | NB8 | NB9 | GR1 | GR2 | GS1 | GS2 |
| SH2 | SH5 | SH7 | TU1 | TU5 | TL2 | TL3 |
| TL4 | TL5 | TL6 | TL7 | TL9 | other | |

IFTDSS

Fuel Model (FBFM)

Fuel Model	Pixel Count (freq)	Acres In LCP	Percent In LCP
NB1 (91)	55163	12268	2
NB3 (93)	9392	2089	0
NB8 (98)	36399	8095	1
NB9 (99)	343258	76339	10
GR1 (101)	62005	13790	2
GR2 (102)	108524	24135	3
GR3 (103)	1960	436	0
GS1 (121)	39862	8865	1
GS2 (122)	1019306	226688	29
SH1 (141)	3302	734	0
SH2 (142)	92115	20486	3
SH3 (143)	14	3	0
SH4 (144)	6205	1380	0
SH5 (145)	86964	19340	2
SH7 (147)	182990	40696	5
TU1 (161)	331715	73772	10
TU2 (162)	1	0	0
TU5 (165)	377034	83850	11
TL1 (181)	3110	692	0
TL2 (182)	57381	12761	2
TL3 (183)	119214	26513	3
TL4 (184)	160409	35674	5
TL5 (185)	20577	4576	1
TL6 (186)	266424	59251	8
TL7 (187)	44653	9931	1
TL8 (188)	15514	3450	0
TL9 (189)	39955	8886	1
SB2 (202)	100	22	0

Canopy Cover



Canopy Cover

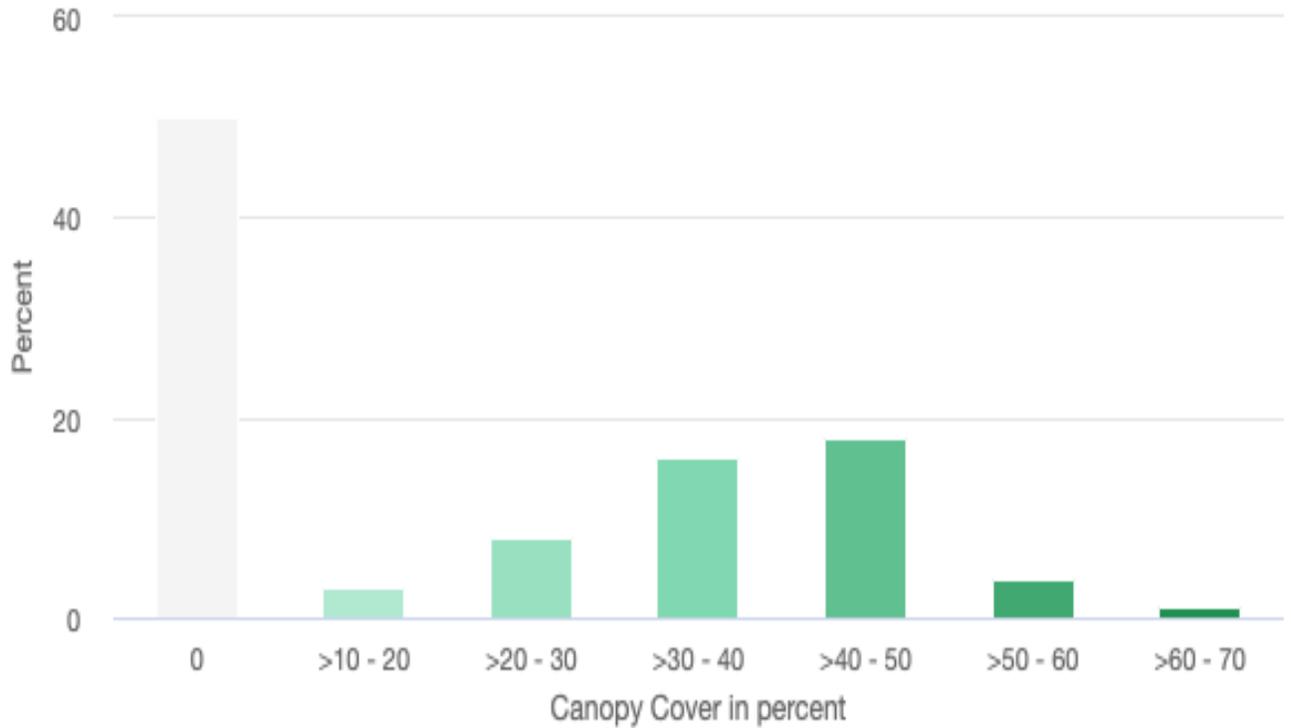
Canopy Cover (percent) Data Summary within "AC_2016" Landscape

Source Landscape Name: AC_2016

Landfire Version: LANDFIRE 2016

Source Landscape Acres: 774,723

Model Name: AC_2016 - Auto97th

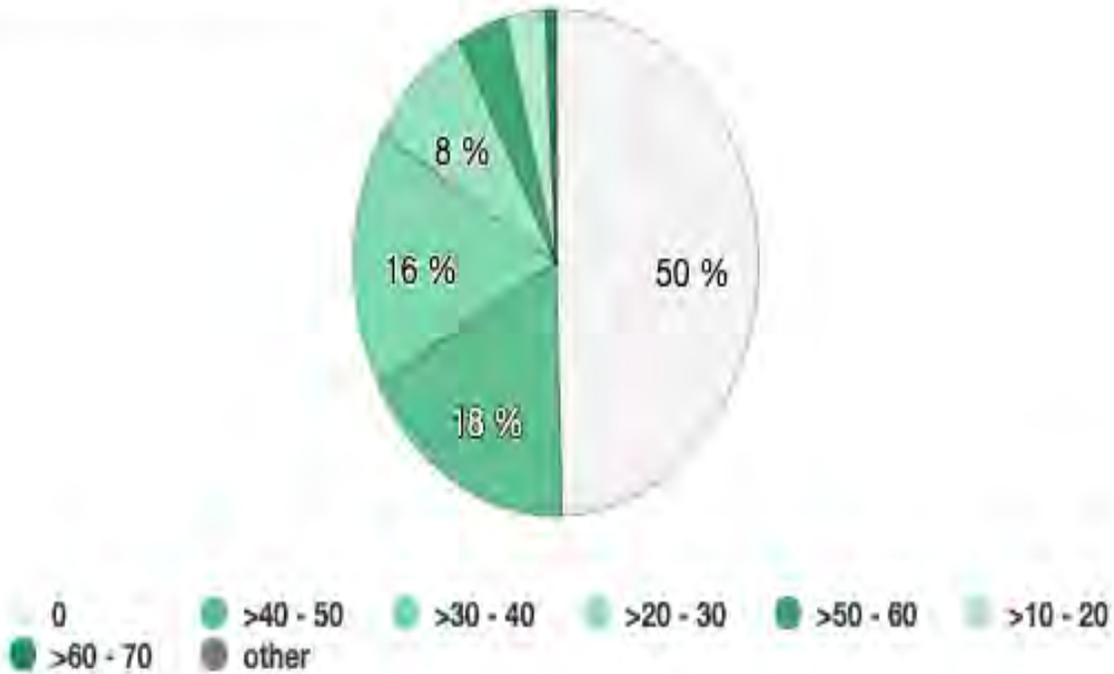


IFTDSS

Canopy Cover

Canopy Cover (percent) Data Summary within "AC_2016" Landscape

Source Landscape Name: AC_2016
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 774,723
Model Name: AC_2016 - Auto97th

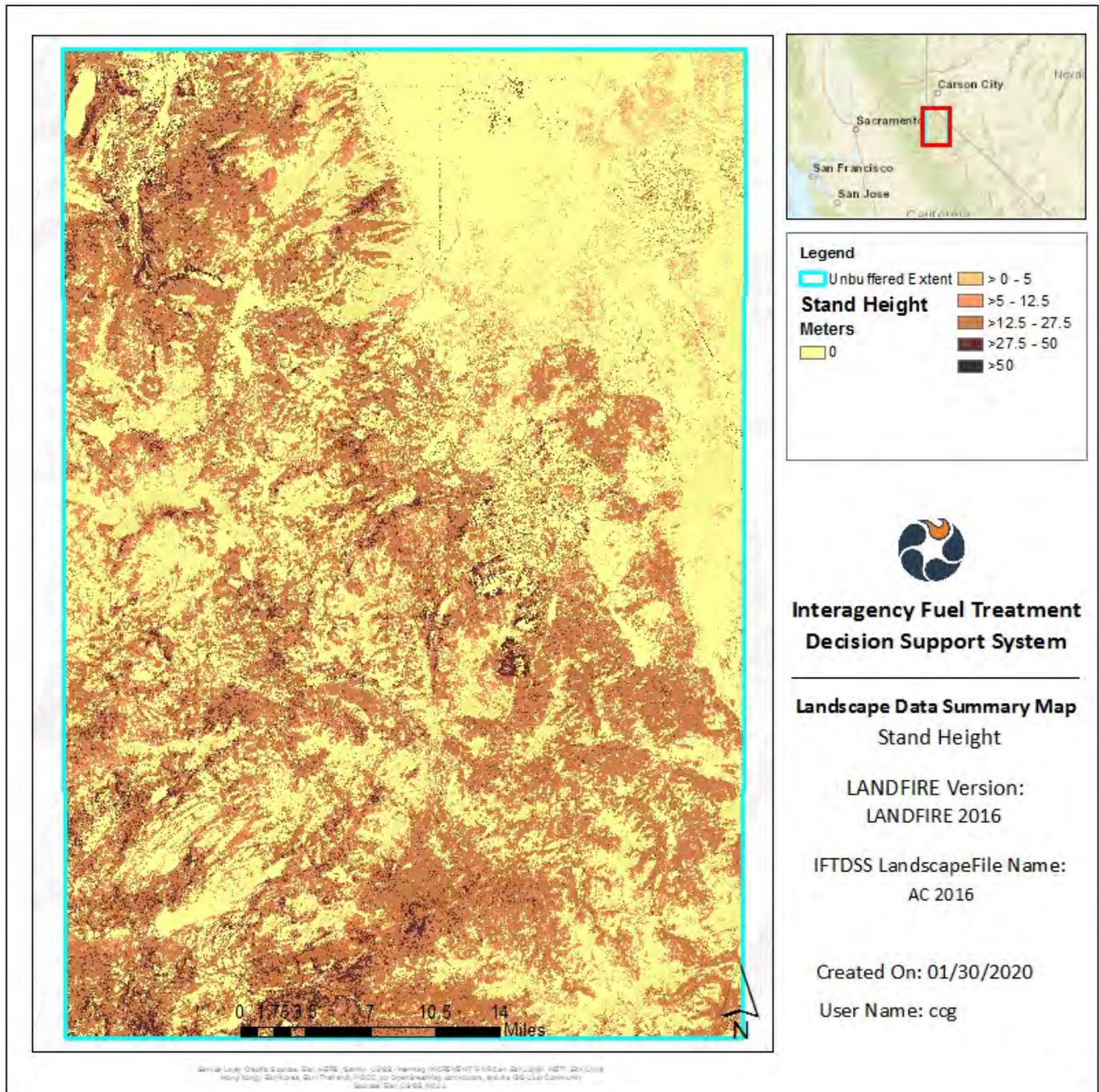


IFTDSS

Canopy Cover

Canopy Cover (percent)	Pixel Count (freq)	Acres In LCP	Percent In LCP
0 (non-forested)	1726090	383874	50
>10 - 20	109902	24442	3
>20 - 30	294327	65457	8
>30 - 40	574707	127812	16
>40 - 50	612288	136170	18
>50 - 60	137332	30542	4
>60 - 70	27021	6009	1
>70 - 80	1879	418	0

Stand Height



Stand Height

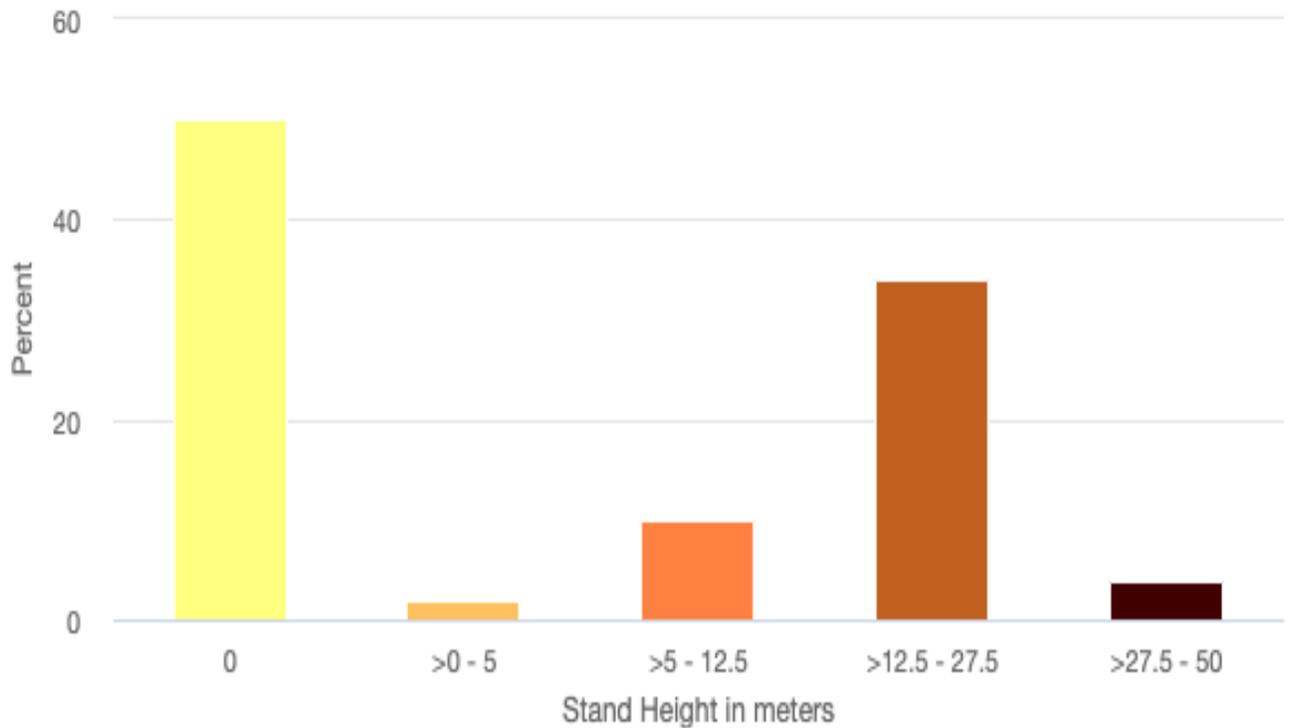
Stand Height (meters) Data Summary within "AC_2016" Landscape

Source Landscape Name: AC_2016

Landfire Version: LANDFIRE 2016

Source Landscape Acres: 774,723

Model Name: AC_2016 - Auto97th

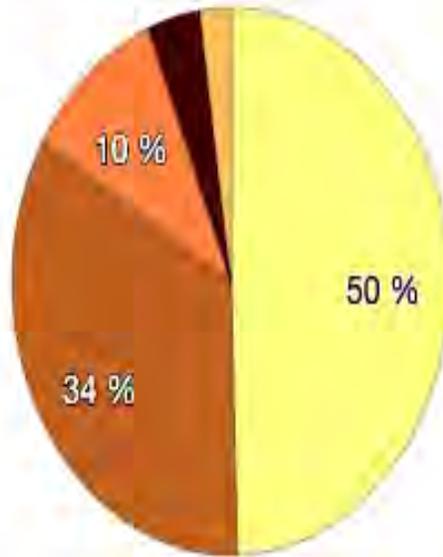


IFTDSS

Stand Height

Stand Height (meters) Data Summary within "AC_2016" Landscape

Source Landscape Name: AC_2016
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 774,723
Model Name: AC_2016 - Auto97th



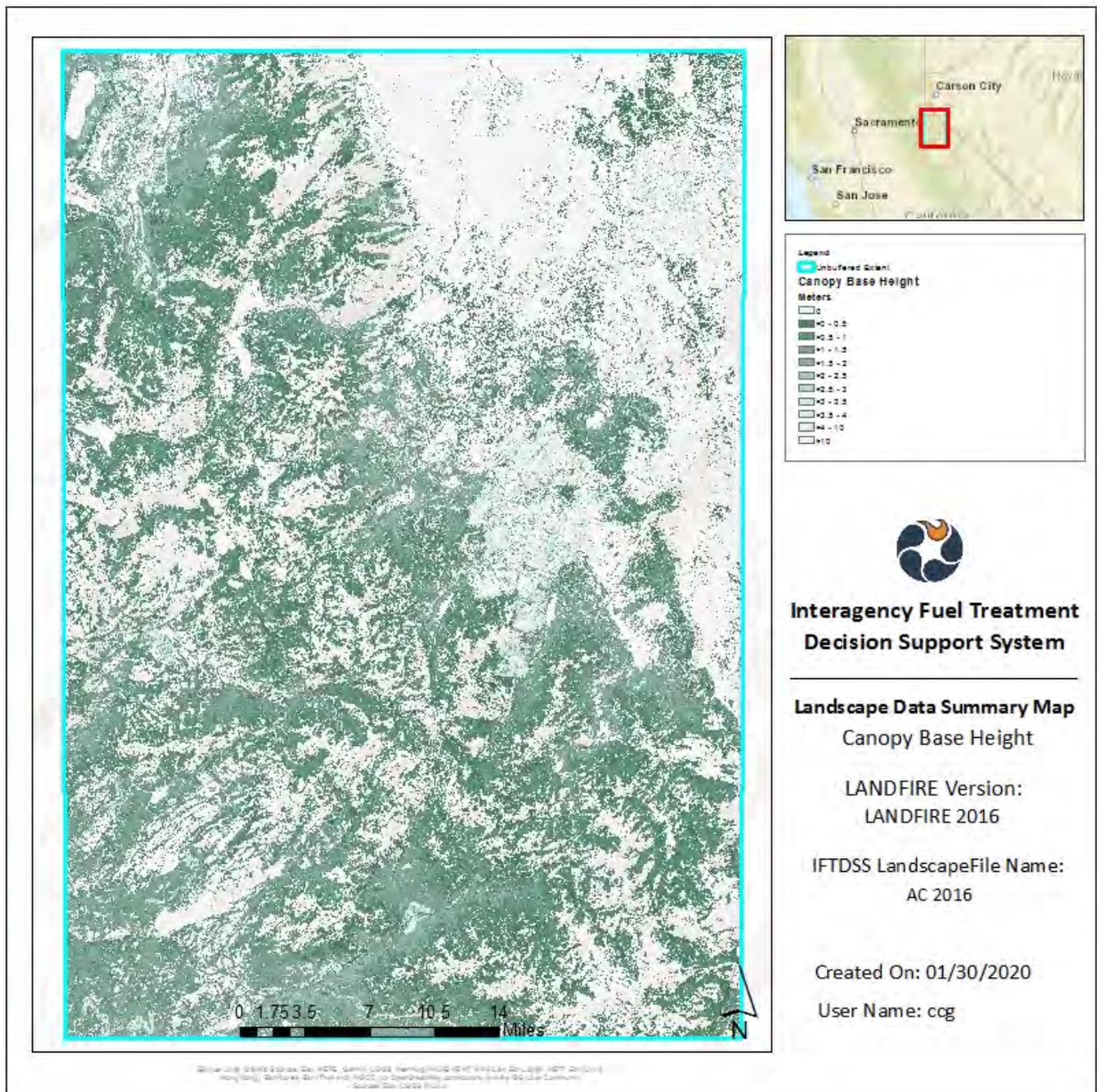
0 >12.5 - 27.5 >5 - 12.5 >27.5 - 50 >0 - 5

IFTDSS

Stand Height

Stand Height (meters)	Pixel Count (freq)	Acres In LCP	Percent In LCP
0 (non-forested)	1726090	383874	50
>0 - 5	79420	17663	2
>5 - 12.5	355430	79046	10
>12.5 - 27.5	1186934	263968	34
>27.5 - 50	135672	30173	4

Canopy Base Height



Canopy Base Height

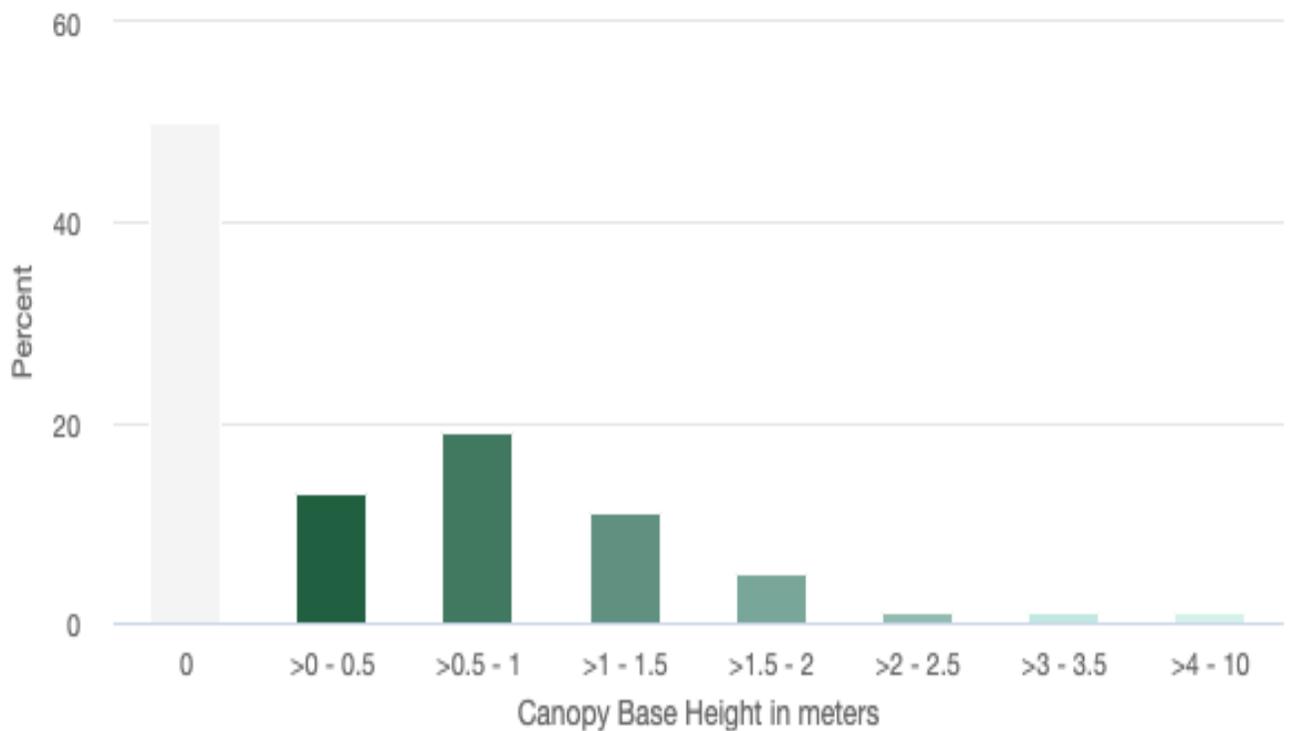
Canopy Base Height (meters) Data Summary within "AC_2016" Landscape

Source Landscape Name: AC_2016

Landfire Version: LANDFIRE 2016

Source Landscape Acres: 774,723

Model Name: AC_2016 - Auto97th

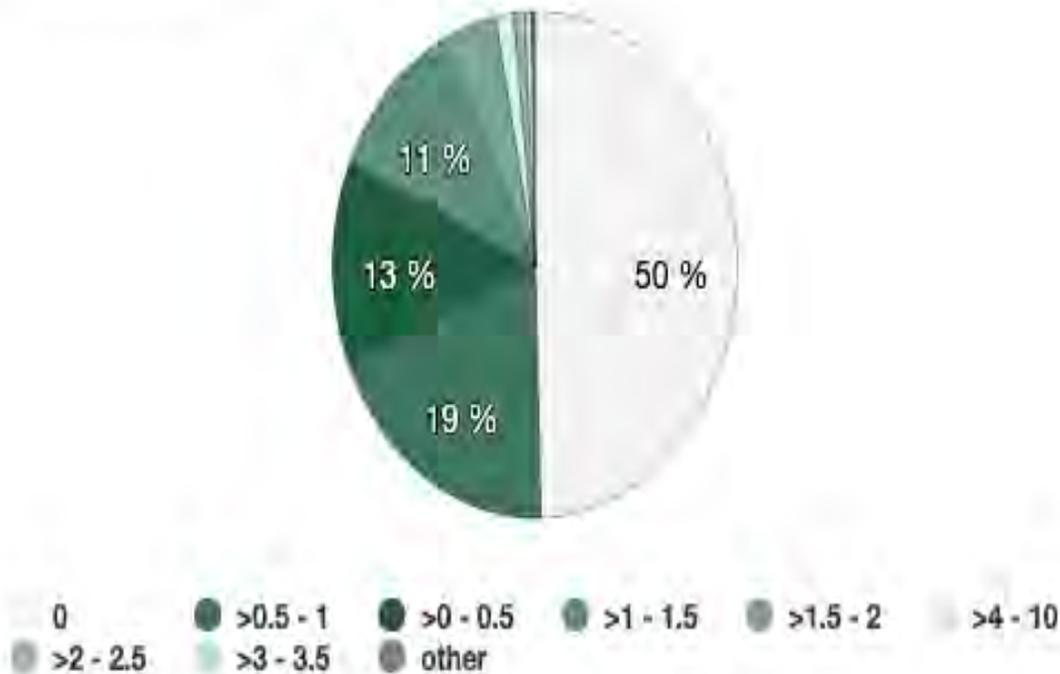


IFTDSS

Canopy Base Height

Canopy Base Height (meters) Data Summary within "AC_2016" Landscape

Source Landscape Name: AC_2016
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 774,723
Model Name: AC_2016 - Auto97th



IFDSS

Canopy Base Height

Canopy Base Height (meters)	Pixel Count (freq)	Acres In LCP	Percent In LCP
0 (non-forested)	1726090	383874	50
>0 - 0.5	457662	101782	13
>0.5 - 1	659782	146732	19
>1 - 1.5	374634	83317	11
>1.5 - 2	157121	34943	5
>2 - 2.5	30045	6682	1
>2.5 - 3	7504	1669	0
>3 - 3.5	18127	4031	1
>3.5 - 4	1985	441	0
>4 - 10	50596	11252	1

Canopy Bulk Density

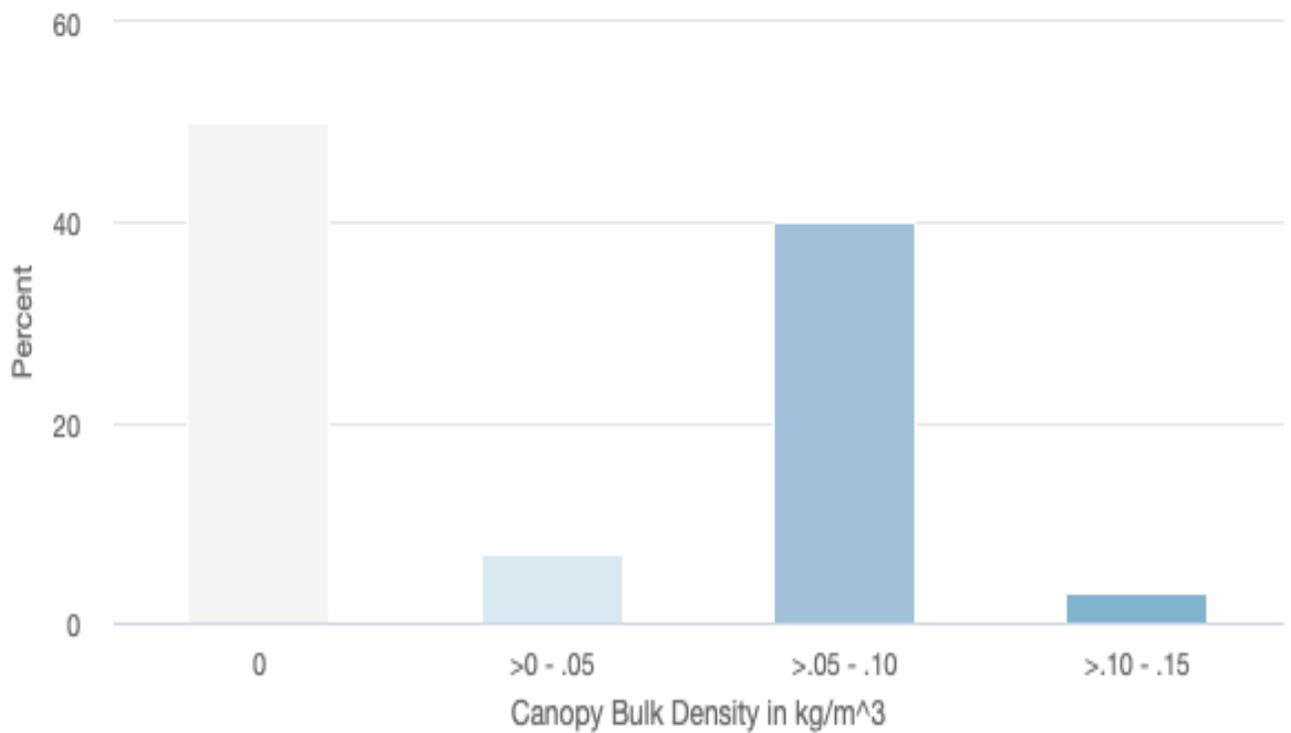
Canopy Bulk Density (kg/m³) Data Summary within "AC_2016" Landscape

Source Landscape Name: AC_2016

Landfire Version: LANDFIRE 2016

Source Landscape Acres: 774,723

Model Name: AC_2016 - Auto97th

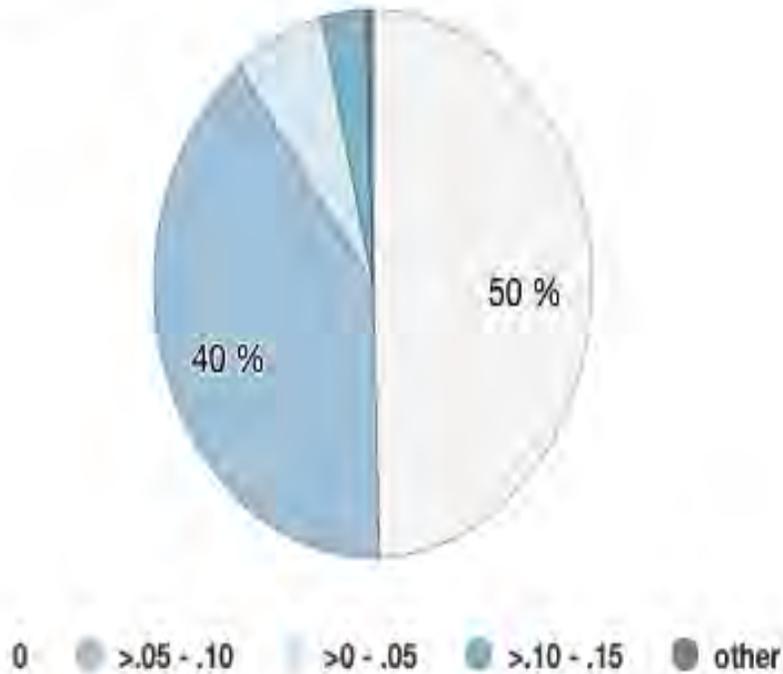


IFTDSS

Canopy Bulk Density

Canopy Bulk Density (kg/m³) Data Summary within "AC_2016" Landscape

Source Landscape Name: AC_2016
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 774,723
Model Name: AC_2016 - Auto97th



APTUS

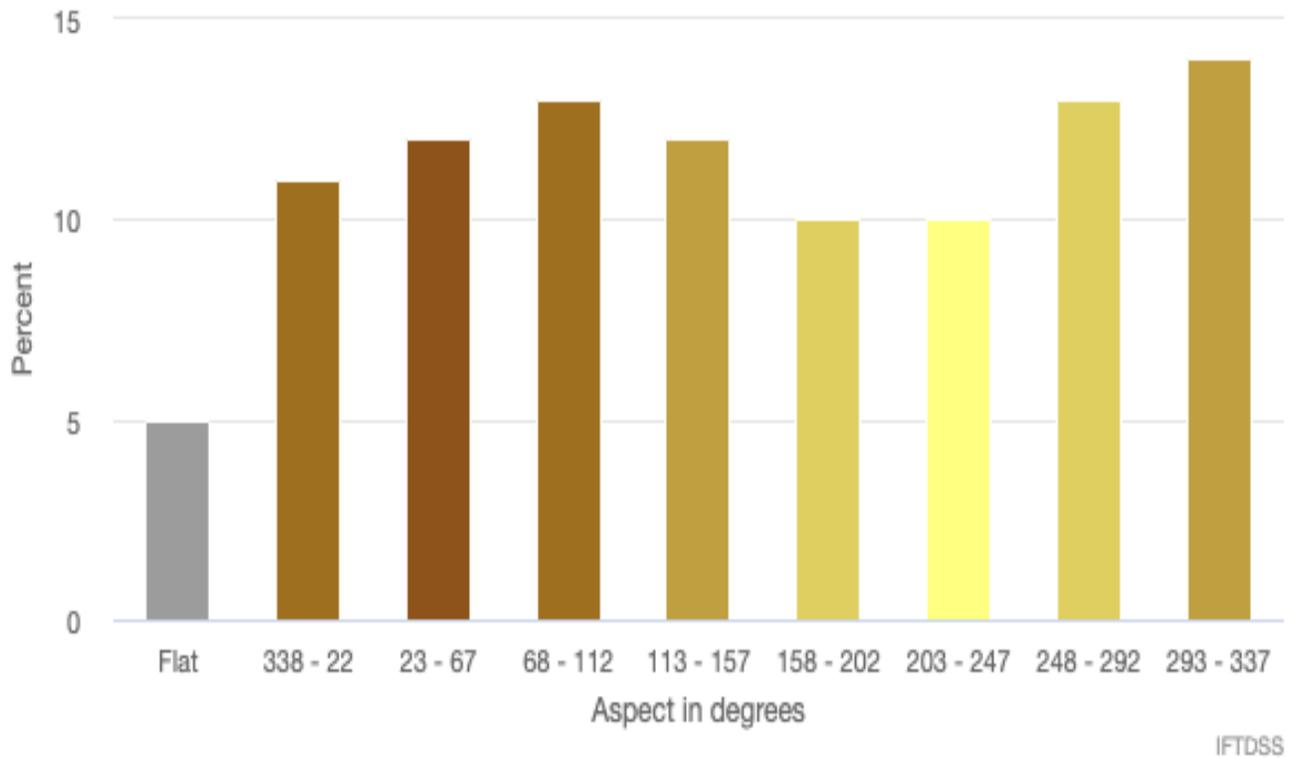
Canopy Bulk Density

Canopy Bulk Density (kg/m ³)	Pixel Count (freq)	Acres In LCP	Percent In LCP
0 (non-forested)	1726090	383874	50
>0 - .05	233868	52011	7
>.05 - .10	1392311	309643	40
>.10 - .15	113629	25271	3
>.15 - .20	12470	2773	0
>.20 - .25	5137	1142	0
>.25 - .30	20	4	0
>.30 - .35	18	4	0
>.35 - .40	3	1	0

Aspect

Aspect (degrees) Data Summary within "AC_2016" Landscape

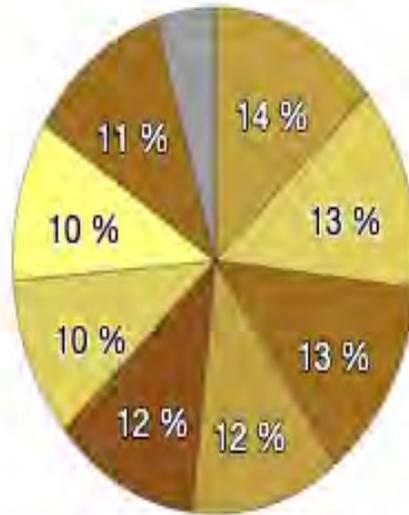
Source Landscape Name: AC_2016
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 774,723
Model Name: AC_2016 - Auto97th



Aspect

Aspect (degrees) Data Summary within "AC_2016" Landscape

Source Landscape Name: AC_2016
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 774,723
Model Name: AC_2016 - Auto97th

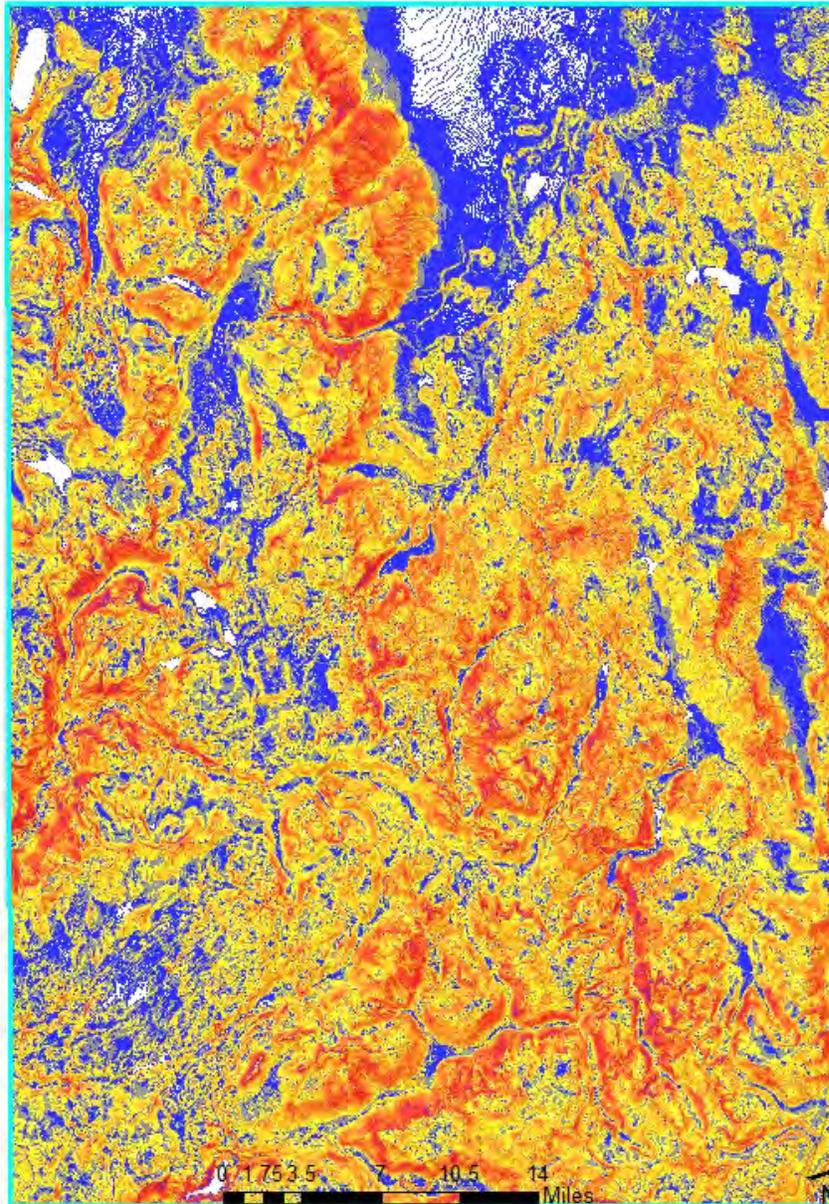


IFTDSS

Aspect

Aspect (degrees)	Pixel Count (freq)	Acres In LCP	Percent In LCP
Flat	165635	36836	5
338 - 22 (N)	388675	86439	11
23 - 67 (NE)	401336	89255	12
68 - 112 (E)	457953	101846	13
113 - 157 (SE)	415840	92481	12
158 - 202 (S)	362311	80576	10
203 - 247 (SW)	359756	80008	10
248 - 292 (W)	460085	102321	13
293 - 337 (NW)	471955	104960	14

Slope



Legend

Unbuffered Extent	>15 - 20
Slope	>20 - 25
Degrees	>25 - 30
0	>30 - 35
>0 - 5	>35 - 40
>5 - 10	>40 - 45
>10 - 15	>45



Interagency Fuel Treatment Decision Support System

Landscape Data Summary Map Slope

LANDFIRE Version:
LANDFIRE 2016

IFTDSS LandscapeFile Name:
AC 2016

Created On: 01/30/2020

User Name: cgg

Revised 01/30/2020 by cgg. All rights reserved. No warranty is made for the use of the data for purposes other than those intended. The data is provided as a service to the public and is not to be used for any other purpose.

Slope

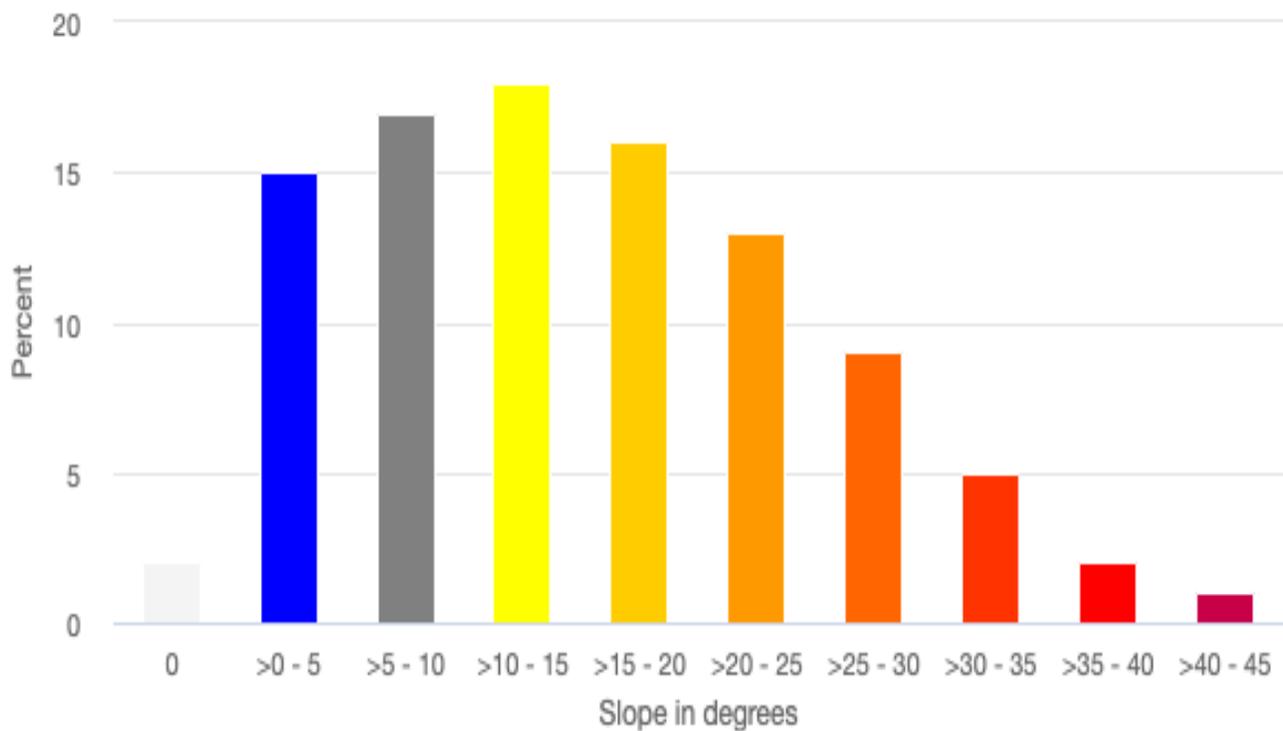
Slope (degrees) Data Summary within "AC_2016" Landscape

Source Landscape Name: AC_2016

Landfire Version: LANDFIRE 2016

Source Landscape Acres: 774,723

Model Name: AC_2016 - Auto97th



IFTDSS

Slope

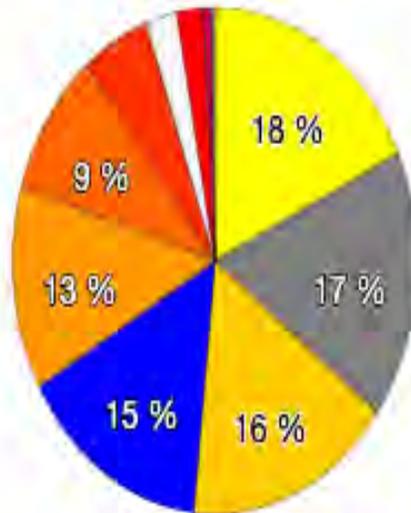
Slope (degrees) Data Summary within "AC_2016" Landscape

Source Landscape Name: AC_2016

Landfire Version: LANDFIRE 2016

Source Landscape Acres: 774,723

Model Name: AC_2016 - Auto97th



IFTDSS

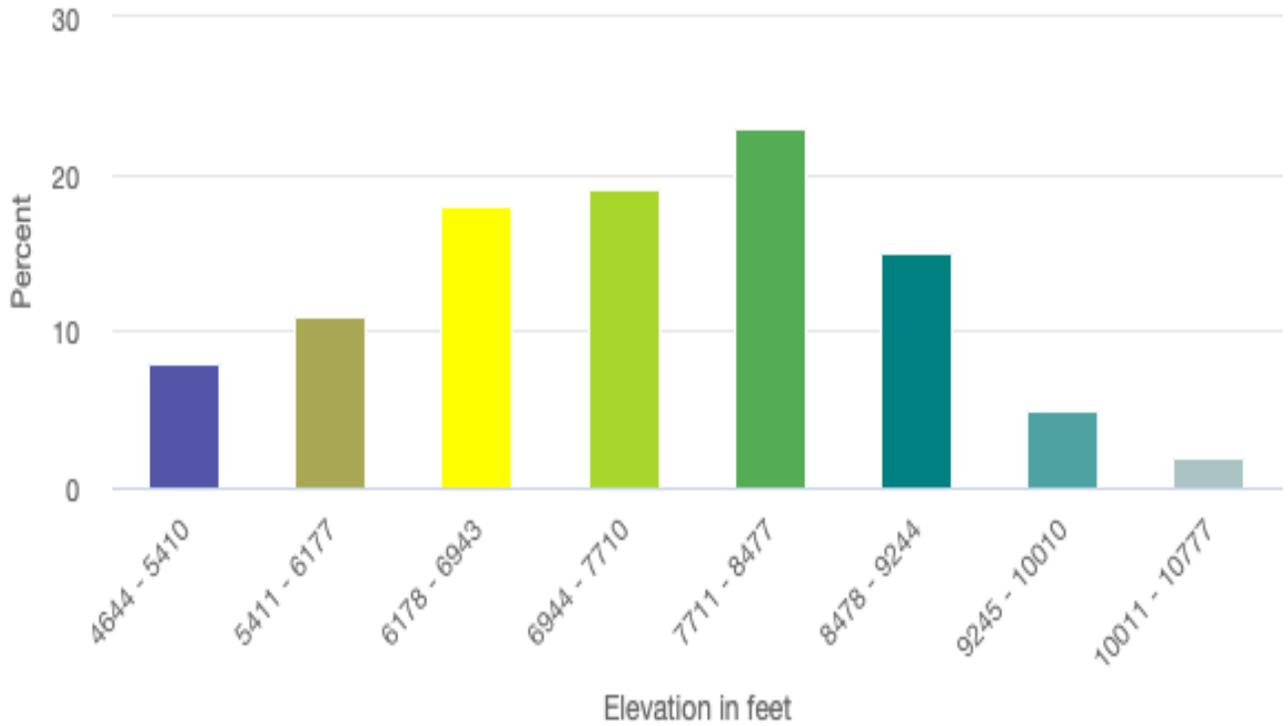
Slope

Slope (degrees)	Pixel Count (freq)	Acres In LCP	Percent In LCP
0	86934	19334	2
>0 - 5	525433	116854	15
>5 - 10	599359	133294	17
>10 - 15	628477	139770	18
>15 - 20	572551	127332	16
>20 - 25	453255	100802	13
>25 - 30	325151	72312	9
>30 - 35	186822	41548	5
>35 - 40	73579	16364	2
>40 - 45	22344	4969	1
>45	9641	2144	0

Elevation

Elevation (feet) Data Summary within "AC_2016" Landscape

Source Landscape Name: AC_2016
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 774,723
Model Name: AC_2016 - Auto97th



IFTDSS

Elevation

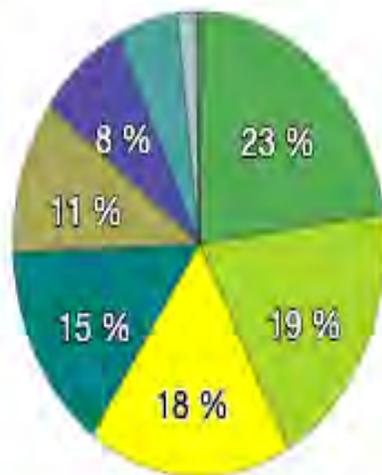
Elevation (feet) Data Summary within "AC_2016" Landscape

Source Landscape Name: AC_2016

Landfire Version: LANDFIRE 2016

Source Landscape Acres: 774,723

Model Name: AC_2016 - Auto97th

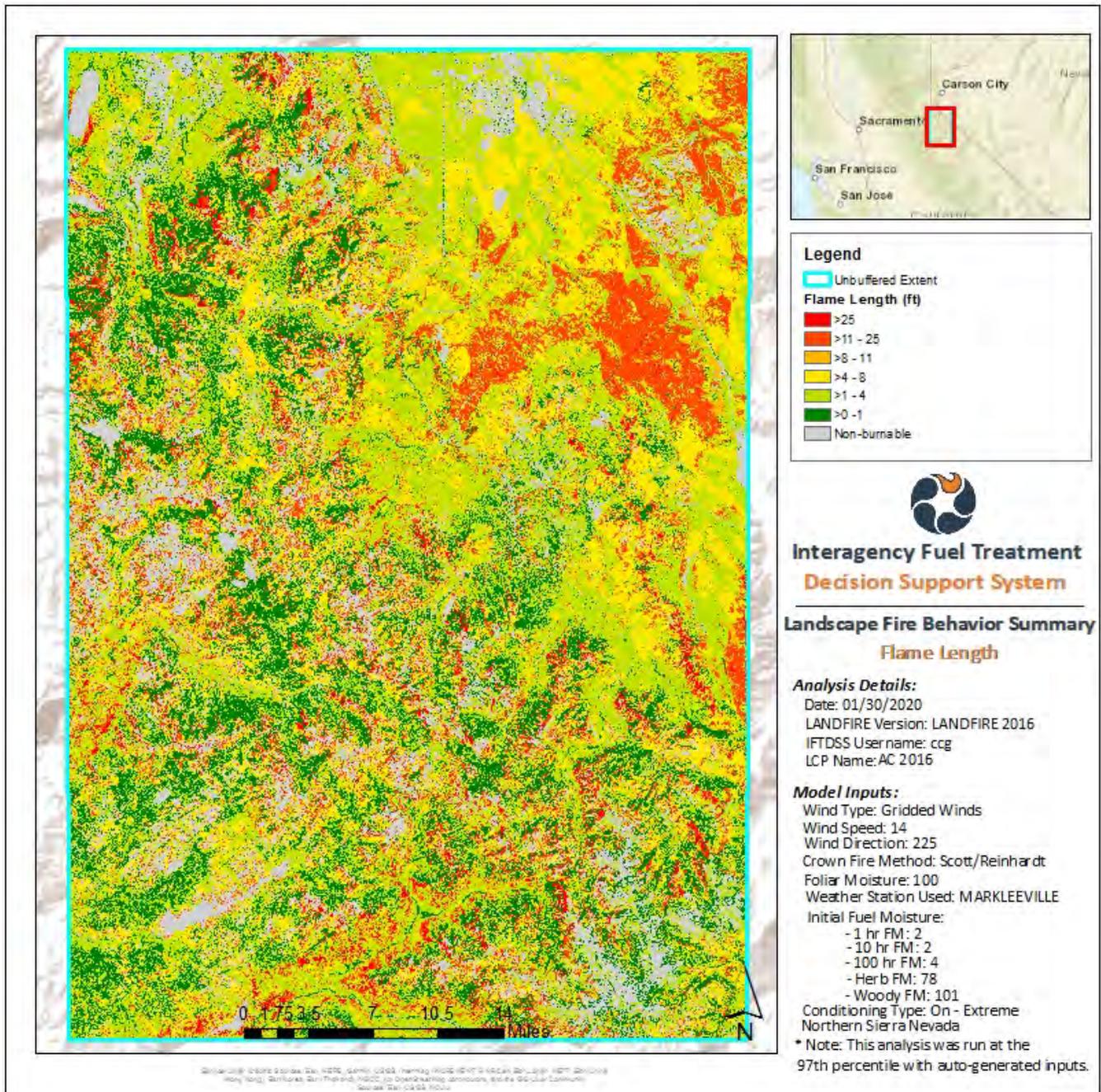


IFTDSS

Elevation

Elevation (feet)	Pixel Count (freq)	Acres In LCP	Percent In LCP
3877 - 4643	196	44	0
4644 - 5410	265138	58965	8
5411 - 6177	373086	82972	11
6178 - 6943	614850	136739	18
6944 - 7710	668601	148693	19
7711 - 8477	798651	177616	23
8478 - 9244	511693	113798	15
9245 - 10010	186841	41552	5
10011 - 10777	58153	12933	2
10778 - 11546	6337	1409	0

Flame Length



Flame Length

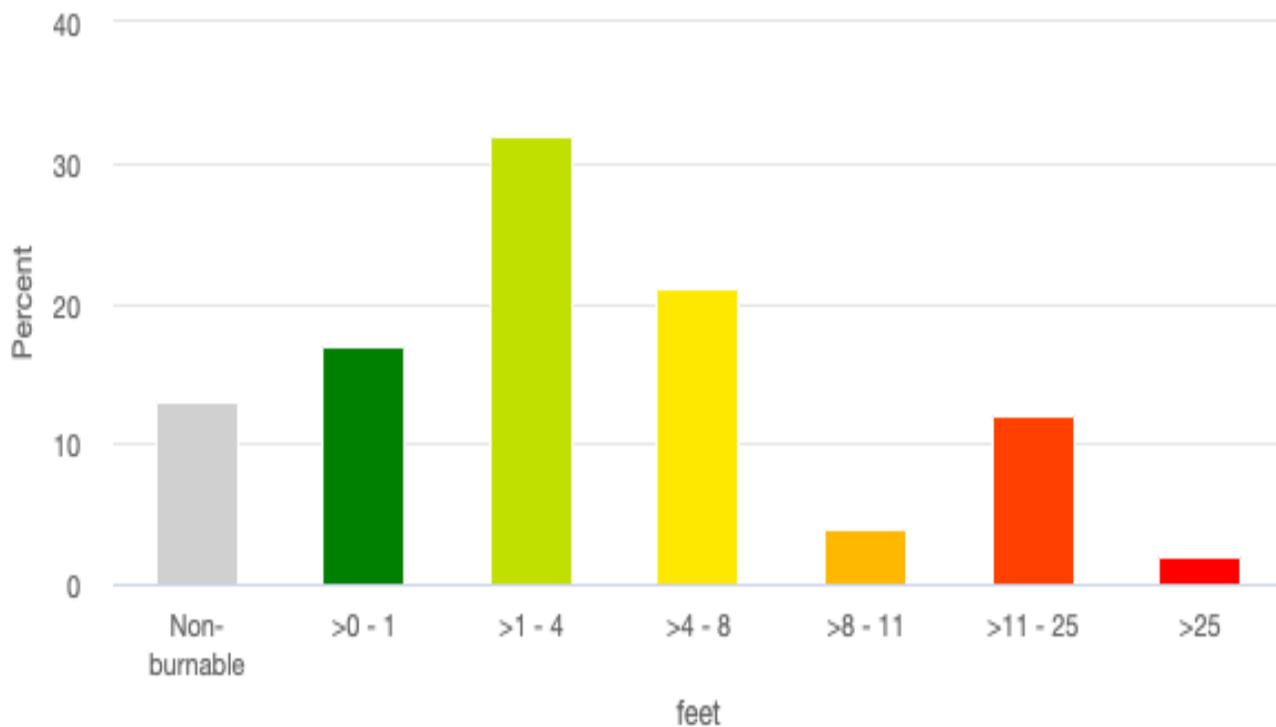
Flame Length (feet) Data Summary within "AC_2016" Landscape

Source Landscape Name: AC_2016

Landfire Version: LANDFIRE 2016

Source Landscape Acres: 774,723

Model Name: AC_2016 - Auto97th

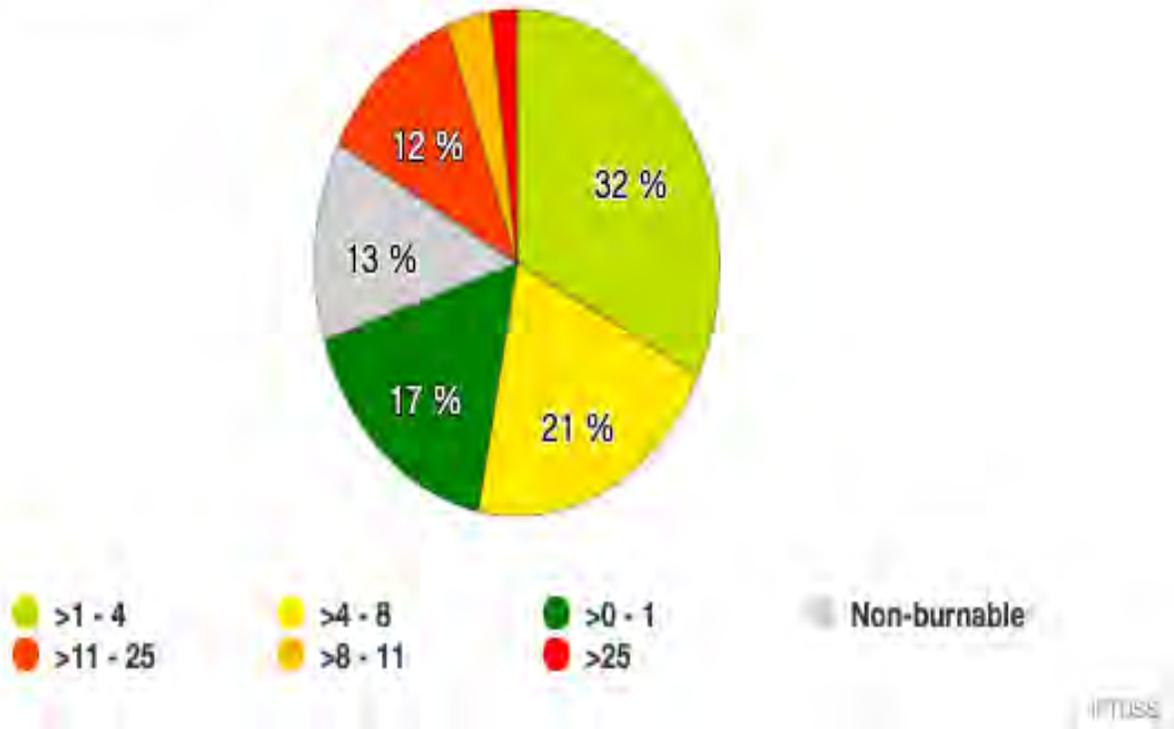


IFTDSS

Flame Length

Flame Length (feet) Data Summary within "AC_2016" Landscape

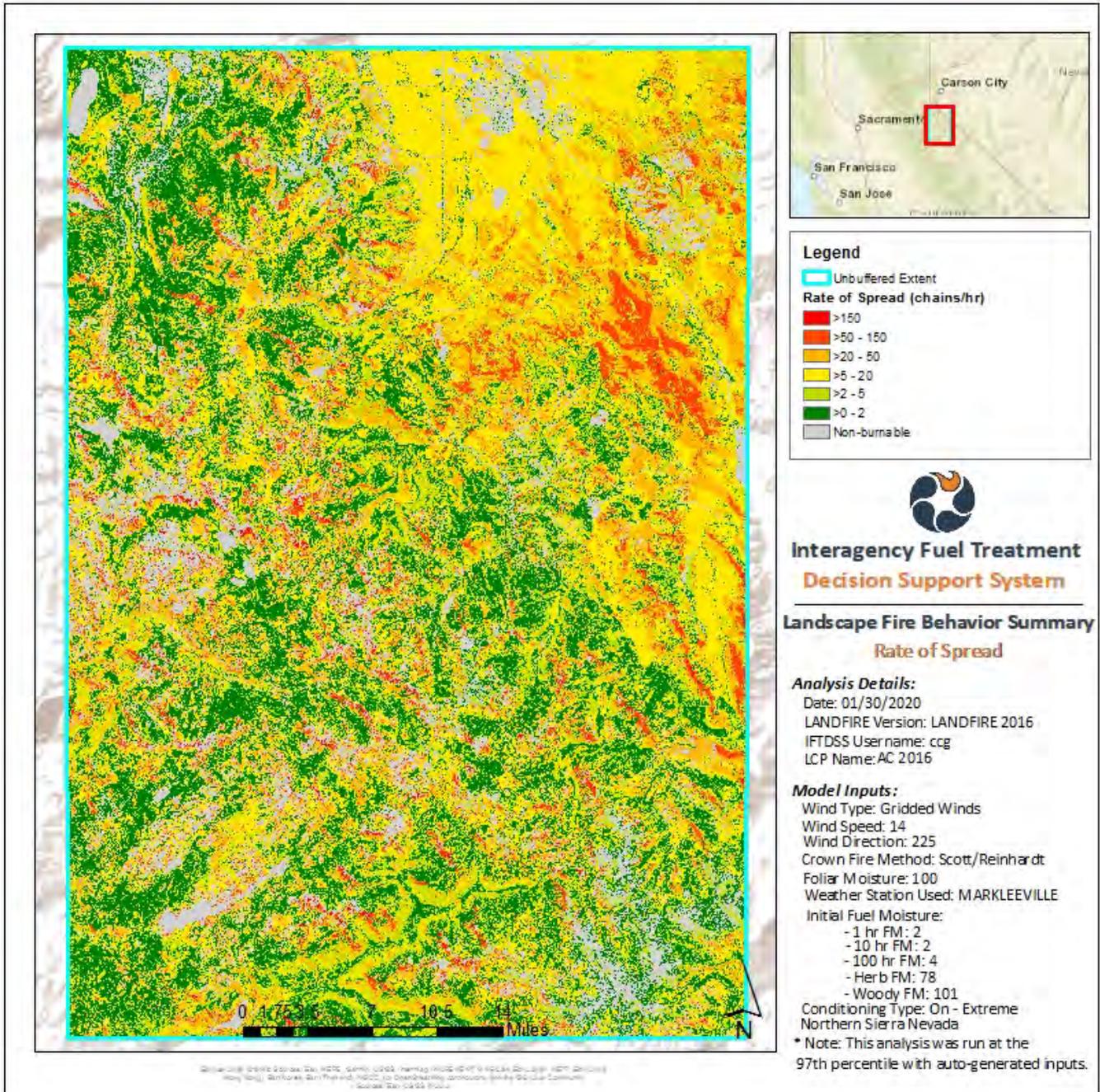
Source Landscape Name: AC_2016
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 774,723
Model Name: AC_2016 - Auto97th



Flame Length

Flame Length (feet)	Pixel Count (freq)	Acres In LCP	Percent In LCP
Non-burnable	444212	98790	13
>0 - 1	591253	131492	17
>1 - 4	1124821	250154	32
>4 - 8	724736	161178	21
>8 - 11	123169	27392	4
>11 - 25	402831	89588	12
>25	72524	16129	2

Spread Rate



Spread Rate

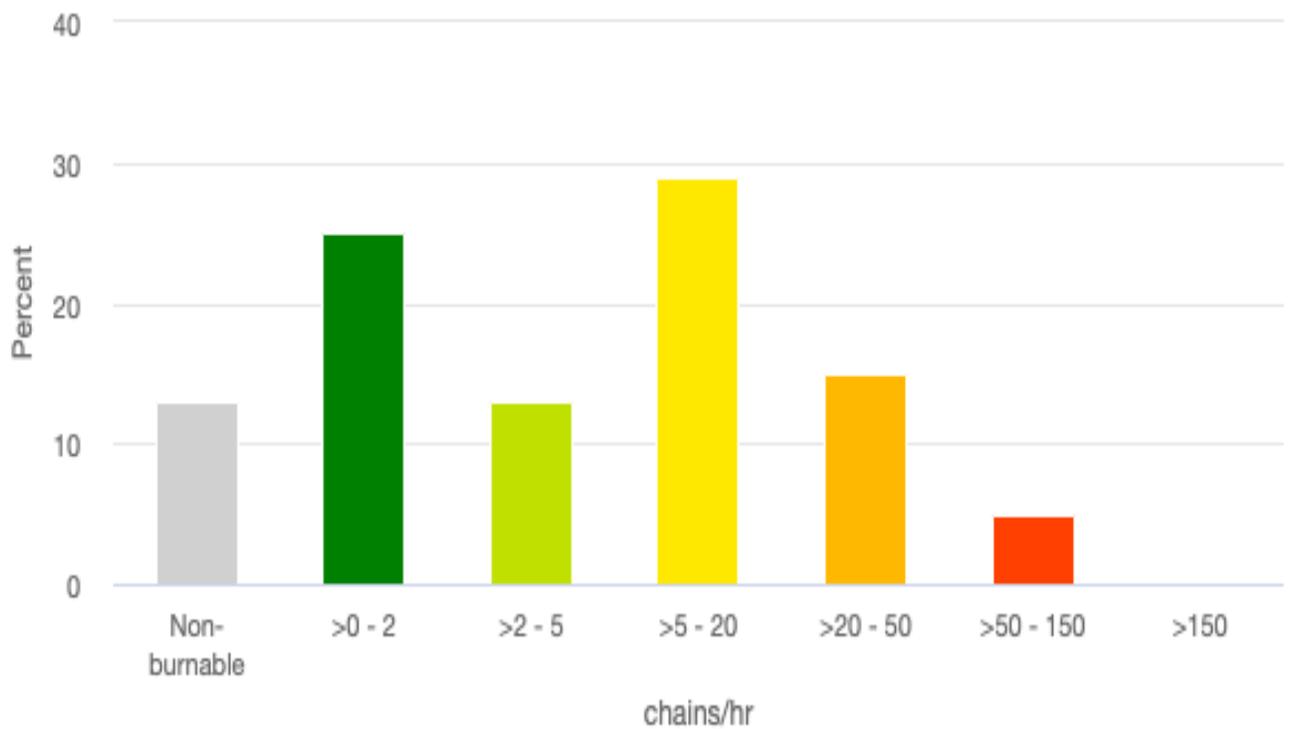
Rate of Spread (chains/hr) Data Summary within "AC_2016" Landscape

Source Landscape Name: AC_2016

Landfire Version: LANDFIRE 2016

Source Landscape Acres: 774,723

Model Name: AC_2016 - Auto97th



IFTDSS

Spread Rate

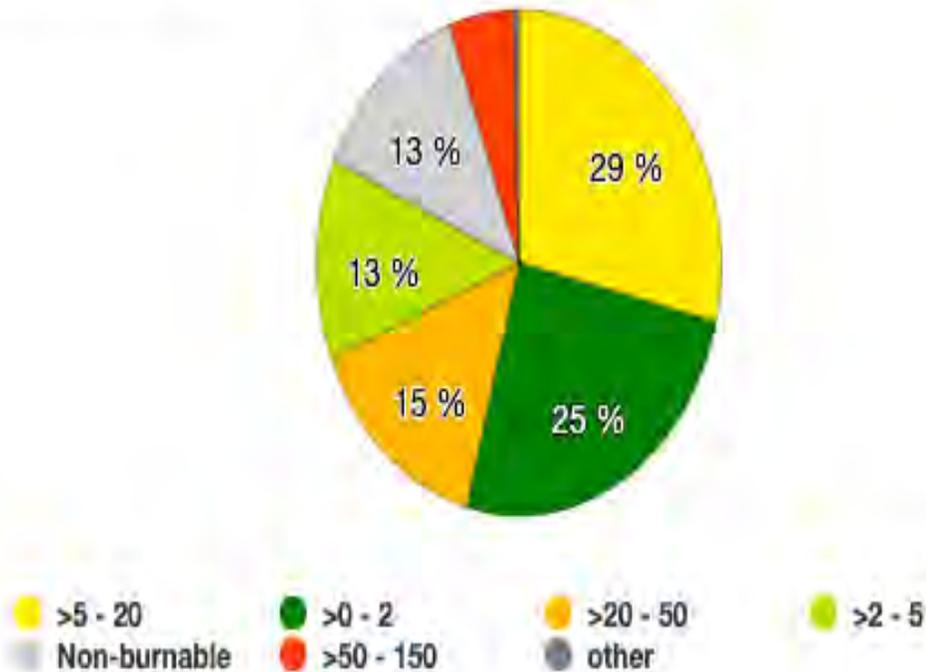
Rate of Spread (chains/hr) Data Summary within "AC_2016" Landscape

Source Landscape Name: AC_2016

Landfire Version: LANDFIRE 2016

Source Landscape Acres: 774,723

Model Name: AC_2016 - Auto97th

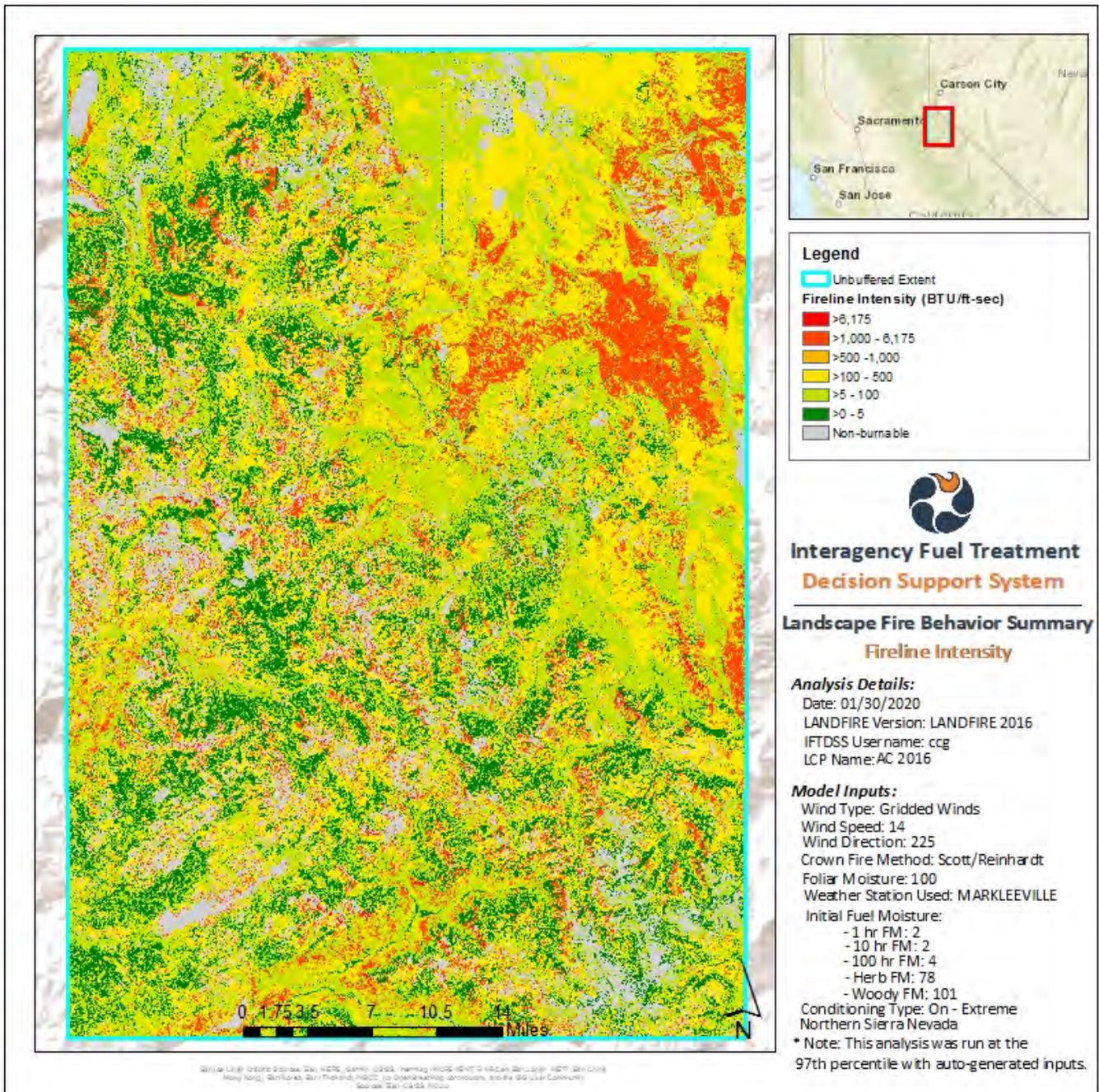


IFTDSS

Spread Rate

Rate of Spread (chains/hr)	Pixel Count (freq)	Acres In LCP	Percent In LCP
Non-burnable	444212	98790	13
>0 - 2	886310	197111	25
>2 - 5	447767	99581	13
>5 - 20	1002066	222854	29
>20 - 50	509198	113243	15
>50 - 150	179151	39842	5
>150	14842	3301	0

Intensity



Intensity

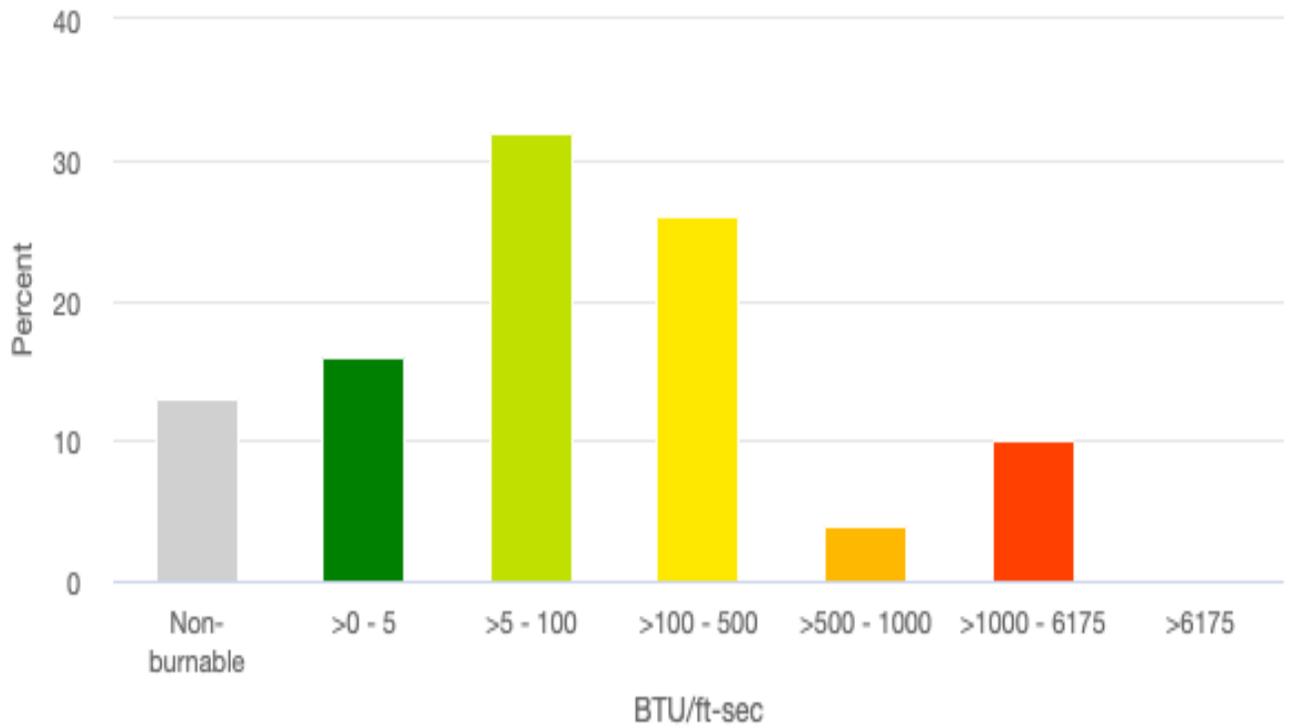
Fireline Intensity (BTU/ft-sec) Data Summary within "AC_2016" Landscape

Source Landscape Name: AC_2016

Landfire Version: LANDFIRE 2016

Source Landscape Acres: 774,723

Model Name: AC_2016 - Auto97th



IFTDSS

Intensity

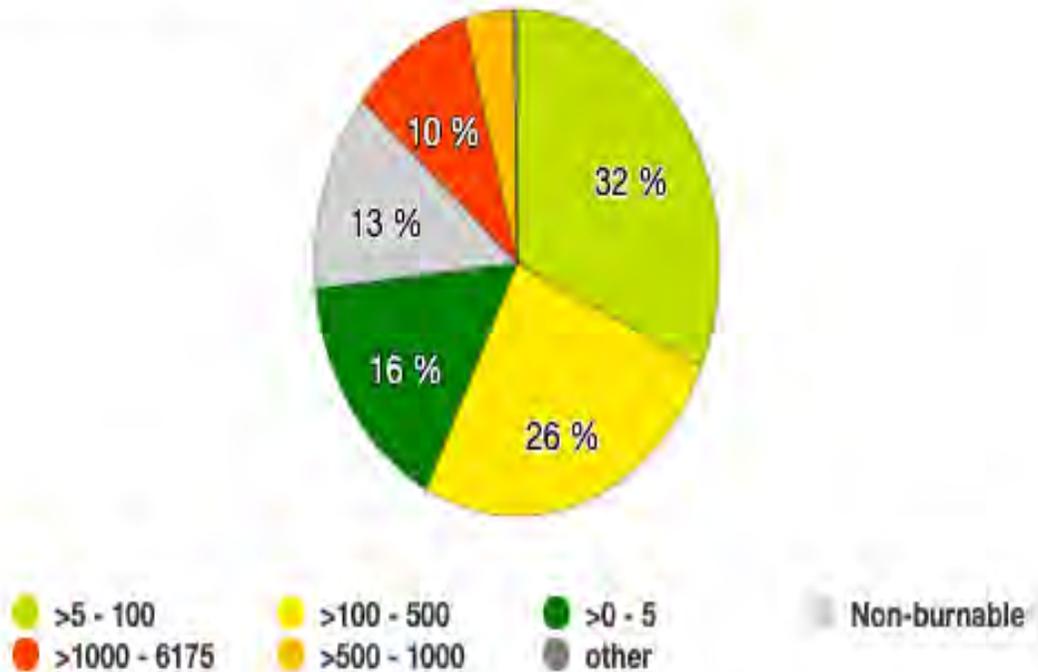
Fireline Intensity (BTU/ft-sec) Data Summary within "AC_2016" Landscape

Source Landscape Name: AC_2016

Landfire Version: LANDFIRE 2016

Source Landscape Acres: 774,723

Model Name: AC_2016 - Auto97th

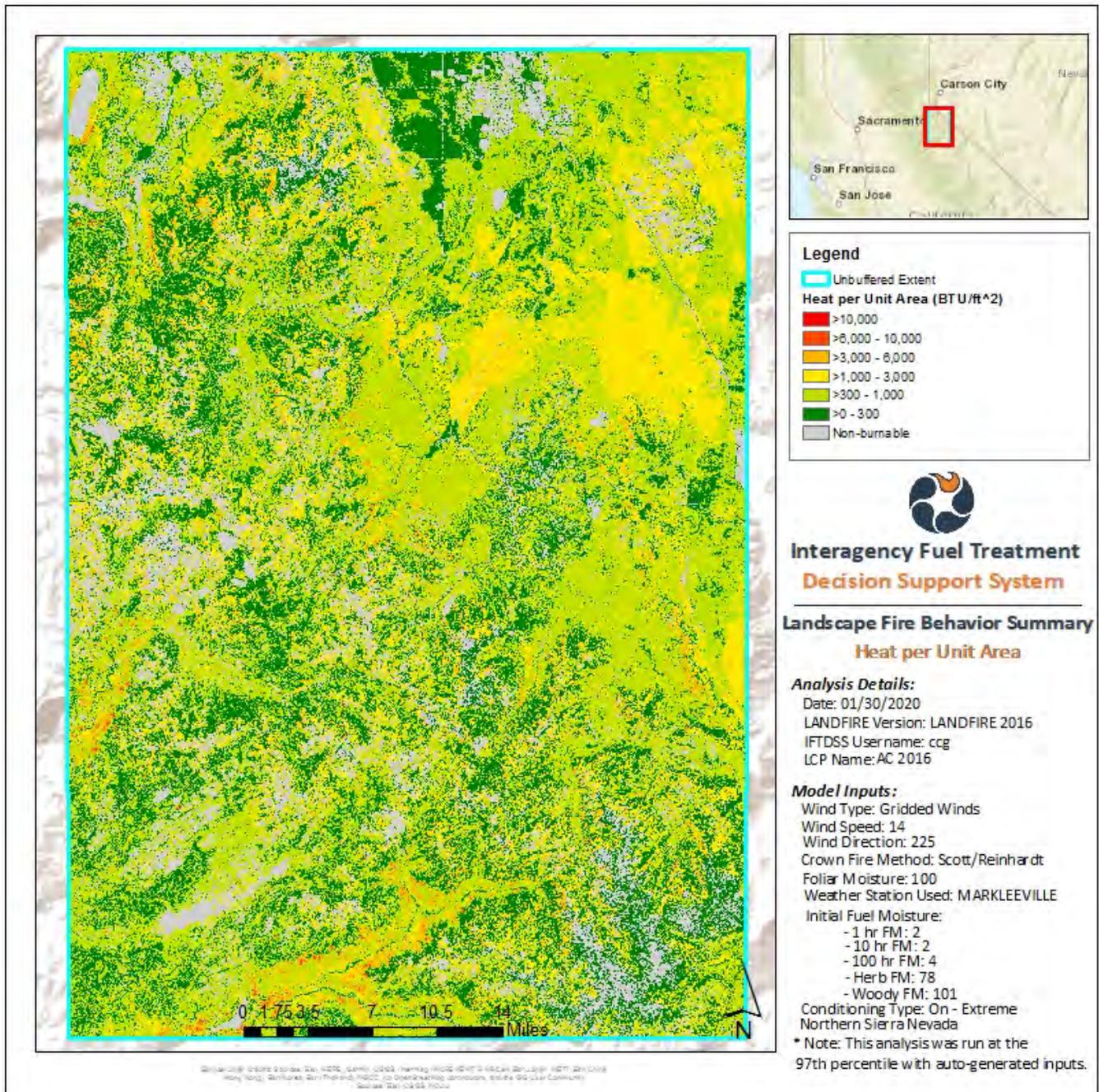


IFTDSS

Intensity

Fireline Intensity (BTU/ft-sec)	Pixel Count (freq)	Acres In LCP	Percent In LCP
Non-burnable	444212	98790	13
>0 - 5	554791	123383	16
>5 - 100	1108968	246629	32
>100 - 500	892306	198444	26
>500 - 1,000	139210	30960	4
>1,000 - 6,175	336389	74811	10
>6,175	7670	1706	0

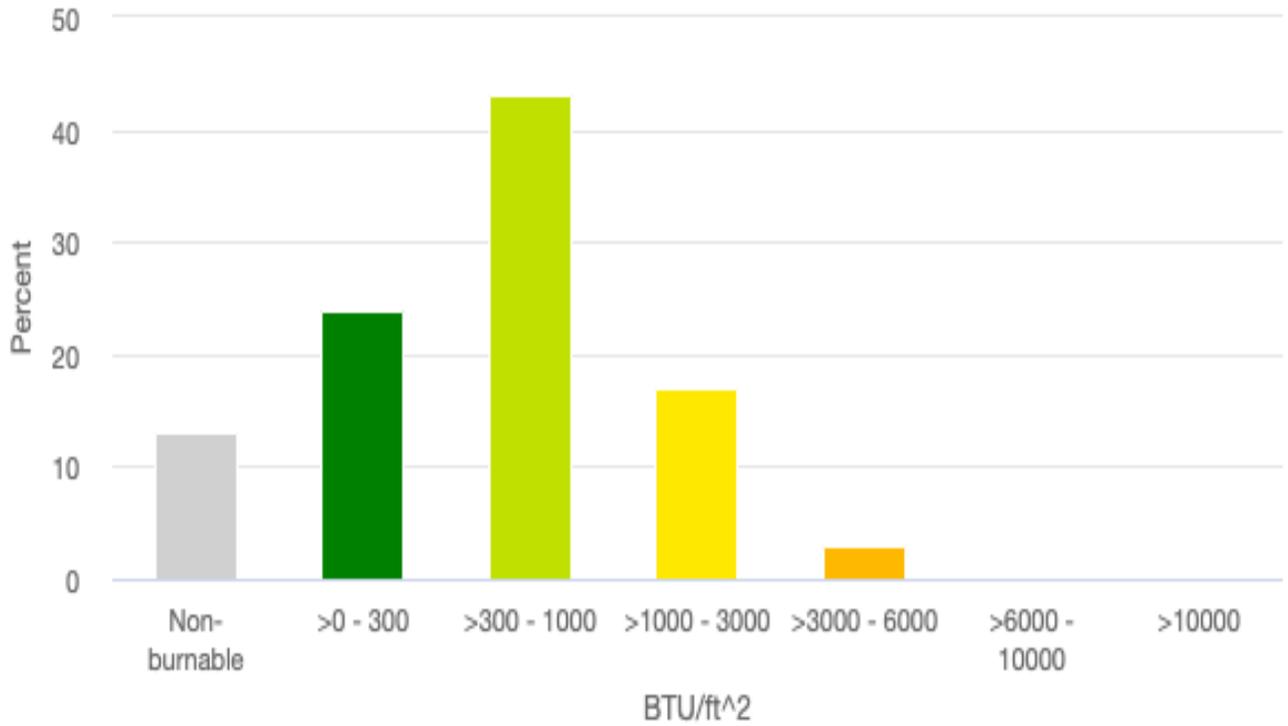
Heat/Area



Heat/Area

Heat per Unit Area (BTU/ft²) Data Summary within "AC_2016" Landscape

Source Landscape Name: AC_2016
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 774,723
Model Name: AC_2016 - Auto97th

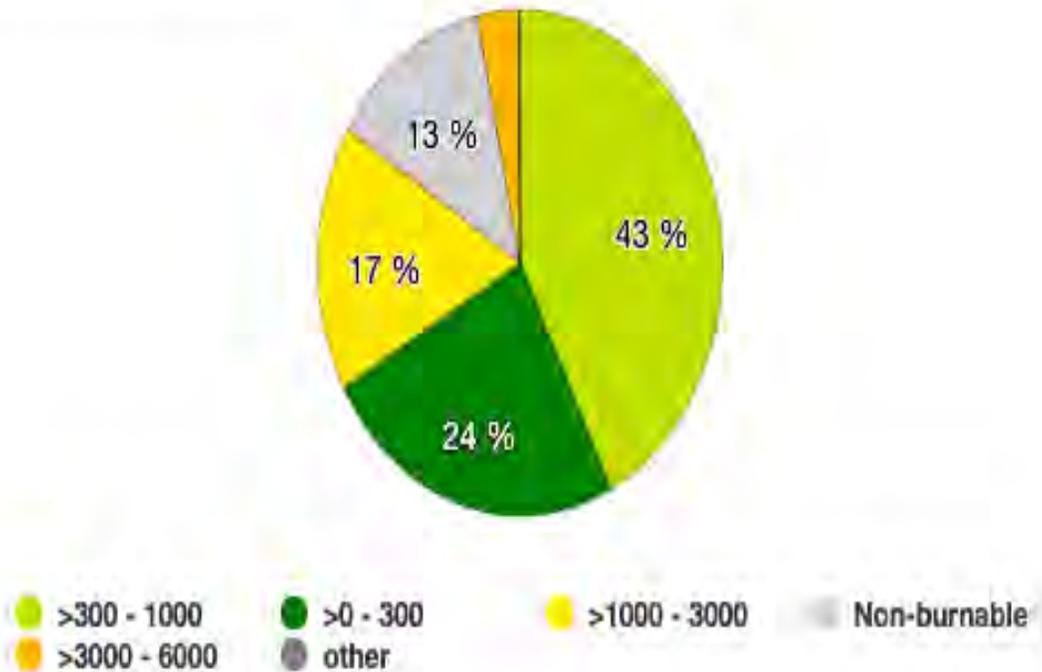


IFTDSS

Heat/Area

Heat per Unit Area (BTU/ft²) Data Summary within "AC_2016" Landscape

Source Landscape Name: AC_2016
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 774,723
Model Name: AC_2016 - Auto97th



IFTDSS

Heat/Area

Heat per Unit Area (BTU/ft ²)	Pixel Count (freq)	Acres In LCP	Percent In LCP
Non-burnable	444212	98790	13
>0 - 300	842213	187304	24
>300 - 1,000	1485136	330287	43
>1,000 - 3,000	593536	131999	17
>3,000 - 6,000	114324	25425	3
>6,000 - 10,000	4040	898	0
>10,000	85	19	0

Crown Fire

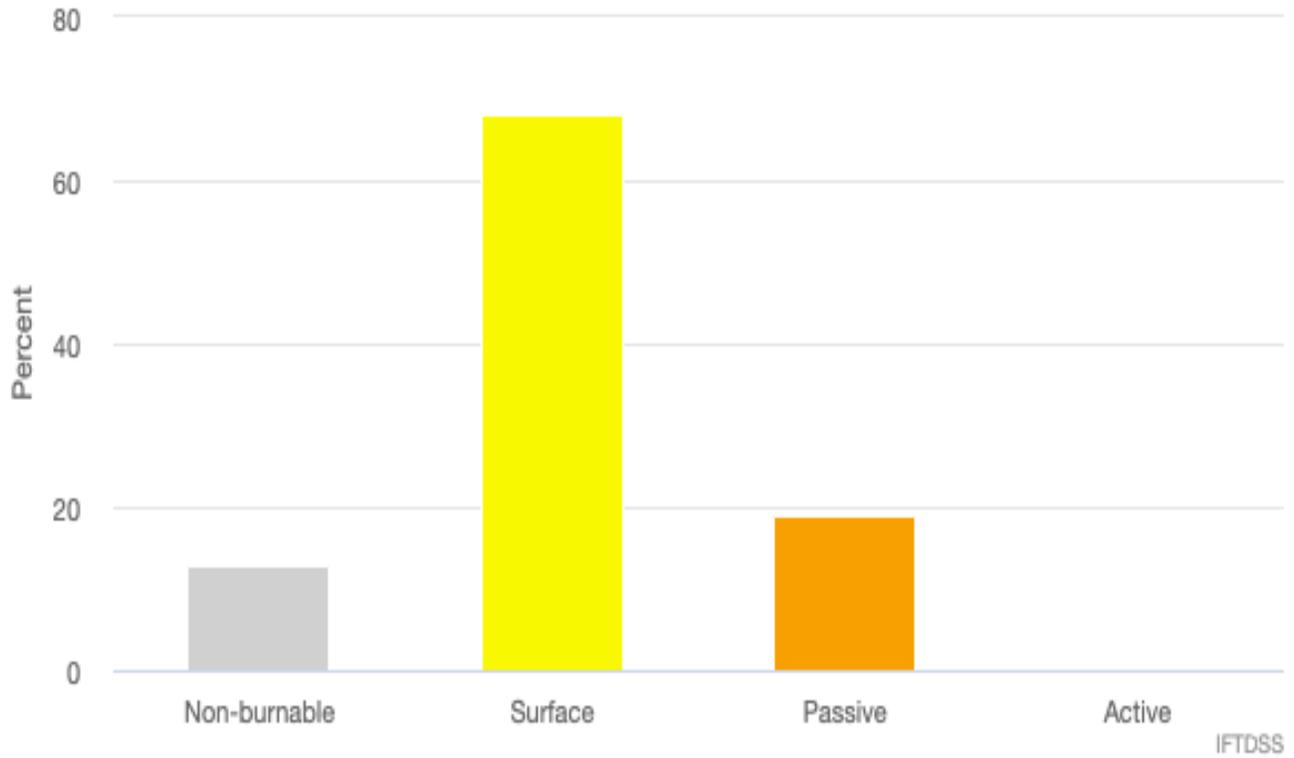
Crown Fire Activity Data Summary within "AC_2016" Landscape

Source Landscape Name: AC_2016

Landfire Version: LANDFIRE 2016

Source Landscape Acres: 774,723

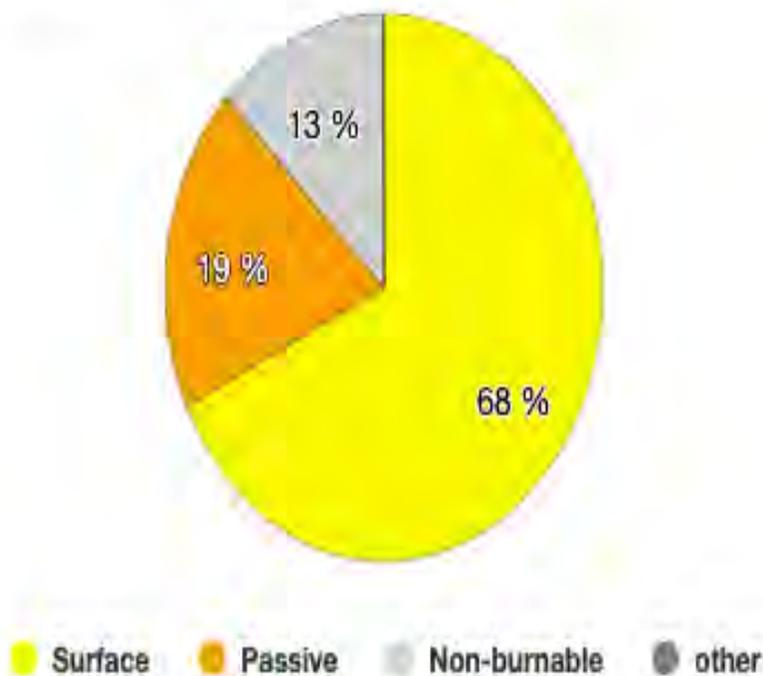
Model Name: AC_2016 - Auto97th



Crown Fire

Crown Fire Activity Data Summary within "AC_2016" Landscape

Source Landscape Name: AC_2016
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 774,723
Model Name: AC_2016 - Auto97th



Crown Fire

Crown Fire Activity	Pixel Count (freq)	Acres In LCP	Percent In LCP
Non-burnable	444212	98790	13
Surface Fire	2364604	525876	68
Passive Fire	672856	149640	19
Active Fire	1874	417	0

APPENDIX C

Response Function Survey



Highly Valued Resources and Assets (HVRA) Response Function Characterization Survey – Alpine County

In this survey, we ask survey participants to assign a "response function" or fire effects value to each of the HRVAs that have been identified for the project area. For each combination of HVRA and flame length, we ask that you determine whether a flame length category would be relatively:

- “beneficial” (+1 [slightly] to +3 [extremely]);
- “neutral” (0); or
- “detrimental” (-1 [slightly] to -3 [extremely]) to a HVRA

For the purposes of this survey, fire severity is defined as the amount of live vegetation killed in a fire. Low severity is generally <25% mortality, moderate is from 25-90% mortality, and high severity is >90% mortality. Examples of fire behavior are given for forested vegetation, but the general gradient applies to other vegetation types as well. We are using flame length as surrogate to fire intensity as follows:

Flame Length (ft)	Description of general fire behavior and effects
0-2	Scorch height 5-20'; typically, low severity; ground/surface fire in low fuel load and/or mild conditions. Fire burns surface fuels, small shrubs or seedlings.
2-4	Scorch height 10-40'; typically, low-to-moderate severity; ground/surface fire, moderate fuel load and/or moderate conditions. Fire burns surface fuels, shrubs and smaller trees.
4-6	Scorch height 20-60'; typically, moderate severity; ground/surface fire in moderate fuel and moderate-to-severe conditions. Fire burns surface fuels, shrubs and smaller trees, as well as individual mature trees.
6-8	Scorch height 30-80'; typically, moderate-to-high severity; some ground/surface fire transitioning to canopy fire in moderate-to-heavy fuel and moderate-to-severe conditions. Fire burns surface fuels, shrubs and smaller trees, and some smaller clumps of mature trees.
8-12	Scorch height 50-100'; typically, high severity; some ground/surface fire transitioning to canopy fire in moderate-to-heavy fuel load and moderate-to-severe conditions. Fire burns

	burns very hot, killing larger clumps of mature trees as well as consuming under-story and surface fuels.
>12	Scorch height exceeds tree height; high severity; crown/canopy fire in heavy fuel in moderate-to-severe conditions. Fire burns very hot, killing nearly all mature trees in a wider area, as well as consuming under-story and surface fuels.

For questions about this survey, please contact Scott Conway at: sconway@sig-gis.com

* 1. Your Name (Optional)

* 2. Agency or Institution

* 3. Position Description

4. Please use dropdowns to score each HVRA listed below in terms of their 'response function' (i.e., expected fire effects) to different flame length/fire intensities.

Description of response function scoring scheme

-3	Highly detrimental to HVRA
-2	Moderately detrimental to HVRA
-1	Slightly detrimental to HVRA
0	No beneficial or detrimental effect HVRA
1	Slightly beneficial to HVRA
2	Moderately beneficial to HVRA
3	Highly beneficial to HVRA
N/A	Unsure

For example, the result of your responses for each HVRA should look something like this - where a response function value is inserted for each combination of HVRA and fire severity level:

	Fire Severity						
HVRA:Sub-HVRA	Low: Flame	Low: Flame	Moderate: Flame	Moderate: Flame	Extreme: Flame	Extreme: Flame	Don't Know/Unsure

	Length 0-2ft	Length 2-4ft	Length 4-6ft	Length 6-8ft	Length 8-12ft	Length 12+ft	
Natural Resources/Open Space: Watersheds of Special Significance	3	2	0	-1	-3	-3	
Infrastructure/Utilities: Major Evacuation Corridors	0	-1	-2	-3	-3	-3	

	Low - Flame Length 0-2 ft.	Low - Flame Length 2-4 ft.	Moderate - Flame Length 4-6 ft.	Moderate - Flame Length 6-8 ft.	Extreme - Flame Length 8-12 ft.	Extreme - Flame Length 12+ ft.	Don't Know/Unsure
Community Structures: Residential Structures	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Community Structures: Education facilities (e.g., daycare/schools/colleges)	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Community Structures: Recreational Facilities – campgrounds, RV parks (non-ski)	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Community Structures: Health and elder care facilities	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Community Structures: Business and Public structures	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Community Structures: Places of Worship	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Community Structures: High-hazard Buildings	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Community Structures: Non-Habitable/Unknown Structures (barns/sheds)	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Infrastructure/Utilities: Communication Infrastructure (cell towers, microwave towers, etc)	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Infrastructure/Utilities: Potable water storage (e.g., tanks); snow making infrastructure	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Infrastructure/Utilities: Airport	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Infrastructure/Utilities: Major Evacuation Corridors (ingress and egress routes)	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

	Low - Flame Length 0-2 ft.	Low - Flame Length 2-4 ft.	Moderate - Flame Length 4-6 ft.	Moderate - Flame Length 6-8 ft.	Extreme - Flame Length 8-12 ft.	Extreme - Flame Length 12+ ft.	Don't Know/Unsure
--	-------------------------------	-------------------------------	---------------------------------------	---------------------------------------	---------------------------------------	--------------------------------------	-------------------

Infrastructure/Utilities: Minor Evacuation Corridors (ingress and egress routes)	<input type="text"/>						
Infrastructure/Utilities: Community Evacuation/Refuge/Safe Zones/Areas	<input type="text"/>						
Cultural/Historic Resources: Cemeteries or significant resource buildings, areas	<input type="text"/>						
Natural Resources/Open Space - Watersheds of special significance	<input type="text"/>						
Natural Resources/Open Space - Wildland Urban Interface - Defense	<input type="text"/>						
Natural Resources/Open Space - Ski Area Terrain	<input type="text"/>						

Add Any Notes Regarding Responses Here

Done

Powered by



See how easy it is to [create a survey](#).

[Privacy & Cookie Policy](#)

APPENDIX D

Relative Importance Survey



Highly Valued Resources and Assets (HVRA) Relative Importance Characterization Survey – Alpine County

Alpine County is applying “A Wildfire Risk Assessment Framework” (Scott et al. 2013 – USDA RMRS-GTR-315) across the County to help prioritize the implementation of forest fuels treatments. One of the steps in the process is to identify and rank the relative importance of a landscape’s ‘Highly Valued Resources and Assets’ (HVRA). Resources and assets are deemed ‘highly valued’ based on their utility in driving fire management decision making. For example, above-ground electrical utilities can be identified as a HVRA because this ‘infrastructure’ can be a source of wildfire ignitions, and their loss due to wildfire, could impact the power supply to a community.

For this step in the process, a HVRA scoring system has been designed to help you assign the ‘relative importance’ of different HVRAs identified by stakeholders for Alpine County (i.e., the project area). Four criteria are used to aid in assigning relative importance, including:

Uniqueness/Rarity/Endemism - a rating of the commonness or uniqueness of a HVRA to the project area.

Replaceability - rating of how quickly an HVRA can be recovered, be replaced or restored after a wildfire disturbance.

Importance for safety or as critical infrastructure – a rating of systems and assets, whether physical or virtual, when incapacitated or destroyed would have a debilitating impact on security, economic security, public health or safety, or any combination thereof.

Participants are asked to score each HVRA from 1 to 5, for each of the above described criterion. If you are unsure of the relative importance of HVRA, select the "Don't Know/Unsure" option. After the survey has been completed by all participants, scores for each HVRA will be tallied, then ranked to determine their relative importance across survey participants. This survey will take approximately 10 to 15 minutes to complete.

Please contact Scott Conway (sconway@sig-gis.com) if you have questions about the survey.

Thank you for your participation.

* 1. Please enter your name (optional)

2. Agency, Institution, or Affiliation

* 3. Position Description

* 4. Please score the Uniqueness/Rarity/Endemism of the following HVRA at the project area

Score	Description
5	Only occurs within the project area - The resource or asset only occurs within the project area and nowhere else on. The asset's function, character, or architecture is unique to project area and nowhere else in the world.
4	Unique - A large proportion of the resource, or asset's function, character, or architecture, occurs within project area boundaries, with a smaller proportion represented outside the project area's boundaries, but within same region of the Sierra Nevada (e.g., within 50 miles of the project area boundary).
3	Moderately Unique - The resource or asset's function, character, or architecture, occurs within project area boundaries and occurs outside the boundaries, but is contained within the Sierra Nevada ecoregion.
2	Common - The resource or asset's function, character, or architecture, is within the project area boundaries and is common throughout California.
1	Very Common - The resource or asset's function, character, or architecture, is within the project area boundaries and is common throughout the United States.

	1 - Very common	2 - Common	3 - Moderately unique	4 - Unique	5 - Only at Project Area	Don't Know/Unsure
Community Structures: Business and Public structures	<input type="radio"/>	<input type="radio"/>				
Community Structures: Residential Structures	<input type="radio"/>	<input type="radio"/>				

	1 - Very common	2 - Common	3 - Moderately unique	4 - Unique	5 - Only at Project Area	Don't Know/Unsure
Community Structures: Education Facilities (Daycare/Schools/Colleges)	<input type="radio"/>	<input type="radio"/>				
Community Structures: Recreational Facilities – campgrounds, RV parks (non-ski)	<input type="radio"/>	<input type="radio"/>				
Community Structures: Places of Worship	<input type="radio"/>	<input type="radio"/>				
Community Structures: Non-Habitable/Unknown Structures (barns/sheds)	<input type="radio"/>	<input type="radio"/>				
Community Structures: Health and Elder Care Facilities	<input type="radio"/>	<input type="radio"/>				
Community Structures: High Hazard Buildings	<input type="radio"/>	<input type="radio"/>				
Infrastructure/Utilities: Potable water storage (e.g., tanks); snow making infrastructure	<input type="radio"/>	<input type="radio"/>				
Infrastructure/Utilities: Airport	<input type="radio"/>	<input type="radio"/>				
Infrastructure/Utilities: Communication infrastructure (cell towers, microwave towers, etc)	<input type="radio"/>	<input type="radio"/>				
Infrastructure/Utilities: Major Evacuation corridors (ingress and egress routes)	<input type="radio"/>	<input type="radio"/>				
Infrastructure/Utilities: Minor Evacuation corridors (ingress and egress routes)	<input type="radio"/>	<input type="radio"/>				
Infrastructure/Utilities: Community Evacuation/Refuge/Safe Zones/Areas	<input type="radio"/>	<input type="radio"/>				
Cultural/Historic Resources: Cemeteries or significant resource buildings, areas	<input type="radio"/>	<input type="radio"/>				
Natural Resources/Open Space - Ski Area Terrain	<input type="radio"/>	<input type="radio"/>				
Natural Resources/Open Space - Wildland Urban Interface - Defense	<input type="radio"/>	<input type="radio"/>				
Natural Resources/Open Space - Watersheds of special significance	<input type="radio"/>	<input type="radio"/>				

*** 5. Please score the Replaceability of the following HVRA at the project area**

Score	Description
5	Extremely difficult to replace or restore - The asset can be rebuilt at significant cost (>\$2 million), or resource is not replaceable (e.g., cultural), or will not likely recover (regardless of management intervention) to its pre-fire condition within 20 years.
4	Difficult to replace or restore - The asset can be rebuilt at substantial cost (\$500,000 to <\$2 million), or resource will likely recover with management intervention to its pre-fire condition within 15 years of fire.
3	Moderately difficult to replace or restore - The asset can be rebuilt at a cost of \$200,000 to <\$500,000, or resource will likely recover with some management intervention to its pre-fire condition within 10 years of fire.
2	Reasonably replaced or restored - The asset can be rebuilt at a cost of \$50,000 to <\$200,000, or resource will likely recover with little or no management intervention to its pre-fire condition within 5 years of fire.
1	Easily replaced or restored - The asset can be rebuilt at a cost of <\$50,000, or resource will likely recover with little or no management intervention to its pre-fire condition within 1 year of fire.

	1 - Easily replaced/restored	2 - Reasonably replaced/restored	3 - Moderately difficult to replace/restore	4 - Difficult to replace/restore	5 - Extremely difficult to replace or restore	Don't Know/Unsure
Community Structures: Business and Public structures	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Community Structures: Residential Structures	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Community Structures: Education facilities (e.g., daycare/schools/colleges)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Community Structures: High-hazard Buildings	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Community Structures: Health and elder care facilities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	1 - Easily replaced/restored	2 - Reasonably replaced/restored	3 - Moderately difficult to replace/restore	4 - Difficult to replace/restore	5 - Extremely difficult to replace or restore	Don't Know/Unsure
Community Structures: Non-Habitable/Unknown Structures (barns/sheds)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Community Structures: Recreational Facilities – campgrounds, RV parks (non-ski)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Community Structures: Places of Worship	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Infrastructure/Utilities: Airport	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Infrastructure/Utilities: Communication infrastructure (cell towers, microwave towers, etc)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Infrastructure/Utilities: Potable water storage (e.g., tanks); snow making infrastructure	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Infrastructure/Utilities: Major Evacuation corridors (ingress and egress routes)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Infrastructure/Utilities: Minor Evacuation corridors (ingress and egress routes)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Infrastructure/Utilities: Community Evacuation/Refuge/Safe Zones/Areas	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cultural/Historic Resources: Cemeteries or significant resource buildings, areas	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Natural Resources/Open Space - Wildland Urban Interface - Defense	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Natural Resources/Open Space - Watersheds of special significance	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Natural Resources/Open Space - Ski Area Terrain	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

*** 6. For the Community Structures and Infrastructure/Utilities , please score each HVRA for its importance for public safety or as critical infrastructure within the project area.**

Score	Description
5	Highest safety or infrastructure value - Asset is defined as 'Critical Infrastructure' Per 42 U.S. Code § 5195c. 'Critical Infrastructure' is defined per 42 U.S. Code § 5195c as "systems and assets, whether physical or virtual, so vital to the United States that the incapacity or destruction of such systems and assets would have a debilitating impact on security,

	national economic security, national public health or safety, or any combination of those matters.”
4	Elevated safety or infrastructure value - Asset is not defined as ‘Critical Infrastructure’ Per 42 U.S. Code § 5195c but is critical to the project areas public safety and operations.
3	Moderate safety or infrastructure value - Asset is not defined as ‘Critical Infrastructure’ 42 U.S. Code § 5195c but is important to public safety and city government mission.
2	Low safety or infrastructure value - Asset has temporary or readily replaceable infrastructure value.
1	Little if any safety or infrastructure value - Asset has limited or no infrastructure value.

	1 - Little or no	2 - Low	3 - Moderately	4 - Elevated	5 - High	Don't Know/Unsure
Community Structures: Business and Public structures	<input type="radio"/>					
Community Structures: Residential Structures	<input type="radio"/>					
Community Structures: High Hazard Buildings	<input type="radio"/>					
Community Structures: Health and elder care facilities	<input type="radio"/>					
Community Structures: Non-Habitable/Unknown Structures (barns/sheds)	<input type="radio"/>					
Community Structures: Recreational Facilities – campgrounds, RV parks (non-ski)	<input type="radio"/>					
Community Structures: Education Facilities (Daycare/Schools/Colleges)	<input type="radio"/>					
Community Structures: Places of Worship	<input type="radio"/>					
Infrastructure/Utilities: Airport	<input type="radio"/>					
Infrastructure/Utilities: Communication infrastructure (cell towers, microwave towers, etc)	<input type="radio"/>					
Infrastructure/Utilities: Potable water storage (e.g., tanks); snow making infrastructure	<input type="radio"/>					
Infrastructure/Utilities: Major Evacuation corridors (ingress and egress routes)	<input type="radio"/>					

	1 - Little or no	2 - Low	3 - Moderately	4 - Elevated	5 - High	Don't Know/Unsure
Infrastructure/Utilities: Minor Evacuation corridors (ingress and egress routes)	<input type="radio"/>					
Infrastructure/Utilities: Community Evacuation/Refuge/Safe Zones/Areas	<input type="radio"/>					

Done

Powered by



See how easy it is to [create a survey](#).

[Privacy & Cookie Policy](#)