OCTOBER 2023

SOLANO COUNTY

COMMUNITY WILDFIRE PROTECTION PLAN

Working together to build fire adapted communities, resilient to wildfire

SWCA® ENVIRONMENTAL CONSULTANTS

Funding for this project was provided by the California Department of Forestry and Fire Protection as part of the California Climate Investments Program.

Plan prepared by:

SWCA Environmental Consultants would like to formally thank the Core Team and all stakeholders, notably Solano County Office of Emergency Services, all Fire Departments and Fire Protection Districts, Solano Fire Safe Council, Pleasants Valley Fire Safe Council, Green Valley Fire Safe Council, Solano Resource Conservation District, and CAL FIRE, for contributing their time and expertise throughout the planning process. Your participation in formulating this document will contribute to creating resilient landscapes, implementing public education, reducing structural ignitability, and ensuring safe and effective wildfire response.

The entities listed below participated in the development of and/or reviewed and are in support of the Solano County Community Wildfire Protection Plan:

Signature	**Signature**
John M. Vasquez	
Name (printed)	**Name (printed)**
10/24/23	
Date	**Date**
Solano County Board of Supervisors, Chairman	
Agency /Position (printed)	**Agency /Position (printed)**
Signature	**Signature**
Name (printed)	**Name (printed)**
Date	**Date**
Agency /Position (printed)	**Agency /Position (printed)**

Solano County

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Meeting Minutes - Action Only

Board of Supervisors

John M. Vasquez (Dist. 4), Chairman
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Tuesday, October 24, 2023 **9:00 AM** **Board of Supervisors Chambers**

42 **23-844** Receive a presentation and consider adopting the 2023 Solano County Community Wildfire Protection Plan

Attachments: A - Link to CWPP Plan and Appendix

On motion of Supervisor Hannigan, seconded by Supervisor Mashburn, the Board adopted the 2023 Solano County Community Wildfire Protection Plan. So ordered by a 5-0 vote.

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EXECUTIVE SUMMARY

The Solano County Community Wildfire Protection Plan (Plan) serves multiple purposes in addressing the risk of wildfires and protecting human life and property. It aims to provide a comprehensive assessment of wildfire risk and protection needs across the county, bringing together various stakeholders involved in wildfire management and suppression. By identifying gaps and deficiencies, the Plan provides a framework for future planning and implementation of mitigation measures. It also includes a list of actionable projects to mitigate the identified risks.

The Plan's development involved a core planning team (the Core Team) consisting of federal, state, and local agencies, and community organizations with extensive experience in fire management and prevention. The planning process brought together wildfire responders and land managers in a collaborative effort, modeling and mapping wildfire risk, identifying physical hazards, and incorporating public input. Public meetings, surveys, workshops, and online platforms facilitated community engagement and awareness. The project recommendations and draft Plan underwent review and feedback from community members. Additionally, projects identified in the Plan are in alignment with the wildfire-specific hazard mitigation actions identified in the Mitigation Action Plan of the Solano County Multi-Jurisdictional Hazard Mitigation Plan (Multi-Jurisdictional Hazard Mitigation Plan, Solano County Office of Emergency Services [Solano OES] 2022).

The Plan meets the following requirements of the Healthy Forests Restoration Act of 2003 (HFRA) and the Federal Emergency Management Agency's (FEMA's) community wildfire protection plan (CWPP) guidelines:

1. Collaborating with community stakeholders.
2. Using community risk maps.
3. Identifying key components of risk in local home and infrastructure construction and defining ways to improve these elements to reduce the risk of ignition.
4. Identifying the condition of the natural environment surrounding the community and identifying opportunities to mitigate wildfire risk.
5. Identifying and prioritizing potential projects that will mitigate the identified risks.

Solano County faces a particular risk of wind-driven wildfires due to its unique topography and regional weather patterns. Recent large wildfires, such as the LNU Lightning Complex's Quail and Hennessey Fires, have caused significant damage and loss of property. In addition to large fires in the Solano-Napa-Yolo region, the county regularly experiences many smaller fires and ignitions within grasslands, agricultural fields, and vegetated marshlands due to human ignitions (i.e., roadside ignitions, mowing accidents, and unauthorized encampments). Indeed, some of the highest risk areas identified in the county are communities located within and adjacent to the mountains and foothills in western Solano County.

Several key issues are identified in the Plan:

- The need for adequate funding for fire prevention and protection in rural and unincorporated areas.
- Gaps and/or deficiencies in vegetation management plans.
- Fuel treatment recommendations for land management agencies and homeowners.

- Prioritizing hazardous fuels reduction in high-risk communities and the wildland-urban interface (WUI).
- Ingress and egress issues, including access routes and fire response access.
- Lack of consolidated fire and EMS dispatch center.
- Increasing community participation and community capacity-building (e.g., to secure more resources and volunteers).
- Educating property owners about defensible space, structural hardening, and community collaboration.
- Effective messaging for residents and visitors regarding wildfire risks and mitigation strategies.
- Investing in and supporting fire response at all levels, including resources for local fire departments and districts to increase capacity to serve the community.
- Increasing public understanding of the fire response process and emergency notification systems.
- Continuing to address wildfire issues at the landscape level across multiple jurisdictions.
- Managing fire to protect resources and accomplish resource management goals, including protection and enhancement of wildlife habitat, water supply and quality, and forest health.
- Recent climate patterns and associated changes to the wildfire environment.
- Disease and insect outbreaks associated with tree mortality.
- Raising awareness about the role of fire in maintaining resilient landscapes and managing invasive species.

SWCA Environmental Consultants (SWCA) conducted a Risk-Hazard Assessment to identify the risk of wildfires. This assessment combines a graphical model of risk and hazard (desktop risk assessment) based on fire behavior and fuels modeling with an on-the-ground assessment of community hazards and assets at risk. For the desktop risk assessment, factors considered include potential fire behavior, exposure and susceptibility of the WUI and resources and assets at risk, proximity to fire stations, ember exposure, and fire suppression difficulty. By integrating variables like vegetation, topography, and weather, the assessment provides a comprehensive and integrated model of wildfire risk. The results categorize the landscape into four levels of risk: low, moderate, high, and extreme. A substantial portion of western Solano County was identified as having high or extreme risk.

For the on-the-ground component of the risk assessment, a team from SWCA, along with a representative from Solano OES, conducted field surveys using the National Fire Protection Association (NFPA) 1144 standard. SWCA also consulted with local fire personnel to target high-risk areas for the surveys. These surveys focused on evaluating the ignitability of structures in the WUI, providing a consistent process for assessing the potential for structure ignition. The evaluations generated total risk and hazard scores based on various parameters observed during the surveys, with descriptive ratings of low, moderate, high, or extreme. Worth noting is that the field evaluations were primarily concentrated on communities adjacent to vegetative fuels and did not extensively cover urban centers surrounded by non-burnable features.

CWPPs do not have the authority to mandate implementation of any of the recommendations, but the message throughout this document is that the greatest fire mitigation could be achieved through the joint actions of individual property owners and local, state, and federal governments. Indeed, the value of

CWPPs is in providing a framework for collaboration between the public, governments, agencies, and other entities to develop solutions and strategies for wildfire management and mitigation.

Lastly, the Plan should be regarded as a dynamic document that requires regular updates, particularly after significant fire events. It is crucial to consistently revise the Plan to incorporate any changes, modifications, or new information. These elements play a vital role in effectively reducing wildfire risks across Solano County and will help preserve the Plan's core ideas and priorities for the benefit of the communities it serves in the long run.

Solano OES, supported by the fire safe councils, will oversee the Plan's governance to ensure project progression.

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CHAPTER 1 – INTRODUCTION

The United States is facing urgent forest and watershed health concerns. In the last 5 years, the 2020 fire season had the most acreage impacted in a single year at 10.1 million acres, and 2017 was the second highest with 10 million acres (Congressional Research Service 2022). These statistics demonstrate that wildfires are becoming larger and increasingly impactful.

As wildfire severity increases, communities need a plan to help prepare for, reduce the risk of, and adapt to wildfire events. Community wildfire protection plans (CWPPs) help accomplish these goals. A CWPP provides recommendations that are intended to reduce, but not eliminate, the extreme severity or risk of wildfire. This CWPP document will be referred to as the Plan throughout.

The development of the Plan is rooted in meaningful collaboration among many stakeholders, including local, state, and federal officials. The Plan ultimately identifies the current local wildfire risks and needs that occur in Solano County, which is further supported with relevant science and literature from the western region of the United States.

The Plan reviews, verifies, and/or identifies potential new priority areas where mitigation measures are needed to protect the life, property, and critical infrastructure in the county from wildfire. This Plan does not attempt to mandate the type and priority for treatment projects that will be carried out by the land management agencies and private landowners. The responsibility for implementing wildfire mitigation treatments lies at the discretion of the landowner; the Plan will only identify potential treatments and a suggested priority for these projects.

1.1 GOAL OF A COMMUNITY WILDFIRE PROTECTION PLAN

The goal of a CWPP is to enable local communities to improve their wildfire mitigation capacity while working with government agencies to identify high fire risk areas and prioritize areas for mitigation, fire suppression, and emergency preparedness, and to enhance public awareness by helping residents better understand the natural and human-caused risks of wildfires that threaten lives, safety, and the local

economy. The minimum requirements for a CWPP, as stated in the Healthy Forests Restoration Act of 2003 (HFRA), are:

- **Collaboration:** A CWPP must be collaboratively developed by local and state government representatives, in consultation with federal agencies or other interested (Society of American Foresters [SAF] 2004).
- **Prioritized Fuel Reduction:** A CWPP must identify and prioritize areas for hazardous fuel reduction treatments and recommend the types and methods of treatment that will protect one or more at-risk communities and their essential infrastructure (SAF 2004).
- **Treatments of Structural Ignitability:** A CWPP must recommend measures that homeowners and communities can take to reduce the ignitability of structures throughout the area addressed by the plan (SAF 2004).

The Core Team established the following overarching goals for the Plan:

- **Collaborative Planning:** Establish a collaborative planning approach that engages local governments, state and federal stakeholders, residents, and community groups.
- **Engagement:** Ensure wide visibility of the Plan within communities, including those in unincorporated areas, and gain local support.
- **Transparency:** Involve and engage the community and relevant stakeholders throughout all phases of project planning and implementation to ensure transparency.
- **Implementation:** Identify actionable projects, including suggested methodology for implementation.

This Plan intends to provide a countywide scale of wildfire risk and protection needs and bring together all responsible wildfire management and suppression entities in Solano County to address the identified needs and to support these entities in planning and implementing the necessary mitigation measures. Additional information on wildfire planning and legislative direction within the county is available in Appendix A.

1.2 PLAN ALIGNMENT WITH THE NATIONAL COHESIVE STRATEGY

The goal of the Cohesive Strategy and its Phase III Western Regional Action Plan is “to safely and effectively extinguish fire, when needed; use fire where allowable; manage our natural resources; and as a Nation, live with wildland fire” (Forests and Rangelands 2014:3).

The primary national goals identified as necessary to achieving the vision are:

- **Restore and maintain landscapes:** Landscapes across all jurisdictions are resilient to fire-related disturbances in accordance with management objectives.
- **Fire-adapted communities:** Human populations and infrastructure can withstand a wildfire without loss of life and property.
- **Wildfire response:** All jurisdictions participate in making and implementing safe, effective, efficient risk-based wildfire management decisions.

For more information on the Cohesive Strategy, please visit: https://www.forestsandrangelands.gov/strategy/documents/strategy/CSPhaseIIINationalStrategyApr2014.pdf

Alignment with these Cohesive Strategy goals is described in more detail in Chapter 4, Mitigation Strategies.

In addition to aligning with the Cohesive Strategy, this Plan also incorporates information on post-fire recovery, the significant hazards of a post-fire environment, and the risk that post-fire effects pose to communities (Figure 1.1).

Figure 1.1. The Plan integrates the Cohesive Strategy's goals and post-fire recovery, serving as a comprehensive plan for fire prevention and resilience

1.3 ALIGNMENT WITH PLANS AND FIRE POLICIES

This Plan aligns with multiple local, state, and federal planning documents. These documents or agreements are summarized in Appendix A and are provided to support stakeholders in implementing the Plan.

1.4 CORE TEAM

The Solano County Office of Emergency Services (Solano OES) invited engagement from local and regional government agencies in the development of the Solano County Plan. Stakeholder involvement is critical in producing a meaningful document that includes all collaborators' diverse perspectives.
The project startedon August 31, 2022; the Core Team met for the first time on October 20, 2022, convened again on December 9, 2022, and met for the final time on August 14, 2023.

Members of the Core Team are listed below.

Table 1.1. Core Team List

Name	Organization
Mary Heath	Solano County Office of Emergency Services
Jenny Novelli	Solano County Office of Emergency Services
Robyn Rains	Solano County Office of Emergency Services
Donald Ryan (retired)	Solano County Office of Emergency Services
Terry Schmidtbauer	Solano County Resource Management
Chris Rose	Solano Resource Conservation District
Karin Young	Solano Resource Conservation District
Josh Chadwick	Benicia Fire Department
Della Olm	Benicia Fire Department
Dave Carpenter	Cordelia Fire Protection District
Todd McNeal	Dixon Fire Department
Steven Conti	Fairfield Fire Department
Trent Herron	Fairfield Fire Department
Matt Luckenbach	Fairfield Fire Department
John Sturdee	Fairfield Fire Department
Mike O'Connor	Montezuma Fire Protection District
Jeff Armstrong	Rio Vista Fire Department
Brad Lopez	Suisun City Fire Department
Alfred Abruzzini	Suisun Fire Protection District
Jill Childers	Vacaville Fire Department
Kris Concepcion	Vacaville Fire Department
Alex Nourot	Vacaville Fire Department
Paul Dahlen	Vacaville Fire Protection District
Howard Wood (retired)	Vacaville Fire Protection District
Kyle Long	Vallejo Fire Department
Rochelle Sherlock	Green Valley Fire Safe Council
David Stevens	Pleasants Valley Fire Safe Council
Justin Benguerel	CAL FIRE LNU Unit
Ben Sitter	CAL FIRE LNU Unit
Victoria Amato	SWCA Environmental Consultants
Angela Chongpinitchai	SWCA Environmental Consultants
Montiel Ayala	SWCA Environmental Consultants
Elizabeth Hitzfelder	SWCA Environmental Consultants

1.5 PUBLIC INVOLVEMENT

A key element in the CWPP process is the meaningful discussions it generates among community members regarding their priorities for local fire protection and forest management (SAF 2004). The draft project recommendations were discussed extensively during virtual workshops with the three Fire Safe Councils (Solano, Green Valley, and Pleasants Valley) and were made available for public review and comment from late March through late April 2023. The draft Plan was also made available for public review from August 28, 2023, through September 18, 2023. In addition to the Plan and project recommendations, public meetings and events were held to gather community input. These efforts are described in detail in Appendix G.

Every effort was made to include a broad cross section of the county in the outreach process, and different communication channels were used to engage as many members of the public as possible (e.g., social media postings, email distributions, and in-person activities). All county residents were welcomed and encouraged to participate in virtual workshops and in-person activities such as the public event held in December 2022 and the Solano County Wildfire Safety Expo in April 2023. Moreover, all county residents were provided multiple opportunities to provide input, such as the community survey and Plan document and project recommendations review.

Recommendations for future community education and outreach are provided in Appendix J, Table J.2.

Education and outreach programs targeting the public are a shared priority among various agencies and organizations working on wildfire-related issues.

1.6 PLANNING AREA GEOGRAPHY

The following sections provide context for the remainder of the Plan by describing the baseline conditions throughout the county.

The planning area includes the entirety of Solano County as delineated by its geographic and political boundaries (Figure 1.2).

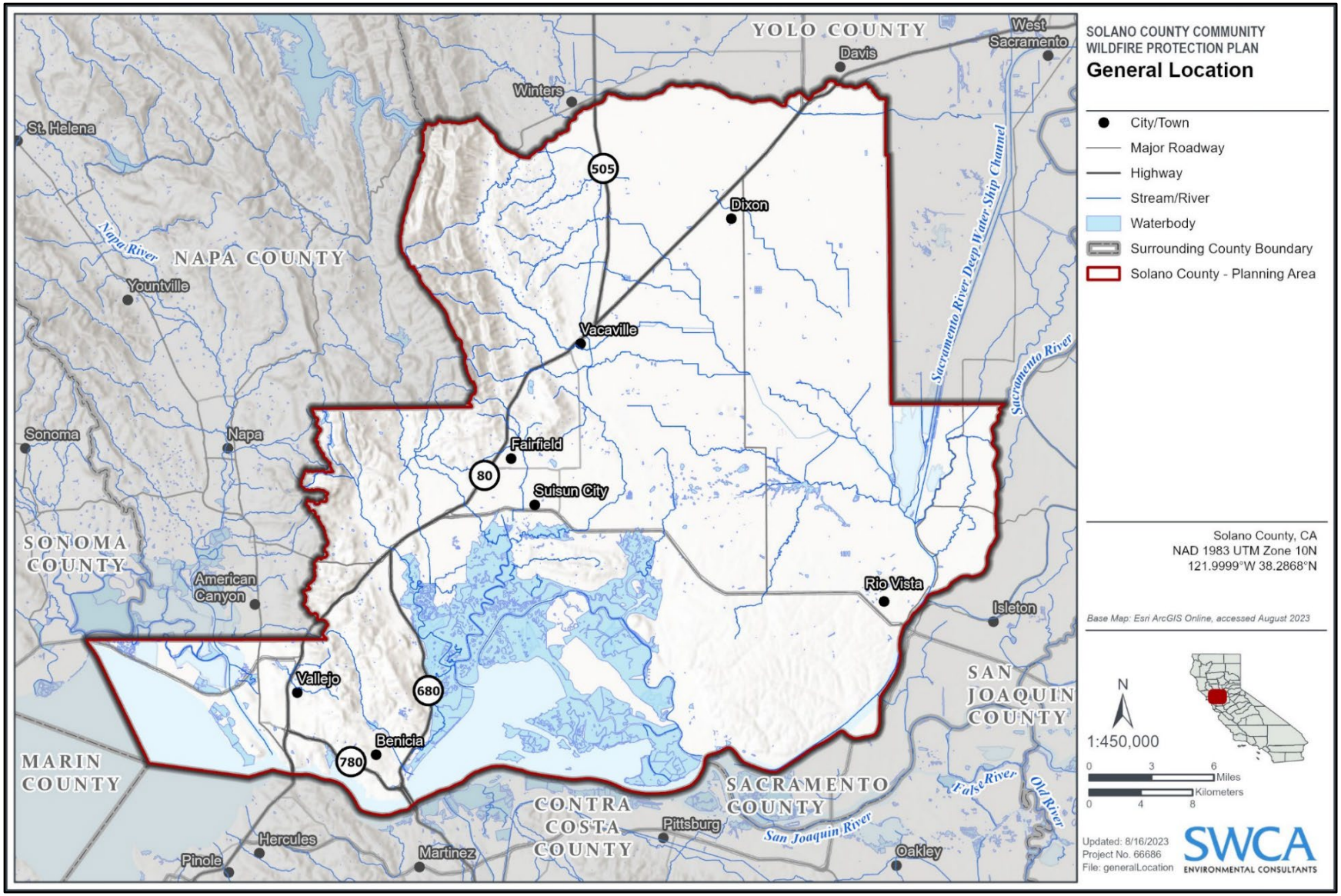

Figure 1.2. Solano County planning area

Note: the county boundary and the planning area boundaries are the same.

Solano County is located in the San Francisco Bay Area of California, reaching from the shores of San Pablo Bay in the west to California's Central Valley in the east. It encompasses an area of 909 square miles, of which approximately 762 square miles are within the unincorporated areas. In total, 84 square miles are covered by water, including the largest contiguous brackish water marsh on the West Coast, the Suisun Marsh (Multi-Jurisdictional Hazard Mitigation Plan, Solano OES 2022). The majority of the county is designated as agricultural land (Solano County 2008), with Solano County ranking twenty-seventh out of 58 counties in agricultural production, and fourth in the production of both sudan hay, and sheep and lambs (California Department of Food and Agriculture 2021).

The seven incorporated municipalities in Solano County are the cities of Benicia, Dixon, Fairfield (county seat), Rio Vista, Suisun City, Vacaville, and Vallejo. Solano County is bordered by Yolo, Sacramento, Contra Costa, Napa, and Sonoma Counties, and is included in the Bay Area Urban Area Security Initiative (UASI) region, as well as the Sacramento-San Joaquin River Delta (also referred to as the California Delta).

The county includes a variety of wetland areas along its Bay and Delta borders, and vernal pool complexes and riparian corridors in the upland areas. The county also features oak woodland areas and extensive marshlands, which are vital to the health and longevity of the estuary ecosystem in the San Pablo Bay and the larger San-Joaquin River Delta, including more than 10% of California's total remaining natural wetlands (Solano County 2008). Many of the wetland, wetland meadow, and marsh areas are protected to some degree, including the Suisun Marsh, Lynch Canyon Open Space Park, Lake Solano, and Liberty Island Reserve, as well as several other wildlife reserves managed by the California Department of Fish and Wildlife (CDFW).

1.6.1 LAND OWNERSHIP

Solano County has relatively uniform land ownership, with most (87.3%) of the land belonging to private owners (Figure 1.3). The CDFW is the next largest landowner with 4.3% of the county under its jurisdiction. Conservancies and land trusts own 2.3% of the county; local governments own roughly the same amount (2.2%). The remaining land in the county (about 4%) is managed by different agencies, including the State of California, Department of Defense, U.S. Fish and Wildlife Service, Bureau of Land Management (BLM), and California Department of Parks and Recreation.

1.6.2 ROADS AND TRANSPORTATION

Many transportation routes transect and connect the county, including Interstate routes I-80, I-505, I-780 and I-680. State highways include State Route 12 and Highways 29, 37, 84, and 113. The eastern border of the county contains National Scenic Byway 160, River Road. In addition to the surfaced highways, numerous smaller rural and residential roads traverse the county, with variable road conditions. Some steep grades and gravel road surfaces may impede travel in the event of a wildfire evacuation or emergency response.

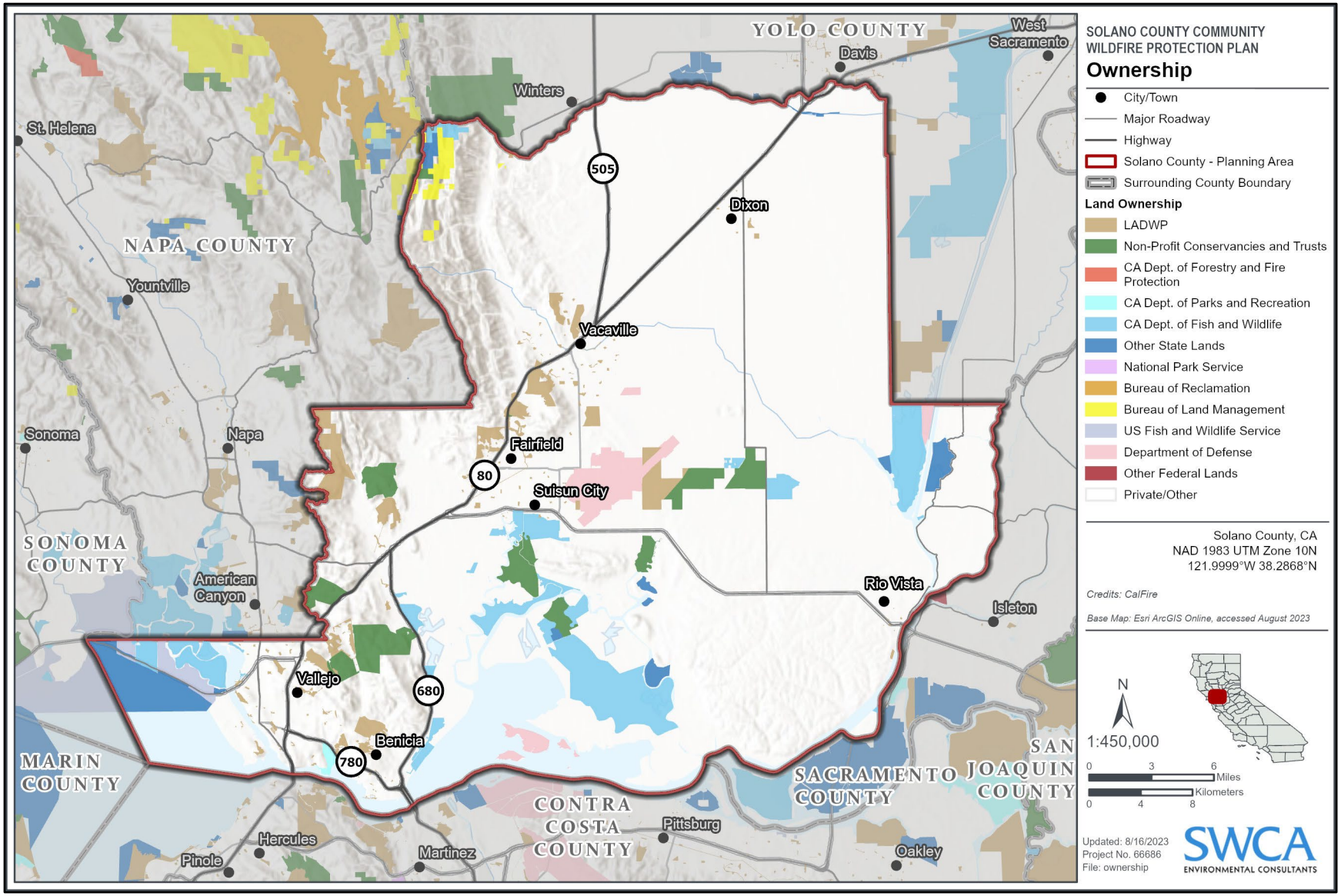

Figure 1.3. Solano County land ownership

1.6.3 TOPOGRAPHY

The county has two primary topographical sections: the mountainous western portion and the lower-lying eastern portion (Figures 1.4 and 1.5). To the west, the county contains portions of the Coastal Range with steep slopes. The Vaca Mountains define the northwestern border of the county, running north to south. The range gives way to gradual hills moving east through the county. The eastern portion of the county is part of the Central Valley and is characterized by level ground, with intermittent marshes and rolling hills. The Sacramento River runs from the northeastern portion to the southern portion of the county and meets with the San Joaquin River to form the Sacramento-San Joaquin Delta. Tributaries of the river, such as Lindsey Slough, extend westward from the eastern-bordering river. The southwestern area contains the Suisun Marsh, which transitions into Grizzly Bay and Suisun Bay, which are fed by the delta (Solano County 2008).

Figure 1.4. Mountainous landscape in western Solano County where topography may contribute to more intense wildfire behavior

Figure 1.5. Lower-lying landscape in eastern Solano County showing the contrast between topographic hazards from east to west

1.6.4 POPULATION

According to the 2020 U.S. Census, the population estimate of Solano County was 453,491 persons, an increase of 9.7% over the 2010 census numbers of 413,344 (Quick Facts: Solano County, California, U.S. Census Bureau 2021a). The county has a population density of 551.8 people per square mile. According to the 2020 population estimate, Fairfield, Vacaville, and Vallejo have the largest populations in the county with 119,881, 103,092, and 124,869, respectively (ACS Demographic and Housing Estimates, U.S. Census Bureau 2021b).

1.6.5 SOCIAL VULNERABILITY

The Federal Emergency Management Agency (FEMA) defines social vulnerability as the susceptibility of social groups to the negative impacts of natural hazards (e.g., wildfire), which include disproportionate death, injury, loss, or disruption of livelihood (FEMA 2022). A sole hazard occurrence can bring about considerably different impacts for distinct individuals, even if the magnitude of the hazard was the same for the entire community. Specific groups of individuals may be more susceptible to natural hazards because of socioeconomic status, physical state, or other factors. For instance, elderly individuals may have more difficulty in quickly evacuating during wildfire emergencies, which may make them more susceptible to entrapment. In other cases, low-income individuals may be less able to harden and improve their homes to reduce structural ignitability and, therefore, can face a higher probability of their homes being damaged or destroyed should a wildfire event occur.

The communities of Green Valley and Pleasants Valley are examples of socially vulnerable areas. Census data show that some areas in the Green Valley and Pleasants Valley communities have high

proportions of people aged 65 or older (Multi-Jurisdictional Hazard Mitigation Plan Annexes, Solano OES 2022). Moreover, Pleasants Valley and Green Valley are areas identified as high or extreme wildfire risk in the risk assessment (see Figure 3.6 in Chapter 3). The combination of the heightened wildfire risk in the surrounding landscape and the demographic characteristics of Green Valley and Pleasants Valley may pose challenges and time constraints for residents during fire evacuations. Furthermore, the presence of limited access routes in these areas exacerbates the complexities associated with evacuation efforts.

At the state level, the California Environmental Protection Agency (CalEPA) designates disadvantaged communities with respect to environmental pollution. The designation is based on pollution burden, prior designation as a disadvantaged community, and federal land status (i.e., federally recognized tribes) (California Office of Environmental Health Hazard Assessment 2023). CalEPA has designated several communities within Solano County as “disadvantaged” (Figure 1.6). This designation makes these communities a priority for funding through the California Climate Investments program, including the Wildfire Prevention Grants Program, which is a part of the California Climate Investments program and is administered by CAL FIRE (State of California 2022).

1.6.5.1 Unhoused Populations

With continued economic and social trends exacerbating the level of housing insecurity, urban areas throughout the United States have recently experienced significant increases in unhoused populations. As a result, fire departments are responding to a growing number of incidents involving fires that impact unhoused people and their shelters or encampments. In order to survive in often harsh environments without adequate protection from the elements, many people living in unsheltered communities utilize fire as a tool for general survival. This includes burning open flames to allow themselves to keep warm and cook food. Fire-safe practices are not always strictly adhered to in these settings, contributing to increased fire risk. Additionally, unhoused individuals are often situated in areas of existing high fire risk, such as densely vegetated riverbank or vacant and unmaintained buildings. Jurisdictions across the United States face difficulties addressing the houselessness crisis due to legislative and political barriers, causing the issue to stagnate and fire risk to persist among these vulnerable populations. In search for a solution, nonprofit and research organizations have begun examining the behaviors that contribute to fire risk and establishing programs through which unhoused people are provided fire safety gear and proper training to educate them in fire safety and response. These groups are advocating for increased awareness to both those experiencing houselessness and the wider public, with a push for intervention and assistance to those at risk (Antonellis et al. 2023).

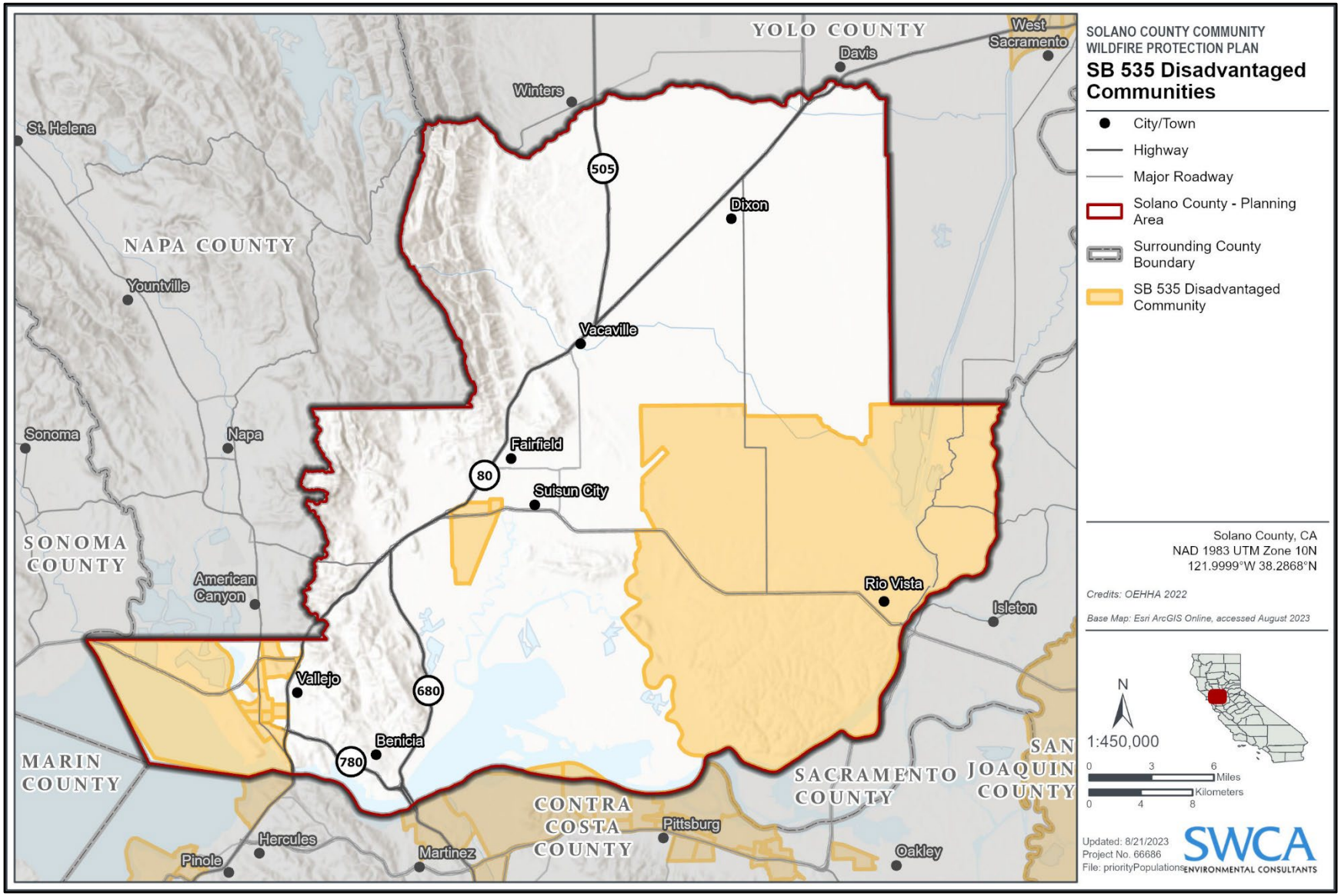

Figure 1.6. Disadvantaged communities in Solano County as designated by the California Environmental Protection Agency

Source: https://oehha.ca.gov/calenviroscreen/sb535

1.6.6 RECREATION

Solano County has a variety of outdoor recreational opportunities at the many parks, natural areas, and preserves within the county. Solano County Parks manages Belden's Landing, Lake Solano, Lynch Canyon, and Sandy Beach, providing opportunities for camping, hiking, swimming, and other recreation across the diverse landscape of the county (Resource Management—Solano County Parks, Solano County 2022b). Other natural areas and preserves open to recreation include two UC Davis Natural Reserve System sites, Berryessa Snow Mountain National Monument, Jepson Prairie, Lynch Canyon, Rush Ranch Open Space, Rockville Park, Patwino Worrtla Kodoi Dihi Open Space Park, San Pablo Bay National Wildlife Refuge, and seven CDFW wildlife areas and ecological reserves.

The abundant agricultural community also supports a network of farmers' markets that are seasonally open throughout the county, as well as vineyards that support tours and tastings (Visiting Solano, Solano County 2022c). These recreation resources are valued assets that should be protected against severe wildfire impacts.

1.6.7 VEGETATION AND LAND COVER

Solano County is home to a diverse arrangement of vegetative communities, a characteristic that can largely be attributed to the varied geography, hydrology, and climate. The extensive natural layout of the county encompasses valleys, inner coastal ranges, riparian and freshwater regions, and coastal marshes. This mosaic of land classifications leads to deviations in elevation, slope aspect, substrate, and microclimates, all influencing the region's land cover. Among the most commonly occurring land cover types and/or vegetation types are valley grasslands, agricultural land, scrub oak mixed chaparral, and marshland vegetation (Figure 1.7).

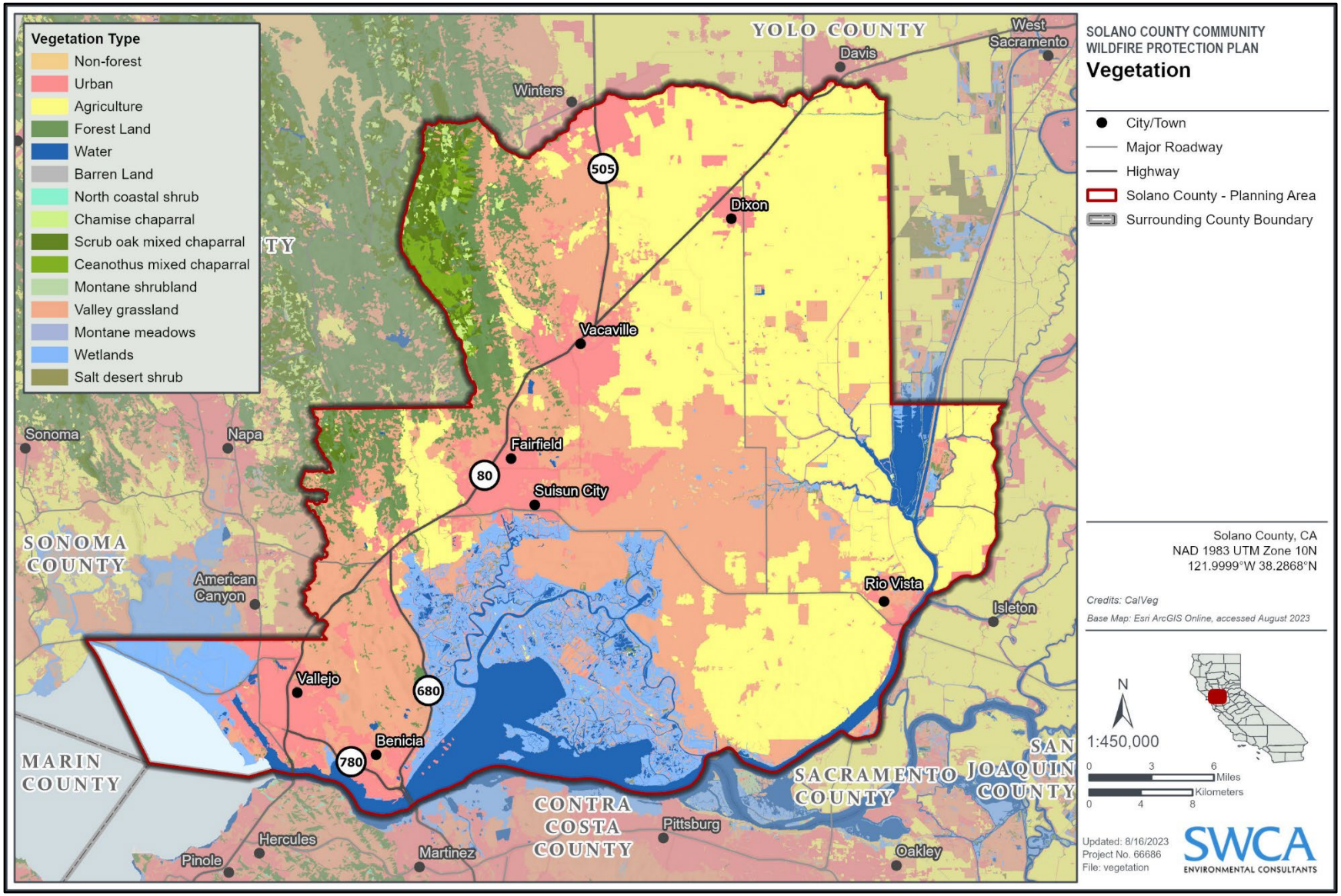

Figure 1.7. Solano County existing vegetation cover

1.6.8 FOREST HEALTH CONSIDERATIONS

1.6.8.1 Diseases

Sudden oak death is the highly consequential effect of a disease that inflicts devastating mortality upon oak communities throughout coastal and inland California counties. *Phytophthora ramorum*, the invasive pathogen responsible for sudden oak death, can kill oak and a variety of other tree species, spreading through the movement of soils and other plant materials. The die-offs resulting from sudden oak death create heavy loads of low-moisture fuels and pose the threat of increased fire intensity throughout the affected region (Valachovic et al. 2011).

Several other diseases can also affect native plant species, especially when trying to reestablish native vegetation communities; for example, there are several Phytophthora species that have been found in native plant nurseries in California that can be very destructive (personal communication, David Bakke, Bay Area Chapter, California Society of American Foresters).

1.6.8.2 Impact of Climate Change

The escalating wildfire risk in California is primarily driven by the rapidly shifting climate, including rising temperatures, changing wind patterns, and increased temporal and spatial variability of water availability. California's Fourth Climate Change Assessment indicates that if greenhouse gas (GHG) emissions continue to increase, the state could experience a 50% increase in fires larger than 25,000 acres and a potential 77% increase in the average area burned by the year 2100. Recent wildfire events in California have illustrated this trend, with over 50% of the top 20 largest wildfires occurring in the last 5 years alone (2022 Incident Archive, CAL FIRE 2022d). The LNU Lightning Complex Fire of 2020 burned 363,220 acres north of the Bay Area and impacted forests, grasslands, and scrub-oak (Multi-Jurisdictional Hazard Mitigation Plan, Solano OES 2022). In total, the LNU Lightning Complex resulted in six deaths, destroyed 1,491 structures, and was listed as the sixteenth most deadly wildfire in California’s history (Top 20 Deadliest California Wildfires, CAL FIRE 2022e). Without appropriate wildfire mitigation efforts, these statistics would be further impacted under current climate trends.

Climate change presents a significant concern for Solano County, as it exacerbates extreme heat, drought, and hazardous wildfire conditions (Solano County 2011; Multi-Jurisdictional Hazard Mitigation Plan, Solano OES 2022). The county already experiences a dry climate, but climate change is expected to bring even hotter and drier conditions, further increasing the wildfire risk for communities within Solano County (Multi-Jurisdictional Hazard Mitigation Plan, Solano OES 2022a). The risks from wildfire and climate change are predicted to increase in almost every community in Solano County in the upcoming years (Multi-Jurisdictional Hazard Mitigation Plan, Solano OES 2022). However, it is important to acknowledge that fire is a natural and essential component of California's diverse landscapes, playing a crucial role in balancing ecosystems and restoring their natural functions (Science: Wildfire Impacts, CDFW 2021b). Frequent, uncharacteristically large, high-severity wildfires are the primary source of the catastrophic damage listed above. Wildfire, when not intensified by human actions, works to balance ecosystems, and restore their natural functions.

1.6.8.3 Tree Mortality

The combination of rising temperatures, extensive droughts, extreme wildfires, and insect outbreaks has resulted in widespread tree mortality in California (California Tree Mortality, U.S. Forest Service [USFS] 2022b). While tree mortality is a natural process in forest ecosystems, when large regions experience a

significant number of tree deaths within a short time period, it can negatively impact forest health and disrupt ecosystem functions. The presence of dead trees near developed or recreational areas also poses hazards, as they can fall and potentially endanger the public and infrastructure (National Park Service 2021). Furthermore, increased tree mortality leads to higher fuel loading, contributing to the potential for high-severity fires and extreme fire behavior in the region.

1.6.9 WILDLIFE

1.6.9.1 Threatened and Endangered Species

Several threatened and endangered species can be found in Solano County, including mammals, reptiles, birds, and plant species. This includes 34 species listed at the federal level as endangered or threatened, along with 20 species listed at the state level. A list of threatened and endangered state-listed species was provided by the California Department of Fish and Wildlife (Table 1.2). Treatments on federal land are subject to the National Environmental Policy Act (NEPA) and associated analysis of impacts to these species. Similarly, treatments on state land are subject to the California Environmental Quality Act (CEQA). Treatments in areas that may impact threatened and endangered species require application of certain mitigation measures to prevent degradation to habitat.

Table 1.2. State-Listed Threatened and Endangered Species

Type	Scientific Name	Common Name	State Status
Animals - Amphibians	*Ambystoma californiense* pop. 1	California tiger salamander - central California distinct population segment (DPS)	Threatened
Animals - Amphibians	*Ambystoma californiense* pop. 3	California tiger salamander - Sonoma County DPS	Threatened
Animals - Birds	*Buteo swainsoni*	Swainson's hawk	Threatened
Animals - Birds	*Haliaeetus leucocephalus*	bald eagle	Endangered
Animals - Birds	*Coccyzus americanus occidentalis*	western yellow-billed cuckoo	Endangered
Animals - Birds	*Agelaius tricolor*	tricolored blackbird	Threatened
Animals - Birds	*Sternula antillarum browni*	California least tern	Endangered
Animals - Birds	*Laterallus jamaicensis coturniculus*	California black rail	Threatened
Animals - Birds	*Rallus obsoletus obsoletus*	California Ridgway's rail	Endangered
Animals - Fish	*Hypomesus transpacificus*	delta smelt	Endangered
Animals - Fish	*Spirinchus thaleichthys*	longfin smelt	Threatened
Animals - Fish	*Oncorhynchus kisutch* pop. 4	coho salmon - central California coast evolutionary significant unit (ESU)	Endangered
Animals - Fish	*Oncorhynchus tshawytscha* pop. 11	chinook salmon - Central Valley spring-run ESU	Threatened
Animals - Fish	*Oncorhynchus tshawytscha* pop. 7	chinook salmon - Sacramento River winter-run ESU	Endangered
Animals - Mammals	*Reithrodontomys raviventris*	salt-marsh harvest mouse	Endangered
Animals - Reptiles	*Thamnophis gigas*	giant gartersnake	Threatened
Plants - Vascular	*Gratiola heterosepala*	Boggs Lake hedge-hyssop	Endangered
Plants - Vascular	*Neostapfia colusana*	Colusa grass	Endangered
Plants - Vascular	*Orcuttia inaequalis*	San Joaquin Valley Orcutt grass	Endangered
Plants - Vascular	*Tuctoria mucronata*	Crampton's tuctoria or Solano grass	Endangered

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CHAPTER 2 – FIRE ENVIRONMENT

2.1 WILDLAND-URBAN INTERFACE

Important note: this chapter contains technical terms and nomenclature regarding wildland fire and fire behavior. Please refer to the glossary for definitions of these terms.

The wildland-urban interface (WUI) is composed of both interface and intermix communities, defined as areas where human habitation and development meet or intermix with wildland fuels (U.S. Department of the Interior and U.S. Department of Agriculture [USDA] 2001:752–753). Interface areas include housing developments that meet or are in the vicinity of continuous vegetation. Locations where structures are scattered throughout a wildland area and where continuous vegetation and fuels is greater than human habitation are known as intermix areas.

In addition, the WUI has an I-zone, which is described as an area with a set of conditions that facilitate the opportunity for fire to burn from wildland fuels to the home and or structure ignition zone (NWCG Glossary of Wildland Fire, PMS 205, I-Zone, National Wildfire Coordinating Group [NWCG] 2021a).

A CWPP facilitates collaboration of land managers to establish a definition and boundary for the local WUI; to better understand the unique resources, fuels, topography, and climatic and structural characteristics of the area; and to prioritize and plan fuel treatments to mitigate fire risks. In this Plan, the WUI (Figure 2.1) is defined as:

- An area extending 1.5 miles from the boundary of an at-risk community.
    - In the event a strategic fuel project enhances community protection, the WUI boundary may extend beyond the traditional 1.5-mile buffer to include areas where the strategic project would be completed. For example, sustained slopes and ridgelines may continue beyond the 1.5-mile buffer. Project work should be completed in those high-risk areas. Therefore, the entire strategic planning area would be considered as WUI.

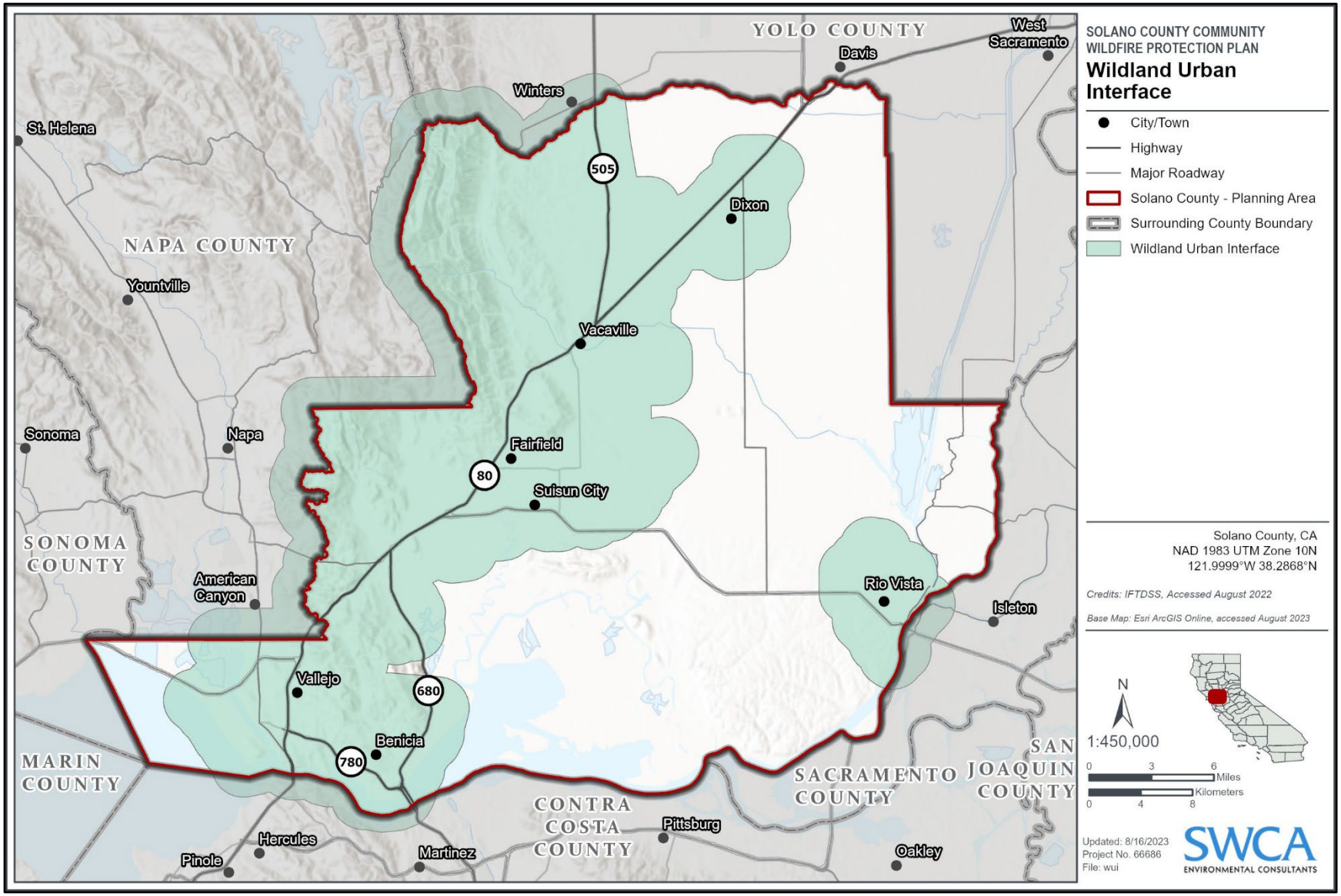


Figure 2.1. Wildland-urban interface in Solano County

In addition, the Core Team determined the WUI extends an additional 1.5 miles on the northwestern flank into Napa County due to the fuels, topography, and wind patterns in the Napa–Solano boundary and surrounding environment. Moreover, the Core Team determined the WUI should encompass the cities, not just the perimeter, given the presence of interspersed grasslands and other vegetated areas that are subject to frequent ignitions (Figures 2.1, 2.2, and 2.3). Mitigation techniques for fuels and fire management can be strategically planned and implemented in WUI areas, for example, with the development of defensible space around homes and structures.

Figure 2.2. Example of the wildland-urban interface in Pleasants Valley

Figure 2.3. Example of the wildland-urban interface in Green Valley

2.1.1 WILDLAND-URBAN INTERFACE LAND USE

Cities and counties are continuously challenged to accommodate both current and future residents in need of safe and affordable housing. Development in high or very high fire hazard areas is required to be constructed in a way that reduces the risk from fire hazards and meets all appropriate county and state fire standards. The requirement includes the use of fire-resistant materials produced to minimize fire susceptibility in new structures within high or very high fire hazard areas per the 2022 California Fire Code, Fire Safe Regulations. New development schemes must contain certain fire protection plans, codes, and actions for fire engineering components of buildings and structures in very high fire hazard zones.

Chapter 6.3 of the Solano County code cites the adoption of the 2022 edition of the California Fire Code and 2019 WUI Code to direct new construction within the county. Established within the 2018 WUI Code are regulations on fire management activities and requirements for construction practices. These directives are aimed at limiting the risk of fire intrusion and safeguarding communities within the WUI (Solano County Code, Solano County 2022a).

Additional fire code information is described in Appendix A.

Appendix C contains the WUI delineation map for cities and unincorporated areas within Solano County as well as a description and a hazard rating for each city and unincorporated area. The WUI map depicts the entire WUI boundary for each city or unincorporated area. The WUI buffer is an area where fuel treatments should be prioritized to provide additional protection to communities from potential wildfire and/or grassland fire spread.

2.1.2 CAL FIRE'S FIRE HAZARD SEVERITY ZONES

In accordance with Public Resources Code (PRC) 4202, CAL FIRE maintains fire hazard severity zone (FHSZ) data for the entire state. The FHSZs rely on the most advanced scientific data and are determined by considering key factors such as vegetation, topography, and weather (Frequently Asked Questions About: 2022 Fire Hazard Severity Zones, CAL FIRE 2022a). These zones reflect the likelihood of a fire occurring in a given area and the potential behavior of such a fire. Figure 2.4 shows the FHSZs for Solano County based on data available at the time of plan development. The CAL FIRE FHSZs in State Responsibility Areas (SRAs) are under regulatory review (as of August 2023); updated layers will be posted on the CAL FIRE Office of the State Fire Marshal website: Fire Hazard Severity Zones (ca.gov).

The Plan is designed to focus on areas within the county with the highest wildfire risk; it is therefore important to note that FHSZs evaluate wildfire "hazard" and not "risk". As defined by CAL FIRE:

"Hazard" is based on the physical conditions that create a likelihood and expected fire behavior over a 30 to 50-year period without considering mitigation measures such as home hardening, recent wildfire, or fuel reduction efforts. "Risk" is the potential damage a fire can do to the area under existing conditions, accounting for any modifications such as fuel reduction projects, defensible space, and ignition resistant building construction (Fire Hazard Severity Zones, CAL FIRE 2023a).

Thus, while FHSZs help guide the community fire planning and mitigation process by assessing hazards, this Plan enhances the "hazard only approach" by considering the hazard and risk dynamic across the county.

Regulatory background regarding the development and updates of FHSZs are summarized in Appendix A.

2.1.3 FUELS AND TOPOGRAPHY WITHIN THE WILDLAND-URBAN INTERFACE

Solano County is characterized by varied topography and a wide assortment of vegetative fuel types. Though the highest proportion of land cover in the county is agriculture, the county's grasslands and native woodlands present a heightened risk of wildfire. The highly contoured western expanses of the County pose the most substantial wildfire threat, with portions of the mountainous areas designated as very high FHSZs by CAL FIRE (see Figure 2.4). Historic fire regimes maintained relatively lower fuel loads for the forested mountain regions; however, human development and expansion of the WUI and contemporary fire suppression practices have increased the likelihood of human ignitions and led to increased fuel accumulation, respectively. Also posing a major threat of ignition potential are the county's low-laying valley grasslands, accounting for a high proportion of vegetation cover throughout the county. Grasslands adjacent to heavily trafficked roadways are especially susceptible to vehicle-related ignitions (Solano County 2008).

Map B.1. in Appendix B shows fuels within Solano County.

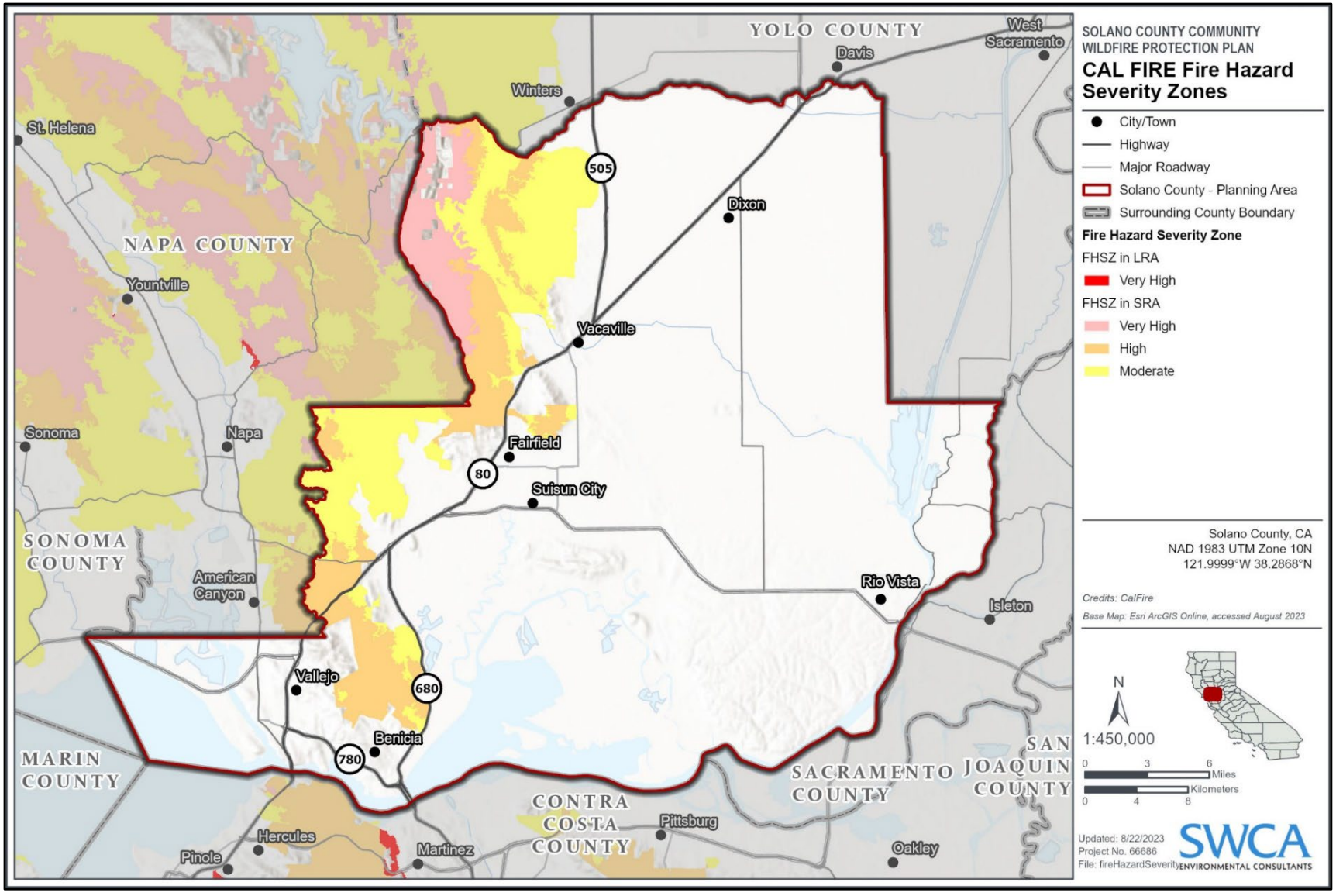


Figure 2.4. CAL FIRE's fire hazard severity zones (as of August 2023, prior to the 2023 update and regulatory review)

Note: for the latest version of the CAL FIRE FHSZ map, please visit: https://osfm.fire.ca.gov/divisions/community-wildfire-preparedness-and-mitigation/wildfire-preparedness/fire-hazard-severity-zones/

2.2 FIRE REGIMES

Fires are characterized by their intensity, the frequency at which they occur, the season in which they occur, their spatial pattern or extent, and their type. Combined, these attributes describe the fire regime. While fire regimes for distinct ecosystem types are detailed below, Figure 2.5 provides an overview of the mean fire return intervals across Solano County's diverse landscape. The prevailing mean fire return interval observed across this terrain ranges from 11 to 15 years. Following closely are the intervals of 0 to 5 years and 6 to 10 years, ranking as the second and third most prominent categories, respectively. Notably, the county experiences notably short fire return intervals, particularly within its most densely populated areas.

2.2.1 OAK WOODLAND

Historically, humans have lived alongside oak woodland communities, using fire as a management tool, rendering it difficult to make a distinction between the natural and anthropogenic roles of fire.
The average historical fire return interval in these communities is from 8 to 16 years (U.S. Forest Service [USFS] 2012). In communities where oak is associated with chaparral and grassland, fire may spread quickly through the shrub canopy; if fire intensity is high and trees are in a closed stand, the fire may spread through large lateral branches or the crown. Research suggests that oak woodlands are well adapted to fires, responding to high frequency fires with enhanced recruitment (Standiford et al. 2012). Solano County contains oak woodlands that are composed largely of valley oak and often interspersed with California sycamore, California black walnut, boxelder, Oregon ash, interior live oak, California buckeye, coast live oak, foothill pine, and blue oak (University of California, Agriculture and Natural Resources [UCANR] n.d.; personal communication, Karin Young, Solano Resource Conservation District [RCD]).

2.2.2 MIXED CHAPARRAL

Mixed chaparral communities in Solano County consist of several species, including chamise and manzanita. They typically grow quickly; generate plentiful fine, dead branches; and have leaves with high resin content (oils). When chaparral communities burn, fire spreads through the shrub canopy, typically resulting in a stand-replacement crown fire (a fire killing all or most of the dominant aboveground vegetation). The estimated historical fire return intervals for chaparral communities with common manzanita range from 30 to 125 years. However, fires now occur more frequently in California chaparral environments because of human encroachment into wildlands. Short interval (<10 years) repetition of fires that kill juvenile plants before they produce seed can decrease populations of shrub species that usually follow fire disturbances. Additionally, invasive grasses frequently colonize chaparral stands that are in recovery and persist until the shrubs close the canopy. However, if fire occurs during the grass succession phase, competition from chaparral shrub species is reduced and can allow grass seeds to survive and propagate a cycle of more frequent fires and decreased shrub cover (Fire in Chaparral Ecosystems, USFS n.d.(a)).

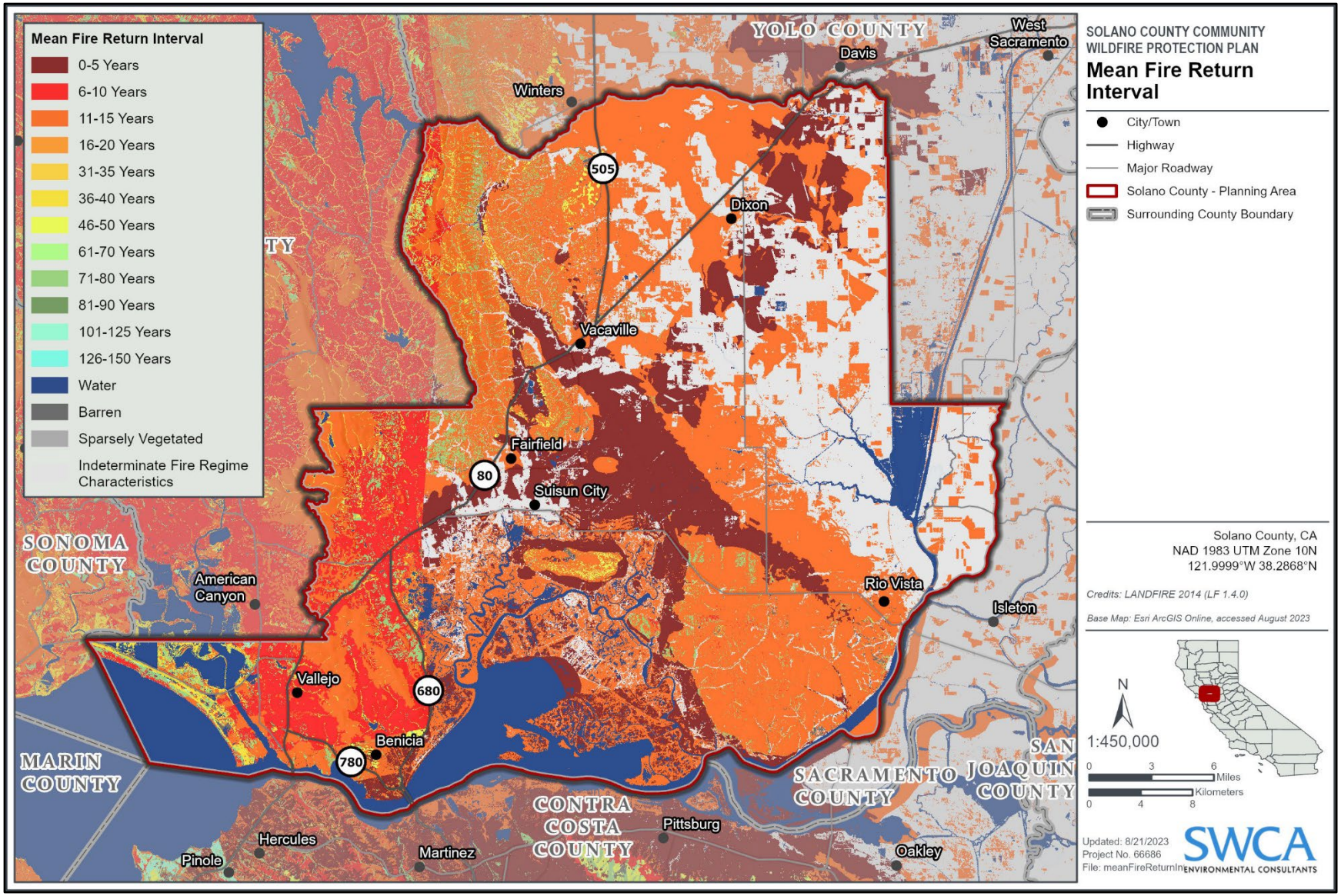


Figure 2.5. Mean fire return intervals across Solano County

2.2.3 VALLEY GRASSLAND

Solano County's valley grassland communities house a wide assortment of herbaceous and wildflower species. Because these communities occur frequently among oak woodlands and savannas, they are likely to have experienced similar frequent fire regimes (NatureServe 2022). When valley grasslands burn, fire spreads rapidly, with high intensity and brief duration. While grassland communities have relatively low amounts of surface level fuels, when compared with communities with large amounts of woody biomass, grassland fuels pose a substantial threat of ignition during hot and dry seasons.

2.3 CLIMATE AND WEATHER PATTERNS

Highly varied topographical characteristics along the WUI contribute to slope variability within the county. Shifts in elevation affect wildland fuels, wind speed and direction, and the configuration of the interface (downslope fuels). The county has various ridges and canyons that interface with the main wildland interface (e.g., Northern Coast Ranges), but most of the communities in the foothills are surrounded by steep terrain.

The climate of Solano County is a result of its varied topography and proximity to the bay. The climate along Solano County's Bay and Delta borders is generally characterized by a Mediterranean temperature with maritime influences, while the eastern portions of the county experience hotter summer temperatures.

Wind conditions vary throughout the county depending on the location and topographical area. The county is subject to periods of extreme wind events (e.g., Diablo Winds), which can be problematic during warmer months and drought years. Little to no precipitation falls in the county during the summer months, and the area has a history of naturally occurring wildfires (Multi-Jurisdictional Hazard Mitigation Plan, Solano County Office of Emergency Services [Solano OES] 2022).

Table 2.1. Mean Annual Temperature and Precipitation by Station in Solano County

			Mean Annual Temperature (°F)		
Station	**Period of Record**	**Mean Annual Precipitation (inches)**	**Max**	**Min**	**Mean Annual**
Vacaville	1991–2020	24.8	76.2	47.9	62.1
Vallejo	1991-2020	20.8	70.1	47.0	58.5
Fairfield	1991–2020	23.0	72.8	47.8	60.3

Sources: National Oceanic and Atmospheric Administration (2023); PRISM (2023)

July is typically the hottest month of the year in the county, with average maximum temperatures ranging from 80.6 ºF in the Vallejo area to 95.0 ºF in Vacaville (Figures 2.6, 2.7, and 2.8). December is usually the coldest month, with average minimum temperatures ranging from 37.1 ºF in Vacaville to 39.2 ºF in Vallejo (National Oceanic and Atmospheric Administration 2023; PRISM 2023). Mean annual temperatures vary throughout the county due to the cooling influence of the bay, with the western portions of the county experiencing cooler summer temperatures than the eastern portions. The county is typically subject to high temperatures with gusting winds and low humidity from May through November (Multi-Jurisdictional Hazard Mitigation Plan, Solano OES 2022).

Solano County experiences the same seasonally dependent precipitation patterns common in the region, with January and February generally receiving the highest precipitation and July and August receiving the least (see Figures 2.6, 2.7, and 2.8). The western portion of the county receives a greater amount of precipitation compared with the eastern region. West of Vacaville, precipitation averages between 33 and 37 inches per year, while Rio Vista on the eastern edge of the county receives between 14 and 17 (Multi-Jurisdictional Hazard Mitigation Plan, Solano OES 2022). Drought is a common occurrence in the county as the USDA has declared 12 drought disaster declarations since 2012 (Multi-Jurisdictional Hazard Mitigation Plan, Solano OES 2022).

Monthly climate normals (30-year averages) for Solano County are graphed by weather stations below (see Figures 2.6, 2.7, and 2.8).

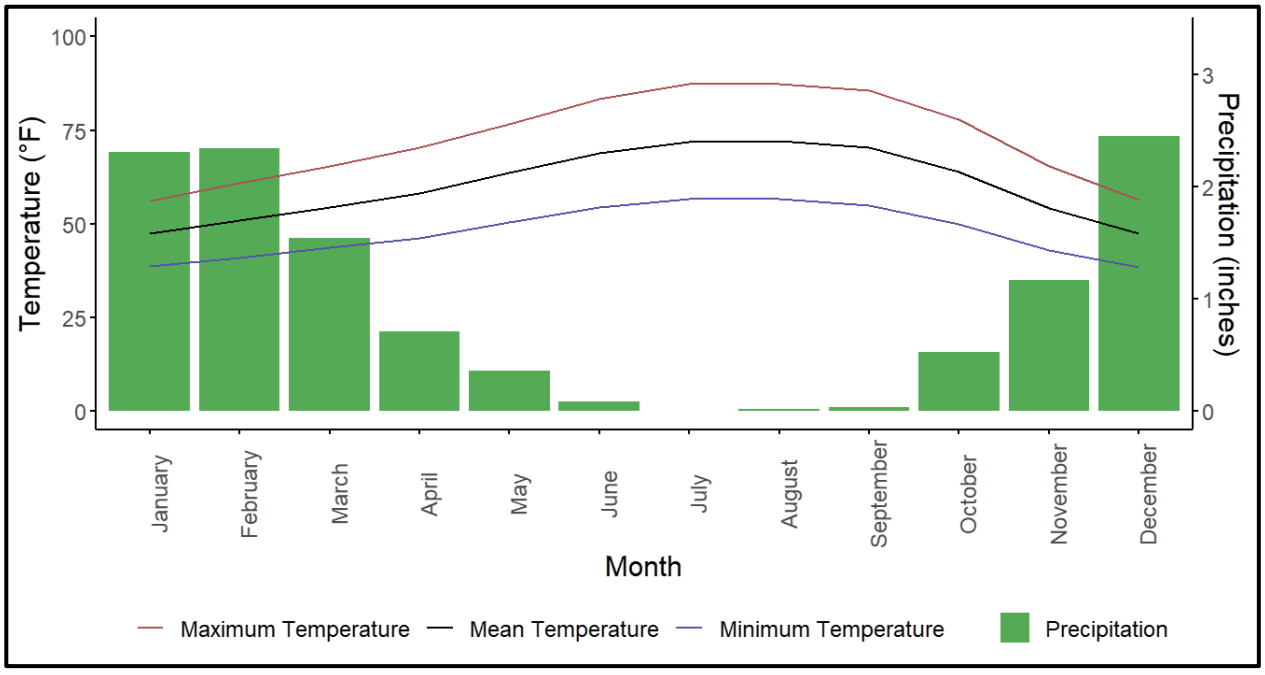


Figure 2.6. Monthly climate averages for the City of Fairfield
Source: PRISM (2023)

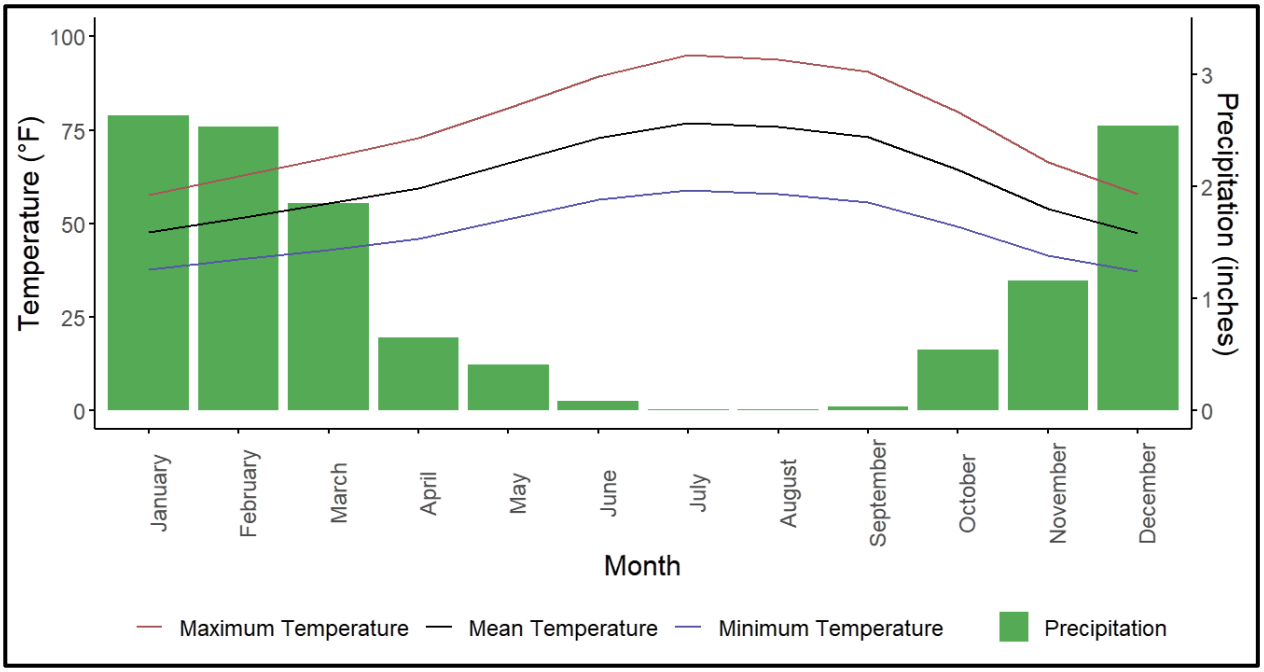


Figure 2.7. Monthly climate averages for the City of Vacaville

Source: National Oceanic and Atmospheric Administration (2023)

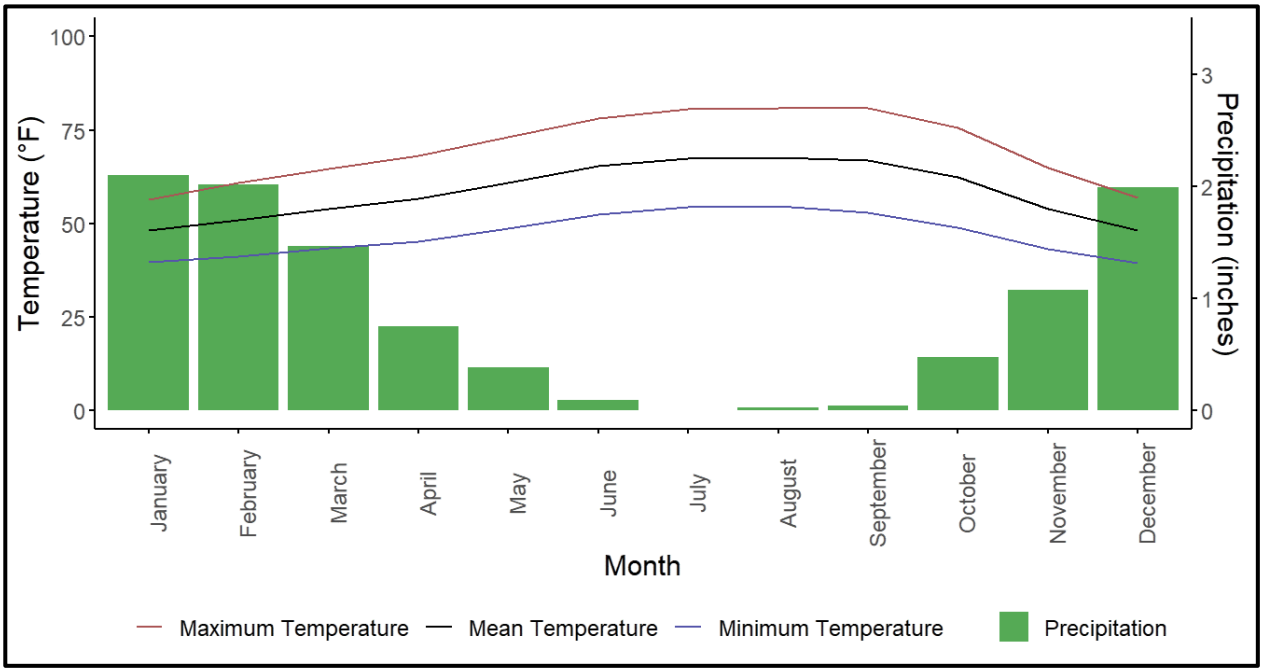


Figure 2.8. Monthly climate averages for the City of Vallejo

Source: PRISM (2023)

2.4 FIRE HISTORY

Fire is a natural part of California's diverse landscapes and is essential to many ecosystems across the state. Almost all of California's diverse ecosystems are fire-dependent or fire-adapted. For centuries, many California Native American tribes recognized this interdependence between fire and the ecosystem and used prescribed burning to maintain and restore ecosystem health. However, in the 1800s settlers began enforcing strict fire suppression regimes. This shift in management actions led to dense stand conditions and increased vulnerability to fire. Wildfire suppression regimes, in conjunction with other management actions, human expansion into wildlands, and climate change, have resulted in an imbalance between wildfire and ecosystem interactions (CDFW Initiates Massive Wildfire Protection Effort at Wildlife Areas, Ecological Reserves Statewide, California Department of Fish and Wildlife [CDFW] 2021a).

2.4.1 RECENT FIRE OCCURRENCE

This section was developed using fire history data from CAL FIRE's Fire and Resource Assessment Program (Fire Perimeters, CAL FIRE 2022b) and the National Interagency Fire Center (NIFC) website (https://data-nifc.opendata.arcgis.com/datasets/nifc::wildland-fire-incident-locations/about). The Core Team acknowledged that fire reporting, especially for small ignitions (that grow to less than 1 acre), is notoriously limited throughout the county and nationally, and therefore, fire history data may not fully represent the actual numbers of fires that occur on an annual basis.

A depiction of Solano County's wildfire history (1945–2021) shows historic fires occurring in the northwestern portion of the county, within and around the Vaca Mountains and foothills (Figures 2.9 and 2.10). Fires have also occurred in the Suisun Valley area but at a lower frequency. From a county perspective, the primary threat is within the historic fire corridors, i.e., the western and northwestern areas.

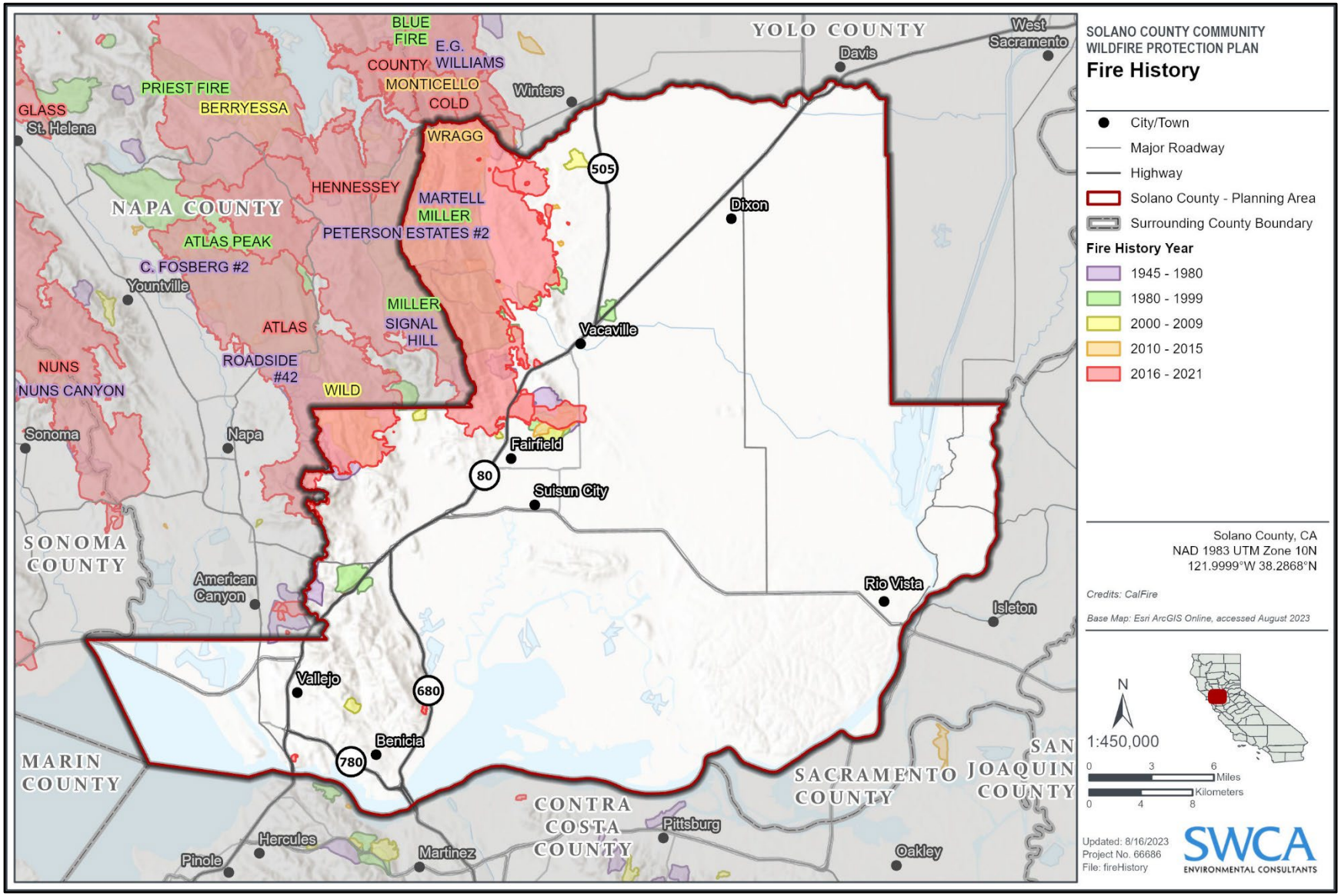


Figure 2.9. Historic fire perimeters for Solano County from 1945 through 2021

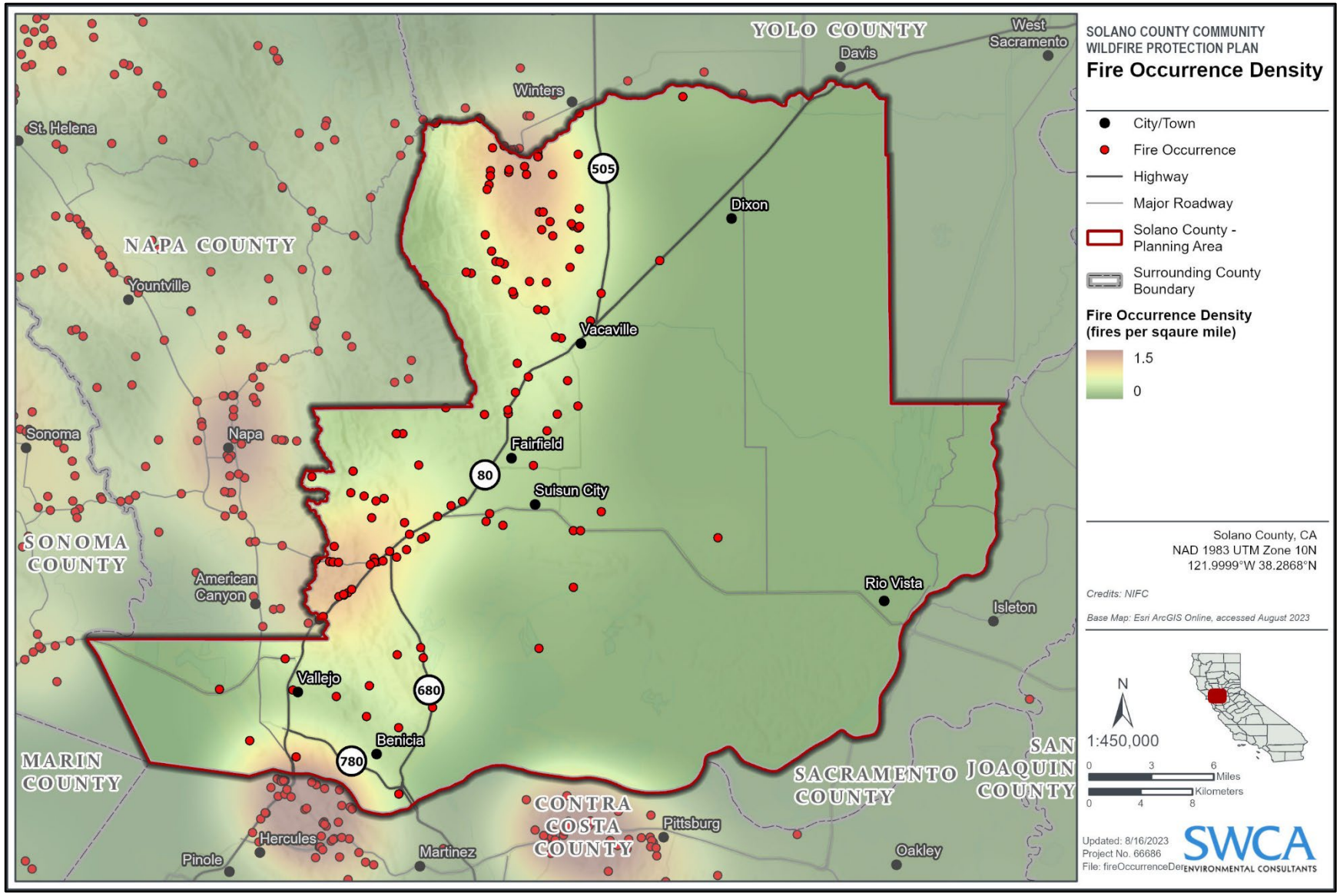


Figure 2.10. Fire occurrence density map illustrating ignition points and the spatial density of these ignition points

Historically, fire events have followed an oscillating pattern, with some decades experiencing more events and other decades experiencing fewer. However, there has been a steady increase of fire events, human ignitions, and total acreage burned per decade over the last 30 years (Figures 2.11–2.14). In fact, 60% (432,700 acres) of all acres burned since 1945 have burned in the last two decades (2000–2021). Many of the fires in and around the county have unknown causes. However, human ignitions have increased substantially in the last four decades (see Figure 2.14). Among the fires with a known cause, equipment use, arson, powerline, vehicle, and campfires are the most common.

Fire history data from the period of 1923 through 2021 show alternating periods, some with low fire occurrence and some with high fire occurrence (see Figure 2.11); fire sizes have been variable (see Figure 2.12). Since 2000, wildfire events have been increasing, especially in the western portion of the county with more forested areas and larger proportions of WUI (see Figure 2.9). Still, the number of total fires has increased and reached a decadal record high of 42 in the period of 2010–2019 (see Figure 2.11). Large wildfires, such as the 2020 Quail and Hennessey Fires that burned about 1,840 and 2,400 acres, respectively, have contributed to the 2010–2021 period having a significantly higher rate of acres burned than previous periods (see Figure 2.13).

The Hennessey, Gamble, Green, Markley, and Spanish Fires were part of the larger LNU Lightning Complex Fire that burned from August 17 through October 2, 2020, and impacted Solano, Lake, Napa, Sonoma, and Yolo Counties. The complex was primarily caused by lightning strikes sparking numerous small fires, which collectively burned a total of 363,220 acres. Although most of the fires were lightning-caused, the Markley Fire was a human-caused fire, which significantly exacerbated the Complex (NBC News 2021). In Solano County alone, the LNU Lightning Complex Fire burned 42,000 acres and resulted in two deaths and the loss of 711 structures, 302 of which were residential homes (Multi-Jurisdictional Hazard Mitigation Plan, Solano OES 2022). The LNU Complex Lightning Fire is the sixth largest in the state's history (Top 20 Largest Wildfires, CAL FIRE 2022c).

Fires historically occur when high temperatures and hot, dry winds are most frequent (Figure 2.15). Climate change acts as a key driver of increased fire season duration due to warmer spring and summer temperatures, decreased snowpack, and earlier spring snow melt.

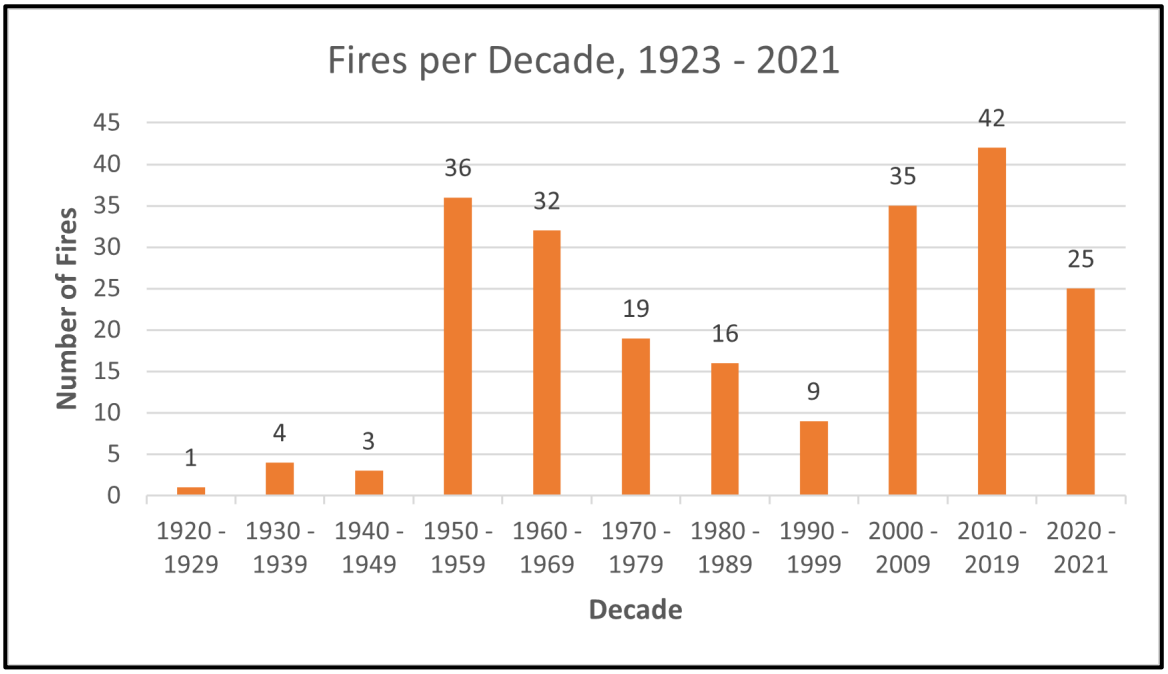


Figure 2.11. Decadal wildfire frequency in Solano County from 1923 through 2021

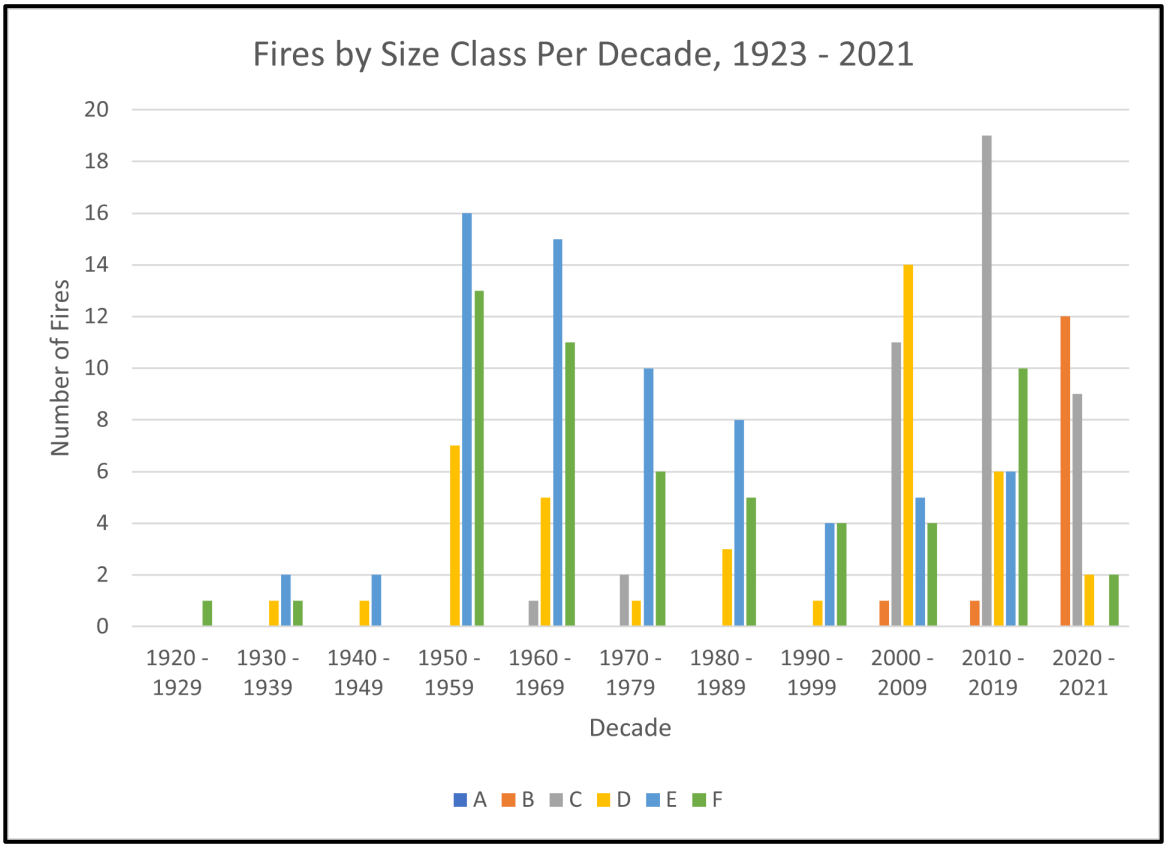


Figure 2.12. Solano County fire size statistics per decade from 1923 through 2021

Size Class: A = 0.25 acre or less; B = greater than 0.25 to 10 acres; C = 10 to 100 acres; D = 100 to 300 acres; E = 300 to 1,000 acres; F = 1,000+ acres.

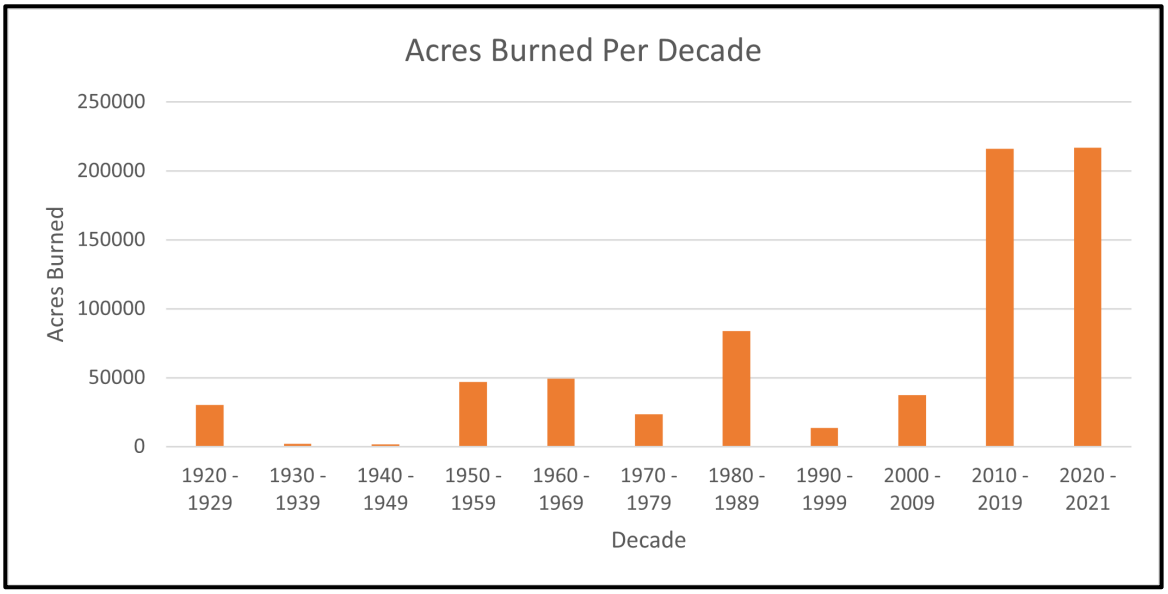


Figure 2.13. Solano County acres burned per decade from 1923 through 2021

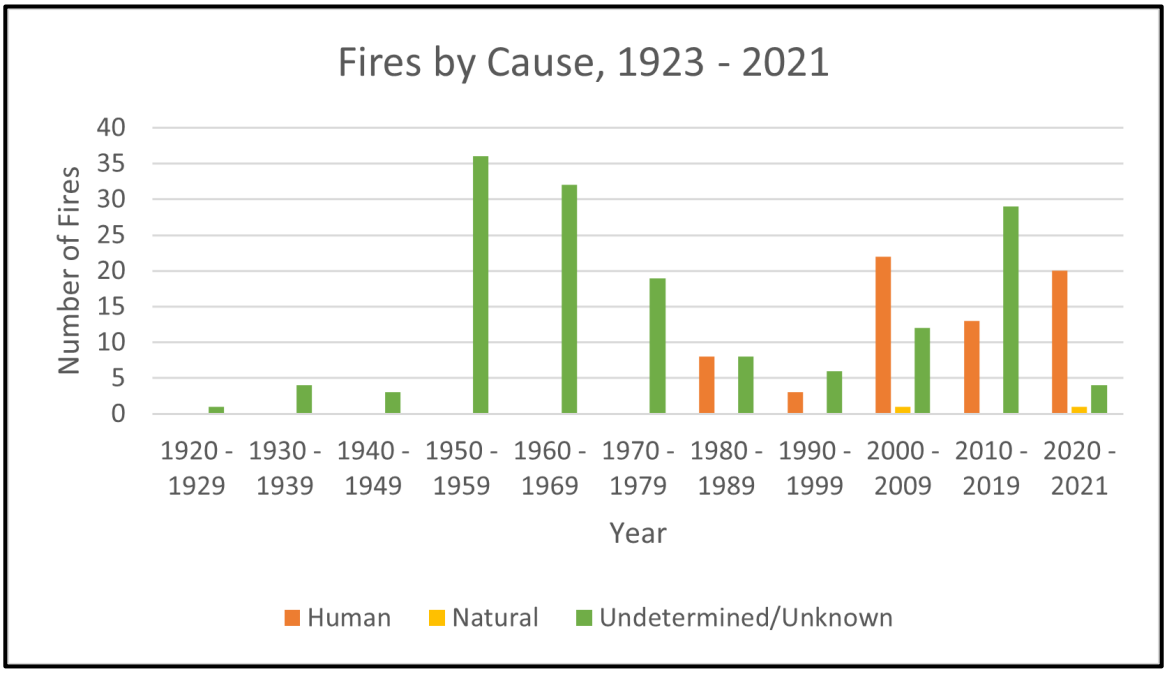


Figure 2.14. Solano County fire causes from 1923 through 2021

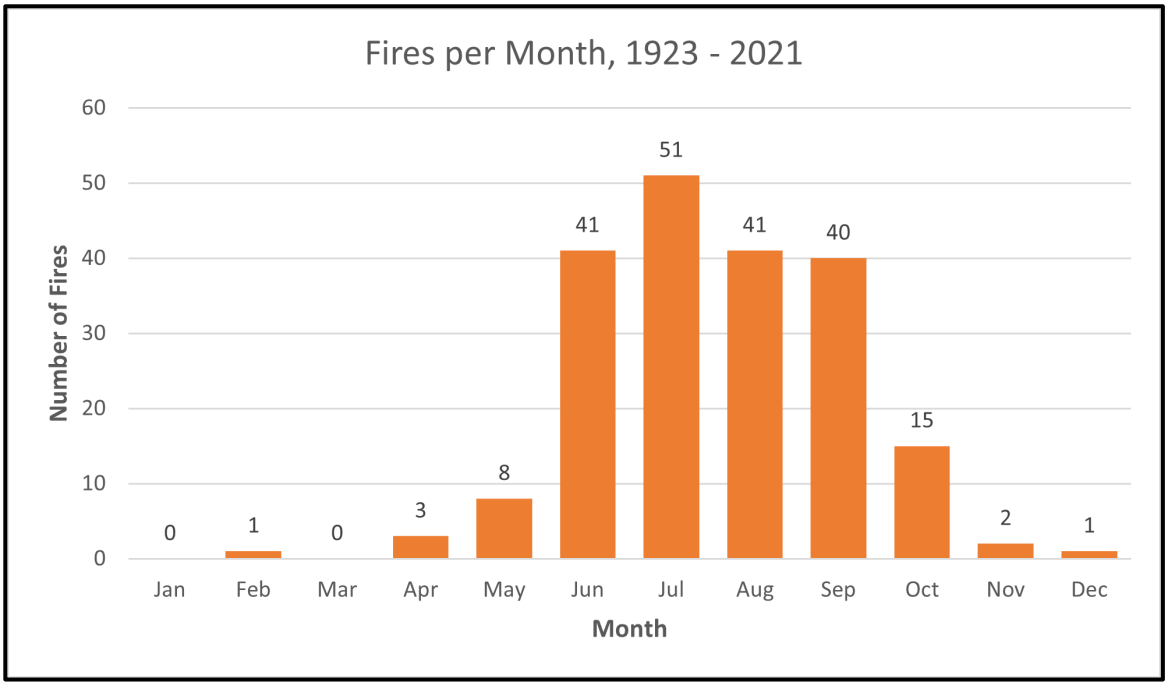


Figure 2.15. Solano County monthly fire frequency from 1923 through 2021

2.5 FIRE RESPONSE

California contains many federal, state, and local fire protection organizations that are well integrated through a variety of mutual aid and fire protection agreements and coordinated by organizations such as the California Wildfire Coordinating Group, the Northern and Southern California Geographic Area Coordination Centers, and FIRESCOPE. Agencies such as the California Governor's Office of Emergency Services (Cal OES), USFS, and CAL FIRE form the basis for a robust wildfire response capacity that can be deployed in wildfire incidents throughout the state. California contains what many regard as the strongest wildfire suppression capability in the nation.

Within California, fire response is broken down into three areas: Local, State, and Federal Responsibility Areas. Local Responsibility Area (LRA) is a legal term defining the area where the local government has financial responsibility for the prevention and suppression of wildfire. State Responsibility Area (SRA) defines where the state government is responsible for wildfire response, and Federal Responsibility Area (FRA) defines where the federal government is responsible (Figure 2.16). Most of Solano County is within the LRA; however, the western portion of the county that is classified as a very high FHSZ is primarily an SRA.

2.5.1 LOCAL RESPONSE

2.5.1.1 Solano County Fire Response

Solano County fire response consists of seven local fire departments and six local fire protection districts (Figure 2.17).

Information regarding fire department and fire protection district equipment and personnel is available in Appendix C.

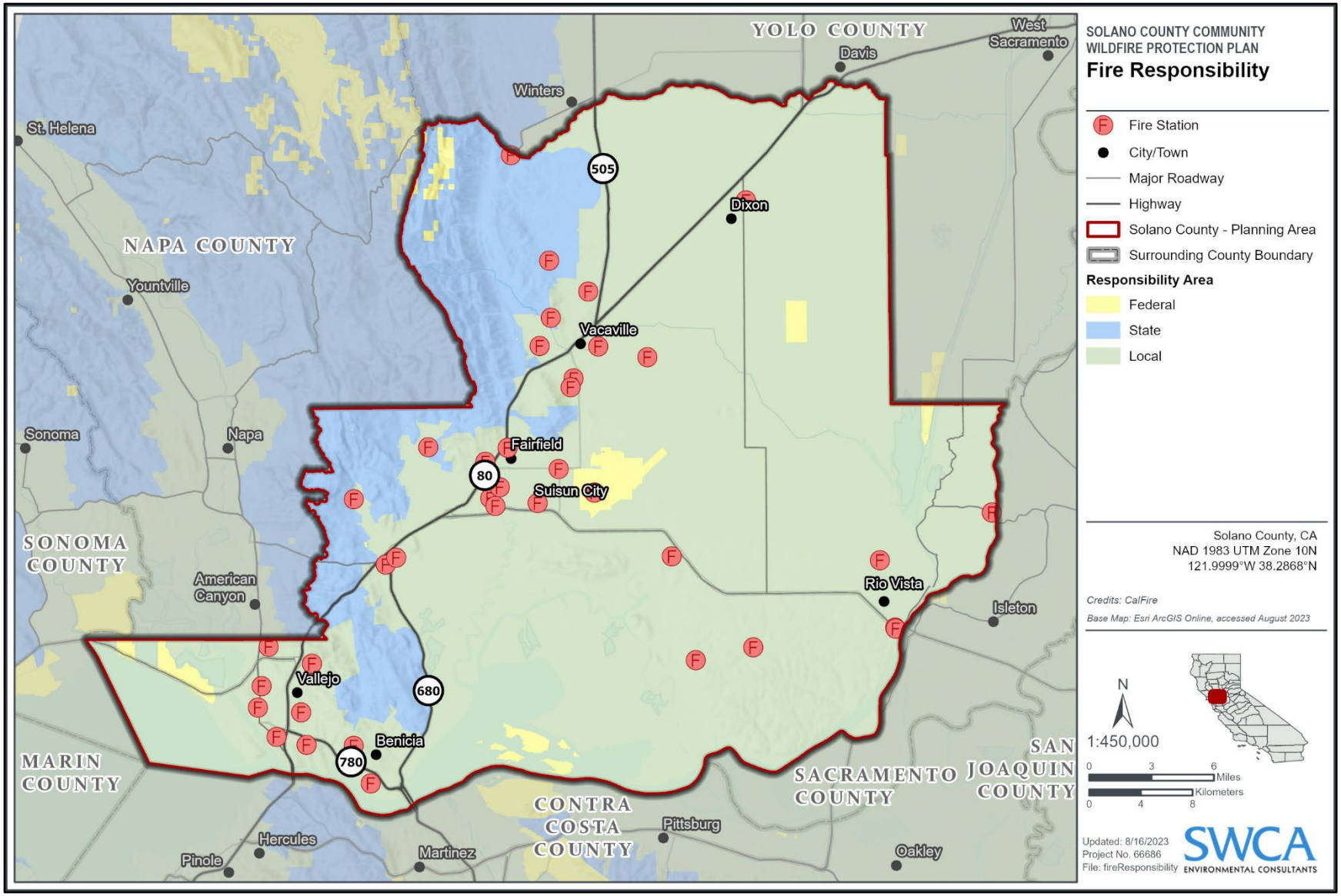


Figure 2.16. Fire response zones and fire station locations

Note: some stations are not staffed 24 hours per day.

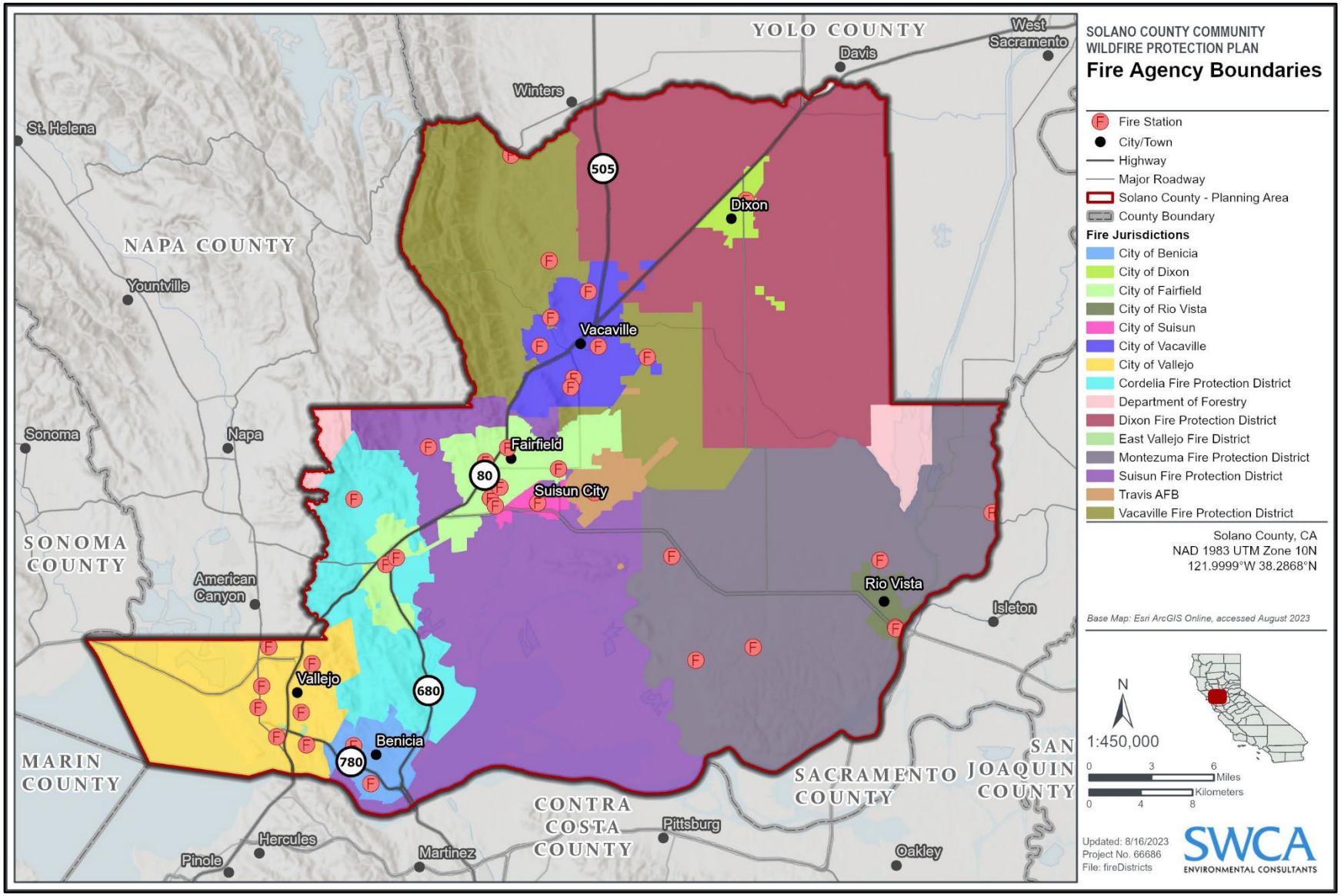


Figure 2.17. Solano County fire agency boundaries map

2.5.1.2 Fire Departments

Benicia

The Benicia Fire Department is an “all risk” department that was founded in 1847 with the mission of “providing exceptional community-focused service.” The department’s stated vision is “to set the standard for public safety excellence in preparedness, emergency response, and customer service.” The department operates out of a jurisdictional area of 15.7 square miles, serving the community in an effective manner. The department maintains a fire prevention division within its operations that enforces fire codes, conducts vegetation management, and conducts preparedness efforts such as education events and alert systems (Benicia Fire Department 2022).

The department is responsible for fire suppression, examining fire scenes, and emergency medical and rescue services. Additionally, the department maintains a water rescue program and is trained to identify and respond to hazardous materials (HazMat) calls for service.

Dixon

The Dixon Fire Department’s guiding mission is “through a constant state of readiness, provide a quality and reliable service to its community through leadership, education and training” (Dixon Fire Department 2022). The fire department was established in 1871 as a community-supported service and today operates out of one station located in Dixon. The department is operated by the City of Dixon and covers a 6.7-square-mile area of the city. The Dixon Fire Department has partnered and contracted with the Dixon Fire Protection District since the 1920s to serve all residents within the district, extending the total jurisdictional area to 320 square miles.

The key functions of the department are responding to and mitigating fire and responding to medical emergencies. The department is trained and equipped to provide initial attack on all fire types occurring in the city and district (Dixon Fire Department 2022).

Fairfield

The Fairfield Fire Department has the mission of taking responsibility “for all aspects of fire service operations. This includes Fire Suppression, Emergency Medical Services, and Fire Prevention” (Fairfield Fire Department 2022).

The department operates out of five stations providing fire suppression and emergency medical service and has a Community Emergency Response Team (CERT). Additionally, the department coordinates building inspections and works closely with fire investigators to identify reoccurring ignitions and address the cause.

Rio Vista

The Rio Vista Fire Department is an “all-risk” fire department that provides fire suppression and emergency medical services to the city of Rio Vista. The department’s capacity includes structural fire suppression, wildland fire suppression, response to limited HazMat incidents, urban search and rescue, surface water rescue, vehicle extrication, and technical rescue, as well as basic life support and advanced life support medical services. The department’s mission is “to serve our residents by protecting the lives, property, and environment of those who visit, travel through, and live in our community, from

dangers and hazards during emergencies and non-emergencies alike. We are committed to providing skilled and well-trained professional services to all who request us" (Rio Vista Fire Department 2022).

The Rio Vista Fire Department operates out of one station located on Main Street in Rio Vista. The department is part of a mutual aid agreement with Solano County and provides and receives aid from the City of Isleton through an automatic aid agreement. (Rio Vista Fire Department 2022).

Suisun City

The Suisun City Fire Department was established in 1861 and strives to serve the citizens to the highest standard. The Suisun City Fire Department is an "all hazard" combination fire department providing advanced life support emergency medical services, fire suppression, fire prevention, and public education services to city residents. The mission statement of the department is "to ensure the protection of life and property through effective and efficient delivery of professional firefighting, fire prevention, and emergency medical services to the communities of Suisun City" (Suisun City 2022). The department's jurisdiction covers an area of 4.5 square miles coinciding with the city boundaries. The Suisun City Fire Department operates out of one fire station and is staffed by career and volunteer firefighters. In addition to providing emergency response to structural, agricultural, wildland, and vehicle fires, as well as medical emergencies, the department maintains a water rescue team, the Urban Search and Rescue team, and manages a disaster preparedness division (Suisun City Fire Department 2020). The department consists of four divisions: Administration, Operations, Training & Emergency Medical Services, and Fire Prevention & Public Education.

Vacaville

The Vacaville Fire Department was founded in 1895 to serve city residents and protect life and property. The department has a mission to "reduce the impact of emergencies in a caring and competent manner" (Vacaville 2022). The department provides fire response to the 28 square miles of the city while extending medical services to a 160-square-mile area in Solano County. The Vacaville Fire Department is always staffed with at least 22 personnel (Vacaville Fire Department 2021).

The department has several key functions ranging from fire suppression to emergency medical services, to prevention and code enforcement, and community engagement.

The department is part of a mutual aid agreement through the California Fire and Rescue System, which allows the department to respond to emergencies statewide, as needed (Vacaville 2022).

Vallejo

The mission of the Vallejo Fire Department is to ensure a safe community through exceptional, professional fire service (Fire Department, City of Vallejo 2022a). The department was established in 1858 and has since expanded to seven stations across the city. There are 108 employees of the department with 99 firefighter-paramedics, firefighters, engineers, captains, and battalion chiefs.

The department's main functions include, fire suppression and emergency services and response, management of an apprentice program, and community education for awareness and prevention.

2.5.1.3 Fire Protection Districts

Vacaville

The Vacaville Fire Protection District was established in 1946 and consolidated with Elmira Fire Protection District in 1984. The mission of the district is to "provide the highest level of customer service by protecting life, property, and the environment through the delivery of innovative, fiscally responsible and ethical emergency services in our community" (Vacaville Fire Protection District 2022). The Vacaville Fire Protection District covers an area of 135 square miles with two stations in Vacaville, one in Elmira, and one in Winters.

The district participates in a mutual aid agreement with neighboring districts and departments, as well as the Cal OES Mutual Aid Agreement. The Vacaville Fire Protection District responds to emergency calls regarding wildland and structural fires, medical and vehicle emergencies, technical rescues, hazmat incidents, and other emergencies. The department has developed a fire protection plan that establishes a normal fire control capability for the district and identifies responsibilities for public entities and private citizens (Vacaville Fire Protection District 2022).

Cordelia

Established in 1918, the Cordelia Fire Protection District provided emergency fire and medical response services for a 56 square mile jurisdiction in the county. The service area covered Green Valley, Rockville, Cordelia, and Lower Suisun Valley, encompassing portions of the Suisun Marsh and transitioning into the foothills of the Howell Mountains (About Us, Cordelia Fire Protection District 2022a).

The mission of the Cordelia Fire Protection District was to "dedicate our efforts to provide for the safety and welfare of the public through the preservation of life, property, and the environment" (About Us, Cordelia Fire Protection District 2022a). The district responded to structural, wildland, and other fires, medical emergencies, vehicle accidents, hazmat incidents, and technical rescues. Given the high amount of WUI in the response area, the Cordelia Fire Protection District placed specific emphasis on wildland fire prevention. This involved conducting fire hazard inspections in the WUI, where district personnel identified potential fire hazards and recommended corrective actions.

In December 2022, the Cordelia Fire Protection District announced an Interim Contract for Service with the Fairfield Fire Department. Through this agreement, the Fairfield Fire Department will provide all fire, medical, and incident response services within the Cordelia Fire Protection District. With the Fairfield Fire Department responding to 100% of calls within the Cordelia Fire Protection District service area beginning January 2023. This agreement took place in response to long-standing staffing challenges faced by the Cordelia Fire Protection District (Status of Cordelia Fire Protection District, Cordelia Fire Protection District 2022b).

Montezuma

The Montezuma Fire Protection District is a mostly volunteer unit that provides emergency medical and fire response in eastern Solano County. The Montezuma Fire Protection District has a jurisdiction of 300 square miles consisting of mostly agricultural land and grasslands. The district operates out of two stations located in Rio Vista and Birds Landing (Montezuma Fire Protection District 2023).

Suisun

Established in 1935, the Suisun Fire Protection District is dedicated to safeguarding lives and property. Operating from two stations, the district offers fire suppression and emergency medical services, led by a mixture of volunteers and paid staff. The district has a prevention division that takes on the role of reducing fire risk and safeguarding the public from other life hazards. The prevention division also coordinates building inspections, plans reviews within the fire department, and investigates the cause and origin of fires. Also housed within the district is public education division, which provides widespread fire safety, evacuation, and disaster preparedness education.

2.5.2 STATE RESPONSE

2.5.2.1 California Department of Forestry and Fire Protection (CAL FIRE)

CAL FIRE is responsible for initial fire response within SRAs, or where the state is responsible for fire response, in California. SRAs are located in the western portion of Solano County. Dispatch, coordination, and logistical support is provided via the St. Helena Emergency Command Center (CAL FIRE LNU 2021), which operates under the Northern California Geographic Coordination Center. Resource distribution for all-risk incidents, such as aircraft and equipment requests, is handled by the St. Helena Emergency Command Center.

2.5.3 FEDERAL RESPONSE

2.5.3.1 Berryessa Snow Mountain National Monument

Bureau of Land Management (BLM) lands in Solano County fall under the BLM California Central District, Ukiah Field Office. While the BLM does not have a specific fire and aviation program within the Ukiah Office, the agency is a member of the California Forest Management Task Force and the California Wildfire Coordinating Group. The Task Force is composed of several state, federal, and local wildland firefighting agencies. Additionally, the Task Force joins local communities to prevent or minimize fire danger (California Fire Management Program, BLM 2022a).

2.5.4 MUTUAL AID

The California Fire Service and Rescue Emergency Mutual Aid Plan provides planning basis and concepts for the Incident Command System, the Integrated Emergency Management System, and multi-hazard response. The California Disaster and Civil Defense Master Mutual Aid Agreement between the State of California, each of its counties, and those incorporated cities and fire protection districts signatory thereto: create formal structure for provision of mutual aid, provides that no agency shall unreasonably deplete their own resources equip mutual aid, the responsible local official of the jurisdiction of the incident requiring mutual aid remain in charge at the specific incident, intra- and inter area and intra-regional mutual aid are developed by and operated by those in agreement, and reimbursement for mutual aid extended under the California Disaster and Civil Defense Master Mutual Aid Agreement must be pursuant to state law and in accordance with Cal OES, (Cal OES Fire and Rescue Mutual Aid Plan 2023).

CAL FIRE LNU has mutual aid agreements with local fire departments, fire protection districts, and the BLM. In addition, CAL FIRE LNU participates in the California Fire Management Agreement, which includes the following agencies: USFS, U.S. Fish and Wildlife Service, BLM, National Park Service, Bureau of Indian Affairs, and Cal OES (CAL FIRE LNU 2021).

2.5.5 EMERGENCY NOTIFICATIONS AND EVACUATION

The safe and efficient evacuation from wildfire involves several factors, including:

- **Public Alert and Warning:** Solano County has implemented a countywide emergency notification system in cooperation with its municipalities. The Alert Solano Emergency Notification System allows residents to register phone numbers and emails to receive alerts. This allows county and municipal emergency agencies to rapidly communicate information regarding severe weather and disasters, evacuation notices, road closures, and any other relevant emergency information (Multi-Jurisdictional Hazard Mitigation Plan, Solano OES 2022). Other pathways for informing the community during an emergency are the Wireless Emergency Alert System, Neighbors Helping Neighbors, Hi-Lo Sirens, local radio, social media, etc. (Alert Solano, Solano County 2022f).
- **Public Awareness:** Community members should have personal evacuation plans ahead of time and be signed up to receive emergency notifications. Through public outreach and education, agencies should encourage the community to sign up for emergency notifications, know their emergency evacuation zone, and make a plan for emergencies.

2.5.5.1 Evacuation Resources

The Health and Safety chapter of the Solano County general plan contains guidance, policies, and programs on disaster preparedness. This includes HS.I-38, which tasks the county with creating and maintaining emergency response plans that contain evacuation routes, emergency response strategies, and evacuation guidance. The plan also requires the county to regularly assess resource needs for response agencies to ensure staffing and readiness, increase public outreach and education on disaster response, and facilitate cooperation and communication between responders and residents during emergencies (Solano County 2008).

The Solano County hazard mitigation plan lists priority actions to decrease vulnerability and improve response. To improve evacuation, the county has identified a need to develop spatial wildfire data (Multi-Jurisdictional Hazard Mitigation Plan, Solano OES 2022). The hazard mitigation plan also has information on the Alert Solano program, which provides emergency notification and evacuation information to residents.

The county has established a fire ready webpage on the county website that provides an extensive list of resources for wildfire preparedness and response. The webpage contains home hardening and defensible space information, evacuation preparation steps, and an evacuation guide (Fire Ready, Solano County 2022e). Solano County's wildfire preparedness page can be accessed here: https://emergency.solanocounty.com

Integrated Public Alert & Warning System

The Integrated Public Alert & Warning System (IPAWS) is a comprehensive system that aims to ensure effective communication and timely dissemination of critical information during emergencies. With

implementation and oversight by the Federal Emergency Management Agency (FEMA), IPAWS utilizes various methods of communication to notify the public during emergencies. One of the methods is the Emergency Alert System (EAS), which delivers messages through radio and television broadcasts. IPAWS also utilizes Wireless Emergency Alerts (WEA) to send alerts directly to mobile devices. In addition, the National Oceanic and Atmospheric Administration (NOAA) weather radio is another tool used by this system to provide warnings to the public.

More information, including news and updates about IPAWS, can be found on FEMA's website at https://www.fema.gov/emergency-managers/practitioners/integrated-public-alert-warning-system.

ALERTCalifornia Live Cameras

ALERTCalifornia monitoring cameras serve as a disaster awareness tool, providing visual alerts for various purposes. These cameras offer a visual tool that aids in the early detection and prevention of fire incidents. By monitoring areas susceptible to fires, the ALERTCalifornia cameras contribute to proactive measures and prompt response efforts. The real-time visual feed enhances situational awareness and allows for swift action to mitigate potential risks and safeguard high-risk communities. The cameras are particularly utilized by Pacific Gas and Electric Company (PG&E) to screen for fires within its service areas.

2.5.5.2 Animals and Livestock

In the event of a wildfire, it is important that residents, fire responders, and Solano OES have a plan for evacuation of pets and livestock. While creating evacuation plans, residents should take into consideration the time needed to load livestock into stock vehicles and evacuate during a wildfire incident.

There is also a need to pre-identify where animals can be taken for large animal shelter. Similarly, locations where small animals such as dogs and cats picked up in the fire area should be pre-identified, as well as the lead agencies coordinating this work.

Solano Community Animal Response Team

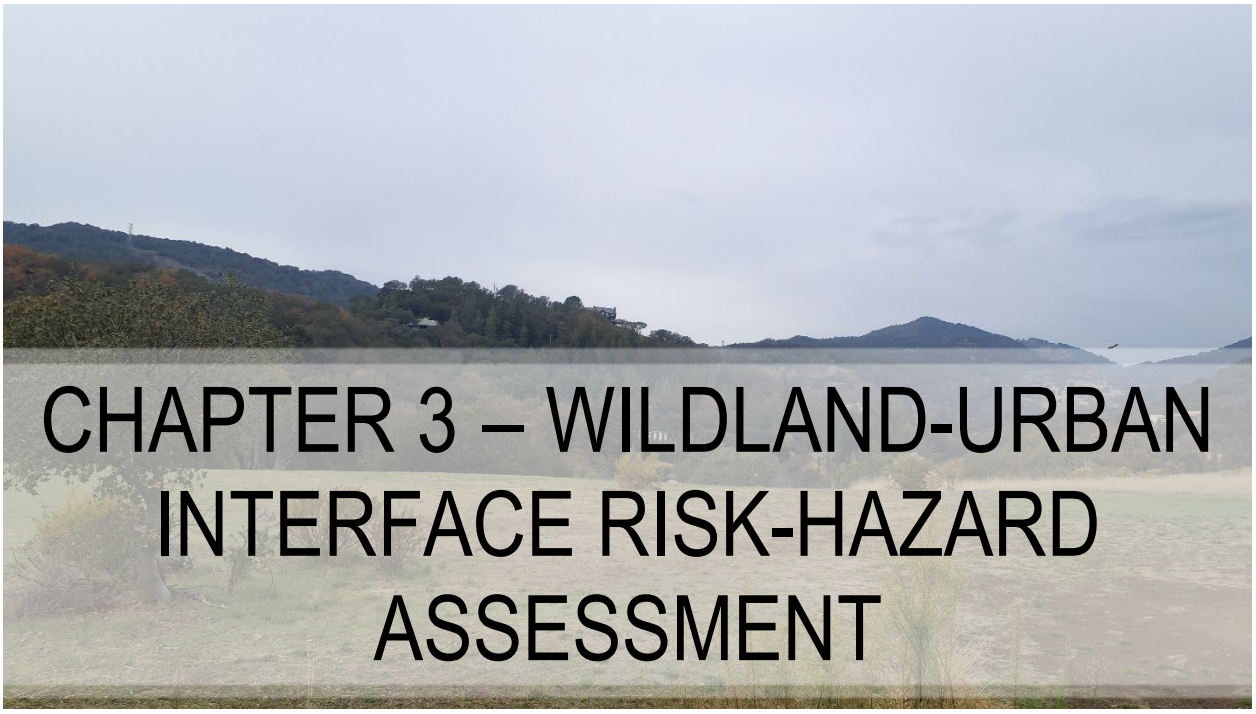
The Solano Community Animal Response Team (CART) works in collaboration with local agencies and governmental bodies within the region to assist in the preservation of animal well-being during emergencies (Solano CART 2022). The team consists of trained volunteers that provide a range of services for animal owners during a disaster event requiring evacuations, shelter in place, or other support. Since its formation, Solano CART has responded to the 2020 LNU Lightning Complex in Solano County, as well as the 2021 Caldor Fire. Solano CART is not a county-affiliated department or agency but rather a volunteer-led 501(c)(3) non-profit organization.

Ag Pass Program Solano County has established its Ag Pass program, which conditionally permits qualifying commercial livestock producers, agriculturalists, processors and horse stable operators, and/or their managerial employees, to enter evacuation areas to carry out eligible essential agricultural operations. This program emphasizes the need for landowners and livestock owners to engage in natural disaster preparedness. In order to apply for the programs, applicants are required to provide proper documentation and complete the Incident Safety for Agricultural and Livestock Producers training, which has been approved by the State Fire Marshal.

For more information, please visit:
https://www.solanocounty.com/civicax/filebank/blobdload.aspx?blobid=40720

2.5.6 WATER AVAILABILITY AND SUPPLY

Water supply is variable throughout the county. In general, most of the cities are serviced by a wide network of hydrants with good flow. Contrarily, most rural and/or unincorporated areas have inadequate water resources for fire suppression, e.g., limited or lack of hydrants and hydrant systems with poor water pressure and/or flow.



CHAPTER 3 – WILDLAND-URBAN INTERFACE RISK-HAZARD ASSESSMENT

Disclaimer

The purpose of this risk assessment is solely to provide a community and landscape-level overview of general wildfire risks within the assessment area as of the date hereof, and to provide a potential resource for community pre-fire planning. This risk assessment is premised on various assumptions and models which include and are based upon data, software tools, and other information provided by third parties (collectively, "Third-Party Information and Tools"). SWCA, Incorporated, doing business as SWCA Environmental Consultants ("SWCA"), relied on various Third-Party Information and Tools in the preparation of this risk assessment and SWCA shall have no liability to any party in connection with this risk assessment including, without limitation, as a result of incomplete or inaccurate Third-Party Information and Tools used in the preparation hereof. This risk assessment may not be relied upon by any party without the express written consent of SWCA. Any reproduction or dissemination of this risk assessment or any portion hereof shall include the entirety of this plan disclaimer. SWCA hereby expressly disclaims any responsibility for the accuracy or reliability of the Third-Party Information and Tools relied upon by SWCA in preparing this risk assessment. SWCA shall have no liability for any damage, loss (including loss of life), injury, property damage, or other damages whatsoever arising from or in connection with this risk assessment, including any person's use or reliance on the information contained in this risk assessment.

3.1 PURPOSE

Important note: this chapter contains technical terms and nomenclature regarding wildland fire and fire behavior. Please refer to the glossary for definitions of these terms.

The purpose of developing the Composite Risk-Hazard Assessment model described here is to create a unique tool for evaluating the risk of wildfires to communities within the wildland-urban interface (WUI)

areas of Solano County. Although many definitions exist for hazard and risk, for the purpose of this document these definitions follow those used by the firefighting community:

> **Risk** is defined as the chance of a fire starting as determined by the presence and activity of causative agents (National Wildfire Coordinating Group [NWCG] 1998).
>
> **Fire Hazard** is a fuel complex, defined by type, arrangement, volume, condition, and location that determines the ease of ignition and of resistance to control.

The Composite Risk-Hazard Assessment combines the findings from a Desktop Risk-Hazard Assessment (a geographic information system [GIS] model of hazard based on fire behavior and fuels modeling technology) and a Community Hazard Assessment (a Core Team–generated assessment of on-the-ground community hazards and values at risk).

From these assessments, land use managers, fire officials, planners, and others can begin to prepare strategies and methods for reducing the threat of wildfire, as well as work with community members to inform them about methods for reducing the damaging impacts of fire. The fuels reduction treatments can be implemented on both private and public land, so community members have the opportunity to actively apply the treatments on their properties, as well as recommend treatments on public land.

The Solano County Multi-Jurisdictional Hazard Mitigation Plan recognizes wildfire occurrence as an annual threat, exacerbated by heavy fuel loads, highly susceptible topography, and critical weather conditions (Multi-Jurisdictional Hazard Mitigation Plan, Solano County Office of Emergency Service [Solano OES] 2022).

3.2 FIELD-BASED COMMUNITY HAZARD ASSESSMENTS

Community Hazard Assessments were conducted using the NFPA Wildland Fire Risk and Hazard Severity Form 1144 (see Appendix D). The NFPA standard focuses on individual structure hazards and requires a spatial approach to assessing and mitigating wildfire hazards around existing structures.

The purpose of the Community Hazard Assessment and subsequent ratings is to identify fire hazards and risks and prioritize areas requiring mitigation and more detailed planning. Each community was rated based on conditions within the community and immediately surrounding structures, including access, vegetation (fuels), defensible space, topography, roof and building characteristics, available fire protection, and placement of utilities. Each score was given a corresponding rating of low, moderate, high, or extreme.

Community Hazard Assessments for Solano County were conducted in December 2022. The community at risk hazard ratings from the Community Hazard Assessment are provided in Table 3.1. This table also includes a summary of the positive and negative attributes of a community as they relate to wildfire risk. Full community at risk descriptions with recommended mitigation actions, are provided in Appendix C.

Table 3.1. Communities at Risk Ratings with Community Hazard Assessment Summary

Community	Risk Rating	Fire Station	Advantages	Disadvantages
Benicia	62 (moderate)	Benicia Fire Department	• Street signs present and reflective • Surfaced, low-grade roads • Two or more roads in and out • Mostly fire-resistant construction materials • Good separation from slope • Hydrants present • Community is <5 miles from fire station • Fire-resistant roofing materials • Fire-resistant house siding materials • Relatively wide roads • Good water sources	• Limited defensible space around structures • Many cul-de-sacs and dead ends • Fire access is >300 feet before turnaround • Aboveground electric utilities • Lack of separation of adjacent structures • Oil refineries and lots of industrial facilities at risk • Vegetated open space areas surrounding some communities • Combustible decks and fences

Community	Risk Rating	Fire Station	Advantages	Disadvantages
Cordelia (Fairfield)	65 (Moderate)	Fairfield Fire Department	• Relatively flat, surfaced roads • Existing street signage is reflective • Relatively wide roads • Fire-resistant roofing materials • Fire-resistant siding materials • Good separation from slope • Community is <5 miles from fire station	• Fire access is >300 feet before turnaround • Many cul-de-sacs and dead ends • Limited defensible space around structures • Lack of separation of adjacent structures • Aboveground electric utilities • Combustible decks and fences • One way in and out of some areas of the community • Steep hills in some areas • Water infrastructure for fire suppression is not dependable • Bridges to access residential properties with unknown capacities • Lack of or poor weed abatement and vegetation management practices
Dixon	48 (Moderate)	Dixon Fire Department	• Two or more roads in and out • Relatively wide roads • Relatively flat, surfaced roads • Fire access <300 feet before turnaround • Existing street signage is reflective • Generally flat topography • Hydrants present (in Dixon proper) • Community is <5 miles from fire station • Good water sources	• Severe fire weather potential • Limited defensible space around structures • Aboveground electric utilities • Combustible siding, roofing, and deck materials • Lack of hydrants in the rural areas

Community	Risk Rating	Fire Station	Advantages	Disadvantages
Fairfield (field survey focus areas: Rancho Solano, Paradise Valley, and Gold Ridge)	69 (Moderate)	Fairfield Fire Department	• Relatively wide roads • Surfaced, low-grade roads • Fire access <300 feet before turnaround • Existing street signage is reflective • Fire-resistant roofing materials • Fire-resistant siding materials • Hydrants present	• One road in and out in some communities • Limited defensible space around structures • <30 feet separation from slope • Community >5 miles from fire station • Aboveground electric utilities • Combustible decks and fences
Green Valley	117 (Extreme)	Fairfield Fire Department	• Surfaced roads • Existing street signage is reflective • Fire-resistant roofing • Fairfield is building a new fire station closer to Green Valley	• Only one road in and out • Roads <20 feet wide • Fire access >300 feet with no turnaround • Many long, narrow, steep, and winding driveways, some gated • Limited defensible space around structures • Some areas >40% slope • Most driveways with slope >40% • Mostly combustible materials; few houses hardened • Combustible siding material • Station >5 miles from community • Combustible decks/fences that are less than 30 feet to a slope • Aboveground electric utilities • Poor water supply

Community	Risk Rating	Fire Station	Advantages	Disadvantages
Pleasants Valley	112 (Extreme)	Vacaville Fire Protection District	• Surfaced, low-grade roads • Existing street signage is reflective (main thoroughfares) • Post-LNU Lightning Complex Fire, newer construction with fire-resistant materials. • Hydrants present (very few and sparse) • Underground utility efforts have started in some areas • Select power poles have been wrapped in fiberglass reinforced plastic (PG&E)	• Only one road in and out • Roads are less than 20 feet wide • Fire access <300 feet without a turnaround • Copious amounts of dead and downed logs in ditches and creeks • Limited defensible space around structures • Many homes are situated on hilltops • History of high fire occurrence • Decks/fences <30 feet to a slope • Community >5 miles from fire station • Hydrants are not present in some areas • Ditches are mostly dry or overgrown • Aboveground electric utilities • Steep slopes within and around community
Rio Vista and Montezuma (field survey focus area: city perimeter and Highway 12)	40 (Moderate)	Rio Vista Fire Department/Montezuma Fire Protection District	• Two or more roads in and out • Relatively flat, surfaced roads • Existing street signage is reflective • Fire-resistant roofing • Fire-resistant siding materials • Noncombustible deck/fence • Good separation from slope • Hydrants present • Community <5 miles from fire station • Good water sources	• Fire access >300 feet before turnaround • Some narrow roads • Limited defensible space around structures • Aboveground electric utilities

Community	Risk Rating	Fire Station	Advantages	Disadvantages
Suisun City (field survey focus area: city perimeter)	57 (Moderate)	Suisun City Fire Department	• Two or more roads in and out • Relatively wide roads • Relatively flat, surfaced roads • Existing street signage is reflective • 70–100 feet of defensible space • Fire-resistant roofing materials • Noncombustible siding material • Hydrants present • Fire access <300 feet before turnaround • Community within 5 miles of fire station	• Community bordered by vegetated open spaces to the east, west, and south • Structures <30 feet to slope • Aboveground electric utilities • Marshland vegetation prone to ignitions
Suisun Valley	76 (High)	Suisun Fire Protection District	• Surfaced, low-grade roads • Existing street signage is reflective • Fire-resistant roofing material • Fire-resistant siding material	• One road in and out • Limited turnarounds • Road width is <20 feet • Fire access no turnarounds >300 feet • Limited defensible space around structures • History of high fire occurrence • Community >5 miles from fire station • Combustible decks/fences • Aboveground electric utilities • No fire hydrants

Community	Risk Rating	Fire Station	Advantages	Disadvantages
Vacaville (field survey focus area: north Vacaville, Gibson Canyon area)	80 (High)	Vacaville Fire Department	• Relatively flat, surfaced roads • Existing street signage is reflective • Fire-resistant roofing materials • Fire-resistant siding materials • Hydrants present	• One road in and out • Road width is <20 feet • Fire access <300 feet, no turnaround • Many areas are accessible via one road only, with potential for choke points • Numerous dead and downed logs in creeks and ditches • Limited to no defensible space around structures • History of high fire occurrence • Combustible deck/fences, <30 feet to the slope • Community >5 miles from fire station • Aboveground electric utilities
Vallejo (field survey focus areas: Glen Cove, Hiddenbrooke)	93 (High)	Vallejo Fire Department	• Wide roads >24 feet • Surfaced, low-grade roads • Fire access <300 feet with turnaround • Existing street signage is reflective • Fire-resistant roofing materials • Fire-resistant siding materials • Good separation from slope • Water tanks present • Good water sources	• One road in and out (two lanes on each side that merge into one at the entrance/exit) • Many cul-de-sacs and dead ends • No fuel break around community • Topographic features: communities situated between rolling hills with grassland • Community >5 miles from fire station • <30 feet of defensible space around structures • Combustible decks and fences

Note: The Community Hazard Assessments conducted for the cities were focused on communities adjacent to vegetative fuels and not the urban centers that are primarily surrounded by non-burnable features (e.g., concrete and asphalt). Also, the findings present average conditions for each community surveyed.

3.3 COMPOSITE RISK-HAZARD ASSESSMENT INPUTS

3.3.1 FIRE BEHAVIOR MODELING

3.3.1.1 Overview

The wildfire environment consists of three factors that influence the spread of wildfire: fuels, topography, and weather. Understanding how these factors interact to produce a range of fire behavior is fundamental to determining treatment strategies and priorities in the WUI. In the wildland environment, vegetation is synonymous with fuels. When sufficient fuels for continued combustion are present, the level of risk for those residing in the WUI is heightened.

There are three primary modes of fire spread: surface fire spread (e.g., grasses and shrubs), crown fire (e.g., ladder fuels), and spotting (embers) (Figure 3.1). Surface fire spread occurs at ground level, crown fire spreads through the upper forest canopy, and spotting involves the transportation of embers ahead of the main fire.

For this plan, an assessment of fire behavior has been carried out using well-established fire behavior models: FARSITE, FlamMap, BehavePlus, and FireFamily Plus housed within the Interagency Fuel Treatment Decision Support System (IFTDSS), as well as ArcGIS Desktop Spatial Analyst tools. Data used in the Composite Risk-Hazard Assessment is largely obtained from LANDFIRE.

(A)

(B)

(C)

Figure 3.1. Illustration of the three primary modes of wildfire spread: 1) fire spread along the surface (e.g., grasses, shrubs) (Image A), 2) fire spread through the tree canopy (e.g., ladder fuels) (Image B), and 3) spotting (embers) (Image C)

Images A and B were developed internally with the assistance of artificial intelligence.

Image C source: https://www.nist.gov/feature-stories/piecing-together-timeline-californias-deadliest-wildfire

3.3.2 FIRE BEHAVIOR MODELS

3.3.2.1 LANDFIRE

LANDFIRE is a national remote sensing project that provides land managers a data source for all inputs needed for FARSITE, FlamMap, and other fire behavior models. The database is managed by the U.S. Forest Service (USFS) and the U.S. Department of the Interior. More information can be obtained from http://www.landfire.gov.

3.3.2.2 FARSITE

FARSITE is a computer model based on Rothermel's spread equations (Rothermel 1983). FARSITE uses spatial data on fuels, canopy cover, crown bulk density, canopy base height, canopy height, aspect, slope, elevation, wind, and weather to model fire behavior across a landscape. Information on fire behavior models can be obtained from http://www.fire.org.

3.3.2.3 FlamMap

Like FARSITE, FlamMap uses a spatial component for its inputs but only provides fire behavior predictions for a single set of weather inputs. In essence, FlamMap gives fire behavior predictions across a landscape for a snapshot of time; however, FlamMap does not predict fire spread across the landscape. FlamMap has been used for the Plan to predict fire behavior across the landscape under extreme (97% worst case) weather scenarios.

3.3.3 FIRE BEHAVIOR MODEL INPUTS

3.3.3.1 Fuels

The fuels in Solano County are classified using Scott and Burgan's (2005) Standard Fire Behavior Fuel Model classification system. This classification system is based on the Rothermel surface fire spread equations, and each vegetation and litter type is broken down into 40 fuel models.

The general classification of fuels is by fire-carrying fuel type (Scott and Burgan 2005):

- (NB) Non-burnable
- (GR) Grass
- (GS) Grass-Shrub
- (SH) Shrub
- (TU) Timber-Understory
- (TL) Timber Litter
- (SB) Slash-Blowdown

Table 3.2 provides a description of each fuel type.

Map B.1 in Appendix B illustrates the fuels classification throughout the county.

Table 3.2. Fuel Model Classification for the Solano County Planning Area

1.	**Nearly pure grass and/or forb type (Grass)**
i.	**GR1:** Grass is short, patchy, and possibly heavily grazed. Spread rate is moderate (5–20 chains/hour); flame length low (1–4 feet); fine fuel load (0.40 ton/acre).
ii.	**GR2:** Moderately coarse continuous grass, average depth about 1 foot. Spread rate high (20–50 chains/hour); flame length moderate (4–8 feet); fine fuel load (1.10 tons/acre).
iii.	**GR3:** Very coarse grass, average depth 2 feet. Spread rate high (20–50 chains/hour); flame length moderate (4–8 feet).
2.	**Mixture of grass and shrub, up to about 50% shrub cover (Grass-Shrub)**
i.	**GS1:** Shrubs are about 1-foot high, low grass load. Spread rate moderate (5–20 chains/hour); flame length low (1–4 feet); fine fuel load (1.35 tons/acre).
ii.	**GS2:** Shrubs are 1–3 feet high, moderate grass load. Spread rate high (20–50 chains/hour); flame length moderate (4–8 feet); fine fuel load (2.1 tons/acre).
iii.	**GS3:** Moderate grass and shrub load, average depth less than 2 feet. Spread rate high (20–50 chains/hour); flame length moderate (4–8 feet).
3.	**Shrubs cover at least 50% of the site; grass sparse to non-existent (Shrub)**
i.	**SH1:** Low fuel load, depth about 1 foot, some grass fuels present. Spread rate very low (0–2 chains/hour); flame length very low (0–1 feet).
ii.	**SH2:** Moderate fuel load (higher than SH1), depth about 1 foot, no grass fuels present. Spread rate low (2–5 chains/hour); flame length low (1–4 feet); fine fuel load (5.2 tons/acre).
iii.	**SH3:** Moderate shrub load. Fuel bed depth 2–3 feet. Spread rate low (2–5 chains/hour), flame length low (1–4 feet).
iv.	**SH4:** Low to moderate shrub and litter load, possibly with pine overstory. Fuel bed depth about 3 feet. Spread rate high (20–50 chains/hour); flame length moderate (4–8 feet).
v.	**SH5:** Heavy shrub load. Fuel bed depth 4–6 feet. Spread rate very high (50–150 chains/hour), flame length very high (12–25 feet).
vi.	**SH6:** Dense shrubs, little to no herb fuels. Fuel bed depth about 2 feet. Spread rate high (20–50 chains/ hour); flame length high (8–12 feet).
vii.	**SH7:** Very heavy shrub load, possibly with pine overstory. Fuel bed depth 4–6 feet. Spread rate high (20–50 chains/hour); flame length very high (12–25 feet).
4.	**Grass or shrubs mixed with litter from forest canopy (Timber-Understory)**
i.	**TU1:** Low load of grass and/or shrub with litter. Spread rate low (2–5 chains/hour); flame length low (1–4 feet); fine fuel load (1.3 tons/acre).
ii.	**TU2:** Moderate litter load with shrub component. Spread rate moderate (5–20 chains/hour); flame length low (1–4 feet).
iii.	**TU3:** Moderate litter load with grass and shrub components. Spread rate high (20–50 chains/hour); flame length moderate (4–8 feet).
iv.	**TU5:** High load conifer litter with shrub understory. Spread rate moderate (5–20 chains/hour); flame length moderate (4–8 feet).

5.	**Dead and downed woody fuel (litter) beneath a forest canopy (Timber Litter)**
i.	**TL1:** Low to moderate load, fuels 1–2 inches deep. Spread rate very low (0–2 chains/hour); flame length very low (0–1 foot).
ii.	**TL2:** Low load, compact. Spread rate very low (0–2 chains/hour); flame length very low (0–1 foot).
iii.	**TL3:** Moderate load. Spread rate very slow (0–2 chains/hour); flame length low (1–4 foot); fine fuel load (0.5 ton/acre).
iv.	**TL4:** Moderate load. Spread rate very slow (0–2 chains/hour); flame length low (1–4 foot).
v.	**TL5:** High load conifer litter. Spread rate slow (2–5 chains/hour); flame length low (1–4 foot).
vi.	**TL6:** Moderate load. Spread rate moderate (5–20 chains/hour); flame length low (1–4 foot).
vii.	**TL8:** Long needle litter; long needle fuel. Spread rate moderate (5–20 chains/hour); flame length low (1–4 feet).
viii.	**TL9:** Very high load fluffy dead and downed fuel littler. Spread rate moderate (5–20 chains/hour); flame length moderate (4–8 feet).
6.	**Insufficient wildland fuel to carry wildfire under any condition (Non-burnable)**
i.	**NB1:** Urban or suburban development; insufficient wildland fuel to carry wildfire.
ii.	**NB3:** Agricultural field, maintained in non-burnable condition.
iii.	**NB8:** Open water.
iv.	**NB9:** Bare ground.
7.	**Activity fuel (slash) or debris from wind damage (blowdown) (Slash-Blowdown)**
i.	**SB1:** Fine fuel load is 10 to 20 tons/acre, weighted toward fuels 1 to 3 inches diameter class, depth is less than 1 foot. Spread rate moderate (5–20 chains/hour); flame length low (1–4 feet).
ii.	**SB2:** Fine fuel load is 7 to 12 tons/acre, evenly distributed across 0 to 0.25, 0.25 to 1, and 1 to 3 inch diameter classes, depth is about 1 foot. Spread rate moderate (5–20 chains/hour); flame length moderate (4–8 feet).

Notes: Based on Scott and Burgan's (2005) 40 Fuel Model System.

The Core Team determined that some fuels were incorrectly classified in the fuel model. Specifically, it was noted that some burnable features in the model were classified as non-burnable. For instance, vegetated marshlands and agricultural plots were classified as non-burnable. To correct this discrepancy, SWCA calibrated the fuels to align with the correct fuel model, i.e., the identified non-burnable features were changed to burnable.

3.3.3.2 Topography

Topography plays a vital role in shaping fire behavior as it encompasses several key factors. The steepness of slopes significantly influences how a fire progresses, as steeper slopes can accelerate the spread of flames due to increased fuel availability and the potential for fire to travel uphill more rapidly. The aspect, which refers to the direction a slope faces, also impacts fire behavior by influencing the amount of sunlight received and the moisture levels in the vegetation. Variations in elevation contribute to variations in temperature, which in turn affect fuel moisture content and atmospheric stability, further influencing fire behavior. Additionally, landscape features such as canyons, ridges, and valleys can channel winds, potentially affecting fuels and intensifying fire behavior by directing flames and increasing the rate of fire spread. Understanding and considering these topographic factors are crucial for assessing fire risk, predicting fire behavior, and implementing effective wildfire management strategies.

3.3.3.3 Weather

Of the three fire behavior components, weather is the most likely to fluctuate. As downslope winds from the Vaca Mountains and rising temperatures dry fuels in the spring and summer, conditions can deteriorate rapidly, creating an environment that is susceptible to wildfire. Fine fuels (grass and leaf litter) can cure rapidly, making them highly flammable in as little as 1 hour following light precipitation. Low live fuel moistures of shrubs and trees can significantly contribute to fire behavior in the form of crowning and torching. With a high wind, grass fires can spread rapidly, engulfing communities, often with limited warning for evacuation. The creation of defensible space is of vital importance in protecting communities from this type of fire. For instance, a carefully constructed fuel break placed in an appropriate location could protect homes or possibly an entire community from fire. This type of defensible space can also provide safer conditions for firefighters, improving their ability to suppress fire and protect life, property, and the environment.

One of the critical inputs for FlamMap is the fuel moisture files. The initial run of the Risk-Hazard Assessment utilized the IFTDSS Auto 97th modeling parameters, which integrate historic fire weather data from nearby remote automated weather (RAW) stations. The Core Team noted that some of the fire behavior outputs did not reflect the intensity and severity of fire behavior that has been observed during recent fires. Therefore, the Risk-Hazard Assessment was revised using more extreme live and dead fuel moistures to better align with extreme fire behavior conditions.

3.3.4 FIRE BEHAVIOR MODEL OUTPUTS

The following is a discussion of the fire behavior outputs from IFTDSS.

3.3.4.1 Flame Length

Map B.2 in Appendix B illustrates the flame length classifications for Solano County. Flame lengths are determined by fuels, weather, and topography. Flame length is a particularly important component of the Risk-Hazard Assessment because it relates to potential crown fire (particularly important in timber areas) and suppression tactics. Direct attack by hand lines is usually limited to flame lengths less than 4 feet. In excess of 4 feet, indirect suppression is the dominant tactic. Suppression using engines and heavy equipment will move from direct to indirect with flame lengths in excess of 8 feet.

Flame lengths across the county range from 0 to more than 11 feet. The highest flame lengths are associated with the timber fuels found in the higher elevations of the county.

Following the fuel model calibration, flame length increased slightly as areas previously classified as non-burnable (vegetated marshland and agricultural fields) were calibrated to burnable (grass).

3.3.4.2 Suppression Difficulty Index

Map B.8 in Appendix B shows the level of difficulty in performing fire control work on the landscape. The index considers topography, fuels, expected fire behavior under severe fire weather conditions, firefighter line production rates in various fuel types, and accessibility (distance from roads/trails).

3.3.4.3 Slope and Rate of Spread

Map B.4 in Appendix B illustrates the rate of spread classifications for the county.

The rate of spread, or the speed with which fire moves away from the point of origin, is influenced by the slope. Fire moves at a faster rate uphill than downhill, thus the steeper the slope the faster the rate of spread. Additionally, steep slopes bring the fuels above the fire closer to a growing fire, making them more susceptible to ignition. Another issue with steep slopes is the possibility of burning debris rolling down the hill and igniting fuel below the main fire. This is illustrated in Figure 3.2.

The rates of spread in the area range from 0 chains/hour up to 150 chains/hour (one chain is approximately 66 feet and is a common measure in wildland firefighting). Low rates of spread are associated with timber-dominated areas, while moderate and high rates of spread are associated with grass and shrub fuels and riparian vegetation.

Following the fuel model calibration, rate of spread increased substantially as areas previously classified as non-burnable (vegetated marshland and agricultural fields) were calibrated to burnable (grass).

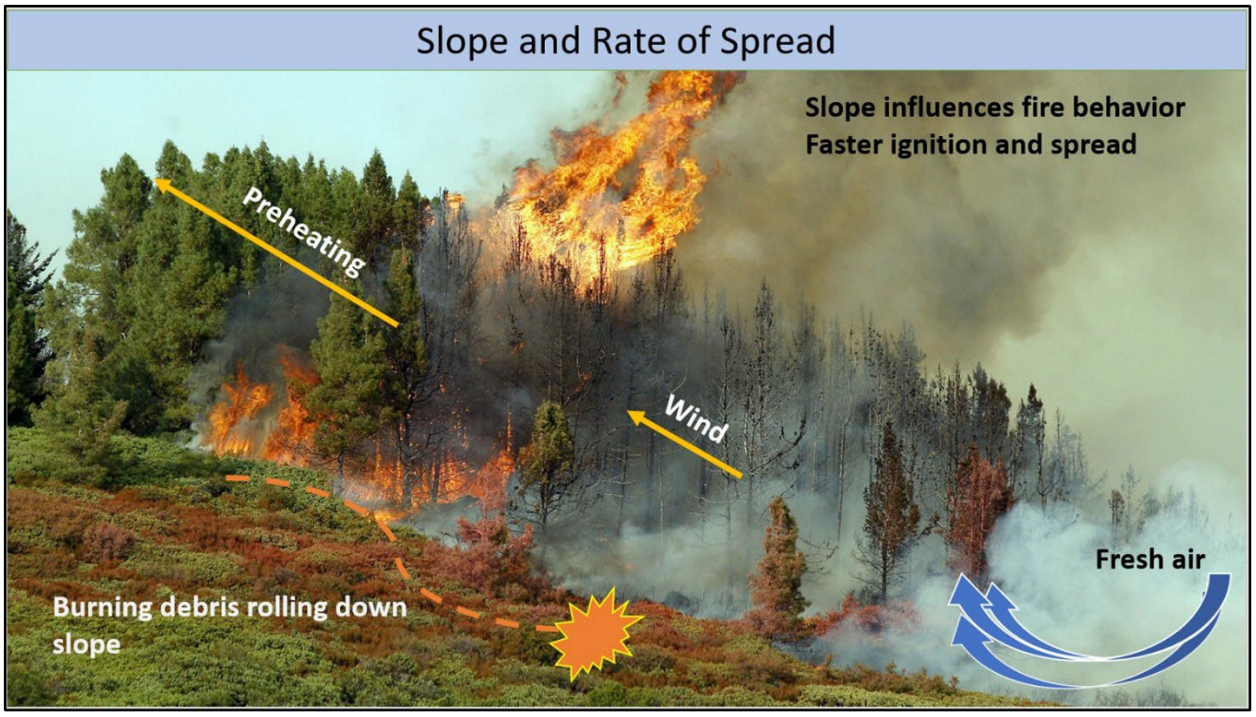


Figure 3.2. Demonstration of the effect of topography and wind patterns on fire behavior

3.3.4.4 Crown Fire Potential

Map B.5 in Appendix B illustrates the range of crown fire activity from surface fire (in grass-dominated areas) to passive and active crown fire (in timber-dominated fuels). Since the fuel calibration focused on calibrating areas classified as non-burnable (vegetated marshland and agricultural fields) to burnable (grass), crown fire activity stayed the same.

3.3.4.5 Burn Probability

Map B.3 in Appendix B shows the likelihood of a given location on the landscape burning. Burn probabilities consider the size and frequencies of fires that occur on a given landscape as well as the rate of spread and weather conditions.

Following the fuel model calibration, burn probability increased substantially in areas that were reclassified as burnable (grass).

3.3.5 EMBER EXPOSURE ZONES

Ember exposure from wildfires can pose a significant threat to homes and other structures in the WUI (Maranghides and Mell 2013). Spotting occurs when embers travel in advance of the flaming front; long-range spotting can be miles ahead of the main fire. Many factors determine whether an ember will result in an ignition (firebrand source and size, wind, receiving materials, exposure duration, etc.), but the potential for structure ignition from embers exists. Burning structures and other materials (vehicles and ornamental vegetation) have been identified as another source of embers that can ignite additional combustible materials in the WUI, particularly when structures are not well separated; however, only wildland fuels were considered in this model (Maranghides et al. 2022; Suzuki and Manzello 2019).

Ember exposure levels were determined using the National Institute of Standards and Technology *Framework for Addressing the National Wildland Urban Interface Fire Problem* (Maranghides and Mell 2013). Four levels (E1–E4) were used to categorize ember exposure threat, with increasing intensity per level. This categorization focuses solely on ember exposure from wildland fuels, not fire exposure (radiant and convective heat). The exposure matrix considered terrain, wind, and wildland fuel types (based on the 2005 Scott and Burgan 40 Fire Behavior Fuel Models). Descriptions of each category are shown in Table 3.3, and the ember exposure zones are displayed in Figure 3.3.

Table 3.3. Ember Exposure Categorization

Terrain	Wind	Fuels
• **Flat**: 0%–10% slope • **Steep Slope**: 11%–40% slope • **Ravine**: >40% slope	• **None**: 0–2 mph • **Low**: 3–7 mph • **High**: >7 mph	• **Homogenous surface fuels**: all GR fuel models, GS1, and GS3 • **Inhomogenous surface fuels**: SH5 and SH7 (decadent chaparral) • **Inhomogenous shrubs and low vegetation**: all remaining SH fuel models, GS2, GS4, and SB1 • **Canopied forest**: SB2, SB3, SB4, all TL fuel models, all TU fuel models

The exposure matrix generally defined E1 as being flat, having zero to light winds, and having light fuel loading. E2 is defined as having moderate to steep slope, low winds, and light to moderate fuel loading. E3 is defined as having steep slope, high winds, and moderate fuel loading. E4 is defined as having steep slope or ravines, high winds, and high fuel loading.

While these metrics and categories are generalized and not all-encompassing, they are a realistic representation of the major influences in the fire environment. Ember generation can be defined as the function of wildland fuels, topography, and local winds together.

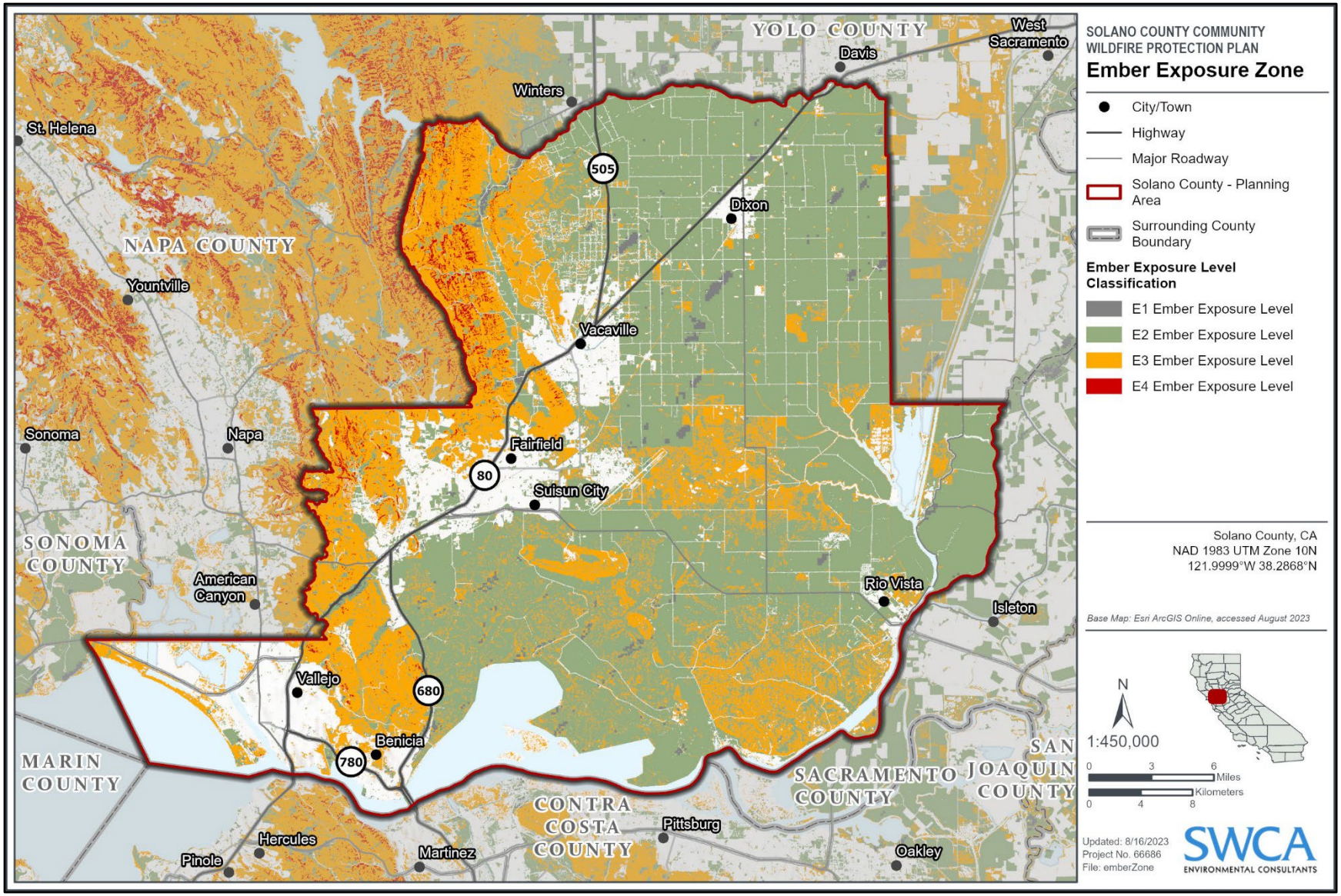


Figure 3.3. Risk-Hazard Assessment inputs: ember zone/spotting distance

3.3.5.1 Composite Risk-Hazard Assessment Modeling Process

Our Composite Risk-Hazard Assessment uses various inputs, which can be categorized into hazard, threat, and values. These inputs contribute to a raster data layer that assesses risk through weighting and summation. Hazard data sets consist of historical weather data, topography, vegetation, and fuel regimes. Threat data sets encompass ember exposure zones, burn probability, and fire history. Lastly, the values category includes data for the WUI, critical infrastructure, and natural, cultural, and socioeconomic assets.

SWCA utilized the IFTDSS application to generate a landscape file for the county, incorporating various LANDFIRE data sets (fuels, slope, elevation, and aspect) into a single layer (Figure 3.4). Core Team input was used to refine the fuels model, resulting in customized fire behavior outputs. Subsequently, in Esri ArcGIS Pro, SWCA combined the fire history, fire station, WUI, suppression difficulty, and highly valued resources and assets (HVRAs) data sets. Finally, to assess risk, a weighted sum raster process was conducted in ArcGIS Pro, assigning weights based on significance and Core Team input.
All 10 inputs were given equal weight (10%) due to their potential impact to wildfire risk (Table 3.4).

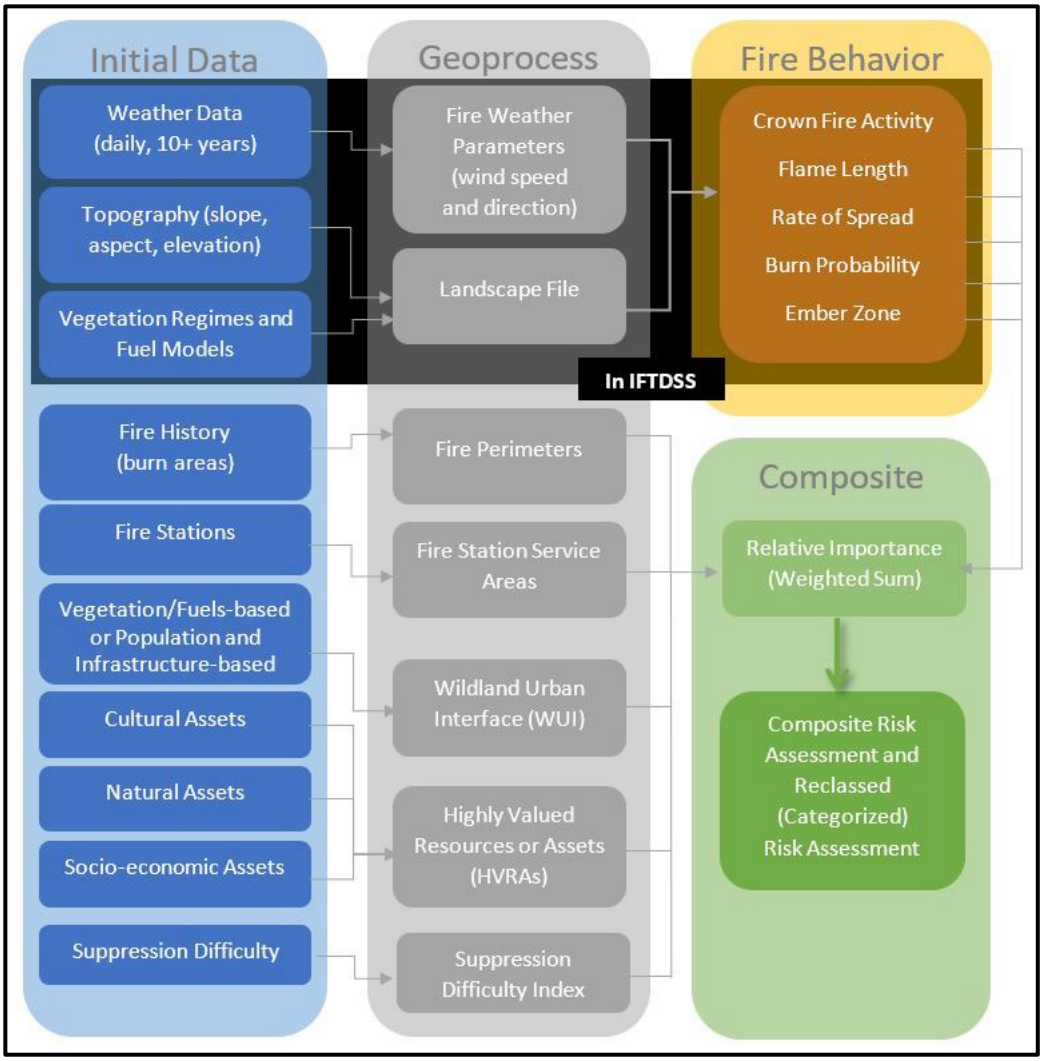


Figure 3.4. Composite Risk-Hazard Assessment breakdown

The distance from the nearest fire station(s) to the community typically determines fire response times, and the level of suppression difficulty impacts effectiveness and feasibility of suppression efforts. The WUI and HVRAs designate areas that constitute life, property, and critical infrastructure. Lastly, fire occurrence, ember exposure, burn probability, and fire behavior characteristics (crown fire activity, flame length, and rate of spread) determine where a fire is likely to occur and the type, intensity, and speed at which the fire will spread.

Table 3.4. Risk Assessment Inputs, Sources, and Weights

Risk Assessment	
Inputs	**Source**
Flame length	IFTDSS, LANDFIRE
Rate of spread	IFTDSS, LANDFIRE
Burn probability	IFTDSS, LANDFIRE
Crown fire activity	IFTDSS, LANDFIRE
Fire history	CAL FIRE
Highly valued resources and assets	Solano County GIS and IFTDSS
Wildland-urban interface (WUI)*	Delineated by using a 1.5-mile buffer around each community
Fire station response time†	Fire station data from CAL FIRE and city fire protection districts/fire departments
Suppression difficulty index	NIFC
Ember zone	IFTDSS, LANDFIRE, and SWCA

Note: IFTDSS and LANDFIRE are federal databases for fire planning.

*SWCA used a 1.5-mile buffer around each city or unincorporated area and an additional 1.5-mile buffer to the west based on Core Team guidance regarding the fuels, topography, and wind patterns in the Napa County–Solano County boundary and surrounding environment.

†Distance from fire stations was partitioned in 5-minute (rated 0), 10-minute (rated 1), 15-minute (rated 2), and >15-minute (rated 3) drive time intervals. SWCA used the Esri tool—generate service areas—and configured the analysis for access for emergency vehicles.

3.4 COMPOSITE RISK-HAZARD ASSESSMENT RESULTS

Figure 3.5 illustrates the individual data sets and the relative weights assigned within the modeling framework. Table 3.4 shows the same data sets and weights but includes the data source. These include fire behavior parameters, HVRAs, WUI, fire history, suppression difficulty index, ember zone, burn probability, and distance from fire stations. Figure 3.6 is the Composite Risk-Hazard Assessment for Solano County and classifies the county into low, moderate, high, and extreme risk categories.

Overall, the Composite Risk-Hazard Assessment (see Figure 3.6) shows high and extreme risk areas along the western portion of the county, with extreme risk areas particularly concentrated along the southern escarpment of the Vaca Mountains in the communities of Pleasants Valley, Green Valley, and Suisun Valley. It is important to note that the risk assessment was executed at a community level and not

at the parcel level. Therefore, this risk assessment is not intended to depict the level of risk for individual parcels.

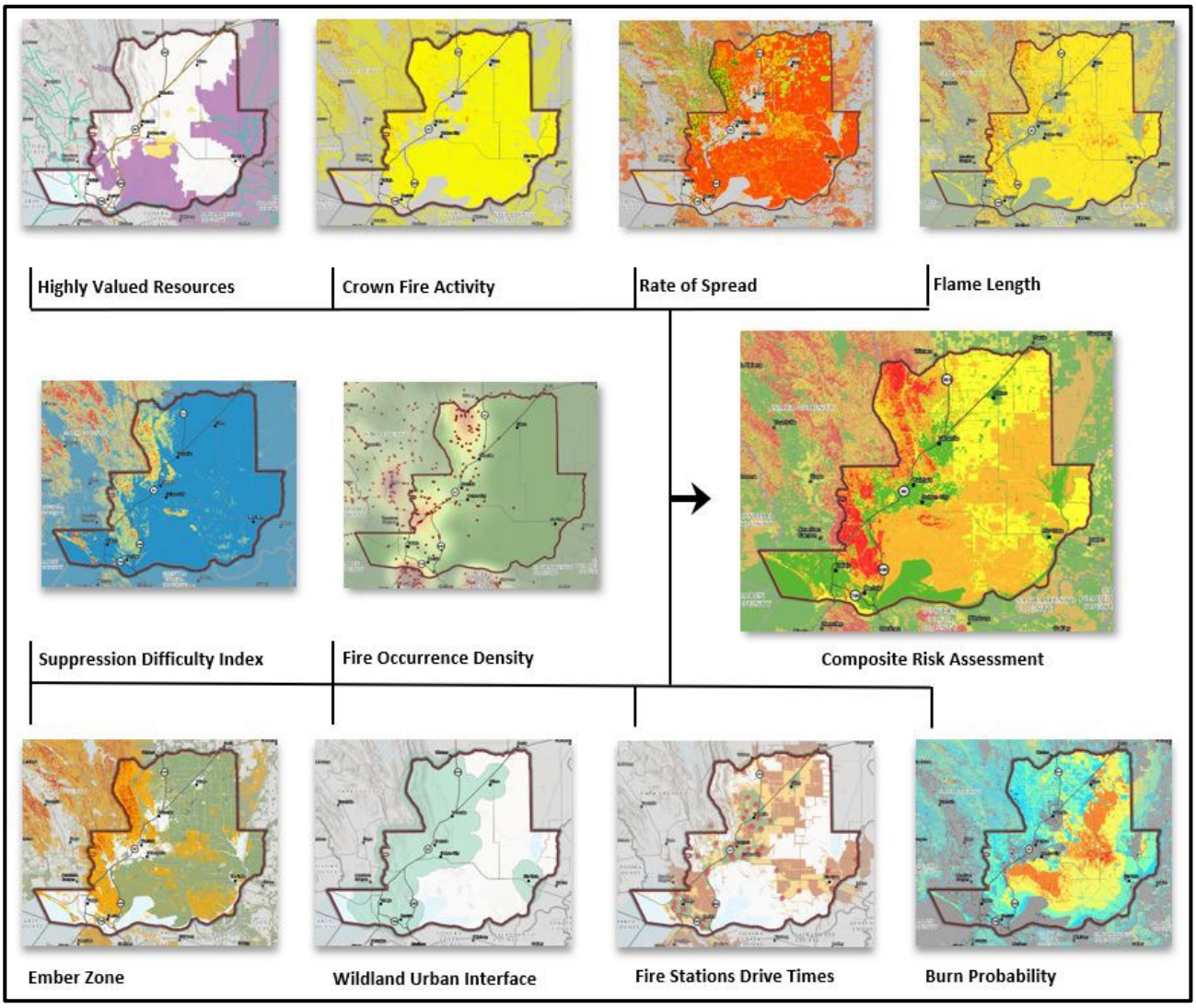


Figure 3.5. Composite Risk-Hazard Assessment overlay process

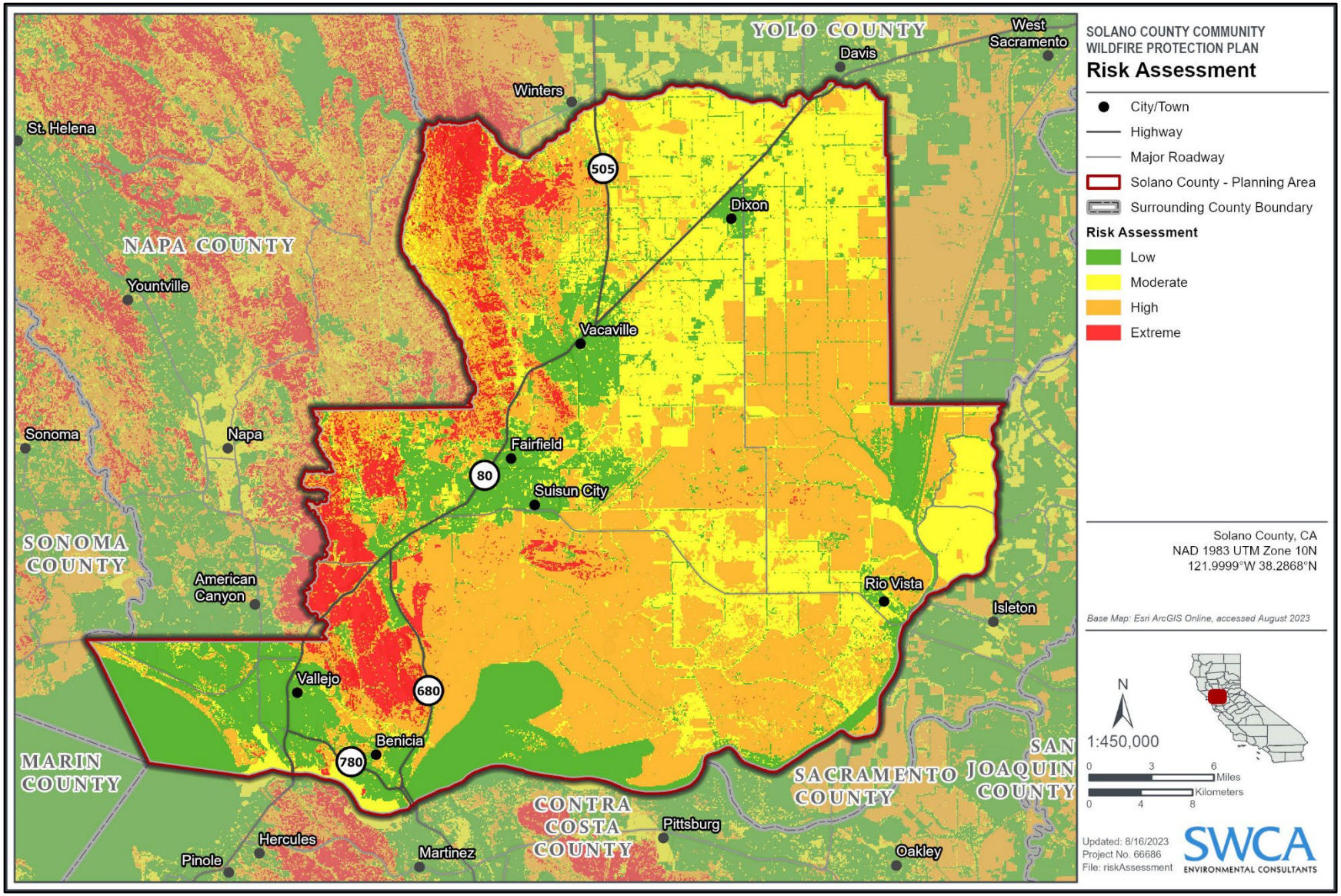


Figure 3.6. Composite Risk-Hazard Assessment for Solano County

3.5 VALUES AT RISK

The list of values at risk from wildfire was developed based on a compilation of the critical infrastructure, community assessments, public outreach, and Core Team input. The data are also supplemented with HVRA (highly valued resources or assets) data, which is a data set that is being gathered nationwide and available through the IFTDSS.

In addition to critical infrastructure, values at risk can also include natural, social, and cultural resources. It is important to note that although an identification of values at risk can inform treatment recommendations, a number of factors must be considered in order to fully prioritize areas for treatment; these factors include appropriateness of treatment, land ownership constraints, locations of ongoing projects, available resources, and other physical, social, or ecological barriers to treatment.

3.5.1 NATURAL VALUES AT RISK

Solano County has a variety of natural resources of particular concern to land managers, such as rare habitats and listed plant and wildlife species (see Table 1.2 in Chapter 1). Public outreach throughout the county has emphasized the importance of protecting natural/ecological values to the general public (Figure 3.7). Examples of natural values identified by the public and the Core Team include the following:

- Local and regional parks
  - Glen Cove waterfront
  - Rockville Hills Regional Park
  - Lake Solano County Park
- Solano Land Trust properties:
  - Patwino Worrtla Kodoi Dihi Open Space Park
  - Lynch Canyon Open Space Park
  - Jepson Prairie
  - Rush Ranch Open Space
- Agricultural land
- Wildlife areas and ecological preserves
  - Putah Creek
- Outdoor recreation areas
  - Scenic viewsheds
  - Trail systems
  - Scenic rural areas
- Watersheds and preservation of water quality for Solano County
  - Suisun Creek watershed
- California Department of Fish and Wildlife (CDFW) lands:
  - Liberty Island Ecological Reserve
  - Putah Creek Wildlife Area
  - Calhoun Cut Ecological Reserve
  - Hill Slough Wildlife Area
  - Peytonia Slough Conservation Easement
  - Grizzly Island Wildlife Area
  - Napa-Sonoma Marshes Wildlife Area

Figure 3.7. Example of scenic viewsheds present within central Solano County

3.5.2 SOCIOECONOMIC VALUES AT RISK

Social values include population, recreation, infrastructure, and the built environment. A large portion of communities in the county are located within the WUI. Examples include the following:

- Communications infrastructure (e.g., cell phone and radio towers) (Figure 3.8)
- Tourism values (e.g., restaurants, recreational facilities)
- Schools
- Public safety infrastructure
- Highways
- Municipal infrastructure
- Industrial infrastructure
- Water treatment plants
- Churches
- Care homes, senior housing, day care, and other group homes
- Water storage
- Recreation sites (e.g., golf courses, hot springs, trails, parks)

Figure 3.8. Example of a socioeconomic value at risk: communications infrastructure.

3.5.3 CULTURAL VALUES AT RISK

Many historical landmarks are scattered throughout the county. Cultural values at risk that have been identified by the Core Team and the public in the planning area are the following:

- Pacific Railroad Passenger Depot
- Bird and Dinkelspiel Store (Birds Landing)
- Dixon Carnegie Library
- Benicia Southern
- Joyful Ranch
- Pena Adobe
- Windfall Farm
- Will H. Buck House (Vacaville) (Figure 3.9)
- Vallejo Old City Historic District
- Suisun Masonic Lodge No. 55
- Rockville Stone Chapel

Figure 3.9. Example of a cultural value at risk, the National Register of Historic Places–listed Will H. Buck House in Vacaville

Source: https://noehill.com/solano/nat1985003372.asp

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CHAPTER 4 – MITIGATION STRATEGIES

The Plan recommendations have been structured around the three main goals of the Cohesive Strategy: restoring and maintaining landscapes, fire-adapted communities, and wildfire response. Many of the recommendations listed can be implemented at the homeowner or community level. Projects requiring large-scale support can be further prioritized based on the Composite Risk-Hazard Assessment.

Recommendations in this chapter have also been aligned with the strategies in the 2021 California's Wildfire and Forest Resilience Action Plan (California Forest Management Task Force 2021) wherever possible.

4.1 GOAL 1: RESTORE AND MAINTAIN LANDSCAPES

Efforts to restore and maintain landscapes should focus on vegetation management and hazardous fuel reduction.

The federal and state lands to the northwest of Solano County have been home to an active fuels treatments program by land managers for many years. Figure 4.1 shows fuels treatments that are proposed, planned, or in progress in and around the county. Fuels treatments data for the Green Valley area were primarily provided by the Green Valley Fire Safe Council. Moreover, The LNU Lightning Complex footprint (shown in Figure 4.1) could be used to strategically reduce fuel loading as well as install fuel breaks. The treatment already observed surrounding the county and within the Green Valley area should be built upon to increase fuel treatment effectiveness across the landscape. Please refer to agency websites for the latest information on planned or ongoing actions on adjacent public land.

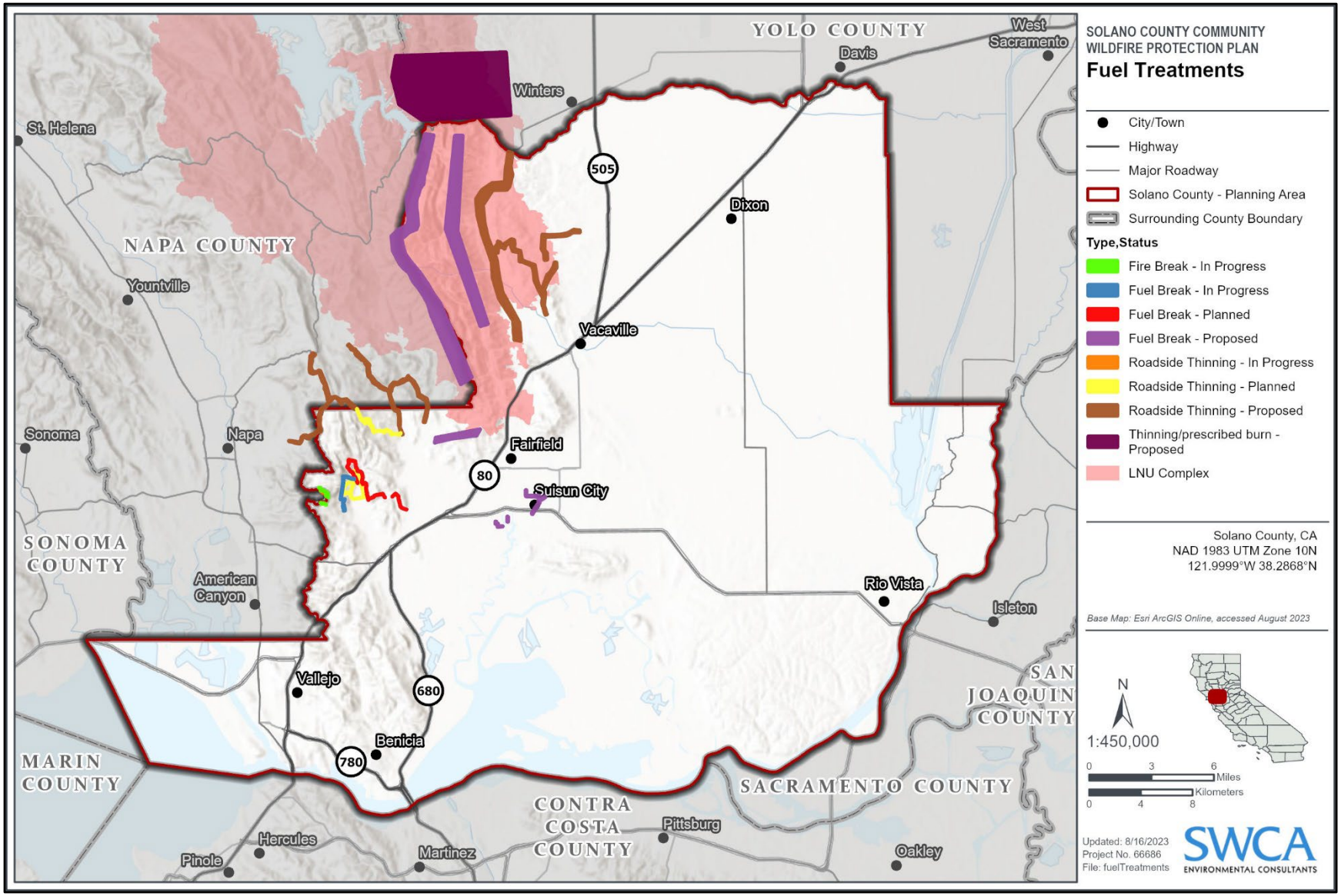

Figure 4.1. Existing, planned, and proposed fuel treatments across all jurisdictions

4.1.1 RECOMMENDATIONS FOR HAZARDOUS FUEL REDUCTION

Recommendations for hazardous fuel reduction are briefly summarized below. For a complete description, strategy, suggested timeline, potential project partners, potential applicable funding sources, and prioritization of recommendations, please refer to Appendix J.

Fuels management of public and private land in the wildland-urban interface (WUI) is key to the survival of homes during a wildfire event, as well as the means to meet the criteria of Goal 1. Research has shown how fuel treatments in the WUI can change fire behavior to support suppression activities and protect homes (Evans et al. 2015).

Fuels should be modified with a strategic approach to reduce the threat high-intensity wildfires pose to lives, property, and other values. Recommendations focus on reducing fire intensity and fire spread rates proximate to structures, consistent with Firewise and International Fire Code standards. Further into open space areas, treatments tend to emphasize forest health and increasing resiliency to catastrophic wildfire and other disturbances.

Most of the treatment recommendations are focused on higher risk areas, as defined by the Composite Risk-Hazard Assessment and Core Team input. Many of these treatment recommendations are general across the communities because similar conditions occur in those areas. Addressed within these recommendations is the requirement for an action plan and assessment strategy, providing monitoring guidelines and a suggested timeline for implementation. This suggested timeline is dependent on available funding and resources, as well as National Environmental Policy Act (NEPA) and California Environmental Quality Act (CEQA) protocols for any treatments pursued on public land.

Treatments on state-owned lands will require CEQA compliance, and Figures 4.2 and 4.3 show the CEQA process for California Vegetation Treatment Program (CalVTP) implementation and the CalVTP treatable landscape, respectively. It should be noted that the CalVTP process is not necessarily restricted to the treatable landscape. Lands outside of the treatable landscape area may also qualify with proper paperwork and justification. The CalVTP Final Programmatic Environmental Report is applicable to projects at least partially within the State Responsibility Area (SRA), including projects on private land, if they receive state or local government grants for vegetation treatment. It should also be noted that CalVTP is not the only option available to comply with CEQA requirements; project-specific negative declarations or mitigated negative declarations may also be employed.

In addition, areas of concern have been delineated based on the Risk-Hazard Assessment and Core Team and community input (Figure 4.4). Areas of concern include regions of high concentrations of highly valued resources or assets (HVRAs) that coincide with high potential exposure to wildfire and/or areas where land management agencies have ongoing vegetation management treatments that could be enhanced by adjacent projects. These are areas where land managers should consider employing mitigation measures to protect life, property, and other values. Treatment types will be site specific but should address a need to slow fire spread or mitigate potential extreme fire behavior parameters, such as high flame lengths or fireline intensity.

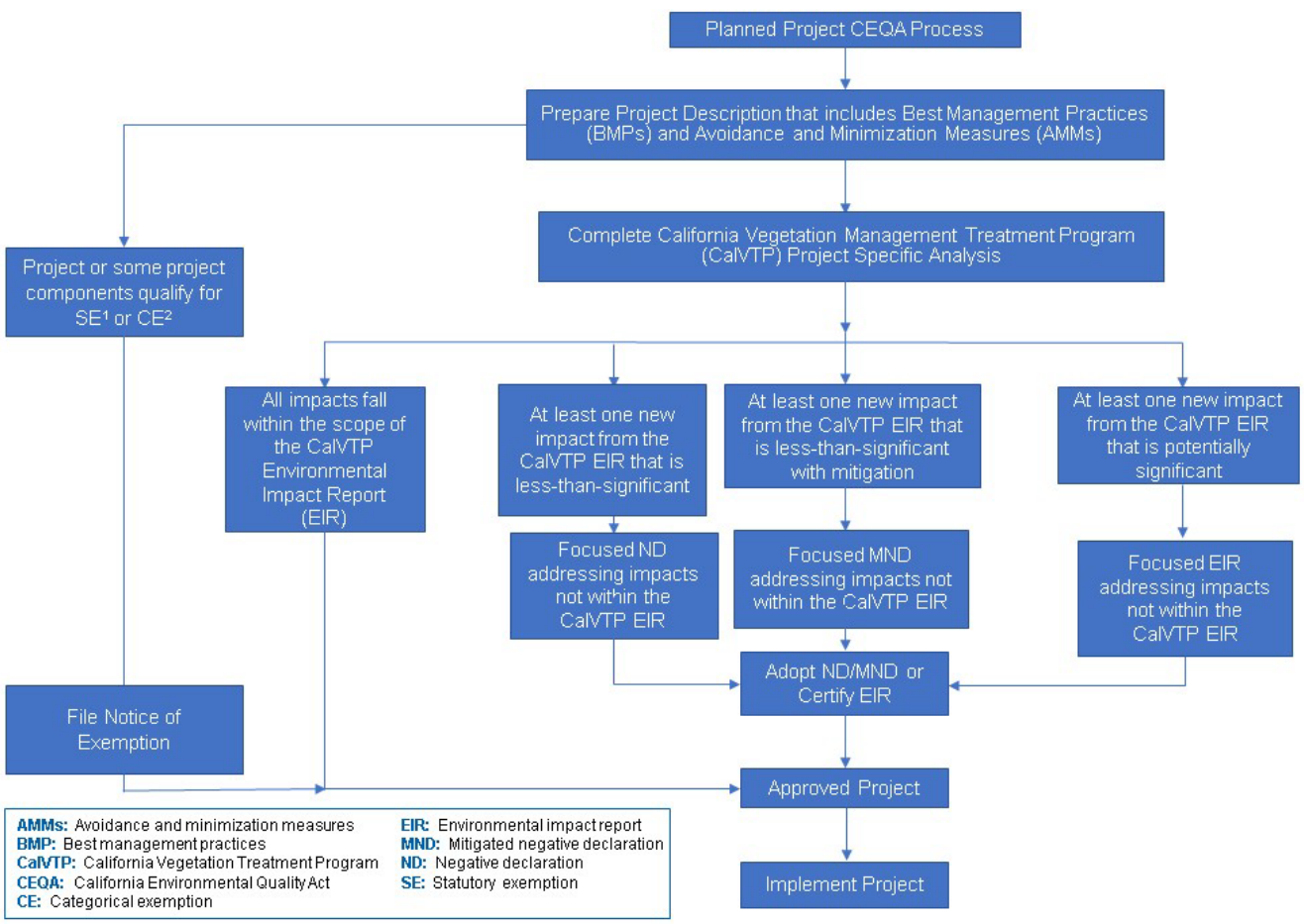

Figure 4.2. California Environmental Quality Act process for California Vegetation Treatment Program implementation

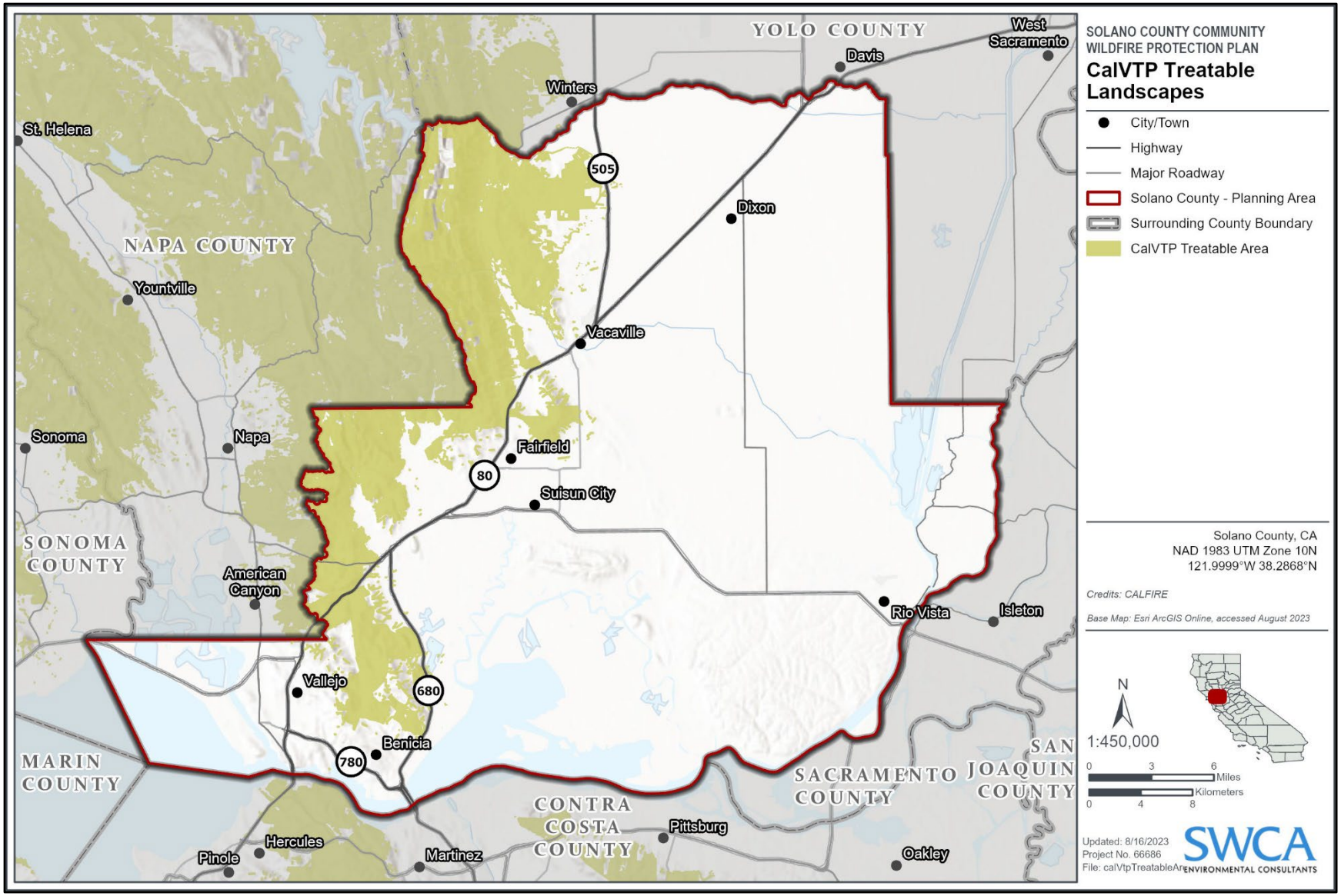

Figure 4.3. California Vegetation Treatment Program treatable landscape

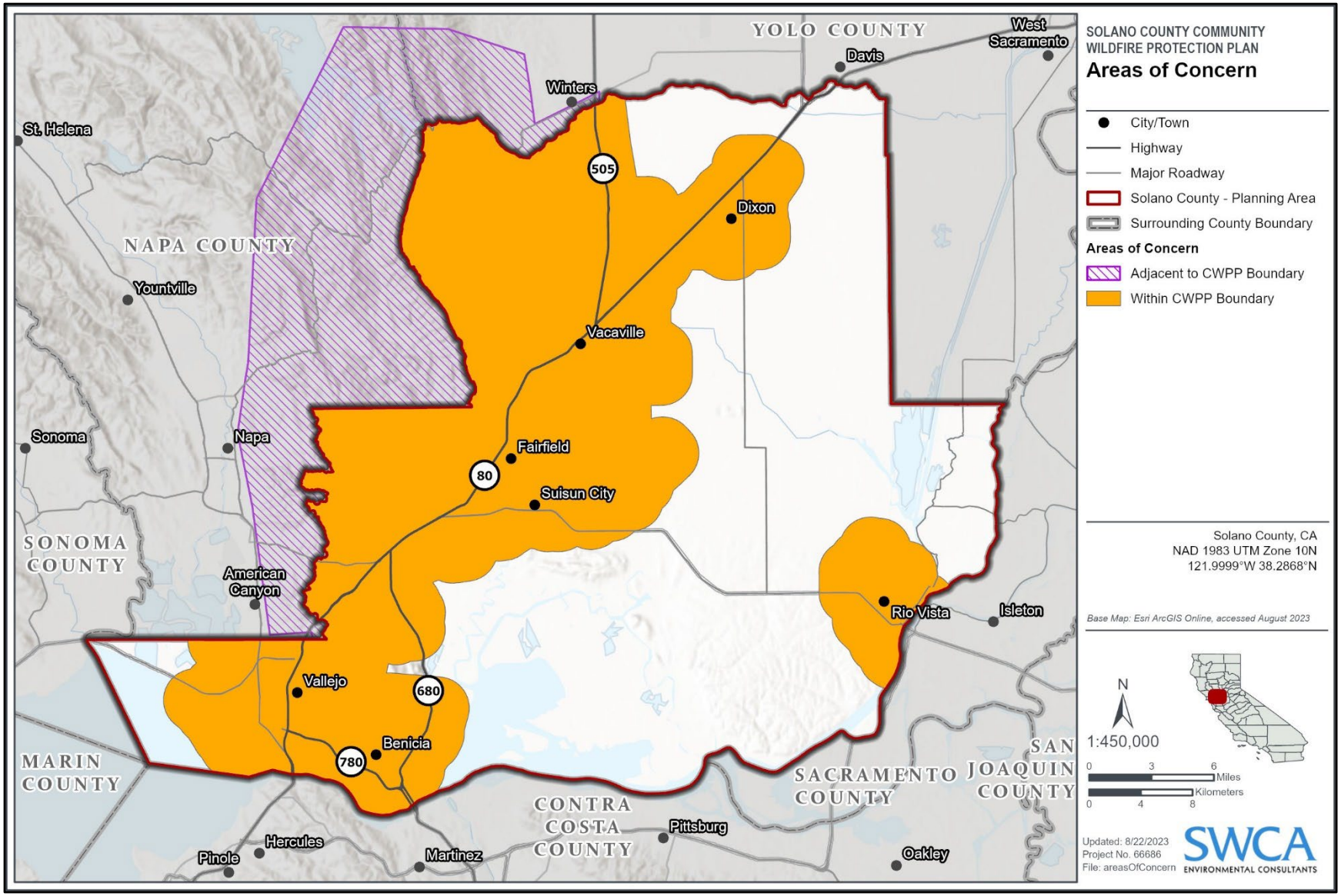

Figure 4.4. Areas of concern within and adjacent to Solano County

The recommendations for restoring and maintaining landscapes to build resilience from wildfire impacts include a range of mitigation activities. These include bolstering vegetation management planning, implementing a range of fuel projects (e.g., fuel reductions, strategic fuel break placement, regional grazing), collaborating with neighboring counties, and forming a prescribed burn association. Resilient landscape (RL) recommendations are housed within Appendix J. Below are brief descriptions of each RL recommendation, with the goal of accomplishing Cohesive Strategy Goal 1:

#1. Conduct a gap analysis for existing vegetation management plans (e.g., division of public works and city plans) to determine needs.
- Develop vegetation management plans and programs at the city level for cities without plans.

#2. Address invasive species through the framework of fuels management.

#3. Use the risk assessment to identify priority areas for treatments to determine compliance requirements (e.g., CEQA, CalVTP).

#4. Address hazardous fuels along riparian corridors by delineating areas for potential treatment based on compliance requirements and suitability.

#5. Install strategic fuel breaks throughout the county based on findings of the risk assessment.
- Fuel breaks should be designed according to site-specific conditions.
- Potential methods include prescribed burning, grazing, and mechanical.

#6. Collaborate with Napa and Yolo Counties to enhance landscape resiliency and hazardous fuels reduction at the regional level.

#7. Establish a prescribed burn association.

#8. Investigate the feasibility of funding fuels management crews.

#9. Establish a regional grazing plan.

For additional details regarding these recommendations, including a broad timeline, location specifics, potential collaborators, approach methodology, monitoring approaches, and potential funding channels, see Table J.1 in Appendix J.

When applying fuel treatments, every effort should be made to align treatments with the State Forest Action Plan Assessment and Strategy with consideration of all appropriate best management practices and sound science (California's Forest and Rangelands 2017 Assessment, CAL FIRE 2018a; Strategic Fire Plan for California, CAL FIRE 2018b). In addition, treatments should be strategically located in areas to maximize effectiveness of other planned and ongoing projects (see Figure 4.1). A list and detailed descriptions of fuels treatment types and methods, including defensible space practices and larger-scale projects, is housed in Appendix H.

When possible, simultaneously planning for the management of multiple resources while reducing fuels will ensure that the land remains viable for multiple uses in the long term. The effectiveness of any fuel reduction treatment depends on the degree of maintenance and monitoring that is employed. Monitoring will also ensure that objectives are being met in a cost-effective manner.

The treatment list is by no means exhaustive and serves to provide a baseline of recommended projects for the future management of Solano County. Many projects may be eligible for grant funds available from federal and/or state sources. For a list of funding sources, please refer to Appendix E.

4.1.1.1 Ongoing, Planned, and Proposed Fuels Treatments

Entities throughout the County have been proactive in planning and implementing fuel breaks, fire breaks, and roadside thinning projects in the WUI. For example, the Green Valley Fire Safe Council has started work on a few projects in the western portion of Green Valley, which include a shaded fuel break that wraps around the western flank of the of the community (adjacent to Glencannon and Rockville Roads) and fire breaks and roadside thinning adjacent to the western Solano County–Napa County border. Figure 4.1 above shows the ongoing, planned, and proposed fuels reductions projects throughout the county. In addition, the Core Team, Solano County residents, and the Risk-Hazard Assessment identified several high-risk areas where treatments should be prioritized, which include but are not limited to Pleasants Valley, rural Vacaville, Suisun Valley, Cordelia, and a few areas within and around Fairfield, Benicia, Suisun City, Vallejo, Rio Vista, and Dixon (see Table J.1 and Figure 4.1).

4.2 GOAL 2: FIRE-ADAPTED COMMUNITIES

Efforts to create fire-adapted communities include public education and outreach actions and actions to reduce structural ignitability.

4.2.1 RECOMMENDATIONS FOR PUBLIC EDUCATION AND OUTREACH

Recommendations for public education and outreach and reducing structural ignitability are briefly summarized below. For a complete description, strategy, suggested timeline, potential project partners, applicable funding sources, and prioritization of recommendations, please refer to Appendix J.

Just as environmental hazards must be mitigated to reduce the risk of fire loss, so must human hazards. Lack of knowledge, lack of positive actions (e.g., failing to create adequate defensible space), and negative actions (e.g., keeping large amounts of flammable debris and rubbish on the property) all contribute to increased risk of loss in the WUI.

Methods to improve public education could include increasing awareness about fire department response and resource needs; providing workshops at demonstration sites showing Firewise landscaping techniques or fuels treatment projects; organizing community cleanups to remove green waste; publicizing availability of government funds for treatments on private land; and, most importantly, improving communication between homeowners and local land management agencies to improve and build trust, particularly since the implementation of fuel treatments and better maintenance of existing treatments needs to occur across property boundaries and in the interface between public and private land.

Solano OES provides the community with webpages containing resources for various disaster and emergency scenarios including wildfires. Included are general recommendations for implementing defensible space on one's property and various home hardening strategies such as clearing vegetation around homes and structures. In addition, many local fire departments and fire protection districts throughout the county have addressed the necessity of community engagement with the implementation of various education programs, tools, and safety guidelines.

Following the impacts of the LNU Lightning Complex Fire, Solano County is currently developing a countywide Fire Safe Council through collaboration with local Fire Safe Councils, the Solano Resource Conservation District (RCD), and community members. Among many other functions, the Solano Fire Safe Council will act as forum and allow the community groups to engage in wildfire decision making, allowing the public to play a role in shaping the county's wildfire resilience and response.

4.2.2 RECOMMENDATIONS FOR REDUCING STRUCTURAL IGNITABILITY

Table J.2 provides a list of community-based recommendations to reduce structural ignitability that should be implemented throughout the county. Reduction of structural ignitability depends largely on public education, which provides homeowners the information they need to take responsibility for protecting their own properties. Carrying out fuels reduction treatments on public land may only be effective in reducing fire risk to some communities. If homeowners have failed to provide mitigation efforts on their own land, the risk of home ignition remains high, and firefighter lives are put at risk when they carry out structural defense.

> The Casualty Actuarial Society compared the impact of individual and community-level mitigation on individual homeowner risks. They found that "the model indicates that all mitigation measures reduce the individual risk, but individual home mitigation —– which individual homeowners control —– can have a bigger impact than any community mitigation alone" (Casualty Actuarial Society 2023).

Preparing for wildfire by creating defensible space around the home is an effective strategy for reducing structural ignitability as discussed under Cohesive Strategy Goal 1: Resilient Landscapes. Studies have shown that burning vegetation beyond 120 feet of a structure is unlikely to ignite that property through radiant heat (Butler and Cohen 1996), but firebrands that travel independently of the flaming front have been known to destroy houses that had not been impacted by direct flame impingement. Hardening the home to ignition from embers, including maintaining vent coverings and other openings, is also strongly advised to protect a home from structural ignitability. Managing the landscape around a structure by removing weeds and debris within a 30-foot radius and keeping the roof and gutters clean are two maintenance measures proven to limit combustible materials that could provide an ember bed and ignite the structure. Detailed information regarding defensible space practices, as well as a list of actions for reducing structural ignitability, can be found in Appendix H.

Pertinent information regarding recent legislation related to Goal 2 of the Cohesive Strategy is provided below.

Assembly Bill 38: Assembly Bill 38 (2019) amended sections of the Civil, Government, and Public Resources Codes to set forth a comprehensive wildfire mitigation financial support program, which facilitates cost-effective home/structure hardening and retrofitting to create fire-resistant homes, businesses, and public structures. The amendments require the State Fire Marshal, in consultation with the Director of Forestry and Fire Protection and the Director of Housing and Community Development, to identify building retrofits and hardening measures eligible for financial assistance under the program. Additionally, the amendments require that CAL FIRE identify defensible space, vegetation management, and fuel treatment procedures eligible for financial assistance. Wildfire hazard areas eligible for financial assistance under the program include Local Responsibility Areas (LRAs) situated within very high FHSZs and SRAs within any FHSZ (California Governor's Office of Planning and Research [CA GOPR] 2020) (Casualty Actuarial Society 2023).

The recommendations for creating fire-adapted communities include a multitude of efforts to enhance public awareness to wildfire risks and develop or build upon local programs. This include establishing countywide ordinances, initiating public engagement, expanding property owner assistance programs, assessing evacuation planning and capabilities, enhancing emergency notification systems, fostering collaborations with neighboring counties. Fire-adapted community (FAC) recommendations are housed within Appendix J. Below are brief descriptions of each FAC recommendation, with the goal of accomplishing Cohesive Strategy Goal 2:

#1. Create a countywide ordinance to address hazardous fuels on private property.

#2. Create a countywide ordinance regarding emergency access as well as right-of-entry agreements for fuels work.

#3. Develop a comprehensive public education and community engagement program.

#4. Promote and expand a countywide program to assist property owners with 1) defensible space and home hardening measures; 2) addressing and signage; and 3) green waste disposal.

#5. Conduct an initial assessment of ingress and egress issues to identify service/planning gaps regarding evacuation efforts.

#6. Increase awareness of the emergency notification system.

#7. Maintain roadside clearance along highways.

#8. Partner and work with adjacent counties to collaborate on mutually beneficial projects and initiatives.

#9. Assess opportunities to expand the Ag Pass program to include non-commercial operations and small-scale ranchers.

#10. Work with landowners and local emergency management agencies to improve local access for emergency response personnel.

For additional details regarding these recommendations, including a broad timeline, location specifics, potential collaborators, approach methodology, monitoring approaches, and potential funding channels, see Table J.2.

4.3 GOAL 3: WILDFIRE RESPONSE

All jurisdictions participate in making and implementing safe, effective, efficient risk-based wildfire management decisions.

4.3.1 RECOMMENDATIONS FOR IMPROVING FIRE RESPONSE CAPABILITIES

Recommendations for improving fire response capabilities are briefly summarized below. For a complete description, strategy, timeline, potential project partners, applicable funding sources, and prioritization of recommendations, please refer to Appendix J.

Informing and empowering the public so they can reduce dependence on fire departments is essential because these resources are often stretched thin due to limited personnel. Increasing awareness and knowledge to enhance community preparedness is a key factor in supporting local fire departments in fire response, particularly educating residents about emergency notifications and evacuation protocols so that residents can safely evacuate an area while emergency responders prepare to protect life and property.

These recommendations for promoting safe and effective wildfire response incorporate a variety of measures and actions that aim to enhance the county's fire safety and emergency response capabilities. They include establishing improved response coordination, creating new positions, improving public safety communications, and enhancing fire response resources and capabilities. Additionally, there is a focus on increasing budget and funding support. Fire response (FR) recommendations are housed within Appendix J. Below are brief descriptions of each FR recommendation, with the goal of accomplishing Cohesive Strategy Goal 3:

#1. Continue working towards countywide consolidated fire and EMS services.

#2. Investigate dedicated countywide fire marshal and wildfire coordinator positions.

#3. Investigate the feasibility of a countywide interoperable public safety communications system.

#4. Investigate ways to support fire prevention and protection services in the unincorporated and rural areas.

#5. Supplement budget allocations to Solano OES to support preparedness, planning, response, and recovery.

#6. Assess water supply in rural areas near critical infrastructure.

#7. Identify and create a map of environmentally sensitive areas.

#8. Assess the viability of establishing a dedicated tax to support countywide fire prevention, preparedness, response, and recovery efforts.

For additional details regarding these recommendations, including a broad timeline, location specifics, potential collaborators, approach methodology, monitoring approaches, and potential funding channels, see Table J.3.

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CHAPTER 5 – MONITORING AND EVALUATION

All stakeholders and signatories to this Plan desire worthwhile outcomes. The amount of money and effort invested in implementing a plan such as this requires that there be a means to describe whether the goals and objectives expressed in this plan are being accomplished according to expectations. Furthermore, as the Plan evolves over time, there may be a need to track changes in policy, requirements, stakeholder changes, and levels of preparedness. These can be significant for any future revisions and/or addendums to the Plan.

It is recommended that project monitoring be a collaborative effort. There are many resources for designing and implementing community-based, multi-party monitoring that could support and further inform a basic monitoring program for the Plan (Egan 2013). Table 5.1 identifies suggested monitoring strategies.

Table 5.1. Recommended Monitoring Strategies

Monitoring Approach	Method	Remarks
Maintain a project tracking system	Use an online web app to track hazardous fuels projects spatially, integrating wildfire risk layer to show progress toward wildfire hazard and risk reduction. The web app would include attribute tables that outline project details	Interactive tool will be easily updated and identify areas that require additional efforts
Keep a photographic record (documents pre- and post-fuels reduction work, evacuation routes, workshops, classes, field trips, changes in open space, treatment type, etc.)	Establish field GPS location; photo points of cardinal directions; keep photos protected in archival location	Relatively low cost; repeatable over time; used for programs and tracking objectives
Keep a record of the number of acres treated (by fuel type and treatment method)	GPS/GIS/fire behavior prediction system; online database	Evaluating costs, potential fire behavior

Keep a record of the number of home ignition zones/defensible space treated to reduce structural ignitability	Use GPS/web map	Structure protection
Keep a record of the number of residents/citizens participating in any Plan projects and events	Track attendance at relevant events/public hearings	Evaluate culture change objective
Keep a record of the number of homeowners who have been contacted during public outreach campaigns	Keep an updated online database with the number of homeowners that have been contacted through phone, home visits, or public events	Evaluate effectiveness of public outreach efforts
Keep a record of the number of jobs created through contracts and grants	Maintain an online database	Evaluate local job growth
Education outreach: track the number of events and kinds of involvement	Keep an updated online database	Evaluate objectives
Emergency management: assess changes in agency response capacity	Track staffing and equipment changes	Evaluate mutual aid
Track codes and policy changes affecting the Plan	Track relevant policy and evaluate impact	Plan changes
Keep a record of the number of stakeholders	Assess the number of stakeholders added or dropped	Plan changes
Keep a record of wildfire acres burned, human injuries/ fatalities, infrastructure loss, environmental damage, suppression, and rehabilitation costs	Keep an updated comprehensive online database	Compare with 5- or 10-year average

5.1 IMPLEMENTATION

This Plan makes recommendations for prioritized fuels reduction projects, measures to reduce structural ignitability, and methods for carrying out public education and outreach. Implementation of projects must be tailored to the specific project and will be unique to the location depending on available funding resources and regulations. Information pertaining to funding is provided in Appendix E.

5.2 PLAN EVALUATION

Community wildfire protection plans (CWPPs) are intended to reduce the risk from wildfire for a community and its surrounding environment. However, over time, communities change and expand, vegetation grows back, and forests and wildlands evolve. As such, the risk of wildfire to communities is constantly changing. The plans and methods to reduce risk must be dynamic to keep pace with the changing environment. An evaluation of this Plan will gather information and identify whether the plans and strategies are on course to meet the desired outcomes or if modifications are needed to meet expectations. It is recommended that the Plan be evaluated on an annual basis, which should be completed by convening the existing Core Team so that all entities contribute to the evaluation. The Plan

document and planning goals and objective should be updated annually, based on findings from the evaluation.

Four general steps can be used to evaluate the Plan:

1. Identify objectives: What are the goals identified in the Plan? How are they reached? Is the Plan performing as intended?
    i. Structural ignitability
    ii. Fuel treatments
    iii. Public education and outreach
    iv. Multi-agency collaboration
    v. Emergency response
2. Assess the changing environment: How have population characteristics and the wildfire environment changed?
    i. Population change
        a. Increase or decrease
        b. Demographics
    ii. Population settlement patterns
        a. Distribution
        b. Expansion into the WUI
    iii. Vegetation
        a. Fuel quantity and type
        b. Drought and disease impacts
3. Review action items: Are actions consistent with the Plan's objectives?
    i. Check for status, i.e., completed/started/not started
    ii. Identify completed work and accomplishments
    iii. Identify challenges and limitations
    iv. Identify next steps
4. Assess results: What are the outcomes of the action items?
    i. Multi-agency collaboration
        a. Who was involved in the development of the Plan?
        b. Have partners involved in the development process remained involved in the implementation?
        c. How has the planning process promoted implementation of the Plan?
        d. Have Plan partnerships and collaboration had a beneficial impact to the community?
    ii. Risk-hazard assessment
        a. How is the risk-hazard assessment utilized to make decisions about fuel treatment priorities?
        b. Have there been new wildfire-related regulations?

c. Are at-risk communities involved in mitigating wildfire risk?

iii. Hazardous fuels

a. How many acres have been treated?
b. How many projects are cross-boundary?
c. How many residents have participated in creating defensible space?

iv. Structural ignitability

a. Have there been updates to fire codes and ordinances?
b. How many structures have been lost to wildfire?
c. Has the Plan increased public awareness of structural ignitability and reduction strategies?

v. Public education and outreach

a. Has public awareness of wildfire and mitigation strategies increased?
b. Have residents been involved in wildfire mitigation activities?
c. Has there been public involvement?
d. Have vulnerable populations been involved?

vi. Emergency response

a. Has the Plan been integrated into relevant plans (e.g., hazard mitigation or emergency operations)?
b. Is the Plan congruent with other hazard mitigation planning efforts?
c. Has availability and capacity of local fire departments changed since the Plan was developed?

5.3 TIMELINE FOR UPDATING THE PLAN

The Healthy Forests Restoration Act of 2003 (HFRA) allows for maximum flexibility in the planning process.The Core Team members are encouraged to meet on an annual basis to review the project list, discuss project successes, and strategize regarding project implementation funding. It is suggested that the evaluation framework above be used annually to make Plan updates, and a more formal revision be made on the fifth anniversary of signing and every 5 years following.

ABBREVIATIONS AND ACRONYMS

°F	degrees Fahrenheit
AQMD	Air Quality Management District
ATV	all-terrain vehicle
BAER	Burned Area Emergency Response
BLM	Bureau of Land Management
BRIC	Building Resilient Infrastructure and Communities
CA GOPR	California Governor's Office of Planning and Research
CAL FIRE	California Department of Forestry and Fire Protection
CalEPA	California Environmental Protection Agency
Cal OES	California Governor's Office of Emergency Services
CalVTP	California Vegetation Treatment Program
CARB	California Air Resources Board
CART	Community Animal Response Team
CDFW	California Department of Fish and Wildlife
CDI	California Department of Insurance
CE	categorical exemption
CEQA	California Environmental Quality Act
CERT	Community Emergency Response Team
CIG	Conservation Innovation Grants
Cohesive Strategy	National Cohesive Wildland Fire Management Strategy
county	Solano County
CUSP	Coalition for the Upper South Platte
CWPP	community wildfire protection plan
EFRP	Emergency Forest Restoration Program
EPA	U.S. Environmental Protection Agency
EQIP	Environmental Quality Incentives Program
ES	executive summary
Esri	Environmental Systems Research Institute
EWP	Emergency Watershed Protection
FAC	fire-adapted community
FEMA	Federal Emergency Management Agency
FHSZ	fire hazard severity zones
FIREMON	Fire Effects Monitoring and Inventory System

FIRESCOPE	Firefighting Resources of Southern California Organized for Potential Emergencies
FP&S	Fire Prevention and Safety
FR	fire response
FRA	Federal Responsibility Area
GHG	greenhouse gas
GIS	geographic information system
GNC	Good Neighbor Citizenship
hazmat	hazardous materials
HFRA	Healthy Forests Restoration Act of 2003
HIZ	home ignition zone
HMGP	Hazard Mitigation Grant Program
HVRA	highly valued resource and asset
ICARP	Integrated Climate Adaptation and Resiliency Program
IFTDSS	Interagency Fuel Treatment Decision Support System
IPAWS	Integrated Public Alert & Warning System
LNU	Sonoma-Lake-Napa Unit
LRA	Local Responsibility Area
MJHMP	multi-jurisdictional hazard mitigation plan
NEPA	National Environmental Policy Act
NFPA	National Fire Protection Association
NIFC	National Interagency Fire Center
NMAC	National Multi-Agency Coordinating Group
NRCS	Natural Resources Conservation Service
NWCG	National Wildfire Coordinating Group
OES	Office of Emergency Services
PFCG	Post-Fire Coordination Group
PG&E	Pacific Gas and Electric Company
Plan	Solano County Community Wildfire Protection Plan
PRC	Public Resources Code
PVAA	Pleasants Valley Agricultural Association
RAW	remote automated weather
RCD	Resource Conservation District
RL	resilient landscape
SAF	Society of American Foresters
SAFER	Staffing for Adequate Fire and Emergency Response

SJT	Silver Jackets Team
Solano OES	Solano County Office of Emergency Services
SRA	State Responsibility Area
SWCA	SWCA Environmental Consultants
UC	University of California
UCANR	University of California, Agriculture and Natural Resources
ULI	Urban Land Institute
USDA	U.S. Department of Agriculture
USFA	U.S. Fire Administration
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VOAD	Voluntary Organization Active in Disaster
WFDSS	Wildland Fire Decision Support System
WiRē	Wildfire Research Center
WUI	wildland-urban interface

GLOSSARY

Aspect: Cardinal direction toward which a slope faces in relation to the sun (NWCG Glossary of Wildland Fire, PMS 205, Aspect, National Wildfire Coordinating Group [NWCG] 2021b).

Active Crown Fire: A crown fire in which the entire fuel complex is involved in flame, but the crowning phase remains dependent on heat released from surface fuel for continued spread. An active crown fire presents a solid wall of flame from the surface through the canopy fuel layers. Flames appear to emanate from the canopy as a whole rather than from individual trees within the canopy. Active crown fire is one of several types of crown fire and is contrasted with **passive crown fires**, which are less vigorous types of crown fire that do not emit continuous, solid flames from the canopy (SWCA).

Available Canopy Fuel: The mass of canopy fuel per unit area consumed in a crown fire. There is no post-frontal combustion in canopy fuels, so only fine canopy fuels are consumed. We assume that only the foliage and a small fraction of the branchwood is available (Wooten 2021).

Available Fuel: The total mass of ground, surface and canopy fuel per unit area available fuel consumed by a fire, including fuels consumed in postfrontal combustion of duff, organic soils, and large woody fuels (Wooten 2021).

Backfiring: Intentionally setting fire to fuels inside a control line to contain a fire (Wooten 2021).

Biomass: Organic material. Also refers to the weight of organic material (e. g. biomass roots, branches, needles, and leaves) within a given ecosystem (Wooten 2021).

Burn Severity: A qualitative assessment of the heat pulse directed toward the ground during a fire. Burn severity relates to soil heating, large fuel and duff consumption, consumption of the litter and organic layer beneath trees and isolated shrubs, and mortality of buried plant parts (SWCA).

Canopy: The more or less continuous cover of branches and foliage formed collectively by adjacent trees and other woody species in a forest stand. Where significant height differences occur between trees within a stand, formation of a multiple canopy (multi-layered) condition can result (SWCA).

Chain: Unit of measure in land survey, equal to 66 feet (20 m) (80 chains equal 1 mile). Commonly used to report fire perimeters and other fireline distances. Popular in fire management because of its convenience in calculating acreage (example: 10 square chains equal 1 acre) (New Mexico Future Farmers of America 2010).

Climate Adaptation: Adaptation is an adjustment in natural or human systems to a new or changing environment. Adaptation to climate change refers to adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities (California Governor's Office of Planning and Research [CA GOPR] 2020).

Climate Change: A change of climate that is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and that is in addition to natural climate variability observed over comparable time periods (CA GOPR 2020).

Community Assessment: An analysis designed to identify factors that increase the potential and/or severity of undesirable fire outcomes in wildland-urban interface (WUI) communities (SWCA).

Communities at Risk: Defined by the Healthy Forests Restoration Act of 2003 (HFRA) as "Wildland-Urban Interface Communities within the vicinity of federal lands that are at high risk from wildfire."

- CAL FIRE expanded on this definition for California including all communities (regardless of distance from federal lands) for which a significant threat to human life or property exists as a result of a wildfire event. California uses the following three factors to determine at-risk communities: 1) high fuel hazard, 2) probability of a fire, and 3) proximity of intermingled wildland fuels and urban environments that are near fire threats (CA GOPR 2020).

Community Emergency Response Team (CERT): The CERT program educates volunteers about disaster preparedness for the hazards that may impact their area and trains them in basic disaster response skills, such as fire safety, light search and rescue, team organization, and disaster medical operations. CERT offers a consistent, nationwide approach to volunteer training and organization that professional responders can rely on during disaster situations, allowing them to focus on more complex tasks (Ready 2021).

Community Wildfire Protection Plan (CWPP): A planning document that seeks to reduce the threat to life and property from wildfire by identifying and mitigating wildfire hazards to communities and infrastructure located in the wildland-urban interface (WUI). Developed from the HFRA, a CWPP addresses issues such as wildfire response, hazard mitigation, community preparedness, or structure protection (SWCA).

Conditional Surface Fire: A potential type of fire in which conditions for sustained conditional surface fire active crown fire spread are met but conditions for crown fire initiation are not. If the fire begins as a surface fire, then it is expected to remain so. If it begins as an active crown fire in an adjacent stand, then it may continue to spread as an active crown fire (Wooten 2021).

Contain: A tactical point at which a fire's spread is stopped by and within specific contain features, constructed or natural; also, the result of stopping a fire's spread so that no further spread is expected under foreseeable conditions. For reporting purposes, the time and date of containment. This term no longer has a strategic meaning in federal wildfire policy (Wooten 2021).

Control: To construct fireline or use natural features to surround a fire and any control spot fires therefrom and reduce its burning potential to a point that it no longer threatens further spread or resource damage under foreseeable conditions. For reporting purposes, the time and date of control. This term no longer has a strategic meaning in federal wildfire policy (Wooten 2021).

Cover Type: The type of vegetation (or lack of it) growing on an area, based on cover type minimum and maximum percent cover of the dominant species, species group or non-living land cover (such as water, rock, etc.). The cover type defines both a qualitative aspect (the dominant cover type) as well as a quantitative aspect (the abundance of the predominant features of that cover type) (Wooten 2021).

Creeping Fire: A low-intensity fire with a negligible rate of spread (Wooten 2021).

Crown Fire: A fire that advances at great speed from crown to crown in tree canopies, often well in advance of the fire on the ground (National Geographic 2021).

Defensible Space: An area around a structure where fuels and vegetation are modified, cleared, or reduced to slow the spread of wildfire toward or from a structure. The design and distance of the defensible space is based on fuels, topography, and the design/materials used in the construction of the structure (SWCA).

- In California, PRC Section 4291, "defensible space" refers to a 100-foot perimeter around a structure in which vegetation (fuels) must be maintained in order to reduce the likelihood of ignition. This space may extend beyond property lines, or 100 feet as required by State law as well as local ordinances, rules, and regulations (CA GOPR 2020).

Duff: The layer of decomposing organic materials lying below the litter layer of freshly fallen twigs, needles, and leaves and immediately above the mineral soil (SWCA).

Ecosystem: An interacting natural system including all the component organisms together with the abiotic environment and processes affecting them (SWCA).

Environmental Conditions: That part of the fire environment that undergoes short-term changes: weather, which is most commonly manifest as windspeed, and dead fuel moisture content (Wooten 2021).

Escape Route: A preplanned and understood route firefighters take to move to a safety zone or other low-risk area. When escape routes deviate from a defined physical path, they should be clearly marked (flagged) (SWCA).

Evacuation: The temporary movement of people and their possessions from locations threatened by wildfire (SWCA).

Federal Responsibility Area (FRA): A term specific to California, designating areas where the federal government is responsible for fire response efforts. These areas include lands under federal ownership (CA GOPR 2020).

Fire-Adapted Community: A fire-adapted community collaborates to identify its wildfire risk and works collectively on actionable steps to reduce its risk of loss. This work protects property and increases the safety of firefighters and residents (What is the WUI?, U.S. Fire Administration [USFA] 2021b).

Fire Behavior: The manner in which fuel ignites, flame develops, and fire spread and exhibits other related phenomena as determined by the interaction of fuels, weather, and topography (Fire Research and Management Exchange System 2021).

Fire Break: Areas where vegetation and organic matter are removed down to mineral soil (SWCA).

Fire Environment: The characteristics of a site that influence fire behavior. In fire modeling the fire environment is described by surface and canopy fuel characteristics, windspeed and direction, relative humidity, and slope steepness (Wooten 2021).

Fire Frequency: A broad measure of the rate of fire occurrence in a particular area. For historical analyses, fire frequency is often expressed using the fire return interval calculation. For modern-era analyses, where data on timing and size of fires are recorded, fire frequency is often best expressed using fire rotation (SWCA).

Fire Hazard: Fire hazard is the potential fire behavior or fire intensity in an area, given the type(s) of fuel present—including both the natural and built environment—and their combustibility (CA GOPR 2020).

Fire Hazard Severity Zones: Fire hazard severity zones are defined based on vegetation, topography, and weather (temperature, humidity, and wind), and represents the likelihood of an area burning over a 30- to 50-year time period without considering modifications such as fuel reduction efforts. In California, CAL FIRE maintains fire hazard severity zone (FHSZ) data for the entire state. There are three classes of fire hazard severity ratings within FHSZs: moderate, high, and very high (CA GOPR 2020).

Fire History: The chronological record of the occurrence of fire in an ecosystem or at a specific site. The fire history of an area may inform planners and residents about the level of wildfire hazard in that area (SWCA).

Fire Intensity: A general term relating to the heat energy released in a fire (SWCA).

Fireline Intensity: Amount of heat release per unit time per unit length of fire front. Numerically, the product of the heat of combustion, quantity of fuel consumed per unit area in the fire front, and the rate of spread of a fire, expressed in kilowatts per minute (SWCA). This expression is commonly used to describe the power of wildfires, but it does not necessarily follow that the severity, defined as the vegetation mortality, will be correspondingly high (Wooten 2021).

Fire Prevention: Activities such as public education, community outreach, planning, building code enforcement, engineering (construction standards), and reduction of fuel hazards that is intended to reduce the incidence of unwanted human-caused wildfires and the risks they pose to life, property or resources (CA GOPR 2020).

Fire Regime: A measure of the general pattern of fire frequency and severity typical to a particular area or type of landscape: The regime can include other metrics of the fire, including seasonality and typical fire size, as well as a measure of the pattern of variability in characteristics (SWCA).

Fire Regime Condition Class: Condition classes are a function of the degree of fire regime condition class departure from historical fire regimes resulting in alterations of key ecosystem components such as composition structural stage, stand age, and canopy closure (Wooten 2021).

Fire Return Interval: Number of years (interval) between two successive fires in a designated area (SWCA).

Fire Severity: A qualitative measure of the immediate effects of fire on the fire severity ecosystem. It relates to the extent of mortality and survival of plant and animal life both aboveground and belowground and to loss of organic matter. It is determined by heat released aboveground and belowground. Fire Severity is dependent on intensity and residence dependent of the burn. For trees, severity is often measured as percentage of basal area removed. An intense fire may not necessarily be severe (Wooten 2021).

Fire Risk: “Risk” takes into account the intensity and likelihood of a fire event to occur as well as the chance, whether high or low, that a hazard such as a wildfire will cause harm. Fire risk can be determined by identifying the susceptibility of a value or asset to the potential direct or indirect impacts of wildfire hazard events (CA GOPR 2020).

Flammability: The relative ease with which fuels ignite and burn regardless of the quantity of the fuels (SWCA).

Flame Length: The length of flames in the propagating fire front measured along the slant of the flame from the midpoint of its base to its tip. It is mathematically related to fireline intensity and tree crown scorch height (Wooten 2021).

Foliar Moisture Content: Moisture content (dry weight basis) of live foliage, foliar moisture content expressed as a percent. Effective foliar moisture content incorporates the moisture content of other canopy fuels such as lichen, dead foliage, and live and dead branchwood (Wooten 2021).

Forest Fire: uncontrolled burning of a woodland area (National Geographic 2021).

Fuel Bed: An array of fuels usually constructed with specific loading, depth, and particle size to meet experimental requirements; also, commonly used to describe the fuel composition.

Fuel Break: A natural or manmade change in fuel characteristics which affects fire behavior so that fires burning into them can be more readily controlled (NWCG Glossary of Wildland Fire, PMS 205, fuel break, NWCG 2021c).

Fuel Complex: The combination of ground, surface, and canopy fuel strata (Wooten 2021).

Fuel Condition: Relative flammability of fuel as determined by fuel type and environmental conditions (SWCA).

Fuel Continuity: A qualitative description of the distribution of fuel both horizontally and vertically. Continuous fuels readily support fire spread. The larger the fuel discontinuity, the greater the fire intensity required for fire spread (Wooten 2021).

Fuel Loading: The volume of fuel in a given area generally expressed in tons per acre (SWCA). Dead woody fuel loadings are commonly described for small material in diameter classes of 0 to 0.25, 0.25 to 1, and 1 to 3 inches and for large material greater than 3 inches (Wooten 2021).

Fuel Management/Fuel Reduction: Manipulation or removal of fuels to reduce the likelihood of ignition and to reduce potential damage in case of a wildfire. Fuel reduction methods include prescribed fire, mechanical treatments (mowing, chopping), herbicides, biomass removal (thinning or harvesting or trees, harvesting of pine straw), and grazing. Fuel management techniques may sometimes be combined for greater effect (SWCA).

Fuel Model: A set of surface fuel bed characteristics (load and surface-area-to- fuel model volume-ratio by size class, heat content, and depth) organized for input to a fire model (Wooten 2021).

Fuel Modification: The manipulation or removal of fuels (i.e., combustible biomass such as wood, leaves, grass, or other vegetation) to reduce the likelihood of igniting and to reduce fire intensity. Fuel modification activities may include lopping, chipping, crushing, piling and burning, including prescribed burning. These activities may be performed using mechanical treatments or by hand crews. Herbicides and prescribed herbivory (grazing) may also be used in some cases. Fuel modification may also sometimes be referred to as “vegetation treatment” (CA GOPR 2020).

Fuel Moisture Content: This is expressed as a percent or fraction of oven dry fuel moisture content weight of fuel. It is the most important fuel property controlling flammability. In living plants, it is physiologically bound. Its daily fluctuations vary considerably by species but are usually above 80 to 100 percent. As plants mature, moisture content decreases. When herbaceous plants cure, their moisture content responds as dead fuel moisture content, which fluctuates according to changes in temperature, humidity, and precipitation (Wooten 2021).

Fuel Treatment: The manipulation or removal of fuels to minimize the probability of ignition and/or to reduce potential damage and resistance to fire suppression activities (NWCG Glossary of Wildland Fire, PMS 205, fuel treatment, NWCG 2021d). Synonymous with fuel modification.

Grazing: There are two types of grazing: 1) traditional grazing, and 2) targeted grazing. Traditional grazing refers to cattle that are managed in extensive pastures to produce meat. Targeted grazing involves having livestock graze at a specific density for a given period of time for the purpose of managing vegetation. Even though both kinds of grazing manage fuel loading in range- and forested lands, targeted grazing is different in that its sole purpose is to manage fuels. Targeted grazing is done by a variety of livestock species such as sheep, goats, or cows (University of California, Agriculture and Natural Resources [UCANR] 2019).

Ground Fire: Fire that burns organic matter in the soil, or humus; usually does not appear at the surface (National Geographic 2021).

Ground Fuels: Fuels that lie beneath surface fuels, such as organic soils, duff, decomposing litter, buried logs, roots, and the below-surface portion of stumps (Wooten 2021).

Hazard: A "hazard" can be defined generally as an event that could cause harm or damage to human health, safety, or property (CA GOPR 2020).

Hazardous Areas: Those wildland areas where the combination of vegetation, topography, weather, and the threat of fire to life and property create difficult and dangerous problems (SWCA).

Hazardous Fuels: A fuel complex defined by type, arrangement, volume, condition, and location that poses a threat of ignition and resistance to fire suppression (NWCG Glossary of Wildland Fire, PMS 205, hazard fuel, NWCG 2021e).

Hazardous Fuels Reduction: Any strategy that reduces the amount of flammable material in a fire-prone ecosystem. Two common strategies are mechanical thinning and controlled burning (Wooten 2021).

Hazard Reduction: Any treatment that reduces the threat of ignition and spread of fire (SWCA).

Highly Valued Resources and Assets: Landscape features that are influenced positively and/or negatively by fire. Resources are naturally occurring, while assets are human made (IFTDSS 2021).

Ignition: The action of setting something on fire or starting to burn (SWCA).

Incident: An occurrence or event, either natural or person-caused, which requires an emergency response to prevent loss of life or damage to property or natural resources (Wooten 2021).

Influence Zone: An area that, with respect to wildland and urban fire, has a set of conditions that facilitate the opportunity for fire to burn from wildland fuels to the home and or structure ignition zone (NWCG Glossary of Wildland Fire, PMS 205, I-Zone, NWCG 2021a).

Initial Attack: The actions taken by the first resources to arrive at a wildfire to protect lives and property and prevent further extension of the fire (SWCA).

Invasive Species: An introduced, nonnative organism (disease, parasite, plant, or animal) that begins to spread or expand its range from the site of its original introduction and that has the potential to cause harm to the environment, the economy, or to human health (U.S. Geological Survey [USGS] 2021).

Ladder Fuels: Fuels that provide vertical continuity allowing fire to carry from surface fuels into the crowns of trees or shrubs with relative ease (SWCA).

Litter: Recently fallen plant material that is only partially decomposed and is still discernible (SWCA).

Local Responsibility Area (LRA): A term specific to California, designating areas where the local government is responsible for wildfire protection. The Local Responsibility Area (LRA) includes incorporated cities, cultivated agricultural lands, and portions of the desert. Local responsibility area fire protection is typically provided by city fire departments, fire protection districts, counties, and by CAL FIRE under contract to local government (CA GOPR 2020).

Manual Treatments: Felling and piling of fuels done by hand. The volume of material generated from a manual fuel treatment is typically too small to warrant a biomass sale therefore collected material is disposed of by burning or chipping. The work can be performed by either a single individual or a large, organized crew with powered equipment (Manual, UCANR 2021a).

Mechanized Treatments: Mechanical treatments pulverize large continuous patches of fuel to reduce the volume and continuity of material. Mechanical treatments can be applied as either mastication or chipping treatments. Both treatments shred woody material, but mastication leaves residue on-site while chipping collects the particles for transportation off site. Similar to hand treatments, mechanical treatments can target specific areas and vegetation while excluding areas of concern. In addition, mechanical treatment is easily scalable to large areas (>30 acres) with little added cost (Mechanical, UCANR 2021b).

Mitigation: Action that moderates the severity of a fire hazard or risk (SWCA).

Mutual Aid: Assistance in firefighting or investigation by fire agencies, irrespective of jurisdictional boundaries (NWCG Glossary of Wildland Fire, PMS 205, mutual aid, NWCG 2021f).

Native Revegetation: The process of replanting and rebuilding the soil of disturbed land (e.g., burned) with native plant species (U.S. Department of Agriculture [USDA] 2005).

Native Species: A species that evolved naturally in the habitat, ecosystem, or region as determined by climate, soil, and biotic factors (USDA 2005).

National Cohesive Strategy: The National Cohesive Wildland Fire Management Strategy is a strategic push to work collaboratively among all stakeholders and across all landscapes, using best science, to make meaningful progress toward three goals:

- Resilient Landscapes
- Fire-Adapted Communities
- Safe and Effective Wildfire Response

Vision: To safely and effectively extinguish fire when needed; use fire where allowable; manage our natural resources; and as a nation, to live with wildland fire (Forests and Rangelands 2021).

Overstory: That portion of the trees in a forest which forms the upper or uppermost layer (SWCA).

Passive Crown Fire: A type of crown fire in which the crowns of individual trees or small groups of trees burn, but solid flaming in the canopy cannot be maintained except for short periods. Passive crown fire encompasses a wide range of crown fire behavior, from occasional torching of isolated trees to nearly active crown fire. Passive crown fire is also called torching or candling. A fire in the crowns of the trees in which trees or groups of trees torch, ignited by the passing front of the fire. The torching trees reinforce the spread rate, but these fires are not basically different from surface (SWCA).

Prescribed Burning: Any fire ignited by management actions under specific, predetermined conditions to meet specific objectives related to hazardous fuels or habitat improvement. Usually, a written, approved prescribed fire plan must exist, and National Environmental Policy Act (NEPA) requirements must be met, prior to ignition (Prescribed Fire, USFS n.d.(c)).

Rate of Spread: The relative activity of a fire in extending its horizontal dimensions. It is expressed as rate of increase of the total perimeter of the fire, as rate of forward spread of the fire front, or as rate of increase in area, depending on the intended use of the information. Usually, it is expressed in chains or acres per hour for a specific period in the fire's history (NWCG Glossary of Wildland Fire, PMS 205, rate of spread, NWCG 2021g).

Resilience: Resilience is the capacity of any entity – an individual, a community, an organization, or a natural system – to prepare for disruptions, to recover from shocks and stresses, and to adapt and grow from a disruptive experience (CA GOPR 2020).

Resilient Landscape: Landscapes or ecosystems that resist damage and recover quickly from disturbances (such as wildfires) and human activities (Forests and Rangelands 2014).

Response: Movement of an individual firefighting resource from its assigned standby location to another location or to an incident in reaction to dispatch orders or to a reported alarm (SWCA).

Safety Element: One of the seven mandatory elements of a local general plan (a county plan that forms the foundation for future development), the safety element must identify hazards and hazard abatement provisions to guide local decisions related to zoning, subdivisions, and entitlement permits. The element should contain general hazard and risk reduction strategies and policies supporting hazard mitigation measures (CA GOPR 2020).

Slash: Debris left after logging, pruning, thinning, or brush cutting. Slash includes logs, chips, bark, branches, stumps, and broken trees or brush that may be fuel for a wildfire (SWCA).

Slope Percent: The ratio between the amount of vertical rise of a slope and horizontal distance as expressed in a percent. One hundred feet of rise to 100 feet of horizontal distance equals 100 percent (NWCG Glossary of Wildland Fire, PMS 205, slope percent, NWCG 2021h).

State Responsibility Area (SRA): A term specific to California, designating areas where the state has financial responsibility for wildfire protection. Incorporated cities and lands under federal ownership are not included in the SRA. Lands under federal ownership are in the federal responsibility area (CA GOPR 2020).

Suppression: The most aggressive fire protection strategy, it leads to the total extinguishment of a fire (SWCA).

Surface Fire: fire that typically burns only surface litter and undergrowth (National Geographic 2021).

Surface Fuel: Fuels lying on or near the surface of the ground, consisting of leaf and needle litter, dead branch material, downed logs, bark, tree cones, and low stature living plants (SWCA).

Structural Ignitability: The ability of structures (such as homes or fences) to catch fire (SWCA).

Topography: The arrangement of the natural and artificial physical features of an area (SWCA).

Total Fuel Load: The mass of fuel per unit area that could possibly be consumed in a hypothetical fire of the highest intensity in the driest fuels (Wooten 2021).

Tree Crown: The primary and secondary branches growing out from the main stem, together with twigs and foliage (SWCA).

Understory: Low-growing vegetation (herbaceous, brush or reproduction) growing under a stand of trees. Also, that portion of trees in a forest stand below the overstory (SWCA).

Understory Fire: A fire burning in the understory, more intense than a surface fire with flame lengths of 1 to 3 m (Wooten 2021).

Values and Assets at Risk: The elements of a community or natural area considered valuable by an individual or community that could be negatively impacted by a wildfire or wildfire operations. These values can vary by community and can include public and private assets (natural and human-made)—such as homes, specific structures, water supply, power grids, natural and cultural resources, community infrastructure—as well as other economic, environmental, and social values (CA GOPR 2020).

Vulnerable Community: Vulnerable communities experience heightened risk and increased sensitivity to natural hazard and climate change impacts and have less capacity and fewer resources to cope with, adapt to, or recover from the impacts of natural hazards and increasingly severe hazard events because of climate change. These disproportionate effects are caused by physical (built and environmental), social, political, and/ or economic factor(s), which are exacerbated by climate impacts. These factors include, but are not limited to, race, class, sexual orientation and identification, national origin, and income inequality (CA GOPR 2020).

Wildfire: A "wildfire" can be generally defined as any unplanned fire in a "wildland" area or in the wildland-urban interface (WUI) (CA GOPR 2020).

Wildfire Exposure: During fire suppression activities, an exposure is any area/property that is threatened by the initial fire, but in National Fire Incident Reporting System (NFIRS) a reportable exposure is any fire that is caused by another fire, i.e., a fire resulting from another fire outside that building, structure, or vehicle, or a fire that extends to an outside property from a building, structure, or vehicle (USFA 2020).

Wildfire Influence Zone: A wildland area with susceptible vegetation up to 1.5 miles from the interface or intermix WUI (CA GOPR 2020).

Wildland: Those unincorporated areas covered wholly or in part by trees, brush, grass, or other flammable vegetation (CA GOPR 2020).

Wildland Fuels (aka fuels): Fuel is the material that is burning. It can be any kind of combustible material, especially petroleum-based products, and wildland fuels. For wildfire, it is usually live or dead plant material, but can also include artificial materials such as houses, sheds, fences, pipelines, and trash piles. In terms of vegetation, there are six wildland fuel types (fuel type: An identifiable association of fuel elements of distinctive species, form, size, arrangement, or other characteristics that will cause a predictable rate of spread or resistance to control under specified weather conditions.) The six wildland fuel types are (Instructor Guide, S-190 Unit 2: Fuels, NWCG 2021i):

- Grass
- Shrub
- Grass-Shrub
- Timber Litter
- Timber-Understory
- Slash-Blowdown

Wildland-Urban Interface (WUI): The WUI is the zone of transition between unoccupied land and human development. It is the line, area or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels (Fire-Adapted Communities, USFA 2021a). In the absence of a CWPP, Section 101 (16) of the HFRA defines the WUI as " (I) an area

extending ½ mile from the boundary of an at-risk community; (II) an area within 1 ½ miles of the boundary of an at-risk community, including any land that (1) has a sustained steep slope that creates the potential for wildfire behavior endangering the at-risk community; (2) has a geographic feature that aids in creating an effective fire break, such as a road or ridge top; or (3) is in condition class 3, as documented by the Secretary in the project-specific environmental analysis; (III) an area that is adjacent to an evacuation route for an at-risk community that the Secretary determines, in cooperation with the at-risk community, requires hazardous fuels reduction to provide safer evacuation from the at-risk community." A CWPP offers the opportunity to establish a localized definition and boundary for the WUI (What is the Wildland Urban Interface?, USFS n.d.(d)).

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DISCLAIMER

The purpose of the risk assessment contained in this Plan is solely to provide a community and landscape-level overview of general wildfire risks within the assessment area as of the date hereof, and to provide a potential resource for community pre-fire planning. This risk assessment is premised on various assumptions and models, which include and are based on data, software tools, and other information provided by third parties (collectively, "Third-Party Information and Tools"). SWCA, Incorporated, doing business as SWCA Environmental Consultants ("SWCA"), relied upon various Third-Party Information and Tools in the preparation of this risk assessment and SWCA shall have no liability to any party in connection with this risk assessment including, without limitation, as a result of incomplete or inaccurate Third-Party Information and Tools used in the preparation hereof. This risk assessment may not be relied upon by any party without the express written consent of SWCA. Any reproduction or dissemination of this risk assessment or any portion hereof shall include the entirety of this plan disclaimer. SWCA hereby expressly disclaims any responsibility for the accuracy or reliability of the Third-Party Information and Tools relied upon by SWCA in preparing this risk assessment. SWCA shall have no liability for any damage, loss (including loss of life), injury, property damage, or other damages whatsoever arising from or in connection with this risk assessment, including any person's use or reliance on the information contained in this risk assessment.

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