Cloverdale Fire Protection District Community Wildfire Protection Plan

Plan Prepared for
Cloverdale Fire Protection District, CA

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WILDFIRE SERVICES

STi | Sonoma Technology

Acknowledgments

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Signatures

The Cloverdale Fire Protection District, Community Wildfire Protection Plan (CFPD CWPP) was developed in accordance with the Healthy Forests Restoration Act (HFRA). The plan was developed collaboratively among community stakeholders including federal, state, local, and private landowners, and the Cloverdale Fire Protection District (CFPD). The plan includes a prioritized list of hazardous fuel reduction strategies and includes actions that community members can take to improve defensible space, reduce structural ignitability, and make their properties and homes more fire resilient. The undersigned have reviewed the CFPD CWPP and accept this document.

Approved by Chief Jason Jenkins, Cloverdale Fire Protection District Date

Reviewed by Chief Mike Marcucci, CAL FIRE Sonoma-Lake-Napa Unit (LNU) Date

Reviewed by David Kelley, Cloverdale City Manager Date

Reviewed by James Gore, District 4 Supervisor Date

Reviewed by Roberta MacIntyre, Fire Safe Sonoma Date

Executive Summary

This Community Wildfire Protection Plan (CWPP) provides a science-based assessment of wildfire hazard and threat to properties and homes in the wildland urban interface and intermix (WUI) within the Cloverdale Fire Protection District (CFPD) in northern Sonoma County, California. The purpose of the CWPP is to provide fire agencies, land managers, and community members with strategies and an action plan to protect people, homes, and properties in the community. This CWPP represents analysis and ground survey work conducted in 2021 and is intended to supplement the Sonoma County CWPP. The CWPP was developed through a collaborative process involving CFPD, CAL FIRE, local officials, Fire Safe Sonoma, land management agencies, and community members. It meets the requirements set forth in the federal Healthy Forests Restoration Act (HFRA) for the development of CWPPs, which include:

- Ensuring Stakeholder collaboration (Section 2)
- Addressing structural ignitability (Sections 3.2 and 4.2)
- Identifying and prioritizing areas for fuel reduction activities (Section 4 and Appendix C)

Wildfire Services Group (WSG) and Sonoma Technology, in collaboration with the CFPD and stakeholders, prepared this CWPP to assist the CFPD in 1) assessing and documenting actions that homeowners and communities can take to make their homes and properties more fire resilient; and 2) identifying hazards within WUI areas and roadways encompassed by the CFPD. The purpose of the assessment was to identify specific hazards associated with wildfire in and around the city of Cloverdale and the CFPD, and to assist the CFPD in developing a strategic mitigation plan.

The mitigation plan is part of this CWPP (see Appendix C – Mitigation Plan) and contains a list of priority areas and projects for future mitigation work. The goal of the mitigation plan is to provide the CFPD and community members with a specific list of actions to help reduce the risk of catastrophic wildfire within the WUI, while ensuring the protection and enhancement of economic and ecological values and resources within the CFPD's jurisdiction. Special focus was given to the road network and issues related to access and egress in the event of an evacuation. The intent is consistent with the mission of the CFPD and builds upon the CFPD's ongoing wildfire mitigation activities, the Sonoma County CWPP, and other CFPD plans and policies.

This CWPP and mitigation plan is focused on current conditions and recommends sound, long-term strategies for:

- vegetation management and improvements to existing roadways and fuel breaks;

- improvements to public outreach and education activities to address structural ignitability and defensible space; and

- support for developing Firewise USA® accredited communities throughout the CFPD to help homeowners learn how to adapt to living with wildfire while encouraging and empowering neighbors to work together to reduce their wildfire risk and prevent losses.

Using geographic information system (GIS) analyses combined with ground and aerial surveys, an online Community Basemap was developed that contains multiple map layers of information that were used to inform this CWPP. This CWPP is aligned with the California Strategic Fire Plan, the Sonoma County CWPP, and the Cloverdale Local Hazard Mitigation Plan (LHMP), which was completed in November 2021.

1. Introduction

The Cloverdale Fire Protection District (CFPD) located in northern Sonoma County has undertaken an assessment of potential hazards and mitigation strategies in and around the communities within its jurisdiction as documented in this Community Wildfire Protection Plan (CWPP). Largely focused on communities in and around the wildland urban interface or intermix (WUI), the assessment included roadways that provide ingress/egress during an evacuation and strategic fire breaks. The WUI is commonly described as the zone where structures and other human development meet and intermingle with undeveloped wildland or vegetative fuels. In WUI areas, urban "fuels" (homes and other structures) directly meet wildland "fuels" (vegetation). When wildfires occur in the WUI, they pose tremendous risks to life, property, and infrastructure, and can create dangerous and complicated situations for firefighters. This CWPP provides an assessment of potential fire hazards and recommendations for pre-fire planning and mitigation strategies to help protect people, homes, and properties within the CFPD.

This CWPP is intended to complement the Sonoma County CWPP. The 2022 Sonoma County CWPP provides an assessment of wildfire threat throughout the county and was developed through a collaborative process involving fire agencies; county officials; county, state, and federal land management agencies; and landowners and community members. The county-level CWPP provides a framework that can be used to identify, prioritize, implement, and monitor hazard reduction activities throughout the county. This CWPP for the CFPD provides a more focused, community-specific assessment and wildfire protection plan for the community of Cloverdale and the surrounding area. It is based on current maps and data combined with the results of a field assessment performed by Wildfire Services Group (WSG), Sonoma Technology, and the CFPD in 2021. Maps and data from the county-level CWPP were used for this assessment, wherever possible, to create consistency between this CWPP and the county-level CWPP. In addition, the CFPD CWPP team worked collaboratively with the Cloverdale City Manager and other stakeholders to ensure that this CWPP aligns with the General Plan and the Cloverdale Local Hazard Mitigation Plan (LHMP).[1] An online Community Basemap and Story Map accompany this document and allow the public to interactively view the CWPP, maps, and data.

The various fire protection agencies responsible for the protection of wildlands and communities within and around Cloverdale (primarily CFPD and CAL FIRE) recognize the potential for catastrophic wildland fires that pose serious threats to people and infrastructure. The 2017, 2018, and 2020 California wildfire seasons were the deadliest and most destructive in recorded history. The fire season of 2017 brought 5 of the top 20 most destructive WUI fires, including the Tubbs Fire in Napa and Sonoma counties. In 2018, northern California alone experienced several large, destructive fires including the Mendocino Complex, Carr, and Camp fires. The fire season of 2020 was a record- setting year of wildfires in California with approximately 4.4 million acres burned representing approximately 4% of the total land

[1] Cloverdale LHMP (https://www.cloverdale.net/437/Cloverdale-Local-Hazard-Mitigation-Plan)

area of the state. As the number of acres burned, property, and structure loss increase, more attention has been directed at pre-fire planning and public preparedness throughout California.

Recent research on climate change strongly suggests that the threat of wildfire is likely to increase in coming years due to California's ongoing drought situation, excessive heat, accumulation of fuels, and the occurrence of wind-driven fires. The damage from wildfires extends beyond the immediate cost of structures lost and includes long-term health effects from smoke exposure, smoke damage to crops (particularly wine grapes), and damage to forest health. There is increasing evidence of psychological damage to residents from repeated emergencies and financial damage to unaffected but nearby homeowners due to changed property values.

1.1 District Overview

The CFPD is located along Highway 101 in northern Sonoma County and is approximately 68 square miles (43,335 acres) with a population of approximately 11,500. The CFPD is bordered by Mendocino County to the north, Geyserville to the south, and rural areas to the east and west (**Figure 1**). Much of the CFPD is rural, undeveloped, and forested, and not served by fire hydrants. The city of Cloverdale is in the center of the CFPD with most of the urban landscape concentrated in the area along Highway 101.[2]

According to the 2019 American Community Survey (ACS)[3], the median age of residents living in the city of Cloverdale is 39, with a median annual income of approximately $70,000. The 2020 Decennial Census found that there are 3,365 occupied housing units and 159 vacant housing units; the 2019 ACS indicates that there are 2.7 persons per household. The median value of occupied housing units according to the 2019 ACS is $476,100.

The CFPD is approximately 97% coterminous with the Cloverdale United School District (CUSD). According to statistics collected by the CUSD, 17% of the population is over the age of 65, 35% of the population is Hispanic or Latino, and 38.3% of households have an income less than $45,000 per year. As of fall 2017, 60% of students were considered economically disadvantaged and 18.4% were considered fluent in English. Of all enrolled students, 55% were classified as Hispanic or Latino. This area is considered a low-income community under California AB 1550.

[2] Cloverdale Chamber of Commerce (https://cloverdalechamber.com/)

[3] U.S. Census Bureau American Community Survey (https://www.census.gov/programs-surveys/acs)

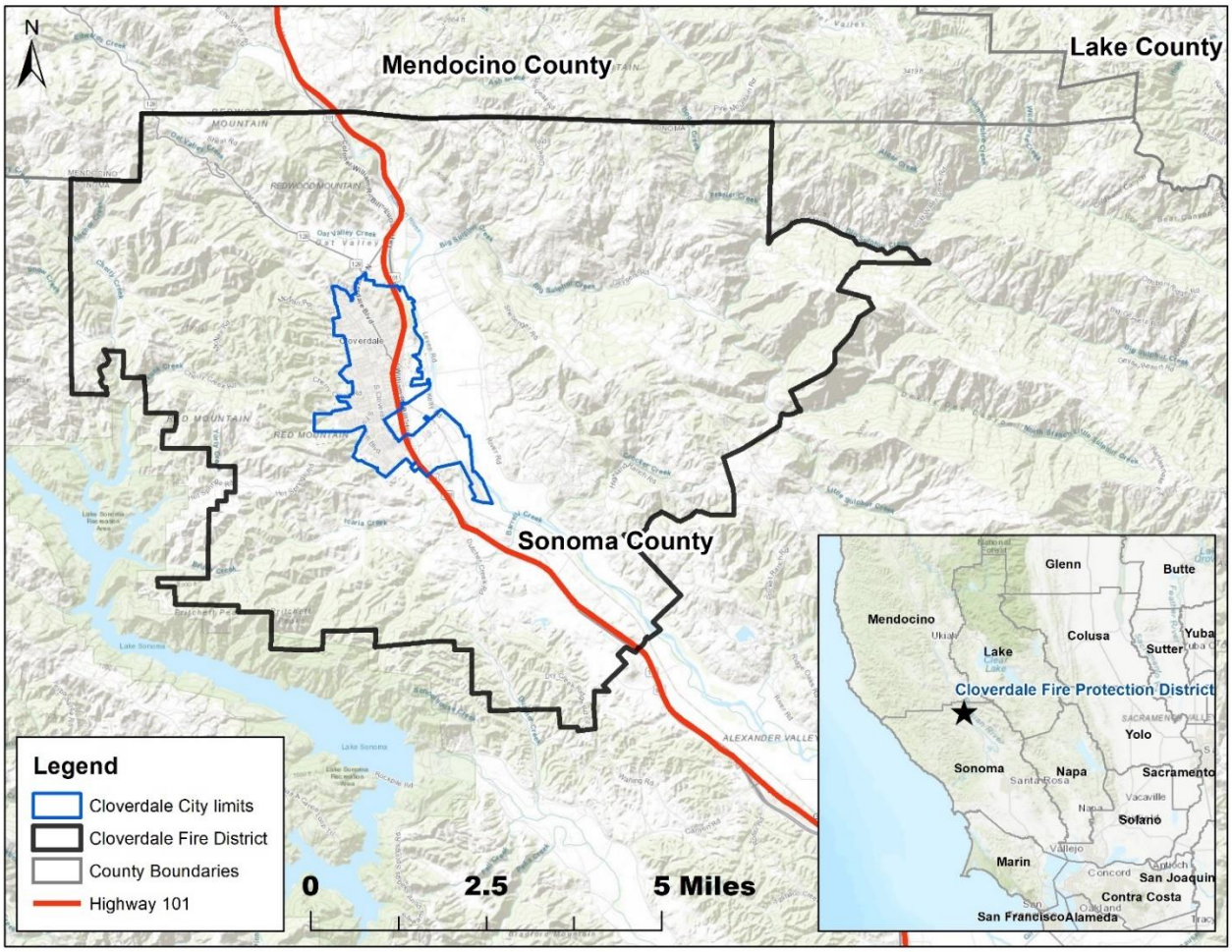

Figure 1. Map of the Cloverdale Fire Protection District (CFPD).

Fire protection in California is the responsibility of either the federal, state, or local government. On federally owned land, or federal responsibility areas (FRA), fire protection is the responsibility of the federal government, often in partnership with local grants and contracts. In state responsibility areas (SRA), which are defined according to land ownership, population density, and land use, CAL FIRE has a legal responsibility to provide fire protection. Public Resources Code, Section 4126 designates SRAs as a state- or privately owned forest, rangeland, or watershed. CAL FIRE is not responsible for densely populated areas, incorporated cities, agricultural lands, or federal lands. Local responsibility areas (LRA) include incorporated cities and cultivated agriculture lands. In LRAs, fire protection is provided by city fire departments, fire protection districts, or counties, or by CAL FIRE under contract to local government. SRA designations undergo a five-year review cycle, as well as annual updates to reflect incorporations/annexations, error fixes, and ownership changes (which do not require Board of Forestry approval). Figure 2 shows the FRA, SRA, and LRA in the CFPD.

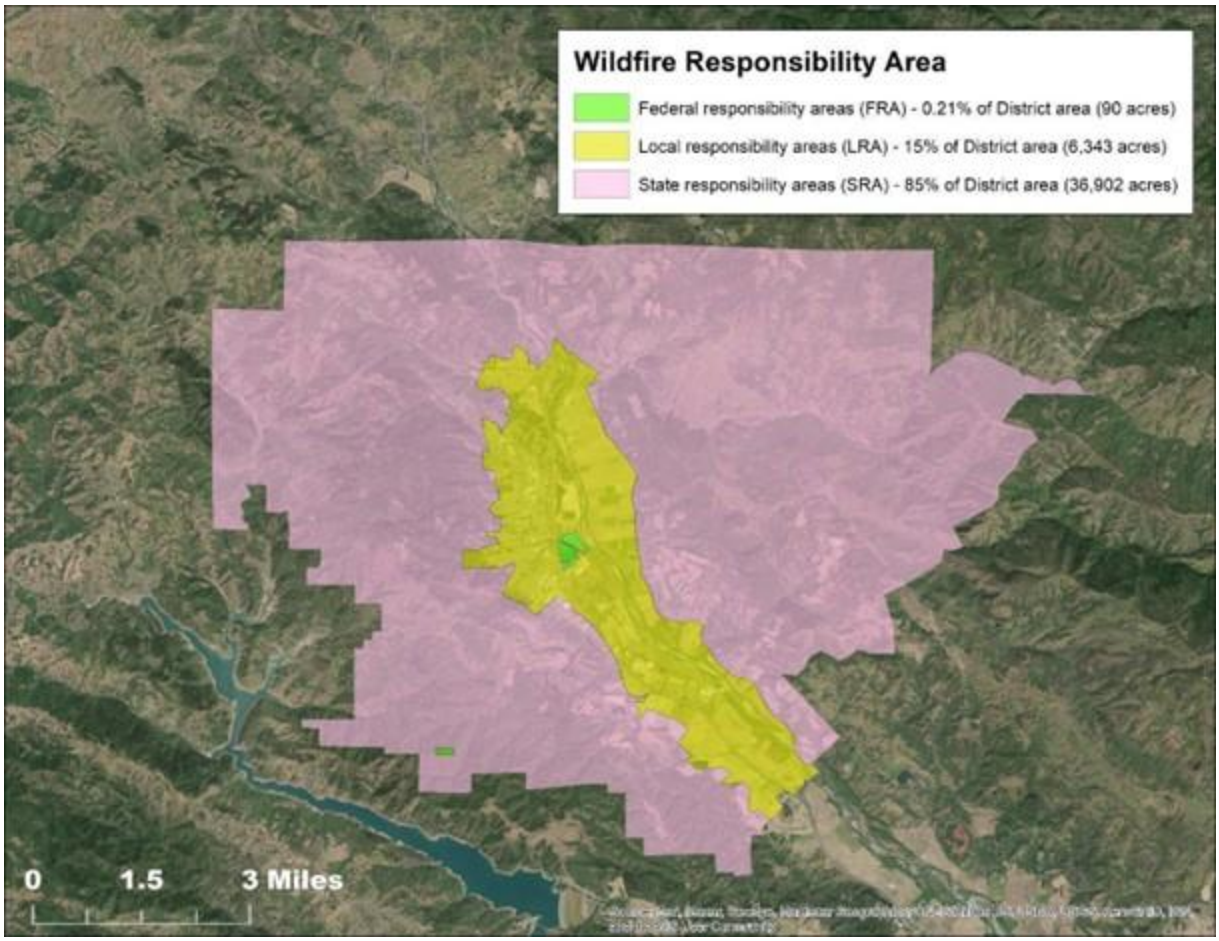

Figure 2. Map of the federal responsibility areas (green), state responsibility areas (pink), and local responsibility areas (yellow) in the Cloverdale Fire Protection District.

The CFPD has both full-time staff and volunteer firefighters on call 24 hours a day, 7 days a week. The CFPD staffs six full-time firefighters, a fire chief, an administrative assistant, seasonal firefighters, and a variety of staffing programs utilizing volunteers. The CFPD provides protection to a large area totaling approximately 68 square miles and helps to staff the Cloverdale Healthcare District's Ambulance.[4] There is one fire station located in the city of Cloverdale that covers the entire CFPD. CAL Fire has a station located in Cloverdale that is staffed seasonally.

Like many populations in Sonoma County, several CFPD communities consist of neighborhoods located along large tracts of undeveloped land. Wildfires represent a potential threat to both established and newly constructed communities within the WUI, and local emergency services may be quickly overwhelmed by a fast-growing wildfire in its early stages. The CFPD and CAL FIRE maintain equipment and daily staffing to quickly suppress small wildfires. However, as a fire grows, especially during extreme weather scenarios, additional firefighting resources must be drawn from farther away,

[4] http://www.cloverdalefiredistrict.com/about.htm

introducing significant lag-time between when the fire impacts a community and when resources arrive to suppress the fire or to protect homes, structures, and infrastructure at risk.

Because of this "lag-time" in firefighting response, communities cannot depend entirely on local firefighters to save their homes. To help reduce the hazards associated with living in the WUI, homeowners and residents must help protect their property and community by taking educated steps before and during the fire season to "harden"[5] their homes and make properties defensible from the threat of fire. Scientific research shows the effectiveness and benefits of implementing wildfire mitigation concepts across individual property boundaries and throughout communities (Brenkert-Smith, 2011). It is important that community members work together so that the region is more fire resilient.

The National Fire Protection Association's (NFPA's) Firewise USA® Program encourages homeowners to develop community-based solutions for protecting homes and properties from the risk of wildfire. The nationally recognized program provides resources to help homeowners learn how to adapt to living with wildfire while encouraging and empowering neighbors to work together to take action to reduce their wildfire risk and prevent losses. There are currently more than 1,500 recognized Firewise USA® communities throughout the country.

1.2 Risk Factors

Approximately 5% of the CFPD's land area falls within the WUI. However, a much larger portion, 55%, falls into the wildfire influence zone that contains vegetation susceptible to wildfire and narrow roadways that pass through neighborhoods into densely vegetated areas. Because of the mix and density of structures and natural fuels, combined with limited access and egress routes, fire management is more complex in WUI environments. In addition, rapid response times to areas far from the city can be challenging because the CFPD covers such a large area. Therefore, it is critical that roadways provide direct access and egress during emergency situations.

As part of the CWPP process, the CFPD in collaboration with stakeholders identified areas of concern for fire hazard. These areas largely overlap with the WUI and intermix areas identified by CAL FIRE. **Figure 3** shows a map of the CFPD's WUI, intermix, and wildfire influence zone areas as designated by CAL FIRE in 2019.[6]

[5] Home hardening refers to modifying a home with building materials and installation techniques that increase resistance to heat, flames, and embers that accompany most wildfires.
[6] CAL FIRE Wildland Urban Interface (WUI) map and definitions (https://frap.fire.ca.gov/media/10300/wui_19_ada.pdf)

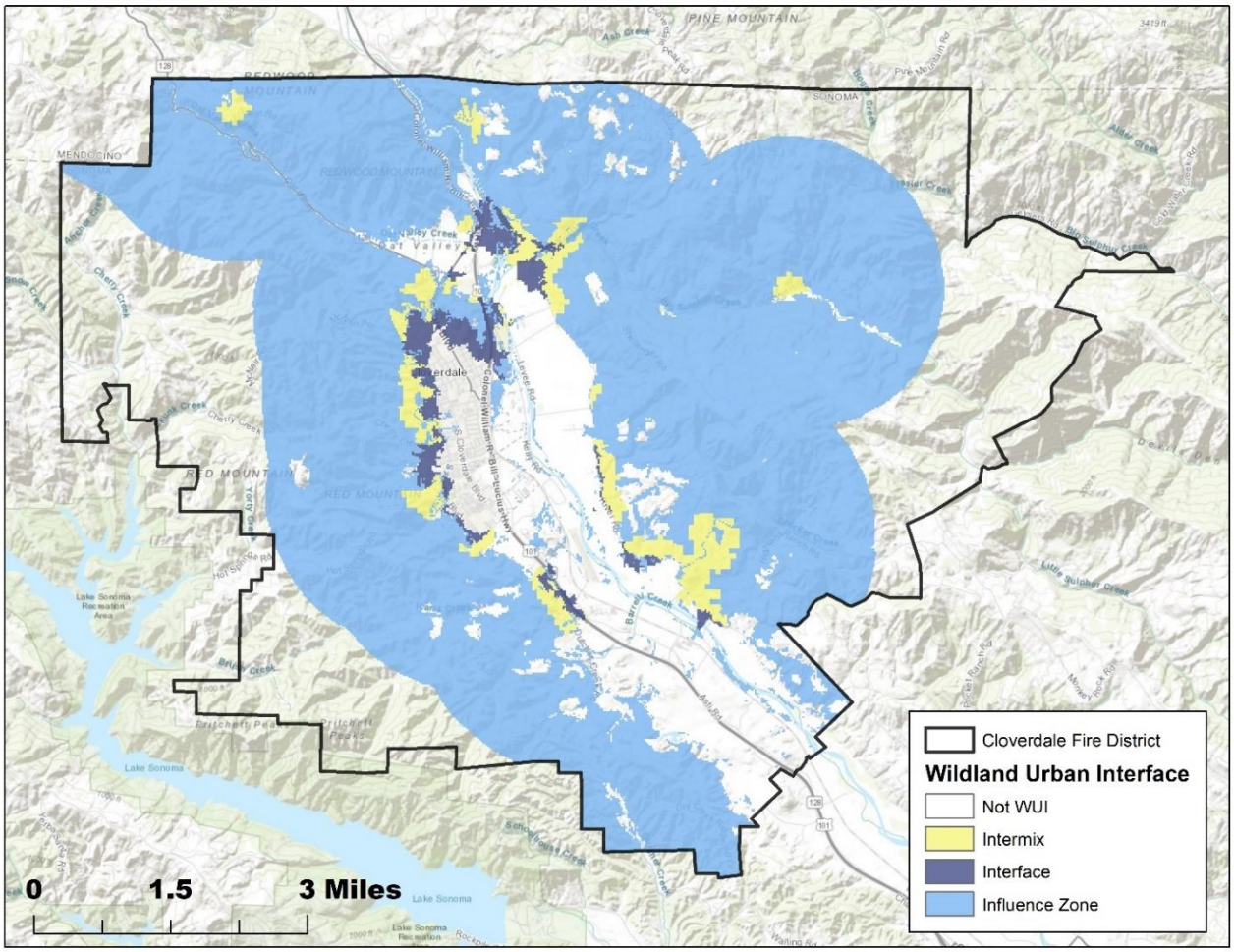

Figure 3. Map of the CFPD's WUI, intermix, and wildfire influence zone areas as designated by CAL FIRE in 2019.

Much of CFPD's service area is characterized by WUI and adjacent parklands and wildlands. These areas and their accompanying wildfire risk and hazard were analyzed and mapped as part of the Sonoma County CWPP. **Figure 4** shows the Sonoma County CWPP wildfire hazard index for the area within the CFPD. The wildfire hazard index is a model that predicts relative wildfire hazards on the landscape. Higher index values represent a higher relative hazard. The index is based on inputs that inform potential fire behavior, burn probability, and wildfire suppression difficulty.

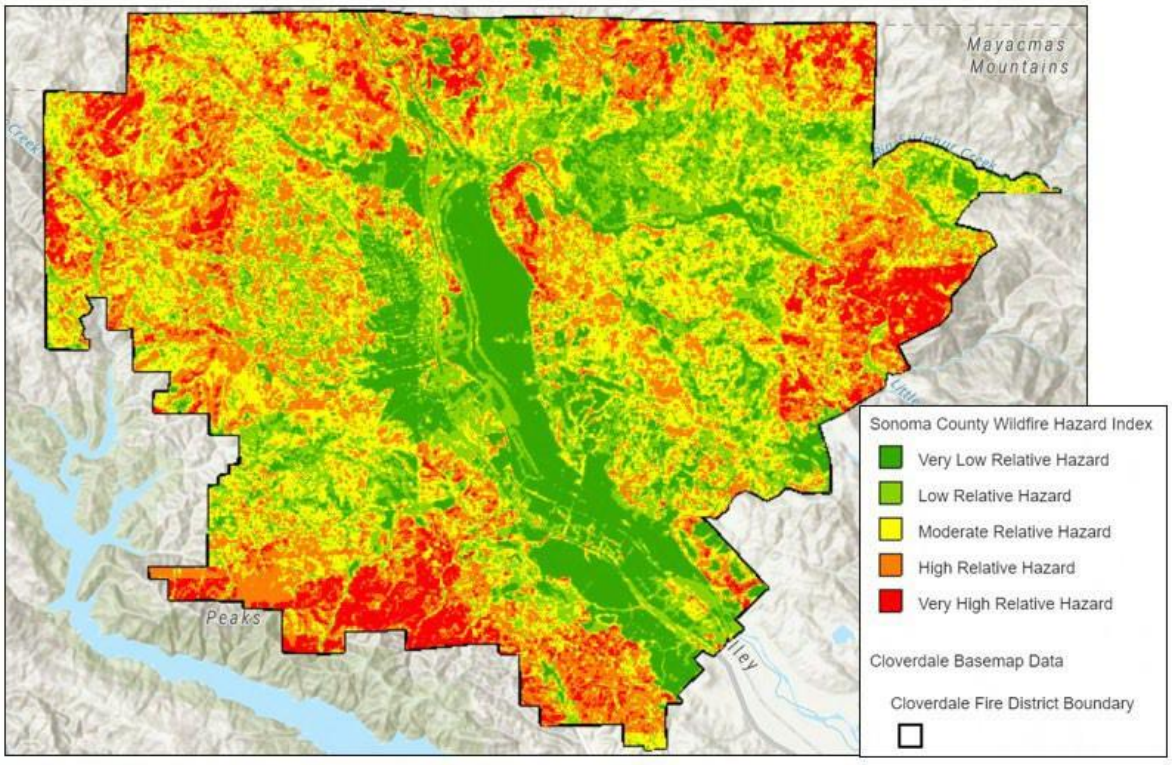

Figure 4. Map showing the Sonoma County wildfire hazard index developed as part of the Sonoma County CWPP. The full Sonoma County Wildfire Hazard Index Map can be accessed here: **https://sonoma-county-cwpp-hub-site-sonomacounty.hub.arcgis.com/apps/sonoma-county-wildfire-hazard-index/explore**.

The CFPD has a long history of wildfires. The most recent large fire was the Pocket Fire in October 2017. The Pocket Fire burned in the south-eastern area of the CFPD. The fire burned a total of approximately 17,400 acres; however, not all of the burned area was within the CFPD boundary. The CFPD experiences smaller wildfires under "normal" prevailing weather conditions. Significant potential exists for larger, more destructive wildfires under extreme weather scenarios such as the easterly, offshore Diablo wind events that typically occur in the late summer through late fall.

The risk created by the natural environment is compounded by certain physical constraints and limitations in the CFPD, including:

- Constrained Ingress and Egress: Many streets outside of the city limits are narrow with one or two-lane egress routes, which may restrict access for first responders and evacuation for residents.
- Overhead Utilities: Overhead utility lines and equipment present a potential ignition source for a wildfire.

- Older Structures: Many structures within the CFPD were built prior to the adoption of current WUI codes and standards. Chapter 7A of the CA Building Code, adopted in 2008, set a standard for ignition resistance in buildings that vastly increases the likelihood that structures built or substantially remodeled after 2008 will survive exposure to wildfires.

Many homes along the western edge of the city are built with combustible materials adjacent to vegetation with varying defensible space[7] and are at risk from wildfire. To complicate matters, drought conditions combined with dense vegetation and heavy fuel loads have increased the potential for extreme fire behavior such as crown fire, blowups (sudden increases in fire intensity), and spotting (firebrands, or lofted burning embers, igniting flammable fuels ahead of the main fire). Defensible space is the buffer you create between a building on your property and the grass, trees, shrubs, or any wildland area that surround it. This space is needed to slow or stop the spread of wildfire and it helps protect your home from catching fire-either from embers, direct flame contact, or radiant heat.

1.3 Geographic Setting

The city of Cloverdale is located along the Highway 101 corridor in the Alexander Valley on the banks of the Russian River. The population of the city of Cloverdale is approximately 9,000, and the population of the CFPD is 11,500. The CFPD is home to the Cloverdale Rancheria of Pomo Indians. Approximately 88% of the land within the CFPD is zoned for resource and rural development. The remaining 12% is zoned for public facilities; agriculture; and rural residential. Table 1 shows the distribution of zoning areas throughout the CFPD.

[7] Cloverdale General Plan, Chapter 10
(https://www.cloverdale.net/DocumentCenter/View/4696/Cloverdale_GP_BG_Chap_10_PHS_Public_Draft_May_2021_rev?bidId=)

Table 1. Distribution of zoning area throughout the Cloverdale Fire Protection District Boundary.

Zoning Description	Percent of Zoning Area in CFPD
Resource and Rural Development	74%
Public Facilities	14%
Land Extensive Agriculture	5%
Land Intensive Agriculture	5%
Rural Residential	1%
Agricultural and Residential; Limited Urban Industrial; Recreation and Visitor-Serving Commercial; Diverse Agriculture; Limited Rural Industrial; Rail; Limited Commercial; Road; Medium Density Residential; Planned Community	1%
Total	**100%**

1.3.1 Road Network

Vegetation maintenance adjacent to roadways is an issue throughout California and particularly in rural and WUI communities. There are two main highways (Highway 101 and State Route 128) that run through the CFPD. There are many primary and secondary roads throughout Cloverdale where most of the population resides. Outside of the city, there are fewer, tertiary roadways surrounded by mostly undeveloped land. The road network outside of the city is approximately 39 miles long.

Highways, such as Highways 101 and State Route 128, are maintained at the state level by the California Department of Transportation (Caltrans). Other primary and secondary roads are maintained at the county, city, or town level. There are many private roads in unincorporated parts of Sonoma County. The California Civil Code requires that these roads be maintained by private property owners and be shared equitably by the landowners benefiting from them.

The existing network of tertiary roads requires mitigation to provide ingress/egress for residents and fire personnel. Examples of tertiary roads in the CFPD include Asti Ridge and Old Crocker Roads. These roadways radiate out from the local responsibility area through the state responsibility area in a predominantly east-west direction. A number of these routes cross areas determined by CAL FIRE's FHSZ mapping as high and very high wildfire hazard severity risk. The roadways provide critical access and egress to residents and service access for numerous at-risk values such as utilities, water supply, and erosion control. They also present an opportunity for direct attack and other important strategic and tactical uses during a wildfire incident. As a result, the areas of Henry Lane (Figure 5), Highland

Ranch Road (Figure 6), McNair Road/Kerry Lane (Figure 7), Cherry Creek Road/Port Circle (Figure 8), Riverfront (Figure 9), and Hot Springs Road (Figure 10) have been identified as high-priority areas for mitigation.

Figure 5. Photos of the Henry Lane area.

Figure 6. Photos of the Highland Ranch Road area.

Figure 7. Photos of the McNair Road area.

Figure 8. Photos of the Cherry Creek Road area.

Figure 9. Photos of the Riverfront area.

Figure 10. Photos of the Hot Springs Road area.

1.3.2 Fire Roads and Fuel Break Networks

Fire roads primarily consist of roadways and trails on adjacent open space lands, including unpaved roads and trails, as well as some paved roads that connect and pass through open space areas. A network of unpaved Fire Access Roads ("Fire Roads") exists in the vegetated areas outside of the city of Cloverdale. These fire roads are in various states of repair, with some showing signs of regular maintenance, while others are unpassable in a vehicle due to vegetation overgrowth, washouts, or other unsafe surface conditions.

Fuel Breaks are strategic locations along a ridge, access road, or other location where fuels can be modified. The width of a fuel break is usually 60 to 100 feet depending on the site. A shaded fuel break is a carefully designed thinning of dense vegetation, so fire does not easily move from the ground into the tree canopy.

Approximately 81 miles of strategic roadways were identified as part of this assessment within the boundaries of the CFPD. These roads were mapped to help characterize potential wildfire response and emergency access issues, and to consider implications for access during an emergency incident. This road network connects the primary, secondary, and tertiary roads; fire roads; and the fuel breaks, offering over 80 miles of strategic access and egress for Cloverdale and surrounding communities. The road network and corresponding mitigation plan are documented in Section 4 and Appendix C.

1.3.3 Community Infrastructure

Wildfires frequently damage infrastructure, including roadways, communication facilities, above-ground utility lines, and water delivery systems. Restoring basic services following a fire is a top priority, and many agencies and organizations responsible for infrastructure incur significant restoration costs after a fire. Efforts to restore roads and highways post-fire include the costs of maintenance and damage assessment teams, field data collection, and replacement or repair of roads, guardrails, signage, electrical supply, culverts, and landscaping. Direct impacts to water supplies may occur through contamination of ash and debris during the fire, destruction of above- ground delivery lines, and soil erosion or debris deposits after the fire. As part of the development of this CWPP, critical infrastructure was considered in developing the mitigation plan.

1.3.4 Natural Gas, Electrical, and Wired Communications

The most significant infrastructure identified in the CFPD at risk from wildfire is overhead utility lines, including residential power lines, landline voice and data lines, and cable television/data distribution lines. Above ground utility poles are particularly vulnerable to wildfire and frequently fall during fires when wooden pole bases burn. These fallen poles and lines present several challenges: ingress/egress routes may be blocked to evacuating residents and the responding fire apparatus; communications can be cut off, including access to landline and Voice over internet protocol (VoIP) 911 systems; and fallen power lines can create a significant electrical hazard to firefighters and the public during a fire event.

Pacific Gas and Electric (PG&E) provides natural gas distribution in Sonoma County. According to PG&E's natural gas transmission pipeline map there is one major natural gas transmission line located within the CFPD that runs from south to north under S Cloverdale Boulevard, N Jefferson Street, intersects with State Highway 128, then under Redwood Mountain where it exits Sonoma County.[8] In

[8] PG&E Natural Gas Pipeline Map (https://www.pge.com/en_US/safety/how-the-system-works/natural-gas-system-overview/gas-transmission-pipeline/gas-transmission-pipelines.page)

residential areas, smaller, local lines are low pressure, 2"-4", underground, and are not likely to be impacted by wildfire. Wildfires may threaten individual residential natural gas services with above ground meters and exposed interior residential gas lines if a structure ignites.

Highway 101, the main Highway providing north-south access through northern California, runs through the CFPD and could be susceptible to fire damage. Following a fire, utility, communications, and road repairs are necessary, with the cost or repair sometimes exceeding the cost of fighting the fire.

1.3.5 Cellular Communications

Cellular communications are an increasingly important tool for the public and fire managers. Adoption of systems such as the SoCoAlert[9] disaster and evacuation notice system depend on cellular voice and data transmission to communicate emergency information and evacuation notices to the public.

Although the dominant local cellular carriers (AT&T, T-Mobile, Verizon Wireless, and Sprint) each indicate in their public GIS coverage data that the city of Cloverdale has nearly 100% coverage, remote areas elsewhere in the CFPD often lack reliable wireless voice and data connectivity. Further, during unplanned or intentional power outages such as PG&E's Public Safety Power Shutdowns (PSPS), cellular service may be impacted, as has occurred in recent years. Overhead fiber cable lines may also be damaged by the fire, which would lead to a disruption of cellular coverage. When communication systems suffer disruption, the remaining infrastructure are degraded as demand migrates to a diminishing number of access points with limited bandwidth. Recent disruptions have been primarily caused by electrical power outages and physical damage to regional fiber lines, both of which can occur during a fire.

1.3.6 Natural Resources

The creeks, streams, and the Russian River that flow through the CFPD are important natural resources in the area. The three major creeks that go through the city of Cloverdale include Cloverdale Creek, Porterfield Creek, and Cherry Creek. They remove water pollutants, improve water quality, and contribute to flood control and stormwater drainage. They also provide an important wildlife habitat and improve the aesthetic of the neighborhoods and quality of life. Included in the Cloverdale General Plan are programs and policies to protect the wildlife and natural environment.

1.3.7 Biodiversity

The CFPD is located in northern Sonoma County, and the county is recognized as a globally significant hotspot for biodiversity. The environment within the county supports a variety of ecosystems and species. These ecosystems include redwood forests, coastal prairies, oak savannas, rivers, estuaries, and

[9] Sonoma County SoCoAlert (https://socoemergency.org/get-ready/sign-up/socoalert/)

beaches that all provide important habitat for wildlife. The county is also home to several endangered species including the Coho Salmon and the California Red-Legged Frog. When developing mitigation strategies and fuels treatment prescriptions, it is important to consider potential biological and ecosystem impacts.

Efforts are underway in Sonoma County to provide information at multiple scales to facilitate strategic, ecologically sensitive fuel management across the region. The Sonoma County Wildfire Resilience Decision Support Framework is part of a county-wide coordinated initiative to prioritize actions and investments by Sonoma Water, University of California Cooperative Extension, the Sonoma County Community Wildfire Protection Plan, and Sonoma County's Office of Climate Action & Resiliency.

Two online decision-support tools make up the Framework: (1) The Wildfire Resilience Planner: Strategic Planning at the Landscape Scale and (2) The Wildfire Fuel Mapper: Property-Specific Information for Fuels Management (https://wildfirefuelmapper.org/). Sonoma Water has partnered with Conservation Biology Institute (CBI), Pepperwood Preserve, and other organizations and stakeholders to support strategic investments in fuel load reduction for the long-term resilience of Sonoma County's communities and watersheds. The partnership is creating the Wildfire Resilience Planner, an online decision support tool that applies science and expert knowledge to prioritize locations where the reduction of fuels will best protect lives and property, community infrastructure, ecosystem services, and biodiversity. The Wildfire Fuel Mapper is being developed by the University of California Cooperative Extension, Pepperwood Preserve, and stakeholders. The Wildfire Fuel Mapper provides landowners and managers with a set of tools, resources, and information for designing and implementing projects to reduce wildland fuels.[10]

1.3.8 Watersheds and Water Districts

Watersheds are land areas that channel rainfall and snowmelt to creeks, streams, and rivers, and eventually to outflow points such as reservoirs, bays, and the ocean. The main watersheds within the CFPD include Ash Creek, Frasier Creek, Lower Big Sulfur Creek, Cherry Creek, Cloverdale Creek, and Icaria Creek. Other watersheds that have a small area within the CFPD include Lower Dry Creek, Dutcher Creek, Lower Little Sulfur Creek, N. Branch Little Sulfur Creek, and Middle Big Sulfur Creek. **Figure 11** shows a map of the watersheds within the CFPD and the rivers and streams from the watersheds that flow into Lake Sonoma. Named streams that flow into Lake Sonoma include Cherry Creek, Skunk Creek, Yorty Creek, Brush Creek, and Dutcher Creek. Lake Sonoma is important for its water storage and use, as is the Russian River, which provides water to several cities in northern Sonoma County including Cloverdale, Geyserville, and Healdsburg. Named streams that flow into the Russian River include Ash Creek, Oat Valley Creek, Big Sulphur Creek, Crocker Creek, Icaria Creek, and Barrelli Creek.[11]

[10] The Sonoma County Wildfire Resilience Decision Support Framework (https://consbio.org/products/projects/the-sonoma-county-wildfire-resilience-decision-support-framework)
[11] https://www.cloverdale.net/66/Engineering-Department

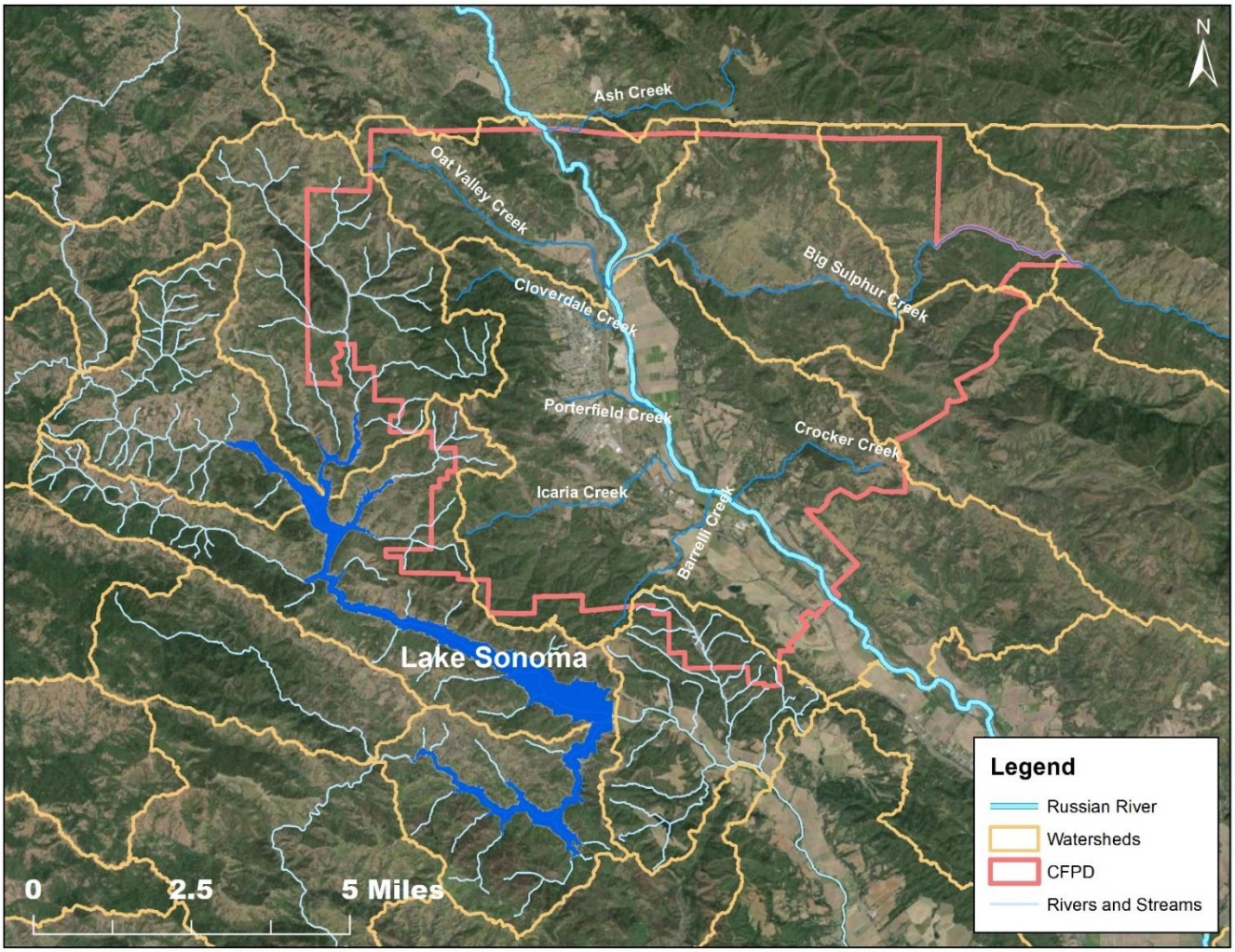

Figure 11. Map of the Russian River and creeks that flow into the Russian River, the watersheds within the Cloverdale Fire Protection District, and rivers and streams that flow into Lake Sonoma. Data source: Sonoma County Veg Map in ArcGIS Online.[12]

The Russian River and the rivers and streams that flow into Lake Sonoma are considered critical infrastructure to the CFPD. The Russian River, in addition to other creeks and streams, are important natural resources in the CFPD. The named streams in the CFPD support threatened steelhead trout while some also support threatened chinook salmon. Several more streams flow to parent streams that support endangered coho salmon. These streams and the wildlife that they support are susceptible to pollution and habitat loss. All streams in the CFPD flow to downstream (southern) water sources that supply agriculture and municipal water to Sonoma and Marin counties. In addition, these streams and creeks carry away storm water, conveying flood water from infrastructure, and provide recreational opportunities.

[12] Sonoma County Veg Map (https://sonomavegmap.org/)

1.4 Fire Environment

The weather, vegetation and fuel characteristics, topography, and land-use history are important factors for the fire environment within the CFPD. Strong, northeasterly, offshore winds create the wind regime that is commonly associated with the largest and most destructive wildfires in northern California. These "north" winds occur as high-pressure forms in the Great Basin and drive air over the Sierra Nevada Mountains (from the east) and down toward the Pacific Ocean (to the west and south). When the winds travel over the Sierra Nevada Mountains, the descending air is compressed which lowers the relative humidity resulting in strong dry winds (Werth et al., 2016). When these winds travel through canyons, they create strong gusts.

1.4.1 Climate

The city of Cloverdale and the CFPD area includes the cold-winter valley floors, canyons, and land troughs characteristic of the California coastal ranges. Marine air moderates the coastal range which, without the marine influence, would otherwise be colder in winter and hotter in summer. Fall afternoon winds are common, with strong drying winds observed from summer to late fall. Lowland valley areas, and surrounding ridges and hilltops experience colder winters. The average annual low temperature is 48 degrees Fahrenheit, and the average annual high temperature is 75 degrees Fahrenheit. Annual average precipitation is 43 inches. During the typical fire season from May to October, the average low temperature is 54 degrees Fahrenheit, the average high temperature is 87 degrees Fahrenheit, and the average precipitation is less than an inch.[13]

The Mediterranean climate experiences summer drought, with typical rainfall measured between May and October at less than 0.5 inches, and has lower relative humidity (RH) and lower overnight RH recovery than nearby coastal valleys. These conditions may contribute to slight to moderate increases in expected fire behavior relative to surrounding areas.

Research on climate change and wildfires in the western United States, including California, indicate that climate change has increased the annual area burned by fire, as well as the likelihood of high-severity fires. This is due in part to an increase in the frequency of days with extreme fire weather, increased aridity, and a lengthening of the fire season (Abatzoglou and Williams, 2016; Williams, 2019; Goss et al., 2020). Climate projections indicate that the annual area burned and the threat of high-severity fire will likely increase in the future as the western United States warms and becomes more arid (Brown et al., 2021; Liu et al., 2012; Weatherly and Rosenbaum).

[13] U.S. Climate Data (https://www.usclimatedata.com/climate/cloverdale/california/united-states/usca0232)

1.4.2 Vegetation and Fuels Characteristics

In the context of wildland fire, vegetation is also referred to as fuel, and plays a major role in fire behavior and potential fire hazard. A fuel's composition (including moisture level, chemical makeup, and density) determines its degree of flammability. Of these, fuel moisture is the most important consideration. Generally, live trees contain a great deal of moisture, while dead logs contain very little. The moisture content and distribution of fuels determine how quickly a fire can spread and how intense or hot it may become. High moisture content slows the burning process since heat from the fire must first eliminate moisture.

In addition to moisture, a fuel's chemical makeup determines how readily it will burn. Some plants, shrubs, and trees such as chamise and eucalyptus (both present in Sonoma County) contain oils or resins that promote combustion, causing them to burn more easily, quickly, and intensely. Finally, the density of a fuel influences its flammability; when fuels are close together but not too dense, they will ignite each other, causing the fire to spread readily. However, if fuels are so close that air cannot circulate easily, the fuel will not burn freely.[14]

The CFPD has extensive topographic diversity that supports a variety of vegetation types. Environmental factors, such as temperature, precipitation, soil type, aspect, slope, and land use history, all help determine the existing vegetation at any given location.

The City of Cloverdale manages open space and several parks within the CFPD including City Park, Furber Park, Plaza Park, Porterfield Creek Open Space, River Park, Tarman Park, and Vintage Meadows. The City manages vegetation within these parks and open space.[15] The Clover Springs Community Association (CSCA) manages the City park in Clover Springs for safety. In the fall of 2021, the City initiated Phase 1 of the vegetation management project at the Porterfield Creek Preserve. The goal is to implement an ongoing vegetation management program at the 250+ acre open space. The Cloverdale City Council allocated funding of $30,000 for vegetation management activities at the Porterfield Creek Open Space. Parks staff is coordinating with the Northern Sonoma Fuels Crew managed by the Northern Sonoma County Fire District.[16] CSCA manages vegetation, mostly landscaping, on both City of Cloverdale property and CSCA property in the parkway along Porterfield Creek and adjacent open space located within the community of Clover Springs. CSCA manages open space vegetation in a limited way for safety only, including mowing and removal of some dead vegetation.

Sonoma County Parks manages 15,000 acres and more than 50 parks throughout Sonoma County, including the northern section of River Park in Cloverdale. Sonoma County Parks manages the fuels within the parks for wildfire preparation and prevention using a variety of methods. Vegetation

[14] City of Cloverdale Newsletter, November 5, 2021 (https://www.cloverdale.net/CivicSend/ViewMessage/message/155476)
[15] https://parks.sonomacounty.ca.gov/Learn/Natural-Resources/
[16] http://www.nps.gov/fire/wildland-fire/learning-center/fire-in-depth/fire-behavior.cfm.

management is used for ecologically appropriate tree and brush thinning, as well as road clearing to improve emergency vehicle access.

1.4.3 Updated Vegetation and Fuel Model Map

Sonoma County Vegetation Mapping and LiDAR Program (Sonoma Veg Map) is a five-year collaborative program between the Sonoma County Agricultural Preservation and Open Space District, and the Sonoma County Water Agency to map Sonoma County's topography, physical and biotic features, and plant communities and habitats. On-the-ground fieldwork to develop a vegetation classification for Sonoma County was conducted in 2013 and 2014, LiDAR and 4-band 6-inch aerial photography were acquired in 2013, and vegetation and habitat mapping were completed in 2017. The program produced a variety of high-resolution topographic and land cover data, including a 1-meter resolution Bare Earth Digital Elevation Model (DEM), 1-meter resolution forest metrics (e.g., canopy height and canopy density), and a fine scale vegetation and habitat map using the National Vegetation Classification Standard.

The 2013 LiDAR-derived topographic products, including the forest metrics, and the high-resolution vegetation and habitat map were inputs for the development of a 5-meter spatial resolution fuel model. The fuel model, created by the Pepperwood Foundation, represents surface vegetation and structure according to Scott and Burgan's fuel model classification scheme (Scott and Burgan, 2005). Fuel model data are used as input to fire behavior models and provide a simplified means for estimating fire behavior given the mix of vegetation in a specific area. Although the LiDAR data were collected in 2013, the fuel model map is periodically updated to include the most recent available data. For example, the fuel model map was updated to reflect canopy damage after the 2017 fire season. As of writing this CWPP, the most recent update to the fuel model map was in February 2021.

Vegetation distribution across the CFPD is characterized by 44 distinct classes, but only 10 classes represent approximately 90% of the total land area of the CFPD. Table 2 lists the top 10 fuel model types present in the CFPD. A map of the fuel model data can be viewed on the Community Basemap.

Table 2. Top 10 fuel model types present in the CFPD that make up approximately 90% of the total land area.

Scott and Burgan Fuel Model Description (and Number)	Acres	Percent of Land Area
Very High Load, Dry Climate Timber-Shrub (165)	12,238	28%
Low Load, Dry Climate Grass (102)	7,926	18%
Moderate Load, Dry Climate Grass-Shrub (122)	6,187	14%
Agricultural (93)	3,320	8%
Very High Load Broadleaf Litter (189)	3,027	7%
Urban/Developed (91)	2,317	5%
Very High Load, Dry Climate Shrub (147)	1,838	4%
Moderate Load Dry Climate Shrub (142)	1,475	3%
Low Load Dry Climate Timber-Grass-Shrub (161)	856	2%
Moderate Load Conifer Litter (183)	639	1%
Other	3,513	8%
Total	**43,335**	**100%**

1.4.4 Forest Health, Drought, Infestation, and Disease

Many of the native tree species that occur in the coastal forests are well-adapted to drought and are able to survive and persist through hot and dry seasons. However, the persistent and severe drought conditions are worsening already widespread forest health issues and resulting in new insect and disease outbreaks. For example, western bark beetle and red turpentine beetle activity have been observed in neighboring Mendocino and Napa counties' ponderosa pines due to the insects establishing in fire stressed trees and then spreading to healthy trees.[17]

Sudden oak death has had a significant impact on the county due to the large number of oak trees. The pathogen kills some trees and leaves other trees alone in a forest. The diseased trees bleed out sap, and the only solution is to remove affected trees.[16] This syndrome is caused by the fungus-like *Phytophthora ramorum*, which has led to widespread mortality of several tree species in mid-1990s; the tanoak (*Notholithocarpus densiflorus*) in particular appears to have little or no resistance to the disease. Sudden oak death has resulted in stands of essentially dead trees with very low fuel moistures. In addition to tanoak mortality, there are an increasing number of dead and dying Douglas Fir trees in the hills west of Cloverdale and along the west side of Highway 101 north of Geyserville. Studies examining the impacts of this disease on fire behavior indicate that predicted surface fire behavior in sudden oak death stands seems to conform to a common fuel model already in use for hardwood stands. However,

[17] https://www.vintagetreecare.com/most-common-tree-issues-in-sonoma-county

the very low moisture leaves may more often lead to crown ignitions during fires of "normal" intensity (Lee, 2009). Other studies indicate that over longer time scales (over 8 years), rates of spread, fireline intensity, and flame lengths could drastically increase in diseased tanoak forests due to an increase in fuel loading (Valachovic et al., 2011).

1.4.5 Topography

Topography characterizes the land surface features of an area in terms of elevation, aspect, and slope. Aspect is the compass direction that a slope faces, which can have a strong influence on surface temperature and, more importantly, on fuel moistures. Both elevation and aspect play an important role in the type of vegetation present, the length of the growing season, and the amount of sunlight absorbed by vegetation. Generally, southern aspects receive more solar radiation than northern aspects; the result is that soil and vegetation on southern aspects is warmer and dryer than soil and vegetation on northern aspects. Slope is a measure of land steepness and can significantly influence fire behavior as fire tends to spread more rapidly on steeper slopes. For example, as slope increases from 20% to 40%, flame heights can double and rates of fire spread can increase fourfold; from 40% to 60%, flame heights can become three times higher, and rates of spread can increase eightfold.[18]

The elevation of the city of Cloverdale is approximately 340 feet. The city is in a valley surrounded by gradually sloping terrain to the east and west. Farther from the city, the terrain is topographically diverse with networks of river valleys and mountain peaks. The average elevation of the CFPD is 924 feet. The highest elevations are in the northern and eastern areas of the CFPD where elevations are in the range of 1,000 to 2,000 feet or greater. The maximum elevation is approximately 2,665 feet.

1.4.6 Fire History

Fire history is an important part of predicting potential future fire frequency, fire behavior, and ignition sources. Based on data available from CAL FIRE, the historical fire record shows that there have been 12 large wildfires (greater than 500 acres) within the CFPD since 1878. Smaller wildfires have occurred

[18] Adapted from the S-290 Intermediate Wildland Fire Behavior course material (National Wildfire Coordinating Group, http://training.nwcg.gov/courses/s290.html

throughout the CFPD that are not reflected in this data. Boundaries of historical fires (pre-1970) may not be completely accurate, as modern technology and data collection methods allow for more precise mapping of wildfire boundaries. More recent fires tend to burn on the eastern side of the CFPD, thereby making the eastern side potentially more vulnerable. This knowledge helps us understand the frequency and location of future fires. Figure 12 shows a map of historical fires in and around the CFPD based on data from CAL FIRE. Note that the fire history data shown in Figure 12 represents a statewide data set and may contain inaccuracies.

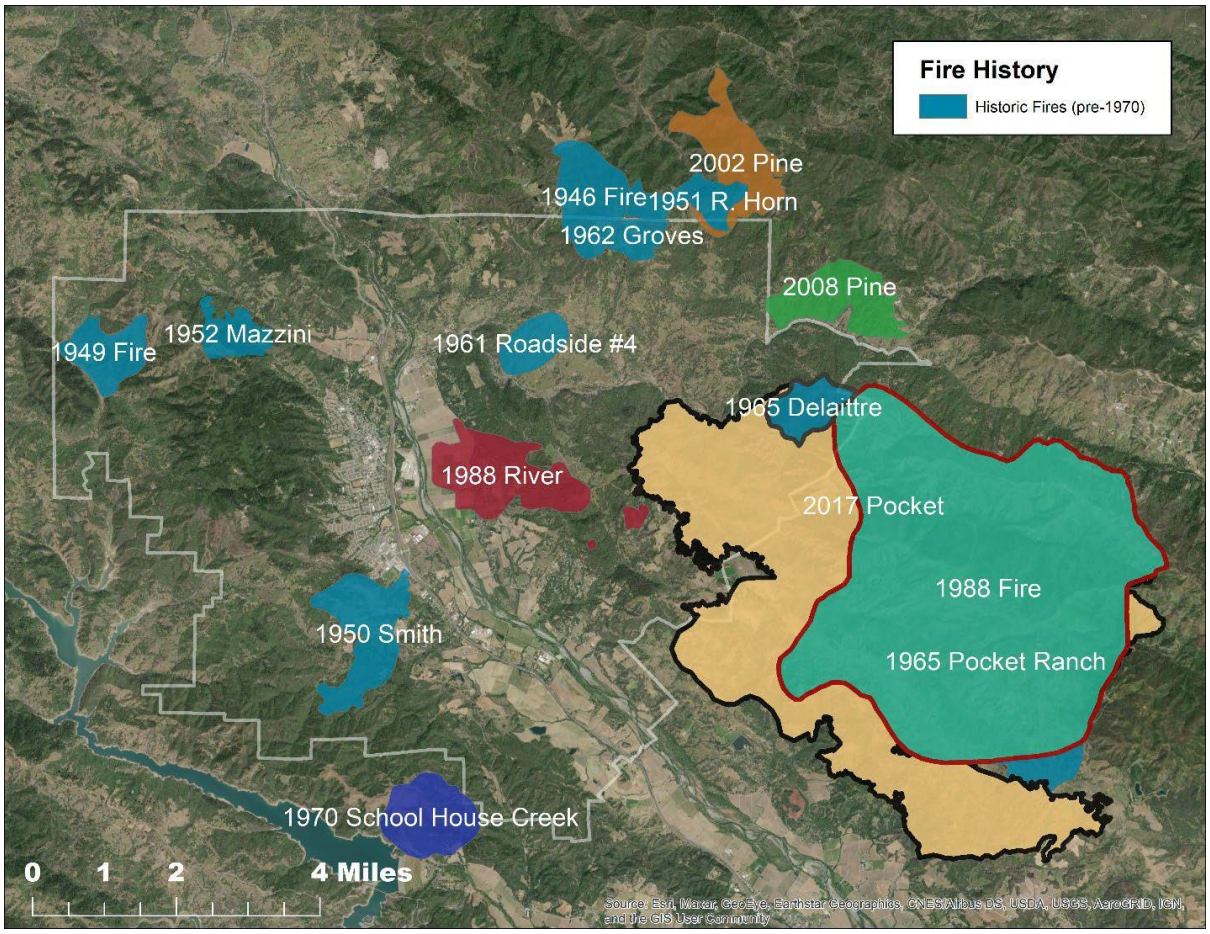

Figure 12. Map of fires larger than 200 acres that have occurred in and around the Cloverdale Fire Protection District from 1946 to 2020.

The native vegetation in Sonoma County has evolved and adapted to wildfires, and periodic fire is important for many native species to reproduce. Wildfires are essential for biodiversity and the different types of habitats present within the county. Excess fuels can accumulate and create a high wildfire risk in areas without active vegetation management. This can contribute to bigger and more destructive wildfires that may threaten buildings and homes near wildlands.[19]

[19] https://www.sonomaopenspace.org/news-and-features/2018/12/working-with-partners-to-reduce-fire-risk-in-sonoma-valley/?locale=en

1.4.7 Climate Variability

Recent research indicates that higher summer temperatures, and longer, drier periods will likely increase the area burned and fire severity in California, particularly in northern California (Westerling, 2018). Future changes in fire frequency and severity are difficult to predict; however, regional climate change associated with elevated greenhouse gas concentrations could alter large weather patterns and produce conditions conducive to extreme fire behavior. A warmer climate will bring drier winters, higher spring temperatures, and early snowmelt. Combined with drought conditions, this leads to drier soils in early summer, drier vegetation, and an increase in the number of days in the year with flammable fuels, all of which further raise the likelihood of fires.[20] Fuel and vegetation treatments will be challenging to implement at spatial scales large enough to make a difference, especially if the number of wildfires increases greatly in the future. However, hardening homes, creating defensible space, and managing vegetation to reduce fire hazard can enhance resilience in areas with high resource and economic values such as the WUI.

[20] http://www.fs.usda.gov/ccrc/topics/wildland-fire

2. Stakeholders and Collaboration

A key requirement when developing a CWPP is stakeholder and community involvement and collaboration. A CWPP provides a mechanism for obtaining community input and identifying high risk areas, potential fire hazards, and a prioritized list of potential projects intended to mitigate areas of concern and fire hazard.

One of the first steps in developing a CWPP is to form a stakeholder group of individuals representing CFPD, state and private landowners, local decision-makers, and public representatives. Collectively, this stakeholder group is the core decision-making entity responsible for the development and approval of the CWPP. Stakeholders and decision-makers volunteered to participate in this CWPP process to help establish community priorities and recommendations, and to provide input and feedback on an action plan and assessment strategy through a series of public meetings and workshops.

During the development of this CWPP, several public meetings were conducted in person and virtually and a survey was disseminated in English and Spanish to capture the issues and concerns of private land and homeowners, neighborhood groups, civic organizations, professional organizations, and environmental groups.

In July 2021, the Project team met with the Committee and the Cloverdale City Council to gather feedback and to present the plan for developing the CWPP.

In August 2021, the Project team presented early iterations of the Community Basemap in person at the Northern Sonoma County Fire and Earthquake Safety Expo. Here the team met with hundreds of Cloverdale residents and gathered meaningful and timely feedback from the community.

In November 2021, the CWPP Committee hosted a virtual workshop on Resilient Landscaping: Gardening in the Defensible Space Zone. This workshop, led by the Resilient Landscaping Coalition, was tailored specifically to the Cloverdale Community, and had over 60 participants.

Additionally, the Stakeholder group met in late July, October, and December and early January 2022, to continue to gather community input, share feedback, and discuss and review the mitigation priorities of the CFPD.

In January/February of 2022, the Committee Co-Chairs, in collaboration with Jason Jenkins, Cloverdale Fire Chief and WSG, conducted a series of Home Assessment Workshops. These comprehensive, hands-on, and informative educational workshops on wildfire mitigation were led by an experienced Certified Wildfire Mitigation Specialist and a local Cloverdale fire prevention professional. Participants learned what it takes to increase the survivability of local properties to create personal safety, property

resilience, and safety for First Responders. The workshops included visits to neighborhood properties where participants observed and learned the structures' vulnerabilities and strengths in terms of wildfire risk reduction. A brief presentation prior to field observations included topics such as: early alert warning systems, evacuation issues, structural hardening concepts, additional assets in your "mitigation toolbox," and understanding defensible space.

To gather additional community input from those who may not have attended the virtual meetings, a survey was created and shared through multiple channels. It was posted on the WSG website, shared through CFPD social media, and shared in person at the Del Webb Community Center, the Cloverdale Senior Center, and with members of the Cloverdale Rancheria. The concerns and ideas expressed from these surveys and during these public meetings and workshops were captured online and in meeting notes. Public concerns regarding fire hazards were consistent and generally included:

- Improvement of evacuation routes
- Increased emergency communication
- Increased public education and outreach
- Improvement and enforcement of defensible space
- Increased vegetation management outside of town, effective community-scale fuel reduction
- Increased defensible space and home hardening efforts in the WUI
- Protection of values at risk

Appendix A includes notes from the public meetings.

3. Hazards, Identified Risks, Assets, and Resources

The concept of hazard versus risk can be confusing, as these terms are often used interchangeably. A "risk" is the chance, high or low, that any "hazard" will cause harm. Examples of fire hazards may include the presence of dry chaparral, brush, or dry grass, stands of dead or diseased trees, or other fuels prone to wildfire, electrical distribution and power lines, vehicle exhaust systems, and concentrations of homes that do not meet current wildfire building codes and standards.

In the context of technical risk assessments, the term ''risk'' considers not only the probability, or likelihood, of an event, but also includes values and expected losses. Within the fire community, risk also refers to the probability of ignition (both human and lightning-caused) (Hardy, 2005). The fire risk (vulnerability) of an area can vary based on daily conditions (weather and dead fuel moisture) and longer-term trends (climate and vegetation health and distribution) within the local environment.

The purpose of this CWPP is to assist the community in developing collaborative methods of reducing the fire "risk" within the CFPD by employing strategies and tactics that will reduce or mitigate one or more distinct fire "hazards." Successful implementation of this report's action plan may result in meaningful reduction of the fire risk in the CFPD through the identification and subsequent mitigation of specific hazards.

3.1 Wildfire Hazard Assessment

Wildfire is a hazard wherever people and residential developments meet wildlands. The degree of hazard and the required amount of fire safety preparation varies from community to community. Identifying areas and neighborhoods of differing severity enables the application of reasonable standards and mitigation strategies based on the actual threat. This allows agencies and property owners to allocate limited resources more effectively.

To take effective action, the CFPD and property owners must understand the elements and factors that contribute to the problem. This hazard assessment, in conjunction with the CFPD's desire to implement recommended mitigation strategies, presents a unique opportunity to treat risk at the community level.

Information in this report is based on several available data sources, including the Sonoma County CWPP, the Sonoma County GIS database augmented by information collected during the CWPP process, the Sonoma County-level wildfire hazard assessment, public meetings held in 2021, site visits conducted in 2021, meetings with CFPD staff, published reports, and the professional knowledge of the consultants.

3.1.1 Community Basemap

GIS data and maps are crucial for pre-fire mitigation and preparation for wildfires, offering valuable tools for better understanding fire risk through:

- assessment of potential fire behavior and intensity
- assessment of vulnerable neighborhoods, infrastructure, and the WUI
- identification of possible evacuation routes and needed improvements; and
- analysis of potential benefits of mitigation work

As part of the CWPP process, a **Community Basemap** was developed. The purpose of the Community Basemap is to document and provide a visual tool for community members to understand the geographical and physical features of the community, fire history, infrastructure and assets at risk, areas of high potential fire hazard, areas of concern, and resulting mitigation project locations. To create consistency between the **Sonoma County CWPP** and other geographic information for Sonoma County, wherever possible, existing data were acquired and included in the basemap. The Community Basemap was compiled throughout the duration of the CWPP project and was used as a tool to help communicate with the public. A list of map layers and descriptions is included in **Appendix B**.

3.1.2 Assets at Risk

Assets at risk are defined as structures and resources that can be damaged or destroyed by wildfire. In addition to providing a framework for protecting citizens and enhancing firefighter safety, the California Fire Plan identifies the following assets warranting consideration in pre-fire planning: watersheds and water; wildlife; habitat; special status plants and animals; scenic, cultural, and historic areas; recreation; rangeland; structures; infrastructure; and air quality.

Assets in Cloverdale include real estate (homes and businesses), schools, water distribution, historical sites, utilities and electrical distribution infrastructure, communications networks and facilities, transportation infrastructure, watersheds, protected open-space, recreation areas, and agricultural lands. For the purposes of this CWPP, facilities at risk are primarily schools and public safety infrastructure.

3.1.3 Schools

Schools in Cloverdale include Jefferson Elementary, Washington Middle School, Cloverdale High School, and Eagle Creek Community Day School.

Schools may present a unique wildfire evacuation challenge; evacuating students during a daytime fire may be challenging due to lack of adequate transportation. Schools typically have emergency

management plans in place to respond to emergency and evacuation situations and address evacuation and supervision of children until they can be reunited with their parents or guardians. In addition to managing the logistics of an emergency situation, backup communication and power should be prioritized. Annual wildfire drills should test facilities and plans, including parent communications.

A unique feature of school facilities is that they typically have playing fields that may be suitable for Community or Temporary Refuge Areas (CRA/TRA). Schools should consider combustible-free zones around all structures to limit potential ember ignitions.

3.1.4 Critical Infrastructure

Public safety infrastructure includes facilities, systems, and structures that are developed, owned, and operated by the government or by PG&E. **Figure 13** shows a map of the critical infrastructure in the CFPD including locations of cell tower(s), power plants, transmission lines, natural gas lines, and the location of the future site of a 60-foot-tall fire watch tower.

The fire watch tower will be equipped with at least two high-definition cameras that rotate continuously and will overlook Big Sulphur Creek, the Geysers, and will be able to see into Mendocino County to the north and Napa County to the east. In the case of a suspected fire detection by a camera, the camera will stop rotating and zoom into the location of smoke and/or light from the fire. The other camera will continue rotating and monitoring for potential fire spread. If a fire is confirmed, timestamped images, coordinates, azimuth, and range information is made available to the incident commander and dispatched firefighters. The tower will also be equipped with radio repeater equipment that reaches approximately 90% of the CFPD, and a weather station to continuously measure wind speed, wind direction, temperature, and humidity. All of the images from the cameras, weather data, and repeater frequencies will be provided to the public to assist in disseminating real-time information. These data layers can be accessed in the online Community Basemap.

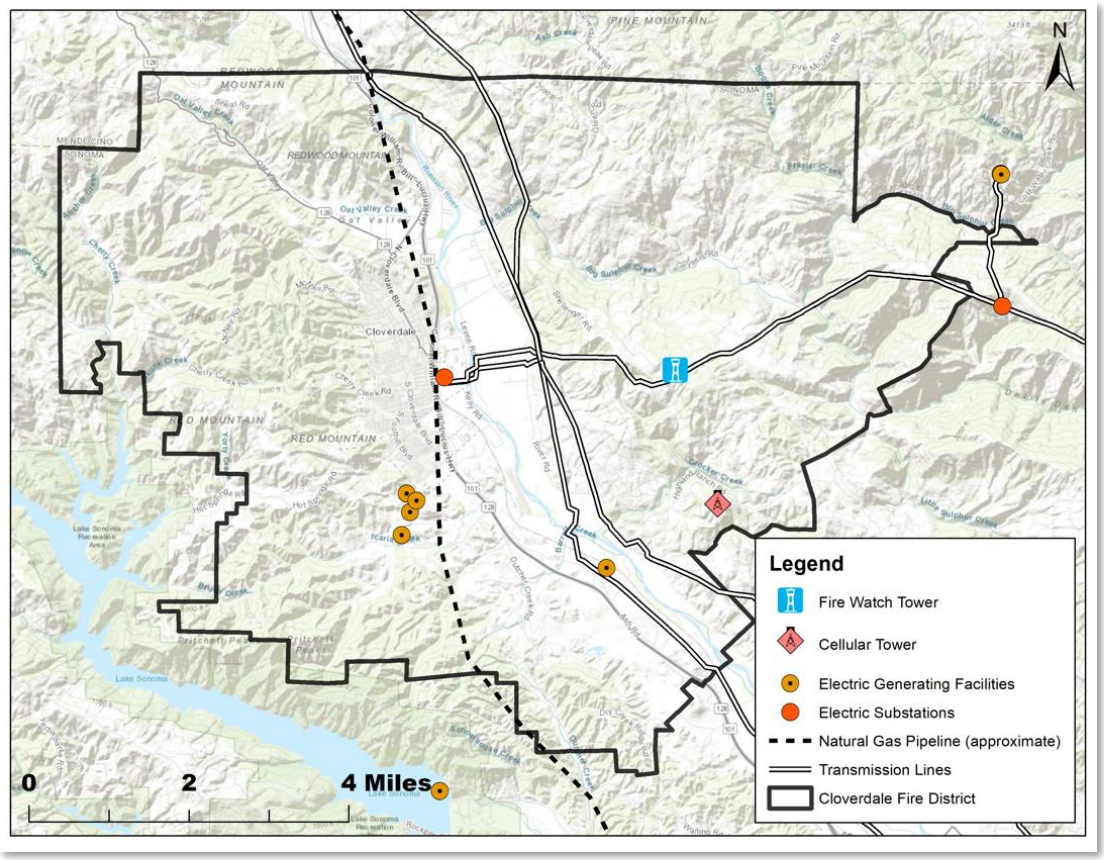

Figure 13. Map of the critical infrastructure in the CFPD.[21]

3.1.5 Vegetation

Vegetation in the City of Cloverdale and throughout the CFPD includes a variety of native and nonnative landscaping vegetation, native plant communities, and urban forest. Vegetation adds a variety of benefits to the CFPD, including ecological and aesthetic benefits. The native plant communities, including mixed conifer forests (e.g., Douglas-fir, Coastal Redwood, Gray Pine), hardwood forests, mixed conifer and hardwood forests, oak woodlands, bay forest, coastal scrub, chaparral, and grasslands are naturally adapted to fire, and may depend on fire for regeneration, soil health, and paradoxically, protection from fire (by consuming dead material with frequent low intensity fires, the risk of high intensity fire is reduced).

[21] This map was assembled from national data sets (see Appendix B for data sources) and may not include all critical infrastructure features and/or may need to be adjusted to better reflect the locations of critical infrastructure features. For example, the cellular tower at Asti Mill and Cloverdale Citrus Fair is not shown on the map; the location of the natural gas pipeline and powerlines may need to be adjusted on the map; and one of the features labeled as a power plant is a solar panel facility.

3.1.6 Landscaping Plants

Older yards and gardens may contain the presence of fire-hazardous plant and tree species such as juniper, boxwood, bamboo, and eucalyptus. These types of bushes and trees present a significant hazard, with extremely high heat output often concentrated along critical driveways and access routes to homes where firefighters must work and park apparatuses during wildfires. In recent years, the concept of firescaping (landscape design that reduces house and property vulnerability to wildfire) has become more popular in fire-prone communities. Fire safety organizations such as Fire Safe Sonoma and the NFPA's Firewise USA® program publish lists of common native and landscaping plants that are often labeled either "good" or "bad" from a fire standpoint. The Sonoma County Resilient Landscaping Coalition[22] conducts workshops that teach homeowners how to create fire-wise, water-wise, and biodiverse landscaping using California native plants. The Coalition promotes sustainable practices, plant selection, and maintenance to reduce the risk of fire in the defensible space zone.

3.1.7 Identification of Areas of Concern

Areas of concern in the CFPD were identified based on factors such as structure density, utilities, values at risk, fire behavior, fire history, slope, vegetation type, and vegetation density. These features were measured geospatially, photographed by drones, and "ground truthed" through human surveys of the landscape. This process of mapping, ground truthing, and prioritizing based on scientific data ensures that the highest risk areas are addressed, with the very high-risk areas at the top of the list based on the CAL FIRE Fire Hazard Severity Zone (FHSZ) map. A map identifying areas of concern was developed and used to inform the development of mitigation strategies and priority project locations. This map can be found in the online Community Basemap.

3.2 Structural Ignitability

Structures can ignite during wildfires from ember (also called firebrand) penetration, direct flame contact, and/or radiant heat. Many wind-driven wildfires spread through firebrands, which are burning materials that are blown by wind from one place to another. Winds can blow firebrands more than a mile away from their source, starting new fires wherever they land. Flames often occur within columns of heat known as convection columns and can ignite anything flammable that they come into contact with. Radiation is the process by which wildfires heat up the surrounding area. Radiant heat from a wildfire can ignite combustible materials from distances of 100 feet or more.[23]

Embers can be blown through the air and can travel miles. They can result in the rapid spread of wildfire by spotting (embers are blown ahead of the main fire, starting other fires). When embers land on or near a house, they can easily ignite nearby vegetation or accumulated debris. They can also enter

[22] Sonoma County Resilient Landscaping Coalition (https://www.sonomaresilientlandscapes.com/)
[23] Federal Emergency Management Agency (https://emilms.fema.gov/IS320/WM0102020text.htm)

the home or attic through openings or vents, igniting furnishing or combustible debris in those locations.[24] Recent research about home destruction versus home survival in wildfires indicates that embers and small flames are the primary source of structural ignition during wildfires.[25]

It is imperative that property owners prepare their properties with adequate defensible space and fire-resistant construction to prevent or lengthen the time between exposure and structural ignition in these fire scenarios. The ignition of even a single structure increases the likelihood that other structures nearby will ignite, largely due to the production of many embers (Cohen and Quarles, 2011).

The current state-of-the-art in computer wildfire modeling is not adequate to accurately predict fire growth, spread, or structural ignitions in the WUI when housing density is high. Modeling can, however, help predict the location, travel paths, and intensity of fire in areas where structures are likely to be impacted by the flaming front of a vegetation fire.

[24] FireSafe Marin (https://www.firesafemarin.org/how-homes-ignite).
[25] National Fire Protection Association (https://www.nfpa.org/Public-Education/Fire-causes-and-risks/Wildfire/Preparing-homes-for- wildfire#:~:text=home%20 survival%20in%20wildfires%20 point,homes%2C%20debris%20and%20other%20 objects)

4. Mitigation Measures and Strategies

The CFPD encompasses a large area of approximately 68 square miles. The scale of the CFPD relative to available resources requires a careful strategic mitigation approach that includes identifying and prioritizing many of the key factors related to wildfire. Homeowners, landowners, and fire officials must work together to achieve the goals listed within the CWPP. The community must have the desire and ability to manage wildfire risk and maintain a dialogue with local fire officials around fire prevention, wildfire mitigation, defensible space, and fire suppression activities.

The objective of developing mitigation strategies is to establish a multifaceted approach to minimize the risk of catastrophic wildfire within the WUI while ensuring the protection and enhancement of economic and ecological values and resources within CFPD's jurisdiction. To this end, a three-pronged mitigation approach was developed focused on 1) improving access and egress on key roadways; 2) maintaining fire roads and fuel breaks, 3) promoting preparedness and fire resilient neighborhoods through improved outreach, education, and Firewise USA ® neighborhood accreditation. And when feasible, improving forest health through stewardship to create sustainable forest structure that is more resilient to disturbances, such as wildfire and climate change, which helps to protect the community.

4.1 Improving Access and Egress on Key Roadways/ Maintaining Fire Roads and Fuel Breaks

A key goal of the mitigation strategy is to improve the existing network of roadways, fire roads, fuel breaks, and other legacy roadbeds to allow invaluable egress so residents can safely evacuate before it's too late. The positive impact on life and safety will be enhanced further by establishing temporary refuge areas (TRAs) as a hub-and-spoke component of the system. This improved network also has the potential to greatly enhance fire suppression efforts during a wildfire incident. Additionally, once the routes are made more accessible, the cost of maintaining ingress/egress and TRAs will be less than the initial mitigation work.

Roadside vegetation clearance is ultimately the responsibility of individual landowners when property lines extend to the edge of the right-of-way. In certain situations, right-of-way maintenance, such as annual mowing, drainage maintenance, and hazardous tree removal, may be the responsibility of the County or Public Works. Neighborhood associations have the responsibility for roadside vegetation management if not maintained by the county. Should grant funds become available to assist property owners, the focus should be on the high hazard areas that block important evacuation routes.

Based on the identified areas of concern, a mitigation strategy and corresponding Vegetation Management Plan (VMP) was developed. Through collecting GIS data, walking historical routes,

ground-truthing, and analysis, a network of 43 roadways were identified. These routes form the framework for the VMP, which will be carried out in multiple phases as funding becomes available. The first phase includes an environmental review for the pilot project and implementation of the pilot project. Beyond the pilot project, additional projects will be prioritized by the CFPD. It is critical that ongoing maintenance remains a priority relative to this mitigation plan.

This Vegetation Management Plan benefits the community of Cloverdale and stakeholders in three tangible ways:

1. It creates areas of lower fire intensity. By creating fuel breaks in strategic ridgeline locations on the perimeter of the CFPD, the intensity of an active fire will decrease under predictable circumstances.
2. It Improves the safety of evacuation routes for property owners. Residents can safely exit to designated temporary refuge areas (TRAs) or farther out of harm's way.
3. It Improves strategic and direct attack routes for fire agencies. Firefighters and equipment will have improved direct routes to existing fire roads as well as strategic locations for the deployment of resources and aerial attack. By treating the existing fire roads and creating fuel breaks, fire agencies could have an increased chance of getting ahead of a fast-approaching fire.

The details of the complete mitigation plan are included in **Appendix C**.

4.2 Promoting Preparedness and Fire Resilient Neighborhoods

Mitigation strategies for achieving community-wide protection require acceptance throughout the community. Homeowners, land managers, CFPD Directors, and fire officials must work together to achieve these goals. The community must have the desire and ability to manage wildfire risk and maintain a dialogue with local fire officials. Cloverdale has several active volunteer groups that will continue to work to prepare the community for wildfire and organize training on home hardening and defensible space, including Asti-Cloverdale COPE and Northern Sonoma County CERT.

A major question for policymakers, land managers, fire officials, and community leaders is how best to engage and encourage residents to reduce the ignitability of their homes and to create defensible space. Studies have shown that in general, the rate of adoption of hazard reduction techniques is significantly lower than policy goals (Brenkert-Smith, 2011). Research has uncovered several reasons why residents do not take steps to reduce risk from wildfire, including general knowledge and risk perceptions, economic issues, and the desire to protect amenity values and community aesthetics (e.g., not wanting to remove or thin trees) (Collins et al., 2005). A community must be willing to collectively

understand the risks and establish new standards to reduce fire hazards, balancing the safety of the community with private property rights.

4.2.1 Public Outreach and Education

Fire Safe Sonoma (https://www.firesafesonoma.org/) is a county-wide organization that supports fire agencies and communities throughout Sonoma County and hosts several public outreach and community workshops each year to educate Sonoma County residents about wildfire preparedness. Fire Safe Sonoma resources include the *Ready, Set, Go* information package, the *Living With Fire* booklet and preparedness education program, and the *Evacuation Warning Resource* guide. Collectively, these resources cover:

- Personal Preparedness, Safety, and Evacuation
- Home Hardening and Reducing Structural Ignition
- Defensible Space and Firescaping

These resources were made available to Cloverdale residents at the Northern Sonoma County Fire and Earthquake Safety Expo in August 2021, and are available, among others, on the Fire Safe Sonoma website (firesafesonoma.org). While Fire Safe Sonoma hosts many outreach and education events throughout the county, it is imperative that the public be engaged at the community level to build awareness of local issues and to encourage community members to work together to make their homes and neighborhoods more fire resilient. Accreditation with Firewise USA® (1.8.4) will provide additional resources for Public Outreach and Education.

In addition to personal preparedness, animal owners should plan for evacuating pets and large animals. Recent catastrophic events, including the Valley Fire in 2015 identified the need to provide animal evacuation and sheltering. During disasters, emergency managers have learned that many people refuse to leave their pets behind, and sometimes do not evacuate early (when conditions are safer) due to the failure to locate animals or lack of preparation for animal evacuation. Refusals or delays to evacuate may begin a chain of events that can seriously jeopardize or cause a total breakdown of an overall evacuation.

Additionally, large numbers of pets and large animals (i.e., horses and livestock) are often left behind or otherwise become stray during wildfires. Minimizing the likelihood of animals becoming stray improves animal, public, and firefighter safety, and may facilitate a more rapid recovery following disasters.

Disaster and wildfire preparedness for equine and large animal owners may differ somewhat from disaster preparedness for domestic pet owners; however, general guidelines and recommendations are similar.

During a wildland fire, local animal rescue organizations will work with law enforcement and fire departments to rescue as many animals as they can. While fighting a wildfire, firefighters will attempt to protect animals, but they are not responsible for evacuating animals. Firefighters may cut fences or open gates to free trapped animals.

A key part of preparedness is understanding the complexities of animal evacuation and developing an evacuation plan before there is an event. Several local government resources exist to assist animal owners in developing an evacuation plan including (but not limited to) the HALTER Project (https://www.halterproject.org/emergency-assistance), Sonoma Humane Society (https://humanesocietysoco.org/), and Sonoma County Animal Services (https://sonomacounty.ca.gov/health-and-human-services/health-services/divisions/public-health/animal-services).

4.2.2 Home Hardening

Reducing structural ignition is a high priority when considering mitigation strategies to reduce the likelihood of urban conflagration. High-intensity wildfires in the WUI typically do not spread directly through residential developments, as access roads, driveways, utility corridors, and home sites produce gaps in the forest and shrub canopy sufficient to discontinue high-intensity canopy fires. Home destruction largely results from direct firebrand ignitions, or lofted burning embers, and fires spreading on the ground within the community. When homeowners take action to harden their homes and lessen the ignitability of the home ignition zone, they dramatically increase their home's survivability (Cohen and Quarles, 2011).

Fire-resistant building materials and designs are extremely effective at reducing structural ignitions. These include a wide variety of materials combined with engineering and design choices for nearly every aspect of home construction, ranging from relatively expensive materials such as tempered glass and upgraded roofing, to simple, inexpensive but effective features such as fine wire mesh covering attic and basement vents. Many of these features can be retrofitted or applied to new construction.

While new construction and substantial remodels are required to use ignition-resistant materials meeting the standards of Chapter 7A of the California Building Code (CBC), owners of existing homes should be encouraged to make simple but effective upgrades. By reducing structural ignitability, in conjunction with improved defensible space and vegetation maintenance in open spaces, overall community risk can be dramatically reduced.

Property owners are required to keep properties in compliance with Sonoma County's Fire Safety Ordinance including Chapter 13A. Chapter 13A specifies defensible space requirements which vary depending on if a parcel is in a SRA, LRA, or within a municipality[26]. The City of Cloverdale also has a

[26] Permit Sonoma (https://permitsonoma.org/divisions/firepreventionandhazmat/servicesandfees/vegetationmanagementservices/

weed abatement ordinance (Chapter 8.16) in place to prevent property owners from allowing weeds to grow to the extent of creating a health, fire, or safety hazard.[27]

4.2.3 State Regulations

- Chapter 7A Building Code
- CA Building Code Chapter 7A (January 2009 Supplement)
- CA Fire Code Chapters 47
- CA Building Code Testing Standards
- 2010 Title 24 California regulations

4.2.4 Fire Safe Regulations

- 2006 International Wildland-Urban Interface Code
- Public Resources Code 4290
- Public Resources Code 4291
- California Code of Regulations Title 14
- 2010 California Fire Code
- California Code of Regulations, Title 24, Part 9 Chapter 49: Requirements for Urban-Wildland Interface Areas

4.2.5 Ignition Resistant Roofing to Reduce Structural Ignitability

Disaster examinations reveal that most destroyed homes are not ignited directly by intense wildfire (Mell et al., 2011). This indicates flame contact from surface fires and that direct firebrand (lofted burning embers) ignitions are the cause. Firebrands that result in roof ignitions commonly originate from a fire over ½ mile away depending on the fire intensity and the type of fuel burning.

For a home, the roof is the most common structural fuel bed for ignition by firebrands or embers. For this reason, roofing material and the physical construction of a roof are of great importance.

Homeowners should be aware of the benefits of fire-resistant roof types. All newly constructed homes are required to utilize roof materials of Class-A or better. While roof surfacing is important, what is more important is how the roof assembly is built and how roofing is protected to reduce ember penetration and ignitions. Homeowners should consider assessing their roofing construction, roofing material, and protection from ember penetration.

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hazardousvegetation).

[27] City of Cloverdale City Council Resolution No. 46-2019 (https://www.cloverdale.net/DocumentCenter/View/3228/City-Council-Resolution-46-2019?bidId=)

Many roofing materials meet the Class-A standard, allowing flexibility in achieving architectural aesthetics while providing fire resistance. Typical Class-A roofing products include (but are not limited to):

- Asphalt Shingles
- Metal
- Concrete (standard and lightweight)
- Clay Tile
- Synthetic
- Slate
- Hybrid Composites

4.2.6 Design, Construction, and Building Material Upgrades to Reduce Structural Ignitability

The building design and construction process provides one of the most cost-effective means of addressing wildfire risk (Schwab et al., 2005). The new construction and remodel process is governed by building codes, design criteria, architecture, and soils and landscaping considerations. Most often code criteria that support risk reduction apply only to new construction, substantial renovation, or renovation to change the type or use of the building. The construction process offers other opportunities to use fire resistant building materials such as stone, tile, and stucco, and incorporate new technologies and design features to help homes resist and survive wildfires. The Fire Safe Sonoma *Living with Fire* brochure was shared at the Northern Sonoma County Fire and Earthquake Safety Expo in August 2021 and provides information on construction design and building materials to reduce structural ignitability.

4.2.7 Defensible Space

Landscaping is particularly critical in areas of potential wildfires because vegetation close to structures can become fuel for a fire. Clearing, grading, and siting all impact soil stability and erosion, and can be included as part of the design or building permit review process. The use of "hardscape" features, such as retaining walls and stone pathways, can also be used to engineer an attractive landscape that helps structures survive wildfire and should be encouraged. Individual homeowners are ultimately responsible for the protection of their homes from wildfire. In a severe wildfire event, the fire service cannot protect all homes at risk. Individual responsibility and preparation undertaken long before a wildfire starts is of paramount importance.

Defensible Space is required by law (California Fire Code 4907.2, PRC 4291, Title 14 CCR). Residents and landowners must be encouraged to develop, enhance, and maintain defensible space annually. Property

owners are ultimately responsible for maintaining defensible space, however, in some instances, rental contracts or lease agreements may subrogate responsibility for landscaping or building maintenance.

If all structures in the CFPD complied with current defensible space requirements and building standards, there would be little threat to assets and infrastructure from fire. Based on recent field observations, some homes in the CFPD are meeting defensible space requirements, yet continued education and action are needed to continue to reduce the threat. Additionally, only structures built or substantially remodeled since 2008 are likely to meet current ignition resistance standards of Chapter 7A of the California Building Code. Any fuel modification within 100-200 feet of a structure could be considered an improvement of defensible space.

4.2.8 Recommend Enhanced Defensible Space for Properties Adjacent to Open Space or Natural Vegetation

Because of the geographic characteristics of the city of Cloverdale and the WUI properties along the city borders, particularly along the western border, properties adjacent to large parcels of open space (public or private) and large tracts of contiguous vegetation are at particular risk from wildfire.

Properties at the boundary of large parcels of open space (private or public) should be encouraged to maintain enhanced defensible space to the extent that is possible and practical. Where property lines are adjacent, property owners are encouraged to work collaboratively to support vegetation management.

Specific recommendations include cutting grass, thinning tree canopies, enhanced spacing of landscaping plants, and thinning vegetation from structures on the side(s) facing contiguous vegetation.

Specific VMP plans that include wildfire risk should be considered by neighborhood associations in order to ensure the safety of people and property. Beyond the basic maintenance of open space (i.e., mowing, weed abatement), consideration should also be given to wildfire mitigation and forest health strategies to both enhance defensible space and to help protect the health of the oak trees and forest in the open space areas.

4.2.9 Firewise USA® Accreditation

Firewise USA®, a program designed to give local communities tools and incentives to reduce their wildfire hazard at the neighborhood and community levels, builds on the power of neighbors and other trusted sources to motivate hazard reduction. The Firewise USA® program grew

out of a partnership between the United States Forest Service (USFS), the U.S. Department of the Interior (USDI), and the National Fire Protection Association (NFPA). In 1997, NFPA launched the Firewise USA® website with information on wildfire safety for homes (NFPA 2015). The Firewise USA® community recognition program started in 2002 and now includes over 1,500 communities across the country.

Firewise USA® incorporates many of the home mitigation and defensible space elements discussed in previous sections of this report. Research and post-wildfire assessments have shown these mitigation measures to be successful. It is encouraged that all communities with significant wildfire risk exposure consider becoming Firewise USA® communities. Based on the results of the hazard assessment, the east and west side of Cloverdale should be areas of specific focus for future Firewise USA® organization and recognition.

Firewise USA® recognition provides direct and indirect benefits to the community. Educational programs may improve awareness and individual accountability, and annual fuel mitigation efforts measurably reduce hazards. Financial benefits may include property insurance discounts, while the Federal Emergency Management Agency (FEMA) gives Firewise USA® communities priority consideration for pre-disaster mitigation planning and project grants. Fire Safe Sonoma can provide resources and guidance for communities seeking Firewise USA® accreditation.

5. Recommendations

This CWPP provides a framework and a starting point for ongoing wildfire mitigation efforts and continued community engagement throughout the CFPD. The CFPD received a grant from the Sonoma County Agricultural Preservation and Open Space District to jump start the vegetation management work outlined in Appendix C. Grant funds will be used to reduce hazards in priority areas identified in the community. Funding will be allocated to expand and enhance defensible space and improve fire breaks and egress for homeowners. The strategies outlined in this CWPP action plan will be the priority for vegetation management grant funds and private property funding to best reduce hazard areas.

The following recommendations will be sustained by the on-going efforts of the Cloverdale community and future revisions of this plan. The following is a list of prioritized recommendations and an outline of the action plan:

1. Mitigation & Maintenance of identified areas: (Appendix C):
    - Environmental Review for the priority (pilot) roads identified in the mitigation plan
    - Pilot Road Project (6 roads)
    - Environmental review for remaining project areas
    - Mitigation plan for remaining project areas
    - Ongoing maintenance work via hand, mechanical, prescribed fire, grazing, and approved herbicides
2. Firewise USA® Accreditation (4.2.9)
3. Continued community engagement in fire planning, prevention, and mitigation
    - Encourage citizens to participate in preparedness clinics - DIY home hardening and DIY defensible space
    - Encourage property owners to abate vegetation hazards
    - Bilingual engagement and education
    - Enhanced early warning systems (video+), GIS mapping, and communications
    - Collaborative efforts with the City of Cloverdale
    - Coordination of wildfire related projects between community groups such as COPE, CERT, etc.

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Appendix A. Public Meeting Notes

Cloverdale CWPP
Wildfire Services and Sonoma Technology
Kick Off Meeting
July 7, 2021
10:00 am

Agenda:
10:00-10:10 - Introductions
10:10-10:15 - Meeting Objectives
10:15-10:25 - About the project team: Wildfire Services and Sonoma Technology
10:25-11:00 - Project Objectives, Roles, Overview, Approach
11:00-11:45 - Q&A, Discussion
11:45-12:00 - Wrap Up

Purpose:
The purpose of this Kick-Off meeting is to ensure that Wildfire Services, Sonoma Technology, Cloverdale Fire Protection District (CFPD), Cloverdale Community members and other key stakeholders, have a mutual understanding of the motivation for our shared work, the overall goals of the project, and the anticipated work products to be delivered over the course of the contract.

Attendees:
Wildfire Services
Sonoma Technology
CFPD
Cloverdale Community Stakeholders

Questions:
Contact Jen Stark at 707.696.9841 or jen@wildfireservices.biz.

Meeting Notes:
WSG, Sonoma Technology, Organizers, Fire Personnel Introductions

Wildfire Services Group (WSG)
Jen Stark - Director and Project Manager for CWPP
Joel Holland - President and Stakeholder Liaison
Whit Ashley - Project Lead
Dave Trebilcock - Project Lead
Steve Bernard - Field Operations Manager and Certified Tree Faller
Andrew Carrillo - Certified Wildfire Risk Assessor; Operations Assessments
Chris Dietz - Field Supervisor and Certified Wildfire Risk Assessor

Sonoma Technology
Tami Lavezzo - Senior Project Advisor
Bryan Penfold - Project Manager, leading Geospatial map-making
ShihMing Huang - Senior Scientist; Fire behavior modeling, Data mapping

Cloverdale
Susie Cummings - Cloverdale Resident; Emergency Preparedness; COPE and CERT
Madeline Wallace - CERT COPE
Geoff Peters - Works with Cert and Cope; Chief Jenkins, On-going contact with Senator Gore
Chief Jenkins - Serving Fire District for 25 years; address areas we know and what we need to know

Objectives Review, Roles, Overview, and Approach, and Q&A with Stakeholders

- *WSG* - Assess, Mitigate, and Maintain for the Safety and Preparedness of our Communities. Within the group, we have clear roles and responsibilities to address everything. Jen Stark is the main point of contact
- *Sonoma Technology* - Environmental consulting; Broad range of offerings - work in Fire for 15 years with pre-fire planning and mitigation, smoke and emissions active, for health exposure and air pollution. Recently completed the Marin CWPP.
- Sonoma Technology Presentation – *What is a CWPP*
    - Broad team with Stakeholders, CFPD, and fire officials being critical participants in this process
    - 2020 was the worst fire season in California History
    - Community preparedness, home safety, and CWPPs
    - CWPPs have served for Federal Funding in the past - change to local application and implementation of mitigation plans
    - Not just a document, brings stakeholders to the table and creates dialogue between and collaboration among the fire departments, land managers, owners, and organizations
    - Title 1 of Healthy Forests Restoration Act
    - Requirement to receive federal grants for hazard mitigation
    - Three Elements of a CWPP
        - Collaboration
        - Prioritized fuel reduction - At district level, what does the district look like in terms of vegetation, assets at risk, fuel density, population density, high-structure density, WUI, and many other factors
        - Treatment of structural ignitability - Analyze at District level and individual parcel level, Home Hardening and structure protection

    - Collaboration is Critical: CFPD, Citizens Organized to Prepare for Emergencies (COPE), County officials, Land management agencies, Home and property owners, HOAs
    - Goals:
        - Provide input
        - Collaborate to establish areas of concerns and priorities
        - Provide feedback
- Protect economic and ecological values and assets within CFPD
- Develop more fire resilient communities
- CWPP is the first step
    - Phase 1 - Develop CWPP to get broad look at district
    - Phase 2 - Focus and localized mitigation action plan
    - Phase 3 - Conduct mitigation work
- Key elements
    - Signature
    - Areas of concern
    - Fire hazard assessment
    - Fire behavior potential and intersection at high-structure density
- Project Tasks and Work Projects
    - StoryMap provides interaction with Data
    - Workshops and meetings to work with Community
- Project Organization and Management
- Stakeholder and Community Engagement
- Core decision-making group CFPD/COPE
- Inclusion of all stakeholders and community members; Spanish translation?
- Location and space for meetings - up to 3 hours long
    - August 7th Fire and Earthquake Safety Expo
- Development of District Base Map to characterize areas
- Wildland urban interface/intermix (WUI)
- Structure Density and population density
- Assets at Risk
- Roadways
- District level GIS data - want to get most local data
- Current conditions of landscape
- District Level Fire Hazard Assessment
    - Where does vegetation, structure density, and extreme fire danger intersect, posing threat to community?
    - Identify greatest likelihood of burning during an ignition
    - Apply to implementation of fire mitigation projects at local level
    - Support decisions about where to prioritize fire hazard reduction projects
- Modeling results come from District Level Fire Hazard Assessment Approach
    - Prepare community base map layers
    - Prepare vegetation fuel model data - fire behavior model accounts fuel model data to model how a fire could behave
    - Local weather and fuel moisture data
    - Fire behavior model
    - Potential fire behavior around structures, population, and assets at risk

- Boots on the ground approach is critical for interpreting fire behavior models at local level
- Tree structure, canopy cover, and lots of information is applied to Fire Behavior model 2017
- Parcel map with assessor records - building characteristics, taking into account structure information for a categorical hazard rating; older homes are typically more at-risk; total area and perimeter gives info on how much would burn; value of property is included. Ground information and discovery can exposure unique features and history that may be missed
- Inclusion of Drone Technology
    - Max of 1500 feet
    - Allows for Boots on the Ground team to focus in at ground level
- Creating Fire-resilient neighborhoods
- Best practices and recent science; what has been more successful?
- CWPP Document and StoryMap
    - Draft posted to Stakeholder, then public, then finalized; lastly the StoryMap

Q&A

- Carol Rankin - Palomino Lakes, COPE, printing and mailings, happy to help with editing
- David Kelley - City Manager of Cloverdale; Vegetation management is very important to the community; local hazard mitigation plan
- Mark Vernon - Resident; preparation for wildfire and emergency response; Ridge winery
- Melanie Bagby - Sonoma County Air pollution group; biofuels
- Bob Cox - Cloverdale resiliency; shelter; former mayor of Cloverdale
- William Wagy - Cloverdale planning commission; central west side; interested in biofuels
- Derek Acomb, Fisheries biologist, wildlife habitat
- Marshall Turbeville - Since 2007 involvement with Mapping and CWPP; Fire wise reports; be open-minded; there will be lines drawn between cities and districts; take the time to invest
- Mina - liaison between business community
- July 14, July 21 - Prep work prior to event August 7th
- Are there key objectives we are missing?
    - Website development with project updates, survey, etc.
    - Engagement with owners and businesses

Cloverdale CWPP
Wildfire Services and Sonoma Technology
Project Meeting
July 21, 2021
10:30 am

Purpose:
The purpose of this meeting is planning and preparation for the Aug. 7 Expo

Attendees:
Wildfire Services – Jen Stark, Joel Holland
Sonoma Technology – Tami Lavezzo, Bryan Penfold
Cloverdale Community Stakeholders - Susie Cummings, Madeline Wallace, Geoff Peters

Meeting Notes:

- Timeline
  - Friday, 8/6/21:
    - 10:00 am – 6:30 pm: Vendors can access for set up
  - Saturday, 8/7/21
    - 6:30 am: Vendors can access for set up
    - 9:00 am: Doors open to public
    - Between 12:15 and 1 pm: CWPP Presentation in the Commercial Room
    - Followed by Q & A and community discussion
- Table needs (Bryan/Tami) (Jen/Joel)
  - QR code
  - paper version of questionnaire
  - tablecloth
  - Collateral
  - giveaways
  - Tech: Monitor, laptop, HDMI cord, slideshow, iPad - parcel level assessments
  - Is there wifi? (YES)
- Signage:
  - 10% Promotional
    - 90% Educational - bilingual
  - Graphic designer - may use CAL FIRE graphics. Seeking permission
  - Printing - quote from Jeff Bricker, SpeedPro

        - 12 48' x 36" (English and Spanish) Total: $763.00
        - Who will pay? Geoff to speak with CFPD. In the spirit of collaboration WSG is moving forward.
- Presentation - TBD beginning between 12:15 and 1 pm
    - The Commercial Room: Room will be set up by Citrus Fair staff. Round tables with chairs, 3 rectangular tables at front of room for presenters.
        - At back of room will be stations for exhibitors
        - The room is also an exit area from the main exhibition hall
        - Some people may bring their lunch into the presentation
        - Will this be a distraction, or good to draw people in there? We don't know.
    - Introductions:
        - Master of Ceremonies (MC) - Welcome, Brief Overview, Introductions (Susie and Madeline - if Madeline agrees
        - District Chief(s) Opening Comments - 1-3 ppl (Joel to reach out and confirm participation
        - Intro Consultants - WSG + Sonoma Technology (Susie & Madeline)
            - Jen - Project Manager, WSG
            - Tami - tbd
            - Joel - Community Engagement
            - Bryan - Project Manager, Sonoma Technology
    - Presentation of CWPP (slide deck - projector/screen. Sonoma Technology to edit final version)
    - Q & A - facilitator - Joel + translator
    - Flip chart - Jen or Andrew
    - Large Laminated Graphics + Small Laminated Graphics - Ref QR Code - additional printing from SpeedPro
- CFPD CWPP Who will provide table coverage - WSG, Sonoma Technology, CFPD, Committee, Agencies
    - 9:00 - 12:15: tbd
    - 12:15 - 3:00: tbd
    - 3:00 - 4:00: tbd
- Open Topics/New Business
    - Very important that we have written and in-person translation available
        - WSG to research (Jen)
    - Question re: why the CWPP is not coordinating with the City's Hazard Mitigation Plan. Joel (WSG) to discuss with David Kelley and CFPD.
    - Are we aligning with the County on their CWPP? Tami (Sonoma Technology) is working with the county on this.
- Wrap Up - next meeting
    - WSG/Sonoma Technology Internal Meeting 7/23, 12pm

- Jen, Susie and Madeline to connect to finalize CWPP Presentation timeline & details.

Cloverdale CWPP
Wildfire Services and Sonoma Technology
CFPD CWPP Committee Meeting
Base Map Presentation and Discussion of Priorities
October 13, 2021
10:00 am

Attendees:
Community Members:

- Geoff Peters, Advisor, Committee Member
- Neena Hanchett - President, Cloverdale Chamber of Commerce, Committee Member
- Chief Jason Ferguson, Cloverdale Chief of Police, Committee Member
- Michael Jones, UC Forestry Advisor, Committee Member
- Derek Acomb, Committee Member
- William Wagy, Committee Member

Working Group:

- Susie Cummings, Committee Co-chair
- Madeline Wallace, Committee Co-chair
- Chief Jason Jenkins, Cloverdale Fire Chief
- Charles Scarborough, Sonoma Technology
- Tami Lavezzo, Sonoma Technology
- Bryan Penfolds, Sonoma Technology
- Andrew Carrillo, WSG
- Joel Holland, WSG
- Jen Stark, WSG

Base map presentation:
The project team will be working on additional map layers to help with decision making in the process; WSG has been using data layers to assist ground Assessors; ArcGIS map link to be shared with committee for feedback; layers, how to be used throughout the CWPP process

- Navigation bar - icons
- Sharing capabilities via link, social media, etc.
- Underlying base map Layers - click on and off, legend and corresponding description
- Sonoma Veg Map - Lidar flyover data to analyze high-res vegetation map for the county
- Vegetation height and canopy cover
- Flame map - prediction model software; flame length and ROS
- Worst case scenario data - provided outputs to visualize flame height and ROS

- Fire Hazard Index

Chief Jenkins CFPD Priorities

- Highland Ranch Road & Henry Road & McNair (Geographic Area)
- Defensible Space areas in Geographical areas
- Evacuation Challenges
- Vegetation management
- Pocket Ranch to South - Mitigation
- Above Palomino Lakes
- West side - McNair access is tight, Road-clearing/Veg mitigation/Access for Fire Equipment
- Cherry Creek area
- Hot Springs to Kelly Road, to Cherry Creek - fire breaks behind homes or fire roads
- Existing network of Dozer roads, need minimal reopening and access remote routes
- Each Pilot Projects - Phase 1-3; Maintenance
- CEQA requirements laxed on access roads - ID areas on Map for grant process
- Get as much preplanning done as possible to get busy
- Critical infrastructure - push out to community, Susie to put some in lodge

Roberta MacIntye - Fire Safe Sonoma

- Messaging - get information specific to area; here to help
- FireWise Community recognition - Insurance benefits to owners, insurance companies required to look at what community has done; many variables considered; required to look at parcel and identify how safe a parcel is, which will translate to insurance rate reductions
- USAA recognizes FireWise Communities
- Policyholders united - offering discounts on premiums

What will homeowners have to do?

- Evaluation tool for FireWise Communities
- Share information that is easy to understand, follow, and execute tasks regarding reducing fuels, home hardening retrofits, etc.
- Have a movie night or prizes for Free Assessment
- Follow up meeting to discuss how to encourage community member participation

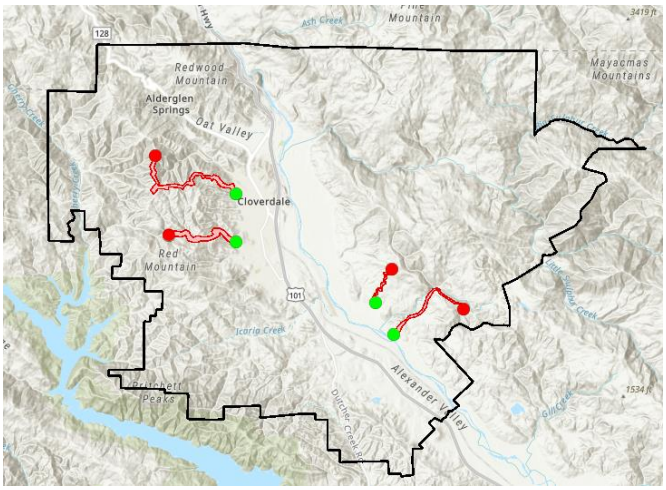
Cloverdale CWPP
Wildfire Services and Sonoma Technology
Discussion of Updates to the Community Base Map and Proposed Mitigation Projects
December 1, 2021
10:00 am

Overview:
Purpose of the meeting is to review recent updates to the community base map and to have a discussion regarding proposed priority mitigation projects. There are three key requirements of a CWPP: 1) stakeholder collaboration and community input, 2) list of priority mitigation projects/actions, and 3) discussion/actions to address structure ignitability.

Everyone on the call was encouraged to fill out the CWPP survey which will serve as a key vehicle for collecting community input. David Kelley, Cloverdale's City Manager, offered to post a link to the survey in the city newsletter. The link to the survey is here: https://www.wildfireservices.biz/cloverdale-cwpp.

Agenda:
1. Review and discuss proposed priority mitigation projects developed by the Cloverdale Fire Protection District
2. Review updates to the community base map
3. Update on the status of the Cloverdale CWPP document
4. Other updates and information

Review and discuss proposed priority mitigation projects developed by the Cloverdale Fire Protection District:
Wildfire Services Group (WSG) provided an overview of updates to the community base map and described the mitigation project priorities and rationale. Joel from WSG explained that the priorities were developed to provide safe egress for people to get out of Cloverdale in the event of a wildland fire and to provide safe ingress for firefighting resources. The initial pilot mitigation projects are along McNair Rd.; Cherry Creek; Henry Rd.; and Highland Ranch Rd. (see map).



These initial priority areas were identified as high risk based on CAL FIRE Fire Hazard Severity Zones and the fire hazard maps from the countywide CWPP. Mitigation in these areas should also result in cost effectiveness because these are existing roadways. There are other important factors to consider, for example, California Environmental Quality Act (CEQA) compliance.

Mitigation projects will include improving road clearance, implementing shaded fuel breaks, and expanding existing fuel breaks. The purpose of the pilot projects is to assess the mitigation effectiveness on the four primary roadways identified above. Funding is currently available for the four pilot projects.

Twenty additional priority projects have also been identified. As we move forward with the Cloverdale CWPP, we will seek funding for the other project areas. The first phase of work (the pilot projects) will focus on work along the roadways identified above. Later phases of work will focus on expanding/improving bulldozer lines, fire roads, and fuel breaks.

We are open to feedback and input on these initial priorities. If you have questions or comments, please contact Joel at WSG.

Review updates to the community base map:

Bryan from Sonoma Technology showed recent updates to the community base map including the priority mitigation project locations, fire history data from CAL FIRE, locations of cell towers, power plants, power lines, natural gas lines, and responsibility areas (local, state, and federal). The community base map is a work in progress and will be updated as new data layers become available.

Chief Jenkins commented that the CAL FIRE fire history data needs to be reviewed and quality assured as some of the historical fire boundaries may not be correct, may be missing, or may have been prescribed fires (not wildland fires). Chief Jenkins has been working on reviewing the data.

Joel pointed out areas of concern on the base map. He encouraged community members to review the areas of concern.

Joel commented that as we are developing the community base map, we gather as much data and information as we can and verify/ground truth the data with the fire chiefs and other experts. This is a draft base map and the CWPP team will coordinate with the city emergency plan to ensure collaboration and coordination.

Careleon Safford, with Permit Sonoma, asked if data from the countywide CWPP has been used in the community base map for Cloverdale. Bryan responded, yes. Sonoma Technology has incorporated the countywide CWPP map layers. Caerleon requested that any data that is updated be provided back to the county to update the countywide map layers for consistency.

If anyone is using the base map and has questions, please contact Joel Holland at WSG (joel@wildfireservices.biz) or Bryan Penfold at Sonoma Technology (bryan@sonomatech.com).

Update on the status of the Cloverdale CWPP document:

Tami Lavezzo, from Sonoma Technology, provided an update on the Cloverdale CWPP document. A working draft is in progress and Sonoma Technology is on schedule to deliver a draft for review in January 2022.

Caerleon provided a status update on the Sonoma countywide CWPP. A draft for public review will be released in January 2022. The countywide plan will link to the various community-level plans via the Fire Safe Sonoma website (https://www.firesafesonoma.org/documents/). There is also a location on the Fire Safe Sonoma website that houses a master list of mitigation projects throughout the county.

Other updates and information:

Susie Cummings, Cloverdale CWPP Community Coordinator, expressed her interest in home hardening and structure ignitability. Several home tours are being organized for members of the public to observe home/property assessments and to learn about fire resilient properties. Stuart Mitchell, a home assessor, will perform the assessments. Susie's home and Geoff Peters' home will be used for the assessments. The tours provide an educational way of learning how to protect yourself and your home. Susie is looking into the feasibility of recording the tours. The tours are planned to happen in January 2022.

Roberta McIntyre, Director of FireSafe Sonoma commented that there are specific requirements for Firewise accreditation and encouraged people to review the risk assessment, funding, and volunteer requirements.

Chief Jenkins expressed concern about not having the fire district at the home assessments. The fire district and WSG will discuss who should attend the home assessments. There was discussion about homeowners being wary about fire officials entering their properties for fear of being cited or reported for fire code violations. Caerleon commented that research shows that the public is more likely to respond to fire officials and there is science to back this up. Joel commented that the home assessments could provide an opportunity for collaboration with representation from the fire district and CAL FIRE. Joel described the assessments as workshops/clinics providing an opportunity for homeowners to learn how to make their properties more fire resilient and that the fire district's

expertise is invaluable. The messaging regarding the home assessments will be important and we need to make sure people understand that they are learning workshops and not for code enforcement.

There was additional discussion on how to engage members of the Rancheria and the Spanish Speaking community more effectively:

- Susie is working with Alma Bowen
- Jen had a call with Vicky at the Rancheria who will help distribute the surveys
- Jen emailed Zeke Guzman
- Jen and Joel to attend coffee with the Mayor and James Gore at the Cloverdale Senior Center

Wrap Up:

- Please fill out the CWPP survey.
- Reach out with any questions or comments regarding the base map or mitigation project priorities.
- The next meeting will be January 12, 2022.

Appendix B. Community Basemap Layers

Link to the Cloverdale Area Basemap created for the CFPD CWPP: (https://arcg.is/1Duiz0). The following data layers are included in the basemap:

- Fire and Mitigation Data:
  - Mitigation Projects (May 18, 2022, Update)
    - Data Description: See Appendix C for data description
    - Data Source: Mitigation projects described in Appendix C
  - Sonoma County Evacuation Areas
    - Data Description: County of Sonoma and its incorporated cities established standardized evacuation zones.
    - Data Source: https://socoemergency.org/get-ready/evacuation-map/
  - Sonoma County Wildfire Hazard Index
    - Data Description: Sonoma County Wildfire Hazard Index is a model that predicts relative wildfire hazard on the landscape. Higher index values represent a higher relative hazard. The index is based on inputs that inform potential fire behavior, inputs that represent fire probability occurrence in any 1 pixel, and a model of wildfire suppression difficulty.
    - Data Source: https://storymaps.arcgis.com/stories/a64d596a8be941c8b28263718880e433
  - CalFire Reducing Wildfire Threats to Communities
    - Data Description: This Priority Landscape (PL) prioritizes lands where communities (people and associated infrastructure) are at risk from wildfire to direct efforts at reducing wildfire risk in these areas. The ranking varies from 1 (least risk) to 5 (greatest risk). Housing density derived from FRAP's WUI layer is used to rank assets. Threat is determined using California Fire Hazard Severity Zones.
    - Data Source: https://gcplcc.databasin.org/datasets/02b725e6cdb047f7ab9a295cfc511d5a/
  - Fire Behavior Modeling (FlameMap)
    - Extreme Fire Weather Scenario: FlameMap Flame Length (feet)
      - Data Description: Wildfire modeling attempts to predict fire behavior including how quickly a fire might spread, how much heat it might generate, and in which direction it might move. Most fire behavior models require the following key inputs: (1) fuel model information, (2) fuel moisture, (3) weather, and (4) topography. The results of fire behavior modeling can indicate how difficult a fire might be to suppress and how likely the fire would be to transition from the ground to the tree canopy. When flames move into the canopy, extreme fire behavior may occur. FlameMap was used to model flame length and rate of spread. Flame length is commonly used as an indicator of how difficult a fire may be to suppress.

        - Data Source: https://sonoma-county-cwpp-hub-site-sonomacounty.hub.arcgis.com/
    - Extreme Fire Weather Scenario: Rate of Spread (feet/minute)
        - Data Description: Wildfire modeling attempts to predict fire behavior including how quickly a fire might spread, how much heat it might generate, and in which direction it might move. Most fire behavior models require the following key inputs: fuel model information, (2) fuel moisture, (3) weather, and (4) topography. The results of fire behavior modeling can indicate how difficult a fire might be to suppress and how likely the fire would be to transition from the ground to the tree canopy. When flames move into the canopy, extreme fire behavior may occur. FlameMap was used to model flame length and rate of spread. Rate of spread is an indicator of how rapidly a fire might spread and is defined as the rate of forward spread of the fire head expressed in feet per minute.
        - Data Source: https://sonoma-county-cwpp-hub-site-sonomacounty.hub.arcgis.com/
- Surface Fuel Data:
    - Sonoma County Update Surface Fuels Map
    - Data Description: The Sonoma County fuel model is a 5-meter spatial resolution fuel model that adheres to Scott and Burgan's classification (Scott and Burgan, 2005) . The fuel model provides a fine scale map of fuel conditions on the landscape and is a required input for fire behavior and fire spread models. The fuel model provides a higher spatial resolution than the existing, publicly available fuel models, which are the LANDFIRE data derived from 30-meter Landsat data.
    - Data Source: https://sonomaopenspace.maps.arcgis.com/home/item.html?id=2d194202dfee4ab5b157e978cd0e4901
- Vegetation Data:
    - Sonoma County VegMap
        - Data Description: The Sonoma County fine scale vegetation and habitat map is an 82-class vegetation map of Sonoma County with 212,391 polygons. The fine scale vegetation and habitat map represents the state of the landscape in 2013 and adheres to the National Vegetation Classification System (NVC). The map was designed to be used at scales of 1:5,000 and smaller.
        - Data Source: https://sonomaopenspace.egnyte.com/dl/qOm3JEb3tD
- Impervious Surfaces:
    - Impervious Surfaces
        - Data Description: The Sonoma County impervious surfaces map is a 4-class land use and land cover map of Sonoma County. The impervious map is a fine-scale polygon vector representation of all artificial impervious surfaces in the county. There are over 690,000 features in the dataset, which covers the entire county. Non-impervious areas are not mapped and are not covered by

polygons. The impervious map represents the state of the landscape in late 2013

- Data Source: https://sonomaopenspace.egnyte.com/dl/V3C5vTG4Mm

- Basemap:
  - National Hydrography Dataset
    - Flowlines
      - Data Description: The National Hydrography Dataset (NHD) represents the water drainage network of the United States with features such as rivers, streams, canals, lakes, ponds, coastline, dams, and streamgages. The NHD is the most up-to-date and comprehensive hydrography dataset for the Nation. NHD Flowline is the fundamental flow network consisting predominantly of stream/river and artificial path vector features.
      - Data Source: https://www.usgs.gov/national-hydrography/national-hydrography-dataset?qt-science_support_page_related_con=0#qt-science_support_page_related_con
    - Area
      - Data Description: The National Hydrography Dataset (NHD) represents the water drainage network of the United States with features such as rivers, streams, canals, lakes, ponds, coastline, dams, and streamgages. The NHD is the most up-to-date and comprehensive hydrography dataset for the Nation. NHD Area contains many additional water-polygon features.
      - Data Source: https://www.usgs.gov/national-hydrography/national-hydrography-dataset?qt-science_support_page_related_con=0#qt-science_support_page_related_con
    - Waterbody
      - Data Description: The National Hydrography Dataset (NHD) represents the water drainage network of the United States with features such as rivers, streams, canals, lakes, ponds, coastline, dams, and streamgages. The NHD is the most up-to-date and comprehensive hydrography dataset for the Nation. Waterbodies such as lake/pond features are represented in NHD Waterbody.
      - Data Source: https://www.usgs.gov/national-hydrography/national-hydrography-dataset?qt-science_support_page_related_con=0#qt-science_support_page_related_con
- Cloverdale Basemap Data
  - Cellular tower
    - Data Description: Geographic location of cellular tower. Cell tower locations infrastructure data set includes site ID, name, description, location, ground elevation, company name, FCC ASR number, FAA study number, tower type, and status.
    - Data Source: https://www.geo-tel.com/cell-tower-locations/#:~:text=Cell%20Towers&text=Cell%20tower%20location%20data%

2 0allows,MMDS%2C%20and%20other%20wireless%20coverage.

- Power plants
  - Data Description: Geographic location for power generation facilities.
  - Data Source: https://www.dataaxleusa.com/
- Power lines
  - Data Description: Homeland Infrastructure Foundation Level Database (HIFLD) as well as the Energy modelling and simulation community.
  - Data Source: https://hifld-geoplatform.opendata.arcgis.com/datasets/electric-power-transmission-lines/explore?location=38.800172%2C-122.391695%2C10.44
- Natural Gas Pipeline
  - Data Description: The National Pipeline Mapping System (NPMS) Public Map Viewer is a web-based mapping application designed to assist the general public with displaying and querying data related to gas transmission and hazardous liquid pipelines, liquefied natural gas plants, and breakout tanks under Department of Transportation (DOT) Pipeline and Hazardous Materials Safety Administration (PHMSA) jurisdiction.
  - Data Source: https://pvnpms.phmsa.dot.gov/PublicViewer/
- Emergency Services
  - Data Description: Geographic location for fire stations and police departments
  - Data Source: https://www.dataaxleusa.com/
- Sensitive Population Locations
  - Data Description: Geographic location for schools, hospitals, and residential care. Facilities that house sensitive populations.
  - Data Source: https://www.dataaxleusa.com/
- Service Stations
  - Data Description: Geographic location for service stations.
  - Data Source: https://www.dataaxleusa.com/
- Buildings
  - Data Description: Buildings is a county-wide GIS layer intended to support visualization, query, and analysis of current buildings throughout the county. The purpose for compiling the building outlines and centroids was to provide an accurate assessment of the building inventory in the County of Sonoma
  - Data Source: https://gis-sonomacounty.hub.arcgis.com/datasets/0f5982c3582d4de0b811e68d7f0bff8f_0/about
- Streets
  - Data Description: Streets, highways, and other transportation infrastructure, including railroad tracks, pathways, fire roads, etc. All regions and jurisdictions within Sonoma County are included.
  - Data Source: https://gis-sonomacounty.hub.arcgis.com/datasets/8c533884059741bc85e943193837d414_0/explore?location=38.450000%2C-122.900000%2C10.14
- Parcels
  - Data Description: “Parcels Public Shapefile” is a seamless, county-wide GIS parcel

layer intended to support visualization, query, and analysis of current land records.
    - Data Source: https://gis-sonomacounty.hub.arcgis.com/pages/data
- Public Owned Land
    - Data Description: The California Protected Areas Database (CPAD) is a GIS dataset depicting lands that are owned in fee and protected for open space purposes by over 1,000 public agencies or non-profit organizations. CPAD depicts the wide diversity of parks and open spaces in California, ranging from our largest National Forests and Parks to neighborhood pocket parks.
    - Data Source: https://www.calands.org/
- Washington School Road Assessment Proposed Boundary
    - Data Description: Washington School Road; showing the proposed project area. The upper, middle, and lower Secondary Special Benefit are shown by color.
    - Areas are differently colored to provide reference.
    - Data Source: https://sonomacounty.ca.gov/TPW/Roads/Projects-in-Planning/
- AB1550
    - Data Description: Census tracts in California are ranked according to their estimated hazard exposures and social vulnerability. Each tract for which data is available is assigned a percentile ranking between zero and one on both measures. Hazard exposure is based on OES analysis of several datasets related to wildfire, flood, earthquake, drought, and heat wave frequencies. Social vulnerability is based on the 2018 CDC Social Vulnerability Index.
    - Data Source: https://www.arcgis.com/apps/dashboards/677300969f9b4d4786d75aaa534318 e6
- Responsibility Areas
    - Data Description: State Responsibility Areas (SRA) are recognized by the Board of Forestry and Fire Protection as areas where Cal Fire is the primary emergency response agency responsible for fire suppression and prevention.
    - Data Source: https://calfire-forestry.maps.arcgis.com/apps/webappviewer/index.html?id=468717e399fa4238ad86861638765ce1
- WUI Interface
    - Data Description: WUI hosted by Sonoma County but comes from CAL FIRE. This layer was determined by housing density and CAL FIRE's Fire Hazard Severity Zones.
    - Data Source: https://frap.fire.ca.gov/mapping/gis-data/
- Fire History
    - Data Description: Data for this map was provided by CAL FIRE's FRAP program (2019 version 1) with 2020 data added.
    - Data Source: https://frap.fire.ca.gov/mapping/gis-data/
- Ignition History
    - Data Description: Fire ignition location dataset from Cal Fire.
    - Data Source: Cloverdale Fire Protection District
- Cloverdale Fire Protection District Boundary
    - Data Description: Feature class showing Cloverdale fire agency's district boundary used for the Countywide Fire Run Book and other applications.

- Data Source: https://gis-sonomacounty.hub.arcgis.com/search?collection=Dataset&tags=boundaries

Appendix C. Mitigation Plan

The scale of the CFPD relative to available resources requires a careful strategic approach to mitigation that includes identifying and prioritizing many of the key factors related to fire prevention, wildfire mitigation, defensible space, and fire suppression. The existing network of roadways, fire roads, fuel breaks, and other legacy roadbeds can be improved to allow invaluable egress to assist residents in safely evacuating before it's too late. The positive impact on life and safety will be enhanced further by establishing temporary refuge areas (TRAs) as a hub-and-spoke component of this system. Access via this improved network also has the potential to greatly enhance fire suppression efforts during a wildfire incident.

This plan, developed in collaboration with the CFPD through the CWPP process, includes hazardous fuels reduction, improved ingress/egress, and added fuel breaks. Over 80 miles of critical mitigation and maintenance will form the framework for the mitigation plan, which will be broken down into multiple phases, to be performed as funding becomes available. The primary focus of this plan is to address the highest impact areas, which include existing roads, tertiary roadways, fire roads, fuel breaks, and legacy roadbeds.

Factors including structure and population density, critical infrastructure, community values at risk, fire history/fire return rate, topography (slope, aspect, vegetation type, and vegetation density), and potential fire behavior, were assessed and modeled. The modeling and analysis results were then verified through site visits and "ground-truthing." Mapping, modeling, ground-truthing, and prioritizing ensures that the high and very high-risk areas are addressed. The CFPD considers the identified mitigation areas as priority areas and the goal is to complete projects over time, as funds allow. Environmental review will occur in advance of all identified mitigation work.

Pilot Project Locations

The pilot project locations include Cherry Creek Road to Port Circle, Henry Lane, Hot Springs Road, Highland Ranch Road, McNair Road/Kerry Lane, and Riverfront. Risk & Hazard Analysis was performed relative to population and structure density, relative distance to suppression resources, geo-location, access/egress, vegetation type, density, slope, aspect, and roadway vegetation encroachment.

Tertiary Road Locations

The tertiary roads include Cloverdale Heights (formerly Ehrman Road), Asti Ridge and Old Crocker Roads, Dry Creek Ridge/Oak Hollow, Clovercrest Drive, Preston Drive, Dutcher Creek Road, Crook Road, Hiatt Road, Geysers Road, Josephine Drive, Mountain Pine Road and Toyon Lane, Palomino and Madrone Roads, Skyview Drive, Shellenger Road, Theresa Drive, Trimble Road, Wilson Road, Woodhawk Lane, Preston Drive, and McCray Road.

Fire Road Locations

The fire road locations include Highland, Monkey Rock, Cloverdale-Geysers, Palamino, River-Henry, Sulphur Creek, Pine Mountain, Aidlen, Kelley-Hot Springs, Ranch House, Yorty Creek, and McNair.

Fuel Break Locations

The fuel break locations include Red Mountain, Big Sulphur Creek #2, Geysers Road, and Big Sulphur Creek #3.

Recommended Prescription

The CFPD faces threat from wildfire, primarily from the east but essentially from all directions. Maintaining roadways and creating shaded fuel breaks has proven to provide greater ingress/egress and defensible space, allowing emergency personnel to attack the wildfire and residents to evacuate when necessary. Work performed on or along roadways will consider fine sediment delivery from roads to streams as outlined in the Handbook for Forest, Ranch, and Rural Roads.[28]

The goal of creating shaded fuel breaks from existing legacy roadbeds and old logging roads is to change the vegetation characteristics to help modify potential fire behavior. Shaded fuel breaks are usually located in strategic locations, such as along a ridge or road. Developing a shaded fuel break involves a carefully designed thinning of dense vegetation of variable width and height, depending on topography.

Specific prescriptions for shaded fuel breaks vary based on vegetation types, composition, structure, topography, existing infrastructure, accessibility, goals, and objectives of the landowner/manager and available funding, making it challenging to set defined numbers and measurable outcomes. The typical recommendation states the dominant canopy is thinned to reduce continuity (but maintained to keep the forest floor shaded), lower limbs are pruned to remove ladder fuels, and the understory is thinned of dead and dense vegetation to reduce surface fuels. This strip of reduced vegetation is intended to change fire behavior and spread to create space for possible fire suppression activities and/or safe ingress/egress.

A modified shaded fuel break is a defensible location where vegetation has been modified to slow the spread of oncoming wildfires. Any fuel break by itself will not stop a wildfire. It is a location where the fuel has been modified to increase the likelihood of success for fire suppression activities.

[28] Handbook for Forest, Ranch, and Rural Roads (https://www.pacificwatershed.com/roadshandbook).

Ground resources can optimize the location for direct attack or firing. Air resources can utilize the location for fire retardant drops. The public and fire resources can use these locations for ingress and egress.

High-Level Plan for Hazardous Fuels Reduction and Defensible Space for Roadways, Structures, and Values at Risk

Work areas will follow established roadbeds and cause minimal soil disturbance. Work will avoid flagged or otherwise marked and protected and environmentally or culturally sensitive areas. Property owner permission/consent for the project will be obtained and communication and coordination with the affected property owners will be maintained throughout the project.

Treatment Objectives

- Reduce fire intensity
- Allow access to roadways for evacuation, travel, and staging of emergency vehicles
- Protect structures, ingress/egress, and values at risk

Treatment Specifications

- Reduce and process ground story fuels and small trees; consider retaining some coarse woody debris to preserve forest floor complexity and wildlife habitat
- Work areas will follow the existing roadbeds
- The following factors will be taken into account when treating vegetation:
    - Slope/aspect
    - Access
    - Vegetation type & density (hazardous fuels)
    - Proximity to roadway, structures, and values at risk
- Project Manager will flag and stake the work areas at 100-m intervals along roadways, around structures, and around other values at risk.
- All treatment types will be clearly identified and marked
- Take or leave and treatments are based on:
    - Size, age, and vigor
    - Dry, dead, dying material
    - Visible disease
    - Root health & stability
    - Density
    - Vertical Growth Pattern
    - Horizontal Growth Pattern
    - Take trees with smaller than 8" DBH
- Take and leave species are:

    - Take, limb, or thin bay laurel, tan oak, madrone, manzanita, Douglas fir, gray pines, other conifers, eucalyptus, other invasives & exotics.
    - Leave, limb, thin, and trim: redwood, blue, black, live, valley oak, toyon, and other herbaceous native specimens.

Vegetation removed, trimmed, or left untouched, will depend on the habitat and structure of the stand.

- Bring all stumps close to ground-level
- Vertical separation between ground fuels and fuel ladders to the ground story
- Horizontal separation (canopy density)
- Separation between canopy/branches
    - Reduce density
- Avoid damaging boles, roots, and crowns of residual trees and vegetation
- Sever and/or remove all climbing vegetation in order to remove ladder fuels
- Minimize soil disturbance
    - Maintain 12" or less soil disturbance
    - If more than 12" of disturbance occurs, repair, rake, or mitigate
- Maintain native grasses wherever possible
- Process dead/downed material greater than 6" in diameter
    - Lop & scatter
    - Masticate
    - Chip & distribute - no accumulations or depths greater than 6"
    - Pile for later burning
- All Slash will be lopped, scattered, removed, chipped, piled, burned, or otherwise treated to achieve a maximum post-project depth of eighteen (18) inches above the ground
- Treat partially fallen trees, including suspended branches and trunks
- All cut material above 6" in diameter will be processed
    - Material that is less than 25' of roadways may be piled for masticating or chipping and distributing (less than 6" deep), distributed away from waterways and seasonal streams) or burning
    - Material that is more than 25' from roadway may be piled for burning, lopped and scattered, masticated, or chipped outside of marked waterways
- Aesthetics
    - Cut branch collar or perpendicular to the bark ridge following pruning best practices as to not cause damage to trees.
    - Cut stumps close to ground level.

- Broadcast chipped or masticated material onsite, away from watercourses, and not accumulated in piles exceeding 6" depth.
- Do not negatively impact marked areas that are biologically sensitive, archaeologically significant, or other wildlife features with work, chipped, or masticated material.