THE Ember Alliance

2026



RED FEATHER LAKES FIRE PROTECTION DISTRICT

Larimer County, Colorado

Community Wildfire Protection Plan

Red Feather Lakes
Fire Protection District
Community Wildfire Protection Plan
2026

PREPARED FOR RED FEATHER LAKES FIRE PROTECTION DISTRICT

44 FIRE HOUSE LN, RED FEATHER LAKES, CO 80545

PREPARED BY THE EMBER ALLIANCE

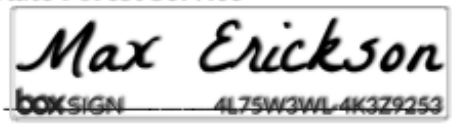
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APPROVAL AND SIGNATURES

This Community Wildfire Protection Plan (CWPP) was developed in response to the Healthy Forest Restoration Act of 2003 and complies with CWPP standards set forth by the 2022 Colorado State Forest Service Minimum Standards for Developing CWPPs. The CWPP is a collaborative effort to guide our wildfire protection. Where possible, we intend to apply the recommended practices to improve our community and increase public safety.

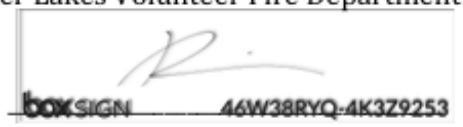
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Signature: 

Date: Oct 14, 2026

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Date: Oct 14, 2026

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How to use this CWPP Document

This document is designed for everyone that lives, works, and manages land within and around Red Feather Lakes Fire Protection District (FPD). Different sections will be most helpful to different people; please use this guide to direct you to the resources most

I want to learn the basics about wildfire, my community, and CWPPs.	• Section 1.a to learn about CWPPs. • Section 2.f to learn about wildfire threats in your local fire protection district. • Appendix A for an introduction to fire behavior.
I want to learn about protecting my home and family.	• Section 3.a to learn about the actions you can take, including detailed recommendations and research-backed guidance for protecting your home and family. • Section 3.b to find detailed hazard ratings and recommendations for your plan unit.
I want to learn about community-led action.	• Sections 3.a, 3.b, 3.d and 3.e to learn about the actions communities can take together to better protect everyone, including funding opportunities. • Section 5.b to find all specific recommended actions for the community.
I want to learn about landscape-scale wildfire mitigation.	• Section 2.e, 2.f and 2.g to learn about fire history and treatment history in the area. • Section 4.c to learn about priority fuel treatment projects for this community. • Sections 4.a, and 4.b for general recommendations for stand-level and roadside fuel treatments.
I want to learn about the science behind these recommendations.	• Appendix B to learn about modelling methodology for fire behavior and evacuation modeling, on-the-ground hazard assessments, and treatment prioritization. • Section 7 to see all referenced research and information.

Acronyms

Acronym	Definition
CCC	Civilian Conservation Corps
CDOT	Colorado Department of Transportation
CFRI	Colorado Forest Restoration Institute
CLRRA	Crystal Lakes Road and Recreation Association
CO-WRA	Colorado Wildfire Risk Assessment
CPRW	Coalition for the Poudre River Watershed
CR	County Road
CSFS	Colorado State Forest Service
CWDG	Community Wildfire Defense Grant
CWPP	Community Wildfire Protection Plan
DFPC	Division of Fire Prevention and Control
FAC	Fire Adapted Community
FEMA	Federal Emergency Management Agency
FPD	Fire Protection District
HFRA	Healthy Forest Restoration Act
HIZ	Home Ignition Zone
HOA	Homeowner's Association
HVRA	Highly Valued Resources and Assets
IIBHS	Insurance Institute for Business & Home Safety
IRPG	Incident Response Pocket Guide
LCCC	Larimer County Conservation Corps
LCD	Larimer Conservation District
LCSO	Larimer County Sheriff's Office
NCFC	Northern Colorado Fireshed Collaborative
NFPA	National Fire Protection Association

Acronym	Definition
NRCS	Natural Resources Conservation Service
NWCG	National Wildfire Coordinating Group
OEM	Office of Emergency Management
PBC	Pile Burn Cooperatives
POA	Property Owners Association
PODs	Potential Operational Delineations
QWRA	Quantitative Wildfire Risk Assessment
RAWS	Remote Automatic Weather Stations
RCP	Representative Concentration Pathway
RFLFPD	Red Feather Lakes Fire Protection District
RFLVFD	Red Feather Lakes Volunteer Fire Department
TEA	The Ember Alliance
USDA	U.S. Department of Agriculture
USFS	U.S. Forest Service
VPD	Vapor pressure deficit
WUI	Wildland-Urban Interface

Refer to the **Glossary** for definitions of the words and phrases used throughout this document.

1. Introduction

1.a. Purpose and Need for a CWPP

Community Wildfire Protection Plans (CWPPs) help communities assess local hazards and identify strategic investments to mitigate risk and promote preparedness (**Figure 1.a.1**). According to the 2020 Wildfire Risk to Communities analysis by the U.S. Forest Service, homes in the district and the surrounding areas have a higher risk of wildfire than 95% of communities in the U.S., and homes have a very high risk to damage or loss from wildfire (USFS, 2021a). Wildfire planning and an up-to-date CWPP for the Red Feather Lakes community are essential to ensure wildfire preparedness and boost community resilience. The assessments and discussions conducted during the planning process and the outputs thereof assist fire protection districts with fire operations in the event of wildfire and help residents and communities prioritize mitigation actions. These plans also assist with funding gaps for fuel mitigation projects since many grants require an approved CWPP.

> *"Community Wildfire Protection Plans (CWPPs) represent the best opportunity we have to address the challenges of the wildland-urban interface (WUI) in a way that brings about comprehensive and locally supported solutions." – Colorado State Forest Service*

The Red Feather Lakes Fire Protection District (RFLFPD) is a Special District in Larimer County organized under Colorado Revised Statutes Title 32 to provide fire protection for the community of Red Feather Lakes. For this CWPP, the following terminology will be used:

- "Red Feather Lakes Volunteer Fire Department" (RFLVFD) will be used to represent the department providing fire services for this special district.
- "The district" may be used generally to represent the physical RFLFPD boundary.[1]
    - The "RFLFPD boundary" represents the district's physical tax boundary defined under Colorado Revised Statutes Title 32 and may not necessarily encompass all areas covered by RFLVFD response area.



***Figure 1.a.1**. Elements of a holistic and actionable CWPP.*

RFLVFD was established in 1959. It came about after electricity came to the high country in 1952 and has been an active community protector for all these years. The district's Title 32 boundary encompasses 6,010 acres in the foothills of Colorado's Front Range (Figure 1.a.2). The district is the ancestral lands of the Ute, Western Dakota (Dakȟóta), Eastern Dakota (Dakhóta), Lakota (Lakȟótiyapi), Cheyenne (Tsėhésenėstsestotse), and Arapaho (Hinóno'eitíít) Tribes, according to Native Land Digital.

For planning purposes and to conduct relative risk assessments, the district was divided into 5 smaller regions called plan units (**Figure 1.a.3**). These plan units are designated as: North, West, East, Fox Acres, and South.

This 2026 CWPP for the RFLFPD is a robust and holistic CWPP that takes advantage of recent advances in fire science and addresses changes to fire risk, home construction, and other characteristics of the community. The

[1] Disclaimer: the boundaries presented in this CWPP may be subject to change during the standard 5-year period this CWPP is active.

CWPP includes a wildfire risk analysis, recommendations for property owners, prioritization of mitigation activities, and implementation recommendations. This document is a tool for RFLFPD, land managers, the Red Feather Lakes community, and residents to prioritize projects and actions that will make the district a safer and a more resilient community to wildfire. The objectives of this project are to:

- Engage community members during the CWPP process to ensure local needs and concerns are addressed.
- Produce a living, actionable CWPP based on analyses of fuel hazards, burn probability, evacuation routes, and community values across the district.
- Provide recommendations, including prioritization of projects, for reducing fire hazards, hardening homes, and increasing evacuation safety.
- Create strategic planning maps and wildfire pre-plans to increase community preparedness and safety of firefighters and residents.
- Set the stage for planning and implementation by RFLFPD, partners, and residents to mitigate hazards and promote community preparedness.

Complex interactions among wildland fuels, weather, and topography determine how wildfires behave and spread. Many aspects of wildfires are predictable based on scientific research of the physical processes driving fire. Much of the work in this CWPP is grounded in scientific research and computer models of wildfire behavior, complemented by local knowledge, calibrated fuel conditions, and identified local risk gathered through partner and community engagement. A basic understanding of fire behavior aids in interpreting the findings and recommendations reported herein. (See **Appendix A: Introduction to Wildfire Behavior and Terminology** and the **Glossary** for key terms and concepts).



View east over Dowdy Lake in RFLFPD. Photo credit: The Ember Alliance.

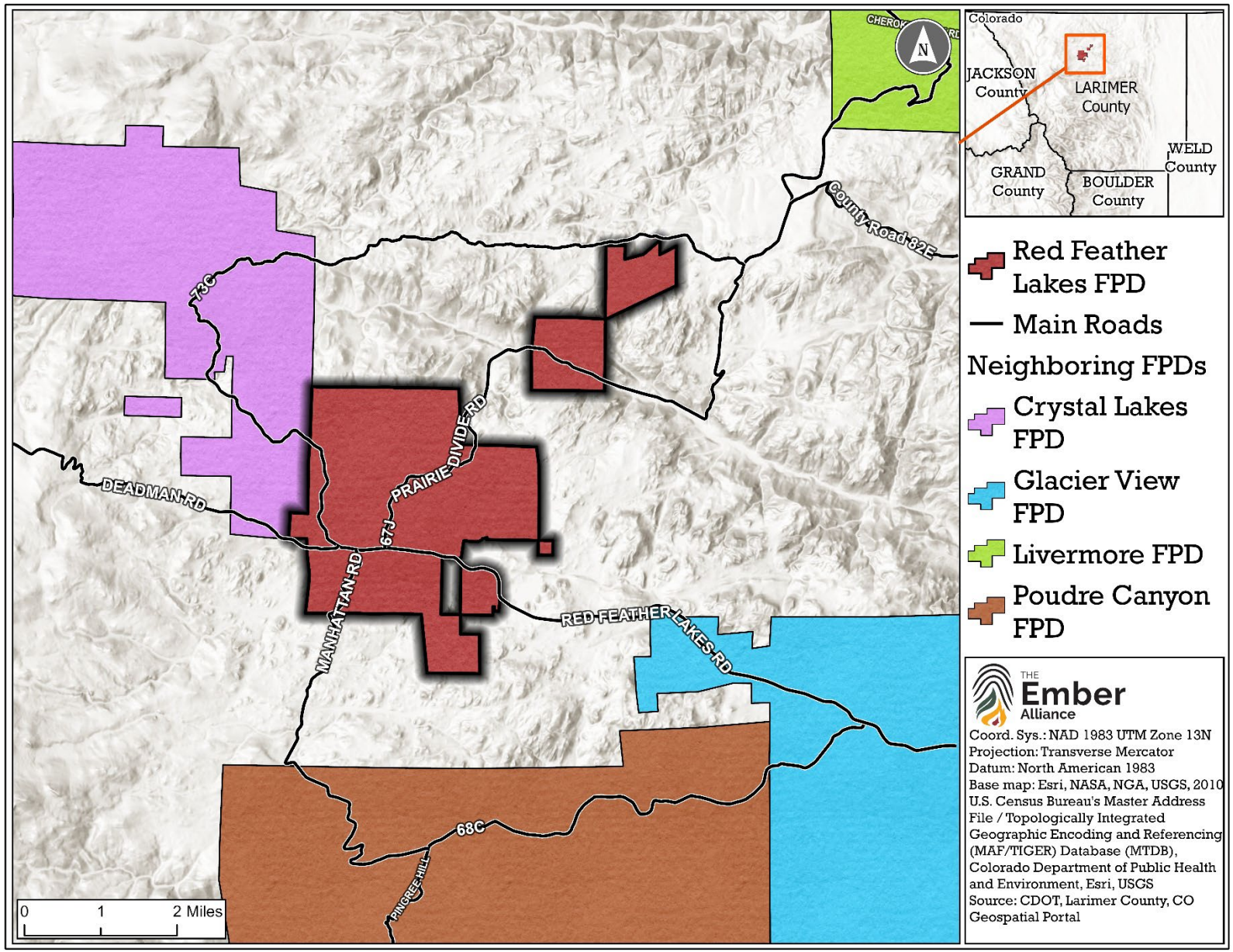


Figure 1.a.2 *Boundary of Red Feather Lakes FPD in Larimer County and bordering Fire Protection Districts. Source: CDOT, Larimer County, and CO Geospatial Portal.*

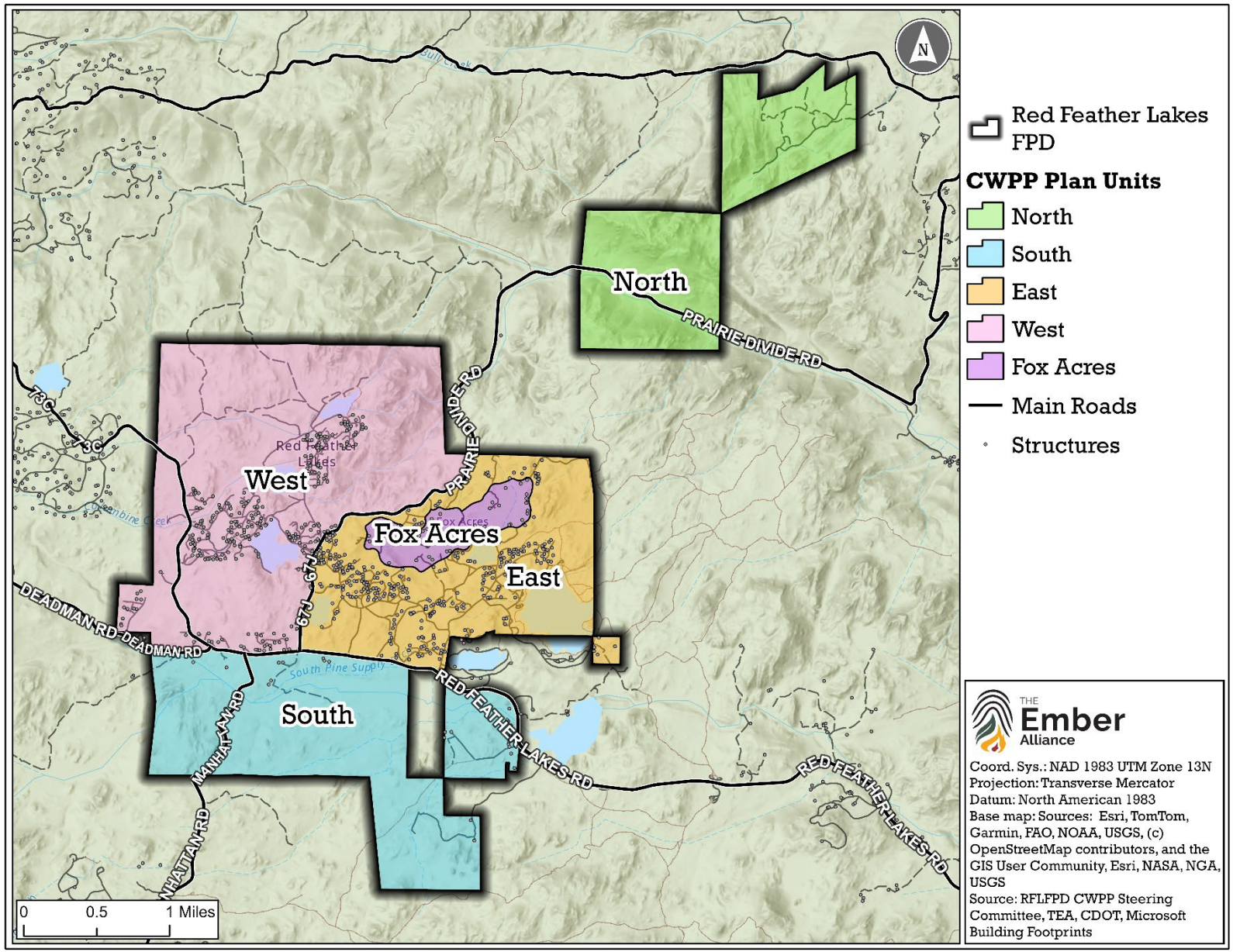


Figure 1.a.3 *RFLFPD divided into five plan units for the purpose of assessment and making tailored recommendations for the CWPP. Source: RFLFPD CWPP Steering Committee, TEA, CDOT, and Microsoft Building Footprints.*

Why is the CWPP relevant to me?

Becoming a fire-adapted community that can safely coexist with wildland fire takes a concerted, ongoing effort by everyone who lives, owns property, recreates, protects, or manages land in and around this community. Conditions in the district share some risk factors common to past catastrophic wildfires across the country. This CWPP provides recommendations for how to prepare your family to safely evacuate during a wildfire, how to mitigate your home ignition zone to give your house a chance to stand strong during wildfires, and how to protect the lives of firefighters engaged in protecting your community.

Even if you do not have a structure or development on your property, you can take steps to protect your assets, including the value of your property, as areas that are heavily burned have less aesthetic and monetary value. More importantly, work you do to reduce fire risk on your property can amplify the work that your neighbors do on theirs, resulting in greater risk reduction for everyone—collective efforts can have wide-ranging implications from life safety to homeowner insurance coverage. Removing trees from along roadways can increase the visibility of your property to firefighters, increase the accessibility of your property for fire engines, and reduce the chance that non-survivable conditions develop and entrap residents and first responders during wildfires.

This CWPP is a call to action to do your part to continue making this district a beautiful and safe community to live and recreate. Land management partners and RFLFPD are here to support your individual efforts and are committed to taking action to reduce wildfire risk and increase emergency preparedness for the benefit of this amazing community.

This CWPP was tailored to your community's unique hazards and needs to complement larger scale implementation projects happening in and around the Red Feather Lakes area.

1.b. Community and Partner Engagement

Collaboration is an essential part of CWPPs. Community engagement and partner commitment and follow-through are what make a CWPP successful and effective. The Ember Alliance (TEA)—a Colorado nonprofit dedicated to fire management and community engagement—worked with RFLFPD, Colorado State Forest Service (CSFS), and various other partner organizations to write this CWPP. TEA and representatives from RFLFPD engaged partners from across the district, neighboring districts, and across the county to develop the recommendations set forth in this CWPP. They incorporated lessons learned from recent, challenging wildfire seasons in Colorado and considered valuable insights shared by subject matter experts (SMEs), community members, and other partners.

Recommendations in this CWPP also consider overlapping and related plans and prioritization processes in the area, including:

- 2025-2029 Red Feather Lakes Area Wildfire Defense Project
- 2026 Livermore CWPP
- 2026 Larimer County CWPP Update
- 2024 Upper Poudre Watershed Resilience Plan
- 2024 USFS Black Diamond Landscape Resiliency & Risk Reduction Project
- 2023 Magic Feather Collaborative Project
- 2023 Poudre Canyon Fire Protection District CWPP
- 2022 Glacier View Fire Protection District CWPP
- 2022 Crystal Lakes CWPP
- Northern Colorado Fireshed Collaborative Common Operating Picture

TEA and RFLFPD would like to thank the following partners for their time and effort in developing content, providing data and feedback, and contributing to planning implementation for this CWPP:

- Coalition for the Poudre River Watershed (CPRW)
- Colorado Forest Restoration Institute (CFRI)
- Colorado State Forest Service (CSFS)
- Colorado State University CLTL Graduate Program
- Fox Acres Community Services
- Larimer Conservation District (LCD)
- Larimer County Conservation Corps (LCCC)
- Larimer County Office of Emergency Management
- Larimer County Planning Division
- Larimer County Sheriff's Office Emergency Services Section
- North 40 Mountain Alliance
- North Larimer Operations Working Group
- Northern Colorado Fireshed Collaborative (NCFC)
- Northern Water
- Red Feather Lakes Area Wildfire Defense Project Advisory Committee
- Red Feather Lakes Community Association
- Red Feather Lakes Community Library
- United States Forest Service (USFS)

TEA and RFLFPD conducted extensive partner and community engagement to better understand present barriers to wildfire mitigation, assess the community's wildfire concerns and needs, evaluate current on-the-ground conditions in the district, learn about ongoing mitigation work, and plan wildfire risk reduction projects. Engagement included:

- Regular advisory committee meetings throughout the CWPP process.
- A virtual community kickoff meeting in spring 2025 to introduce the CWPP process and encourage community participation.
- North Larimer Operations Working Group meetings to engage practitioners working in the Red Feather Lakes area, share CWPP progress, and compile information on previous and planned fuel mitigation projects.
- Red Feather Lakes Area Wildfire Defense Project Advisory Committee meetings to provide CWPP updates, collaborate with area partners, and engage active community members living and working in and around Red Feather Lakes.
- A mid-project community workshop, held in person at the Red Feather Lakes Community Association building on August 15, 2025, to distribute community-wide surveys and gather insight into community values that informed the recommendations and priorities in the 2026 CWPP.
- A fuel treatment project identification and prioritization meeting, held in person at the RFLVFD station on November 6, 2025.
- A final virtual community meeting in summer 2026 to share findings and recommendations from the CWPP process.

Additional outreach was conducted by the North 40 Mountain Alliance, Red Feather Lakes Community Association, Red Feather Lakes Volunteer Fire Department, The Ember Alliance, and the Red Feather Lakes Community Library to engage community members, distribute and collect community wide surveys, distribute informational material, and compile community feedback and input throughout the process.





Community engagement and partner input were fundamental aspects of this CWPP. Thank you for helping us create a locally relevant and actional CWPP to meet your needs! The ***top photo*** *is from the Place-Based Project Prioritization meeting with the Advisory Committee and additional partners; the* ***left photo*** *is of Larimer Conservation District's information booth at the Mid-Project Community Workshop; the* ***bottom photo*** *captures the decision-making phase of the Place-Based Project Prioritization Meeting.*

Source: The Ember Alliance



1.c. Accomplishments Since Previous CWPP

Red Feather Lakes Volunteer Fire Department

- Maintains 16 active duty and several part-time volunteers to respond to emergency calls in and around RFLFPD.
- Attends community events to spread fire prevention awareness and mitigation best practices.



Members of RFLVFD, LCSO Emergency Services, and surrounding fire departments are working to keep the community safe by burning slash piles to remove the buildup of fuels on the landscape. Photo credit: RFLVFD.

Coalition for the Poudre River Watershed

- Awarded a $9.7 million Community Wildfire Defense Grant (CWDG) in 2024 for the 5-year Red Feather Lakes Area Wildfire Defense Project, with work being done in Cherokee Meadows (co-led with Larimer County Office of Emergency Management). The Advisory Team for this effort received an Environmental Stewardship Award in June 2026, recognizing exemplary work in Larimer County.



The Red Feather Lakes Area Wildfire Defense Project Advisory Team received an Environmental Stewardship Award from Larimer County in June 2026. This effort is jointly administered by the Coalition for the Poudre River Watershed (CPRW) and Larimer County Office of Emergency Management (LCOEM) with funding from the U.S. Department of Agriculture (USDA) Community Wildfire Defense Grant (CWDG) program. Photo credit: LCOEM.

Colorado State Forest Service

- Ongoing technical and financial support for wildfire mitigation and forest management through Colorado State Forest Service (CSFS) landowner and grant programs.

Larimer Conservation District

- Larimer Conservation District (LCD) has completed landscape-scale forest restoration projects in the district. All projects are funded using federal Farm Bill money and a combination of local grants.

Larimer County Office of Emergency Management

- Since 2022, 59 Community Mitigation Grant Program projects have been completed in 4 annual grant cycles, with a total of over $343,000 in grant funds awarded to 47 different recipients
- Over 2025 and 2026, the county updated its multi-jurisdictional Hazard Mitigation Plan, which includes RFLFPD as one of the jurisdictions.

Larimer County Sheriff's Office

- Established the Wildfire Partner Program (WPP) in 2023, as a part of the Emergency Services Section of the Larimer County Sheriff's Office, to provide tools, training, and support for local fire districts and departments to offer comprehensive wildfire Home Ignition Zone assessments to residents free of charge.

- Through grant funded projects, LCSO has been able to hire seasonal, full time, firefighters to work on fuel reduction projects when not engaged in fire suppression.

North 40 Mountain Alliance

- The North 40 Mountain Alliance received a 2026 Community Mitigation Grant from Larimer County to fund the 2026 CWPP Mitigation Kickoff for Red Feather Lakes. The funding will be used on costs associated with the acquisition of tools, equipment and a trailer used for Home Ignition Zone (HIZ) mitigation assistance. Many Red Feather Lakes residents currently lack access to essential mitigation tools and resources, making it challenging for them to adequately prepare for and reduce the risks associated with wildfires and embers. The purpose of this grant is to address these gaps and ensure that community members can adequately protect their homes and properties from potential wildfire damage.
- In summer 2026, N40MA ambassadors and volunteers will help mitigate wildfire risk at least 20 homes to introduce the 2026 Community Wildfire Protection Plan to the Red Feather Lakes community and demonstrate mitigation in action.
- See **Section 3.c** for more information on intended use of this funding.

2. Red Feather Lakes Fire Protection District: Background

2.a. General Description

Located in the northern Front Range of the Rocky Mountains in Larimer County, Colorado, the Red Feather Lakes Fire Protection District (RFLFPD) encompasses 6,010 acres approximately 45 miles northwest of Fort Collins via U.S. Highway 287 and County Road 74E. The community of Red Feather Lakes itself sits at approximately 8,230 feet in elevation, with elevations across the district ranging from 7,400 to 8,620 feet. RFLFPD is bordered by Crystal Lakes, Livermore, Glacier View, and Poudre Canyon Fire Protection Districts, and maintains mutual aid agreements with each (**Figure 1.a.2**). The district also operates within the broader Larimer County emergency services framework and coordinates with the Larimer County Sherriff's Office Emergency Management and the USFS Canyon Lakes Ranger District for wildland fire response.

About 20% of the land within the district is publicly owned, with the Arapaho-Roosevelt National Forest comprising the dominant land management presence. Colorado Parks & Wildlife manage Dowdy Lake State Wildland Area in the District, and the Poudre R-1 School District owns property around Red Feather Lakes Elementary School (**Figure 2.a.1**). These federal and state lands directly adjoin residential areas throughout the district, creating a complex wildland-urban interface condition that drives the district's wildfire risk profile.

The community of Red Feather Lakes is an unincorporated census-designated place governed by the Larimer County Board of County Commissioners, with no independent municipal government. Services typically provided by municipal governments are delivered through special districts; RFLFPD, established in 1959, serves as the designated provider of fire protection for the area.

History

The Red Feather Lakes area has documented human history stretching back well before Euro-American settlement. The Ute people held traditional rights to the mountain parks and valleys of the region, while the Arapaho and Cheyenne ranged across the plains with overlapping use extending into the higher terrain. The area was used primarily for hunting and gathering. The Western Dakota (Dakȟóta), Eastern Dakota (Dakhóta), and Lakota (Lakȟótiyapi) Tribes also used the area, according to Native Land Digital. In 1849, Cherokee groups migrating westward during the California Gold Rush passed through the region, leaving trail markers. Aside from Native American use, only occasional hunters and trappers moved through the area until the mid-1800s.

Permanent Euro-American settlement began in 1871 when John Hardin built the first known homestead approximately two miles from what is now the Red Feather Lakes village. Early settlers were drawn by ranching and timber opportunities, hauling lumber to the growing city of Fort Collins. Land in the area had been granted to the Union Pacific Railroad in 1864 and was later transferred to Fort Collins businessman Myron Akin and associates, who recognized its potential for a different purpose entirely.

The area had long been known as Mitchell Lakes when, in 1923, the Red Feather Mountain Lakes Association was incorporated to develop recreational cabin lots in the area. The name "Red Feather" was inspired by Princess Tsianina Redfeather Blackstone, a Creek-Cherokee mezzo-soprano who performed across the country with composer Charles Wakefield Cadman. Following a concert in Denver, local developers adopted her name for the area. Lakes throughout the community were subsequently given Native American names including Hiawatha, Shagwa, and Nokomis.

A summer post office opened in 1924, as well as the local fish hatchery built between Hiawatha Lakes and Ramona Lake with water from Hiawatha Lake. During the 1930s, several Civilian Conservation Corps (CCC) camps operated in the Red Feather Lakes area. CCC crews improved roads, cleared forest, fought fires, and constructed the first fire tower on Deadman Mountain. During World War II, one of the CCC camps was converted to a prisoner of war camp. The Roosevelt National Forest was designated in 1932 from what had been the Medicine Bow

Reserve and its Colorado extensions, and the National Forest surrounds the community and shapes its character as a recreational destination.

The in 1941, the Red Feather Sportsman Club with the goal of inducing the Colorado Game & Fish Commission to buy water rights on the chain of lakes. In 1947, the Red Feather Storage and Irrigation Company was incorporated and made a deal with Colorado Game & Fish to take Dowdy, Westlake, and Bellaire. In 1949, the dam on Ramona broke through, and two board members loaned money to the Red Feather Storage and Irrigation Company to repair the dike. The company could not repay this money, so in early 1950, the Red Feather Improvement Club was formed and ultimately raised money to pay for the dike, the youth center, and community building. In 1952, the Property Owners Association induced Poudre Valley REA to bring electricity to Red Feather Lakes in 1952.

Additional information on the history of the area, including details on early schools and specific homesteads, are maintained by the Red Feather Historical Society, which also operates a museum in the village.

Information on the Red Feather Lakes Property Owners Association came from Linda Gorton and Jody Dahlstrom in the POA's newsletter August 1981.

Highly Valued Resources & Assets

In addition to homes and businesses, there are several highly valued resources and assets (HVRAs) in the district (Figure 2.a.2). Important community assets include Red Feather Lakes Elementary School, Red Feather Lakes Post Office, Red Feather Lakes Community Library, and the RFLVFD Fire Station. There are also several communication towers important for emergency communication, and weather stations important for understanding fire weather conditions. There are numerous dams across the district due to the abundance of lakes. Red Feather Lakes is a favorite weekend destination for recreators, and the area includes many campgrounds, fishing spots, and trailheads.

Deadman Lookout, recognized on the National Historic Lookout Register as the last of eight historic fire towers in the Front Range of northern Colorado and southern Wyoming, sits at 10,710 feet and serves as a radio communications site for the Roosevelt National Forest and the Larimer County Sheriff's Office. To the south of the district, the Drala Mountain Center draws visitors from across the region and, like other large event venues in the area, is a consideration for evacuation planning along Red Feather Lakes Road.

Landscape

The RFLFPD landscape is dominated by conifer forests, specifically ponderosa pine and lodgepole pine. Lodgepole pine blankets large contiguous areas particularly across the western and central portions of the district. Ponderosa pine is also widespread, becoming more prevalent toward the southern and eastern edges of the district and in areas outside the boundary (**Figure 2.a.3**). Mixed conifer and aspen stands appear in scattered patches throughout, while spruce-fir forests occur in smaller isolated areas.

Shrublands are distributed across the district in a dispersed pattern, and riparian vegetation follows stream and drainage corridors, visible as narrow linear bands of hardwood and riparian cover threading through lower terrain. Open water — reflecting the district's numerous named lakes — is concentrated in and around Red Feather Lakes in the central district. Developed land is centered around Red Feather Lakes, and agriculture is minimal and largely peripheral.

The district falls within the Cache la Poudre watershed, with water from the area's lakes and drainages flowing to Lone Pine Creek, a tributary of the Cache la Poudre River and part of the South Platte system. The Cache la Poudre River is Colorado's only designated Wild and Scenic River, and it serves as a municipal water supply for downstream communities including Greeley. Large wildlife present in the district includes black bears, mountain lions, moose, elk, mule deer, and bald eagles.

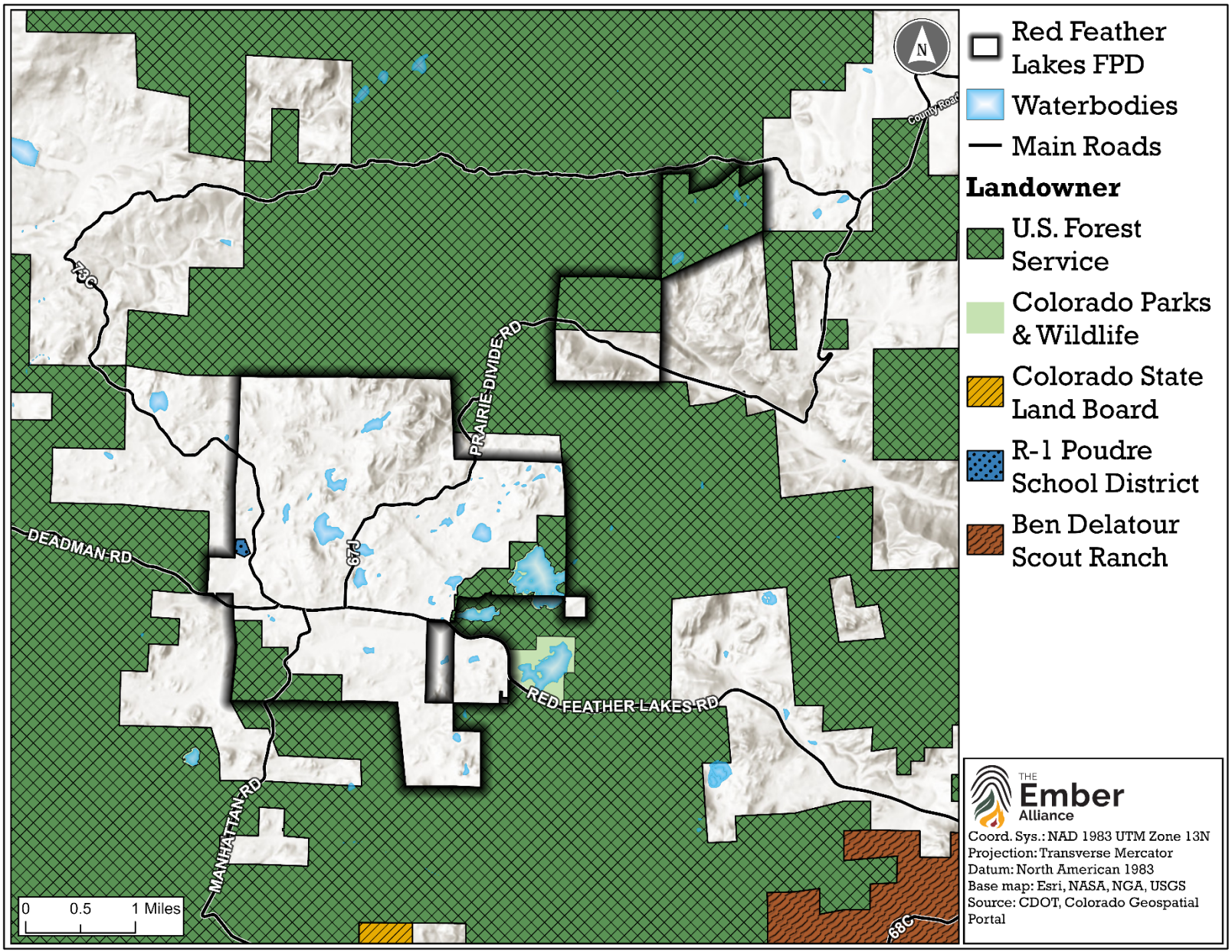


Figure 2.a.1. *Publicly owned land across RFLFPD is dominated by the Arapaho-Roosevelt National Forest. Source: CDOT and Colorado Geospatial Portal.*

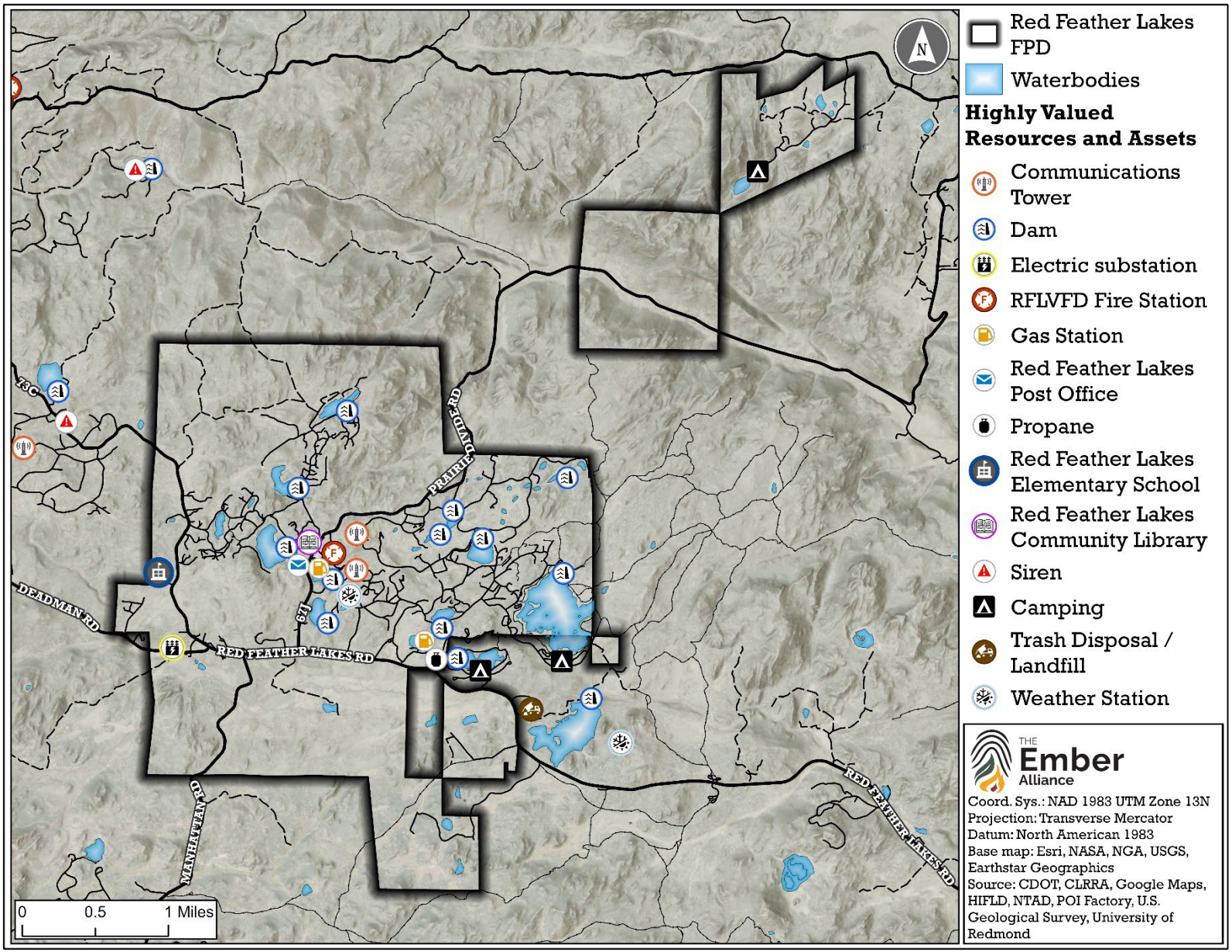


Figure 2.a.2. *Map of highly valued resources across RFLFPD. Source: CDOT, CLRRA, Google Maps, HIFLD, NTAD, POI Factory, USGS, and University of Redmond.*

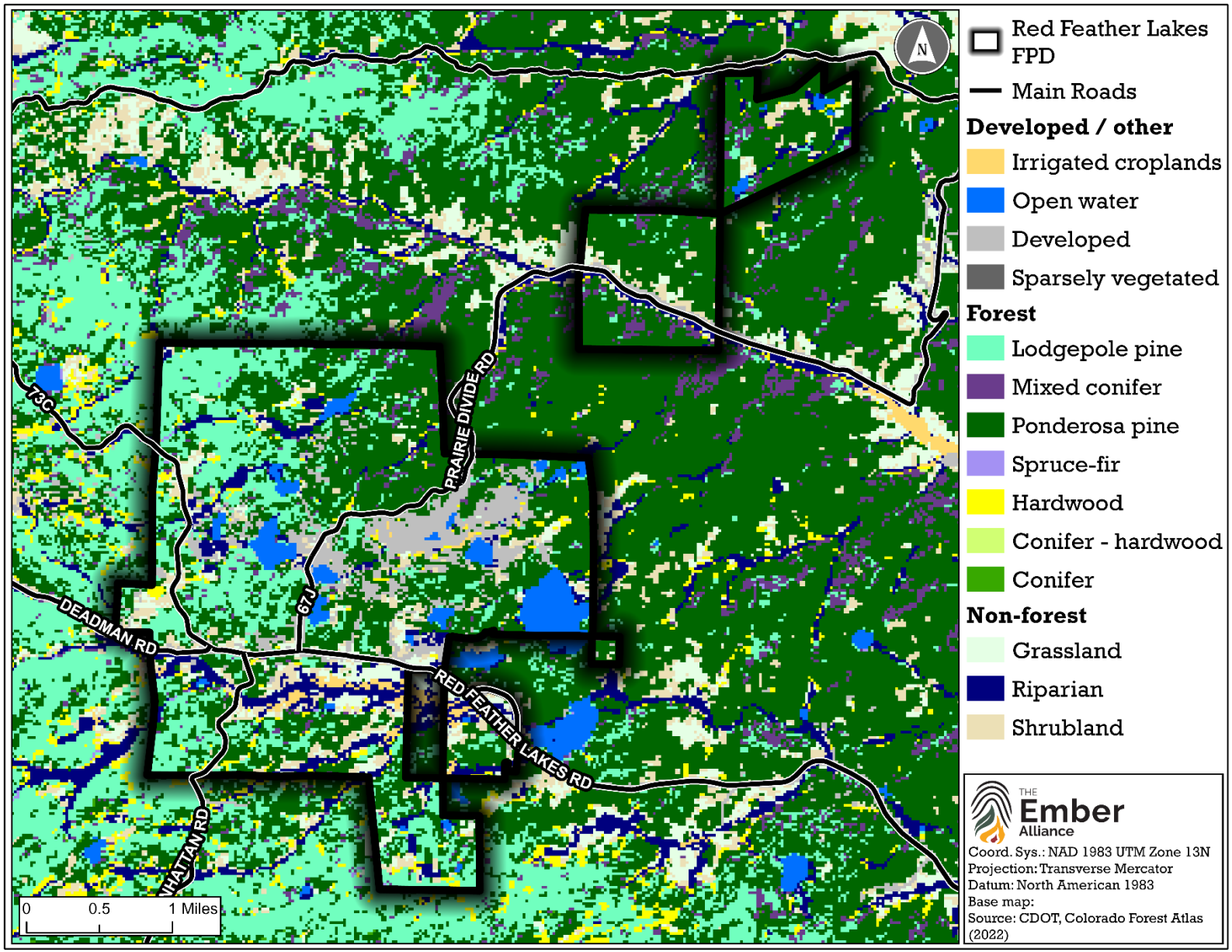


Figure 2.a.3. *Map of vegetation across RFLFPD. Major vegetation types include lodgepole pine and ponderosa pine forests, with scattered clumps of aspen and mixed conifer forests. Source: Colorado State Forest Service, Colorado Forest Atlas 2022.*

2.b. District Capacity

RFLFPD is a volunteer fire department. Their force is comprised of about 50 volunteers, including a fire chief, over 30 firefighters, a logistics support team, auxiliary support, and a board of directors. 25 of the 30 firefighters are trained in wildland fire response, and many of them are EMTs. Each volunteer spends at least 6 hours every month in training and in practice to maintain response readiness.

The district consists of 100% privately owned land, and the surrounding land is owned by the USFS. Within their 9 square mile response area, RFLFPD helps protect close to 1,000 houses. The average response time within the district is 10-12 minutes, beginning with the original emergency dispatch and ending with emergency personnel's arrival on scene.

RFLFPD maintains mutual aid agreements with surrounding volunteer fire districts, which improves wildfire and incident response. Not all parts of the district have hydrants, cisterns, or adequate alternate water sources, causing a need for more reliable water resources. There is an ongoing need for more personnel, newer equipment, and road improvements, although all parts of the district are accessible by engine.

There is one station located at 44 Firehouse Lane in Red Feather Lakes, CO which houses the following resources available for response: (**Table 2.b.1**).

Table 2.b.1. *Resources for the Red Feather Lake VFD.*

Overall District Resources		
Apparatus	**Name**	**Quantity**
Rescue Truck	Rescue Truck 1	1
Type 3 Engine	Engine 1	1
Type 6 Engine (Brush)	Brush 1, Brush 2	2
Tender	Tender 1, Tender 2 (2500 gallons each)	2
Utility Task Vehicle (UTV)	UTV1, UTV 2	2
ATV	ATV	1
Ambulance	Medic 1, Medic 2	2
Command Vehicle	Squad 1, Squad 2	2



Fire station for Red Feather Lakes Volunteer Fire Department located at 44 Firehouse Lane serves the entire fire protection district. Photo credit: 5280 Fire.

2.c. Wildland-Urban Interface

Every year, wildfires result in billions of dollars in fire suppression costs and destroy thousands of homes across the United States (Bayham et al., 2022; Higuera et al., 2023). Some of the most destructive, deadly, and expensive wildfires occurred in the past several years, partly due to construction of additional homes in the wildland-urban interface (WUI). Wildfire risk in the WUI is further exacerbated by severe fire weather perpetuated by climate change (Caton et al., 2016). Some nearby examples include the 2020 Cameron Peak Fire, which destroyed 469 structures; the 2020 East Troublesome Fire, which destroyed at least 366 structures; and the 2021 Marshall Fire, which destroyed over 1,000 structures. (See **Appendix A**: Introduction to Wildfire Behavior and Terminology for a discussion about how wildfire can threaten and destroy homes).

The WUI is any area where the built environment meets wildfire-prone areas—places where wildland fire can move between natural vegetation and the built environment and result in negative impacts on the community (Mowry and Johnston, 2018). The built environment includes homes, businesses, infrastructure, services such as utilities, roadways, and geographic features that aid in wildfire suppression, such as roads or ridgetops (Healthy Forest Restoration Act, 2003). People that live and work in the WUI must be aware of the effect that wildland fires have on their lives.

WUI exists along a continuum of wildland to urban densities. The WUI is often subdivided into intermix, interface, and occluded types. Wildland-urban intermix refers to places where the built environment intermingles with wildland vegetation; wildland-urban interface refers to places where the built environment abuts large area of wildland vegetation; and wildland-urban occluded refers to places where wildland vegetation is surrounded by the built environment (Johnston, 2018).

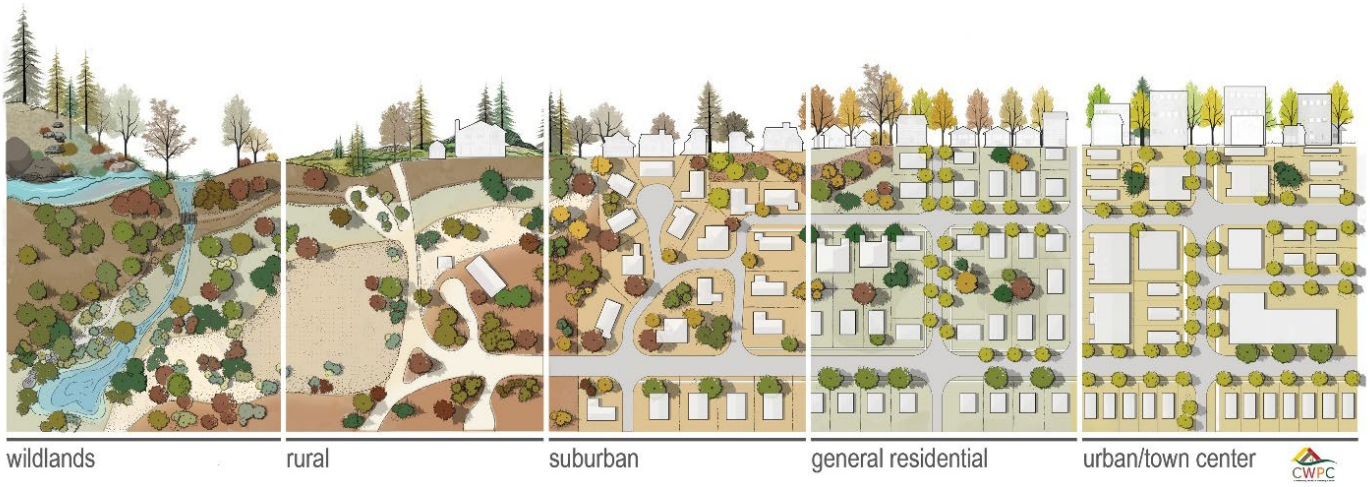


Figure 2.c.1*. The wildland-urban interface exists along a continuum of wildland to urban densities. Source: Community Wildfire Planning Center.*

All residents in the district live in the WUI (**Figure 2.c.2**). The WUI boundary for this CWPP includes potential operational delineations (PODs) that cover the district and important evacuation routes. The WUI for this CWPP captures not just populated areas but also portions of the landscape where fires could originate and spread into the community. PODs are topographic areas bounded by features suitable for fire control, other tactical operations during wildfires, proactive ecological resilience, and wildfire risk mitigation (e.g., ridgetops and roads) (Beeton et al., 2023; Thompson, 2023; Thompson et al., 2022). The Northern Colorado Fireshed has prioritized all PODs in the area for strategic fuel treatments to help protect lives and property and promote safe prescribed burning. The WUI boundary also incorporates Potential WUI Transects that follow terrain and other features within existing PODs that could be used as a secondary line of defense during a wildfire. These transects effectively subdivide a large POD into smaller areas that could be managed like a POD if needed, giving firefighters and planners additional strategic options. See the infographic below for more information on PODs.

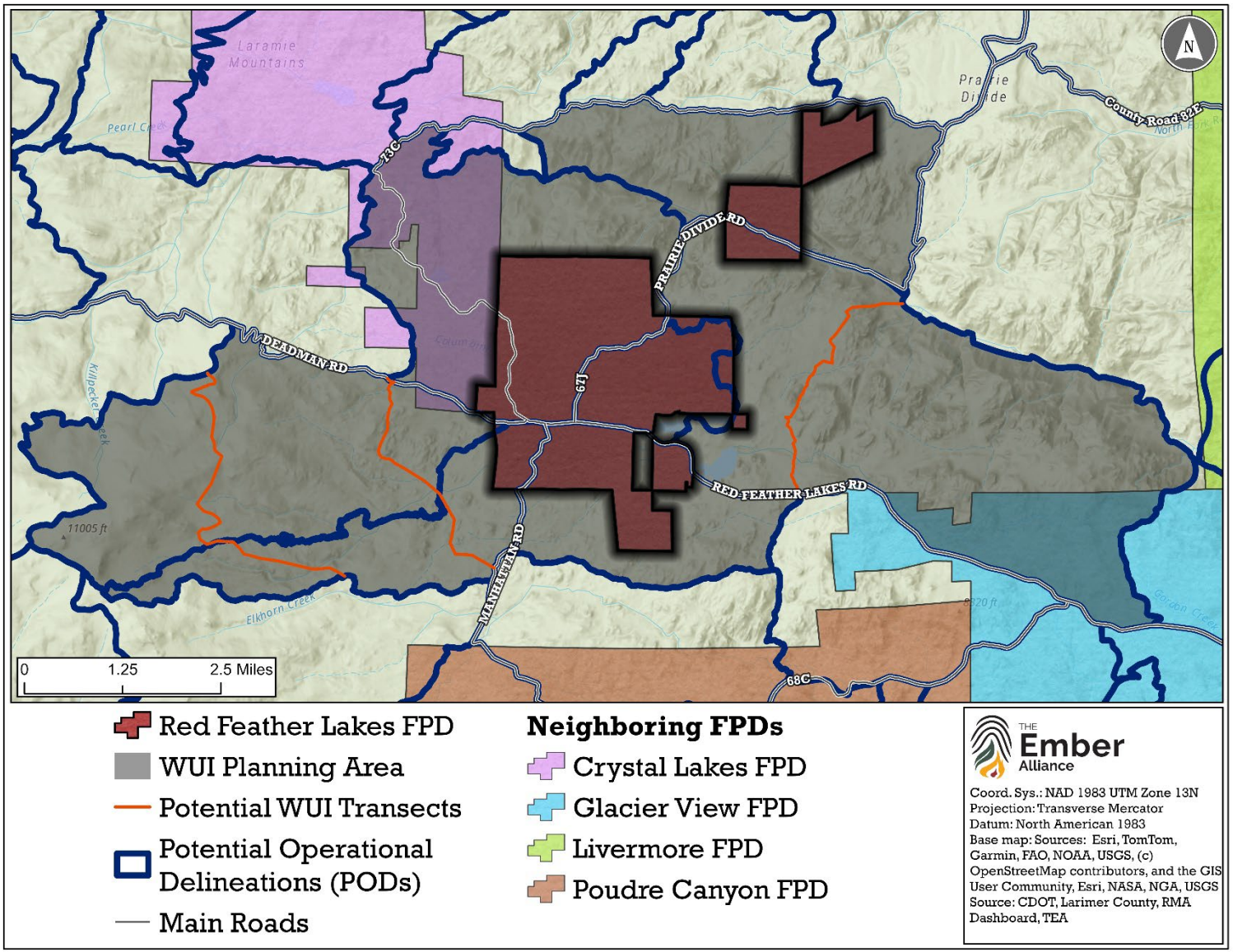


Figure 2.c.2. *All residents of the RFLFPD live within the wildland-urban interface and/or intermix and are exposed to elevated wildfire risk. The WUI boundary for this CWPP includes the full extent of RFLFPD, the surrounding landscape capable of transmitting wildland fire into the district, and areas along key evacuation routes including Deadman Road, Manhattan Road, Prairie Divide Road, Red Feather Lakes Road, and Forest Service Road (see methodology in* ***Appendix B****: Community Risk Assessment and Modeling Methodology).*

Potential Operational Delineations (PODs)

DEFINING PODS

Potential operational delineations (PODs) are collaboratively delineated fire management and planning units. Boundaries of PODs are called potential control lines (PCLs) that follow features such as roads, rivers, and ridgetops and can be used as tactical features during wildfires and for proactive landscape-scale management including prescribed burning.

USING PODS

Fire and fuel managers have delineated PODs across western Colorado. PODs often span multiple landownerships and serve as a useful tool for collaborative, cross-boundary prioritization and implementation of fuel treatments. POD boundaries and fuelbreaks are not synonymous, but it may be beneficial to design fuelbreak projects along POD boundaries (Thompson 2023).

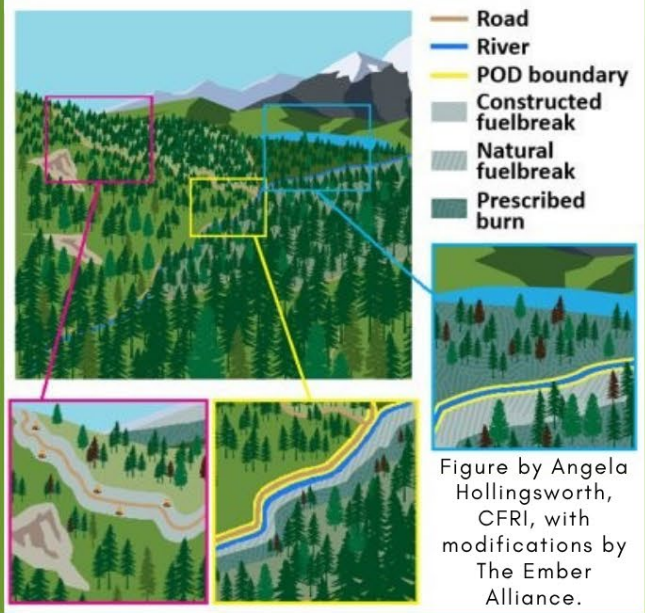
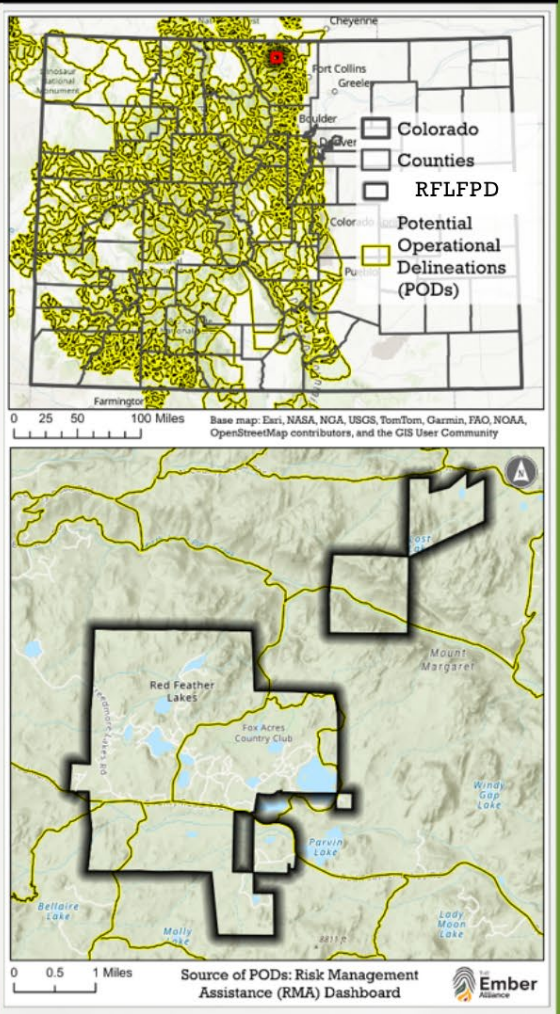


Figure by Angela Hollingsworth, CFRI, with modifications by The Ember Alliance.

MAPPING PODS



"Before smoke is in the air, local units should collaboratively develop and socialize PODs in the pre-season … and support consideration of community and resource values and risks." — Beeton et al., 2023, Colorado Forest Restoration Institute (CFRI)

2.d. Firefighting in the WUI

One of the standard firefighter orders is to "fight fires aggressively, having provided for safety first" (NWCG, 2018a). Firefighters are committed to protecting lives and property, but firefighting is particularly perilous in the WUI. The firefighting community is committed to wildland firefighter safety, which can require them to cease structure protection when conditions are exceedingly dangerous, particularly around homes with inadequate defensible space, safety zones, and egress routes.

High-intensity, fast-moving wildfires in the WUI can quickly overwhelm firefighting resources when homes begin igniting each other (Caton and others 2016). Firefighters are often forced to perform structure triage to effectively allocate limited resources during an incident, and more importantly, to protect the lives of firefighters. The Incident Response Pocket Guide (IRPG), which is carried by all firefighters certified under the National Wildfire Coordinating Group, explicitly states, "Do **NOT** commit to stay and protect a structure unless a safety zone for firefighters and equipment has been identified at the structure during size-up and triage" (NWCG, 2018a). The IRPG outlines four categories of structure triage:

1. Defensible – prep and hold.
2. Defensible – stand alone.
3. Non-defensible – prep and leave.
4. Non-defensible – rescue drive-by.

Do not count on firefighters staying to defend your home—your home should be able to stand strong on its own during a wildfire. There are never enough firefighters to stay and defend every single home during large incidents. Section **Mitigate the Home Ignition Zone** of this CWPP provides recommendations for how residents can increase the chance of their homes standing strong during wildfires and enhance the safety of wildland firefighters.



Defensible space allowed firefighters to protect this home during the 2016 Cold Springs Fire near Nederland, CO. Photo credit: Wildfire Partners.

2.e. Fire History Along the Colorado Front Range

Frequent wildfires significantly shaped Colorado's Front Range before the era of fire suppression. Whether ignited by lightning or for management by Indigenous peoples, frequent, low-severity fires were common in grasslands, shrublands, and ponderosa pine and dry mixed-conifer forests before European settlement in the 1850's, and other forest types, particularly lodgepole and subalpine forests at higher elevations, experienced infrequent but high-severity wildfires (Figure 2.e.1). Some plant species evolved adaptations to wildfire, for example, the heat from wildfires opening the cones of lodgepole pine or mortality from wildfire triggering resprouting in Gambel oak and aspen. Some wildlife benefit from recently burned ecosystems with lower tree densities and a greater abundance of understory plants (Kalies et al., 2012; Pilliod et al., 2006).

Wildfire behavior is vastly different today than it was over a century ago in many ecosystems along the Colorado Front Range. As the initial farming, ranching, and logging activities of Euro-American settlers subsided in the region and government-mandated fire suppression began in the late 1800's, forests filled in with trees (Addington et al., 2018). Tree densities in lower-elevation forests along the Colorado Front Range average 4.5 times higher today than they were in the mid-1800s, and tree densities in mid-elevation forests average 2.3 times higher today (Battaglia et al., 2018). Although many residents consider dense forest as "natural," these conditions are vastly different from the fire-adapted and fire-resilient ecosystems that existed before.

Significant wildfires have burned around the district over the past several decades, including the High Park Fire (2012) and the Cameron Peak Fire (2020)—the largest fire in Colorado history. Other notable fires in the vicinity of the district include the Bear Trap Fire (1980), Sheep Creek Fire (1985), Eaton Reservoir Fire (1989), Starwood Fire (2016), and Pearl Fire (2024). While there haven't been any large wildfires within the district boundary, there are several small wildfires every year, and the surrounding fire history and fuel conditions indicate significant potential for large fire growth under hot, dry, and windy conditions.

A combination of dense wildland vegetation, extreme heat and high winds, unplanned ignitions, and housing developments in the wildland urban interface (WUI) can create catastrophic wildfire scenarios (Haas et al., 2015). Climate change is making high-severity wildfires more frequent, intense, and larger in extent (Parks et al., 2016). Many catastrophic wildfires in Colorado’s history have occurred on dry and windy days, resulting in rapidly spreading fires that outpace the ability of firefighters to respond. On the Front Range, wind can gust over 60 miles/hour, which makes wildfire suppression nearly impossible (Haas et al., 2015).

Although catastrophic wildfires are typically associated with warmer "fire season" months from May-September, high winds and dry fuels that persist into the winter can create conditions that quickly drive fire across the landscape. This was demonstrated by the Marshall Fire that occurred on December 30, 2021, in Boulder County. Therefore, destructive wildfires have become a year-round risk for communities including RFLFPD.

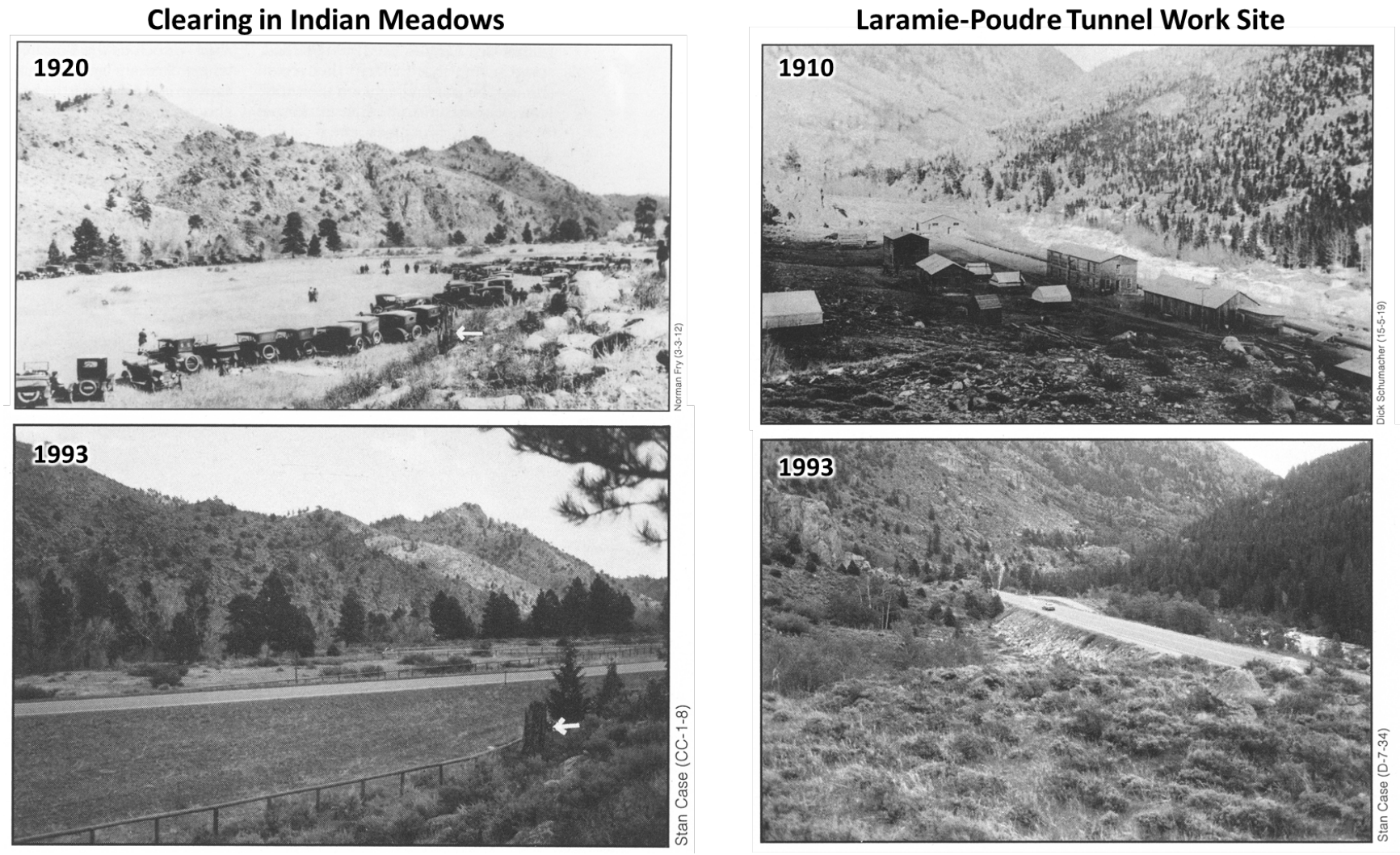


Figure 2.e.1. *Tree densities have remained low in some ponderosa pine savannas in Larimer County (photos at left), but in other ponderosa pine and mixed-conifer forests, particularly north-facing slopes, tree densities are substantially higher today than they were historically in part due to fire suppression (photos at right). Photo credits: Norman Fry, Stan Case, and Dick Schumacher. Source: Case, 1995*

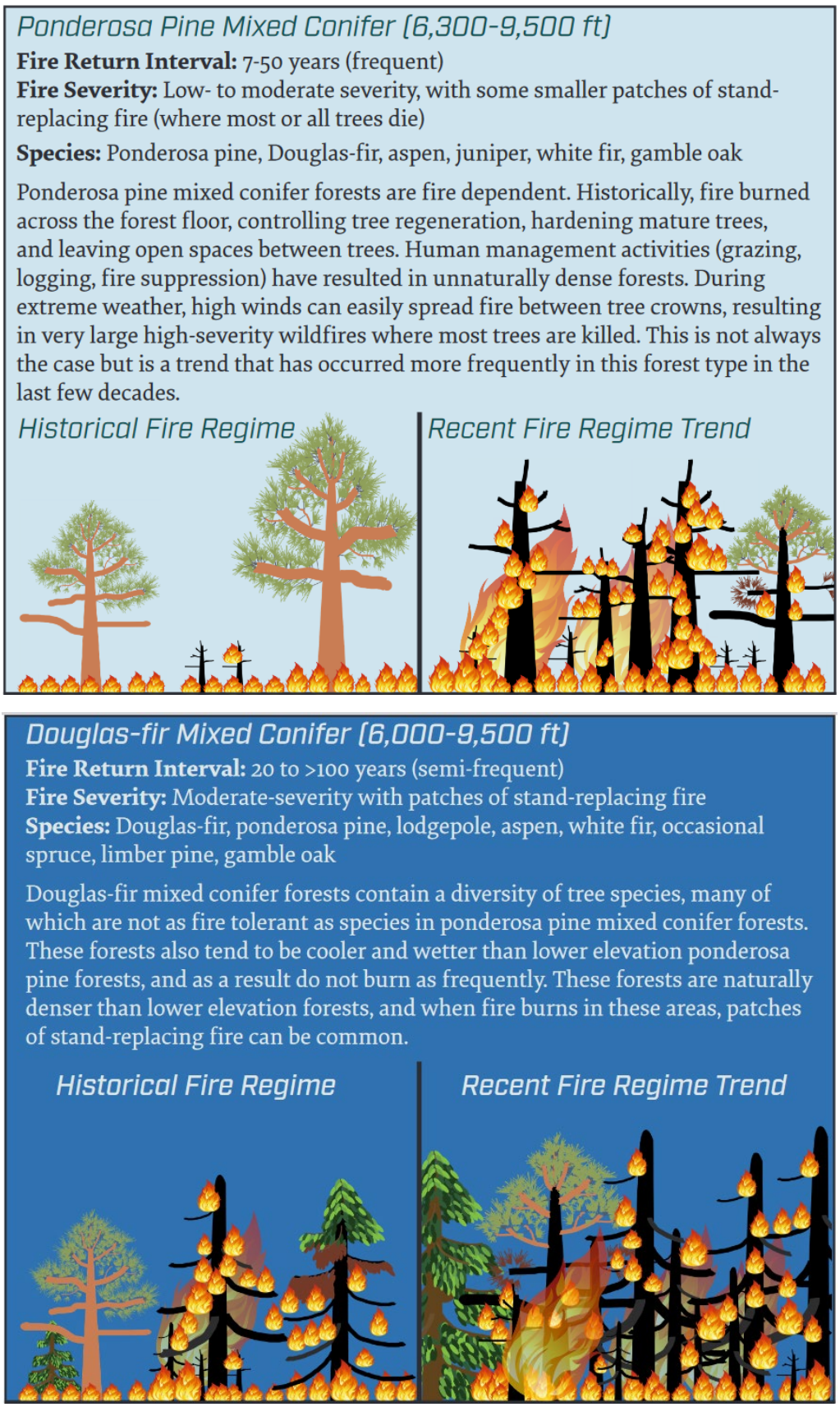


Figure 2.e.2. *Fire behavior has changed for many ecosystems along the Front Range of Colorado, partially due to the suppression of wildfires for over a century. Source: Colorado Forest Restoration Institute.*

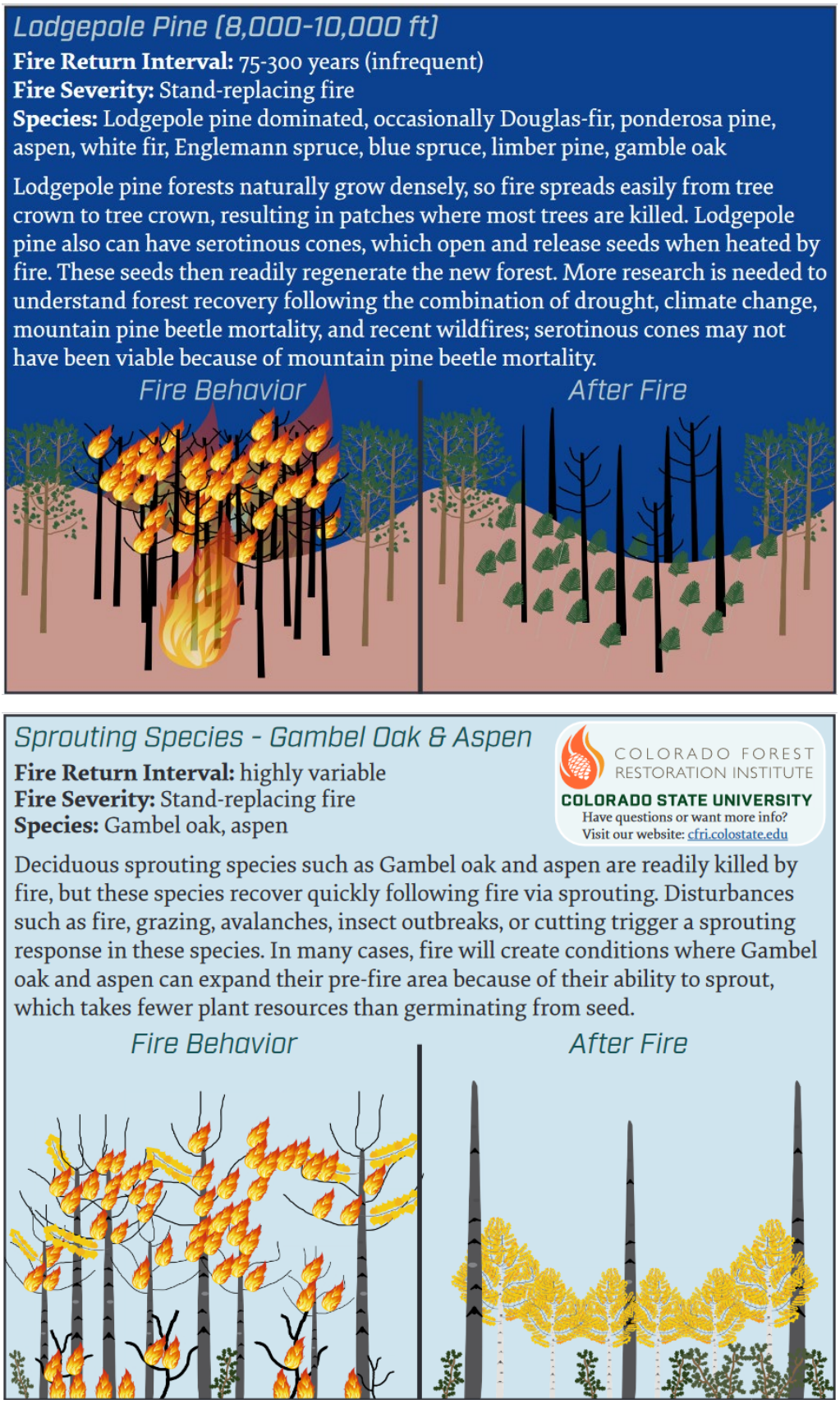


Figure 2.e.2. *(Continued). Other forests experienced more infrequent but high-severity wildfires in the past, and this fire behavior persists today. Source: Colorado Forest Restoration Institute.*

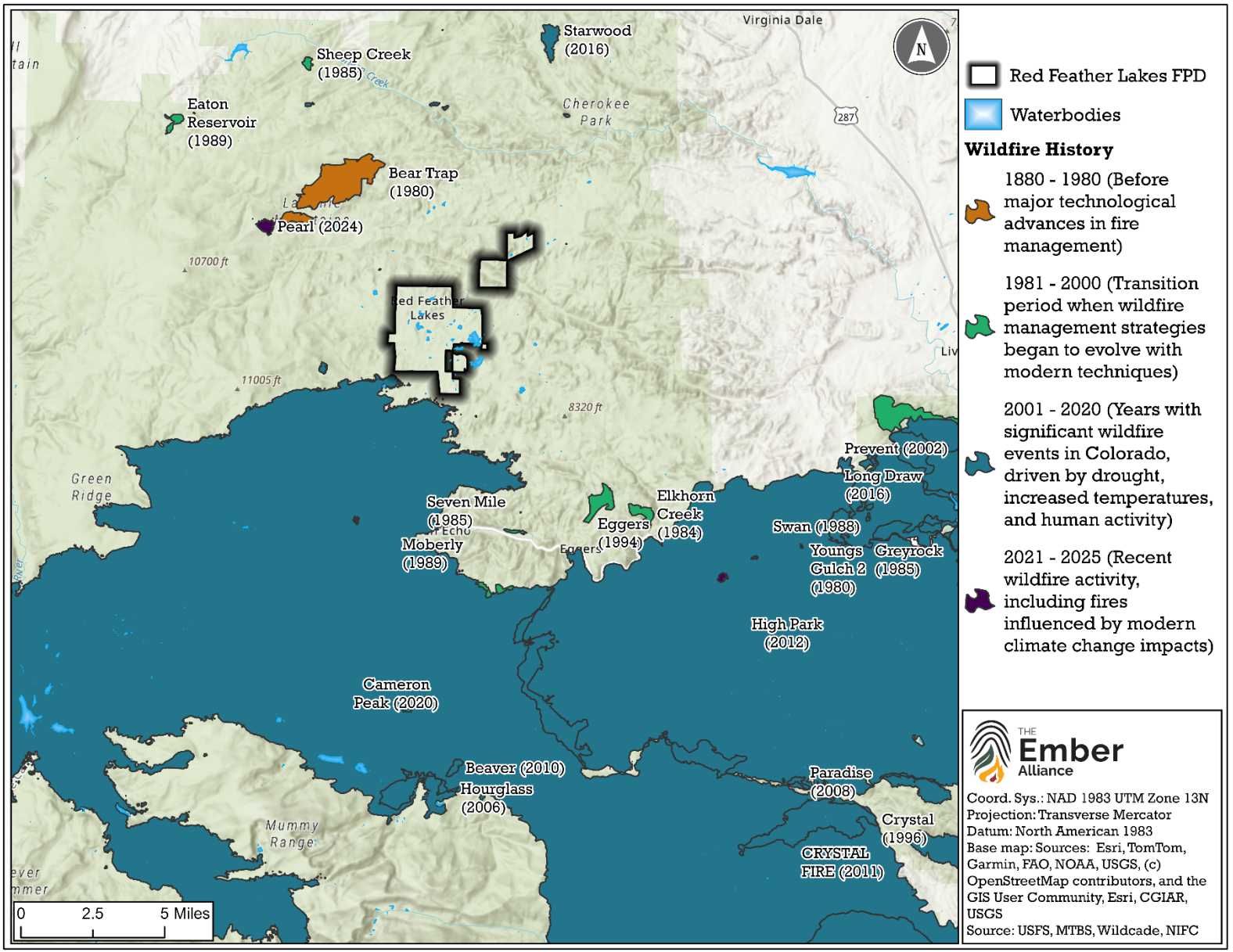


Figure 2.e.3 *Many significant wildfires have burned around RFLFPD. While fires within the district have been small to date, there is significant potential for large fire growth under hot, dry, and windy conditions. Source: USFS, MTBS, Wildcade, NIFC.*

2.f. Potential for Extreme Fire Behavior and Exposure in RFLFPD

All areas within RFLFPD could experience extreme fire behavior that could put the lives of residents, visitors, and firefighters at risk. Dense forests, limited road access in and out of neighborhoods, and flammable building materials contribute to this dangerous situation. **There is an immediate need for this community to undertake proactive measures to mitigate wildfire risk to protect lives and property. Implementing recommendations in this CWPP will go a long way towards helping the district become a fire adapted community.**

Important Considerations about Fire Behavior Predictions

Fire behavior models can provide reasonable estimates of relative wildfire behavior across a landscape. However, wildfire behavior is complex, and models are a simplification of reality. Models also struggle to capture the impacts of structures on wildfire spread and home-to-home ignitions. Fire behavior analyses are best applied at a landscape scale to assess relative risk across the entire district.

Exceptionally hot, dry, and windy conditions are increasingly common due to climate change and could result in even more extreme fire behavior than predicted by this analysis.

See **Appendix B** for details on fire behavior modeling used for this CWPP.

Potential Fire Behavior

Topography and fuel conditions are highly variable across the district (**Figure 2.f.1**), and this variation, plus alignment between wind patterns and topography, helps explain the patterns of potential fire behavior. If wind is pushing wildfire up a steep slope, it can result in more extreme fire behavior than if a fire is backing down the leeward side of a slope. Northwest facing slopes are likely to have dense forest conditions and a greater quantity of fuel available to burn if conditions are dry enough. However, south facing slopes are usually drier than north-facing slopes, and grasses present in moderately dense forests and shrublands can dry out very quickly on hot days and support rapidly moving fires with high flame lengths.

Under extreme fire weather conditions—hot, dry, and windy conditions typical of red flag days−73% percent of the district is at risk of high to extreme fire behavior (**Figure 2.f.2**). High to extreme fire behavior includes ember production that ignites additional fires away from the main fire and the movement of high-intensity fire from treetop to treetop. Such fires are extremely difficult, if not impossible, to control until winds subside and fuel moisture content changes.

Only small, scattered patches of moderate fire behavior exist, concentrated around the village of Red Feather Lakes. However, open grassy areas and sparsely vegetated regions could experience fast-moving surface fires, particularly during high-wind events. The mix of forest types and residential development poses additional risk, as structures can act as supplemental fuel sources, intensifying fire behavior and contributing to ember cast and potential structure-to-structure ignitions.

Fire growth could be extensive across the district if wildland firefighters cannot engage due to dangerous conditions from extreme fire behavior and if wildland fire moves rapidly through shrublands and grasslands. Potential fire growth and spread are strongly affected by the initial location of a fire ignition, wind speed and direction, topography, and fuels in the pathway of the fire. Under extreme fire weather conditions fueling fires with long flame lengths and abundant ember production, fires could even spread across major roads within RFLFPD.



Figure 2.f.1 *Fuel loads are variable across the district, ranging from dense forests with abundant ladder fuels (top left), to open ponderosa pine forests with moderately spaced trees and few ladder fuels (top right). Other ponderosa pine forests have abundant shrubs and grasslands in the understory, which can fuel rapidly moving wildfires (middle left and right). Aspen trees are intermixed with ponderosa pine and lodgepole in places, and aspen usually has higher fuel moisture and doesn't burn as readily as conifer trees (bottom left). Agricultural land is also interspersed in the district and is less flammable when green, but fields of tall dead grass and fuel rapidly spreading wildfires (bottom right). Photo credit: The Ember Alliance.*

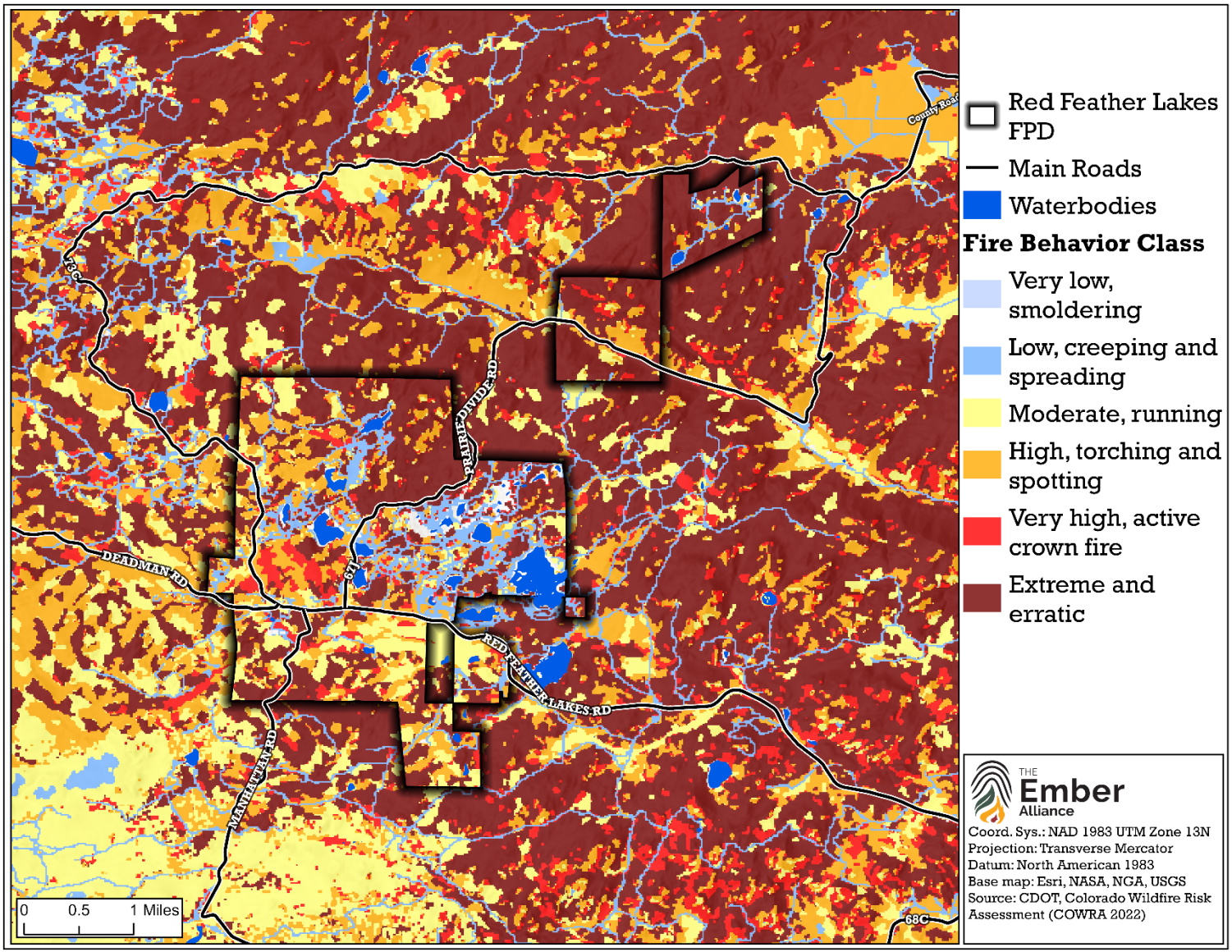


Figure 2.f.2 *Under extreme fire weather conditions— hot, dry, and windy conditions typical of red flag days—73% percent of RFLFPD is at risk of high to extreme fire behavior. High to extreme fire behavior is more likely to produce embers that ignite additional fires away from the main fire and ignite homes. Such fires are extremely challenging if not impossible to control until winds die down and fuel moistures increase See* ***Appendix B****: Community Risk Assessment and Modeling Methodology for a description of fire behavior modeling for this CWPP. Source: CDOT and COWRA 2022.*

Likelihood of Wildfire

Wildfire risk is composed of hazard (the potential intensity and likelihood of wildfire) and vulnerability (the exposure of highly valued resources and their susceptibility to damage). Likelihood is measured as burn probability—the annual probability of any given location burning due to wildfire. According to the Colorado Wildfire Risk Assessment (COWRA 2022), the district falls in the high burn probability category, meaning fires are more likely to occur in the district any given year than many other parts of Colorado (**Figure 2.f.3**).

High burn probabilities occur across much of the district due to the potential for rapid rates of fire spread through ponderosa pine forests with abundant grasses and shrubs that act as ladder fuels (see map below). Burn probabilities are somewhat lower in dense lodgepole pine forests in the northwestern portion of the district where fires tend to move slowly through timber litter under most fire weather conditions. However, when lodgepole pine forests burn under extreme conditions, the potential for extreme fire behavior is significant.

Another measure of wildfire likelihood is the frequency of days with weather conducive to large-scale fire growth. The district frequently experiences such conditions, driven by low humidity, high temperatures, and strong winds. Days with red flag warnings indicate severe fire weather and require extra vigilance by fire departments and residents. Hot, dry, and windy conditions on red flag days can lead to exceptionally fast fire growth and high fire intensity that exceeds the ability of firefighters to quickly suppress a blaze. The occurrence of red flag warnings varies from year to year due to regional weather patterns and anomalies such as El Niño and La Niña.

On average, 6 red flag warnings were issued in this area from 2006-2025, with a maximum of 17 in 2012 (the year of the High Park Fire) and 15 in 2020 (the year of the Cameron Peak Fire) (**Figure 2.f.4**). The most common months for red flag warnings are March, April, and October when strong winds are common along the Colorado Front Range. Climate change could result in 9 to 13 more days of very high fire danger every year by 2050 according to the Climate Toolbox.



Airtanker drops retardant near the Manhattan Road south of Red Feather Lakes during the 2020 Cameron Peak Fire on August 27, 2020. Photo credit: NWCG InciWeb.

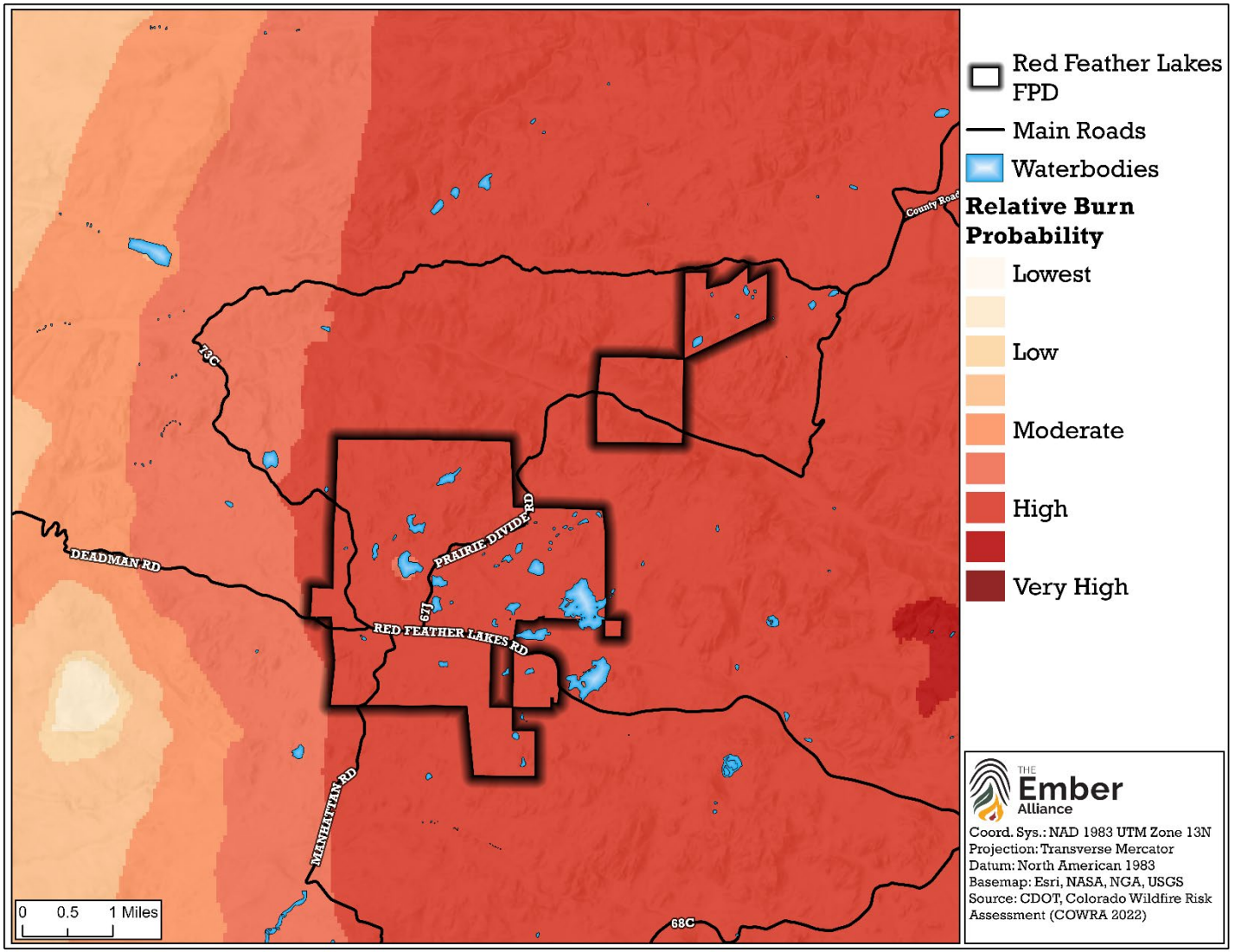


Figure 2.f.3. *Most of RFLFPD falls into the high burn probability category relative to the state of Colorado. Predictions are based on simulations under a variety of fire weather conditions. Source: COWRA 2022. See* ***Appendix B****: Community Risk Assessment and Modeling Methodology for a description of fire behavior modeling for this CWPP.*

FIRE WEATHER DANGER IN RFLFPD

During Red Flag Warnings, all residents need to follow fire restrictions and be prepared to evacuate in the case of a wildfire.

RED FLAG CRITERIA

Red Flag Warnings issued by the National Weather Service indicate that warm temperatures, very low humidity, and stronger winds are expected to result in elevated fire danger in the next 24-48 hours.

RFLFPD falls within the Denver/Boulder Forecast Office, which has two options for Red Flag criteria:

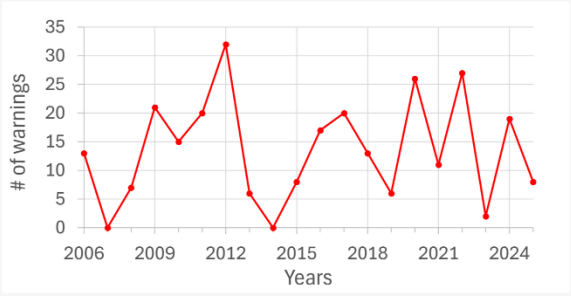
Option 1	Option 2
Relative humidity <= 15% Wind gusts >= 25 mph Dry fuels	Widely scattered dry thunderstorms Dry fuels

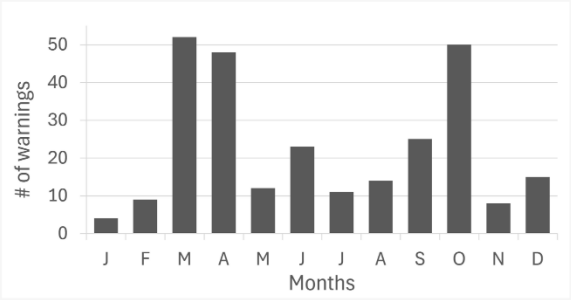
Large wildfires (> 2000 acres) around RFLFPD that occurred during Red Flag Warnings:

2020 Cameron Peak
2012 High Park
2011 Crystal Fire

WARNINGS FROM 2006-2025

The National Weather Service issued on average 7 Red Flag Warnings/year for RFLFPD, with as many as 17 in 2012. Red Flag conditions most often occurred in March and October.





CLIMATE CHANGE MEANS MORE FIRE DANGER AHEAD

Hotter and dryer conditions due to climate change could result in 9-13 more days/year with very high fire weather danger in RFLFPD by 2050.



National Fire Danger Ratings are separate from Red Flag Warnings but use similar indicators of severe fire weather.

BE INFORMED ABOUT COUNTY FIRE RESTRICTIONS

Permissible activities are limited during fire restrictions to protect the community.

Larimer County: https://larimercounty.gov/safety/fire/fire-restrictions/

THE Ember Alliance

Sources: Historic Red Flag Warnings from Iowa Environmental Mesonet at Iowa State University. Future fire danger from https://climatetoolbox.org.

Figure 2.f.4. *RFLFPD experiences on average 7 days with weather conditions that qualify as Red Flag Warnings. Climate change could further increase the number of Red Flag Warning days by 9 to 13 more days per year by 2050. Source: Iowa Environmental Mesonet and the Climate Toolbox. Infographic by The Ember Alliance.*

Potential Consequences to the Community

High to extreme fire behavior can create non-survivable conditions along roadways, which is of particular concern in the district where there are few points of egress for an evacuation. Under extreme fire weather conditions, 75% of the length of roadways in the district could experience non-survivable conditions (**Figure 2.f.5**). Many areas of potentially non-survivable conditions occur along the important evacuation routes of Red Feather Lakes Road, Manhattan Road, and Prairie Divide Road. Evacuation preparedness is of the utmost importance for residents in neighborhoods with hazardous conditions along roadways (see **Evacuation Preparedness**).

On days with extreme fire weather conditions, 90% of homes within the district could experience damaging radiant heat from burning vegetation, and 100% of homes within the district could be exposed to embers from burning vegetation, regardless of vegetation in the immediate vicinity of the home (**Figure 2.f.6**; **Figure 2.f.7**). Homes serve as an additional source of fuel that could produce high-intensity flames, emit embers, and initiate home-to-home ignitions. This CWPP outlines home hardening practices that residents and business owners can complete to reduce the risk of embers penetrating their homes.

While it is always a good idea to invest in defensible space and home hardening for residents in the WUI, it is equally important to understand their limitations in certain environments. Solely relying on those actions or expecting the fire department to be able to protect your home and family is naïve in these extreme danger scenarios.

Several non-residential highly valued resources and assets (HVRAs) within and adjacent to RFLFPD could be exposed to damaging wildfire and its effects, including National Register historic sites, recreational areas, critical infrastructure, and downstream water quality. Red Feather Lakes Elementary School and the Red Feather Lakes Post Office could have exposure to radiant heat and short-range embers. The RFLVFP fire station and the Red Feather Lakes Community Library could be exposed to radiant heat or short-range embers. Recreational assets at risk include USFS campgrounds at Dowdy Lake, West Lake, and Parvin Lake, which draw significant summer visitation. Fuel treatments and other recommendations in this CWPP seek to reduce this exposure and protect critical resources in the district.

Postfire Effects on Water Resources

Impacts of wildfires do not end once the flames are extinguished. Intense rainfall events can result in flash floods, erosion, sediment delivery, and debris flow in the years following a wildfire (Neary et al., 2005). High-intensity wildfire can alter soil chemistry, reducing the ability of soils to naturally attenuate runoff from these events. A large storm in the years following a high-intensity wildfire in the district could result in detrimental effects to high-value water resources, including erosion and increased sedimentation into the lakes and stream corridors that characterize the landscape.

Erosion and sedimentation are natural processes that shape streams, transport soil and nutrients across a landscape, and create diversity in streams and riparian habitats (Prettyman, 2018). However, extreme post-fire sediment delivery and debris flows can damage and destroy homes, community assets, infrastructure, fisheries, and riparian vegetation. For example, changes to soil and vegetation brought about by the 2012 High Park Fire exacerbated the degree of flooding experienced in the Poudre Canyon which resulted in the destruction of roads and bridges as well as significant amounts of ash, sediment, and debris deposited in the Cache la Poudre River threatening water quality for the greater Fort Collins area. The 2020 Cameron Peak Fire that burned to the south of the district produced significant post-fire flooding and debris flows in the Cache la Poudre watershed in subsequent years, illustrating the downstream consequences of high-severity fire in this region.

The potential for post-fire erosion is significant in the northwest portion of RFLFPD where slopes are steep, particularly along North Lone Pine Creek and Prairie Divide Road (Figure 2.f.9). Drainages within the district ultimately flow to the Cache la Poudre River, Colorado's only designated Wild and Scenic River and a municipal water supply for downstream communities including Fort Collins and Greeley (Gannon et al., 2019). The U.S. Forest Service's Forest to Faucets 2.0 Analysis rates watersheds in the area as having very high importance for

surface drinking water. Watersheds intersecting the district also rank high to highest priority in the 2024 Upper Poudre Watershed Resilience Plan and fall within the Coalition for the Poudre River Watershed's South Fork Lone Pine and North Fork Lone Pine Action Areas. The plan provides additional detail on wildfire risk and watershed resilience in and around the district. The potential for post-fire sediment delivery and damage to values at risk can be mitigated through activities to improve stream health and resilience, strategic fuel treatments to reduce fire hazards, and pre-planning for emergency response. A study in the upper portions of the Cache la Poudre and Big Thompson Watersheds found that strategic fuel treatments, including prescribed burning, can reduce wildfire risk to water supplies. Treatments should be targeted in dense, fire-prone forests on steep slopes that drain to water supply infrastructure such as reservoirs. This study found that benefits of treatments outweight the cost of treatments – it is usually more expensive to address damages from post-fire sedimentation to water quality and water supply infrastructure than to proactively reduce potential fire occurrence, spread, and severity (Gannon et al., 2019). These considerations were incorporated into the **Section on Priority Project Areas .**

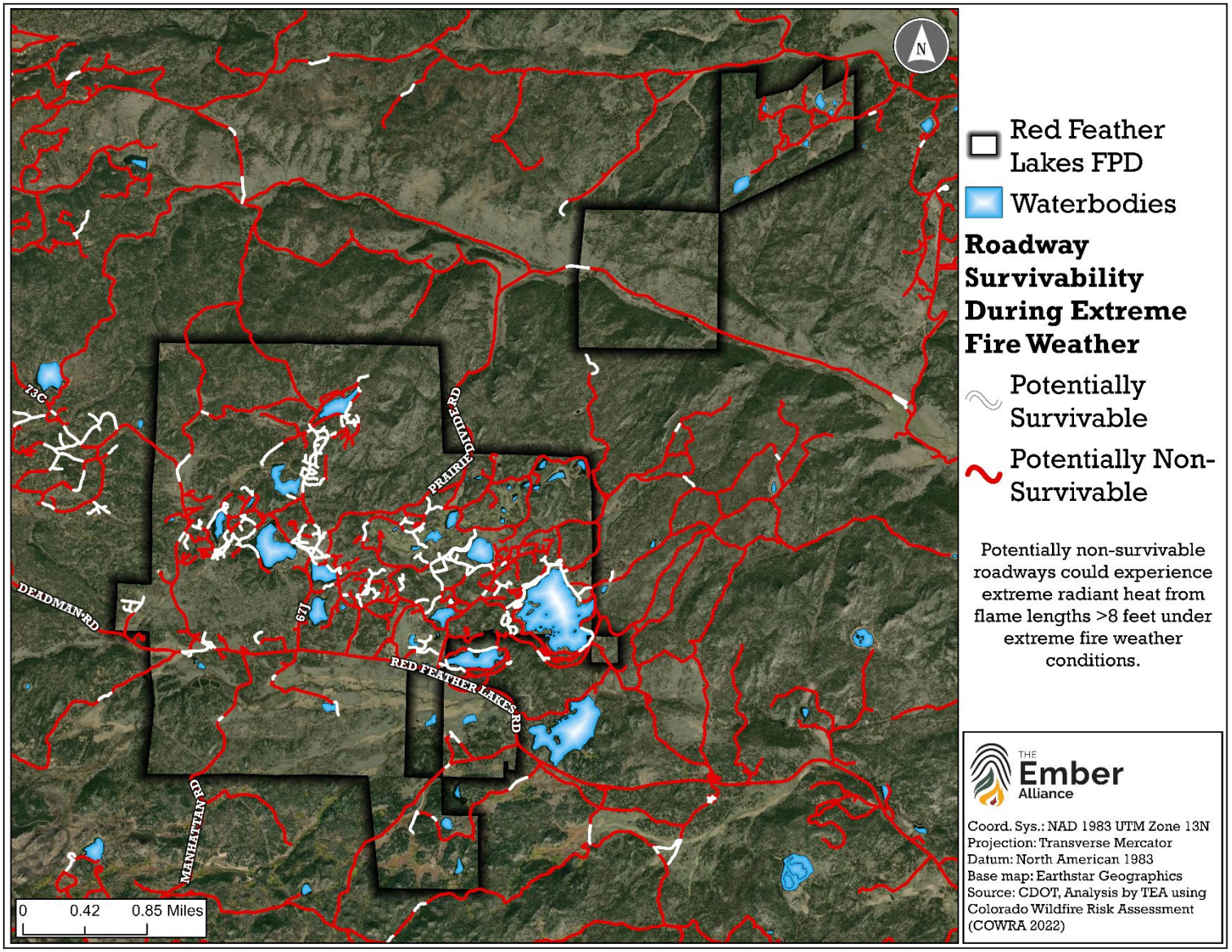


Figure 2.f.5. *Under extreme fire weather conditions, 75% of total road length in RFLFPD could experience potentially non-survivable conditions during wildfires (i.e., flame lengths over 8 feet). Source: Analysis by TEA using CO-WRA 2022. See Appendix B for methodology.*

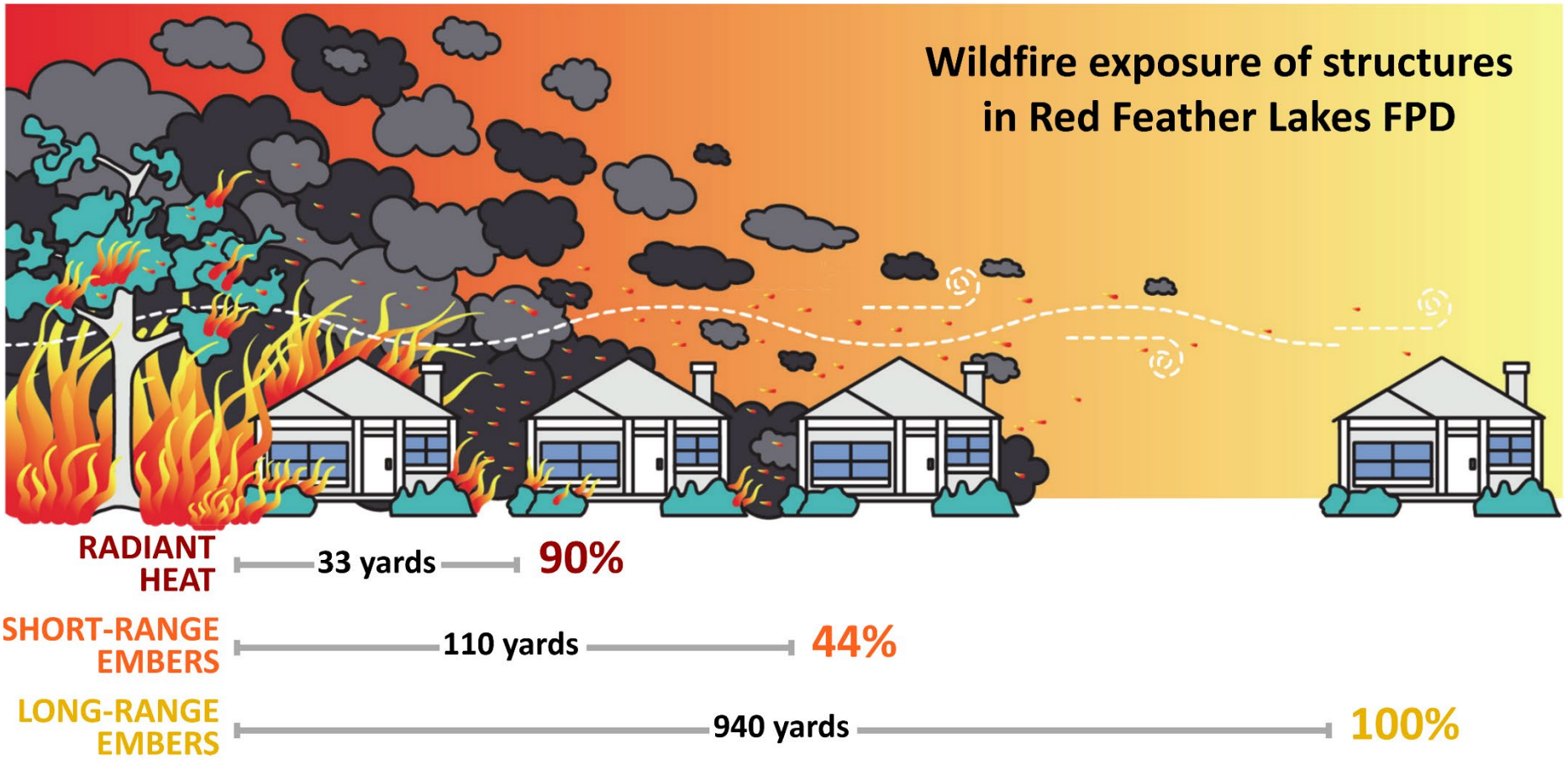


Figure 2.f.6. *Percentage of structures in RFLFPD with different types of exposure to wildfire under extreme fire weather conditions. Radiant heat from burning vegetation can ignite nearby homes, and embers emitted from burning vegetation or other homes can travel long distances and ignite vegetation and homes away from the main fire. Structures closer to the source of embers receive more embers and have a higher chance of exposure than structures receiving fewer, long-range embers. Analysis by TEA based on research by Beverley et al. (2010) and Caggiano et al. (2020) (see* ***Appendix B****: Community Risk Assessment and Modeling Methodology for details). Image modified from Reducing Brushfires Risks by the Victorian Auditor-General's Office.*

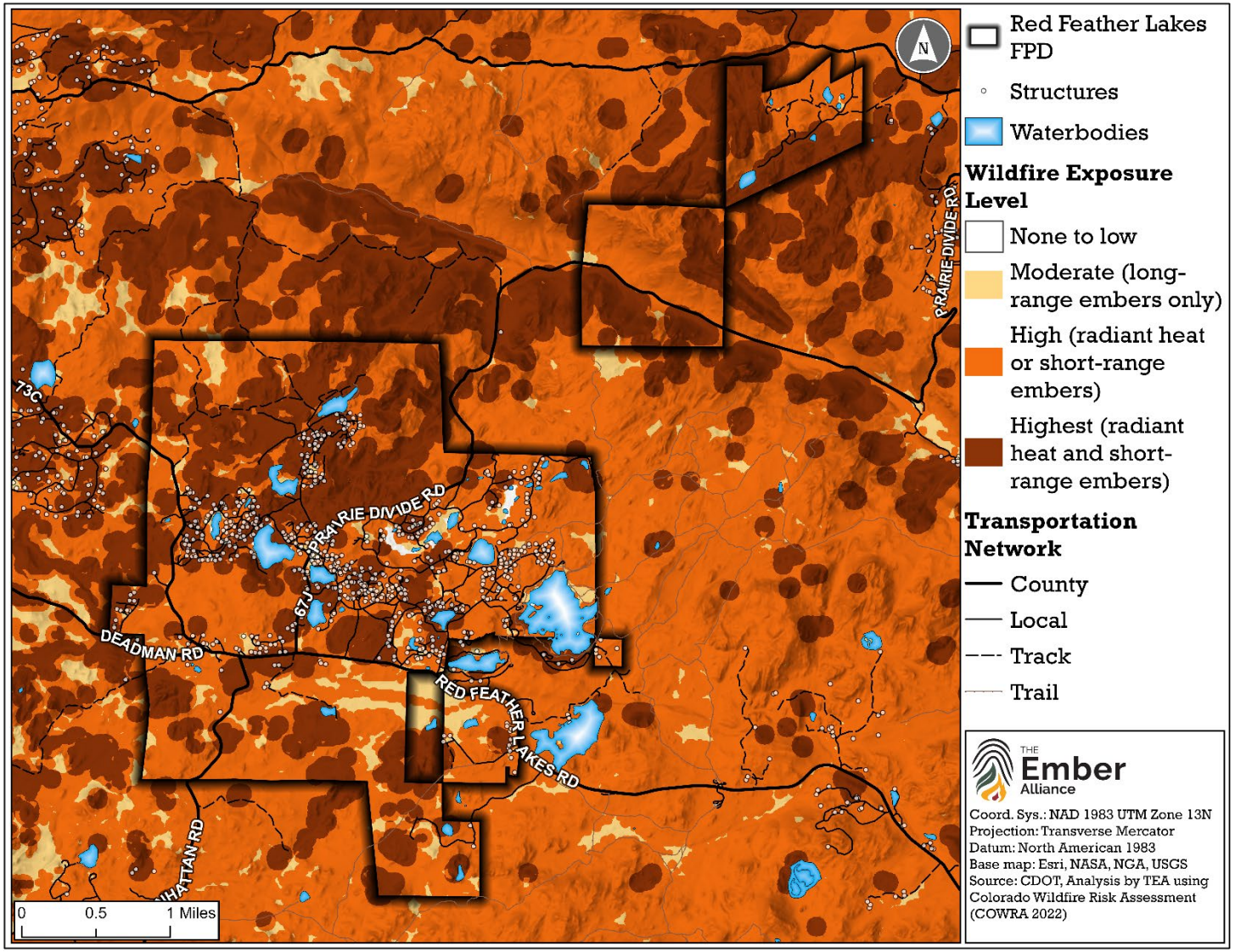


Figure 2.f.7. *Potential exposure of structures to wildfire under extreme fire weather in RFLFPD. 52% of structures have high exposure and 41% have extreme exposure to wildfire. Structures closer to the source of embers receive more embers and have a higher chance of exposure than structures receiving fewer, long-range embers. Source: Analysis by TEA using CO-WRA 2022. See Appendix B for methodology.*

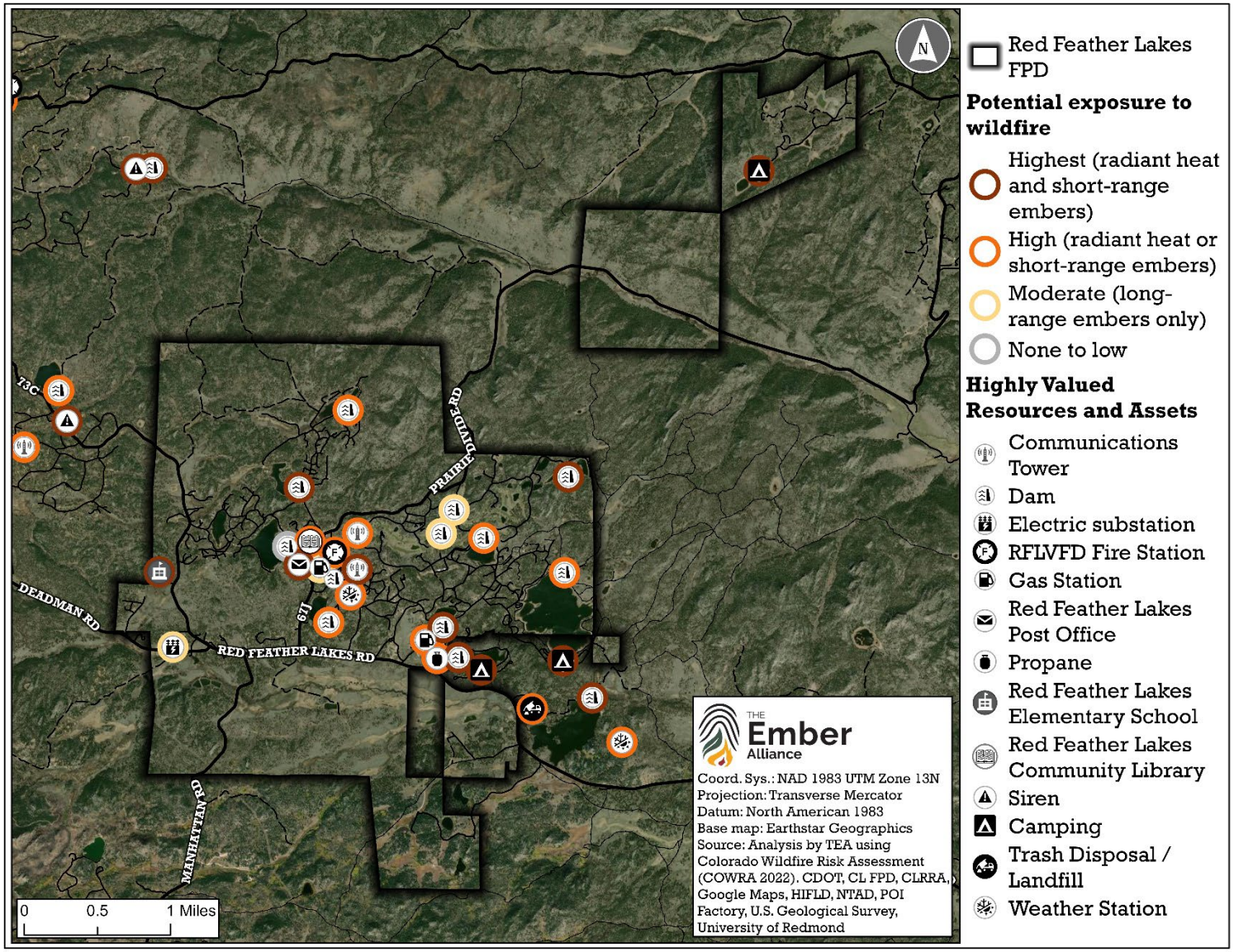


Figure 2.f.8. *The exposure of highly valued resources and assets (HVRAs) to wildfire. Sources: Analysis by TEA using CO-WRA 2022. HVRAs from CDOT, CLRRA, Google Maps, HIFLD, NTAD, POI Factory, USGS, and University of Redmond. See Appendix B for methodology.*

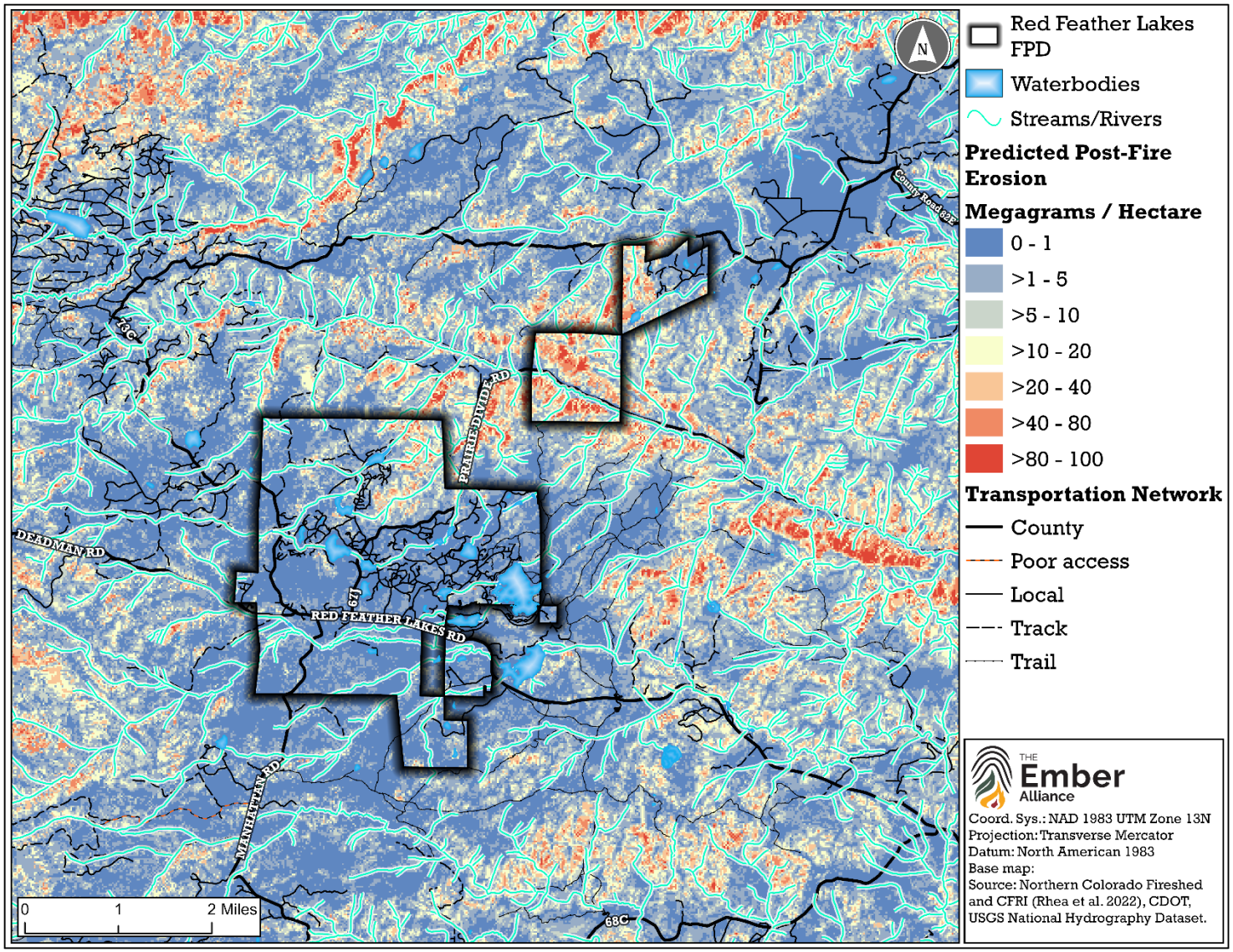


Figure 2.f.9. *The potential for post-fire erosion is significant in the northwest portion of RFLFPD where slopes are steep. Sources: Analysis by the Northern Colorado Fireshed and Colorado Forest Restoration Institute. Roads from CDOT and rivers from USGS National Hydrography Dataset. See Rhea et al. (2022) for methodology.*

Beneficial Fire

Keep in mind that not all wildfire is damaging and destructive. Many ecosystems along the Colorado Front Range have been shaped by wildfire for centuries, and some ecosystems are dependent upon frequent, low-intensity fires. Wildfire creates important habitat for wildlife by removing trees and promoting the growth of a diversity of grasses and forbs. Areas burned by wildfires can serve as fuel breaks for decades afterwards and reduce the potential for damaging wildfire both in the burned area and surrounding landscape.

According to an analysis by the Northern Colorado Fireshed (NCFC), wildfire and/or broadcast prescribed burning could benefit portions of RFLFPD by restoring ecological conditions and reducing fuel loads (**Figure 2.f.10**) (Rhea et al., 2022). The analysis considered potential fire behavior, likelihood of wildfire, exposure of values at risk, relative importance of values, and sensitivity of values to different types of fire behavior. Beneficial fire (positive expected net value change) is more likely in areas without homes, where expected fire behavior is low to moderate, and where ecosystems are more likely to benefit from wildfire (**Figure 2.f.7**). Ponderosa pine ecosystems are very likely to benefit from lower-severity fire but could experience negative impacts from wildfires with higher-severity conditions. Higher severity wildfires in other parts of RFLFPD can threaten homes, threaten important infrastructure, and reduce water quality if post-fire flooding and sedimentation occurs.

Fuel treatments are prioritized as part of this CWPP in the **Section on Priority Project Areas** are intended to reduce potential negative consequences to ecosystems and wildlife while also creating forest conditions that are more resilient to wildfire. Forests with lower tree densities and more open grassy areas can benefit from low- to moderate-severity wildfire and broadcast prescribed burning. Proactive management, including prescribed burning, can support the community's journey towards fire adaptation and coexisting with wildfire.

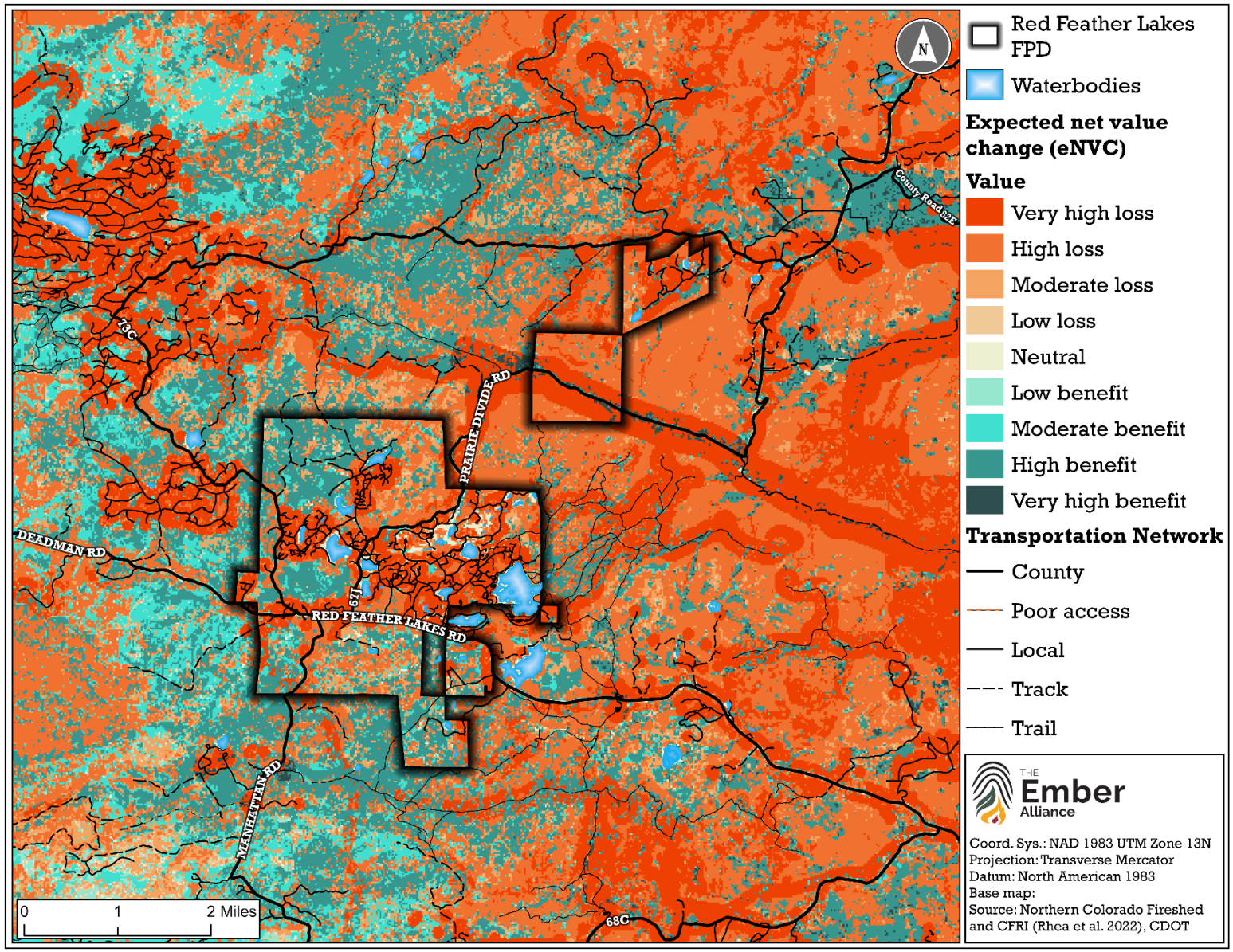


Figure 2.f.10. *According to an analysis by the Northern Colorado Fireshed, wildfire and/or broadcast prescribed burning could benefit portions of RFLFPD by restoring ecological conditions and reducing fuel loads. Beneficial fire is more likely in areas without homes and where expected fire behavior is moderate. Source: Northern Colorado Fireshed (Rhea et al. 2022).*

2.g. Fuel Treatment History in and Around RFLFPD

Fuel treatments reduce the amount of fuel in strategic locations, reducing fire risk to nearby communities and creating tactical opportunities for wildland firefighters to engage with wildland fires. Fuel treatments were important suppression tactical features during the Cameron Peak Fire because they reduced the potential for extreme fire behavior in strategic locations (Avitt 2021). Fuel treatments can also create and maintain healthy, restored forests based on historic conditions, with abundant understory plants, improved wildlife habitat, and lower the risk of high-severity wildfires. The effectiveness of fuel treatments is influenced by a variety of factors, including the type, intensity, quality, and extent of treatment, location of treatments, maintenance of treatments, weather conditions and fire behavior, and actions of firefighters (Agee et al., 2000; Jain et al., 2021). Fuel treatment methods include tree thinning, pruning, pile burning, broadcast prescribed burning, and fuel mastication.

Public land managers and private residents in and around the district have conducted fuel treatments to reduce wildfire risk and restore ecosystem health (**Figure 2.g.1**)[2]. Some of these acres have been treated more than once. For example, some areas were thinned and then experienced a prescribed burn. The USFS completed several successful, large broadcast burns north of the district, and many pile burning projects have been finished to reduce fuel loads around to the west and south of the district. There are large projects in progress and planning around the district and along important evacuation routes to the west of the district as part of the 2024 USFS Black Diamond Landscape Resiliency & Risk Reduction Project.

Fuel treatments can comprise a variety of efforts including vegetative thinning, pile burning, and broadcast burning. Thinning efforts, often involving hand thinning, chipping, mulching, and lop-and-scatter techniques, can reduce tree density and ladder fuels to lower the risk of crown fires. Pile burning has managed woody debris left from thinning operations, while broadcast burning has been used to reduce surface fuels and restore ecological balance.

Strategically located, high-quality fuel treatments can create tactical options for fire suppression (Jolley, 2018; Plucinski, 2019; Reinhardt et al., 2008). Fuel treatments along POD boundaries can allow firefighters opportunities to use direct or indirect suppression techniques to contain fire spread. POD boundaries were an important consideration for defining and prioritizing roadside and stand-scale projects for this CWPP. Using POD boundaries in the district aligns with the NCFC approach to mitigate risk and promote ecological resilience.

There are numerous examples of the tactical use of POD boundaries. Firefighters used fuel treatments in the Red Feather Lakes area as tactical features during the Cameron Peak Fire (Avitt, 2021). A recent analysis demonstrates the importance of previous wildfires and fuel treatments at supporting wildfire suppression during the Cameron Peak Fire (Vorster et al., 2021).

Broadcast prescribed burning is often the most effective method to mitigate wildfire risk and create healthy conditions in a variety of grassland, shrubland, and forest ecosystems (Paysen et al., 2000; Stephens et al., 2009). This method has unique impacts on vegetation, soils, and wildlife habitat that cannot be replicated by mechanical treatments alone (McIver et al., 2013). Prescribed burning mimics naturally occurring wildfire, can treat hundreds of acres at a time, removes surface fuel, and is relatively cost-effective (Hartsough et al., 2008; Hunter et al., 2007). Prescribed burns can reduce property damage during wildfires because they are so effective at reducing fuel loads (Loomis et al., 2019).

Broadcast prescribed burning is challenging in the WUI due to diverse fuel types, proximity to homes, risk of visibility impairments on roads from smoke, health impacts of smoke, and political and social concerns. However, with proper planning and implementation, qualified firefighters can safely conduct prescribed burns, even in the WUI (Hunter et al., 2007). Continuous thinning projects and broadcast prescribed burning are safely and

[2] Note: this dataset may not be all encompassing of individual actions by homeowners.

effectively conducted in Magic Feather, east of Red Feather Lakes, from 2023-2026. Life safety is always a top consideration when developing and conducting prescribed burns.

There is always risk involved in the application of prescribed fire but, when mitigated, the benefits outweigh the risks of not using prescribed fire. Less than 1% of prescribed burns escape containment lines, and most of these are rapidly suppressed (Weir et al., 2019). Unfortunately, one example is the escape of the Elkhorn Prescribed Burn. This experience has understandably created fear amongst some members of the public. The prescribed burn community has taken lessons away from the Elk Fire which will reduce the likelihood of future escapes (CO Department of Public Safety, 2020). The wildland fire community soberly reviews prescribed burn escapes to produce lessons learned and make improvements (Dether, 2005).

An essential component of this CWPP was identifying locations for additional fuel treatments to protect the community. **Section 4** outlines these priority locations and the land management agency leading these efforts in the coming years.

"Broadcast burning, mechanical thinning, and other treatments are proven to mitigate wildfire risk, but they are even more effective when we work together to integrate treatments across the landscape, across borders and ownerships"

– James White, the Rocky Mountain Region Cooperative Fire Specialist.



Prescribed burning can remove surface and ladder fuels and repair ecological processes in frequent-fire ecosystems. This photo is from the Magic Feather prescribed burn in Red Feather. Photo Credit: NCFC.

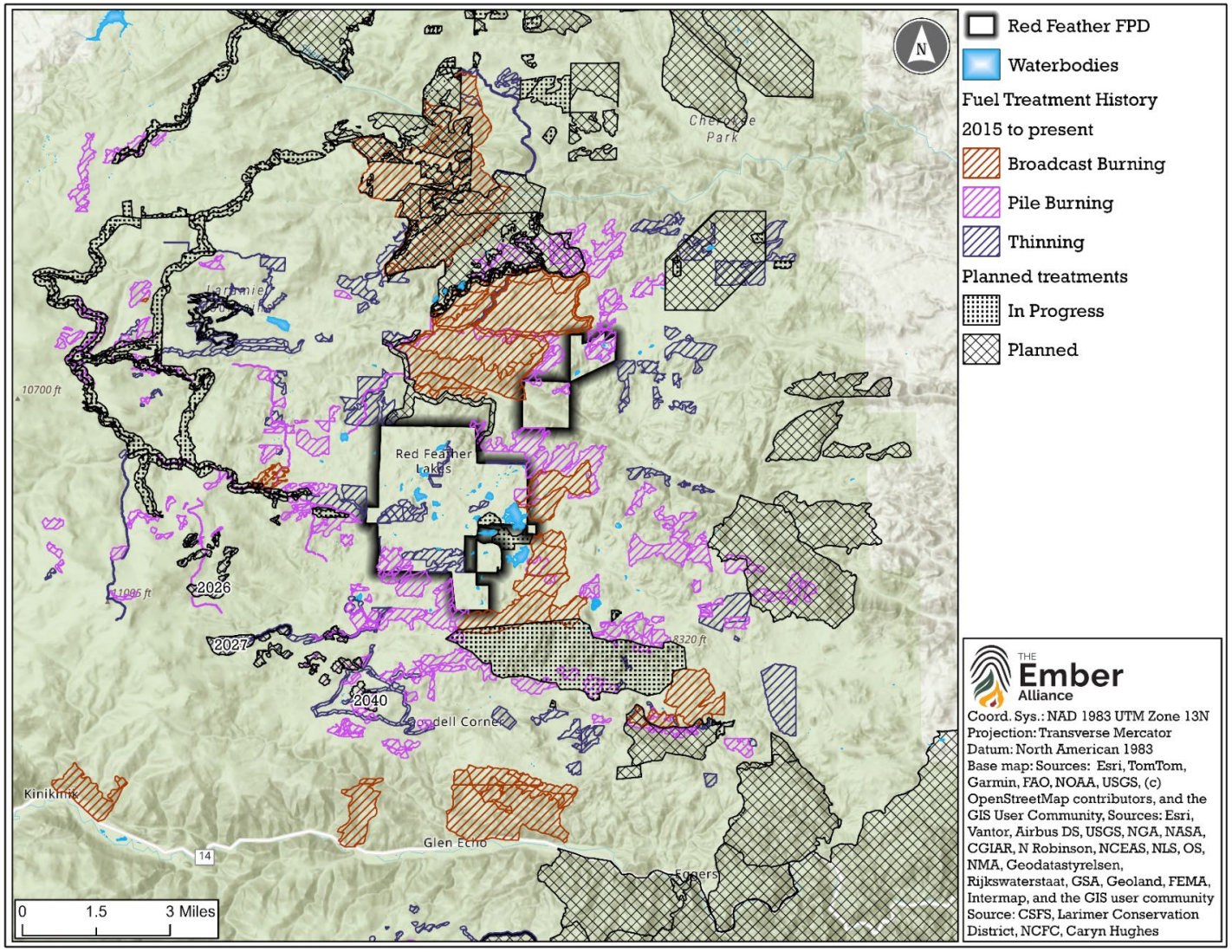


Figure 2.g.1. *Locations of fuel treatment history in and around RFLFPD from 2015 to present, including broadcast burning, pile burning, and thinning, as well as treatments currently in progress and planned. Note: this dataset may not be all-encompassing of all individual actions by homeowners. Sources: CSFS, Larimer Conservation District, NCFC, Caryn Hughes.*

3. Becoming a Fire Adapted Community

RFLFPD, community organizations, and residents are encouraged to adopt the Fire Adapted Communities (FAC) framework to approach wildfire risk comprehensively across multiple scales. Defined by the National Wildfire Coordinating Group (NWCG) as "a human community consisting of informed and prepared citizens collaboratively planning and taking action to safely coexist with wildland fire," this concept can guide residents, fire practitioners, and communities through a holistic approach to become more resilient to fire (Figure 3.1).

Your community's CWPP is the first step toward fire adaptation and increased fire resiliency. By illustrating your community's wildfire risk, engaging residents, developing collaborative relationships among project partners, and outlining existing opportunities and priority activities for risk mitigation, this process lays the foundation for on-the-ground action and an ongoing commitment to risk mitigation at all levels. RFLFPD and public land managers — including the U.S. Forest Service and Larimer County — have an important role to play in implementing the recommendations and priority projects in this CWPP as outlined in both this section and Section 4.

Equally important, individual homeowners and community organizations also play a vital role in addressing shared wildfire risk. The cumulative impact of linked defensible space across private properties can improve the likelihood of home survival and protect firefighters during wildfire events (Jolley, 2018; Knapp et al., 2021). Action and community-building centered around mitigation have reduced wildfire risk and increased community resilience across the mountain west, with mitigation work performed by residents able to spur efforts by their neighbors (Brenkert-Smith et al., 2013).

This section of the CWPP provides homeowners with recommendations and resources for mitigating wildfire risk and enhancing emergency preparedness. It also outlines how residents and community organizations can support RFLFPD and other project partners in this mission and vice versa.

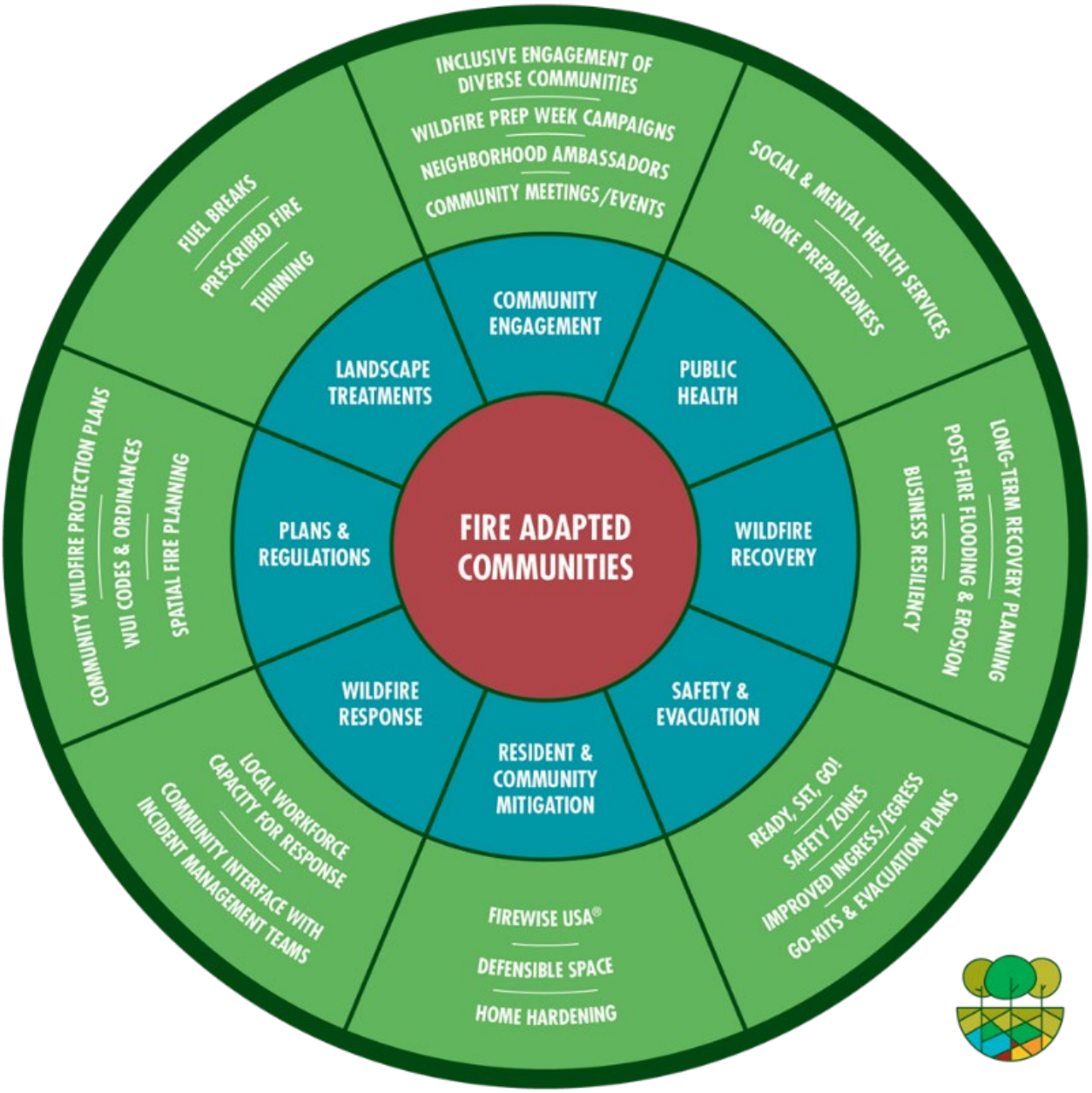


Figure 3.1. *The Fire Adapted Communities graphic provides specific programs and activities that communities can take to reduce their wildfire risk and increase their resilience. Source: [Fire Adapted Community Learning Network]*

3.a. Recommendations for Residents

Mitigate the Home Ignition Zone

During catastrophic wildfires, property loss happens mostly due to conditions in the home ignition zone (HIZ). The HIZ includes your home and other structures (e.g., sheds and garages) and the area within 100 feet of each structure. Firefighter intervention, adequate defensible space, and home hardening are common factors for homes that stand strong during major wildfires (IIBHS, 2019; Knapp et al., 2021; Maranghides et al., 2022).

It is important for residents to work together as a community to mitigate shared wildfire risk in the HIZ. Structure-to-structure ignition is a major concern in WUI neighborhoods and can cause substantial property loss. For example, 99% of the 848 structures that were exposed to direct flame contact during the 2021 Marshall Fire were within 100 feet of another structure, and 78% were within 30 feet (Holstrom et al., 2023). Neighbors can increase their homes' chances of survival during a wildfire if they work together to reduce hazards in their overlapping defensible space. The wildfire resiliency code approved by Larimer County deemed all of unincorporated Larimer County as WUI due to the history of and potential for large, destructive wildland fires.

Defensible space is the area around a building where vegetation, debris, and other types of combustible fuels have been treated, cleared, or reduced to slow the spread of fire and reduce exposure to radiant heat and direct flame. It is encouraged that residents develop defensible space so their homes can stand strong during a wildfire without relying upon limited firefighter resources.

Home hardening is the practice of making a home less likely to ignite from the heat or direct contact with flames or embers. It is important to remember that embers can ignite homes even when the flaming front of a wildfire is far away. Home hardening involves reducing structural ignitability by changing building materials, installation techniques, and structural characteristics of a home. Home hardening measures are particularly important for WUI homes; 50 to 90% of homes ignite due to embers rather than radiant heat during wildfires (Gropp, 2019; Holstrom et al., 2023; Johnston, 2018).



You can increase the likelihood that your home will stand strong during a wildfire and help protect the safety of firefighters by creating defensible space, replacing or altering building materials to harden your home, and increasing firefighter access along your driveway.

Wildfire Risk Reduction Requirements in Larimer County

Effective January 2026, Larimer County approved a wildfire resiliency code which establishes minimum regulations to protect life and property from wildfire exposure in WUI areas of Larimer County. The Larimer County code adopts and amends the 2025 Colorado Wildfire Resiliency Code (CWRC), formalizing wildfire risk mitigation as part of the development and permitting process.

Components of the code include structure hardening and defensible space requirements, as well as permitting and enforcement. Code requirements are not voluntary and apply to construction, alteration, movement, repair, maintenance, and use of any building or structure with occupiable/habitable space within RFLFPD. Buildings or conditions in existence at the time of the adoption of this code are allowed to have their use or occupancy continued, if such condition, use or occupancy was legal at the time of the adoption of this code, provided that such continued use does not constitute a distinct danger to life or property.

Defensible Space Zones 1-3

Do not count on firefighters staying to defend your home—your home should be able to stand strong on its own during a wildfire. There are never enough firefighters to stay and defend every single home during large incidents. Properties that are not defensible will often not receive firefighter resources due to unsafe conditions and the higher likelihood of home loss regardless of firefighter intervention.

Completely eliminating fuels within 5 feet of the home and reducing fuels beyond creates a buffer between your home and vegetation that could ignite during a wildland fire. Mitigation of defensible space can slow the spread of wildfire, prevent direct flame contact, and reduce the chance that embers will ignite material on or near your home (Hakes et al., 2017). Substantially reducing vegetation within a structure's defensible space and removing vegetation that hangs over decks and roofs can reduce structure loss, especially for homes on slopes (Syphard et al., 2014).

Defensible space is divided into three zones around a home or other structure, and recommended practices vary among zones. The Colorado State Forest Service (CSFS) defines the different zones in the following way:

- **Zone 1** (HIZ 1): 0 to 5 feet from the home
    - Some organizations call this zone the "non-combustible zone"
- **Zone 2** (HIZ 2): 5 to 30 feet from the home
    - This is the "lean, clean, and green zone".
- **Zone 3** (HIZ 3): 30 to 100 feet from the home (**Figure 3.a.1**)

Property owners should apply HIZ practices to every structure and surrounding space on their property—not just the primary residence. Campers/RVs, sheds, detached garages, workshops, storage units, and other outbuildings are all potential ignition sources and should be maintained accordingly. Where possible, outbuildings should be placed at least 50 feet from the home to prevent structure-to-structure fire spread (Maranghides et al., 2022). HIZ mitigation not only reduces wildfire risk, but also delivers everyday co-benefits such as lower water use, reduced maintenance and replacement costs, improved energy efficiency, increased durability of homes and landscapes, and enhanced safety and comfort for residents (**Figure 3.a.2**). Make sure you are informed about best practices for protecting your home. See **Table 3.a.1** and the CSFS publication The Home Ignition Zone for recommendations. It is important to familiarize yourself with relevant building code for homes and structures falling within designated WUI. Larimer County wildfire resiliency code requirements are mandatory; however, these requirements apply to new construction, alteration, movement, repair, and maintenance of buildings within RFLFPD and are not applied retroactively to existing homes.

Reviewing safety protocols, creating defensible space, and hardening your home are not one-time actions, but part of *annual* home maintenance when living in the WUI. During a wildland fire, homes that have clear defensible space are identified as sites for wildland firefighters to engage in structure protection, and homes that are not safely defensible will not usually receive firefighter resources. See Home Ignition Zone checklists from the CSFS and the Live Wildfire Ready checklist for annual safety and maintenance activities

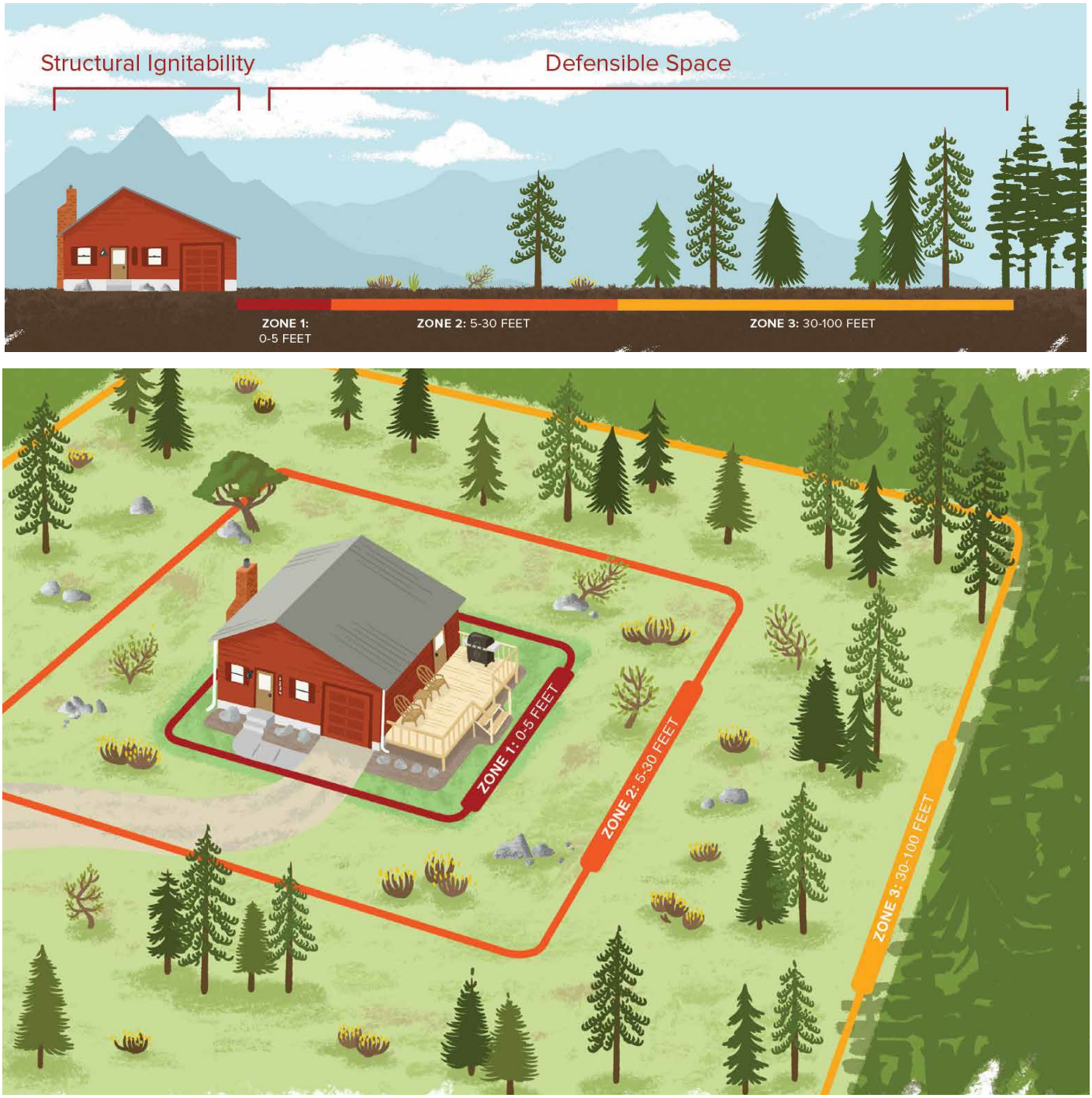


Figure 3.a.1. *Home ignition zones recommended by the Colorado State Forest Service. Using ignition-resistant building materials and removing burnable fuel around primary structures, outbuildings such as sheds, and campers / RVs is crucial for increasing your home's chance of standing strong during a wildfire and creating safe conditions for wildland firefighters. Source: Colorado State Forest Service 2021, The Home Ignition Zone.*



Figure 3.a.2. *HIZ mitigation actions often have additional co-benefits. Source: (Carter et al., 2023; Quarles and Pohl, 2018).*

Table 3.a.1. *Home ignition zone recommendations based on the CSFS publication The Home Ignition Zone. Specific measures will depend on the placement and condition of your property.* ***Section 4.c.*** *includes specific recommendations for zone 3 by forest type.*

Zone 1: 0 to 5 feet from your home – The non-combustible zone.
Goal: Prevent flames from coming into direct contact with your home.
• Create a noncombustible border 5 feet around your home. Remove all vegetation and replace flammable wood chips or mulch with alternatives like dirt, stone, flagstone, concrete, or gravel. Research shows that the worst materials to use in zone 1 are shredded rubber, pine needles, and shredded western red cedar due to their high flammability **(Quarles and Smith, 2011)**. • Remove branches that hang over your roof and drop needles onto your roof. • Remove all fuels within 10 feet of the chimney. • Remove combustible materials (dry vegetation, wooden picnic tables, juniper shrubs, etc.) from underneath, on top of, or within 5 feet of decks, overhangs, windows, and doors. • Annually remove dead or dry leaves, pine needles, and dead plants within 5 feet of your home and off your deck, roof, and gutters. Raking material farther than 5 feet from structures will not significantly reduce the likelihood of ignition. • Move firewood or other combustible materials to zone 3. • Do not use space under decks for storage.

Zone 2: 5 to 30 feet from your home – The lean, clean, and green zone.
Goal: Slow the movement of flames approaching your home and lower the fire intensity.
• Irrigate and mow grasses to 4 inches tall or less. If you are unable to irrigate, replace dry grasses with low-flammability plants that are more drought tolerant and less flammable. • Remove any accumulated surface fuels such as logs, branches, slash, and mulch. • Remove all common junipers because they are highly flammable and tend to hold a layer of flammable material beneath them. Landscape with plants that have more fire-resistant attributes, like short-statures, deciduous leaves, and higher moisture content. See low-flammability plants from Colorado State University Cooperative Extension for suggestions. • Remove enough coniferous trees to create at least 10 feet* of space between crowns. Measure from the outermost branch of one tree to the nearest branch on the next tree. Create even more space between trees if your home is on a slope (**Table 3.a.2**). See **Figure 3.a.3** for how to measure crown spacing. • Favor the retention of aspen trees because this species naturally has high fuel moisture, no low branches, and smooth bark, making them less likely to ignite than conifer trees. Remove only downed or standing dead aspen trees. • Remove ladder fuels under remaining trees. This is any vegetation that can bring fire from the ground up into taller fuels. Keep shrubs at least 10 feet* away from the edge of tree branches. • Remove limbs so branches do not hang below 6 feet above the ground, ideally not below 10 feet above the ground. See **Figure 3.a.3** for a depiction of how to measure limb height. • Keep spacing between shrubs at least 2-3 times their height. • Relocate wood piles and propane tanks to zone 3. • Remove stressed, diseased, dead, or dying trees and shrubs. This reduces the amount of vegetation available to burn and improves forest health.

Zone 3: 30 to 100 feet from your home

If you live on a slope, this zone should be larger due to the greater potential for extreme fire behavior.

Goal: Slow movement of flames, move fire to the ground, and reduce ember production.

- Store firewood and propane tanks at least 30 feet away and uphill from your home and away from flammable vegetation. Store even farther away if your home is on a slope.
- Move campers / RVs, boats, detached garages, storage buildings, barns, and other large structures at least 50 feet away from your home.
- Mow or trim grasses to a maximum height of 6 inches. Grasses can be taller in zone 3 than zone 2 because of the greater distance from your home, but shorter grass is always better for reducing potential flame lengths and therefore radiant heat exposure.
- Follow guidance in **Section 4.c Recommendations by Vegetation Type** to determine the best management practices for the trees and shrubs in your zone 3. This usually involves reducing the number and density of trees and/or altering their arrangement.
- Favor the retention of aspen trees because this species naturally has high fuel moisture, no low branches, and smooth bark, making them less likely to ignite than conifer trees. Remove only downed aspen trees.
- Remove limbs so branches do not hang below 6 feet above the ground, ideally not below 10 feet above the ground. See **Figure 3.a.3** for a depiction of how to measure limb height.
- Remove shrubs and saplings that can serve as ladder fuels.
- Remove heavy accumulations of dead trees and branches.
- Consult with a qualified forester to develop a plan to manage your property to achieve fuel reduction and other goals, such as creating wildlife habitat. The Colorado State Forest Service's Fort Collins Field Office provides a list of forestry contractors on their website to help homeowners find local, reliable private contractors for mitigation work they cannot complete themselves.

*Spacing recommendations are a general guideline and should be increased for properties on steeper slopes. Reach out to RFLFPD, CSFS, LCD, or other forestry professionals to develop a plan for mitigating wildfire risk on your property.



Aspen trees naturally have high fuel moisture, no low branches, and smooth bark, making them less likely to ignite than conifer trees. Retaining small groups of aspen trees is acceptable in zone 2—just remember to rake up dry leaves that fall onto your roof or on the ground within 5 feet of your home. Source: Fire Adapted Colorado.

Table 3.a.2. *Minimum recommended spacing between tree crowns and shrubs is greater for properties on steeper slopes due to the exacerbating impact of slope on fire behavior (Dennis, 2003).*

Percent slope	Minimum spacing between tree crowns	Minimum spacing between shrubs / small clumps of shrubs
0 to 10 %	10 feet	2.5 x shrub height
11 to 20%	15 feet	3 x shrub height
21 to 40%	20 feet	4 x shrub height
>40%	30 feet	6 x shrub height

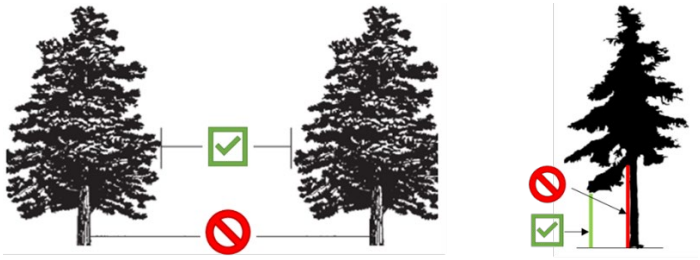


Figure 3.a.3. *Spacing between tree crowns is measured from the edge of tree crown to tree crown, NOT from tree stem to tree stem (left). Height of limbs above the ground is measured from the ground to the lowest point of the limb, NOT from where the limb attaches to the tree (right).*





Figure 3.a.4*. Grasses, shrubs, and wildflowers recovered quickly after tree removal in this ponderosa pine forest at the Shambhala Mountain Center near Red Feather Lakes. This beautiful and restored ecosystem is less susceptible to high-severity crown fire and can help reduce risk of wildfire damage to surrounding communities. The bottom image shows the diverse understory ecosystem that can recover within 1-3 years of removing trees and increasing light availability in ponderosa pine ecosystems. Photo credit: Larimer Conservation District (https://www.fortcollinscd.org/before-and-after.html).*

Some homeowners in the WUI are concerned that removing trees will destroy the forest or diminish the beauty and value of their property. On the contrary, many overly dense ponderosa pine stands are considered unhealthy by forestry professionals and have diverged greatly from the open, resilient forests historically maintained by frequent, lower-intensity wildfires (**Figure 2.e.2**). Regarding aesthetics and property value, the greatest threat is not mitigation work, but the devastation of a high-severity wildfire, which can scorch the landscape and wipe out entire stands of vegetation.

Forest management can look messy and destructive in the first years following treatment; however, grasses, shrubs, and wildflowers will respond to increased light availability after tree removal and create beautiful ecosystems with lower fire risk (**Figure 3.a.4**). Many property owners enjoy their land even more after conducting effective fuel treatments. Removing trees can open incredible views of mountains, rivers, and rock formations, and wildlife are often attracted to forests with lower tree densities and a greater abundance of understory plants. Reducing fuel loads and increasing the spacing between trees increases the chance that your home and your neighbors' homes will stand strong during a wildfire, and most importantly, it increases the safety of wildland firefighters working to protect your community**.**

Linked Defensible Space

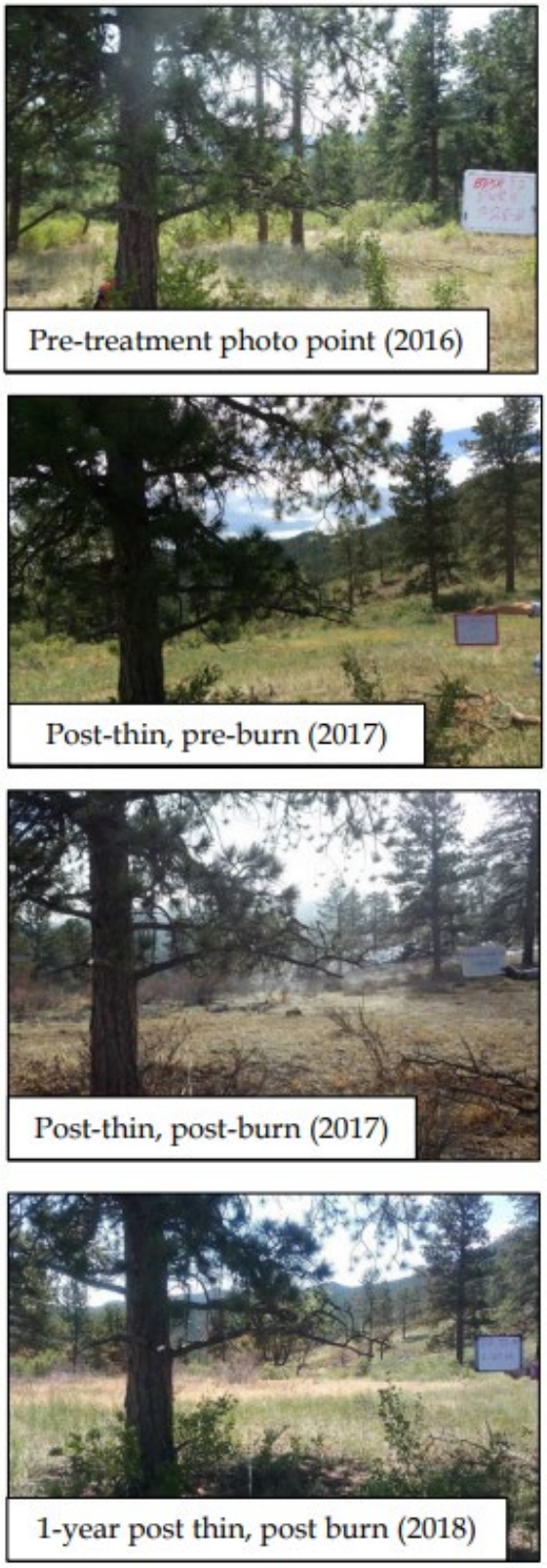
The home ignition zone of individual homes can overlap that of their neighbors, with wildfire hazards on one property threatening adjacent properties. Additionally, many properties within RFLFPD contain multiple large structures. Flaming structures can emit significant radiant heat and embers, endangering homes and structures near them. Nearly all homes in the district (92%) have overlapping HIZs with at least one neighboring home, and 58% have share HIZs with at least three neighboring homes (**Figure 3.a.5**).

Neighbors can increase their homes' chances of survival during a wildfire if they work together to create linked defensible space. Linked defensible space also creates safer conditions and better tactical opportunities for wildland firefighters.

Keeping this in mind, defensible space projects that transcend property lines and ownership boundaries are better candidates for grant funding due to their strategic value.

How can you help inspire your neighbors to act? Start by creating defensible space and hardening your own home. Then try the ideas below:

- ✓ Get a home assessment from RFLFPD or LCSO Wildfire Partner Program and discuss the learnings with your neighbors.



A restored ponderosa pine ecosystem treated with thinning and burning at the Ben Delatour Scout Ranch. Photo Credits: Colorado Forest Restoration Institute.

- ✓ Invite your neighbors over for a friendly conversation about the risk assessment in this CWPP. Review resources about defensible space together, discuss each other's concerns and values, and develop joint solutions to address shared risk.
- ✓ Volunteer with the RFLFPD, North 40 Mountain Alliance, or the Red Feather Lakes Community Association to help educate your community about the benefits of defensible space and home hardening.
- ✓ Follow and share guidance from CSFS Live Wildfire Ready to help educate your community about the benefits of defensible space and home hardening.
- ✓ Help organize walking tours in your neighborhood to visit the property of residents with exemplary defensible space. Witnessing the type of work that can be done, and seeing that a mitigated property can still be aesthetically pleasing, can encourage others to follow suit.
- ✓ Apply for grants that support fuels mitigation for multi-homeowner projects (see **Funding Opportunities Section**).

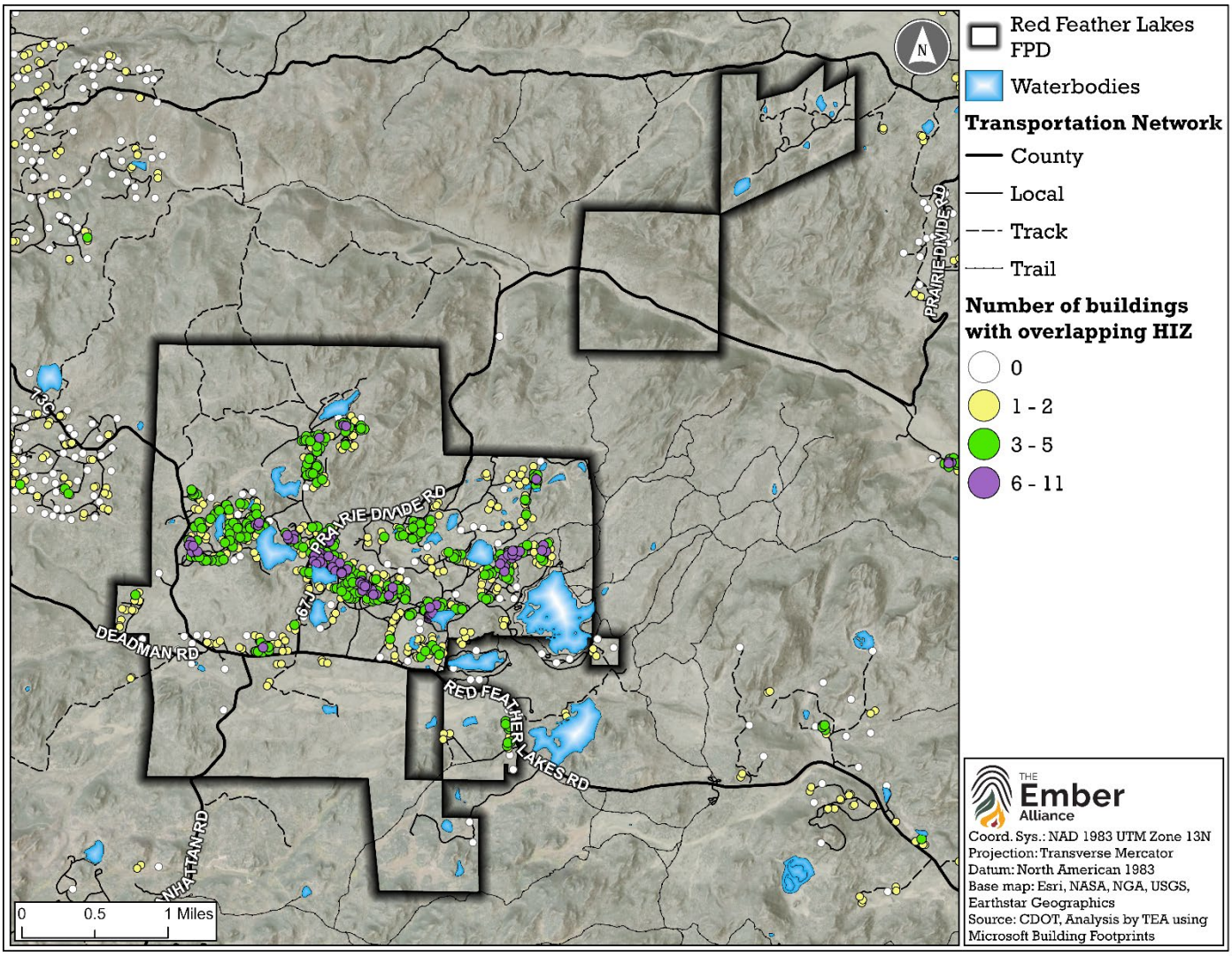


Figure 3.a.5. *92% of structures within RFLFPD have overlapping HIZs with at least one other structure, and 58% share HIZs with at least three other structures, opening them up to higher risk of short-range embers from other structures and home-to-home ignitions. Source: Analysis performed by TEA with structure locations from Microsoft Building Footprints.*

Defensible Space Zone 3 Recommendations by Vegetation Type

Local knowledge and professional expertise are needed to design effective, site-specific fuel treatments based on the best available science. Specific fuel treatment recommendations are dependent on forest type, tree density, fuel loads, terrain, land use, and management objectives. The location and purpose of treatments also matter. Treatments in large, forested areas can include the retention of individual trees and groups of trees. Evenly and widely spacing trees might be reasonable in defensible space zone 3, but this tree arrangement would not be appropriate for resilience-style fuel treatments.

Treatments in defensible space zone 3 (30-100 feet away from the home) can promote forest resilience, but it is most important to focus on reducing wildfire risk to the home, creating safer conditions for firefighters, and increasing the visibility of your home from the road for firefighters. Homeowners often enjoy the more open forest around their home because it lets in more light which encourages understory grasses and shrubs to grow and, in turn, can increase wildlife sightings near their home. Defensible space zone 3 sometimes overlaps neighboring properties and requires residents to work together to address shared wildfire risk.

For all fuel treatments, it is important to address surface fuels. Forest management operations often increase surface fuel loads and can fail to achieve fire mitigation objectives if fuels created by the harvest activities (also known as slash) are not addressed (Agee and Skinner, 2005). Slash can include small trees, limbs, bark, and treetops. See the **Approaches to Slash Management Section** for pros and cons of different slash management options.

Mitigating the impacts of tree removal on soil compaction and erosion is also important when treatments occur near streams and riparian ecosystems. CSFS recommends streamside management zones of at least 50 feet (CSFS, 2023). Treatments should be monitored for colonization of invasive, weedy plants that might require control through integrated weed management. It is always a good idea to take pictures of treatments before and after to help evaluate effectiveness and monitor changes over time.

Here we provide general recommendations for treatments in defensible space zone 3 and stand-scale fuel treatments and ecological resilience by vegetation types. Guidance for defensible space is summarized from the CSFS publication The Home Ignition Zone. Using the CSFS Home Ignition Zone Guide and the resources in this CWPP for different vegetation types, homeowners can create an effective fuel mitigation plan for Zone 3. If homeowners are not comfortable with this, they can work with a forester who knows the Wildfire Resiliency Code to help come up with a plan.

Overall Goals of Mitigation Work in Defensible Space Zone 3:

- Reduce surface fuels, reduce tree density, and increase the distance between surface and canopy fuels.
- Moderate fire behavior near structures and increases their chance of standing strong during a wildfire.
- Increase safety and access for wildland firefighters.
- Increase the visibility of structures from roadways to assist wildland firefighters with locating and accessing your home.
- Coordinate with partners when defensible space zone 3 overlaps neighboring properties to address shared wildfire risk. Linked defensible space creates safer conditions and better tactical opportunities for wildland firefighters. Defensible space that span ownership boundaries are better candidates for grant funding due to their strategic value.

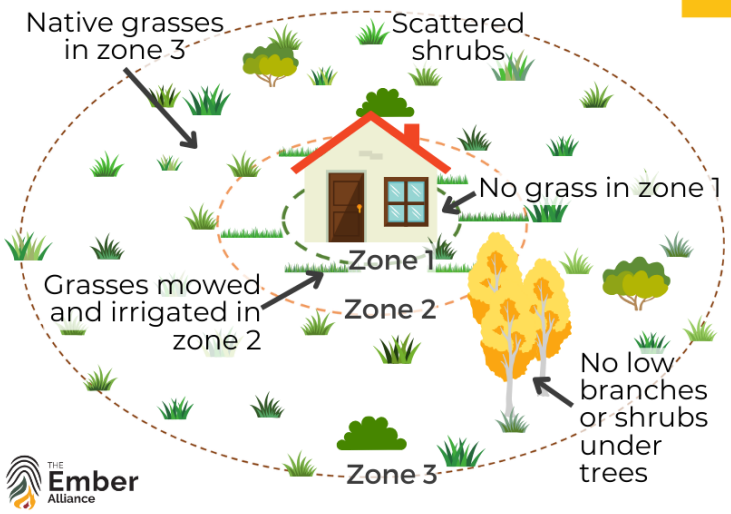
Grasslands

Species: Blue grama, little bluestem, prairie dropseed, buffalograss, sideoats grama, others

Typical elevation: 4,000-6,500 ft

Fire return interval: 2 to 20 years (frequent)

Fire severity: Low severity



Sources: CSFS Home Ignition Zone; Grassland Management in Boulder

Wildfires can spread rapidly across grasslands, and the management of grasslands is important for both fire resilience and ecological restoration.

Management in Defensible Space Zone 3

- Homeowners adjacent to grasslands should focus their efforts in zones 1 and 2
- Mowing grass is not required in zone 3.
- Remove cheatgrass and smooth brome with herbicide, grazing, or prescribed burns, and seed with native species.
- Replace wooden fences with non-flammable materials to reduce the chance of fire spreading from grasses to fences to homes.
- Use goats, cows, or other livestock to manage grasses and/or woody plants.
- Where appropriate, conserve prairie dogs. Their activity creates bare ground that can slow the spread of fire.

Shrublands

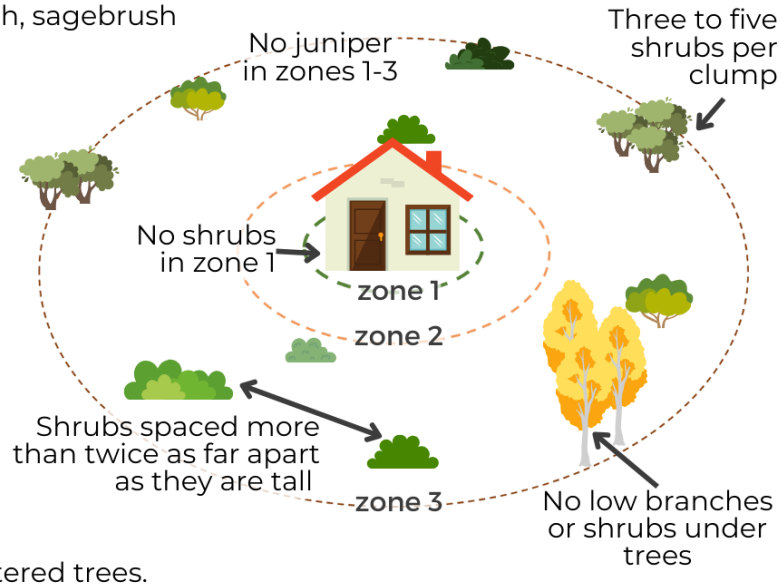
Species: Rocky mountain juniper, common juniper, Gambel oak, mountain mahogany, antelope bitterbrush, sagebrush

Typical elevation: 4,000-9,000 ft

Fire return interval: 2-30 years (frequent)

Fire severity: Low to moderate severity, depending on fuel continuity.

Shrubs that are close together and adjacent to homes are hazardous. In dry climates like Colorado, they can burn very hot and emit embers.



Management in Defensible Space Zone 3

- Remove shrubs under tree canopies.
- Remove limbs below 6-10 feet on scattered trees.
- Remove common junipers, which are highly flammable.
- Thin clumps of shrubs down to three to five shrubs/clump. Favor leaving large, old, Gambel oaks for biodiversity.
- Use mastication, mowing, herbicide, and prescribed fire for shrub removal, depending on the species and appropriate use of these management tools.
- Use goats, cows, or other livestock to manage grasses and/or woody plants.

Source: CSFS Home Ignition Zone

Ponderosa pine mixed conifer

Species: Ponderosa pine, Douglas-fir, aspen, juniper, white fir, gamble oak

Typical elevation: 6,300-9,500 ft



Fire return interval: 7-50 years (frequent)

Fire severity: Low- to moderate-severity, with some smaller patches of stand-replacing fire where most or all trees die

Ponderosa pine mixed conifer forests are fire dependent. Historically, fire burned across the forest floor, controlling tree regeneration, removing lower limbs on mature trees, and creating large, open spaces between trees.

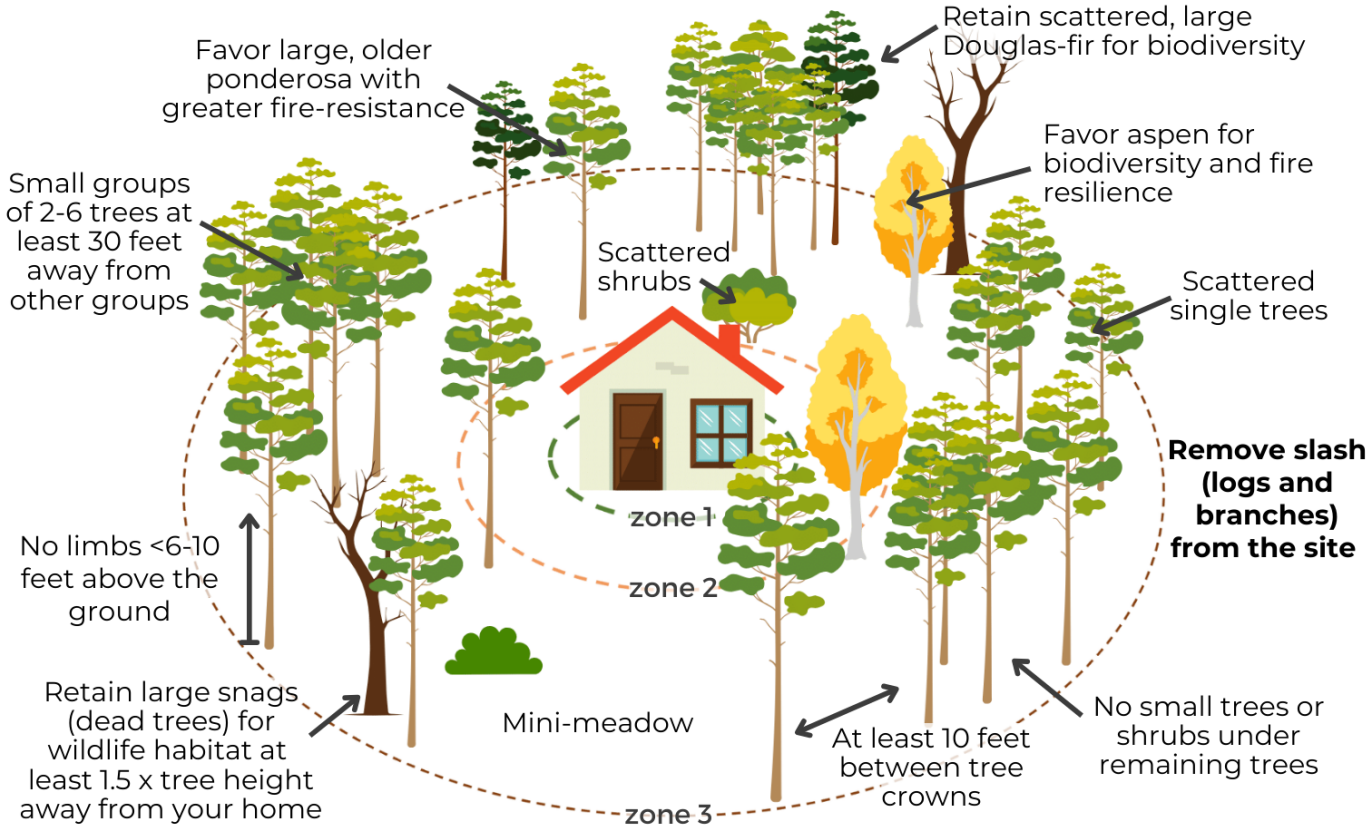


Human management activities (grazing, logging, fire suppression) have resulted in unnaturally dense forests. During extreme weather, high winds can easily spread fire between tree crowns, resulting in very large high-severity wildfires where most trees are killed. This is not always the case but is a trend that has occurred more frequently in this forest type in the last few decades.

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Management in Defensible Space Zone 3

To restore ecological conditions, increase fire resilience, and increase your home's ability to stand against wildfire, leave only 25-60 trees/acre in zone 3 (15-40 trees within 30 to 100 feet of your home) and create mini-meadows for grasses, wildflowers, and scattered shrubs.



THE Ember Alliance

Sources: CSFS Home Ignition Zone; Battaglia et al. 2018. Forest Ecology & Management 422:147-160; Rocky Mountain Research Station GTR-310.

Douglas-fir mixed conifer

Species: Douglas-fir, ponderosa pine, lodgepole, aspen, white fir, occasional spruce, limber pine, gamble oak

Typical elevation: 6,000-9,500 ft

Fire return interval: 20 to >100 years (semi-frequent)

Fire severity: Moderate-severity with patches of stand-replacing fire where most or all trees die

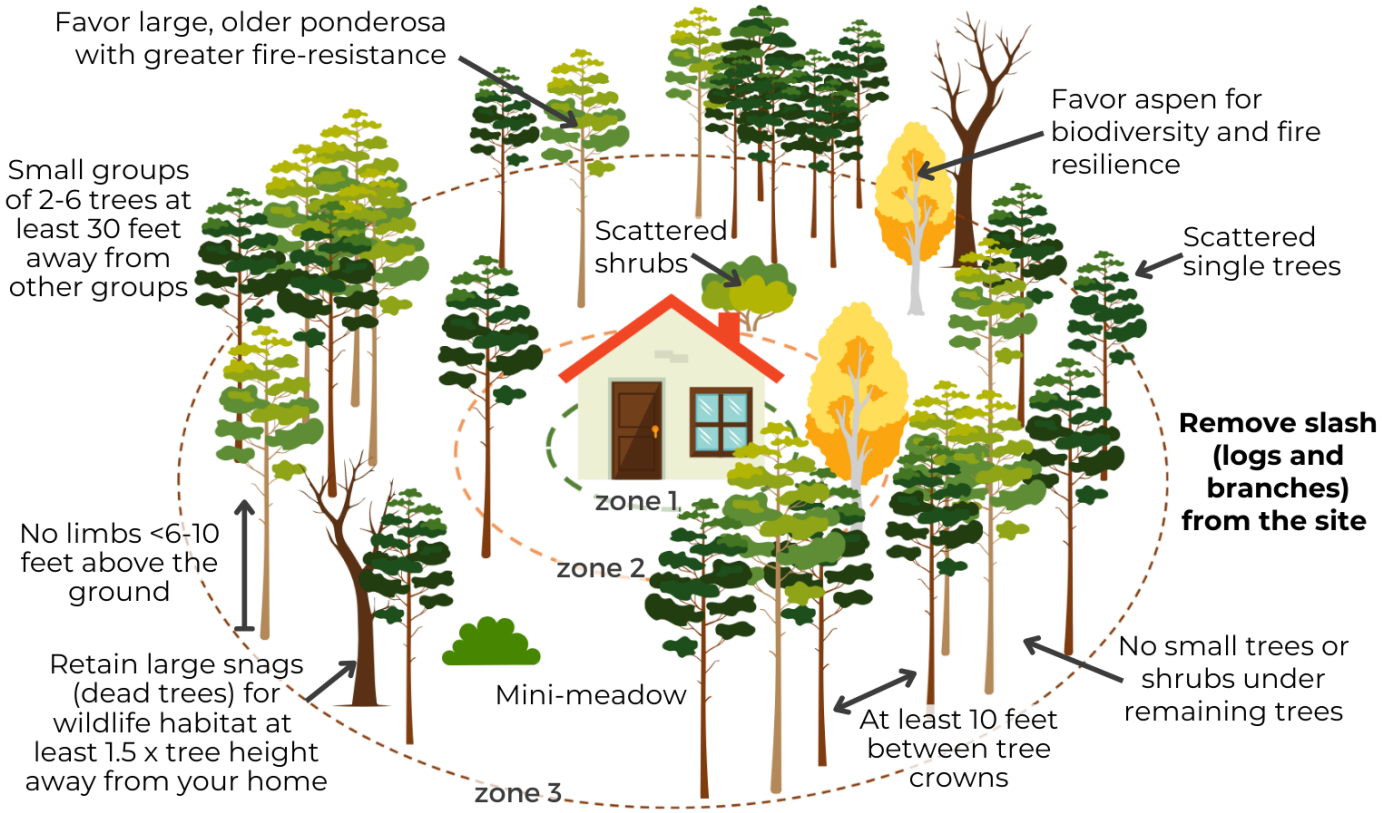


Douglas-fir mixed conifer forests contain a diversity of tree species, many of which are not as fire tolerant as ponderosa pine. These forests also tend to be cooler and wetter, and as a result do not burn as frequently. When fire burns in these areas, patches of stand-replacing fire can be common. These forests are naturally denser than lower elevation forests, but human management activities (grazing, logging, fire suppression) have resulted in unnaturally dense forests that can fuel larger, more extreme wildfires.

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Management in Defensible Space Zone 3

To restore ecological conditions, increase fire resilience, and increase your home's ability to stand against wildfire, leave only 25-60 trees/acre in zone 3 (15-40 trees within 30 to 100 feet of your home) and create mini-meadows for grasses, wildflowers, and scattered shrubs.



THE Ember Alliance

Sources: CSFS Home Ignition Zone; Battaglia et al. 2018. Forest Ecology & Management 422:147-160; Rocky Mountain Research Station GTR-310.

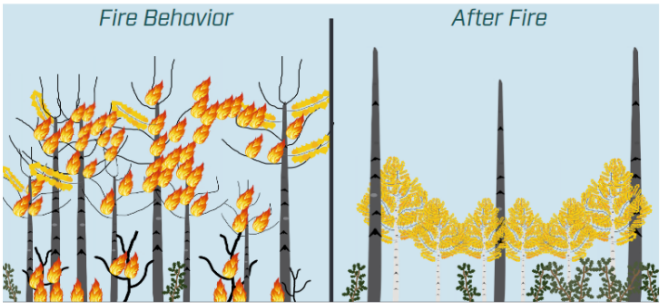
Aspen forests

Species: Aspen, occasional ponderosa pine, lodgepole pine, blue spruce, or other conifers

Typical elevation: Highly variable

Fire return interval: Highly variable

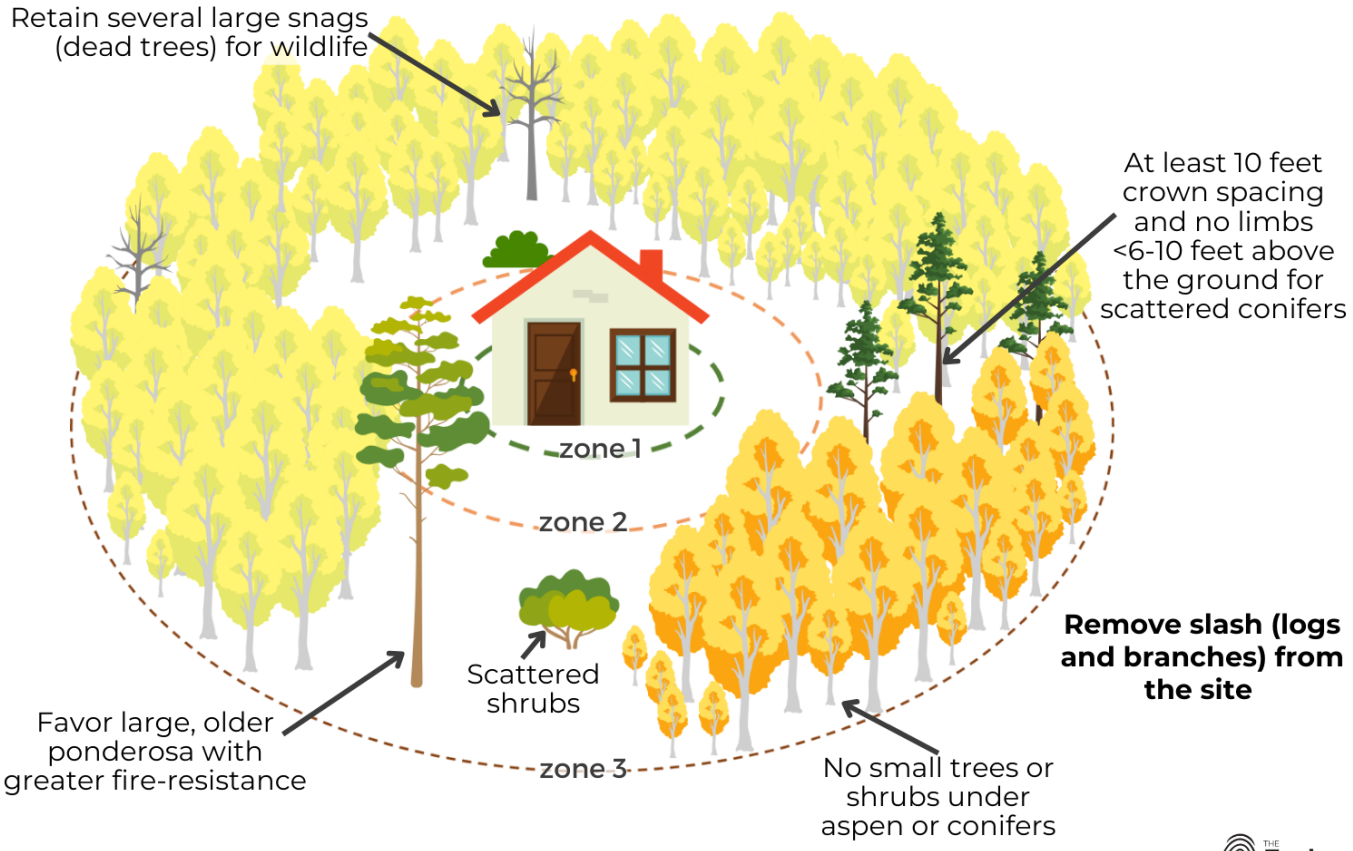
Fire severity: Slow and creeping or, during drought, stand-replacing fire where most or all trees die



Aspen trees are fairly fire resistant and fire resilient. These deciduous trees have high fuel moisture, no low branches, and smooth bark, making them less likely to ignite than conifer trees. Aspens are readily killed by fire, but they recover quickly via sprouting. Fires can create conditions where aspen stands expand because of the species' ability to sprout rather than needing to germinate from seed, and because this sun-loving species experiences reduced competition from conifer trees killed by fire.

Management in Defensible Space Zone 3

Aspen trees do not need to be removed from zone 3 due to their fire-resistant and fire-resilient nature. Instead, focus on removing limbs from conifer trees, shrubs growing under aspen and conifers, and slash (logs, branches, and other woody material).



Source: CSFS Home Ignition Zone.

Lodgepole pine

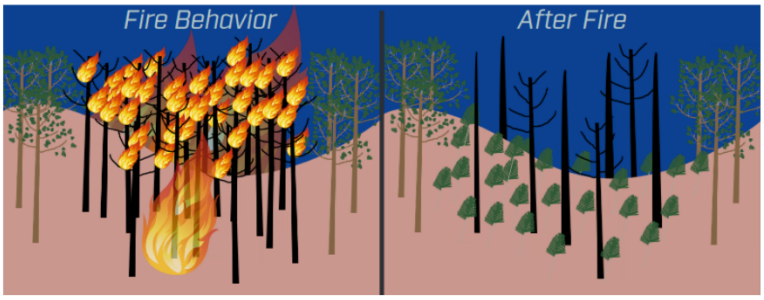
Species: Lodgepole pine dominated; occasional Douglas-fir, ponderosa pine, aspen, white fir, Engelmann spruce, blue spruce, limber pine, gamble oak

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Typical elevation: 8,000-10,000 ft

Fire return interval: 75 to 300 years (infrequent)

Fire severity: Stand-replacing fire where most or all trees die

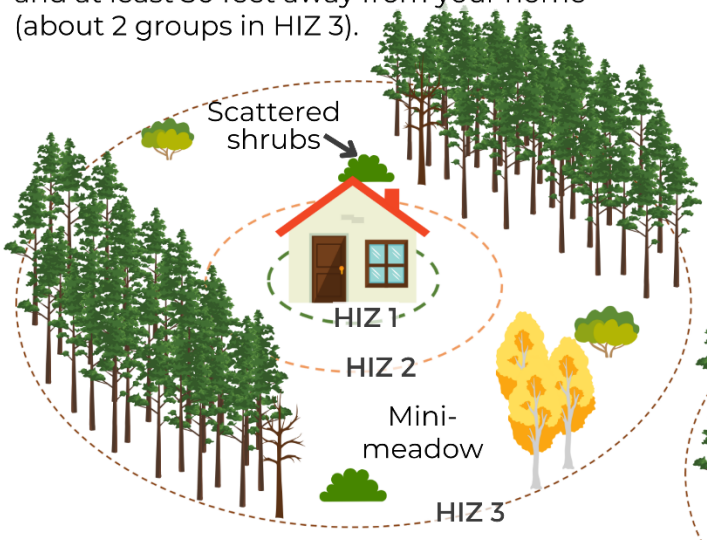


Lodgepole pine forests naturally grow densely, so fire spreads easily from tree crown to tree crown, resulting in patches where most trees are killed. Lodgepole pine also can have serotinous cones, which open and release seeds when heated by fire. These seeds then readily regenerate the new forest. More research is needed to understand forest recovery following the combination of drought, climate change, mountain pine beetle mortality, and recent wildfires.

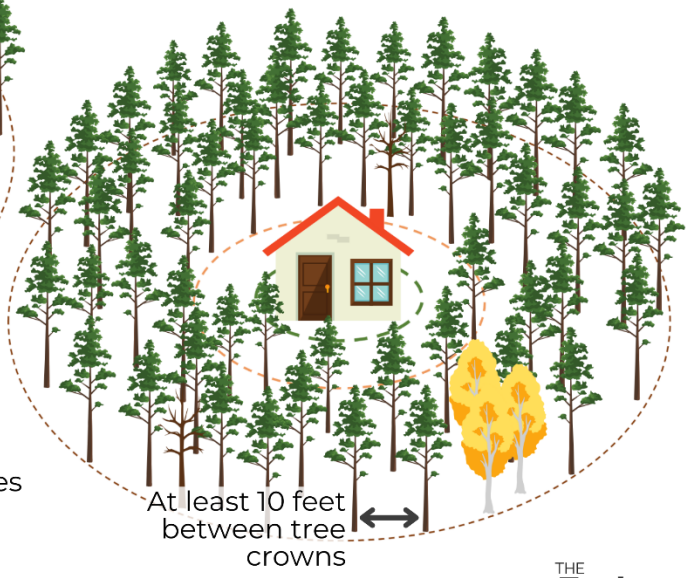
Management in Home Ignition Zone 3

Lodgepole pine trees can blow over if too many neighboring trees are removed before they can adapt to the wind. There are two options for managing lodgepole pine in HIZ 3 to increase your home's chance of standing strong during a wildfire and to reduce windthrow:

Option 1: Leave groups of 30-50 trees at least 30-50 feet apart from other groups and at least 30 feet away from your home (about 2 groups in HIZ 3).



Option 2: Slowly thin the stand, no more than 30% of trees each time. Repeat to achieve at least 10-feet between tree crowns (no more than 80 trees/acre or 50 trees within HIZ 3, fewer for larger trees or on steep slopes). **This can take about 10 years to achieve, during which time, your home is still at risk.**



For both options 1 and 2:

- No limbs <6-10 feet above the ground
- No small trees or shrubs under remaining trees
- Very few to no trees in HIZ 2 and none in HIZ 1
- Favor aspen for biodiversity and fire resilience
- Retain several large snags (dead trees) for wildlife habitat at least 1.5 x tree height away from your home
- **Remove slash (logs and branches)**

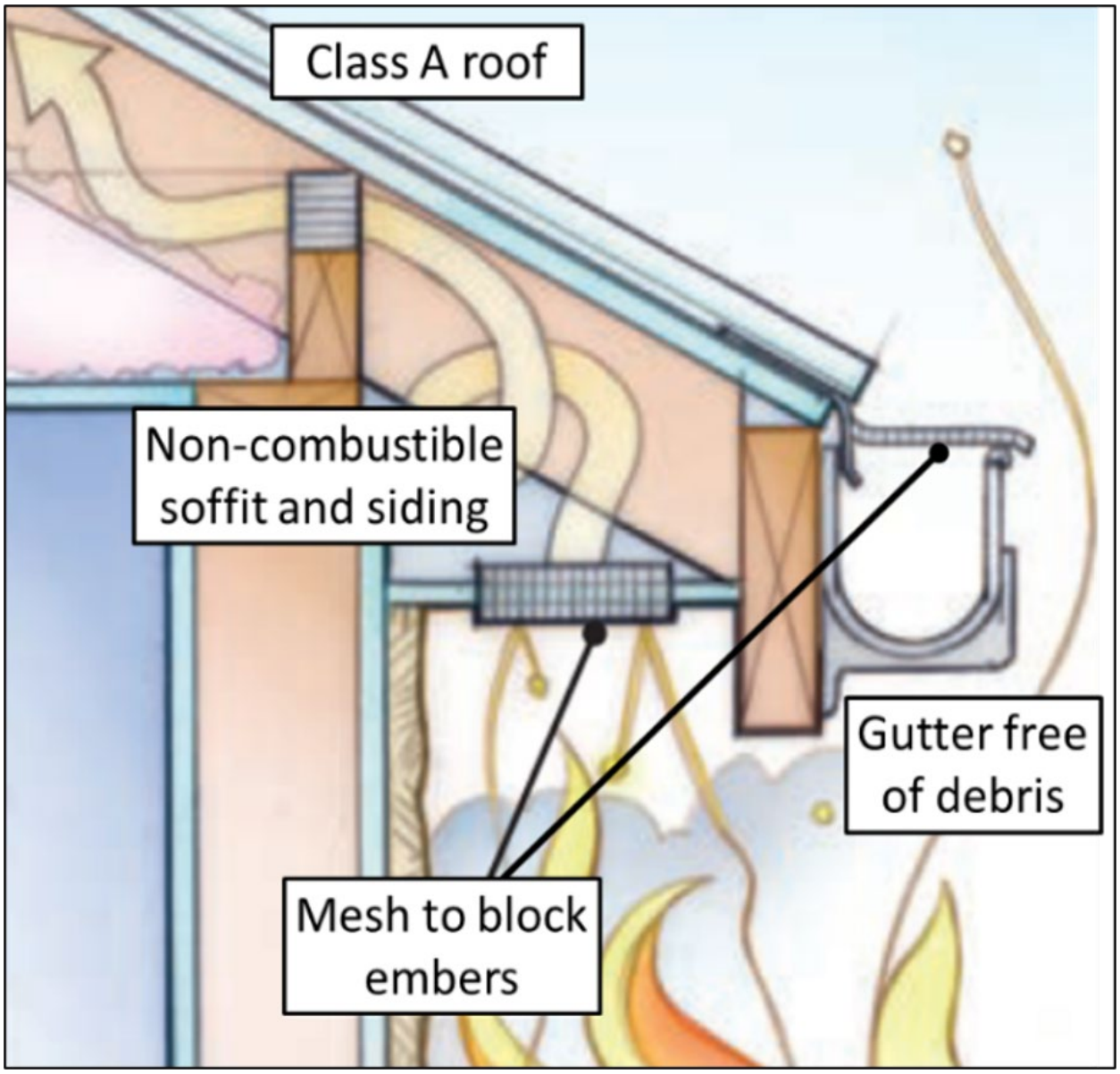
THE Ember Alliance

Sources: CSFS Home Ignition Zone; CSFS Lodgepole Management Guidelines.

Home Hardening

Buildings cannot be made fireproof, but home hardening and well-maintained defensible space greatly reduce structural ignitability and improve your home's chances of surviving a wildfire. Research by the Insurance Institute for Business & Home Safety (IIBHS) demonstrates that home hardening is critical for reducing ignition from embers (see video of the research here). In the Marshall Fire, embers accounted for 70% of structure damage, with the remaining 30% caused by direct flame contact (Holstrom et al., 2023). Due to the long distances embers can travel ahead of a flaming front, home hardening remains the only effective defense against ember ignitions.

All homes in the district (100%) are at risk of long-range embers, and (90%) are at risk of radiant heat from burning vegetation under severe fire weather conditions (**Figure 2.f.6**). Reducing the ability of embers to penetrate and ignite your home is recommended for everyone in the district.



Residents can increase their homes' chance of survival by making it harder for embers to enter and ignite their homes (image from Healthy Building Science).

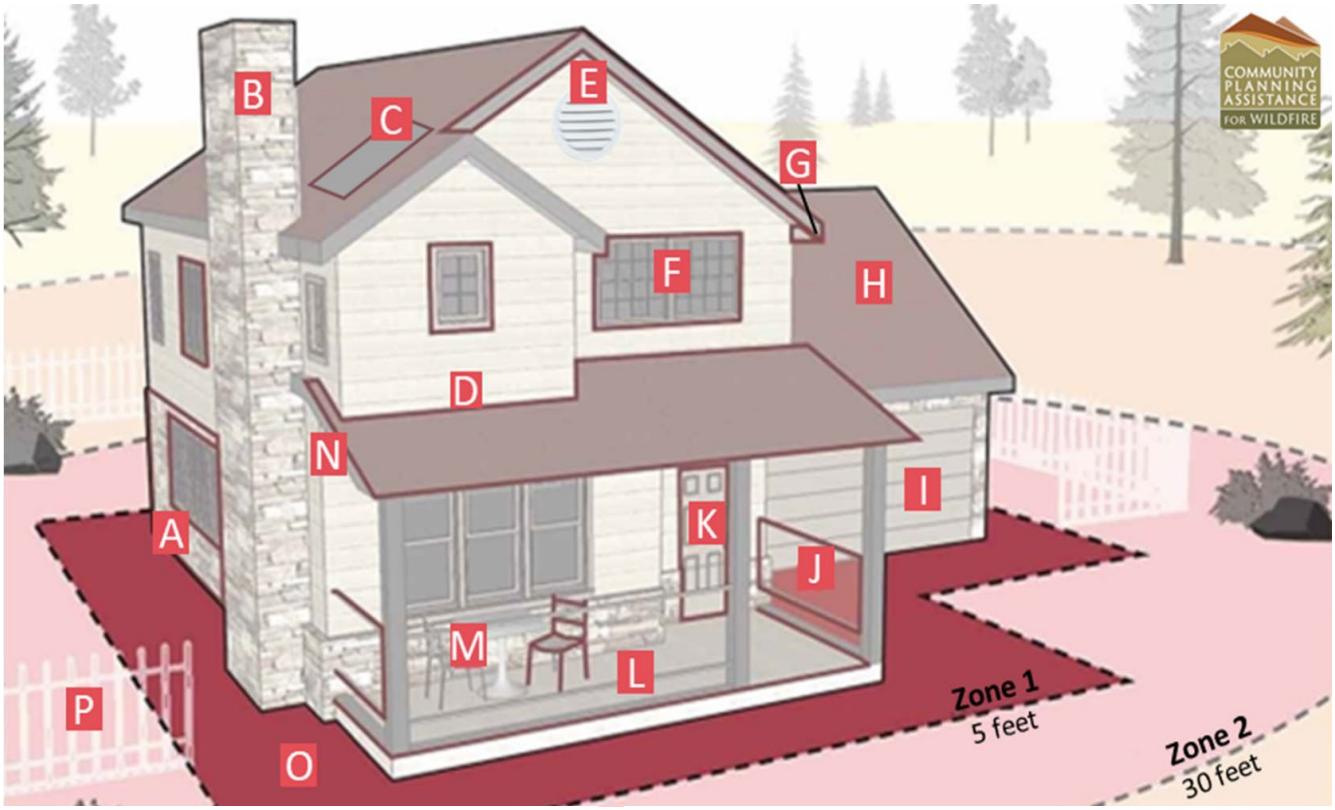
Roofs, siding, decks, windows, vents, and gutters are particularly vulnerable to embers from wildfire, and actions that prevent embers from penetrating your home can offer additional benefits such as reduced maintenance costs, greater durability, and increased energy efficiency:

- **Roofs** should be made of noncombustible materials[3] such as composite, metal, or tile, which tend to be more durable against wind, snow, and hail as well as wildfire.
- **Siding and decking** should be made of ignition-resistant or noncombustible materials, which is particularly effective when homes also have a 5-foot noncombustible border of dirt, stone, or gravel around them. Non-wood siding and decking are often more durable and require less routine maintenance than traditional wood.
- **Multi-pane windows** have greater resistance to radiant heat and provide better insulation and energy efficiency for your home. Windows often fail before a home ignites, providing a direct path for flames and airborne embers to enter a home (CSFS, 2021).
- **Enclosed eaves and vent screens** reduce the penetration of wind-born embers into structures, and can deter pests and critters from nesting in your home's vents and eaves (Hakes et al., 2017; Syphard and Keeley, 2019).
- **Fences** should be made of noncombustible materials and kept at least 8 feet away from the home (at least 20 feet away for double combustible fences). Fences can serve as pathways for wildfire to travel between vegetation and structures and from structure to structure (Maranghides et al., 2022). Wooden fences attached to homes served as one of the leading causes of home loss during the Marshall Fire (Holstrom et al., 2023). Ignition-resistant and noncombustible fences are more durable and require less maintenance than wood fences.

There are many low-cost actions you can start with to harden your home (**Figure 3.a.6**). Keep home-hardening practices in mind and use ignition-resistant materials if you replace a hail-damaged roof or remodel your home.

Hardening your entire home all at once can be expensive, however, you can start by implementing the easiest and low-cost actions first and harden your home in phases (**Figure 3.a.6**). If you replace a roof damaged by hail or remodel your home, keep home-hardening practices in mind and use ignition-resistant materials.

[3] See the Glossary for the definition of terms used to describe the performance of building materials when exposed to fire (e.g., wildfire-resistant, ignition-resistant, and noncombustible).



Low-cost actions:

B. Cover chimneys and stovepipe outlets with 3/8th to ½ inch corrosion-resistant metal mesh.

C. Minimize debris accumulation under and next to solar panels.

E. Cover vent openings with 1/16th to 1/8th inch corrosion-resistant metal mesh. Install dryer vents with metal flappers and keep closed unless in use.

G. Clear debris from roof and gutters regularly.

I. Install metal flashing around and under garage doors that goes up at least 6 inches inside and outside the door.

J. Use noncombustible lattice, trellis, or other decorative features.

K. Install weather stripping around and under doors.

L. Remove combustible materials from underneath, on top of, or within 5 feet of deck.

M. Use noncombustible patio future.

N. Cover all eaves with screened vents.

O. Establish and maintain a 5-foot noncombustible buffer around the home.

Actions to plan and save for:

A. Use noncombustible or ignition-resistant siding and trim (e.g., stucco, fiber cement, fire-retardant treated wood) at least 2 feet up around the base of your home.

C. Use multipaned glass for skylights, not materials that can melt (e.g., plexiglass), and use metal flashing.

D. Install a 6-inch vertical noncombustible surface on all gables above roofs.

F. Install multi-pane windows with at least one tempered-glass pane and metal mesh screens. Use noncombustible materials for window frames.

G. Install noncombustible gutters, gutter covers, and downspouts.

H. Install ignition-resistant or noncombustible roofs (composite, metal, or tile).

I. Install 1-hour fire rated garage doors.

K. Install 1-hour fire rated front and back doors.

L. Use ignition-resistant or noncombustible decking. Enclose crawl spaces.

N. Use noncombustible eaves.

P. Replace wooden fences with noncombustible materials and keep at least 8 feet away from the home (at least 20 feet away for double fences).

Figure 3.a.6. *A home can never be made fireproof, but home hardening practices decrease the chance that flames, radiant heat, and embers will ignite your home. Infographic by Community Planning Assistance for Wildfire with modifications from The Ember Alliance to include information from CALFIRE 2019 and Maranghides et al. 2022.*

Effectiveness and Cost of HIZ Mitigation

HIZ mitigation is critical to reduce the risk of structures to wildfire, and there are co-benefits of many HIZ mitigation strategies, including lower maintenance costs for wildfire-resistant roofing, siding, and decking (**Figure 3.a.2**). Risk from wildfire cannot be eliminated, but actions by residents, land managers, and other partners can reduce risk and increase the chance that homes stand strong to wildfire. Homeowners are encouraged to contact RFLFPD or LCSO's Wildfire Partner Program to discuss specific ways they can reduce risk on their property.

*A study in 2018 by Headwater Economics found that construction costs for a new home were 2% **lower** with wildfire-resistant material than typical materials, primarily because of the lower cost of many fire-resistant siding materials compared to expensive and flammable cedar plank siding (Quarles and Pohl, 2018).*

Wildfire-resistant construction materials can actually be lower in cost than typical construction, assuming typical, non-wildfire-resistant construction uses expensive cedar plank siding (**Figure 3.a.7**) (Quarles and Pohl, 2018). If vinyl siding is used for typical construction instead of cedar plank siding, then cost of new construction that follows WUI code is higher by about $6.00 per square foot, according to an analysis in 2021 in Canada (Porter et al., 2021).

Retrofitting existing structures with wildfire-resistant material can be expensive, and many HIZ mitigation strategies require annual maintenance, such as removing material from gutters and pruning vegetation. According to an analysis in Canada, the cost of retrofitting an existing structure to comply with WUI code is about $16.00 per square foot (Porter et al., 2021). Costs of retrofitting can be reduced to about $7.00 per square foot if flammable material in defensible space zone 1 is eliminated and vegetation in zone 2 is managed because this can reduce the need to replace flammable siding (Porter et al., 2021).

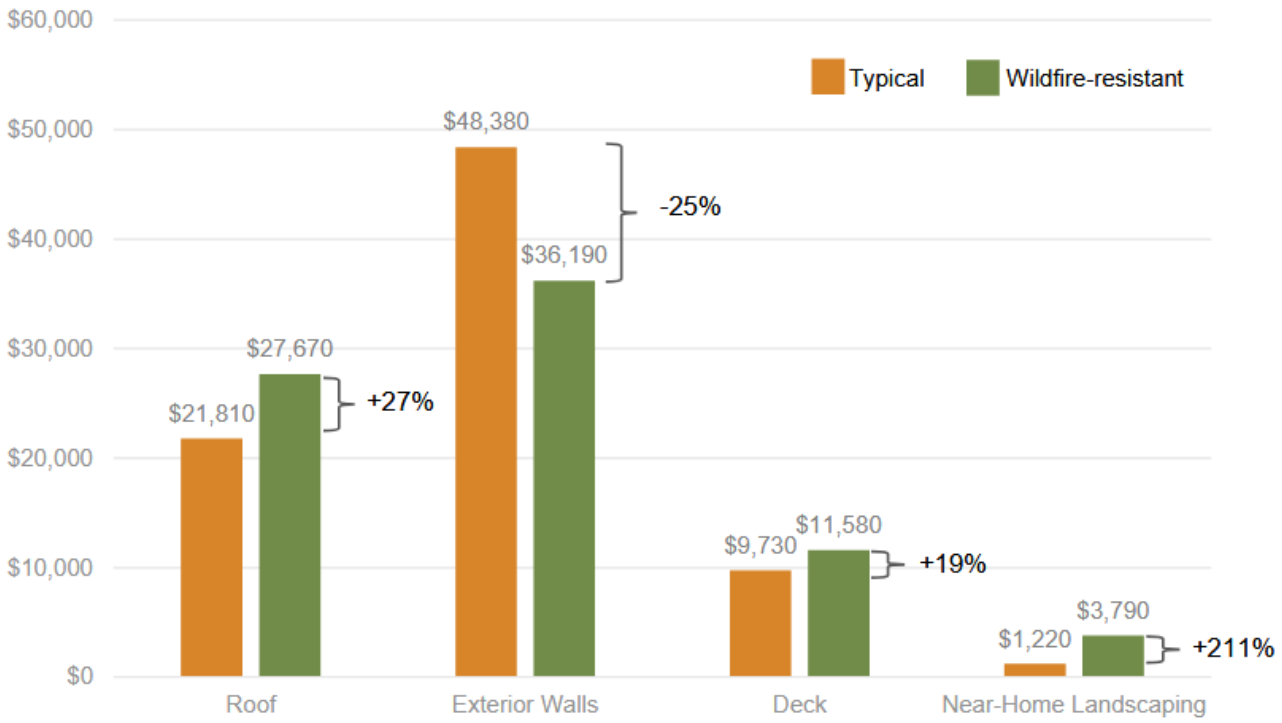


Figure 3.a.7. *An analysis by Headwater Economics in 2018 compared the cost of constructing a three-bedroom, 2,500-square-foot, single-story, single-family home using typical construction materials (orange bars) versus using wildfire-resistant materials (green bars). Cost estimates come from a national database (RSMeans) that averaged material and labor pricing from hundreds of U.S. cities and includes materials, labor, and contractor overhead and profit. Costs do NOT include savings that might occur over time due to reduced maintenance costs and longer lifespans of some fire-resistant construction material.*

Communities can realize substantial avoided costs when structures are built with fire-resistant materials and paired with well-maintained defensible space, as these measures reduce the likelihood of structure loss in high wildfire-risk areas. An analysis conducted in Canada using structure-loss data from the 2018 Camp Fire in California found that the benefit-cost ratio of complying with WUI building codes was $14 saved for every $1 spent in high wildfire hazard communities and $2 saved for every $1 spent in moderate wildfire hazard communities. For individual homeowners in high-risk areas, the analysis estimated savings of $34 for every $1 spent on fire-resistant new construction and $14 for every $1 spent on retrofitting existing homes. In moderate-risk areas, the estimated savings were $5 for every $1 spent on new construction and $2 for every $1 spent on retrofits (Porter et al., 2021).

Homeowners and businessowners often wonder what HIZ mitigation they should prioritize. Multiple interacting factors influence risk, and there is not a one-size-fits-all optimal approach to risk reduction. Research on structure loss during wildfire and construction costs can provide general guidelines regarding high-priority actions for new construction or retrofitting existing structures (**Table 3.a.3**). The following generalizations emerge from research on HIZ mitigation :

- Fire-resistant roofing is one of the most important characteristics of homes that survive wildfire. Fortunately, most homes in RFLFPD have fire-resistant class A roofs.
- Double-paned, tempered-glass windows with fire-resistant frames are very important to prevent internal structure ignition from radiant heat and/or embers, especially when structures are spaced less than 30 feet apart.
- Non-flammable siding is particularly important when structures are spaced less than 30 feet apart and when vegetation in defensible space zones 1 and 2 are not mitigated. Removing vegetation can reduce the chance of flames and radiant heat igniting siding.
- Having no deck or non-flammable decking can increase the chance of homes surviving wildfire.
- The most cost-effective actions (i.e., beneficial but less expensive) are removing fencing or replacing fencing with fire-resistant material, installing fine wire mesh over vents, and mitigating vegetation in defensible space zones 1 and 2. However, the impact of these actions individually is lower in magnitude than some of the more expensive actions, such as non-flammable roofing and double-paned windows.
- No individual action can guarantee your home will stand strong during a wildfire, so it is important to reassess your structure and your ability to pay for mitigation work and make continuous improvements.
- HIZ mitigation requires a regular commitment to maintenance—debris fills gutters, cracks form in siding, and vegetation regrows. Take time every year to walk around your home and identify steps you can take to continue reducing your risk—this can help make your home, your family, your neighborhood, and firefighters safer in the case of an emergency.

Table 3.a.3. *Relative importance of HIZ mitigation actions based on research by Headwater Economics in 2018 and a study in Canada that utilized findings of structure loss and HIZ characteristics during the 2018 Camp Fire in California (Porter et al., 2021; Quarles and Pohl, 2018). Relative costs for retrofitting are classified as low (<$1,00), moderate ($1,000-5,000), high (>$5,000-10,000), and very high (>$10,000) based on cost estimates provided in Porter et al. (2021) and Quarles and Pohl (2018).*

HIZ Mitigation Action	Relative Importance for Risk Reduction	Relative cost for retrofit
Replacing roof with fire-resistant material	Very high	Very high
Installing mesh over vents to reduce ember penetration	Moderate to high	Low
Replacing vinyl gutters with metal gutters and installing gutter cover devices and metal drip edge	High	Moderate
Enclosing soffits with fire-resistant material	Moderate to high	Moderate to high
Replacing flammable siding with fire-resistant exterior siding, sheathing, and vapor barriers	High, especially when home spacing is <30 feet and vegetation is not mitigated in defensible space zone 1 and 2	Very high
Replacing single-pane windows with vinyl frames with double-paned, tempered-glass windows with fire-resistant frames	Very high, especially when home spacing is <30 feet	Very high
Replacing flammable doors with fire-resistant doors and weather stripping	Moderate	Moderate to high
Replacing flammable decking with fire-resistant decking surface, frame, and fascia	High	Very high
Removing fences or replacing flammable fences with fire-resistant material	High	Low (removing fence) to high (replacing fence)
Removing all flammable material and creating non-combustible barrier in defensible space zone 1	Very high	Moderate
Reducing vegetation in defensible space zone 2	Very high	Moderate

Evacuation Preparedness

Evacuation can weigh heavily on the minds of residents in the district, and recent fires close to home underscore how quickly evacuations can become necessary. In 2020, the Cameron Peak Fire — the largest wildfire in Colorado history at nearly 209,000 acres — ignited about 15 miles southwest of Red Feather Lakes and repeatedly forced mandatory evacuations of the Red Feather Lakes and Crystal Lakes communities as it advanced to within a few miles of the village. In September 2024, the Pearl Fire ignited about five miles northwest of Red Feather Lakes in the Crystal Lakes area, again prompting mandatory evacuations that stretched from Colorado Highway 14 to the Wyoming border and drawing a response from RFLFPD and neighboring agencies. That same summer, the Alexander Mountain Fire west of Loveland grew to nearly 9,700 acres, damaged or destroyed at least two dozen structures, and forced extensive evacuations across Larimer County, including the relocation of livestock and large animals. On a larger scale, the death of 29 people in Los Angeles, California during the 2025 Palisades and Eaton Fires further underscores the importance of evacuation preparedness and fuel mitigation along evacuation routes. Of those who tragically perished in those fires, some did not receive evacuation alerts, others could not leave their homes due to limitations from animals or family members, and many were simply overwhelmed by the "perfect storm" of extreme fire weather conditions. Roads lined closely with dense, tall vegetation can create conditions that are dangerous to evacuees during extreme fire weather. Analysis conducted modeling extreme weather showed that about 75% of roadways in RFLFPD could experience extreme fire behavior and potentially non-survivable conditions along roadways (**Figure 2.f.5**).

LCSO is responsible for wildfire-related evacuations in unincorporated Larimer County, and incident commanders make evacuation decisions based on factors such as fire behavior, wind and weather conditions, evacuation routes, structures at risk, and terrain. Evacuations generally fall into two categories. A **voluntary evacuation** is advised for residents who may need extra time or help leaving — including those with health conditions aggravated by smoke and those with livestock or other animals to move — and is a good time for everyone to pack a go-bag, gather valuables, and prepare their home; residents who leave a voluntary zone can return as long as the status does not change. A **mandatory evacuation** means it is time to leave immediately with your people, pets, and medications, as roads are closed to incoming traffic and residents will not be allowed to return. When an evacuation is ordered, an emergency alert is sent to all landlines in the area plus devices registered at nocoalert.org, and in mandatory areas deputies also go door-to-door to notify residents.

LCSO may call evacuations early to get residents out of danger before roads become potentially non-survivable or to avoid congestion. Because a single threatened corner of a pre-established alert polygon triggers evacuation of the entire area, residents may be asked to leave before they can see smoke or flames. If any resident has concerns, such as knowing it may take additional time to evacuate, no one needs to wait for an evacuation order to act. Evacuation preparedness is the responsibility of each resident in the district. **The best way to get out quickly and safely during an evacuation is to be prepared.**

Signing up for local emergency notifications can help you leave quickly. Residents should register their cell phones and email addresses through NOCO Alert, the official emergency notification system for RFLFPD[4]. All residents are encouraged to self-identify access or functional needs when they sign up for emergency alerts.

Visit Larimer County's Plan and Prepare resources from the Office of Emergency Management, and review the CSFS Live Wildfire Ready program and go-bags and evacuation planning guidance — simple and crucial actions that can save lives. Prepare a go-bag and have a family, pet, and livestock emergency plan before the threat of wildfire is in your area. Some residents have family members or neighbors with physical limitations who might struggle to evacuate in a timely manner. Develop specific emergency plans that address these unique needs and vulnerabilities. Parents should work with their neighbors to develop a plan for how to evacuate children.

Residents with livestock trailers or large camper vehicles should plan to leave during voluntary evacuation notices to allow time for their preparations and create more space on the roads for other residents during a mandatory evacuation. It is important to have a plan for where to take livestock to reduce some of the chaos and

[4] NOCO Alert is the official emergency notification system for the district as of the writing of this CWPP in 2026.

uncertainty created by wildfire evacuations. Residents who may need help moving horses, livestock, or other large animals can request assistance from the Larimer County Sheriff's Posse, which serves as the lead agency for large-animal evacuation and sheltering in the county. To make this as smooth as possible, complete a Large Animal Evacuation Intake Form for your animals in advance. FEMA also provides tips for protecting livestock during a disaster. Part of this planning and preparation should include maintenance on equipment used to transport livestock.

Follow evacuation etiquette to increase the chance of everyone exiting RFLFPD in a safe and timely manner during a wildfire or other emergency:

- ✓ Leave as quickly as possible after receiving an evacuation notice.
- ✓ Have a go-bag packed and ready during the wildfire season, especially on days with Red Flag Warnings.
- ✓ Leave with as few vehicles as possible to reduce congestion and evacuation times across the community.
- ✓ Drive safely and with headlights on. Maintain a safe and steady pace. Do not stop to take pictures.
- ✓ Yield to emergency vehicles.
- ✓ Follow directions of law enforcement officers and emergency responders.



Accessibility and Navigability for Firefighters

Address signs

Installing reflective address numbers can save lives by making it easier for firefighters to navigate to your home at night and under smokey conditions. Mount reflective address signs on noncombustible posts, not on stumps, trees, wooden posts, or chains across driveways. Chains across driveways might be removed during wildfire suppression activities to permit access to your property. Make sure the numbers are clearly visible from both directions on the roadway.

Driveways

It is important to ensure emergency responders can locate and safely access your home. Narrow driveways without turnarounds, low-hanging limbs, and dead or down trees along the road can lead firefighters to choose not to defend a home during a wildfire event (Brown, 1994). Many roads and driveways in the district have accessibility issues of this kind, and these conditions could turn firefighters away from attempting to defend homes.

According to the NFPA, driveways and roads should have a minimum of 20 feet of horizontal clearance and 13.5 feet of vertical clearance to allow engines to safely access the roads (O'Connor, 2021). Residents should remove trees and low-hanging limbs along driveways to facilitate firefighter access, and remove any dead trees that could fall across the driveway and block it.



Many driveways within the district do not meet current access requirements and pose safety issues that are difficult to mitigate. Long, narrow, steep driveways lacking turnarounds, and dense trees on the sides of the road can create challenges for emergency response vehicles during wildfires. Photo credit: TEA.

Where possible, residents should improve roadway access, and where this is not feasible, it is vital that homeowners take measures to harden their home and create defensible space. Some actions to increase access to your home are simple, such as installing reflective address numbers, and others take time and investment, such as widening driveways to accommodate fire engines.

If you have locked gates that would prevent first responders from reaching your home, please notify RFLFPD of gate codes or means of access before an incident.

If you or your neighborhood has a private bridge, post the bridge weight limits. Not all firefighting equipment will cross unmarked bridges, so knowing and posting weight limits may help firefighters access and defend your home.

Private Water Resources

Water resources to fight fires in the foothills can be scarce, especially during the typical fire season. Firefighters are skilled at determining the most beneficial ways to use water to protect structures from an approaching fire. Providing clear access to suitable water resources around your home or neighborhood can help them defend your home.

Do not turn sprinklers on around your home as you evacuate. This is counterproductive to protecting your home because continuous use of water far in advance of the fire can drain local wells and cisterns long before the fire reaches your neighborhood. This leaves firefighters with less resources to defend your home, putting their lives and your property at higher risk. Leave sprinklers visible but **turned off** so firefighters can determine whether they will be useful or not. Read this post by Fire Safe Marin about why it is unwise to leave water running when you evacuate during a wildfire.

If time allows and you are not under a mandatory evacuation order, prepare personal water resources by making them easily accessible and clearly labelling how to access them. Unlock pump house doors and remove vegetation or other obstructions. If you have a generator, leave it in an accessible location in case the power is turned off. Notify RFLFPD of community cisterns or tanks so they can be identified prior to an emergency. Contact RFLFPD when planning a new cistern to ensure it is compatible with their fire equipment.

***Most importantly**, create defensible space around your home and buildings so that water resources can be used effectively. Water is not a reliable resource along the Colorado Front Range. A property that requires less water and fewer resources to defend is more likely to stand strong and remain resilient during a wildfire.*

Please reach out to RFLFPD for advice on your specific private water resources. Many homes in the district have active fire defense systems meant to protect the home in case of a wildfire. It is important that you notify RFLFPD of your specific private water resource or home defense system before an incident so they can provide you with guidance on what to do in case of an evacuation.



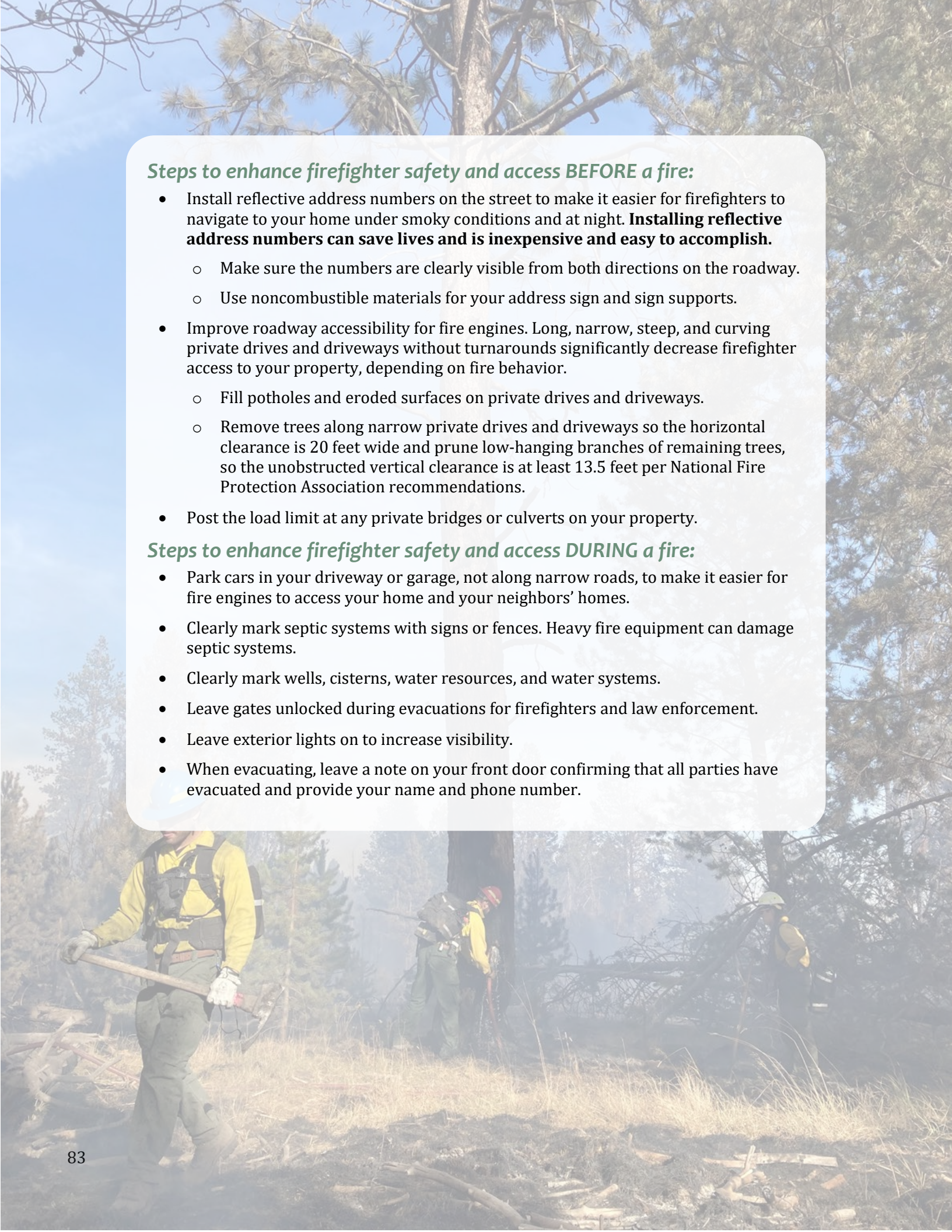
Support Your Local Fire Protection District

Education and outreach are incredibly important to the district–connecting with their constituents is a vital part of building relationships and providing the highest quality services. Your support for RFLVFD can dramatically improve the safety of this community. Visit the RFLVPD website for more information on how to volunteer, to donate, and for upcoming events. Volunteer fire departments also need help with outreach, such as social media, and logistics, so even if you don't feel like you can become a firefighter, you can still meaningfully help your community. Here are tangible things you can do to support the amazing volunteers who protect your community:

- Consider volunteering with RFLVFD.
- Provide financial support in the form of monetary donations or initiate local ballot measures that provide tax revenue for RFLFPD so that RFLVFD can respond to residents in their time of need.
- Attend events hosted by RFLVFD about wildfire mitigation and emergency preparedness.
- Protect your home from wildfire by maintaining good defensible space can also protect your local firefighters.
- Share information you learn with neighbors to build community resilience and magnify the impact of individual actions.
- Stay up to date with the latest district news on the RFLVPD website.



RFLVFD hosts several events throughout the year, including Wildfire Prevention Week, and they participate in the community's Independence Day Celebrations. Photo credit: RFLVFD.



Steps to enhance firefighter safety and access BEFORE a fire:

- Install reflective address numbers on the street to make it easier for firefighters to navigate to your home under smoky conditions and at night. **Installing reflective address numbers can save lives and is inexpensive and easy to accomplish.**
    - Make sure the numbers are clearly visible from both directions on the roadway.
    - Use noncombustible materials for your address sign and sign supports.
- Improve roadway accessibility for fire engines. Long, narrow, steep, and curving private drives and driveways without turnarounds significantly decrease firefighter access to your property, depending on fire behavior.
    - Fill potholes and eroded surfaces on private drives and driveways.
    - Remove trees along narrow private drives and driveways so the horizontal clearance is 20 feet wide and prune low-hanging branches of remaining trees, so the unobstructed vertical clearance is at least 13.5 feet per National Fire Protection Association recommendations.
- Post the load limit at any private bridges or culverts on your property.

Steps to enhance firefighter safety and access DURING a fire:

- Park cars in your driveway or garage, not along narrow roads, to make it easier for fire engines to access your home and your neighbors' homes.
- Clearly mark septic systems with signs or fences. Heavy fire equipment can damage septic systems.
- Clearly mark wells, cisterns, water resources, and water systems.
- Leave gates unlocked during evacuations for firefighters and law enforcement.
- Leave exterior lights on to increase visibility.
- When evacuating, leave a note on your front door confirming that all parties have evacuated and provide your name and phone number.

3.b. Relative Risk Ratings and Special Considerations for Plan Units

This CWPP is a useful planning document, but it will only affect real change if residents, neighbors, RFLFPD, local forestry and community groups, and agency partners come together to address shared risk and implement strategic projects. This section of the CWPP provides relative risk ratings for CWPP plan units in RFLFPD and outlines priority recommendations for collective action to address shared risk and magnify the impact of mitigation actions by individual residents.

CWPP plan units are areas with shared fire risk where residents can organize and support each other to effectively reduce wildfire risk and enhance emergency preparedness. We delineated 11 plan units in RFLFPD by considering clusters of addresses, connectivity of roads, topographic features, land parcels, land ownership, and local knowledge of community organization.

The Ember Alliance conducted on-the-ground assessments to assess fire risk, fire suppression challenges, evacuation hazards, and home ignition zone hazards in November 2024, and combined these assessments with output from our fire behavior, community resources, and evacuation analyses. See **Appendix B**: Community Risk Assessment and Modeling Methodology for a description of hazard rating methodology. Plan unit hazard ratings are specific to RFLFPD and not suitable for comparing this fire protection district to other communities in Colorado or the country.

The potential for wildfires to pose a threat to lives and property is high across RFLFPD, but risk is relatively higher in some parts of the district than others (**Figure 3.b.1**). Plan units with higher relative risk are strong candidates for sooner action and additional support to mitigate hazardous conditions. However, plan units with moderate relative risk still possess conditions that could threaten life and/or property in the case of a wildfire.

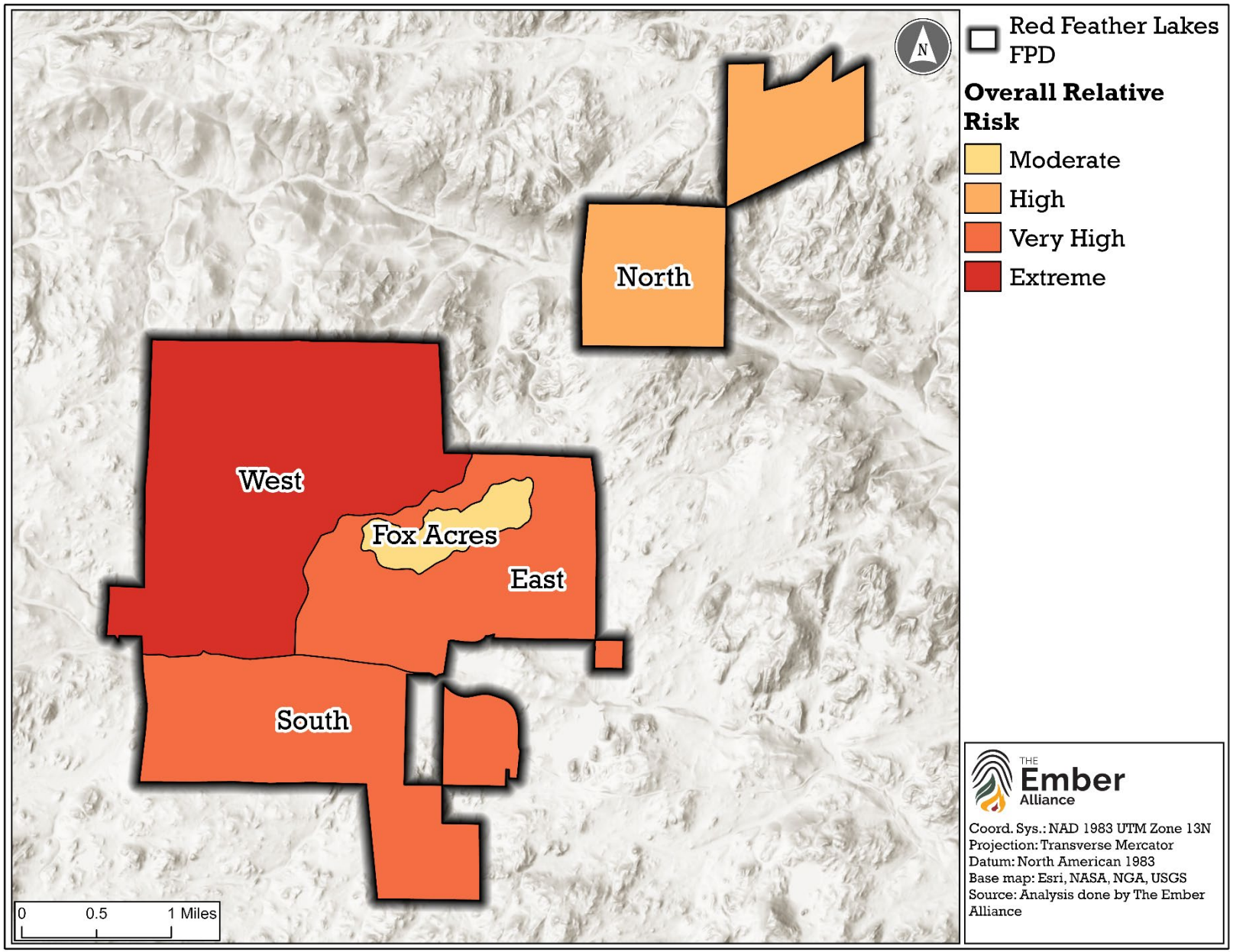


Figure 3.b.1*. Relative risk rating for plan units across RFLFPD. "Moderate" risk is a relative term – most residents within RFLFPD are exposed to elevated fire danger due to topography and fuels in this part of Colorado and should take recommended actions in this CWPP seriously.*

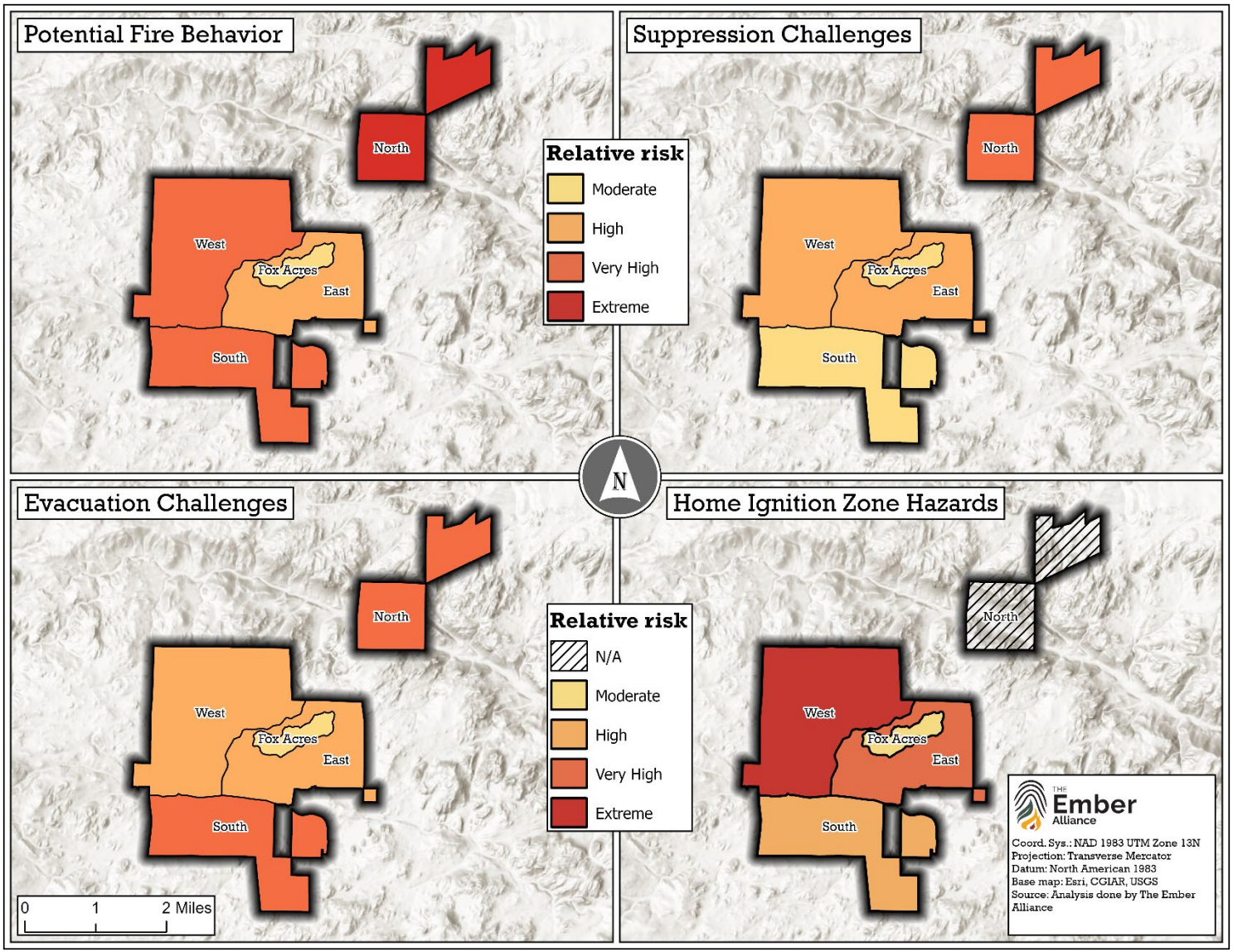


Figure 3.b.2*. Plan unit relative risk for each component used to determine overall risk ratings in RFLFPD. Potential Fire Behavior incorporates the type and probability of wildfire in the area, Evacuation Hazards includes roadway quality and estimated evacuation times, Suppression Challenges incorporates accessibility of the roads by fire engines, response time, and water sources, and Home Ignition Zone Hazards examines structure to structure ignition potential and structure exposure. See* ***Appendix B****: Community Risk Assessment and Modeling Methodology for complete methodology.*

East Plan Unit

Very high relative risk rating

Overall relative risk	Potential fire behavior	Wildland fire suppression challenges	Evacuation challenges	Home Ignition Zone Hazards
Very high	High	High	High	Very high

During a fire burning under extreme fire weather conditions:

- **62%** of the area could experience very high to extreme fire behavior.
- **75%** of roadways could experience potentially non-survivable conditions.
- **96%** of structures could be exposed to radiant heat from burning vegetation.
- **100%** of structures could be exposed to embers from burning vegetation.

General description: The East Plan Unit contains several neighborhoods and widely scattered homes interspersed with moderate- to high-density ponderosa pine forests. Some lodgepole pine forests occur at higher elevations. Riparian vegetation and grasslands surround numerous lakes in the area, including Red Feather Lake, Lake Ramona, and Dowdy Lake. Almost 20% of this plan unit is public land—Dowdy State Wildlife Area and the Arapaho-Roosevelt National Forest.

Highly valued resources & assets: Based on best available data, there are about 330 structures (i.e., homes, barns, sheds, and other large auxiliary structures) in the East Plan Unit, which is the highest among all plan units in the district. This plan unit contains the Red Feather Trading Post, Red Feather Super Market, RFLVFD station, a cell tower, and a weather station (**Figure 2.a.2**). On a busy summer day, over a hundred people might be camping around Dowdy Lake. This plan unit is within the South and North Fork Lone Pine Action Area and highest-priority watersheds for the 2024 Upper Poudre Watershed Resilience Plan.

Fire history and potential fire behavior: A small wildfire was quickly extinguished in the eastern portion of the plan unit near Mount Margaret in 2015. The area has not experienced direct impacts of large wildfires, but residents across the district experienced smoke and ash from the 2020 Cameron Peak Fire. Dense forests across this plan unit could experience passive and/or active crown fire. Burning trees and shrubs can emit prolific embers that ignite fuels and structures ahead of the main fire. It is important to regularly remind recreators about fire bands and fire danger information at Dowdy Lake and other high-use areas to prevent unintended ignitions.

Previous and ongoing fuels mitigation: In 2015, the Colorado State Forest Service completed a thinning project north of Snake Lake Drive, and the plan unit contains portions of several large restoration projects by the USFS that include thinning, broadcast prescribed burning, and pile burning. The USFS has plans to burn additional units of the Magic Feather Prescribed Burn around Dowdy Lake, West Lake, and Parvin Lake (**Figure 2.g.1**).

This plan unit contains four high-priority projects for this CWPP: Poudre Valley Coop Propane Management, Creedmore-74E-Red Feather Lakes Roadside Project, Red Feather Village HIZ Projects, and RFL Fire District Fuel Break .

Fox Acres Plan Unit

Moderate relative risk rating

Overall relative risk	Potential fire behavior	Wildland fire suppression challenges	Evacuation challenges	Home Ignition Zone Hazards
Moderate	Moderate	Moderate	Moderate	Moderate

During a fire burning under extreme fire weather conditions:

- **44%** of the area could experience very high to extreme fire behavior.
- **71%** of roadways could experience potentially non-survivable conditions.
- **83%** of structures could be exposed to radiant heat from burning vegetation.
- **100%** of structures could be exposed to embers from burning vegetation.

General description: The Fox Acres Plan Unit is entirely private property as part of the Fox Acres Country Club. The property includes extensive golf course vegetation surrounded by ponderosa pine forests.

Highly valued resources & assets: Based on best available data, there are about 45 structures in the Fox Acres Plan Unit, including a club house and accommodations for visitors to the country club. This plan unit is within the North Fork Lone Pine Action Area and highest-priority watersheds for the 2024 Upper Poudre Watershed Resilience Plan.

Fire history and potential fire behavior: The area has not experienced direct impacts of large wildfires, but residents across the district experienced smoke and ash from the 2020 Cameron Peak Fire. Pockets of dense forest scattered around the golf course could experience passive crown fire. Burning trees and shrubs can emit prolific embers that ignite fuels and structures ahead of the main fire. It is important to regularly remind visitors to the golf course about fire bands and fire danger information to prevent unintended ignitions.

Previous and ongoing fuels mitigation: No large-scale fuel treatments have occurred in the Fox Acres Plan Unit. Defensible space creation and maintenance and home hardening practices can help ensure that structures on the country club can stand strong against wildfire.

North Plan Unit

High relative risk rating

Overall relative risk	Potential fire behavior	Wildland fire suppression challenges	Evacuation challenges	Home Ignition Zone Hazards
High	Extreme	Very high	Very high	N/A

During a fire burning under extreme fire weather conditions:

- **90%** of the area could experience very high to extreme fire behavior.
- **98%** of roadways could experience potentially non-survivable conditions.
- There are no permanent structures in North Plan Unit

General description: The North Plan Unit is covered in dense ponderosa pine forests on north-facing slopes and low- to moderate-density ponderosa pine forests on south-facing slopes. Riparian vegetation, grasslands, and shrublands occur along North Lone Pine Creek. Almost 70% of this plan unit is public land falling within the Arapaho-Roosevelt National Forest.

Highly valued resources & assets: There are no permanent structures in the North Plan Unit. This area contains several popular fishing and camping areas at Lost Lake and surrounding lakes (**Figure 2.a.2**). On a busy summer day, over a hundred people might be camping around Lost Lake. This plan unit is partially within the North Fork Lone Pine Action Area and high- and highest-priority watersheds for the 2024 Upper Poudre Watershed Resilience Plan.

Fire history and potential fire behavior: Numerous small lightning and human-caused ignitions have occurred around Lost Lake over the past two decades. Firefighters quickly contained these ignitions to <0.1 acres. Dense forests across this plan unit could experience passive and/or active crown fire. Burning trees and shrubs can emit prolific embers that ignite fuels and structures ahead of the main fire. It is important to regularly remind recreators about fire bands and fire danger information at Lost Lake and other high-use areas to prevent unintended ignitions.

Previous and ongoing fuels mitigation: Between 2015-2020, the USFS completed numerous large-scale restoration projects in and around the North Plan Unit, including thinning projects, pile burns, and a successful prescribed broadcast burn (**Figure 2.g.1**).

This plan unit contains two high-priority projects for this CWPP: Greeley Water Priority Project and 67J to Prairie Divide Road Project.

South Plan Unit

Very high relative risk rating

Overall relative risk	Potential fire behavior	Wildland fire suppression challenges	Evacuation challenges	Home Ignition Zone Hazards
Very high	Very high	Moderate	Very High	High

During a fire burning under extreme fire weather conditions:

- **64%** of the area could experience very high to extreme fire behavior.
- **89%** of roadways could experience potentially non-survivable conditions.
- **97%** of structures could be exposed to radiant heat from burning vegetation.
- **31%** of structures could be exposed to embers from burning vegetation.

General description: The South Plan Unit contains a mixture of dense ponderosa pine forests and lodgepole pine forests at higher elevations. Large riparian vegetation and grasslands occur along South Lone Pine Creek. Homes are widely scattered across the plan unit, except for a cluster of homes near the intersection of Red Feather Lakes Road and Phantom Ranch Road. Almost 20% of this plan unit is public land falling on the Arapaho-Roosevelt National Forest.

Highly valued resources & assets: Based on best available data, there are about 30 structures (i.e., homes, barns, sheds, and other large auxiliary structures) in the South Plan Unit. This plan unit is within the South Fork Lone Pine Action Area and high- and highest-priority watersheds for the 2024 Upper Poudre Watershed Resilience Plan.

Fire history and potential fire behavior: The 2020 Cameron Peak Fire burned very close to the edge of the South Plan Unit, and residents across the district experienced smoke and ash from this fire. Several small ignitions were quickly contained to <0.1 acre along southern edge of the plan unit in 2012 and 2021. Dense forests across this plan unit could experience passive and/or active crown fire. Burning trees and shrubs can emit prolific embers that ignite fuels and structures ahead of the main fire. Large grasslands and riparian areas can carry rapidly moving wildfires on hot, windy days during drought conditions.

Previous and ongoing fuels mitigation: Extensive thinning and pile burning were conducted between 2017 and 2023 by the USFS on the Arapaho-Roosevelt National Forest and by LCD on private land. The USFS has plans to burn additional units of the Magic Feather Prescribed Burn around Dowdy Lake, West Lake, and Parvin Lake (**Figure 2.g.1**).

This plan unit contains four high-priority projects for this CWPP: Creedmore-Red Feather Lakes Roadside Project, Deadman Roadside Project, Manhattan Roadside Project, and Phantom Ranch Mitigation.

West Plan Unit

Extreme relative risk rating

Overall relative risk	Potential fire behavior	Wildland fire suppression challenges	Evacuation challenges	Home Ignition Zone Hazards
Extreme	Very high	High	High	Extreme

During a fire burning under extreme fire weather conditions:

- **77%** of the area could experience very high to extreme fire behavior.
- **69%** of roadways could experience potentially non-survivable conditions.
- **93%** of structures could be exposed to radiant heat from burning vegetation.
- **100%** of structures could be exposed to embers from burning vegetation.

General description: The West Plan Unit contains several neighborhoods clustered around Apache Lake, Hiawatha Lake, Shagwa Lake, and Lake Nokomis. Riparian vegetation also surrounds these around lakes. Dense ponderosa pine forests occur on north-facing slopes and low- to moderate-density ponderosa pine forests on south facing slopes. Forests transition into lodgepole pine at higher elevations in the west. Grasslands and shrublands surround CR 73C. Almost all of this plan unit is private land.

Highly valued resources & assets: Based on best available data, there are about 265 structures (i.e., homes, barns, sheds, and other large auxiliary structures) in the West Plan Unit. This plan unit also contains the Red Feather Mountain Library, historic Red Feather Lakes Post Office, and Red Feather Lakes Elementary School (**Figure 2.a.2**). This plan unit is within the North Fork Lone Pine Action Area and high- and highest-priority watersheds for the 2024 Upper Poudre Watershed Resilience Plan.

Fire history and potential fire behavior: The area has not experienced direct impacts of large wildfires, but residents across the district experienced smoke and ash from the 2020 Cameron Peak Fire. Dense forests across this plan unit could experience passive and/or active crown fire. Burning trees and shrubs can emit prolific embers that ignite fuels and structures ahead of the main fire. Large grasslands and riparian areas can carry rapidly moving wildfires on hot, windy days during drought conditions.

Previous and ongoing fuels mitigation: Private landowners have organized several thinning projects in this plan unit to protect the community, including a project southwest of Hiawatha Lake in 2019. Another fuel treatment was completed west of neighborhoods around Lake Nokomis and Apache Lake.

This plan unit contains six high-priority projects for this CWPP: RFL Fire District Fuel Break, Quaint Trust Slash Piles, Red Feather Village HIZ Projects, 67J to Prairie Divide Road Project, Creedmore-Red Feather Lakes Roadside Project, and Deadman Roadside Project.

3.c. Recommendations for RFLVFD and Partner Organizations

The Core Team, partners, and residents had many ideas and suggestions for actions that would help create a more fire-adapted community but were not directly tied to on-the-ground fuels treatment. The Ember Alliance (TEA) collected the ideas that came up during Advisory Committee meetings, community meetings and workshops, an Advisory Committee brainstorming session, and partner meetings. TEA and members of the Core Team combined similar ideas and grouped them into categories with associated goals and responsible parties.

Within each category, TEA assigned a suggested priority — First, Second, or Third — reflecting each activity's relative impact, value to the community, and feasibility, to indicate general sequencing for implementation. These suggested priorities are a starting point to guide RFLVFD, partners, and residents, and may be revisited and refined by the Advisory Committee and partners as implementation proceeds.

Additional details on plans by the North 40 Mountain Alliance to implement the 2026 Community Mitigation Grant for Red Feather Lakes are provided after the table.

Goal	Activity	Responsible Parties	Suggested Priority
Fuels Management			
Increase capacity to complete mitigation work	Establish a Chainsaw Mitigation support group and/or partner with a Youth Corps for projects	RFLVFD, POA	Second
Increase capacity to complete mitigation work	Collaborate with large landowners to increase defensible space	RFLVFD, Large landowners	First
Streamline HIZ mitigation process for homeowners	Establish a mitigation library / mobile shed to check out supplies (PPE, chainsaws with training and disclaimers, handsaws, ⅛" mesh, gas, oil, caulk). This activity is part of the 2026 Community Mitigation Grant for Red Feather Lakes.	RFLVFD, N40 Mountain Alliance	Third
Streamline HIZ mitigation process for homeowners	Update and maintain a list of mitigation contractors across the four FPDs to align treatment techniques and pursue grant-funded discounts	RFLVFD, CSFS	Second
Streamline HIZ mitigation process for homeowners	Keep an ongoing electronic map of completed mitigation work in the RFL area	RFLVFD, TEA	Second
Secure funding to increase capacity	Identify funding sources for fuels management (including CWDG) and apply	RFLVFD, CSFS	First

Goal	Activity	Responsible Parties	Suggested Priority
Woody Biomass Disposal			
Establish district slash and biomass disposal	Identify a slash collection site based on wind direction and space for air curtain burners	RFLVFD, POA, Large landowners	Second
Establish district slash and biomass disposal	Coordinate with Glacier View for use of the Loveland air curtain burner and provide training for a consistent crew	RFLVFD, Glacier View	Third
Establish district slash and biomass disposal	Apply for grant funding for slash and chip removal, HIZ technology, and education materials	RFLVFD	First
Community Outreach and Education			
Broaden wildfire education and community engagement	Coordinate education across Wildfire Partners, N40 Mountain Alliance, RF Library, Glacier View and Crystal Lakes teams, OEM, and forestry experts	RFLVFD, Partners	First
Broaden wildfire education and community engagement	Use regular Library and N40 emails to share articles and CWPP event announcements	RF Library, N40 Mountain Alliance	Second
Broaden wildfire education and community engagement	Host wildfire movie nights in summer with resources for residents	RFLVFD, POA, N40 Mountain Alliance, Local businesses	Third
Broaden wildfire education and community engagement	Refocus annual Fire Days on Labor Day weekend to promote fire risk reduction	RFLVFD	Third
Broaden wildfire education and community engagement	Put up “Fire Danger Level” signage throughout the district	RFLVFD	—
Streamline HIZ mitigation for homeowners	Organize and disseminate HIZ best practices and slash management info	RFLVFD	First
Streamline HIZ mitigation for homeowners	Inform community of grants and other funding opportunities for mitigation work	RFLVFD, Larimer County	First

Goal	Activity	Responsible Parties	Suggested Priority
District Capacity			
Create a CWPP team to implement the plan	Recruit representatives (N40, Library, Fox Acres, RFLVFD, POA, Chamber of Commerce, large landowner)	RFLVFD, Community organizations	First
Understand current capacity and identify water sources	Work with POA and RFLVFD to identify water sources on individual properties (wells, water bodies, cisterns)	RFLVFD, POA, Community members	First
Understand current capacity and identify water sources	Create proper signage to mark water locations	RFLVFD, Community members	Third
Coordinate regionally to avoid duplication	Coordinate with Glacier View, Crystal Lakes, and Livermore FPD/CWPP teams; engage CWDG partner organizations and meetings	RFLVFD, Neighboring FPDs	Second
Evacuation and Safety			
Public educated on evacuation best practices	Organize and disseminate the Sheriff's evacuation reference (1-pager)	RFLVFD, Larimer County Sheriff's Office	First
Public educated on evacuation best practices	Increase voluntary evacuation awareness and preparedness	RFLVFD, Larimer County OEM	—
Public prepared in case of evacuation	Promote NoCo Alerts signups	RFLVFD, Larimer County OEM, Community members	First
Public prepared in case of evacuation	Train FACo Ambassadors	Larimer County, RFLVFD	Second
Increase evacuation efficiency and safety	Apply for an annual evacuation drill with OEM and the HUB system, including HAM operators	RFLVFD, Larimer County OEM	Second
Increase evacuation efficiency and safety	Evaluate use of a siren system to notify second-home owners	RFLVFD	Third

Goal	Activity	Responsible Parties	Suggested Priority
Increase evacuation efficiency and safety	Distribute reflective home address signs and non-burnable posts in a targeted manner	RFLVFD, Community members	First
Misc: Code, Certification, HIZ, Home Hardening			
Receive Firewise Community designation	Complete CWPP and other Firewise requirements	RFLVFD, TEA	First
Adhere to Larimer County WUI code / Enforce adopted wildfire resiliency code	Enforce adopted wildfire resiliency code	RFLVFD, Larimer County	Third

2026 Community Mitigation Grant

The North 40 Mountain Alliance (N40MA) received a 2026 Community Mitigation Grant from Larimer County to fund the 2026 CWPP Mitigation Kickoff for Red Feather Lakes. The grant will be used in the following manner:

- Purchase tools and equipment needed for Home Ignition Zone (HIZ) mitigation in Zones 1 and 2. This includes saws, pickaxes, loppers, grass trimmers, rakes, tarps, reusable bags, and personal protective equipment. To make these resources easy to access, N40MA will establish a sign-up system at the local library or on the N40MA website. This system will allow seasonal residents to schedule tool use while they are visiting or otherwise in Red Feather Lakes.
- Purchase of a 14 x 7 dump trailer to haul slash and grass from properties to a slash repository. Trailer licensing and permits will be provided by N40MA. Pinecones collected during mitigation work will either be chipped or placed in waste management bags for transport to the green site at the new County landfill.
- Support mitigation visits by Red Feather Lakes N40MA Ambassadors to provide:
    - Guidance on recommended HIZ work.
    - Safety training for proper tool use.
    - Volunteer crew assistance on the scheduled mitigation day, if needed.
    - Use of a dump trailer to haul woody biomass materials.

In summer 2026, N40MA ambassadors and volunteers will help mitigate wildfire risk at least 20 homes to introduce the 2026 Community Wildfire Protection Plan to the Red Feather Lakes community and demonstrate mitigation in action. Residents who request volunteer assistance must be onsite and contribute to the effort in ways that match their abilities. This may include joining the mitigation crew, recruiting friends or neighbors to volunteer, providing food, water, or shade for volunteers, and offering encouragement and feedback.

3.d. Funding Opportunities

There are many funding opportunities from federal, state, and local agencies as well as non-profits to assist in forest health and wildfire mitigation projects. These funds can increase capacity but cannot cover all the costs of fire mitigation needed within the fire district. Residents and partners must put forth funds and time to complete this work.

Below is a non-comprehensive list of grants and funding opportunities available as of early 2024.

Opportunities from Local and State Agencies in Colorado

- **Larimer County Environmental Stewardship Award** is an annual award for landowners and stewardship by residents.
- The LCOEM **Community Mitigation Grant Program** was created to help cover upfront costs of hazard mitigation. North 40 Mountain Alliance received one of these grants in 2026 for the Red Feather Lakes community!
- CSFS regularly updates their **Natural Resources Grants & Assistance Database** to help residents, agencies, and other partners find funding for natural resource projects.
- CSFS has multiple grant programs available to community members to help reduce wildfire risk.
    - **Forest Restoration and Wildfire Risk Mitigation** (FRWRM) is a competitive grant program designed to assist with funding community-level actions across the entire state to: reduce the risk to people, property and infrastructure from wildfire in the wildland-urban interface; promote forest health and the utilization of woody material including for traditional forest products and biomass energy; and encourage forest resilience projects. Eligible applicants include local community groups, local government entities such as fire protection districts, public and private utilities, state agencies, and non-profit groups.

    - The **Wildfire Mitigation Outreach Grant Program** allows local governments, counties, and nonprofits to conduct outreach to landowners.
    - The **Colorado IRA Urban & Community Forestry Grant Program** funds projects such as tree planting, removal, and urban forest management plans for growing the tree canopy in disadvantaged areas of Colorado.
    - The **Rural Grant Navigator** aids non-government organizations who provide support for rural Colorado communities applying for federal or state grants for wildfire mitigation.
    - **Timber, Forest Health & Wildfire Mitigation Industries Workforce Development** allows for the hiring and training of employees in timber, forest health, and wildfire mitigation.
- The State of Colorado developed the **Colorado Strategic Wildfire Action Program (COSWAP)** grant program in 2021 to distribute funds for fuels reduction, mitigation, education, and capacity building across the state. COSWAP offers multiple grants:
    - Landscape Resilience Investment through COSWAP offers wildfire risk reduction support with landscape resilience investments.
    - Workforce development grants that offer either crew time or cash grants with SWIFT crews or CYCA (Colorado Youth Corps Association) conservation corps for wildfire mitigation projects.
- **Colorado Water Plan Grants** from the Colorado Water Conservation Board includes a category for watershed health & recreation that can support planning and action to protect critical drinking water, infrastructure, and overall watershed health from post-fire impacts.
- CSFS administers programs for landowner and community assistance, including the **Colorado Forest Ag Program** and **Colorado Tree Farm Program**.
- The Colorado Department of Revenue provides a **State income tax credit for wildfire mitigation (HB22-1007)** whereby individuals, estates, and trusts may claim a subtraction on their Colorado income tax return or receive a state income tax credit for certain costs incurred in performing wildfire mitigation measures on property in the WUI.
- **LCD** helps landowners navigate forestry projects to promote forest health and complete wildfire mitigation projects.
- **CPRW** works with landowners, agencies, and partners to support watershed health, forest restoration, and post-fire recovery efforts that improve ecosystem resilience and reduce wildfire impacts.
- The **Community Mitigation Grant** is offered through the LCOEM to help with upfront costs for hazard mitigation for community-led mitigation projects.
- **RESTORE Colorado**, through the National Fish and Wildlife Foundation and other agencies, helps fund at-scale habitat restoration and stewardship projects on public and private conservation lands that benefit local communities by focusing on priorities like watershed resilience and grasslands/rangelands and urban areas.
- **Restoring Colorado's Forest Fund** provides no-cost seedlings to landowners whose properties have been impacted by wildfires and other natural disasters for restoration through CSU/CSFS.
- **Wildfire Resilient Home Grant** through DFPC helps homeowners improve their home or structures on property with home hardening strategies.
- **Disaster Resilience Rebuilding Program** through Colorado Department of Local Affairs (DOLA) helps communities impacted by environmental disasters, especially suffering from property loss, and helps homeowners, businesses, and local governments and communities to rebuild after natural disasters.
- **Habitat Partnership Program** through CPW can help assist private land conservation efforts.

Funding from Federal Agencies

- **Community Wildfire Defense Grants** (CWDG) are funded annually through the USFS and help communities take action on implementation projects from their local CWPP.
- **Hazard Mitigation Assistance Grants Program** provides funding to state, local, Tribal, and territorial governments so they can rebuild in a way that reduces, or mitigates, future disaster losses in their communities. This grant funding is available after a presidentially declared disaster.
- The **Forest Landowner Support** through the USFS provides grant opportunities to deliver technical and financial assistance to private forest landowners.
- The **WUI Grant Program** through the Council of Western State Foresters is a grant program for fuels treatment, education, and mitigation planning to help reduce hazardous fuels.
- The **Community Catalyst Fund** through Coalitions & Collaboratives (COCO) helps community focused organizations find federal funding for climate resilience through the USFS.
- **Collaborative Capacity Program for Forests & Communities** through the National Forest Foundation (NFF) helps fund land and watershed restoration as well as wildfire resilience for local governments, nonprofits, and tribal organizations.
- FEMA's **Hazard Mitigation Grant Program** provides funding to state, local, and tribal territories for hazard mitigation plans and rebuilding to help with future disaster loss.
- The **Firewood Bank Assistance Program** through the Alliance for Green Heat provides financial and educational resources to programs to access wood heat for low- to moderate-income families who struggle paying for home heating especially during emergencies like power outages.
- **Landscape Scale Restoration** funded through the USFS is a grant program that promotes collaborative, science-based restoration of forest landscapes, leverage public and private resources, and advance State Forest Action Plan priorities.
- **Disaster Supplemental** through the Economic Development Administration (EDA) gives funds to regions struggling with economic harm from wildfires or other natural disasters.
- The **Emergency Forest Restoration Program** through the USDA Farm Service Agency helps owners of nonindustrial private forests restore forest health damaged by natural disasters.
- NRCS helps farmers, ranchers, foresters, and other land managers with conservation efforts.
    - The **Environmental Quality Incentives Program** (EQIP) provides farmers, ranchers, and private forest landowners financial, cost-share assistance to implement conservation practices like forest management, prescribed burning, or prescribed grazing to reduce fire risk.
    - The **Emergency Watershed Protection** helps local communities after natural disasters.

Opportunities from Non-Governmental Organizations

- COCO manages the **Action, Implementation, and Mitigation Program** to increase local capacity and support wildfire risk reduction activities in high-risk communities. AIM provides direct support to place-based wildfire mitigation organizations with pass-through grant funding, on-site engagement, technical expertise, mentoring, and training on mitigation practices to help high-risk communities achieve their wildfire adaptation goals.
- **Community Impact program** from Great Outdoors Colorado funds cities, towns, counties, special districts, and land conservation organizations that manage or acquire open space and natural areas.
- **Conservation Service Corps Grants** from Great Outdoors Colorado fund chainsaw crews to support local agencies, tax districts, political subdivisions, and non-profit with fuel mitigation projects.
- FACO manages the **FACO Opportunity Fund**, which is a matching mini-grant program to support projects, build capacity, and address local needs with funding from the National Fire Adapted Communities Learning Network.

- **Northern Colorado Fireshed Collaborative Fund** awards grants to community partners to add capacity, enhance readiness, and increase the pace and scale of forest treatments.
- **Project Advisory Community Grant Program** is a program through the Rocky Mountain Elk Foundation that supports organizations that are treating elk habitat across the US, including prescribed burning, forest thinning, and noxious weed treatments.

Capacity for Fire Protection Districts

- **Staffing for Adequate Fire and Emergency Response Grants** from FEMA directly fund fire departments and volunteer firefighter organizations to help increase their capacity.
- **Assistance to Firefighters Grants** from FEMA help firefighters and other first responders obtain critical resources necessary for protecting the public and emergency personnel from fire and related hazards.
- **Fire Prevention & Safety Grants** from FEMA support projects that enhance the safety of the public and firefighters from fire and related hazards, such as carrying out fire prevention education and training, fire code enforcement, fire/arson investigation, firefighter safety and health programming, strategic national projects, prevention efforts, and research and development.

4. Landscape-Scale Implementation Recommendations

4.a. Fuel Treatments and Ecological Restoration

Objectives and Benefits

Fuel treatments are a land management tool for reducing wildfire hazards by decreasing the amount and altering the distribution of wildland fuels. Common goals of stand-scale fuel treatments are to reduce the risk of active or passive crown fires and to reduce fire intensity. This is achieved by removing trees, increasing the distance between tree crowns, removing small trees, shrubs, and low branches to increase the distance between surface fuels and tree crowns, and removing downed trees and other dead vegetation (Agee and Skinner, 2005). Fuel treatment methods include grazing, tree thinning, pruning, pile burning, broadcast prescribed burning, and fuel mastication.

> "Given the right conditions, wildlands will inevitably burn. It is a misconception to think that treating fuels can 'fire-proof' important areas... Fuel treatments in wildlands should focus on creating conditions in which fire can occur without devastating consequences, rather than on creating conditions conducive to fire suppression" (Reinhardt et al. 2008).

The goal of promoting ecological resilience is to both improve the ability of an ecosystem to withstand disturbance and increase its ability to recover after disturbance (Dakos and Kéfi, 2022). Many ecosystems evolved with disturbances like insect outbreaks, wildfire, and post-fire erosion, and these disturbances have important impacts that can even improve ecological conditions, such as habitat for some wildlife species. However, many forests in the western United States have been damaged, degraded, or destroyed because of changes to their historical fire regimes following Euro-American colonization, which reduces their ability to withstand disturbance and recover afterwards. In some frequent-fire forests, creating stands with lower tree densities and larger, healthier trees might make forests more resilient in the face of drought, bark beetles, and high-severity wildfire (North et al., 2022).

In some cases, fuel treatments can achieve both ecological objectives and wildfire risk reduction. For example, grazing, prescribed broadcast burning, and reseeding with native plants can restore grassland conditions, reduce the cover of invasive weeds, and lower the risk for rapid fire growth. Low-tech stream restoration can increase the ability of riparian areas to capture sediment after a wildfire, increase fuel moisture, and create natural fuel breaks that slow the spread of wildfire. Restoration treatments in dry-mixed conifer and ponderosa pine forests that create mosaic conditions of tree groups and open meadows tend to achieve both fuel treatment and ecological restoration objectives.

However, fuel treatments and ecological restoration are not synonymous. A treatment that creates a forest with widely, evenly spaced trees could serve as an effective fuel treatment but would not achieve ecological objectives in other forest types. Similarly, mowing grasslands to reduce fuel load might reduce potential flame lengths but will not restore grassland ecosystems without also conducting regular prescribed burns and seeding with native species.

Strategically located, high-quality fuel treatments can create tactical options for fire suppression (Jolley, 2018; Plucinski, 2019; Reinhardt et al., 2008). Fuel treatments along POD boundaries can allow firefighters opportunities to use direct or indirect suppression techniques to contain fire spread. POD boundaries were an important consideration for defining and prioritizing roadside and stand-scale projects for this CWPP. Using POD boundaries in the district aligns with the NCFC approach to mitigate risk and promote ecological resilience.

There are numerous examples of the tactical use of POD boundaries. Firefighters used fuel treatments in the Red Feather Lakes area as tactical features during the Cameron Peak Fire (Avitt, 2021). In 1980, fuel treatments helped firefighters protect the Crystal Lakes area during the Bear Trap Fire (Dennis, 2005). Firefighters used fuel treatments north and west of Loveland Fire Rescue Authority as tactical features when fighting the Cameron Peak

fire in 2020. The most useful treatments were previous wildfires (namely the High Park fire burn area and the Bobcat Fire burn area), fuels treatments from the previous five years, and fuels treatments along roadways (Greiner et al., 2023). See more about PODs in the section **2.c. Wildland-Urban Interface**.

Strategic fuel treatments, in tandem with work by individual residents to mitigate hazards in their HIZ, can help protect life and property. Land management agencies in and around the district are actively reducing wildland fuels (see **Figure 2.g.1** for a map of previous fuel treatments). Addressing shared risk requires shared responsibility and action.

Methods Used to Conduct Fuel Treatments and Promote Resilient Ecosystems

Mechanical Treatments

Trees can be removed manually or mechanically, with the most suitable method depending on slope, road access, cost, and potential damage to soil. Use of mechanical equipment is often infeasible on slopes greater than 35% (Hunter et al., 2007). Handcrews or contractors with chainsaws can operate on steeper slopes but can be less efficient than mechanical thinning. Sometimes the only option for tree removal on steep, inaccessible slopes is expensive helicopter logging.

Thinning operations alone can increase surface fuel loads and can fail to achieve fire mitigation objectives if fuels created by the harvest activities (also known as slash) are not addressed with management methods such as removal or pile burning (Agee and Skinner, 2005). See the **Approaches to Slash Management Section** for options to mitigate surface fuel loads created by fuel management.



A feller-buncher is a common piece of equipment used for mechanical treatments. Photo credit: Oregon Department of Forestry.



Before and after aerial imaging of thinning efforts at Poudre River Ranch Road Association. Removal of trees in large patches mimics the results of fire and reduces ladder and canopy fuel loading to prevent fire from spreading through the canopy. Photo credit: Justin Yow, LCD.

Prescribed Grazing

Prescribed grazing for wildfire uses livestock (usually cattle or goats) to eat large strips of flammable vegetation down to stubble-height to reduce fine fuels, fuel loads, and fuel bed continuity. An effective grazing regime can

decrease the probability, rate of spread, and severity of wildfires. When used in the right place, at the right intensity, for the right amount of time, grazing can be a sustainable and feasible alternative to mowing or prescribed burning.

Well-planned and flexible grazing strategies can help to meet a variety of rangeland and fire-management goals. While other options for creating fuel breaks can be cost prohibitive or difficult to maintain over time, researchers with the USDA Agricultural Research Service found that, "cattle can create and maintain protective fuel breaks with lower financial costs than mechanical methods. Additionally, a targeted grazing program has the potential to mutually benefit rangeland resources and ranching operations by presenting the rancher with the opportunity to reduce or eliminate the need to feed hay or stored forages in the early spring" (Clark, 2024).

By using livestock to create fuel breaks in these swaths of invasive annual grasses, rangeland managers could help to prevent more wildfires from turning into megafires (Clark, 2024).

When considering grazing as a method of wildfire fuel reduction, the following site-specific factors should be considered to determine if grazing is the best option for a specific location:

- Strategic location with potential to protect resources like infrastructure or fragile habitat.
- Safe and effective location for grazing, consider species-specific livestock needs (forage needs, water availability, fencing, access, toxic plant sensitivities, etc.).
- Grazing regime (timing, frequency, intensity) must be tailored to avoid negative effects on desirable plants and other sensitive ecological features and mitigate for potential ecological impacts. Adequate residue must be retained after grazing rotation to protect natural resources, prevent soil erosion, improve water quality, and maintain wildlife habitat.
- Targeted grazing should be located an area that has a high likelihood of experiencing wildfire.
- Feasibility considerations of grazing as a management tool. Analyze costs entailed in improving and maintaining infrastructure to support grazing (fencing, water, transport, etc.).
- Part of an integrated management system with other conservation practices such as: noxious weed management, WUI fuel reduction treatments, rangeland seeding, sage-steppe habitat restoration, climate-smart agriculture, soil enhancements, riparian restoration, and replanting with less flammable vegetation.

Broadcast Prescribed Burning

Broadcast prescribed burning is often the most effective method to mitigate wildfire risk and create healthy conditions in a variety of grassland, shrubland, and forest ecosystems (Paysen et al., 2000; Stephens et al., 2009). This method has unique impacts on vegetation, soils, and wildlife habitat that cannot be replicated by mechanical treatments alone (McIver et al., 2013). Prescribed burning mimics naturally occurring wildfire, can treat hundreds of acres at a time, removes surface fuel, and is relatively cost-effective (Hartsough et al., 2008; Hunter et al., 2007). Prescribed burns can reduce property damage during wildfires because they are so effective at reducing fuel loads (Loomis et al., 2019).



There are many resources that are needed for a successful prescribed burn. Photo taken during the 2023 Magic Feather prescribed burn. Photo credit: USDA Forest Service.

Often, due to decades of fuel accumulation, mechanical treatments are necessary before

broadcast burning can safely and effectively be implemented. Broadcast prescribed burning or pile burning can be used following mechanical treatments to magnify treatment impacts by consuming surface fuels that could burn in a wildfire (Fulé et al., 2012; Prichard et al., 2020). Regular spring burning can also help repair grassland ecosystems by recycling nutrients, replicating natural fire processes, and controlling non-native grasses such as smooth brome (Willson and Stubbendieck, 1997). Many native grass species stay green into the summer, unlike cheatgrass and smooth brome, making them less receptive to wildfire (Miller, 2006).

Broadcast prescribed burning is challenging in the WUI due to diverse fuel types, proximity to homes, risk of visibility impairments on roads from smoke, health impacts of smoke, and political and social concerns. However, with proper planning and implementation, qualified firefighters can safely conduct prescribed burns, even in the WUI (Hunter et al., 2007). Continuous thinning projects and broadcast prescribed burning are safely and effectively conducted in Magic Feather, east of Red Feather Lakes, from 2023-2026. Life safety is always a top consideration when developing and conducting prescribed burns.



Drones can be used during prescribed burns to determine consumption and effectiveness of interior burning and maintain firefighter safety. Photo from 2023 Magic Feather prescribed burn. Photo credit: USDA Forest Service.

Broadcast burning is carefully regulated in Colorado by DFPC, the Colorado Department of Public Health and Environment, local sheriff's offices, and fire departments as outlined in the *Colorado Prescribed Burning Standards of 2024* and *2019 Colorado Prescribed Fire Planning and Implementation Policy Guide*. Firefighters who plan and conduct prescribed burns are highly qualified under national standards set forth by the NWCG.

There is always risk involved in the application of prescribed fire but, when mitigated, the benefits outweigh the risks of not using prescribed fire. Less than 1% of prescribed burns escape containment lines, and most of these are rapidly suppressed (Weir et al., 2019). Unfortunately, one example is the escape of the Elkhorn Prescribed Burn. This experience has understandably created fear amongst some members of the public. The prescribed burn community has taken lessons away from the Elk Fire which will reduce the likelihood of future escapes (CO Department of Public Safety, 2020).



Prescribed burning can remove surface and ladder fuels and repair ecological processes in frequent-fire ecosystems. This photo is from the Magic Feather prescribed burn in Red Feather. Photo Credit: NCFC.

Fuel Treatment Effectiveness

The effectiveness of fuel treatments is influenced by a variety of factors, including the intensity, quality, and extent of treatment, location of treatments, maintenance of treatments, weather conditions and fire behavior, and actions of firefighters (**Figure 4.a.1**). The percentage of fuel breaks that have effectively stopped actual wildfires is between 22-47% in forests (Gannon et al., 2023; Syphard et al., 2011) and 46-71% in sagebrush ecosystems (Weise et al., 2023). A review of fuel treatment effectiveness found that, "A fuel treatment can only be as effective as the suppression that goes along with it"—less than 1% of wildfires are stopped by a fire break alone and in insolation of suppression activities (McDaniel, 2023; page 3).

Fuel treatments are more effective under moderate fire weather conditions than extreme weather conditions, and most effective when firefighters are present to use the fuel treatment as a control feature (Gannon et al., 2023; Jain et al., 2021; Reinhardt et al., 2008; Syphard et al., 2011; Weise et al., 2023). Uncontrollable factors will always play a role in home loss during extreme wildfires. Minute-to-minute shifts in wind directions, unexpected wind gusts, and extreme fire behavior and growth that overwhelm suppression efforts can result in home loss not explained by mitigation efforts prior to the fire.

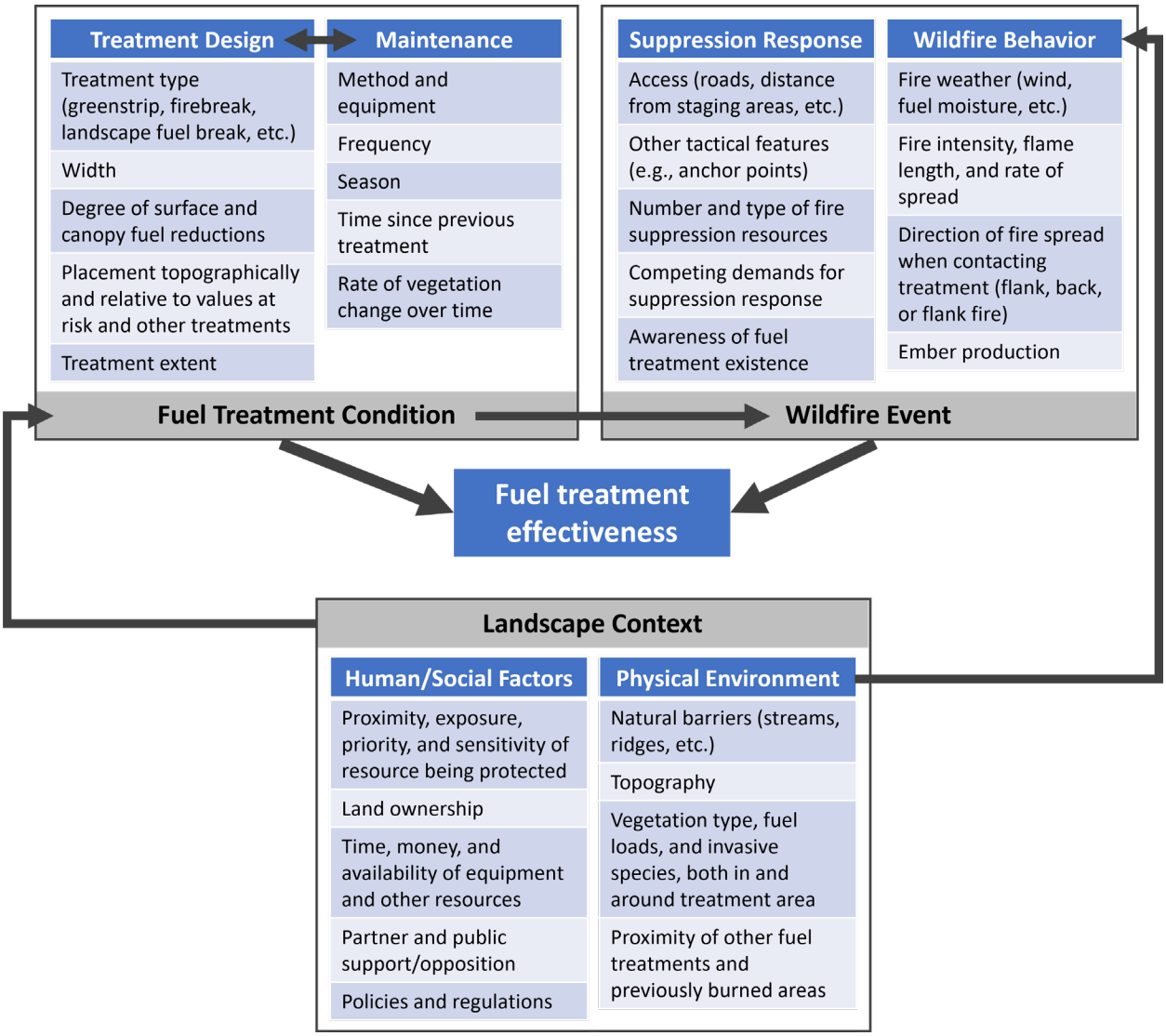


Figure 4.a.1. *The effectiveness of fuel treatments at altering wildfire behavior is influenced by numerous factors related to landscape context, fuel treatment specifications, and conditions during a wildfire event. Figure modified by TEA based on (Jain et al., 2021; Trauernicht and Kunz, 2019).*

4.b. Roadside Fuel Treatments

Treatments along roadways require a dramatic reduction of fuels to create safer and survivable conditions. This includes removing most trees adjacent to the roadway, limbing remaining trees, and regularly mitigating hazardous fuel with high ignition potential (**Figure 4.a.1**). Treatments along roadways are often described as shaded fuelbreaks (Dennis, 2005). Roadside fuel treatments are already ongoing around RFLFPD to make the larger Red Feather Lakes area safer, and this CWPP prioritized additional work along roadsides (see **Section 4.c. Priority Project Areas**).

The width of an effective roadside fuel treatment (distance to the left and right of a road) depends on slope. CSFS recommends that treatments extend 150 to 240 feet off the downhill side of the road and 100 to 150 feet off the uphill side. Wider treatments are necessary on the downhill side on steeper slopes due to the exacerbating effect of slope on fire intensity when fires travel uphill (**Table 4.b.1**) (Dennis, 2005). Important aspects of all roadside fuel treatments include:

- Removing limbs overhanging the road to create at least 13.5-feet of vertical clearance. See **Figure 3.a.3** for a depiction of how to measure limb height.
- Removing trees alongside the road to create at least 20-feet of horizontal clearance.
- Removing trees to create at least 10-feet crown spacing between remaining trees within the roadside treatment zone. See **Figure 3.a.3** for a depiction of how to measure crown spacing.
- Removing all dead trees that could fall across the road and block traffic.
- Removing shrubs and regeneration that can serve as ladder fuels.
- Mitigating hazardous fuel with high ignition potential along the road.

Along important evacuation routes that could experience extreme congestion, roadside treatments should be more aggressive and consist of near removal of all trees within at least 30 feet of roadways. Clearcutting along roads when surrounding forests remain dense can cause problems with snow drifting, so shaded fuelbreaks might be more appropriate in areas where drifting is more likely, or snow fences might need to be installed.

Some residents find roadside fuel treatments aesthetically displeasing because of the removal of so many trees, but these treatments are vital for increasing the safety of residents and firefighters in this community. Roadside treatments must dramatically reduce fuel loads to effectively reduce the risk of non-survivable conditions developing during wildfires.

Overall Goals of Roadside Fuel Treatments:

- Dramatically reduce or eliminate surface and canopy fuels.
- Reduce the likelihood of non-survivable conditions along roadways during wildfires.
- Create tactical opportunities for fire suppression.
- Increase the visibility of structures from roadways to assist wildland firefighters.
- Create conditions that enable safe and effective prescribed burning within potential operational delineations.

Table 4.b.1. *Minimum fuel treatment width uphill and downhill from roads depends on the slope along the roadway[1]. Recommendations from the Colorado State Forest Service (Dennis, 2005).*

Percent slope (%)	Downhill distance (feet)	Uphill distance (feet)	Total fuel treatment width (feet)
0	150	150	300
10	165	140	305
20	180	130	310
30	195	120	315
40	210	110	320
50	225	100	325
60	240	100	340

[1]Measurements are from the toe of the fill for downhill distances and above the road cut for uphill distances. Distances are measured parallel to flat ground, not along the slope.



Figure 4.b.1. *Before and after aerial imaging of thinning efforts at Poudre River Ranch Road Association. Effective roadway fuel treatments remove enough trees to result in widely space crowns, remove ladder fuels (seedlings, saplings, shrubs, and low limbs), and reduce surface fuels. Removal of trees in large patches mimics the results of fire and reduces ladder and canopy fuel loading to prevent fire from spreading through the canopy. Photo credit: Justin Yow, LCD.*

4.c. Priority Project Areas

A critical component of CWPPs is prioritizing strategic projects to reduce the impact of wildfire in the district, create strategic opportunities for wildland firefighters, create safer conditions for evacuations, and promote ecological resilience. The RFLFPD Advisory Committee worked with land management agencies, community members, and other partners to identify high-priority locations to plan and implement work over the next 5 years (**Figure 4.c.1**)**.** Types of projects include POD boundary / roadside treatments, stand-scale fuel mitigation and restoration, riparian and stream restoration, cheatgrass mitigation, and HIZ mitigation / point protection. Some of these projects are already in motion, and others will require years of work to build relationships and find funding before work can begin. These project areas cross ownership boundaries and require community-wide commitment, coordination, and collaboration among private landowners, public land managers, and forestry professionals to create successful outcomes.

Project areas were identified by the RFLFPD CWPP Advisory Committee and partners at an in-person meeting at the RFLVFD station on November 6, 2025 and reviewed at a North Larimer Ops meeting on January7, 2026. Partners involved in the prioritization meeting were RFLVFD, USFS, CSFS, CPW, DFPC, Larimer County Natural Resources, Larimer Conservation District, Larimer County Sheriff's Office of Emergency Services, Larimer County Planning Division, CPRW, and resident representatives. Project area locations and priorities were refined by the RFLFPD CWPP Advisory Committee and through follow-up conversations with partners. The Advisory Committee and partners identified and prioritized project areas based on the following factors:

- Potential fire behavior under extreme fire weather conditions (**Figure B.3**).
- Potential exposure of homes and high valued resources & assets to radiant heat and embers (**Figure B.8**;**Figure B.10**).
- Roadway survivability (**Figure B.14**) and priority locations for roadside treatments (**Figure 4.c.1**).
- Location of PODs[5] prioritized by the NCFC to create a "ribbon" of fuel treatments to protect vulnerable communities along the Front Range
- Priorities for watershed health identified by the 2024 Upper Poudre Watershed Resilience Plan.
- Completed, ongoing, and planned projects identified in nearby CWPPs (2022 Glacier View FPD CWPP and 2022 Cherokee Meadows CWPP), the Red Feather Lakes Area CWDG, and the 2024 USFS Black Diamond Landscape Resiliency & Risk Reduction Project.
- Landownership (**Figure 2.a.1**).

The CWPP priority projects focus on high-priority locations to address in the next five years, but this prioritization does not discourage ecological resilience work and fuel mitigation in other areas. If multiple neighbors work together to mitigate fire risk across ownership boundaries, it could attract funding and increase the priority and effectiveness of treating those areas. Land managers, county administrators, and residents should reevaluate fire risks and reprioritize projects as conditions change over time.

[5] Potential operational delineations (PODs) are topographic areas bounded by features suitable for fire control, other tactical operations during wildfires, proactive ecological resilience, and wildfire risk mitigation (e.g., ridgetops and roads) (Beeton et al., 2023; M. Thompson, 2023; M. P. Thompson et al., 2022). Proactive and strategic management along POD boundaries and within PODs can protect lives and property in RFLFPD, including protecting primary evacuation routes. See the infographic in Section 2.c for more information on PODs.

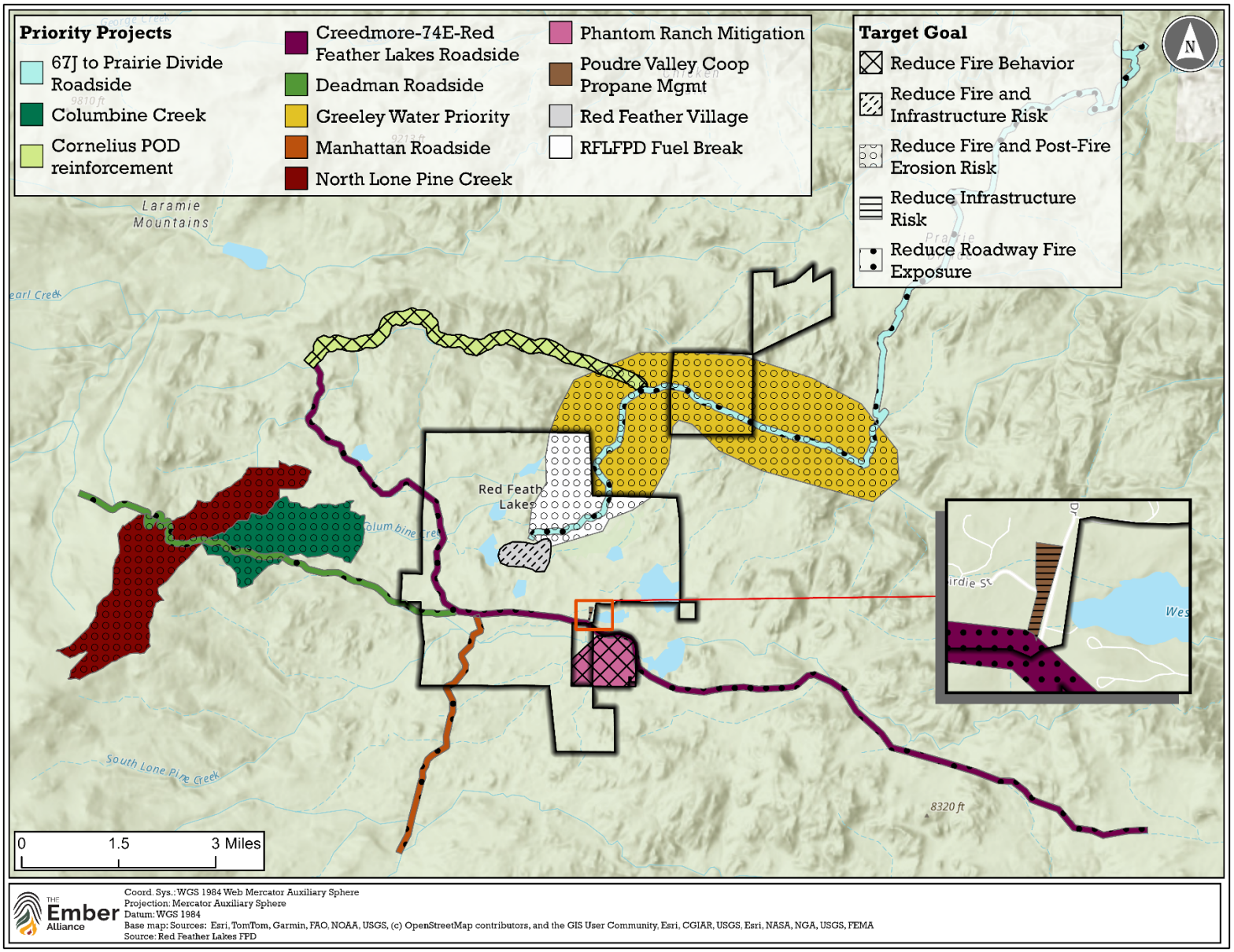


Figure 4.c.1. *Priority project areas identified by members of the CWPP advisory committee and partner organizations. Boundaries were refined by TEA with input from subject matter experts.*

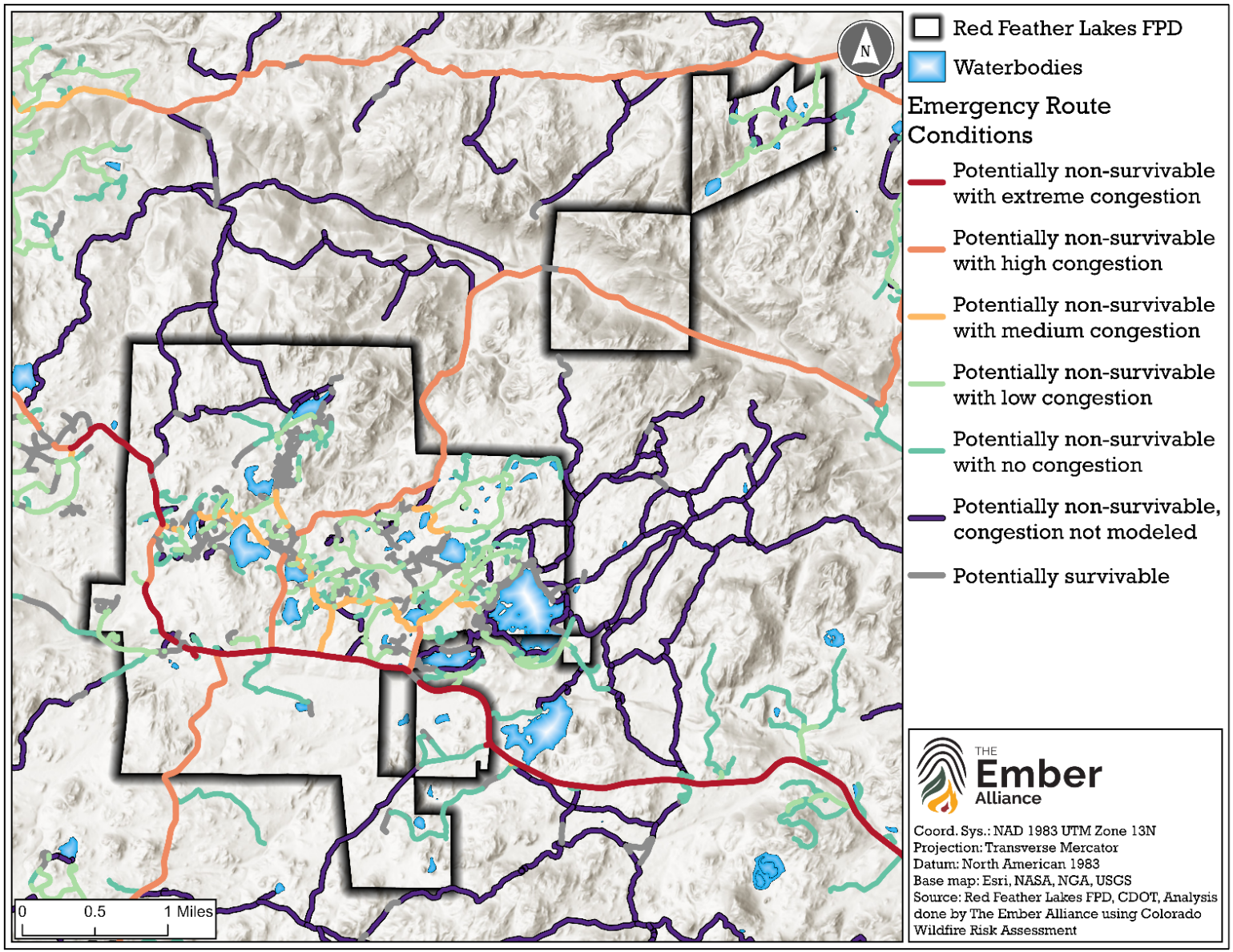


Figure 4.c.2. *Potential need for roadside fuel treatments based on potential fire behavior and evacuation congestion in and around RFLFPD. See* ***Section 9.f. Evacuation Analysis*** *in Appendix B for details on evacuation modeling.*

Table 4.c.1 *Description of priority project areas. Note: Project leads and partner organizations are suggestions and will depend heavily on funding availability and organizational capacity.*

Project: Creedmore – 74E – Red Feather Lakes Roadside		**Project Category:** Roadside treatment	**Priority:** First
Lead	**Partners**	**Objectives**	
LC R&B	LCSO, OEM, USFS, CSFS	Reduce surface and canopy fuel loads to decrease roadway fire exposure along this main evacuation route serving the Red Feather Lakes and Crystal Lakes communities. Improve roadside conditions to support evacuee and firefighter safety. Strengthen the ability for this roadway to be used in suppression efforts as an effective control line.	

Project: 67J to Prairie Divide Roadside		**Project Category:** Roadside treatment	**Priority:** Second
Lead	**Partners**	**Objectives**	
LC R&B	LCSO, OEM, USFS, CSFS	Reduce surface and canopy fuel loads to decrease roadway fire exposure along this main evacuation route serving the Red Feather Lakes community. Improve roadside conditions to support evacuee and firefighter safety. Strengthen the ability for this roadway to be used in suppression efforts as an effective control line.	

Project: Manhattan Roadside		**Project Category:** Roadside treatment	**Priority:** Third
Lead	**Partners**	**Objectives**	
LC R&B	LCSO, OEM, USFS, CSFS	Reduce surface and canopy fuel loads to decrease roadway fire exposure along this secondary evacuation route serving the Red Feather Lakes community. Where appropriate, improve roadside conditions to support evacuee and firefighter safety (e.g. widening the road, road grading, creating pullovers).	

Project: Deadman Roadside		**Project Category:** Roadside treatment	**Priority:** Third
Lead	**Partners**	**Objectives**	
USFS	LCSO, CSFS	Reduce surface and canopy fuel loads to decrease roadway fire exposure along this evacuation route serving the Crystal Lakes community and tying into main evacuation routes for residents within RFLFPD. Where appropriate, improve roadside conditions to support evacuee and firefighter safety (e.g. widening the road, road grading, creating pullovers). Reinforce PODs boundary: strengthen the ability for this roadway to be used in suppression efforts as an effective control line to prevent fire spread into the Red Feather Lakes community.	

Project: Red Feather Lakes Village		**Project Category:** Fuel Treatment: Infrastructure mitigation	**Priority:** First
Lead	**Partners**	**Objectives**	
RFLVFD	N40MA	Inform businesses and residents of their wildfire risk and best practices to mitigate this risk. Perform mitigation work around businesses and structures in the Red Feather Lakes Village area to reduce wildfire risk and protect community assets and identity.	

Project: Poudre Valley Coop Propane Management		**Project Category:** Fuel Treatment: Infrastructure mitigation	**Priority:** First
Lead	**Partners**	**Objectives**	
Poudre Valley Coop	N40MA	Implement mowing and other mitigation work to protect community assets, propane storage, and prevent conflagration events.	

Project: Red Feather Lakes FPD Fuel Break		**Project Category:** Fuel Treatment: Stand-scale fuel mitigation/restoration	**Priority:** First
Lead	**Partners**	**Objectives**	
RFLVFD	Fox Acres, LCD, N40MA	Support evacuation safety by expanding off 67J to Prairie Divide roadside fuel treatment to alter fire behavior along this evacuation route. Perform stand-scale fuel treatments to alter fire behavior in areas of higher risk, wildfire exposure of values and assets, and housing density. Encourage and implement large-scale mitigation work across Fox Acres. Note: Fuel treatments are mechanical/hand thinning.	

Project: Electric Power Infrastructure Mitigation		**Project Category:** Fuel Treatment: Utilities Mitigation	**Priority:** First
Lead	**Partners**	**Recommendations and Objectives**	
PVREA	CPRW, LCOEM	With powerlines and electric utility infrastructure being both an ignition source and critical infrastructure for the Red Feather Lakes community, mitigation work along powerlines and around associated infrastructure throughout the districted is recommended as priority projects.	

Project: North Lone Pine Creek		**Project Category:** Fuel Treatment: Stand-scale fuel mitigation/riparian restoration	**Priority:** Second
Lead	**Partners**	**Objectives**	
USFS	CPRW, Northern Water, CSFS	Provide a strategically placed fuel treatment to alter fire behavior and reduce intensity of wildfires pushed by prevalent winds toward the Red Feather Lakes community. Provide source water protection for water supply, Columbine Creek and all ponds and lakes within Red Feather Lakes. Reinforce POD boundary by expanding fuel treatments off of Deadman Road. Note: Fuel treatments are mechanical/hand thinning and may include riparian restoration efforts. Some areas may be candidates for prescribed burn.	

Project: Phantom Ranch		**Project Category:** Fuel Treatment: Stand-scale fuel mitigation/restoration	**Priority:** Second
Lead	**Partners**	**Objectives**	
Phantom Ranch	LCD, CPRW, CSFS	Connect past treatments to turn individual stand-scale treatments into landscape scale modifications. Note: Fuel treatments are mechanical/hand thinning. Some areas may be candidate for prescribed burn.	

Project: Cornelius POD reinforcement		**Project Category:** Fuel Treatment: POD boundary	**Priority:** Second
Lead	**Partners**	**Objectives**	
USFS	CLRRA, CLFPD, LCCC, LCD, LCSO, CSFS	Provide strategic fuel break to limit wildfire spread into the Red Feather Lakes community. Complete POD boundary and create fireline tie in opportunities to aid in suppression efforts Note: Fuel treatments are mechanical/hand thinning.	

Project: Columbine Creek		**Project Category:** Fuel Treatment: Stand-scale fuel mitigation/riparian restoration	**Priority:** Third
Lead	**Partners**	**Objectives**	
USFS	CPRW, Northern Water, LCSO, LCCC, LCD, CSFS	Provide a strategically placed fuel treatment within dispersed camping areas to reduce wildfire risk in the event of campsite ignitions, alter fire behavior and reduce intensity of wildfires pushed by prevalent winds toward the Red Feather Lakes community. Prevent post-fire conditions conducive to erosion and sediment delivery in water sources. Reinforce POD boundary by expanding fuel treatments off of Deadman Road. Note: Fuel treatments are mechanical/hand thinning and may include riparian restoration efforts. Some areas may be candidates for prescribed burn.	

Project: Greeley Water		**Project Category:** Fuel Treatment: Stand-scale fuel mitigation/riparian restoration	**Priority:** Third
Lead	**Partners**	**Objectives**	
CPRW	USFS, Greeley Water, Northern Water, LCSO, CSFS	Provide source water protection to the City of Greeley water supply. Create a strategically placed fuel break to alter fire behavior and wildfire risk for the northern portion of the RFLFPD. Prevent post-fire conditions conducive to erosion and sediment delivery into key water sources. Reinforce evacuation safety by further expanding off of 67J to Prairie Divide Roadside treatment. Note: Fuel treatments are mechanical/hand thinning and may include riparian restoration efforts.	

4.d. Logistics of Fuel Treatments

Roles and Responsibilities

Landowners are responsible for fuel mitigation on their own lands, including along their private driveways. Residents must initiate and follow through on this work, but that does not mean they must do it alone. For assistance in planning and implementing fuel treatments, please refer to the Resident Assistance for Land Management Planning Section for information and links to contact LCD, CSFS, or other wildfire mitigation specialists. Residents may also apply for help from national volunteer organizations like Team Rubicon.

Tree cutting with a chainsaw and other forestry equipment should be done by experienced and certified individuals. The CSFS provides guidance for how to select a contractor for forest management, and they provide a list of local contractors.

Many land management agencies, homeowners, and other partners in and around the district are already engaged in fuel mitigation and ecological restoration. The Coalition for the Poudre River Watershed (CPRW), co-led with Larimer County Office of Emergency Management, was awarded a $9.7 million Community Wildfire Defense Grant (CWDG) in 2024 for the five-year Red Feather Lakes Area Wildfire Defense Project, with work being completed in the Cherokee Meadows area. Larimer Conservation District (LCD) has completed landscape-scale forest restoration projects within the district, funded through federal Farm Bill money combined with local grants. The Colorado State Forest Service (CSFS) provides ongoing technical and financial support for wildfire mitigation and forest management through its landowner and grant programs.

The responsibility for conducting roadside fuel treatments depends on the location of the road. Landowners are responsible for treatments along their private driveways. Cooperation from private property owners is necessary for effective roadside fuel treatments; CSFS recommends that treatments extend 150 or more feet off the downhill side of the road and up to 150 feet off the uphill side, and roadside easements are rarely wide enough to accommodate this.

Treatment Costs

The cost of fuel treatment depends on management objectives, treatment specifications, slope, accessibility, and treatment method (e.g., mechanical thinning, hand thinning, or prescribed burning). Costs of $2,500 to $10,000 per acre are not uncommon along the Colorado Front Range where there is little biomass or timber industry to provide financial return (Gannon et al., 2019). Follow-up treatments are generally less expensive than the initial entry and help maintain the efficacy of the original treatment investment.

Since fuel treatments are expensive, it is important to conduct strategic, well-designed, landscape-scale treatments to increase the likelihood that fuel treatments modify fire behavior, save lives, and promote resilient ecosystems. Fuel treatments can reduce property damages by making wildfires less damaging and easier to control; this is especially true for prescribed burning which is often cheaper and more effective at altering forest fuel loads than mechanical thinning alone (Fulé et al., 2012; Loomis et al., 2019; Prichard et al., 2020). Proactive management of forests can also reduce the cost of rehabilitating water sources when wildfires are followed by large storms and result in massive erosion (Jones et al., 2017). Fuel treatments can also reduce suppression costs due to the increased efficiency of firefighting (Loomis et al., 2019).

Longevity of Fuel Treatment Benefits

Benefits of fuel treatments are not permanent and decrease overtime, with treatment “lifespan” depending on forest type, topography, rates of seedling regeneration (which is often influenced by precipitation), and the number of trees and understory brush removed during treatments. Many forests require more than one treatment to reduce fuels and promote resilient ecosystem structure. Some areas might require mechanical tree removal followed by prescribed burning, and then a maintenance treatment with tree removal and/or prescribed burning 10 to 20 years later. With a single pulse of tree regeneration, the risk of torching returns to near pre-treatment levels within 10 to 35 years in ponderosa pine forests in Colorado (Tinkham et al., 2016). Gambel oak shrublands can require retreatment every 3-5 years due to vigorous sprouting after treatment (CSFS, 2021).

Approaches to Slash Management



Crews observe the fire effects during the 2023 Magic Feather prescribed burn. Photo Credit: USDA Forest Service.

Thinning operations can increase surface fuel loads and can fail to achieve fire mitigation objectives if fuels created by the harvest activities (also known as slash) are not addressed with management methods such as removal or pile burning (Agee and Skinner, 2005). Slash can include small trees, limbs, bark, and treetops. Slash management is a critical step in the forest management process. It is unwise, ineffective, and even dangerous to conduct poor-quality fuel treatments that fail to reduce canopy fuels, result in increased surface fuel loads, and do not receive maintenance treatments. Such treatments can lead to a false sense of security among residents and fire suppression personnel (Dennis, 2005), and they divert limited funds away from more effective, strategic projects.

Chips and masticated fuels are a type of slash that rearrange fuels on a site but do not remove fuels. However, in some instances, chipping and mastication can reduce fire intensity and rates of spread by increasing the distance between surface and canopy fuels and suppressing the regrowth of grasses (Kreye et al., 2014). See below for more information on pros and cons of chipping and masticating fuels.

Leaving untreated slash within roadside fuel treatments is particularly counterproductive. The risk of active crown fire might be lower after a thinning operation, but untreated slash in fuel treatments can burn at high intensities and endanger the lives of residents stuck on roadways during a wildfire. Slash is easier and cheaper to manage along roadways due to access, and roads can serve as highly effective holding features for controlled burning of grass in the spring and fall and pile burning in the winter.

Methods for managing slash come with different benefits and challenges (**Table 4.e.1**). For example, lop-and-scatter and mastication do not remove surface fuels from the site, they only rearrange them. It can take a decade or more for slash to decompose to a point where it no longer poses a significant fire hazard. Broadcast prescribed burning and pile burning are more effective at removing surface fuels, but they require extensive planning and expertise to conduct properly.



Prescribed burning is a common tool used to restore ecosystem processes and reduce fuel loads. Photo from 2023 Magic Feather prescribed burn. Photo credit: USDA Forest Service.

Slash removal in this part of Colorado is quite difficult due to limited biomass and timber industries. RFLVFD, Larimer County, and partners should work together to develop a slash management strategy and program for the area and its residents. This can and should include a combination of the following slash management techniques.

Broadcast Prescribed Burning

Broadcast prescribed burning is often the most effective method to reduce surface, ladder, and canopy fuel loads. Broadcast burning can be safely and successfully conducted with proper planning and implementation by qualified firefighters. Broadcast burning is regulated in Colorado by the DFPC, Department of Public Health and Environment, local sheriff's offices, and fire departments as outlined in the *2019 Colorado Prescribed Fire Planning and Implementation Policy Guide.*

Barriers/Challenges to Broadcast Burning:

- Public concerns about risk from flames, embers, and smoke.
- Limited opportunities to conduct pile burns because of requirements for snowpack and atmospheric ventilation.
- Limited staffing because firefighters are often on wildfire assignments and unavailable to conduct burns, especially as fire seasons have become almost year-round due to climate change.

Pile Burning

Pile burning can be the best and sometimes only option for slash removal in steep, inaccessible areas, and incomplete slash management can leave an area just as at risk as an unmitigated area. Pile burning is different from broadcast burning; the overall complexity of pile burn operations is lower because fire activity is limited to discrete piles, and piles can be burned when snow covers the ground. Pile burning is often a required treatment before a stand is in a condition and ready to accept broadcast burning.



Pile burning can be a safe and effective method to consume slash created by thinning operations Photo credit: TEA.

Burning piles can produce embers, but the risk of these embers igniting spot fires or structures is low. Piles are typically burned on days with snowpack, high fuel moisture, and low to moderate wind speeds. Embers from burn piles travel shorter distances than embers from passive and active crown fires because the burning material is closer to the ground (Evans and Wright, 2017).

It is critical to properly construct piles either by hand or with machines and to burn them as soon as conditions allow (see the 2015 *Colorado pile construction guide* from the DFPC and CSFS for guidance). Unburnt slash piles can become a hazard during wildfires, especially if loose logs catch fire and roll down slopes. Burning older piles is less effective and does not consume as much material because piles become compact and lose fine fuels over time (Wright et al., 2019).

Individuals must apply for open burn permits from the Larimer County Department of Health and Environment (LCDHE) burn fewer than 50 piles. Burning more than 50 piles requires a smoke management permit from the Colorado Department of Public Health and Environment. Larimer County Sheriff's Office does NOT allow open burning during fire restrictions and fire bans. Contact RFLVFD for specific requirements to burn piles in the district. Pursuant to Colorado House Bill 22-1132 (Darcy's Last Call Act), individuals must contact their local fire department before burning.

DFPC administers a certified burner program that provides civil liability protection to individuals planning and leading burns if smoke or flames cause damage. The burn must have been properly planned, approved, and executed to receive liability protection. The rigorous certification program requires individuals to complete 32 hours of training, pass an exam, lead at least three pile burns, complete a task book, and comply with all legal requirements for pile burning in Colorado.

Barriers/Challenges to Pile Burning:

- Public concerns about risk from flames, embers, and smoke. There are thousands of piles within and around the district that are ready to be burned, but the agency needs more public support before conducting the pile burns.
- Limited opportunities to conduct pile burns because of requirements for snowpack and atmospheric ventilation.
- Impacts to soil and vegetation. Intense heat from pile burning can sterilize soils and result in slow recovery of plants. Mitigation measures, such as raking the burnt soil and seeding with native plants, are sometimes warranted after pile burning if the soil was completely sterilized by extreme heat or if invasive species are prevalent in the area (Miller, 2015).

Air Curtain Burners and Burn Boxes

Air curtain burners and burn boxes are machines that burn woody material cleanly in contained space. They typically consist of a box or trench into which slash is loaded and ignited. A strong fan blows a curtain of air down and over the burning material in a way that keeps oxygen flowing through the fire and keeps smoke from escaping from the top. Carbon from the smoke is filtered out of the air and kept inside the box.



Air curtain burner owned and operated by Loveland Fire Rescue Authority. Photo: TEA

Air curtain burners can be an acceptable form of slash removal where there is no social license for pile or broadcast burning. They produce significantly less smoke than open burns and can be placed in accessible locations in the WUI.

Air curtain burners can be used under a much wider range of conditions and locations than pile burning or broadcast burning. Air curtain burners can burn more kinds of slash than pile burning, including green wood, lumber, and general yard waste. Burning material is contained and can be extinguished with relative ease.

Barriers/Challenges to Air Curtain Burners and Burn Boxes:

- State regulations to get a permit to operate an air curtain burner are cumbersome and take a lot of time.
- Substantial upfront cost, and ongoing cost to pay for professional operators, such as firefighters staffing engines.
- Need for a large, fuel-free area to operate the burner.
- Need for equipment to haul slash from treatment areas to the site of the burner.
- Impacts to soil since nutrients are permanently removed from the treatment site, unlike broadcast prescribed burns. Some nutrients can be returned to the ground if ash is removed from the burner and spread out, and it is rarely feasible to return ash to the original treatment site.

Community Slash Piles

Community slash piles allow residents to immediately reduce fuel loads on their property, and they eliminate the need for residents to burn or chip their own material. However, it can be challenging for residents to haul material from their properties to the slash pile. Providing a program that will pick up the slash material and bring it to the slash disposal site will also reduce barriers for residents to complete mitigation work thoroughly.

The success of community slash piles is dependent on consistent management of the pile. If large slash piles are left in the community, they can pose a fire risk if they were to burn during a wildfire. Community slash piles also come with a cost for management and maintenance, but the cost is spread across all residents and therefore lower than if individual residents were to create and burn their own slash piles.

Lop-and-Scatter

Lopping involves cutting limbs, branches, treetops, smaller-diameter trees, or other woody plant residue into shorter lengths. Scattering involves spreading slash, so it lies evenly and close to the ground. The lop-and-scatter approach reduces the height of slash relative to untreated slash, therefore increasing the distance between surface and canopy fuels (but not as effectively as broadcast prescribed burning or pile burning).

Lop-and-scatter can contribute to more intense fire behavior by not addressing increased surface fuel loads created by thinning (Agee and Skinner, 2005; Hunter et al., 2007). **Lop-and-scatter should not be utilized in defensible space zones 1-3 or along roadways** because this method does not remove surface fuels from the site, it just rearranges them. Lop-and-scatter is better suited to areas with low slash accumulations and for stand-scale fuel treatment areas far away from homes.

Mastication or Chipping

Mastication involves using specialized machines like a tow-behind chipper or a hydro-ax to grind up standing saplings and shrubs and cut slash into medium-sized chips. Chipping involves processing slash through a mechanical chipper to break material into small chips or shreds. Mastication and chipping can reduce fire intensity and rates of spread by increasing the distance between surface and canopy fuels and suppressing the regrowth of grasses (Kreye et al., 2014).

Neighborhood chipping programs are cost-effective ways for communities to gain access to chippers without individuals paying for the unit and service each time they need it. Many communities create chipping programs where a chipper can be brought to anyone's property and chip the material there for them to spread across their land again. The district could host a chipping program for residents as another cost-effective slash management option. For detailed information on chipping and mastication, refer to CFRI's Mulching Knowledge Summary.

Barriers/Challenges to Mastication or Chipping:

- Unless material is hauled away after treatment, fuels are just rearranged, not reduced
- Smoldering fires in masticated and chipped fuels can be difficult to suppress, produce abundant smoke, kill tree roots, and lead to spot fires if high winds reignite masticated fuels and blow them across containment lines (Kreye et al., 2014).
- LFPD and community associations do not have the capacity to keep up with chipping needs of the community given the significant amount of fuel that needs to be removed to reduce risk around homes.
- Fuels left behind in mastication and chipping treatments are deeper and more compact than natural fuels and can impede plant regeneration, particularly when the depth of masticated and chipped fuels exceeds 4 inches (Jain et al., 2018).

Table 4.d.1. *Many methods are available to remove slash created by forest thinning, each with their own benefits and challenges.*

Method	Removes surface fuel from site	Repairs ecosystem functions	Retains nutrients on the site	Expertise required to conduct	Effort to conduct	Relative cost/acre	Total time to plan and conduct
Broadcast prescribed burning	✓	✓	✓	Very high	Very high	$$$	Months to years
Pile burning on site	✓		✓	Moderate	Moderate to high	$$	Weeks to months
Air curtain burner	✓			High	Moderate	$$$$ (upfront)	Weeks to months
Community slash pile	✓			Low to moderate	Moderate	$$	Ongoing
Lop-and-scatter			✓	Low to moderate	Moderate	$ - $$	Weeks to months
Mastication or chipping	(✓)		✓	High	Moderate to high	$$$	Weeks to months

Note: Mastication and chipping only remove surface fuel from the site if material is hauled away after treatment. Utilizing material for firewood can relocate surface fuels from one site to another but increase fuel loads near a home until burned.

5. The Future of the CWPP

CWPPs are a guide and a plan for action. They should be revisited and reviewed annually by RFLFPD and key partners. Check off goals as they are accomplished and celebrate treatments, outreach events, new partnerships, and other accomplishments. Keep track of the work that happens between updates, take pictures, and collect implementation ideas for the next update.

The CSFS requires CWPPs to be updated on a regular basis. It is recommended to update them every 5 years, at minimum. CWPPs greater than 10 years old are outdated and can exclude communities from successfully applying for competitive funding opportunities.

The update to this plan can either be a preface to this document or a new document that integrates with this one. The update to this plan must include:

- A description of progress made since the CWPP was created.
- A description of demographic changes in the community and other important infrastructure changes.
- Identification of new risks in the community.
- Updated risk analysis if major changes have happened between revisions.
- Updated and prioritized projects for the community with maps and descriptions

The suggested review process by CSFS involves:

- Reviewing the existing CWPP.
- Engaging partners that have a vested interest in the plan.
- Hosting collaborative meetings.
- Documenting completed projects and demographic and landscape changes.
- Developing updated wildfire risk reduction priorities.
- Updating maps (priority project areas and fuel treatment history maps should be updated during each CWPP update. Risk assessments and other maps should be updated if they no longer accurately represent the risk in the area, or when they are more than 10 years old).
- Distributing updated drafts to key partners for review and input prior to final approval.
- Finalizing with Core Team signatures and submitting to CSFS State Office.

The RFLFPD CWPP is a call to action! Becoming a fire adapted community and decreasing wildfire risk takes concerted effort, time, and coordination. Use the maps, figures, and implementation recommendations from the CWPP to spark action on your property and across your neighborhood. The need to protect lives, safety, and property from wildfire is too great to wait.

6. Glossary

20-foot wind speed: The rate of sustained wind over a 10-minute period at 20 feet above the dominant vegetation. The wind adjustment factor to convert surface winds to 20-foot wind speeds depends on the type and density of surface fuels slowing down windspeeds closer to the ground (NWCG, 2021).

Active crown fire: Fire in which a solid flame develops in the crowns of trees and advances from tree crown to tree crown independently of surface fire spread (NWCG, 2018b).

ArcCASPER: An intelligent capacity-aware evacuation routing algorithm used in the geospatial information system mapping program ArcMap to model evacuation times and congestion based on roadway capacity, road speed, number of cars evacuating per address, and the relationship between roadways congestion and reduction in travel speed (Shahabi and Wilson, 2014).

Basal area: Cross sectional area of a tree measured at breast height (4.5 feet above the ground). Used as a method of measuring the density of a forest stand in units such as ft^2/acre (USFS, 2021b).

Broadcast prescribed burning (aka, prescribed burn, controlled burn): A wildland fire originating from a planned ignition in accordance with applicable laws, policies, and regulations to meet specific objectives (NWCG, 2018b).

Canopy fuels: The stratum of fuels containing the crowns of the tallest vegetation (living or dead), usually above 20 feet (NWCG, 2018b).

Canopy: The more or less continuous cover of branches and foliage formed collectively by adjacent tree crowns (USFS, 2021b).

Canyon: A long, deep, very steep-sided topographic feature primarily cut into bedrock and often with a perennial stream at the bottom (NRCS, 2017).

Chain: Chains are commonly used in forestry and fire management as a measure of distance. 1 chain is equivalent to 66 feet. Chains were used for measurements in the initial public land survey of the U.S. in the mid-1800s.

Chute: A steep V-shaped drainage that is not as deep as a canyon but is steeper than a draw. Normal upslope air flow is funneled through a chute and increases in speed, causing upslope preheating from convective heat, thereby exacerbating fire behavior (NWCG, 2008).

Community Wildfire Protection Plan (CWPP): A plan developed in the collaborative framework established by the Wildland Fire Leadership Council and agreed to by state, Tribal, and local governments, local fire departments, other partners, and federal land management agencies in the vicinity of the planning area. CWPPs identify and prioritize areas for hazardous fuel reduction treatments, recommend the types and methods of treatment on Federal and non-Federal land that will protect one or more at-risk communities and essential infrastructure, and recommend measures to reduce structural ignitability throughout the at-risk community. A CWPP may address issues such as wildfire response, hazard mitigation, community preparedness, and structure protection (NWCG, 2018b).

Convection: A type of heat transfer that occurs when a fluid, such as air or a liquid, is heated and travels away from the source, carrying heat along with it. Air around and above a wildfire expands as it is heated, causing it to become less dense and rise into a hot convection column. Cooler air flows in to replace the rising gases, and in some cases, this inflow of air creates local winds that further fan the flames. Hot convective gases move up slope and dry out fuels ahead of the flaming front, lowering their ignition temperature and increasing their susceptibility to ignition and fire spread. Homes located at the top of a slope can become preheated by convective heat transfer. Convection columns from wildfires carry sparks and embers aloft.

Crown (aka, tree crown): Upper part of a tree, including the branches and foliage (USFS, 2021b).

Defensible space: The area around a building where vegetation, debris, and other types of combustible fuels have been treated, cleared, or reduced to slow the spread of fire and reduce exposure to radiant heat and direct flame. It is encouraged that residents develop defensible space so that during a wildfire their home can stand

alone without relying upon limited firefighter resources due to the great reduction in hazards they have undertaken. The Colorado State Forest Service defines three zones of defensible space: zone 1 (HIZ 1) as 0 to 5 feet from the home, zone 2 (HIZ 2) as 5 to 30 feet from the home, and zone 3 (HIZ 3) as 30 to about 100 feet from the home (CSFS, 2021).

Direct attack: Any treatment applied directly to burning fuel such as wetting, smothering, or chemically quenching the fire or by physically separating the burning from unburned fuel (NWCG, 2018b).

Draws: Topographic features created by a small, natural watercourse cutting into unconsolidated materials. Draws generally have a broader floor and more gently sloping sides than a ravine or gulch (NRCS, 2017).

Ecological restoration: The process of assisting the recovery of an ecosystem that has been damaged, degraded, or destroyed (SER, 2004). In ponderosa pine and dry mixed-conifer forests of the Colorado Front Range, ecological restoration involves transforming dense forests into a mosaic of single trees, clumps of trees, and meadows similar to historic forests that were maintained by wildfires and very resilient to them (Addington et al., 2018).

Ember: Small, hot, and carbonaceous particles. The term "firebrand" is also used to connote a small, hot, and carbonaceous particle that is airborne and carried for some distance in an airstream (Johnston, 2018).

Ember cast: The process of embers/firebrands/flaming sparks being transported downwind beyond the main fire and starting new spot fires and/or igniting structures. Short-range ember cast is when embers are carried by surface winds and long-range ember cast is when embers are carried high into the convection column and fall out downwind beyond the main fire. The number of embers reaching an area decreases exponentially with distance traveled, and the likelihood of structure ignition increases with the number of embers landing on receptive fuels (Caton et al., 2016). The distance used to differentiate short-range and long-range ember cast varies among sources. NWCG (2018b) classifies short-range ember cast as embers that travel less than 0.25 miles and long-range ember cast as embers that travel more than 0.25 miles, whereas Beverly et al., (2010) use a threshold of 0.06 miles. We use the Beverly et al., (2010) definition in this CWPP.

Fire adapted community (FAC): A human community consisting of informed and prepared citizens collaboratively planning and taking action to safely coexist with wildland fire (NWCG, 2018b). There is not a checklist or one silver bullet to become a FAC; there are many strategic actions and tools that should be used together to reduce shared risk. Risk mitigation is the responsibility of everyone who lives and works in the community—residents, community groups, fire protection districts, agency partners, non-governmental organizations, etc. Fire adaptation is an ongoing process of collaborative action to identify risk, mitigate it, and maintain the work overtime.

Fire behavior: The manner in which a fire reacts to the influences of fuel, weather, and topography. Characteristics of fire behavior include rate of spread, fire intensity, fire severity, and fire behavior category (NWCG, 2018b).

Fire history: A general term referring to the historic fire occurrence in a specific geographic area (NWCG, 2018b).

Fire intensity (aka, fireline intensity): (1) The product of the available heat of combustion per unit of ground and the rate of spread of the fire, interpreted as the heat released per unit of time for each unit length of fire edge, or (2) the rate of heat release per unit time per unit length of fire front (NWCG, 2018b).

Fire regime: Description of the patterns of fire occurrences, frequency, size, and severity in a specific geographic area or ecosystem. A fire regime is a generalization based on fire histories at individual sites. Fire regimes can often be described as cycles because some parts of the histories usually get repeated, and the repetitions can be counted and measured, such as fire return interval (NWCG, 2018b).

Fire severity. Degree to which a site has been altered or disrupted by fire; loosely, a product of fire intensity and residence time (NWCG, 2018b). Fire severity is determined by visually inspecting or measuring the effects that wildfire has on soil, plants, fuel, and watersheds. Fire severity is often classified as low-severity (less than 20% of overstory trees killed) and high severity (more than 70% of overstory trees kills). Moderate-severity or intermediate fire severity falls between these two extremes (Agee, 1996). Specific cutoffs for fire severity

classifications differ among researchers. For example, Sheriff et al. (2014) define high-severity fires as those killing more than 80% of overstory trees.

Fire weather conditions: Weather conditions that influence fire ignition, behavior, and suppression, for example, wind speed, wind direction, temperature, relative humidity, and fuel moisture (NWCG, 2018b).

Firebreak: A natural or constructed barrier where all vegetation and organic matter have been removed down to bare mineral soil. Firebreaks are used to stop or slow wildfires or to provide a control line from which to work (Bennett et al., 2010; NWCG, 2018b).

FireFamilyPlus: A software application that provides summaries of fire weather, fire danger, and climatology for one or more weather stations extracted from the National Interagency Fire Management Integrated Database (NWCG, 2018b).

Fireline: (1) The part of a containment or control line that is scraped or dug to mineral soil, or (2) the area within or adjacent to the perimeter of an uncontrolled wildfire of any size in which action is being taken to control fire (NWCG, 2018b).

Flame length: The distance between the flame tip and the midpoint of the flame depth at the base of the flame (generally the ground surface). Flame length is measured on an angle when the flames are tilted due to effects of wind and slope. Flame length is an indicator of fire intensity (NWCG, 2018b).

FlamMap: A fire analysis desktop application that can simulate potential fire behavior and spread under constant environmental conditions (weather and fuel moisture) (Finney, 2006). FlamMap is one of the most common models used by land managers to assist with fuel treatment prioritization, and it is often used by fire behavior analysts during wildfire incidents.

Fuel model: A stylized set of fuel bed characteristics used as input for a variety of wildfire modeling applications to predict fire behavior (Scott and Burgan, 2005).

Fuel reduction: Manipulation, combustion, or removal of fuels to reduce the likelihood of ignition and/or to lessen potential damage from wildfires and resistance to control (NWCG, 2018b).

Fuel break: A natural or manmade change in fuel characteristics that affects fire behavior so that fires burning into them can be more readily controlled. Fuel breaks differ from firebreaks due to the continued presence of vegetation and organic soil. Trees in shaded fuel breaks are thinned and pruned to reduce the fire potential but enough trees are retained to make a less favorable microclimate for surface fires (NWCG, 2018b).

Fuels mitigation / management: The act or practice of controlling flammability and reducing resistance to control of wildland fuels through mechanical, chemical, biological, or manual means, or by fire, in support of land management objectives (NWCG, 2018b).

Fuels: Any combustible material, most notably vegetation in the context of wildfires, but also including petroleum-based products, homes, and other man-made materials that might combust during a wildfire in the wildland-urban interface. Wildland fuels are described as 1-, 10-, 100-, and 1000-hour fuels. One-hour fuels are dead vegetation less than 0.25 inch in diameter (e.g., dead grass), ten-hour fuels are dead vegetation 0.25 inch to 1 inch in diameter (e.g., leaf litter and pine needles), one hundred-hour fuels are dead vegetation 1 inch to 3 inches in diameter (e.g., fine branches), and one thousand-hour fuels are dead vegetation 3 inches to 8 inches in diameter (e.g., large branches). Fuels with larger diameters have a smaller surface area to volume ratio and take more time to dry out or become wetter as relative humidity in the air changes (NWCG, 2018b).

Hand crews: A number of individuals that have been organized and trained and are supervised principally for operational assignments on an incident (NWCG, 2018b).

Handline: Fireline constructed with hand tools (NWCG, 2018b).

Hazards: Any real or potential condition that can cause injury, illness, or death of personnel, or damage to, or loss of equipment or property (NWCG, 2018b).

Home hardening: Steps taken to improve the chance of a home and other structures withstanding ignition by radiant and convective heat and direct contact with flames or embers. Home hardening involves reducing structure ignitability by changing building materials, installation techniques, and structural characteristics of a home (California Fire Safe Council, 2020). A home can never be made fireproof, but home hardening practices in conjunction with creating defensible space increases the chance that a home will stand strong during a wildfire.

Home ignition zone (HIZ): The characteristics of a home and its immediate surroundings within 100 feet of structures. Conditions in the HIZ principally determine home ignition potential from radiant heat, convective heat, and ember cast (NWCG, 2018b).

Ignition-resistant building materials: Materials that resist ignition or sustained flaming combustion. Materials designated ignition-resistant have passed a standard test that evaluates flame spread on the material (Quarles, 2019; Quarles and Pohl, 2018).

Incident Response Pocket Guide (IRPG): Document that establishes standards for wildland fire incident response. The guide provides critical information on operational engagement, risk management, all hazard response, and aviation management. It provides a collection of best practices that have evolved over time within the wildland fire service (NWCG, 2018a).

Indirect attack A method of suppression in which the control line is located some considerable distance away from the fire's active edge. Generally done in the case of a fast-spreading or high-intensity fire and to utilize natural or constructed firebreaks or fuel breaks and favorable breaks in the topography. The intervening fuel is usually backfired; but occasionally the main fire is allowed to burn to the line, depending on conditions (NWCG, 2018b).

Insurance Services Office (ISO) rating: ISO ratings are provided to fire departments and insurance companies to reflect how prepared a community is for fires in terms of local fire department capacity, water supply, and other factors (see more information online at https://www.isomitigation.com/ppc/fsrs/).

Ladder fuels: Fuels that provide vertical continuity between strata, thereby allowing fire to carry from surface fuels into the crowns of trees with relative ease. Ladder fuels help initiate torching and crowning and assure the continuation of crowning. Ladder fuels can include small trees, brush, and lower limbs of large trees (NWCG, 2018b).

LANDFIRE: A national program spearheaded by the U.S. Department of the Interior and the U.S. Department of Agriculture to provide spatial products characterizing vegetation, fuels, fire regimes, and disturbances across the entire United States. LANDFIRE products serve as standardized inputs for fire behavior modeling. More information about the program is available online at https://www.landfire.gov/.

Lop-and-scatter: Cutting (lopping) branches, tops, and unwanted boles into shorter lengths and spreading that debris evenly over the ground such that resultant logging debris will lie close to the ground (NWCG, 2018b).

Mastication: A slash management technique that involves using a machine to grind, chop, or shred vegetation into small pieces that then become surface fuel (Jain et al., 2018).

Mitigation actions: Actions that are implemented to reduce or eliminate (mitigate) risks to persons, property, or natural resources. These actions can be undertaken before and during a wildfire. Actions before a fire include fuel treatments, vegetation modification in the home ignition zone, and structural changes to increase the chance a structure will stand strong during a wildfire (aka, home hardening). Mitigation actions during a wildfire include mechanical and physical tasks, specific fire applications, and limited suppression actions, such as constructing firelines and creating "black lines" through the use of controlled burnouts to limit fire spread and behavior (NWCG, 2018b).

Mosaic landscape: A heterogeneous area composed of different communities or a cluster of different ecosystems that are similar in function and origin in the landscape. It consists of ‘patches’ arranged in a ‘matrix’, where the patches are the different ecosystems and the matrix is how they are arranged over the land (Hansson et al., 1995).

National Wildfire Coordinating Group (NWCG): An operational group established in 1976 through a Memorandum of Understanding between the U.S. Department of Agriculture and Department of the Interior to

coordinate programs of the participating agencies to avoid wasteful duplication and to provide a means of constructively working together. NWCG provides a formalized system and agreed upon standards of training, equipment, aircraft, suppression priorities, and other operational areas. More information about NWCG is available online at https://www.nwcg.gov/.

Noncombustible building materials: Material of which no part will ignite or burn when subjected to fire or heat, even after exposure to moisture or the effects of age. Materials designated noncombustible have passed a standard test (Quarles, 2019; Quarles and Pohl, 2018).

Non-survivable road: Portions of roads adjacent to areas with predicted flame lengths greater than 8 feet under severe fire weather conditions. Potentially non-survivable flame lengths start at 8 feet according to the Haul Chart, which is a standard tool used by firefighters to relate flame lengths to tactical decisions (NWCG, 2019). Drivers stopped or trapped on these roadways would have a lower chance of surviving radiant heat from fires of this intensity. Non-survivable conditions are more common along roads that are lined with thick forests, particularly with trees that have limbs all the way to the ground and/or abundant saplings and seedlings.

Overstory: Layer of foliage in a forest canopy, particularly tall mature trees that rise above the shorter immature understory trees (USFS, 2021b).

Passive crown fire: Fire that arises when surface fire ignites the crowns of trees or groups of trees (aka, torching). Torching trees reinforce the rate of spread, but passive crown fires travel along with surface fires (NWCG, 2018b).

Pile burning: Piling slash resulting from logging or fuel management activities into manageable piles that are subsequently burned during safe and approved burning conditions (NWCG, 2018b).

Potential operational delineations (PODs): PODs are topographic areas bounded by features suitable for fire control (e.g., ridgetops and roads) that can be used for proactive wildfire decision making and tactical operations during wildfire events. PODs can serve as management units for proactive ecological restoration and wildfire risk mitigation, as well as for cross-boundary and collaborative land and fire management planning (Thompson et al., 2022).

Radiation: A method of heat transfer by short-wavelength energy through air (aka, infrared radiation). Surfaces that absorb radiant heat warm up and radiate additional short-wavelength energy themselves. Radiant heat is what you feel when sitting in front of a fireplace. Radiant heat preheats and dries fuels adjacent to the fire, which initiates combustion by lowering the fuel's ignition temperature. The amount of radiant heat received by fuels increases as the fire front approaches. Radiant heat is a major concern for the safety of wildland firefighters and can ignite homes without direct flame contact.

Rate of spread: The relative activity of a fire in extending its horizontal dimensions. It is expressed as rate of increase of the total perimeter of the fire, as rate of forward spread of the fire front, or as rate of increase in area, depending on the intended use of the information. Rate of spread is usually expressed in chains or acres per hour for a specific period in the fire's history (NWCG, 2018b).

Ravine: Topographic feature created by streams cutting into unconsolidated materials. They are narrow, steep-sided, and commonly V-shaped. Ravines are steeper than draws (NRCS, 2017).

Remote Automatic Weather Stations (RAWS): A weather station that transmits weather observations via satellite to the Wildland Fire Management Information system (NWCG, 2018b).

Risk: (1) The chance of fires starting as determined by the presence and activity of causative agents (e.g., lightning), (2) a chance of suffering harm or loss, or (3) a causative agent (NWCG, 2018b).

Roadside fuel treatment: A natural or manmade change in fuel characteristics along a roadway that affects fire behavior so that fires burning into them can be more readily controlled, survivable conditions with shorter flame lengths are more likely during a wildfire, and firefighter access is enhanced (NWCG, 2018b).

Saddle: A low point on a ridge or interfluve, generally a divide or pass between the heads of streams flowing in opposite directions. The presence of a saddle funnels airflow and increases windspeed, thereby exacerbating fire behavior (NRCS, 2017).

Safety zones: An area cleared of flammable materials used by firefighters for escape in the event the line is outflanked or spot fires outside the control line render the line unsafe. In firing operations, crews progress so as to maintain a safety zone close at hand, allowing the fuels inside the control line to be consumed before going ahead. Safety zones may also be constructed as integral parts of fuel breaks; they are greatly enlarged areas that can be used with relative safety by firefighters without the use of a fire shelter (NWCG, 2018b).

Shaded fuel break: Fuel treatments in timbered areas where the trees on the break are thinned and pruned to reduce fire potential yet enough trees are retained to make a less favorable microclimate for surface fires (NWCG, 2018b).

Slash: Debris resulting from natural events such as wind, fire, or snow breakage or from human activities such as road construction, logging, pruning, thinning, or brush cutting. Slash includes logs, bark, branches, stumps, treetops, and broken understory trees or brush (NWCG, 2018b).

Smoldering combustion: The combined processes of dehydration, pyrolysis, solid oxidation, and scattered flaming combustion and glowing combustion, which occur after the flaming combustion phase of a fire; often characterized by large amounts of smoke consisting mainly of tars (NWCG, 2018b).

Spot fire: Fire ignited outside the perimeter of the main fire by an ember (NWCG, 2018b). Spot fires are particularly concerning because they can form a new flaming front, move in unanticipated directions, trap firefighters between two fires, and require additional firefighting resources to control.

Spotting: Behavior of a fire producing sparks or embers that are carried by the wind and start new fires beyond the zone of direct ignition by the main fire (NWCG, 2018b).

Stand: An area of forest that possesses sufficient uniformity in species composition, age, size, structural configuration, and spatial arrangement to be distinguishable from adjacent areas (USFS, 2021b).

Structure protection: The protection of homes or other structures from an active wildland fire (NWCG, 2018b).

Structure triage: The process of inspecting and classifying structures according to their defensibility or non-defensibility, based on fire behavior, location, construction, and adjacent fuels. Structure triage involves a rapid assessment of a dwelling and its immediate surroundings to determine its potential to escape damage by an approaching wildland fire. Triage factors include the fuels and vegetation in the yard and adjacent to the structure, roof environment, decking and siding materials, prevailing winds, topography, etc. (NWCG, 2018b). There are four categories used during structure triage: (1) defensible – prep and hold, (2) defensible – stand alone, (3) non-defensible – prep and leave, and (4) non-defensible – rescue drive-by. The most important feature differentiating defensible and non-defensible structures is the presence of an adequate safety zone for firefighters (NWCG 2018a). Firefighters conduct structure triage and identify defensible homes during wildfire incidents. Categorization of homes is not pre-determined; triage decisions depend on fire behavior and wind speed due to their influence on the size of safety zones needed to keep firefighters safer.

Suppression: The work and activity used to extinguish or limit wildland fire spread (NWCG, 2018b).

Surface fire: Fire that burns fuels on the ground, which include dead branches, leaves, and low vegetation (NWCG, 2018b).

Surface fuels: Fuels lying on or near the ground, consisting of leaf and needle litter, dead branch material, downed logs, bark, tree cones, and low stature living plants (NWCG, 2018b).

Task book: A document listing the performance requirements (competencies and behaviors) for a position in a format that allows for the evaluation of individual (trainee) performance to determine if an individual is qualified in the position. Successful performance of tasks, as observed and recorded by a qualified evaluator, will result in a recommendation to the trainee's home unit that the individual be certified in the position (NWCG, 2018b).

Torching: The burning of the foliage of a single tree or a small group of trees from the bottom up. Torching is the type of fire behavior that occurs during passive crown fires and can initiate active crown fires if tree canopies are close to each other (NWCG, 2018b).

Values at risk: Aspects of a community or natural area considered valuable by an individual or community that could be negatively impacted by a wildfire or wildfire operations. These values can vary by community and include diverse characteristics such as homes, specific structures, water supply, power grids, natural and cultural resources, community infrastructure, and other economic, environmental, and social values (NWCG, 2018b).

Watershed (aka, drainage basin or catchment): An area of land where all precipitation falling in that area drains to the same location in a creek, stream, or river. Smaller watersheds come together to create basins that drain into bays and oceans (NOAA, 2021).

Wildfire-resistant building materials: A general term used to describe a material and design feature that can reduce the vulnerability of a building to ignition from wind-blown embers or other wildfire exposures (Quarles, 2019; Quarles and Pohl, 2018).

Wildland-urban interface (WUI): Any area where the built environment meets wildfire-prone areas—places where wildland fire can move between natural vegetation and the built environment and result in negative impacts on the community (Mowry and Johnston, 2018).

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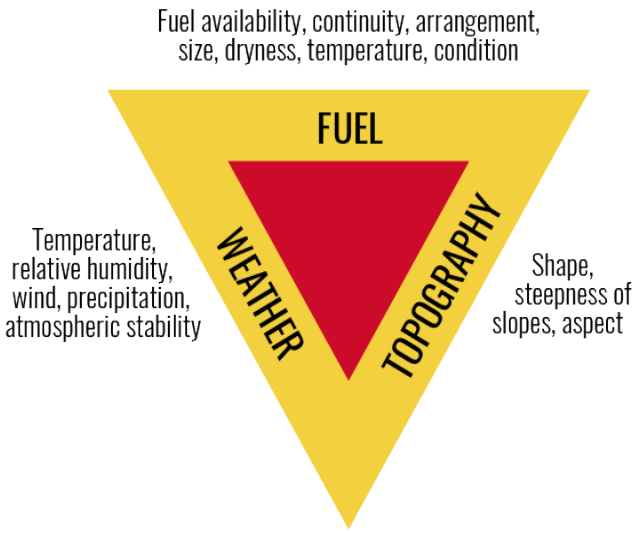
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8. Appendix A: Introduction to Wildfire Behavior and Terminology

8.a. Fire Behavior Triangle

Complex interactions among wildland fuels, weather, and topography determine how wildfires behave and spread. These three factors make up the sides of the fire behavior triangle, and they are the variables that wildland firefighters pay attention to when assessing potential wildfire behavior during an incident (NWCG, 2019).



Interactions between fuels, weather, and topography dictate fire behavior. Source: California State University.

Fuels

Fuels include live vegetation such as trees, shrubs, shrubs, and grasses, dead vegetation like pine needles and cured grass, and materials like houses, sheds, fences, trash piles, and combustible chemicals.

Grasses and pine needles are known as "flashy" fuels because they easily combust and burn the fastest of all fuel types. If you think of a campfire, flashy fuels are the kindling that you use to start the fire. Flashy fuels dry out faster than other fuel types when relative humidity drops or when exposed to radiant and convective heat[6]. Fires in grassy fuel types can spread quickly across large areas, and fire behavior can change rapidly with changes in weather conditions.

Dead branches on the surface dry out slower than flashy fuels, release more radiant heat when they burn, and take longer to completely combust. The rate of spread is fast to moderate through shrublands depending on their moisture content, and long flame lengths can preclude direct attack by firefighters. Shrubs and small trees can also act as ladder fuels that carry fire from the ground up into the tree canopy.

Dead trees (aka, snags) and large downed logs are called "heavy fuels," and they take the longest to dry out when relative humidity drops and when exposed to radiant and convective heat. Heavy fuels release tremendous radiant heat when they burn, and they take longer to completely combust, just like a log on a campfire. Fire spread through a forest is slower than in a grassland or shrubland, but forest fires release more heat and can be extremely difficult and unsafe for firefighters to suppress. An abundance of dead trees killed by drought, insects, or disease can exacerbate fire behavior, particularly when dead trees still have dry, red needles (Moriarty et al., 2019; Parsons et al., 2014).

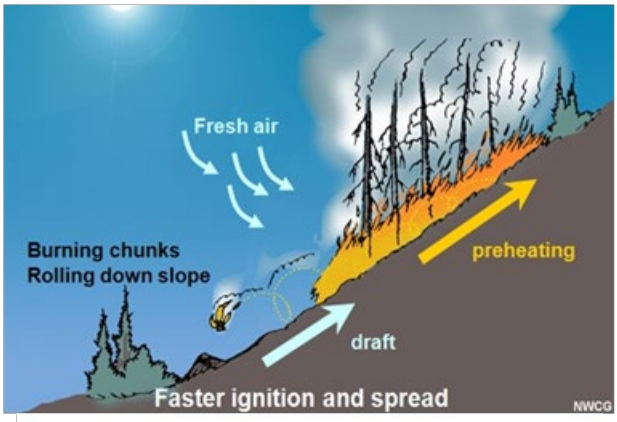
[6] Radiant heat transfer occurs by short-wavelength energy traveling through air. Radiant heat is what you feel when sitting in front of a fire. Radiant heat preheats and dries fuels adjacent to a wildfire, which initiates combustion by lowering the fuel's ignition temperature. Convective heat transfer occurs when air is heated, travels away from the source, and carries heat along with it. Convective heat is what you would feel if you put your hand in the air above an open flame. Air around and above a wildfire expands as it is heated, causing it to become less dense and rise into a hot convection column. Cooler air flows in to replace the rising gases, and in some cases, this inflow of air creates local winds that further fan the flames. Hot convective gases move up slope and dry out fuels ahead of the flaming front, lowering their ignition temperature and increasing their susceptibility to ignition and fire spread.

Topography

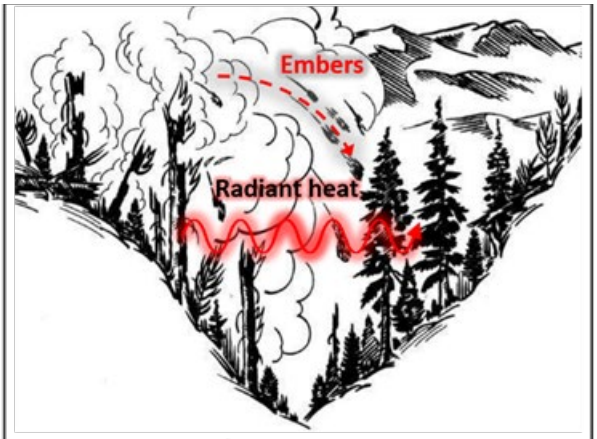
Topography (slope and aspect) influences fire intensity, speed, and spread. In the northern hemisphere, north-facing slopes experience less sun exposure during the day, resulting in higher fuel moisture. Tree density is often higher on north-facing slopes due to higher soil moisture. South-facing slopes experience more sun exposure and higher temperatures and are often covered in grasses and shrubs. The hotter and drier conditions on south-facing slopes mean fuels are drier and more susceptible to combustion, and the prevalence of flashy fuels results in fast rates of fire spread.

Fires burn more quickly up steep slopes due to radiant and convective heating. Fuels are brought into closer proximity with the progressing fire, causing them to dry out, preheat, and become more receptive to ignition, thereby increasing rates of spread. Steep slopes also increase the risk of burning material rolling and igniting unburnt fuels below.

Narrow canyons can experience increased combustion because radiant heat from a fire burning on one side of the canyon can heat fuel on the other side of the canyon. Embers can easily travel from one side of a canyon to the other. Topography also influences wind behavior and can make fire spread unpredictable. Wildfires burning through steep and rugged topography are harder to control due to reduced access for firefighters and more unpredictable and extreme fire behavior.



Slope increases fire spread through radiant and convective heating (source: NWCG).



Fires can easily cross narrow canyons (source: U.S. Forest Service).

Weather

Weather conditions impacting fire behavior include temperature, relative humidity, precipitation, wind speed, and wind direction. The National Weather Service uses a system called a Red Flag Warning to indicate local weather conditions that can combine to produce increased risk of fire danger and behavior. Red Flag Warning days indicate an increased risk of extreme fire behavior due to a combination of hot temperatures, very low humidity, dry fuels, strong winds, and the presence of thunderstorms.

Direct sunlight and hot temperatures impact how ready fuels are to ignite. Warm air preheats fuels and brings them closer to their ignition point. When relative humidity is low, the dry air can absorb moisture from fuels, especially flashy fuels, making them more susceptible to ignition. Long periods of dry

RED FLAG CRITERIA

Red flag days are warnings issued by the National Weather Service (NWS) to indicate that warm temperatures, very low humidity, and stronger winds are expected to result in elevated fire danger in the next 24-48 hours.

The NWS Denver/Boulder Forecast Office has two options for red flag criteria:

Option 1	Option 2
Relative humidity <= 15% Wind gusts >= 25 mph Dry fuels	Widely scattered dry thunderstorms Dry fuels

weather can dehydrate heavier fuels, including downed logs, increasing the risk of wildfires in areas with heavy fuel loads.

Wind influences fire behavior by drying out fuels (think how quickly your lips dry out in windy weather), increasing the amount of oxygen feeding the fuel, preheating vegetation through convective heat, and carrying embers more than a mile ahead of an active fire. Complex topography, such as chutes, saddles, and draws, can funnel winds in unpredictable directions, increasing wind speeds and resulting in erratic fire behavior.

8.b. Categories of Fire Behavior

Weather, topography, and fuels influence fire behavior, and fire behavior in turn influences the tactical options available for wildland firefighters and the risks posed to lives and property. Three general categories of fire behavior are described throughout this CWPP: surface fire, passive crown fire, and active crown fire.

- **Surface fire –** Fire that burns fuels on the ground, which include dead branches, leaves, and low vegetation. Surface fires can be addressed with direct attack using handcrews when flame lengths are less than four feet and with equipment when flame lengths are less than eight feet. Surface fires can emit significant radiant heat, which can ignite nearby vegetation and homes.
- **Passive crown fire –** Fire that arises when a surface fire ignites the crowns of trees or groups of trees (aka, torching). Torching trees reinforce the rate of spread, but passive crown fires travel along with surface fires. Firefighters can sometimes address passive crown fires with an indirect attack, such as dropping water or retardant out of aircraft or digging fireline at a safe distance from the flaming front. The likelihood of passive crown fire increases when trees have low limbs and when smaller trees and shrubs grow below tall trees and act as ladder fuels. Radiant heat and ember production from passive crown fires can threaten homes during wildfires.
- **Active crown fire –** Fire in which a solid flame develops in the crowns of trees and advances from tree crown to tree crown independently of surface fire spread. Crown fires are very difficult to contain, even with the use of aircraft dropping fire retardant, due to long flame lengths and the tremendous release of radiant energy. The likelihood of active crown fires increases when trees have interlocking canopies. Radiant heat and ember production from active crown fires can threaten homes during wildfires.

Passive and active crown fires can result in short- and long-range ember production that can create spot fires and ignite homes. Spot fires are particularly concerning because they can form a new flaming front, move in unanticipated directions, trap firefighters between two fires, and require additional firefighting resources to control. Crown fires are generally undesirable in the wildland-urban interface (WUI) because of the risk to lives and property; however, passive and active crown fires are part of the natural fire regime for some forest types and result in habitat for plant and animal species that require recently disturbed conditions (Keane et al., 2008; Pausas and Parr, 2018). Historically, passive and active crown fires occurred in some lodgepole pine forests and higher-elevation ponderosa pine and mixed-conifer forests on north-facing slopes (Addington et al., 2018; Romme, 1982).



8.c. Wildfire Threats to Homes

Wildfires can ignite homes through several pathways: radiant heat, convective heat, and direct contact with flames or embers. The ability for radiant heat to ignite a home is based on the properties of the structure (i.e., wood, metal, or brick siding), the temperature of the flame, the ambient air temperature, and the distance from the flame (Caton et al., 2016). Ignition from convective heat is more likely for homes built along steep slopes and in ravines and draws. For flames to ignite a structure, they must directly contact the building long enough to cause ignition. Flames from a stack of firewood near a home could cause ignition to the home, but flames that quickly burn through grassy fuels are less likely to ignite the home (although the potential still exists). Fires can also travel between structures along fuel pathways such as a fence or row of shrubs connecting a shed and a home (Maranghides et al., 2022). Some housing materials can burn hotter than the surrounding vegetation, thereby exacerbating wildfire intensity and initiating home-to-home ignition (Mell et al., 2010).



Homes built mid-slope and at the top of steep slopes and within ravines and draws are at greater risk of convective heat from wildfires. A wildfire could rapidly spread up this steep slope and threaten the home above. Photo credit: The Ember Alliance

Homes can be destroyed during wildfires even if surrounding vegetation has not burned. During many wildland fires, 50 to 90% of homes ignite due to embers rather than radiant heat or direct flame (Gropp, 2019; Johnston, 2018). Embers can ignite structures when they land on roofs, enter homes through exposed eaves, or get under wooden decks. Embers can also ignite nearby vegetation and other combustible fuels, which can subsequently ignite a home via radiant heating or direct flame contact. Burning homes can release embers that land on and ignite nearby structures, causing destructive home-to-home ignitions, as evidenced by the destructive 2021 Marshall Fire in Boulder County. Structural characteristics of a home can increase its exposure to embers and risk of combustion, such as wood shingle roofs and unenclosed eaves and vents (Hakes et al., 2017; Syphard and Keeley, 2019). Embers can also penetrate homes if windows are destroyed by radiant or convective heat.

8.d. Resources for More Information on Fire Behavior

- Introduction to Fire Behavior from the National Wildfire Coordinating Group (9:57 minute video)
- The Fire Triangle from the National Wildfire Coordinating Group (7:26 minute video)
- Understanding Fire Behavior in the Wildland/Urban Interface from the National Fire Protection Association (20:51 minute video)
- Understanding Fire from California State University (website)
- S-190 Introduction to Wildland Fire Behavior Course Materials from the National Wildfire Coordinating Group (PowerPoints, handouts, and videos)

9. Appendix B: Community Risk Assessment and Modeling Methodology

9.a. WUI Delineation

Delineating the wildland–urban interface (WUI) is a critical component of Community Wildfire Protection Plans (CWPPs) and is required under the Healthy Forest Restoration Act (HFRA) of 2003. HFRA allows communities to extend the WUI boundary into adjacent areas that pose a wildfire threat to the community, can serve as strategic locations for wildfire response, and are adjacent to evacuation routes (HFRA, 4 U.S.C. §101.16). Strategic wildfire mitigation across the WUI increases the safety of residents and wildland firefighters and reduces the likelihood of structure loss.

For the Red Feather Lakes Fire Protection District (RFLFPD), the WUI was delineated using pre-existing Potential Operational Delineations (PODs). PODs covering the district and its important evacuation routes were dissolved into a unified boundary, capturing not just populated areas but also portions of the surrounding landscape where fires could originate and spread into the community. This approach focuses planning and mitigation efforts along POD boundary lines already being prioritized by the Northern Colorado Fireshed and U.S. Forest Service for wildfire response and operations.

The WUI boundary also incorporates Potential WUI Transects—lines running through the interior of existing PODs that mark where a secondary line of defense could be established during a wildfire. These transects subdivide a large POD into smaller areas that could each be managed like a POD if needed, giving firefighters and planners additional strategic options beyond the outer POD boundaries. All of RFLFPD falls within the WUI under this approach.

9.b. Fire Behavior Analysis

We leveraged two existing, high-quality wildfire risk analyses for the RFLFPD CWPP: (1) the 2022 Colorado Wildfire Risk Assessment (2022 CO-WRA) (CSFS & Technosylva 2023a, 2023b), and (2) the 2022 Northern Colorado Fireshed Quantitative Wildfire Risk Assessment (2022 NCFC QWRA) (Rhea et al., 2022). More details on these analyses are provided below.

Fire behavior models utilized for the 2022 CO-WRA and NCFC QWRA require information on topography, surface fuel loads, canopy fuel loads, and fire weather conditions. Fuel models are a stylized set of fuel bed characteristics used to characterize surface fuel loads areas the area of interest. depicts the fire behavior fuel models present across RFLFPD according to data from the 2022 CO-WRA (**Figure B.1**).

The RFLFPD CWPP relies primarily on fire behavior predictions from the 2022 CO-WRA, but we utilized the analysis of expected net value change from the 2022 NCFC QWRA. The 2022 CO-WRA analysis does not account for potential benefits of wildfire for ecological conditions and other highly valued resources and assets. The 2022 NCFC

Important Considerations about Fire Behavior Predictions

Fire behavior models can provide reasonable estimates of relative wildfire behavior across a landscape. However, wildfire behavior is complex, and models are a simplification of reality. Models also struggle to capture impacts of structures on wildfire spread and home-to-home ignitions. It is recommended to use these fire behavior analyses at a landscape scale to assess relative risk across the entire RFLFPD, not at the parcel-level.

Exceptional hot, dry, and windy conditions are increasingly common due to climate change and could result in even more extreme fire behavior across RFLFPD than predicted by the 2022 Colorado Wildfire Risk Assessment.

QWRA provides a more holistic view of potential consequences of wildfire on the landscape, and it incorporated expert opinion from local fire and fuel specialists with the Arapaho-Roosevelt National Forest and NFCF stakeholders.

2022 CO-WRA: The 2022 CO-WRA is the most recent and advanced version of the wildfire risk assessment available through the Colorado Forest Atlas. The Colorado State Forest Service (CSFS) and Technosylva made improvements in methodology for the 2022 update, notably greater ground-truthing of input data, novel approaches for predicting wildfire spread into suburban and urban areas, and a higher spatial resolution (20-meter resolution versus 30-meter that was used before).

The 2022 CO-WRA includes predictions of flame length, rate of spread, crown fire activity, fire intensity scale, burn probability, and spotting distance from Technosylva's Wildfire Analyst software, which is like the fire behavior model FlamMap. FlamMap is a fire analysis desktop application that simulates potential fire behavior and spread under constant weather and fuel moisture (Finney, 2006). FlamMap is one of the most common models used by land managers to assist with fuel treatment prioritization, and it is often used by fire behavior analysts during wildfire incidents. Details on the 2022 CO-WRA are provided by (CSFS & Technosylva 2023a, 2023b).

Technosylva developed four weather scenarios (low, moderate, high, and extreme), with temperature, relative humidity, and wind speed and direction for each 10-m by 10-m pixels across Colorado based on 1970-2022 data from gridMET. Technosylva used these data to predict surface fuel moistures. Predictions of fire type from the 2022 CO-WRA utilize extreme weather conditions. The 2022 CO-WRA provides characteristic flame lengths and characteristic rates of spread that are a weighted average of the four weather scenarios as well as predicted flame lengths and rates of spread under extreme conditions. The RFLFPD CWPP utilizes flame length and rate of spread predictions for extreme weather conditions to evaluate wildfire risk under the most dangerous fire weather conditions, which are becoming more common across Colorado because of climate change.

To predict burn probability, Technosylva simulated over 3 million wildfires over the state of Colorado, with a mean ignition density of 10 fires/km^2. Ignition locations were spatially distributed based on historical fire occurrences. They then determined how many of those fires intersected each 20 m x 20 m portion of the landscape.

2022 NCFC QWRA: The 2022 NCFC QWRA was conducted by the Colorado Forest Restoration Institute (CFRI) with input from fire and fuel specialists with the Arapaho-Roosevelt National Forest and NCFC stakeholders. The 2022 NCFC QWRA utilizes FlamMap for predictions of flame length and crow fire activity and FSim for burn probability. CFRI developed four weather scenarios (low, moderate, high, and extreme) based on 2000-2019 weather data from eight remote automated weather stations distributed across the analysis area (Red Feather, Redstone, Estes Park, Sugarloaf, Harbison Meadow, Dumont, Pickle Creek, and Corral Creek).

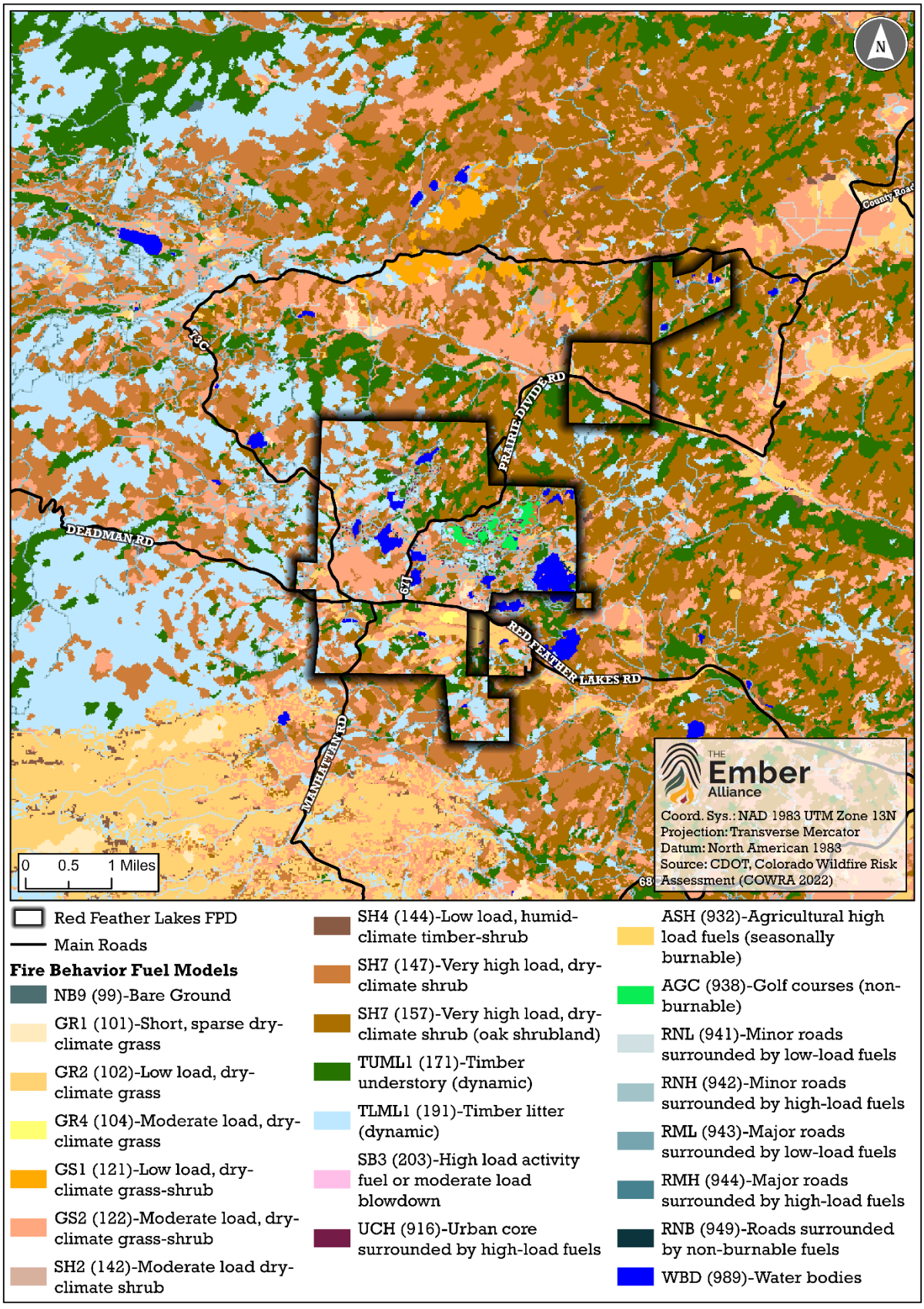


Figure B.1. *Timber litter, timber understory, grass, grass-shrub, and shrub fuel models are common across RFLFPD. See (CSFS and Technosylva, 2023b) for a description of each fuel model. Source: 2022 CO-WRA.*

Model Interpretations and Limitations

Fire behavior models have been rigorously developed and tested based on over 40 years of experimental and observational research (Sullivan, 2009). Fire behavior models allow us to identify areas that could experience high-severity wildfires and pose a risk to lives, property, and other values at risk. **Fire behavior analyses are useful for assessing relative risk across the entire district and are not intended to assess specific fire behavior in the vicinity of individual homes.**

Wildfire behavior is complex, and models are a simplification of reality. It is not feasible to predict every combination of fire weather conditions, ignition locations, and suppression activities that might occur during a wildfire. Uncertainty regarding where a wildfire might ignite and how it will behave is inevitable until one occurs. Even then, fire behavior can be erratic and unpredictable.

Our maps of fire behavior predictions include areas indicated as "unburnable/not modeled"—parking lots, roadways, bodies of water, and barren areas are considered unburnable; areas dominated by homes and buildings were classified as "not modeled" because fire behavior models utilized for the 2022 CO-WRA and NCFC QWRA do not adequately account for structures as a fuel type and cannot capture impacts of structures on wildfire spread and home-to-home ignitions. Data are not available on the building material used for every structure in an area or the vegetation in the HIZ, which are factors that significantly impact the vulnerability of a structure to ignition during wildfire.

In the absence of this data and a deeper quantitative understanding of interactions between structures and wildland vegetation during a wildfire, fire behavior cannot be modeled for areas dominated by homes in the same fashion as areas dominated by grassland, shrubland, or forest vegetation. To address structure exposure, TEA conducted a separate analysis to predict potential exposure of homes to radiant heat and ember cast, as described below in the section below on predicted radiant heat and ember cast exposure.

Predicted Fire Behavior

Wildland firefighters pay attention to current and expected fire behavior when making tactical decisions. The Haul Chart is a tool in the Incident Response Pocket Guide (IRPG) carried by all wildland firefighters that can help them interpret fire behavior based on observed flame length, rate of spread, and crown fire activity (**Table B.1**). We utilize cutoffs from the Haul Chart for classifying flame length, rate of spread, and producing a map of fire behavior class using outputs from the 2022 CO-WRA.

Flame Length

Flame length is the distance measured from the average flame tip to the middle of the flaming zone at the base of the fire. Flame length is measured at an angle when the flames are tilted due to effects of wind and slope (see image at right). Flame length is an indicator of fire intensity—the amount of energy released by a fire. Flame length under extreme fire weather conditions is shown in **Figure B.2**.



Potential Fire Type

Figure B.4 shows the potential fire type that might occur across RFLFPD (see **Appendix A** for a description of different types of fire behavior). CO-WRA predictions of crown fire activity were made for extreme fire weather conditions. Passive crown fire (aka, torching) and active crown fires pose a significant risk to the safety of firefighters and residents and can destroy homes through radiant and convective heating and ember production. Surface fires can rapidly spread under hot, dry, and windy conditions and outpace the ability of firefighters to quickly suppress the blaze.

Rate of Spread

Rate of spread is the speed with which a fire moves in a horizontal direction across the landscape. The 2022 CO-WRA presents characteristic rate of spread, which is the weighted average speed with which a head-fire moves in a horizonal direction across the landscape under low, moderate, high, and extreme weather scenarios (**Figure B.4**). Rates of spread are faster on steep slopes, when wind speeds are greater and aligned with the direction of spread, and in fine, flashy fuels like continuous, dry grass. Although slopes are steep and forests dense to the west part of RFLFPD, predicted rates of spread are low because under most fire weather conditions, fire moves slowly through timber litter in lodgepole pine forests.

Fire Behavior Class

Ember Alliance combined estimates of flame length and crown fire activity from the 2022 CO-WRA to produce a map of fire behavior class across the district (**Figure B.5**). Under hot, dry, and windy weather, 73% percent of the district could experience high to extreme fire behavior, including ember production that ignites additional fires away from the main fire and the movement of high-intensity fire from treetop to treetop. Such fires are extremely challenging if not impossible to control until winds die down and fuel moisture increases.

Relative Burn Probability

Relative burn probability indicates how likely an area is to burn during a wildfire compared to other areas. Areas with a greater potential for rapidly growing wildfires have higher relative burn probabilities because more fire perimeters are likely to overlap when fires are larger. Topography, non-burnable barriers such as wide rivers, interstates, and highways, and fuel loads also influence conditional burn probability by dictating how fire spreads across the landscape. Short-range transport of embers can cause spot fires to ignite even across unburnable barriers such as roads, and CO-WRA modelers account for the potential for spot fires when modeling fire spread to predict burn probability.

Most parts of RFLFPD have high burn probabilities relative to the rest of the state of Colorado (**Figure B.6**). Burn probabilities are lower in some of the dense lodgepole pine forests to the west of the district where fires could move slowly through timbe litter under most fire weather conditions. The pattern in burn probability mirrors historic fire behavior—ponderosa pine forests burned more frequency than lodgepole pine forests, but when lodgepole pine forests do burn under extreme conditions, the potential for extreme fire behavior is great.

Table B.1. *The Haul Chart and tactical interpretations. The Haul Chart is a tool used by firefighters for relating fire behavior to tactical decision-making (NWCG, 2019).*

Fire behavior class	Flame length (feet)	Rate of spread (chains/hr)*	Tactical interpretation
Very low, smoldering	<1	0-2	Fire is not spreading and has limited flames. Fire can be attacked at the head or flanks by persons using handtools. Handline will hold the fire.
Low, creeping, spreading	1-4	2-5	Fire can be attacked at the head or flanks by persons using handtools. Handline should hold the fire.
Moderate, running	4-8	5-20	Fires are too intense for direct attack at the head of the fire by persons using handtools. Handline cannot be relied on to hold the fire. Equipment such as dozers, engines, and retardant aircraft may be effective.
High, torching and spotting	8-11	20-50	Fires present serious control problems with torching, crowning, and spotting. Control efforts at the head of the fire are probably ineffective.
Very high, active crown fire	11-25	50-150	Crowning, spotting, and major fire runs are expected. Control efforts at the head of the fire are ineffective.
Extreme and erratic	>25	>150	Extreme intensity, turbulent fire, and chaotic spread. Escape to safety should be considered.

*__Note:__ 1 chain = 66 feet. Chains are commonly used in forestry and fire management as a measure of distance. 1 chain/hour = 1.1 feet/minute.

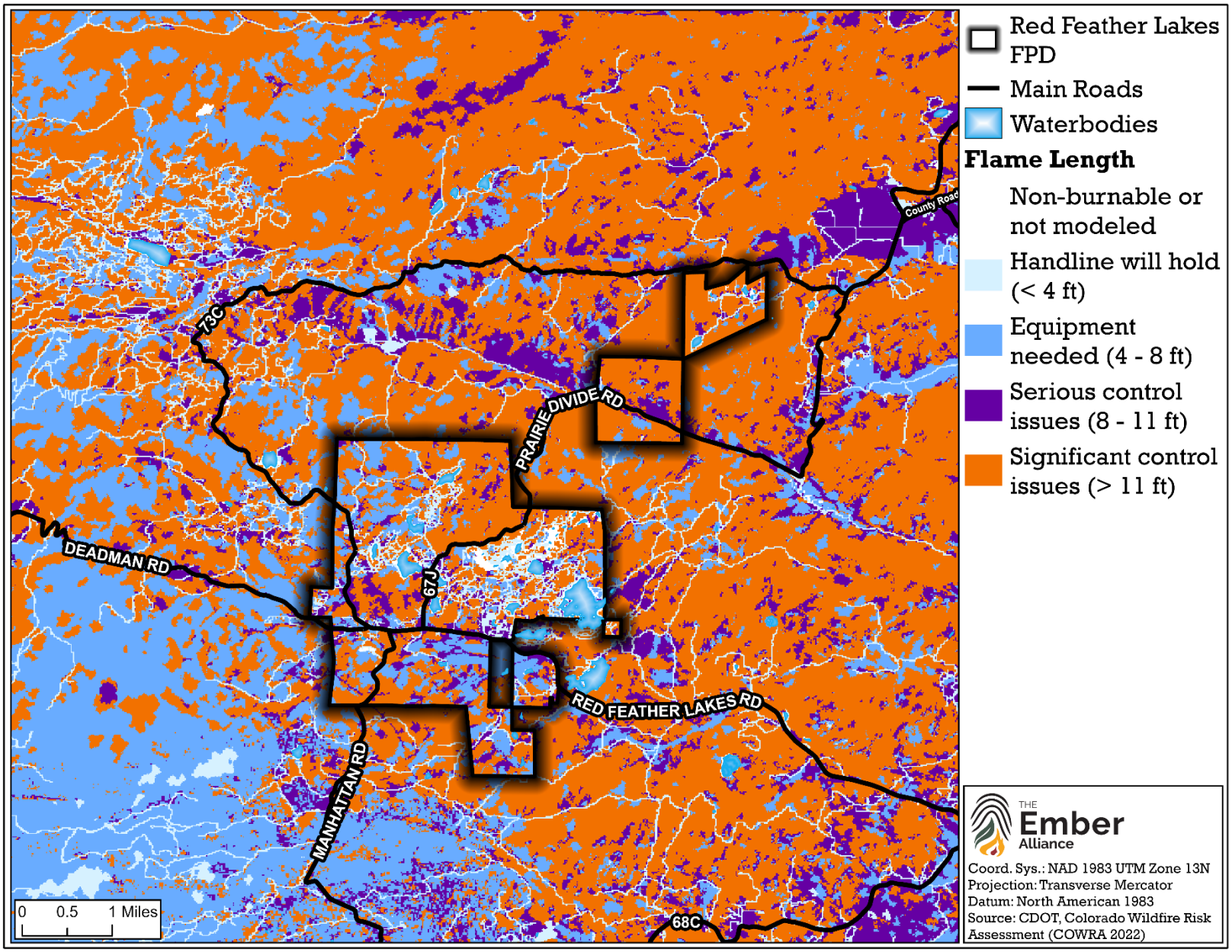


Figure B.2. *Predicted flame lengths in RFLFPD categorized by the Haul Chart and under extreme fire weather conditions. Source: 2022 CO-WRA.*

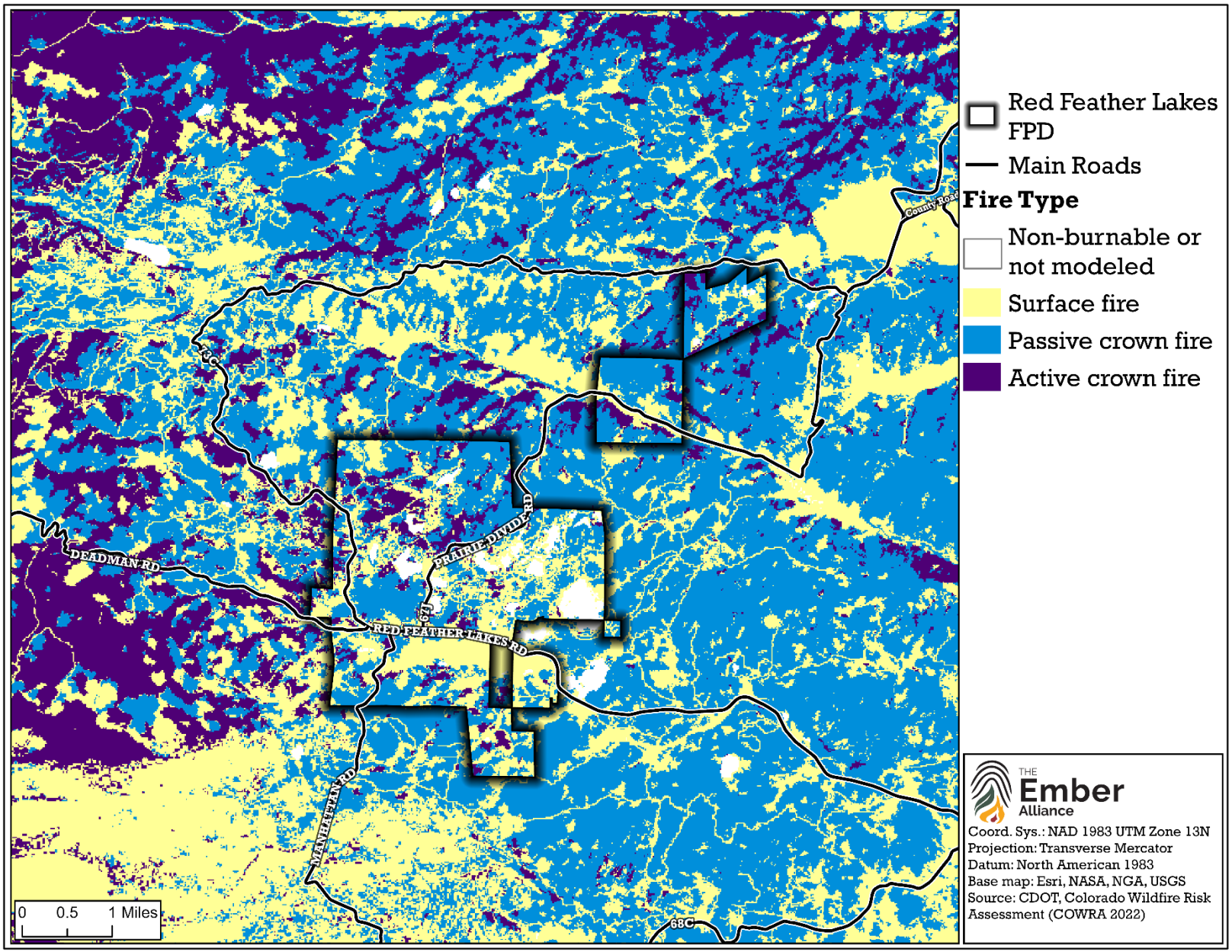


Figure B.3. *Potential fire type under extreme fire weather conditions in RFLFPD. Source: 2022 CO-WRA.*

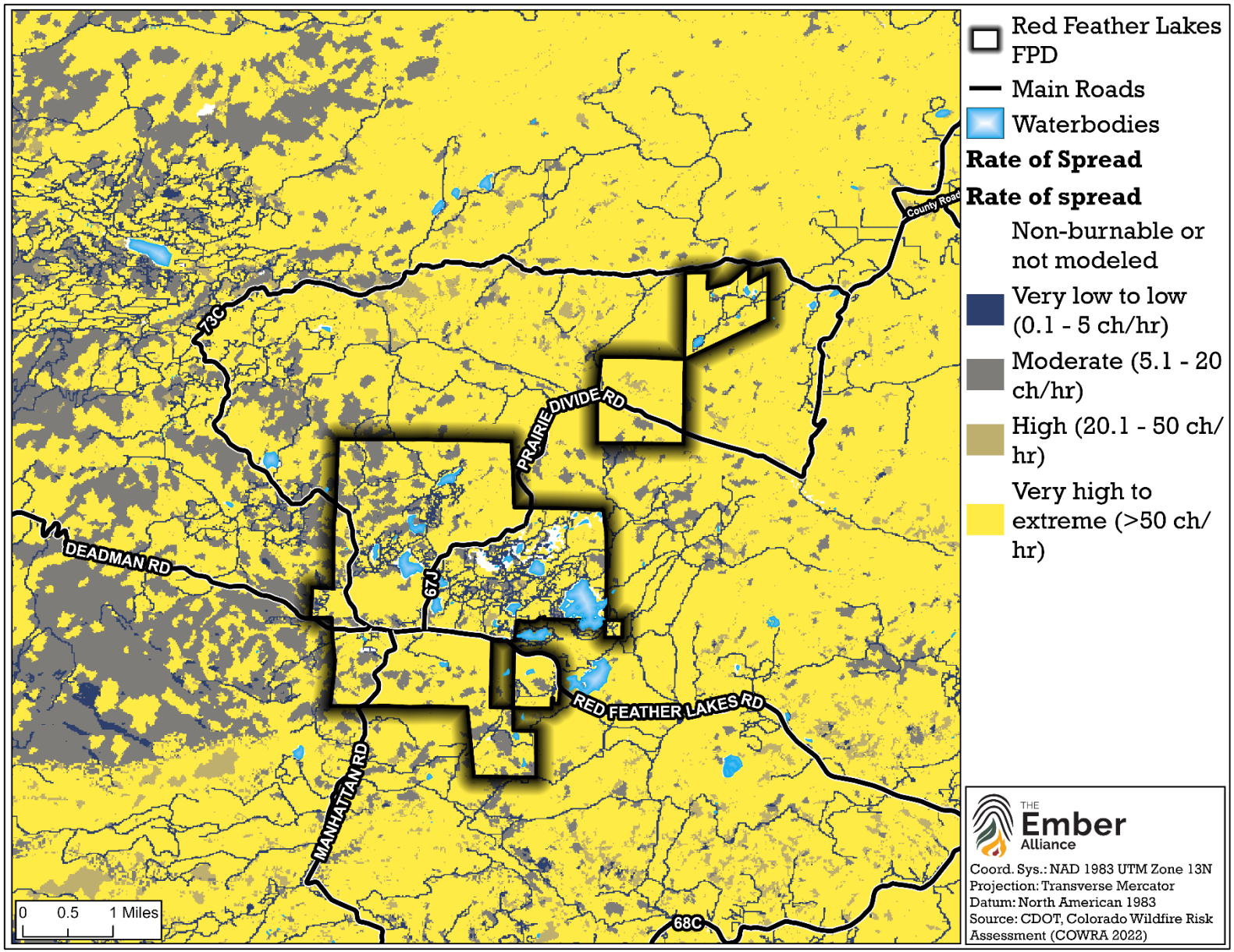


Figure B.4. *Rate of spread at the fire front (aka, head fire) in the district under various weather conditions. Chains are commonly used in forestry and fire management as a measure of distance. 1 chain = 66 feet. 1 chain/hour = 1.1 feet/minute. Source: 2022 CO-WRA.*

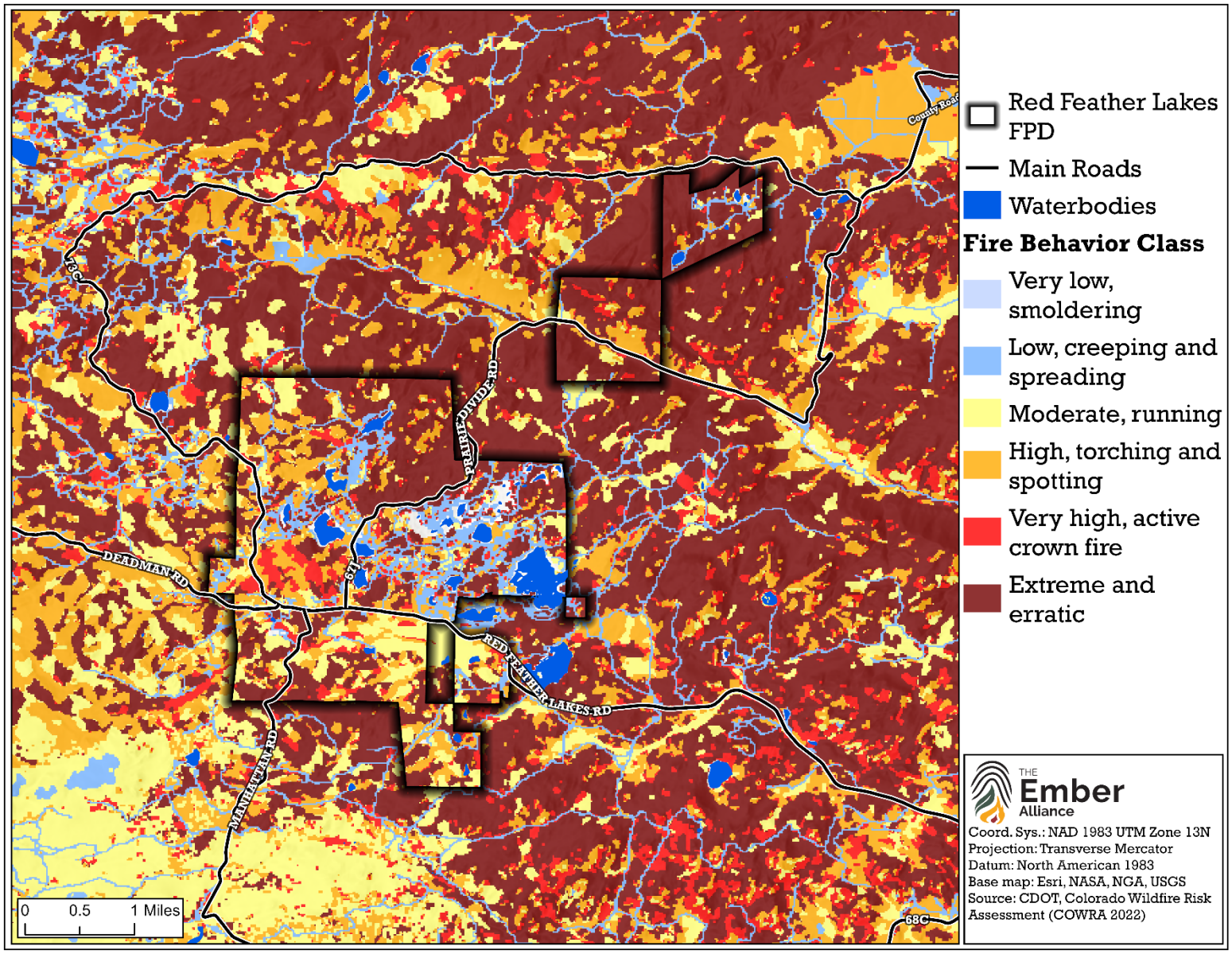


Figure B.5. *Under extreme fire weather conditions, 73% percent of the district could experience high to extreme fire behavior, which includes long flame lengths and active crown fires that are difficult for firefighters to suppress. Source: 2022 CO-WRA from CSFS.*

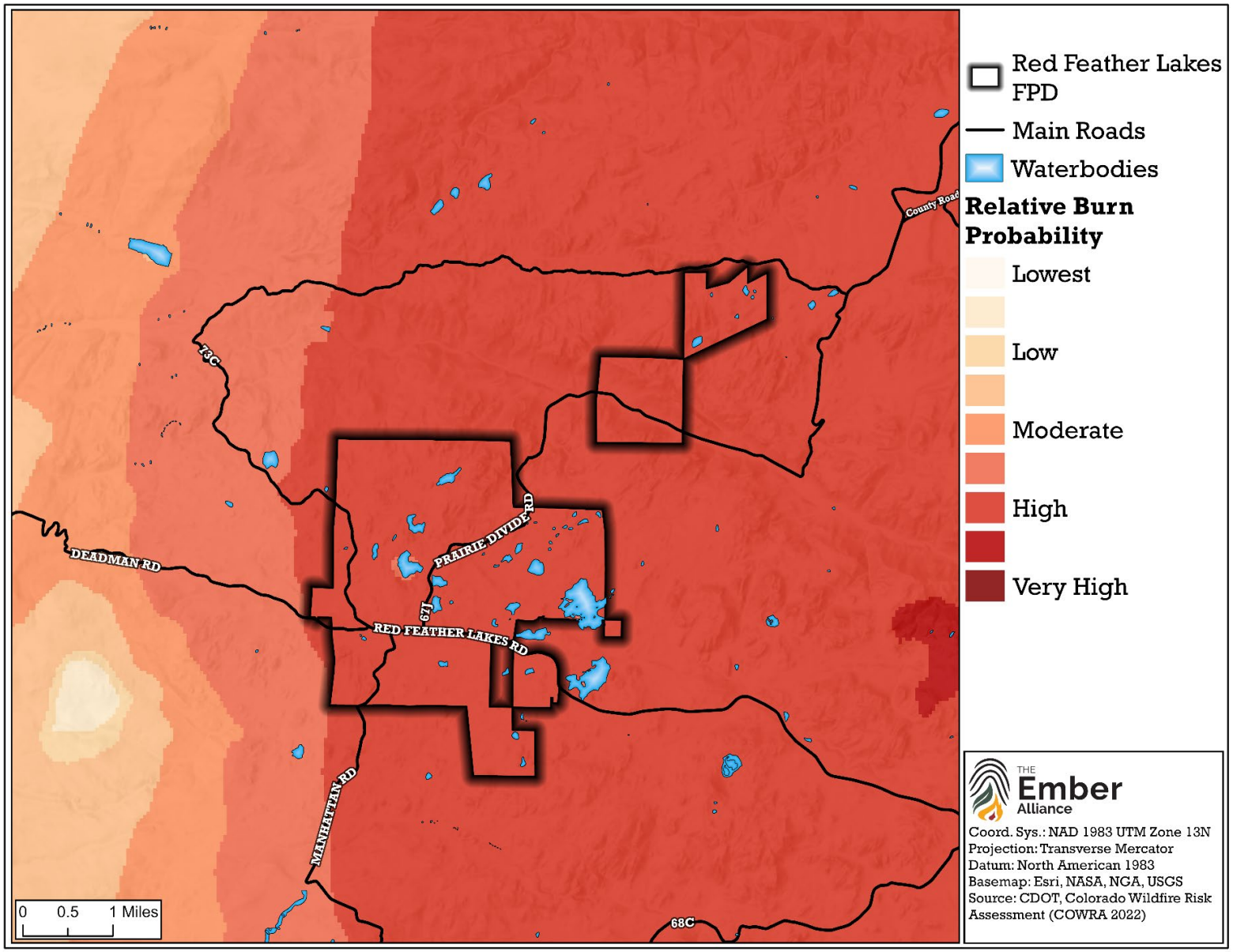


Figure B.6. *Relative burn probability under various weather conditions compared to the rest of the state of Colorado. Source: 2022 CO-WRA.*

9.c. Expected Net Value Change

Expected net value change (eNVC) from the 2022 NCFC QWRA provides a quantitative assessment of wildfire risk to highly valued resources and assets (HVRAs) based on potential fire intensity, likelihood of wildfire, and the exposure, relative importance, and sensitivity of values at risk to different types of fire behavior. Expected net value change is positive where the overall impact of wildfire is expected to benefit HVRAs present at a location, and eNVC is negative where the overall impact is expected to degrade HVRAs. Expected net value change is calculated by multiplying flame length probability for each flame length class by the potential impact of each flame length class on each HVRA (positive or negative impact) by the relative importance of each HVRA by the burn probability at each location.

We used predictions of eNVC from the 2022 NCFC QWRA because it provides locally specific predictions that account for potential benefits of wildfire as well as negative impacts. The 2022 CO-WRA analysis does not account for potential benefits of wildfire to ecological conditions and other HVRAs.

HVRAs included in the 2022 NCFC QWRA were water (critical water supply and designated waters), WUI (building density), infrastructure (monitoring stations, roads, electrical substations, transmission lines, mines, historic structures, and communication towers), recreation (trails, trailheads, camping, and other recreation assets), wildlife habitat (Preble's meadow jumping mouse, lynx, and greenback cutthroat trout), and different vegetation types. Relative weights of HVRA categories were 23% for water, 19% for WUI, 17% for infrastructure, 16% for recreation, 12% for wildlife, and 12% for vegetation. Maps and response functions for HVRAs are provided in (Rhea et al., 2022).

The eNVC analysis for the 2022 NCFC QWRA suggests that some portions of RFLFPD could benefit from wildfire, particularly areas without homes or critical infrastructure and where there is less importance for surface drinking water, ecosystems are more adapted to wildfire, and expected fire behavior is moderate (**Figure B.7**). However, wildfire could have negative impacts on HVRAs across much of RFLFPD because high-severity wildfire can threaten homes, critical infrastructure, surface drinking water, and habitat for sensitive wildlife.

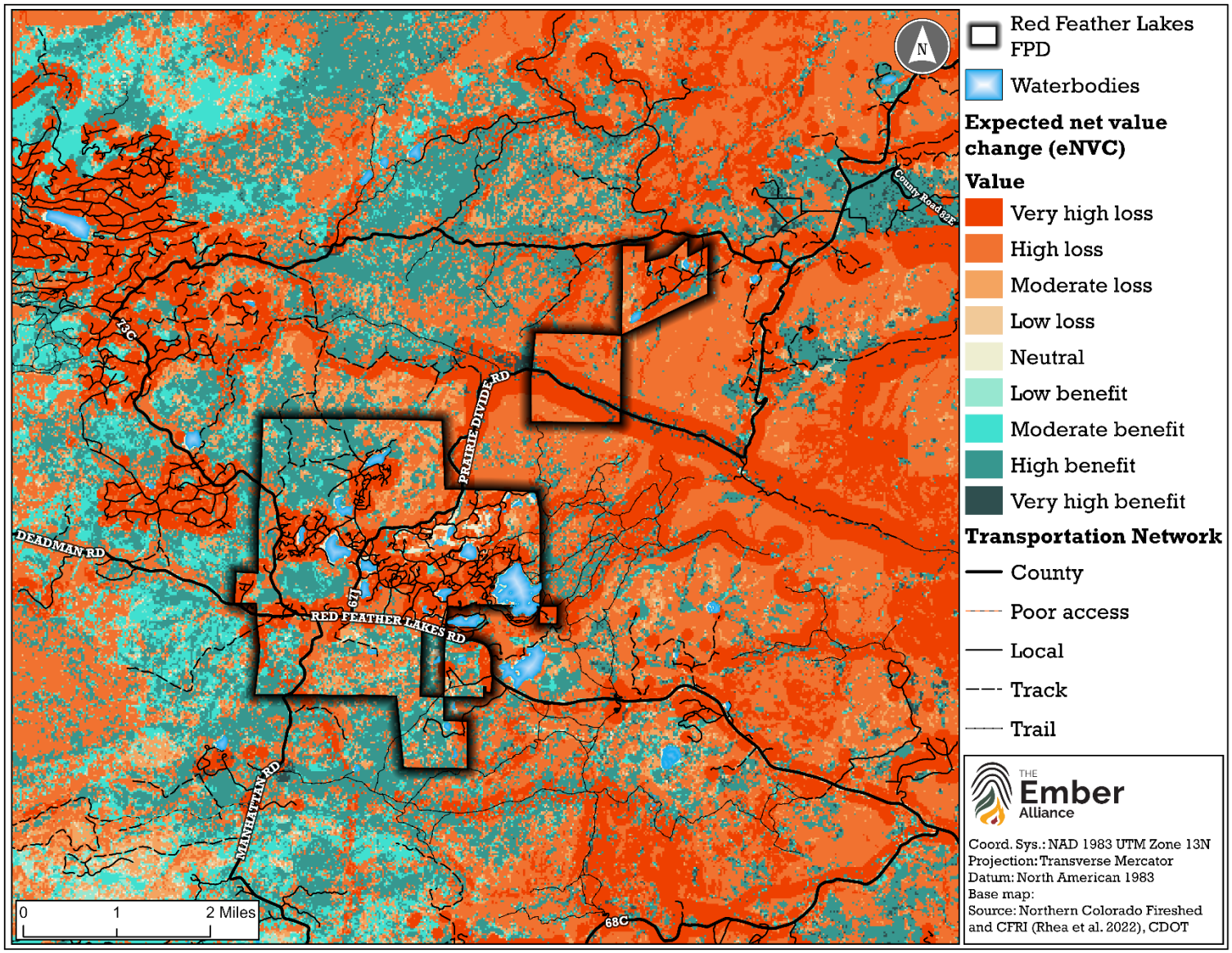


Figure B.7. *According to an analysis for the 2022 NCFC QWRA, beneficial fire is more likely in areas without homes or critical infrastructure, where there is less importance for surface drinking water, ecosystems are more adapted to wildfire, and expected fire behavior is moderate. The analysis considered potential fire behavior, likelihood of wildfire, exposure of values at risk, relative importance of values, and sensitivity of values to different types of fire behavior. Source: 2022 Northern Colorado Fireshed QWRA (Rhea et al., 2022).*

9.d. Predicted Radiant Heat and Ember Cast Exposure

The Ember Alliance assessed the risk that radiant heat and long-range ember cast pose to structures using flame length and fire type predictions from the 2022 CO-WRA and best-available science on structure exposure. Radiant heat from burning vegetation can ignite nearby homes, and embers emitted from burning vegetation or other homes can travel long distances and ignite vegetation and homes away from the main fire. This analysis is useful for comparing relative exposure across the district and not for evaluating absolute risk to individual homes. Fire behavior outputs from the 2022 CO-WRA cannot account for defensible space, the fire resistance of materials used in home construction, and other fine-scale variation in fuel loads that contribute to the ignition potential of individual homes.

Embers can ignite homes even when the flaming front of a wildfire is far away. See **Section 3.a. Mitigate the Home Ignition Zone** for tangible and relatively simple steps you can take to harden your home against embers. Mitigation practices, such as removing pine needles from gutters and installing covers over vents, can make ignition less likely and make it easier for firefighters to defend your property.

Ember production and transport and their ability to ignite recipient fuels are guided by complex processes structure (Caton et al., 2016), so The Ember Alliance utilized research by Beverly et al., (2010) and Caggiano et al., (2020) for simplified predictions of exposure radiant heating, and long-range ember cast. Exposure is based on distance from long flame lengths and torching trees assuming:

- Radiant heat can ignite homes when extreme fire behavior (flame lengths > 8 feet) occurs within 33 yards (30 meters) of structures, following the approach of Beverly et al., (2010). Areas with flame lengths >8 feet (**Figure B.2**) were included in these predictions. Research summarized by (Abo El Ezz et al., 2022) suggest that 75% of structures are destroyed when exposed to >8-foot flame lengths during actual wildfires.
- Short-range embers can reach homes within about 110 yards (100 meters) of active crown fires, following the approach of Beverly et al., (2010).
- Long-range embers can reach homes within 930 yards (850 meters) of active crown fires (**Figure 2.f.6**). (Caggiano et al., 2020) found that a vast majority (95%) of home losses during WUI fires occurred within 100 meters of wildland vegetation, but homes were lost as far as 850 meters from the flaming front. The density of long-range embers received by a location will be less than the density of short-range embers.

The risk to homes from short-range embers is greater than from long-range embers. Although embers can travel miles ahead of a wildfire, the number of embers reaching an area decreases exponentially with distance traveled, and the likelihood of structure ignition increases with the number of embers landing on the structure (Caton et al., 2016). **Note that this analysis looks at exposure of structure, meaning if they could be exposed to radiant heat and/or embers, but it does NOT look at vulnerability, meaning the likelihood a structure would be damaged if exposed to radiant heat and/or embers.** We do not have data on the construction material of each structure and the vegetation within each structure's HIZ—data that would be necessary to predict structure vulnerability.

On days with extreme fire weather conditions, 52% of homes in the district have extreme exposure to wildfire, meaning they could experience damaging radiant heat from burning vegetation and receive abundant short-range embers. 41% of homes have high exposure to wildfire, meaning they could be exposed to damaging radiant heat or short-range embers (**Figure B.8**).

Homes serve as an additional source of fuel that could produce high-intensity flames, emit embers, and initiate home-to-home ignitions. We located areas with an elevated risk of home-to-home ignition by determining the number of structures with overlapping HIZs (0-100 feet from structures). Nearly all structures in the district (92%) share an overlapping home ignition zone with at least one neighboring building, with overlap most concentrated in the village of Red Feather Lakes where many structures share home ignition zones with 3 to 11 neighboring buildings (**Figure B.9**).

It is imperative that homeowners work with their neighbors to reduce shared risk when HIZs 2 and 3 overlap with adjacent properties. Structures with overlapping HIZs have a greater risk for home-to-home fire spread, especially if homes are not mitigated or hardened (Syphard et al., 2012). All structures in the district should be built and upgraded with ignition-resistant materials and need mitigated HIZs to reduce the ability of embers to penetrate the building. This includes secondary structures (e.g., sheds, garages, barns) to reduce the likelihood of ignition and fire spread to primary structures (Maranghides et al., 2022). This CWPP outlines home hardening practices that residents and business owners can complete to reduce the risk of embers penetrating their homes.

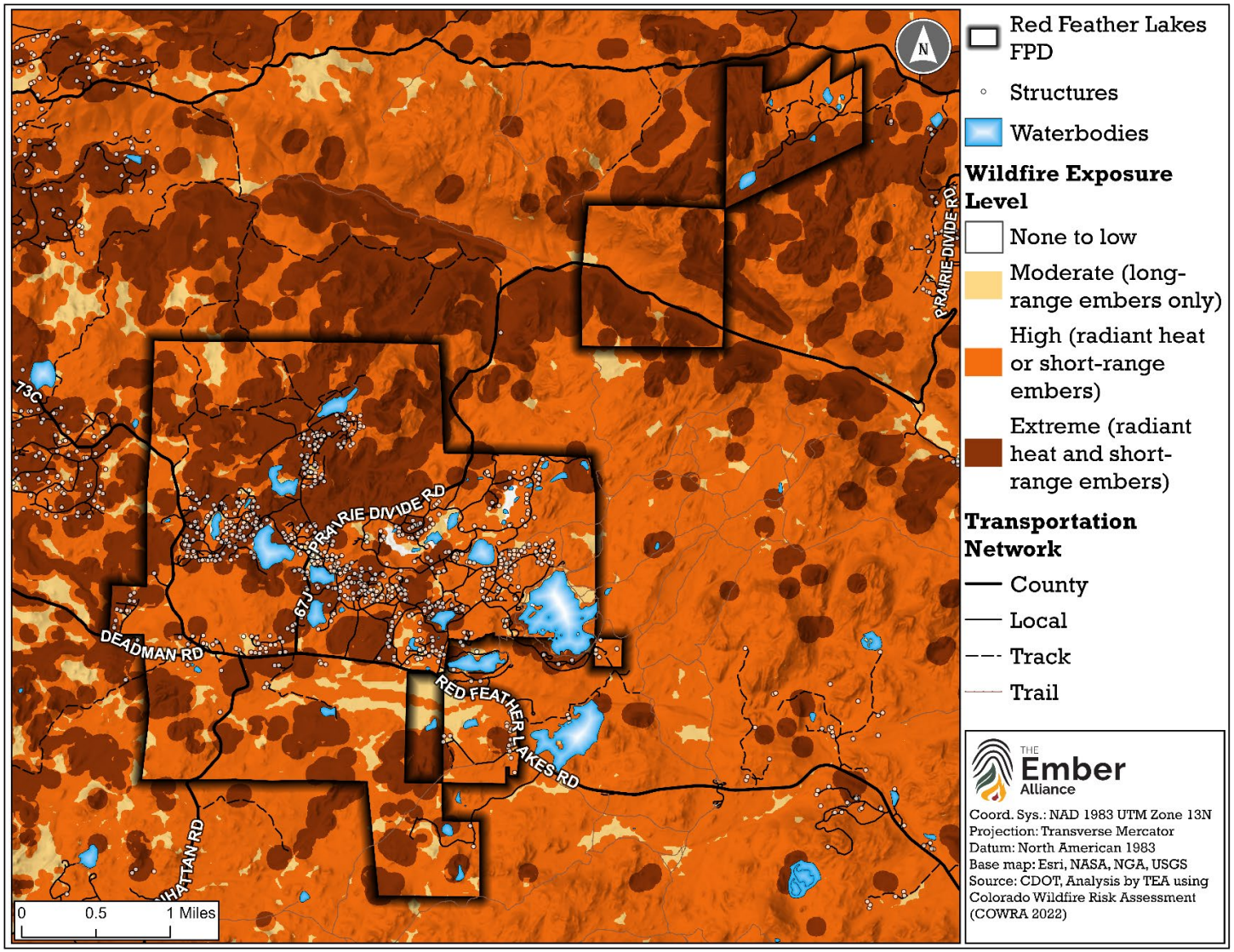


Figure B.8. *Potential exposure of structures to wildfire under extreme fire weather in RFLFPD. 52% of structures have high exposure and 41% have extreme exposure to wildfire. Structures closer to the source of embers receive more embers and have a higher chance of exposure than structures receiving fewer, long-range embers. This analysis does not consider the vulnerability of structures to ignition because data on construction materials and vegetation in the HIZ are not available for all structures. Source: Analysis by TEA using CO-WRA 2022.*

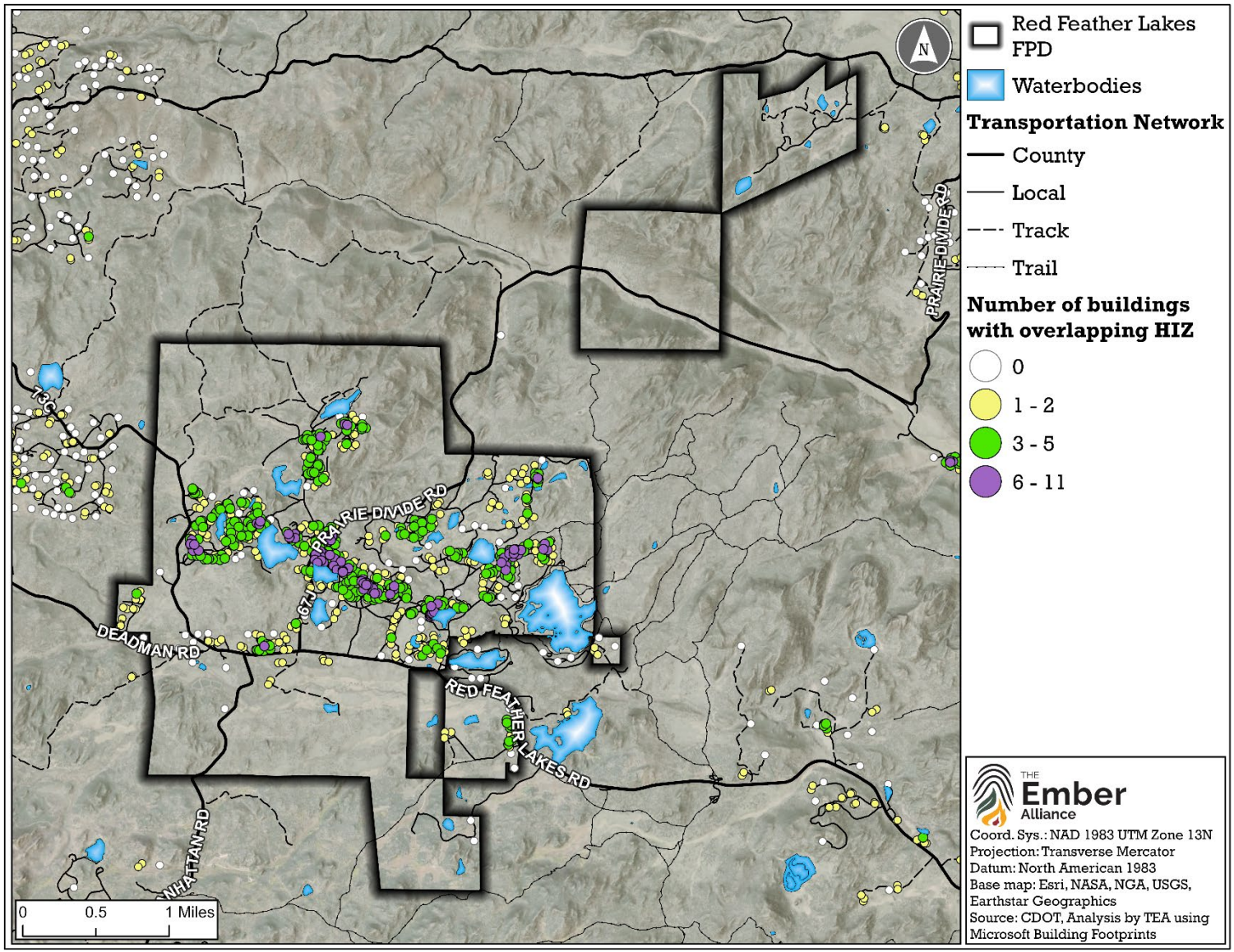


Figure B.9. *Nearly all homes in RFLFPD (92% of homes) have overlapping home ignition zones (HIZ; 0-100 ft from structures) with at least one neighboring home. Homes within close proximity of other homes are at greater risk of home-to-home ignitions from short-range ember cast, and neighbors must coordinate to reduce shared risk in shared HIZs (Maranghides et al., 2022; Syphard et al., 2012). Source: Analysis by The Ember Alliance using Microsoft Building Footprints.*

9.e. Exposure of Highly Valued Resources

We identified highly valued resources in areas that could experience damaging radiant heat, short-range ember cast, and/or long-range embers (**Table B.2**; **Figure B.10**). Highly valued resources that are exposed to radiant heat and/or short-range embers have greater potential risk from wildfire than those exposed to long-range embers. The concentration of embers received by an area decreases with distance from the flaming front of a fire. This analysis informed fuel treatment prioritization and plan unit recommendations.

Note that this analysis looks at exposure of HVRAs, meaning if they could be exposed to radiant heat and/or embers, but it does NOT look at vulnerability, meaning the likelihood an HVRA would be damaged if exposed to radiant heat and/or embers. Also keep in mind that the 2022 CO-WRA fire behavior analyses occurred at the scale of 0.1 acres (20 x 20 meters), and input fuel data is developed via extrapolation of aerial imagery and satellite data. Site-level assessments are vital to verify exposure of HVRAs and develop specific plans for mitigation.

Table B.2. *Potential exposure of HVRAs to radiant heat, short-range embers, and/or long-range embers under extreme fire weather conditions. Colors correspond with symbols displayed in* ***Figure B.10.***

HVRA Category	Sub-Category	Name	Location	Potential Exposure to Wildfire
Community services	Fire station	Red Feather Lakes Volunteer Fire Department	44 Fire House Lane, Red Feather Lakes	High (radiant heat or short-range embers)
Community services	Gas station	Red Feather Super Market	137 Dowdy Rd, Red Feather Lakes	High (radiant heat or short-range embers)
Community services		Red Feather Trading Post	41 Main St, Red Feather Lakes	Moderate (long-range embers only)
Community services	Post office	Red Feather Lakes Post Office (historical)	17 Main St, Red Feather Lakes	Highest (radiant heat and short-range embers)
Community services	Public elementary school	Red Feather Lake Elementary School	505 N County Road 73C, Red Feather Lakes	Highest (radiant heat and short-range embers)
Community services	Public library	Red Feather Mountain Library District	71 Firehouse Lane, Red Feather Lakes	High (radiant heat or short-range embers)
Community services	Waste	Red Feather Convenience Center, solid waste	Red Feather Lakes, CO 80545	High (radiant heat or short-range embers)
Infrastructure	Communications tower	Land mobile private transmission tower	44 Firehouse Lane, Red Feather Lakes	Highest (radiant heat and short-range embers)
Infrastructure	Communications tower	Cellular tower	105.5845936°W 40.8038119°N	High (radiant heat or short-range embers)
Infrastructure	Communications tower	Land mobile private transmission tower	114 Letitia Circle, Crystal Lakes	High (radiant heat or short-range embers)
Infrastructure	Electric substation		105.6087944°W 40.7924657°N	Moderate (long-range embers only)
Infrastructure	Propane		105.5740837°W 40.7912065°N	High (radiant heat or short-range embers)

HVRA Category	Sub-Category	Name	Location	Potential Exposure to Wildfire
Infrastructure	Siren	#3001	Ute Court / Lower Line Pine Dam	Highest (radiant heat and short-range embers)
Infrastructure	Siren	#3003	CR73C / Erie at mailbox shed	Highest (radiant heat and short-range embers)
Infrastructure	Weather station		105.5855659°W 40.7977812°N	High (radiant heat or short-range embers)
Infrastructure	Weather station		105.5500097°W 40.7833477°N	High (radiant heat or short-range embers)
Water infrastructure	Dam	Apache Lake Reservoir Dam	105.5923235°W 40.8084293°N	Highest (radiant heat and short-range embers)
Water infrastructure	Dam	Fox Acres #3 Dam	105.5570970°W 40.8095985°N	Highest (radiant heat and short-range embers)
Water infrastructure	Dam	Haviland / Parvin Dam	105.5538605°W 40.7877107°N	Highest (radiant heat and short-range embers)
Water infrastructure	Dam	Lower Lone Pine Dam	105.6122069°W 40.8401540°N	Highest (radiant heat and short-range embers)
Water infrastructure	Dam	Snake Lake Dam	105.5734048°W 40.7944778°N	Highest (radiant heat and short-range embers)
Water infrastructure	Dam	Twin Lakes Dam	105.5714868°W 40.7916387°N	Highest (radiant heat and short-range embers)
Water infrastructure	Dam	Dowdy Lake Dam	105.5576319°W 40.8001212°N	High (radiant heat or short-range embers)
Water infrastructure	Dam	Deer Lake Dam	105.5682590°W 40.8035053°N	High (radiant heat or short-range embers)
Water infrastructure	Dam	Erie Lake Dam	105.6238415°W 40.8178311°N	High (radiant heat or short-range embers)
Water infrastructure	Dam	Lake Nokomis Dam	105.5860203°W 40.8160817°N	High (radiant heat or short-range embers)
Water infrastructure	Dam	Red Feather Lake Dam	105.5883917°W 40.7950328°N	High (radiant heat or short-range embers)
Water infrastructure	Dam	Fox Acres #2 Dam	105.5720949°W 40.8062723°N	Moderate (long-range embers only)
Water infrastructure	Dam	Fox Acres Dam	105.5737545°W 40.8038925°N	Moderate (long-range embers only)
Water infrastructure	Dam	Hiawatha Dam	105.5938090°W 40.8025183°N	None to low

HVRA Category	Sub-Category	Name	Location	Potential Exposure to Wildfire
Recreation	Tent camping	Lost Lake Campground	105.5332083°W 40.8397803°N	Highest (radiant heat and short-range embers)
Recreation	Tent camping	Dowdy Lake Campground	105.5579008°W 40.7914069°N	Highest (radiant heat and short-range embers)
Recreation	Tent camping	West Lake Campground	105.5685410°W 40.7903603°N	Highest (radiant heat and short-range embers)

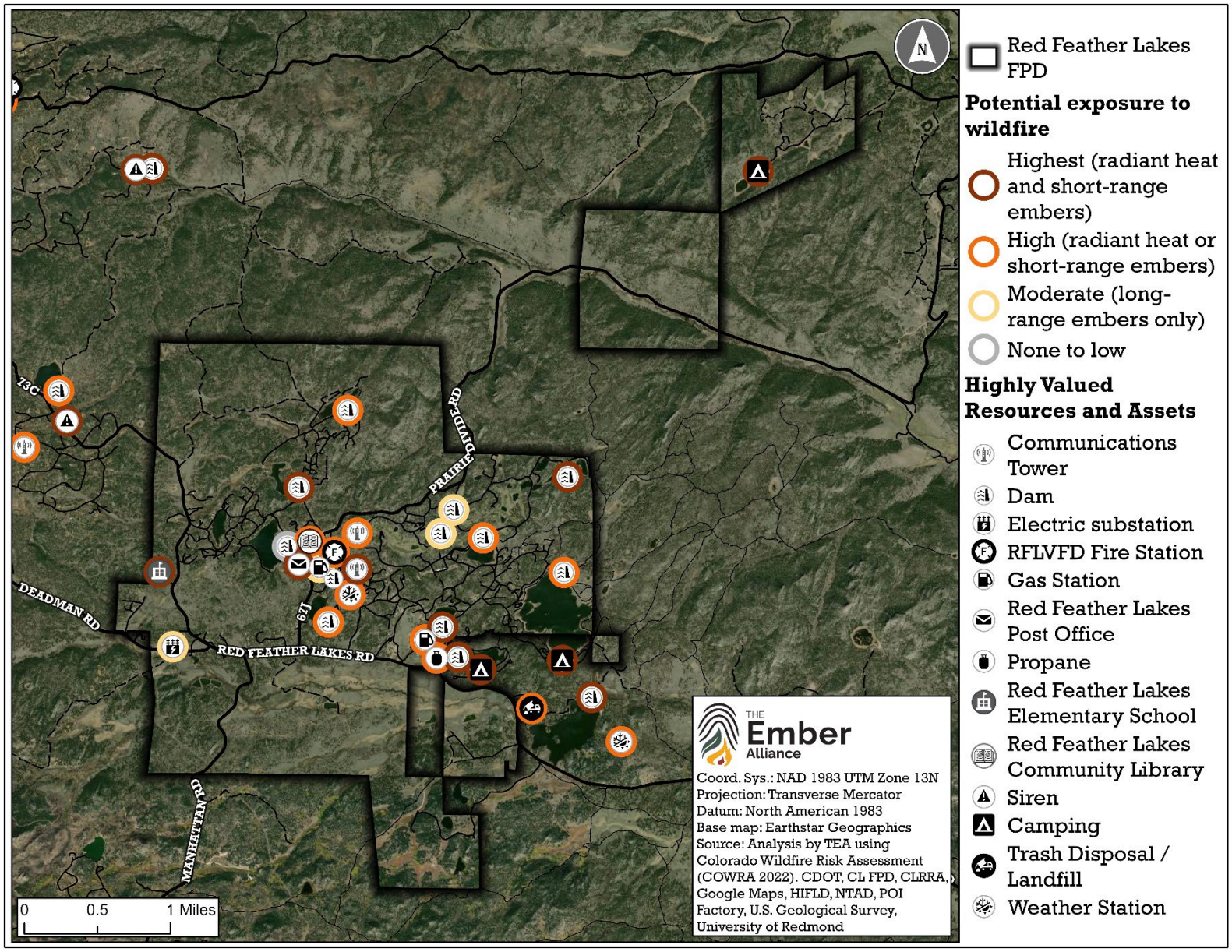


Figure B.10. *Predicted exposure of highly valued resources in and around RFLFPD. Source: Analysis by The Ember Alliance using output from the 2022 CO-WRA.*

9.f. Evacuation Analysis

Evacuation can weigh heavily on the minds of residents in the RFLFPD. The death of 29 people in Los Angeles, California during the 2025 Palisades and Eaton Fires and 86 people in Paradise, California during the 2018 Camp Fire underscores the importance of evacuation preparedness and fuel mitigation along evacuation routes. Of those who tragically perished in these fires, some did not receive evacuation alerts, others could not leave their home due to mobility impairments, and many were simply overwhelmed by the fast-moving and extreme nature of the fires (Lin and Castleman, 2025). Unclear roles and responsibilities for emergency notifications, outdated equipment, gaps in communication systems, and insufficient public education on evacuation zones and personal preparedness also played a role in the tragedies (McChrystal Group, 2025).

Modeling relative evacuation times and congestion were important for the CWPP to provide an understanding of relative evacuation challenges in RFLFPD, guide prioritization of roadside treatments, and inform targeted evacuation education. Dozens of evacuation models are available, all with varying complexities, purposes, assumptions, and limitations (Intini et al., 2019; Ronchi et al., 2019). Modeling hypothetical evacuations is

Simulation models cannot account for all variables present during an evacuation. Evacuation analyses for the 2026 CWPP are useful for assessing relative evacuation times and congestion across RFLFPD, but they are not intended to depict what will occur in any specific evacuation event or to suggest specific routes for individual residents. All residents should know and practice driving different routes out of their neighborhoods. **Residents need to follow guidance from law enforcement personnel during evacuation events, practice safe driving, and follow evacuation etiquette (e.g., allowing cars to merge and not texting or stopping to take photographs).**

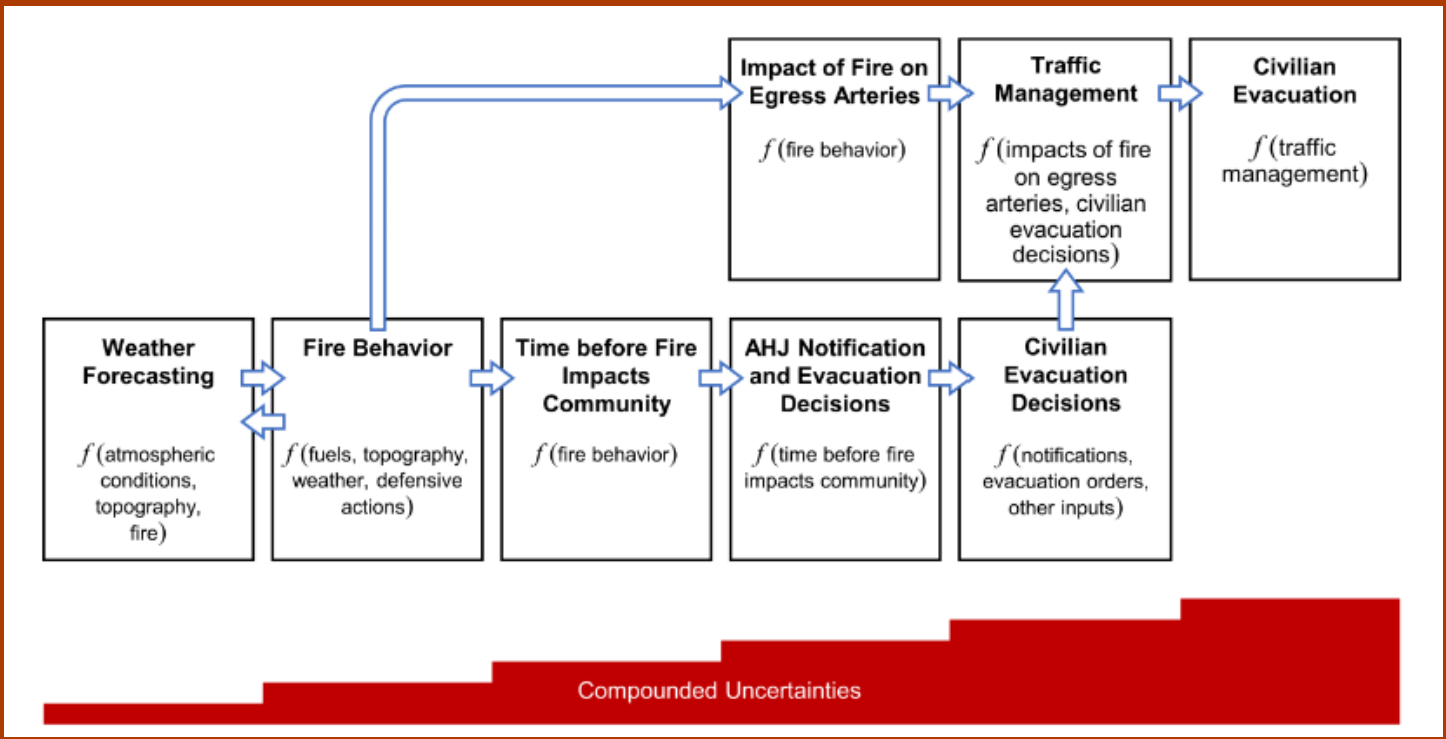


Illustration from Maranghides and Link (2023) demonstrating the interrelationships and compounding uncertainties involved in evacuation models. AHJ = authorities having jurisdiction.

extremely challenging—there are hundreds of possible evacuation scenarios in terms of the direction of wildfire spread, the timing of evacuation orders, the behavior of individuals during an evacuation, potential confusion due to misinformation, potential for impaired visibility due to smoke, potential for lane closures to accommodate emergency traffic, potential for accidents, etc. These assumptions and uncertainties are compounded and layered upon each other when conducting fire behavior and evacuation modeling, making it nearly impossible to precisely model potential evacuation outcomes (Maranghides and Link, 2023).

The Ember Alliance utilized ArcCASPER to model relative evacuation times by plan unit and potential congestion along roadways. ArcCASPER is an open-source, large-scale evacuation routing tool based on peer-reviewed research, and it has been found to simulate reasonable evacuation patterns (Harris et al., 2015; Shahabi, 2015; Shahabi and Wilson, 2014). Assumptions and limitations of ArcCASPER are described below. Many of these limitations are shared with other widely available evacuation models.

The analysis completed using ArcCASPER for the 2026 CWPP was conducted for two specific purposes:

- Determining which parts of RFLFPD might take relatively longer to evacuate than others given the roadway network and housing densities under potential evacuation scenarios. This information fed into plan unit relative risk ratings for the CWPP, and it is helping the district determine where residents might need targeted education about evacuation preparedness before and assistance during an evacuation.
- Determining which roadways might experience relatively more congestion under evacuation scenarios. Congestion predictions were one piece of information supporting the prioritization of roadside fuel treatment for the CWPP.

The analysis using ArcCASPER for the CWPP is NOT intended or appropriate for:

- Developing general or incident-specific evacuation plans. A limited number of scenarios were modeled for the CWPP, so it is unlikely that a specific incident would match the exact situations modeled here.
- Determining when evacuation orders should be given. These decisions are context specific and made by experts during an actual emergency as it unfolds.
- Determining which specific routes people should take during an evacuation. Individual residents are responsible for being familiar with potential evacuation routes and to practice driving these routes under various conditions, including under limited visibility and at night. Law enforcement personnel will provide specific information about route closures and availability during an actual incident.
- Determining the exact amount of time it might take individual residents to evacuate. The purpose of ArcCASPER is to minimize global evacuation time—the time it takes for all simulated evacuees to reach scenario endpoints—and not to optimize evacuation routes for each individual evacuee.
- Determining the exact amount of time it would take for all evacuees to reach scenario endpoints. Relative times are much more reliable than exact times given inherent uncertainty in the model, and relative times were more important than exact times for the purposes of assessing relative risk among plan units.
- Determining the exact level of congestion that could be experienced along a roadway. Estimates of relative congestion are more reliable than exact estimates of congestion given inherent uncertainty in the model, and relative congestion was more important than exact congestion estimates for the purpose of prioritization roadways fuel treatments.

Modeling Approach

We modeled relative evacuation time and roadway congestion using ArcCASPER (Shahabi, 2015; Shahabi and Wilson, 2014). ArcCASPER "intelligently and dynamically takes into account road capacity and travel time to create routes that minimize traffic congestion and evacuation times" (Shahabi, 2012). The CASPER (Capacity-Aware Shortest Path Evacuation Routing) system estimates traversal speeds for road segments based on roadway capacity (number of lanes), road speed, number of cars evacuating per address, and the relationship between roadway congestion and reduction in travel speed (also known as the "traffic model"). We used an exponential

traffic model with a critical density of 10 and saturation density of 150 (see Shahabi, 2015 for a description of traffic models).

ArcCASPER assumes simultaneous departure of vehicles, but the model's algorithm starts with the evacuee farthest from predefined scenario endpoint(s) and finds that evacuee's quickest path to an endpoint. It iteratively continues this process until there are no more evacuees left. During the analysis, ArcCASPER dynamically updates how long it takes to traverse each road segment based on the number of evacuees using that route and the relationship between traffic and travel speeds. The model adjusts evacuation routes until it minimizes the global evacuation time (i.e., the time it takes for all evacuees to reach predefined scenario endpoints). The objective of the model is NOT to minimize the evacuation time for each individual evacuee.

ArcCASPER Limitations

- ArcCASPER does not account for unpredictable events, such as roadway blockage from accidents, non-survivable conditions along roadways burned over by flames, or reduced visibility from smoke.
- ArcCASPER does not model the impact that different types of vehicles might have on evacuations, such as semi-trucks, trucks with trailers, or large recreational vehicles.
- ArcCASPER assumes simultaneous departure of vehicles.
- Predictions are very sensitive to decisions about the shape of the traffic model (e.g., power, exponential, linear), the critical density (number of cars that can be on a road with two lanes [one lane in each direction] without a reduction in travel speed, and the saturation density (number of cars on the road at which the traversal speed reduces to half the original speed) (Shahabi, 2015; Shahabi and Wilson, 2014).
- ArcCASPER does not model the impact of traffic lights, stop signs, or curves on traffic flow. We reduced the baseline traffic speed for all roads to help account for this.
- Delayed departure times cannot be assigned to individual evacuees in ArcCASPER, so we could not model variation in the time it might take recreators to hike back to their vehicles before departing. Even if this were possible in the model, the number of evacuees that might be away from their vehicles at the time of the evacuation and their hiking pace would be unknown.

Evacuation Scenarios

An accurate road network is vital for evacuation modeling, so we worked with the CWPP Advisory Committee to conduct an extensive quality assurance / quality control on road data from CDOT. We also work with the Advisory Committee to define evacuation groups, scenario endpoints, and the number of vehicles that might be departing from recreation locations. **Endpoints were locations along major roads at which point the evacuation simulation ended; endpoints were NOT evacuation destinations that would be used during an actual incident.**

Evacuation scenarios included all residents in RFLFPD evacuating at once. Evacuation orders are sometimes issued for only portions of a community, but modeling evacuations for the entire community at once approximates what might happen if there were a rapidly spreading wildfire that ignited on the district boundary and triggered the need for rapid evacuation of the entire area. Recreation areas and addresses outside the district were included to simulate background traffic that residents might encounter during evacuations.

The eight evacuation scenarios developed for this analysis varied in terms of (1) inclusion of residents from central and northeastern Crystal Lakes, (2) scenario endpoints (the intersection of Red Feather Lakes Road and US-287 and and/or the intersection of CO State Highway 14 and US-287), and (3) total number of evacuees (**Table B.3**). The CWPP Advisory Committee describes Manhattan Road as a secondary evacuation route, but it is not recommended because of driving conditions, and it is particularly unsuitable for trailers. For that reason, we modeled several scenarios that excluded the use of Manhattan Road to CO State Highway 14.

The "full capacity" scenarios assumed 100% occupancy of residential homes and maximum capacity at non-residential locations and recreation areas. The "reduced" scenarios assumed 75% occupancy of residential locations because many homes in RFLFPD and the surrounding area are second homes and not always occupied.

The “reduced” scenarios assumed about a 25% reduction in recreators at recreational locations and assumed that large events were not being held at Drala Mountain Center, Fox Acres Country Club, Sund Dance Trail Guest Ranch, and DU Mountain Campus.

We modeled 2 vehicles leaving each residential address. The number of vehicles assigned to non-residential locations and recreation areas varied based feedback from the CWPP Advisory Committee, values used for evacuation modeling for the 2022 Crystal Lakes CWPP, and parking lot capacity estimated from aerial imagery (**Table B.4**). The simulations assumed a busy summer weekend day with many recreators and no students at Red Feather Lakes Elementary School.

We created a smoothed layer of relative predicted evacuation times for each location within 200 m of roads and presented the results as percentile ranking of evacuation times. Smoothing was done using kriging with a spherical semi-variogram model and a lag size of 65.7 meters (value selected by ArcPro to perform kriging with this data). The purpose of doing this is to mask predictions of evacuation times for individual addresses since the model is not intended for that use. The goal of the model is to minimize global evacuation times for all evacuees, so predictions for individual evacuees cannot be interpreted as exact, point-specific evacuation times. Instead, output shows hotspots where evacuation times might be slower than others if the entire district were to evacuate at once.

We do not present the absolute evacuation times modeled by ArcCASPER because the actual time it would take to evacuate during a specific incident is influenced by a variety of factors not considered in this modeling effort, such as the staggering of evacuation orders, the nature of evacuation orders (i.e., voluntary versus mandatory), traffic accidents, delays from people stopping to take photographs, reduced visibility from smoke, etc.

Table B.3. *Conditions of evacuation scenarios for each plan unit or pair of plan units modeled in ArcCASPER.*

Scenario ID	Inclusion of residents from central and northeastern Crystal Lakes	Percentage of residential structure occupied for scenario	Scenario endpoint(s)		Number of vehicles	
			Intersection of Red Feather Lakes Road and US-287	Intersection of CO State Highway 14 and US-287	Inside RFLFPD	Outside RFLFPD
1	Yes	100% (full-capacity scenario)	Yes	No	2,263	2,675
2	No	100% (full-capacity scenario)	Yes	No	2,263	1,352
3	Yes	100% (full-capacity scenario)	Yes	Yes	2,263	2,675
4	No	100% (full-capacity scenario)	Yes	Yes	2,263	1,352
5	Yes	75% (reduced scenario)	Yes	No	1,703	1,877
6	No	75% (reduced scenario)	Yes	No	1,703	888
7	Yes	75% (reduced scenario)	Yes	Yes	1,703	1,877
8	No	75% (reduced scenario)	Yes	Yes	1,703	888

Table B.4. *Number of vehicles simulated for non-residential locations and recreation sites included in evacuation scenarios based on feedback from the CWPP Advisory Committee, values used for evacuation modeling for the Crystal Lakes CWPP, and parking lot capacity estimated from aerial imagery. The number of vehicles simulated for each location under the "full-capacity" scenarios was greater than for the "reduced" scenarios.*

Non-residential location or recreation site	Number of vehicles for full-capacity scenarios	Number of vehicles for reduced scenarios
Gas station, post office, library, fire stations, Crystal Lakes Water & Sewer Office, and Crystal Lakes Road & Recreation Association shop	10	10
Crystal Lakes Road & Recreation Association Office / Base Camp	10	10
Red Feather Lakes Elementary School	12	12
Fox Acres Country Club	76	46
Drala Mountain Center	100	40
Sun Dance Trail Guest Ranch	80	10
DU Mountain Campus	40	10
Recreation areas		
Parvin Lake	10	8
Bellaire Lake State Wildlife Area	120	88
West Lake State Wildlife Area	60	38
Dowdy Lake	160	126
Lost Lake	105	75
Dispersed camping along Manhattan Road and Forest Road 171	100	80

Model Output

After simulating evacuations for each scenario, we determined the maximum degree of congestion that was experienced for each segment of road across all evacuation scenarios (**Figure B.11**). We also present congestion for each of the eight scenarios (**Figure B.12**). Roads were categorized by the congestion index—how much longer it might take to traverse a segment of road with evacuation traffic versus without traffic. Congestion predictions were combined with potential roadway survivability to help prioritize roads for fuel treatments (**Figure B.15**).

Based on this analysis, roads with the greatest potential to experience extreme congestion (>4 times longer travel times) in and around RFLFPD are parts of Red Feather Lakes Road (County Road 74E), Prairie Divide Road (County Road 67J), Cherokee Park Road (County Road 80C), Manhattan Road (County Road 69), and US-287. As more and more vehicles funnel onto these roads, speeds will decrease and congestion will increase. Segments of roads in and around RFLFPD could also experience high levels of congestion (>3-4 times longer travel times) and medium levels of congestion (>2-3 times longer travel times) (**Table B.4**).

We also determined the time required to evacuate all evacuees to scenario endpoints. Some scenarios required over four hours due to extreme congestion that formed on major evacuation routes. We relativized evacuation time based on the maximum evacuation time experienced across all scenarios to compare relative evacuation times among scenarios and to identify "hotspots" of longer evacuation times (**Figure B.13**). The scenario that had the longest evacuation times was scenario 1 because it included the most evacuees and did not utilize Manhattan Road to allow evacuees to travel south to State Highway 14. The fastest evacuation times were predicted for scenario 8 because it modeled the fewest evacuees and utilized Manhattan Road. While the use of Manhattan Road might spread out evacuation traffic and reduce evacuation times, this is under the assumption that evacuees could safely navigate this challenging dirt road.

When evacuees from central and northeastern Crystal Lakes were included in scenarios (scenarios 1, 3, 5, and 7), those evacuees had the longest evacuation times because they are the furthest from primary evacuation routes and the scenario endpoints. Within each scenario, evacuation times were similar across RFLFPD, with the exception of the evacuees from Lost Lake in North Plan Unit who had shorter evacuation times because there are relatively fewer homes between North Plan Unit and Cherokee Park Road, meaning evacuees from North Plan Unit are less likely to experience significant evacuation congestion than evacuees from the other RFLFPD plan units.

Recreators that might need to evacuate from Dowdy Lake and Bellaire Lake State Wildlife Area appear to increase potential congestion in the area. It is important to communicate with recreators and visitors in RFLFPD and the surrounding area about evacuation procedures and to devise methods to share evacuation alerts with people unfamiliar with the area and who are likely to experience poor cell service.

Big events at Fox Acres Country Club, Drala Mountain Center, Sun Dance Trail Guest Ranch, and DU Mountain Campus could increase traffic and congestion on Red Feather Lakes Road. Drala Mountain Center and the DU Mountain Campus maintain strong evacuation plans for their own properties.

The CWPP Advisory Committee evaluated the model results and found the predictions reasonable based on their experience of traffic flow in the district, and their experience with several actual evacuations during wildfires in the area. The output is useful for understanding where there is a greater potential for evacuation congestion and extended evacuation times under the assumptions of these scenarios. **Evacuation preparedness is paramount for all residents, recreators, and visitors to the district.**

Table B.5. *Roads that might experience extreme, high, or medium congestion in and around RFLFPD under evacuation scenarios modeled for the 2026 CWPP. CLRRA = Crystal Lakes Road & Recreation Association.*

Congestion Index	Roads (listed from west to east)
Extreme congestion (>4 times longer travel times)	County Road 73C Red Feather Lakes Road (County Road 74E) Manhattan Road (County Road 69) Prairie Divide Road (County Road 67J) Cherokee Park Road (County Road 80C) US-287
High congestion (>3-4 times longer travel times)	Tami Road (in CLRRA) County Road 73C Red Feather Lakes Road (County Road 74E) Prairie Divide Road (County Road 67J) Manhattan Road (County Road 69) County Road 67J in the center of RFLFPD Dowdy Lake Road (County Road 67A) County Road 68C State Highway 14 Weymouth Road (near Livermore)
Medium congestion (>2-3 times longer travel times)	Ottawa Way (in CLRRA) Muskogee Trail (in CLRRA) County Road 73C Red Feather Lakes Road (County Road 74E) Prairie Divide Road (County Road 67J) Hiawatha Way Whirlwind Lane Lakeview Drive Nokomis Road Ramona Driver Pipsissewa Lane Fox Acres Drive East Fox Acres Drive West Fox Acres Cross Road Snake Lake Drive Letitia Drive Dowdy Lake Road (Country Road 67A)

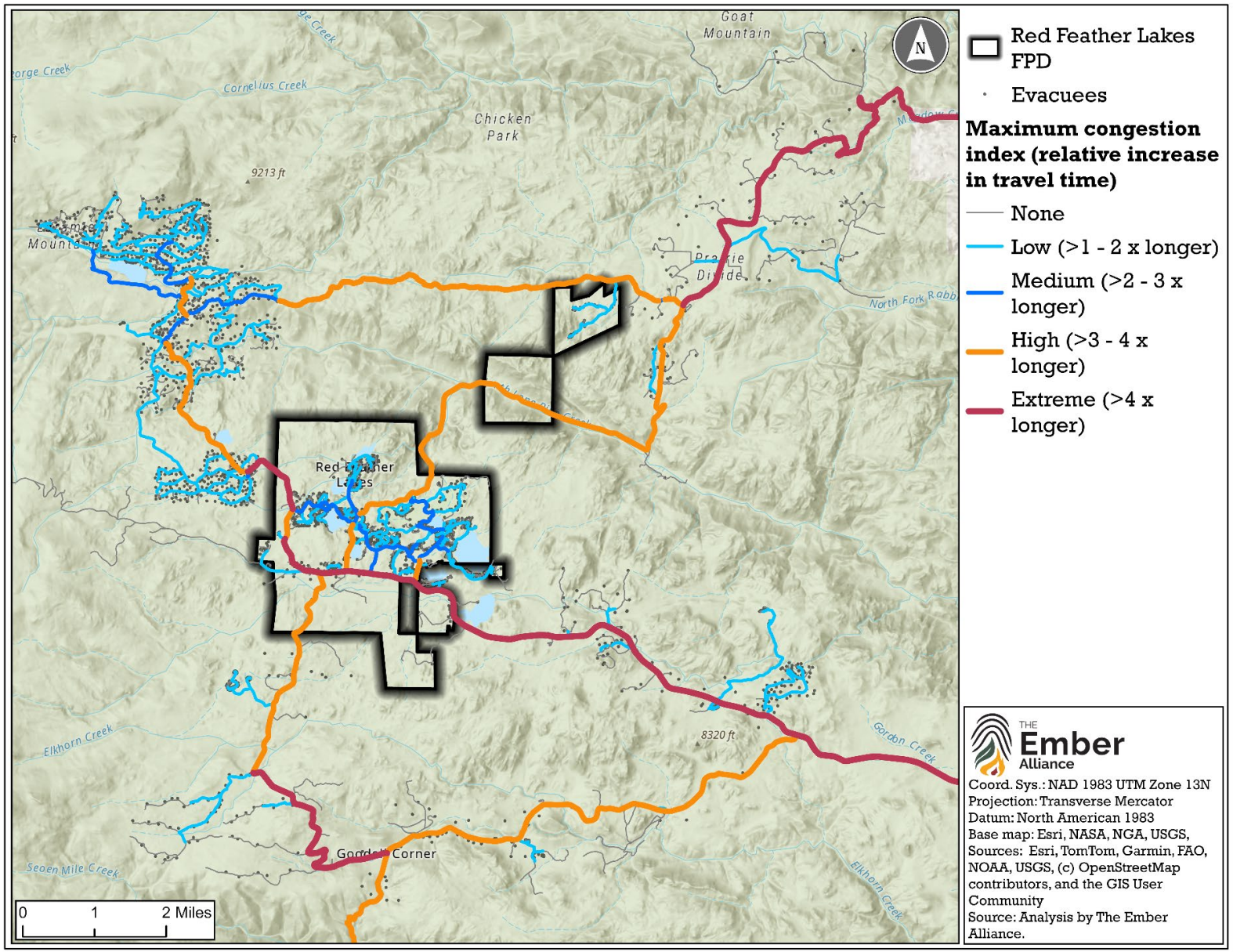


Figure B.11. *Maximum predicted congestion across all evacuation scenarios for the 2026 RFLFPD CWPP. Congestion index is the ratio between the time required to traverse a segment of road with congestion vs. without congestion.*

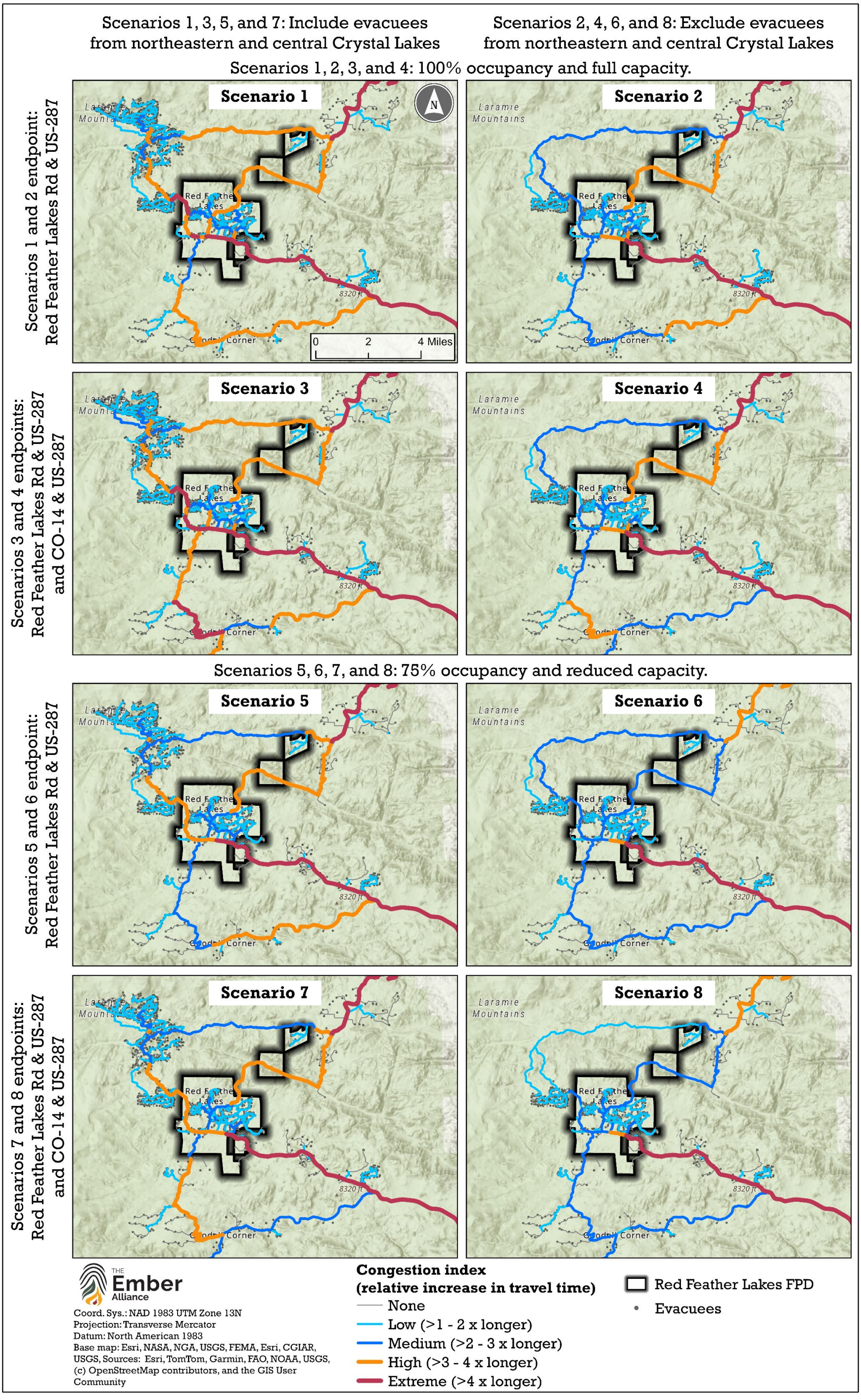


Figure B.12. *Predicted congestion by evacuation scenario for the 2026 RFLFPD CWPP (see Table B.3 for scenario parameters). Congestion index is the ratio between the time required to traverse a segment of road with congestion vs. without congestion.*

Scenarios 1, 3, 5, and 7: Include evacuees from northeastern and central Crystal Lakes

Scenarios 2, 4, 6, and 8: Exclude evacuees from northeastern and central Crystal Lakes

Scenarios 1, 2, 3, and 4: 100% occupancy and full capacity.

Scenarios 1 and 2 endpoint: Red Feather Lakes Rd & US-287

Scenarios 3 and 4 endpoints: Red Feather Lakes Rd & US-287 and CO-14 & US-287

Scenarios 5, 6, 7, and 8: 75% occupancy and reduced capacity.

Scenarios 5 and 6 endpoint: Red Feather Lakes Rd & US-287

Scenarios 7 and 8 endpoints: Red Feather Lakes Rd & US-287 and CO-14 & US-287

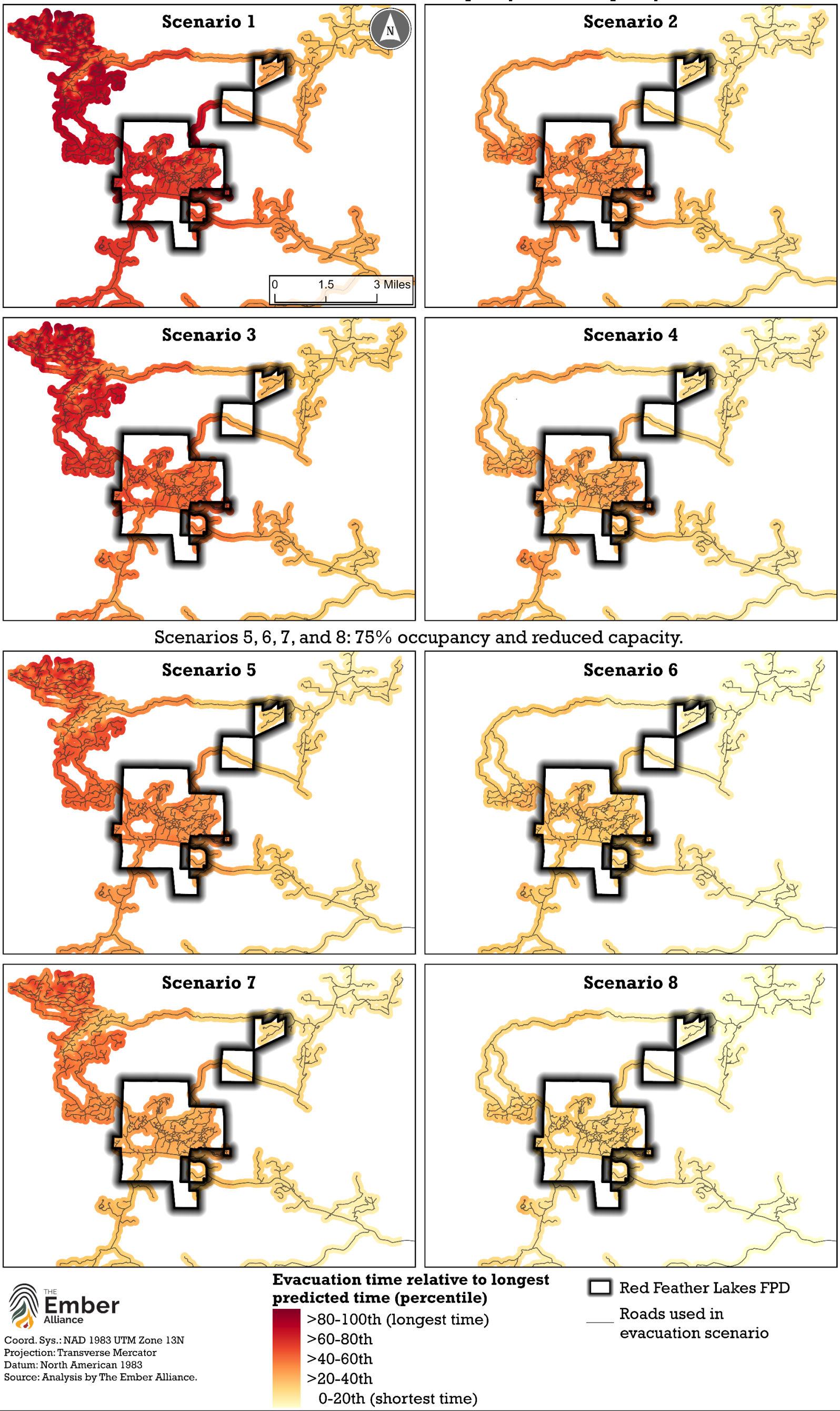


Figure B.13. *Relative time to evacuate from different parts of RFLFPD and the surrounding area by scenario for the 2026 RFLFPD CWPP (see* ***Table B.3*** *for scenario parameters). Predictions are percentiles relative to the longest predicted evacuation time across all eight scenarios.*

9.g. Roadway Survivability

The Ember Alliance identified road segments that could potentially experience non-survivable conditions during a wildfire burning under extreme fire weather conditions (**Figure B.14**). Non-survivable roadways" were defined as portions of roads adjacent to areas with flame lengths greater than 8 feet under extreme fire weather conditions. Drivers stopped or trapped on potentially non-survivable roadways could have a lower chance of survival due to radiant heat emitted from fires of this intensity. This assumption is based on the Haul Chart, which is a standard tool used by firefighters to relate flame lengths to tactical decisions (**Table B.1**). Direct attack of a flaming front is no longer feasible once flame lengths exceed about 8 feet due to the intensity of heat output (NWCG, 2019). Flames greater than 8 feet could also make roads impassable and cut residents off from egress routes. Non-survivable conditions are more common along roads lined by thick forests with abundant ladder fuels, such as trees with low limbs and saplings and tall shrubs beneath overstory trees.

We used roadway data from CDOT, with modifications to the road network based on local expertise, and flame length predictions from the 2022 CO-WRA (**Figure B.2**). Based on this analysis, 75% of the total length of roads in RFLFPD could experience non-survivable conditions. Some non-survivable road segments are part of key evacuation routes, including Red Feather Lakes Road and Prairie Divide Road (**Figure B.15**). These areas are a high priority for roadside fuel mitigation to create safer conditions for residents, visitors, fire fighters, and other first responders.

Mitigation actions along sections of road with high risk for non-survivable conditions during a wildfire can increase the chances of survival for residents stranded in their vehicles during a wildfire and decrease the chance that roadways become impassable due to flames. Evacuation preparedness is paramount for all residents of Red Feather Lakes FPD.

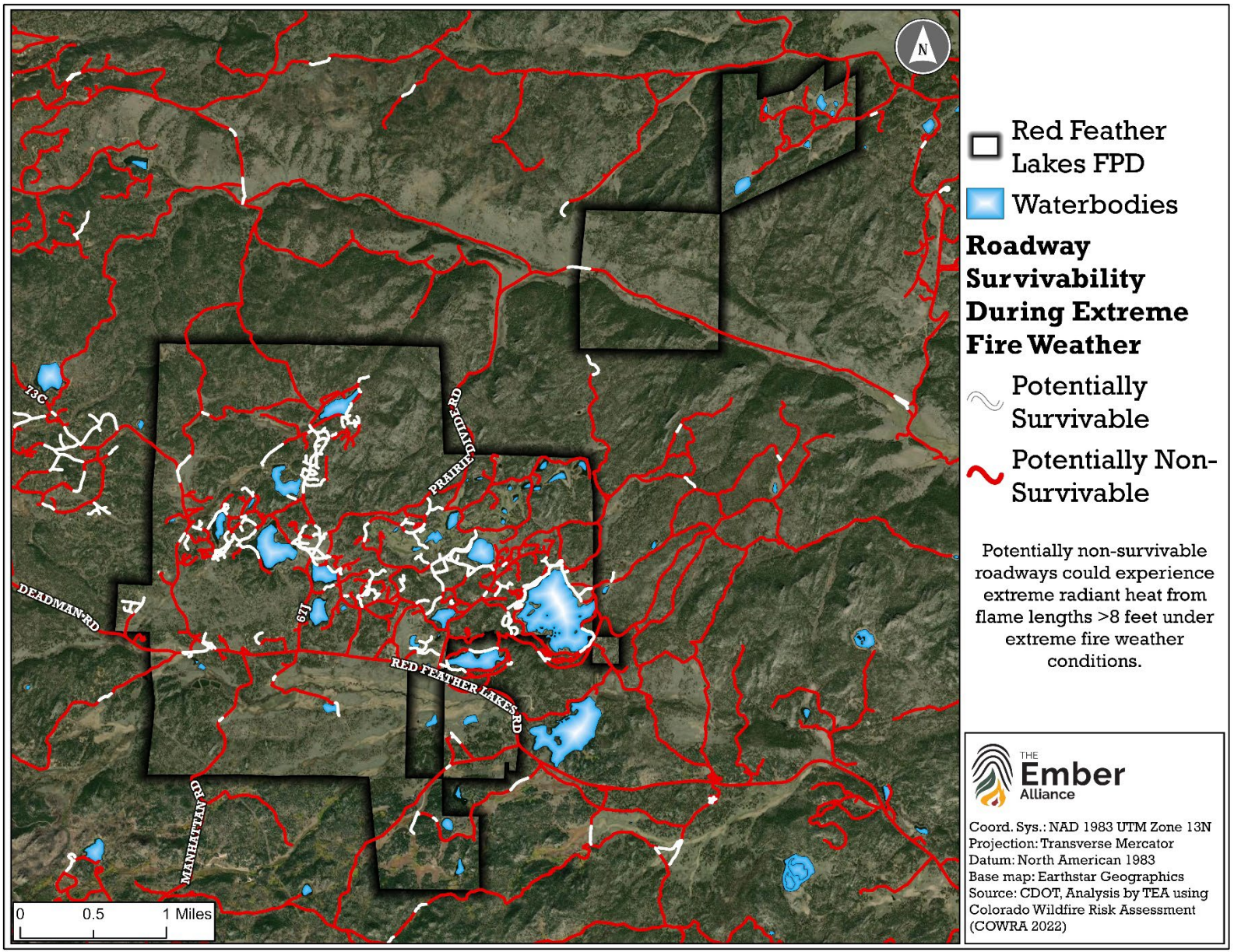


Figure B.14. *Under extreme fire weather conditions, 75% of total road length in RFLFPD could experience potentially non-survivable conditions during wildfires (i.e., flame lengths over 8 feet). Source: Analysis by TEA using CO-WRA 2022.*

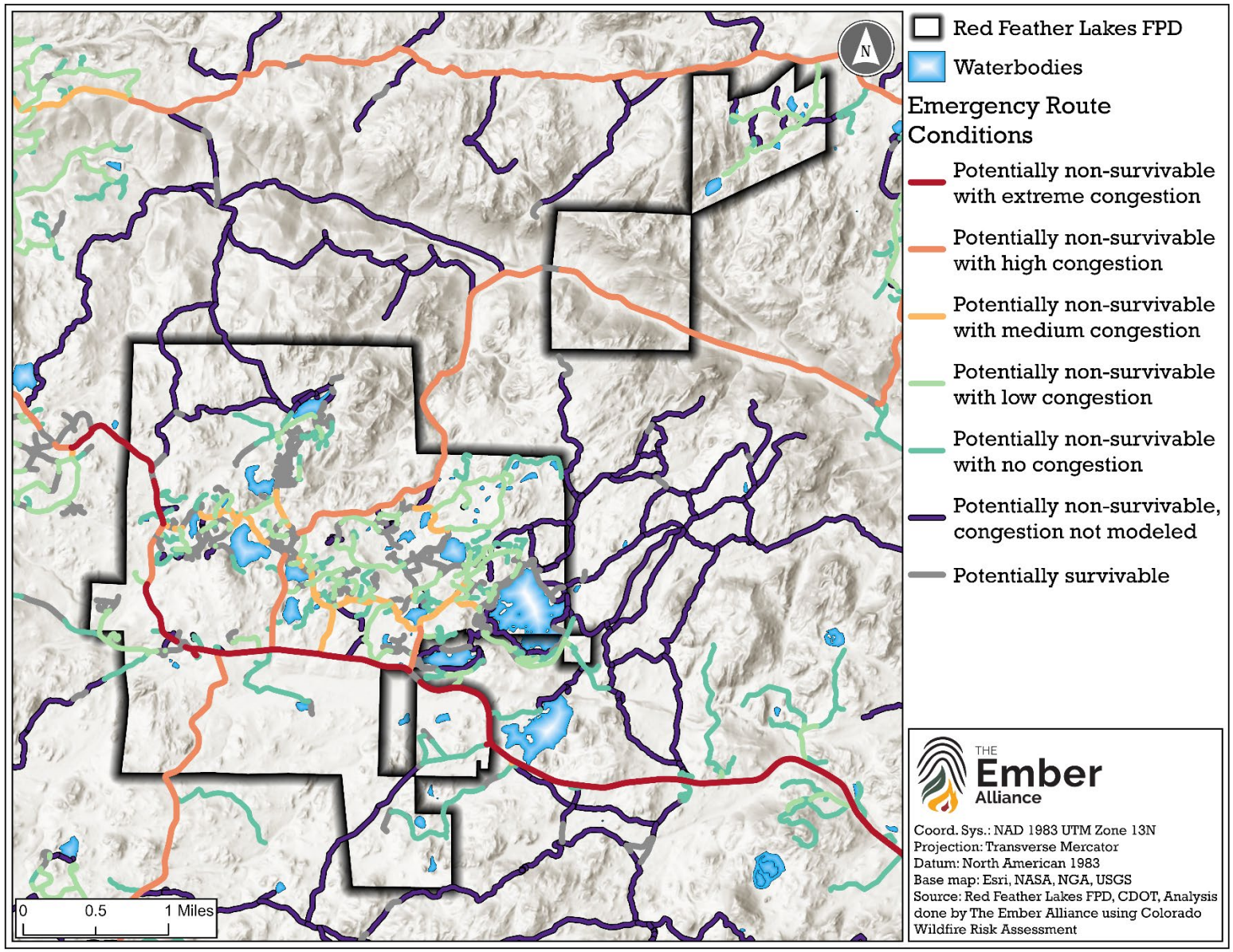


Figure B.15. *Some of the roads that could experience non-survivable conditions could also experience high to extreme congestion during an evacuation. These roads are particularly important for roadside fuel treatments to create safer conditions for evacuees and first responders. Source: Analysis by TEA using ArcCASPER for congestion modeling and flame length predictions from CO-WRA 2022.*

9.h. Climate Change Assessment

Climate change has a measurable impact on fire intensity, frequency, and size, and these impacts are likely to continue over the coming decades (Parks et al., 2016). Fire behavior modeling for this CWPP utilizes weather data from 2014-2022 and does not include future weather predictions. To explore the potential for exacerbated fire weather conditions in the future, we used the Climate Toolbox's future boxplots and future time series tools (Hegewisch et al., 2021). These tools model climate scenarios for the next 50-100 years using two representative concentration pathways (RCP) that assume different levels of global greenhouse gas emissions The RCP 4.5 scenario assumes that greenhouse gas emissions stabilize before the year 2100, peaking around 2040, and the RCP 8.5 scenario assumes that greenhouse gas emissions are not curtailed by 2100 (IPCC, 2014).

We selected three variables for this assessment: maximum temperatures in the summer (June, July, and August), the number of days with very high fire danger, and vapor pressure deficit (VPD) in the summer. The Climate Toolbox defines very high fire danger as days with 100-hour fuel moisture below the 10th percentile fuel moisture from 1971-2000. VPD is a meaningful measurement of moisture stress experienced by plants, more so than relative humidity because VPD is independent of temperature. High values of VPD indicate that the air can draw more moisture out of leaves while they photosynthesize, resulting in drier fuels. Higher values of VPD are strongly related to summers with a greater number of acres burned in the western U.S. (Seager et al., 2015).

The models predict that maximum summer temperatures in RFLFPD could increase by 3.0-4.3° Fahrenheit by 2050, going from 74.6°F in 2005 to 77.6-78.9°F in 2050 (**Figure B.16**). RFLFPD could experience 9-13 more days per year with very high fire danger (**Figure B.17**), and average summer VPD could increase from 1.3 to 1.5 kilopascal (kPa) between 2005 to 2050 (**Figure B.18**). Drier fuels in the summer have a greater potential to carry large wildfires; an increase in summer VPD from 1.3 to 1.5 kPa is related to a 7-fold increase in annual area burned in forested parts of the western U.S. (Seager et al., 2015).

Fire behavior may be even more extreme, frequent, and extensive in the coming decades in the district. Mitigating actions in the coming years, including fuel treatments, defensible space around homes, and structure hardening, are critical to protecting life safety of residents and enhance community resiliency into the future.

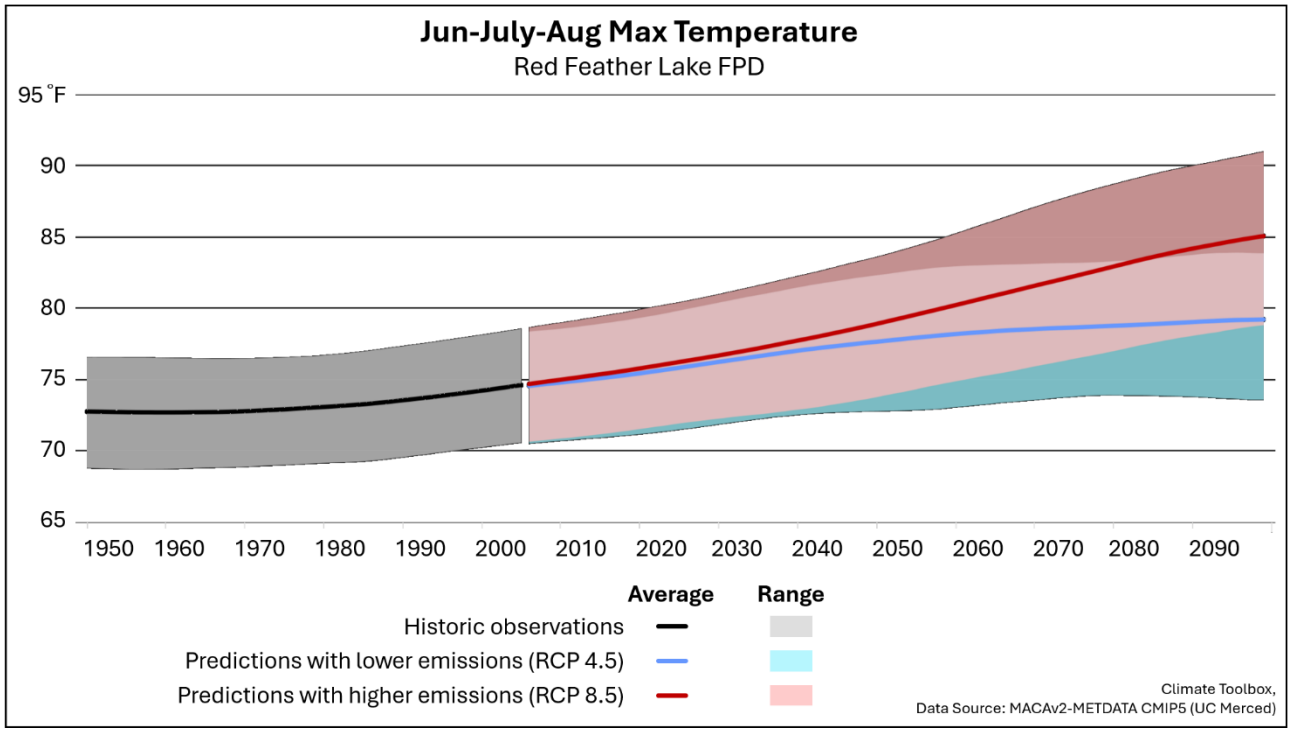


Figure B.16. *Predicted maximum temperature in summer months in RFLFPD under lower and higher greenhouse gas emission scenarios. Source: Climate Toolbox (Hegewisch et al., 2021).*

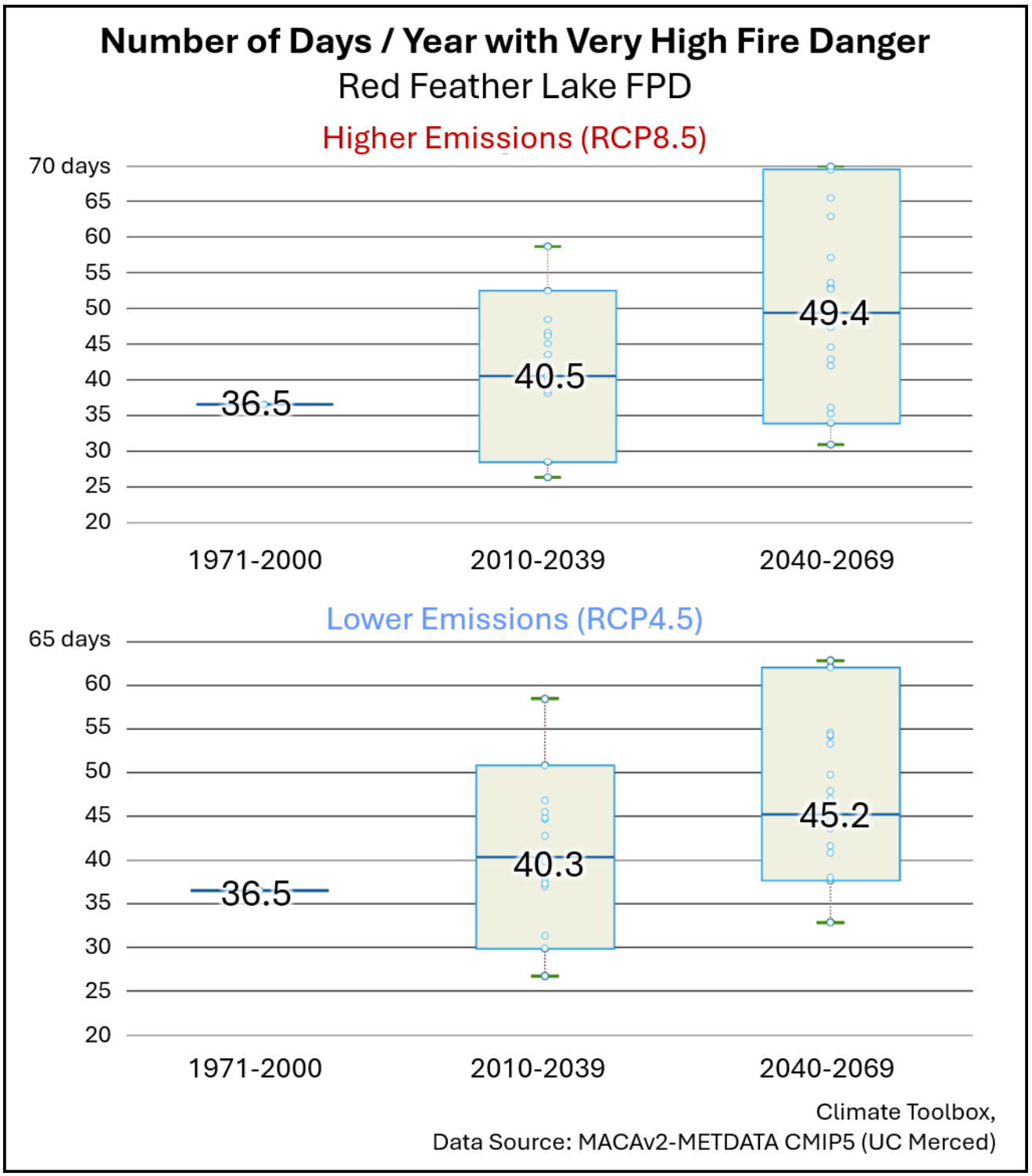


Figure B.17. *Predicted number of days with very high fire danger in RFLFPD under lower and higher greenhouse gas emission scenarios. Source: Climate Toolbox (Hegewisch et al., 2021). Boxplots show 5th percentile, median, and 97th percentile predictions. Numbers indicate median values. Whiskers show minimum and maximum predictions. Dots represent individual predictions from different climate models.*

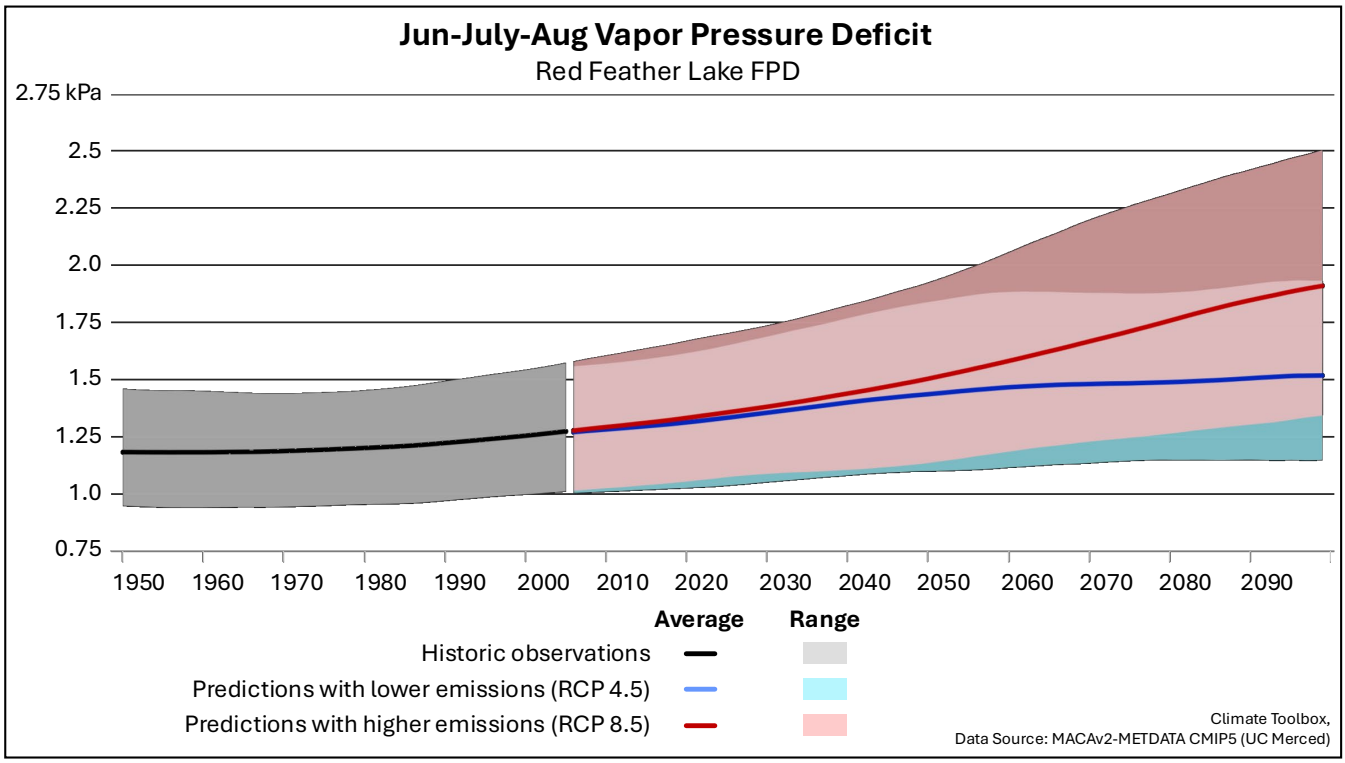


Figure B.18. *Predicted average vapor pressure deficit in summer months in RFLFPD under lower and higher greenhouse gas emission scenarios. Source: Climate Toolbox (Hegewisch et al., 2021).*

9.i. Plan Unit Relative Risk Assessment

CWPP Plan Units

We compared the relative risk that wildfires pose to life and property in 5 plan units across RFLFPD (Figure B.19). Plan units are areas with shared fire risk where residents can organize and support each other to effectively mitigate hazardous fuels across the plan unit. Plan unit boundaries were developed primarily by using roads to divide the district, along with clusters of addresses, land parcels, land ownership, and local knowledge of community organization.

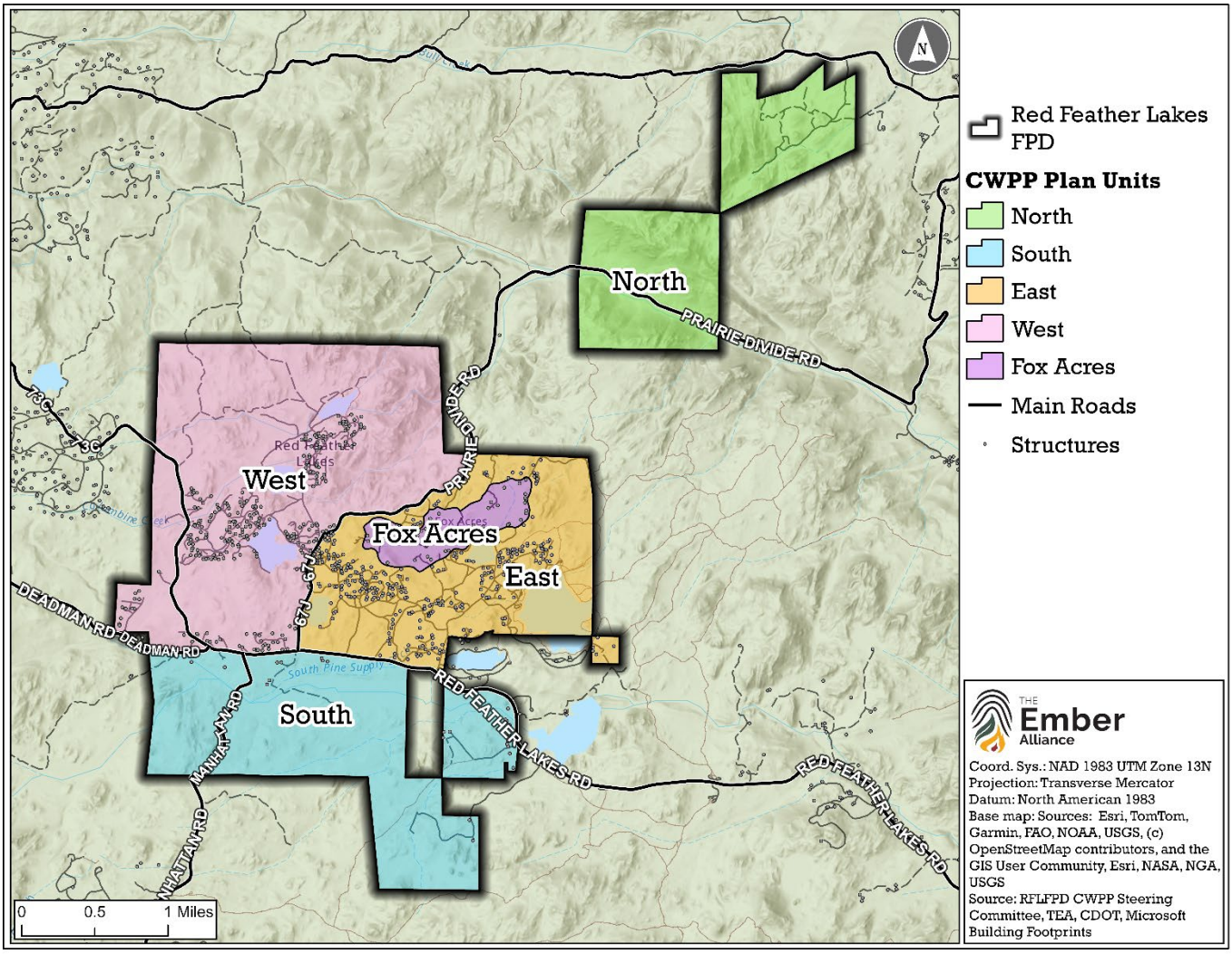


Figure B.19. *CWPP plan units in RFLFPD.*

Risk Rating Approach

Some plan units in RFLFPD have extreme risk from wildfire damage, and to help prioritize hazard mitigation, we developed a rating of relative risk. A plan unit receiving a relative rating of "moderate risk" has risk factors that are lower than risk factors in other plan units, but it is still an area with wildfire hazards. We assessed hazards in four categories: fire risk, fire suppression challenges (e.g., limited hydrant availability and engine access), evacuation hazards, and home ignition zone hazards. **We developed the ratings of relative risk specifically for RFLFPD, so the assessment is not suitable for comparing this fire protection district to other communities in Colorado or the United States.**

Our assessment was based on predictions of fire behavior, radiant heat and ember cast exposure, roadway survivability, and evacuation time, as well as an on-the-ground assessment of each plan unit. In late fall of 2024, employees of The Ember Alliance drove around RFLFPD to familiarize themselves with the district and assess home ignition zone hazards within each plan unit. TEA employees used a modified version of the NFPA Wildfire Hazard Severity Form Checklist (NFPA 299 / 1144) to rate home ignition zone hazards within each plan unit.

A rating scale was developed specifically for RFLFPD based on the range of values observed across the community (**Table B.12**). The purpose of the assessment is to compare relative hazards within the community and is not suitable for comparing RFLFPD to other communities.

Table B.6. *Relative risk ratings for RFLFPD: Hazard categories were ranked from Moderate to Extreme. The North plan unit received an "N/A" ranking for "Home ignition zone hazards" due to the lack of domestic dwellings. The overall risk was also ranked from Moderate to Extreme using the scale in the table below.*

Hazard category	Range of values in RFLFPD Plan Units	Moderate	High	Very High	Extreme
A. Fire risk	20-61	<20	21-32	33-37	>37
B. Fire suppression challenges	10-28	<14	15-22	23-28	-
C. Evacuation hazards	9-22	<9	10-16	17-22	-
D. Home ignition zone hazards	0-55	<26	27-41	41-52	53-55
Overall risk	65-129	<65	66-108	109-119	120-129

Relative Risk Rating Form

Scoring factors and breakpoints from the RFLFPD Plan Unit Assessment. Field teams assessed each factor against the tiers shown; water sources, egress routes, and roadway survivability were assessed via GIS or CO-WRA modeling rather than field point-scoring. Category point maximums: Fire risk 55, Suppression 44, Evacuation 45, Home ignition zone 58 (total 202).

A. Fire Risk (field-assessed factors)	Points
Mid-slope homes	
None (0) · Few, <25% of homes (1) · Many, >25% (2)	0–2
Homes on ridge tops	
None (0) · Few, <25% of homes (1) · Many, >25% (2)	0–2
Topographic saddles / ravines / chimneys	
None (0) · Several, 1–2 features (2) · Numerous, >2 (4)	0–4
Powerline placement	
All underground (0) · 1 overhead line (3) · >1 overhead (5)	0–5
Field-assessed subtotal (of Fire Risk)	**13**

Fire Risk also includes CO-WRA modeling factors (predicted fire behavior, flame length, crown fire activity, conditional burn probability) assessed via GIS; category maximum 55.

B. Fire Suppression Challenges	Points
Roadway accessibility (Type 3 engine access)	
>90% roads accessible (0) · 50–90% (7) · <50% (15)	0–15
Street and address signs	
>90% present (0) · 75–90% (3) · <75% (5)	0–5
HazMat present (tires, propane, fuel tanks, commercial)	
Absent (0) · Present (5)	0 or 5
Response time	
Service-area response time for homes in unit	0–4
Water sources — hydrants and cisterns	
Assessed via GIS (not field point-scored)	GIS
B. Total points possible	**44**

C. Evacuation Capacity	Points
Number of lanes (one direction)	
>90% roads ≥1 lane (0) · 50–90% (5) · <50% (10)	0–10
Primary egress routes	
3+ routes (0) · 2 routes (5) · 1 route (10)	0–10
Livestock requiring multiple evacuation trips	
0–1 properties (0) · 2–5 (3) · >5 (5)	0–5
Roadway survivability (non-survivable roads, 90th pct)	
Assessed via CO-WRA modeling	0–20
C. Total points possible	**45**

D. Home Ignition Zone Hazards	Points
Roof construction material (Class A / B / C)	
Class B/C on <10% homes (0) · 10–50% (7) · >50% (15)	0–15
Siding	
Non-combustible >90% (0) · combustible 10–50% (3) · >50% (5)	0–5
Decking	
Non-combustible >90% (0) · combustible 10–50% (3) · >50% (5)	0–5
Wooden fences within 5 ft of home	
<5% homes (0) · 5–25% (1) · >25% (2)	0–2
HIZ zone 1 (0–5 ft) adequately cleared	
>90% homes (0) · 75–90% (3) · 50–75% (6) · <50% (10)	0–10
HIZ zone 2 (5–30 ft) adequately managed	
>90% homes (0) · 75–90% (3) · 50–75% (6) · <50% (10)	0–10
Other hazards within 30 ft (wood/propane/sheds)	
<10% homes (0) · 10–50% (3) · >50% (5)	0–5
D. Total points possible	**58**

10. Appendix C: Community Survey Methodology and Results

Survey Methodology

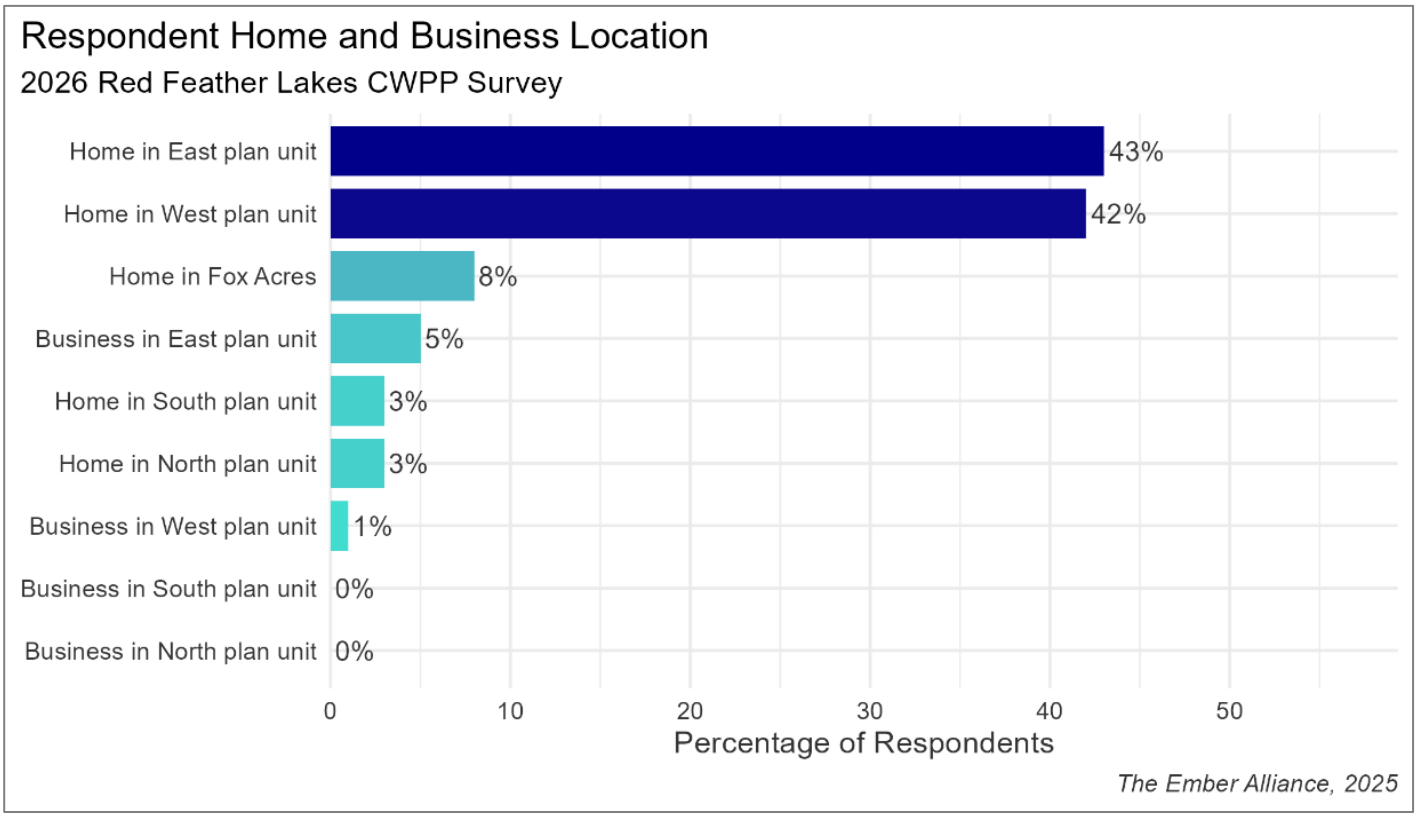
The community survey was developed by the Red Feather Lakes CWPP Advisory Committee. The team used Wildfire Research Center (WiRE) and The Ember Alliance (TEA) surveys to develop their own resident survey. The aim of the survey was to provide vital information on the concerns of community members living in a wildfire prone environment and to guide the prioritization of mitigation projects in the Red Feather Lakes Area.

The survey was available from mid-September to mid-October, 2025 through Google Forms, and a paper version of the survey was made available at the Red Feather Lakes Community Library and disseminated at various community events. A total of 77 individuals responded, with approximately equal representation from seasonal and full-time residents.

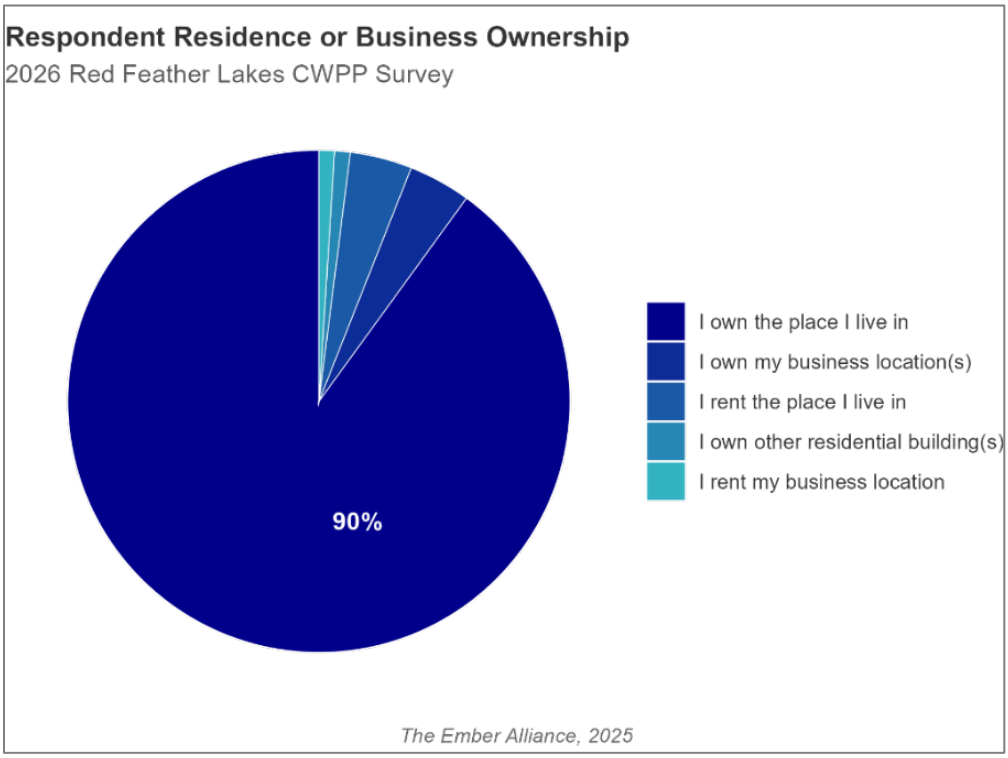
TEA summarized the survey data collected by the Red Feather Lakes Area CWPP Advisory Committee. Results and comments from the survey were used to inform the priorities in the CWPP.

Survey Questions and Answers

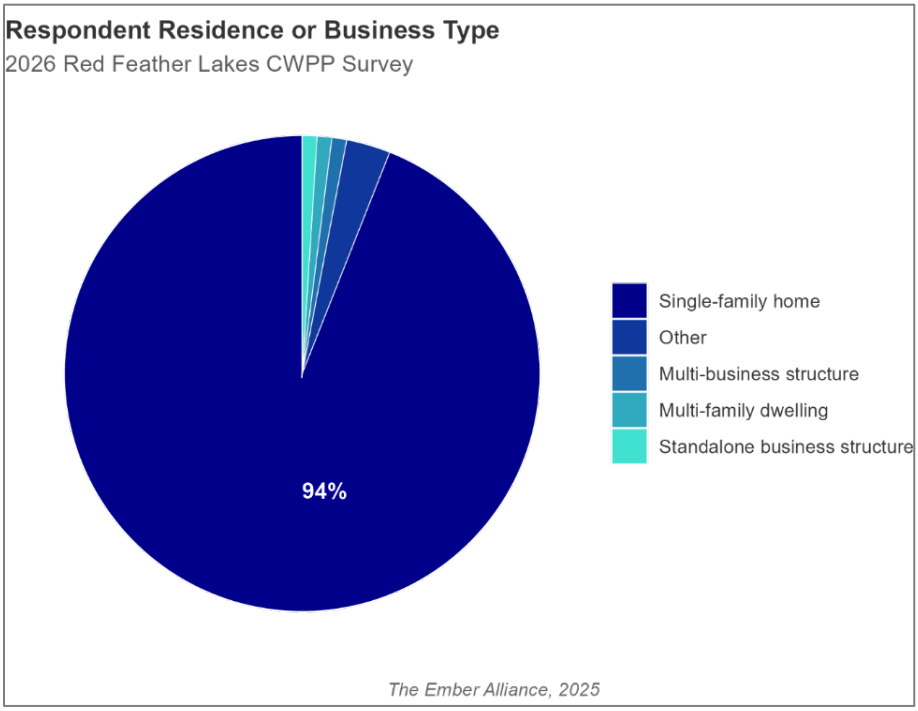
1. In which plan unit of the Red Feather Lakes Fire Protection District do you live or own a business? Check all that apply.



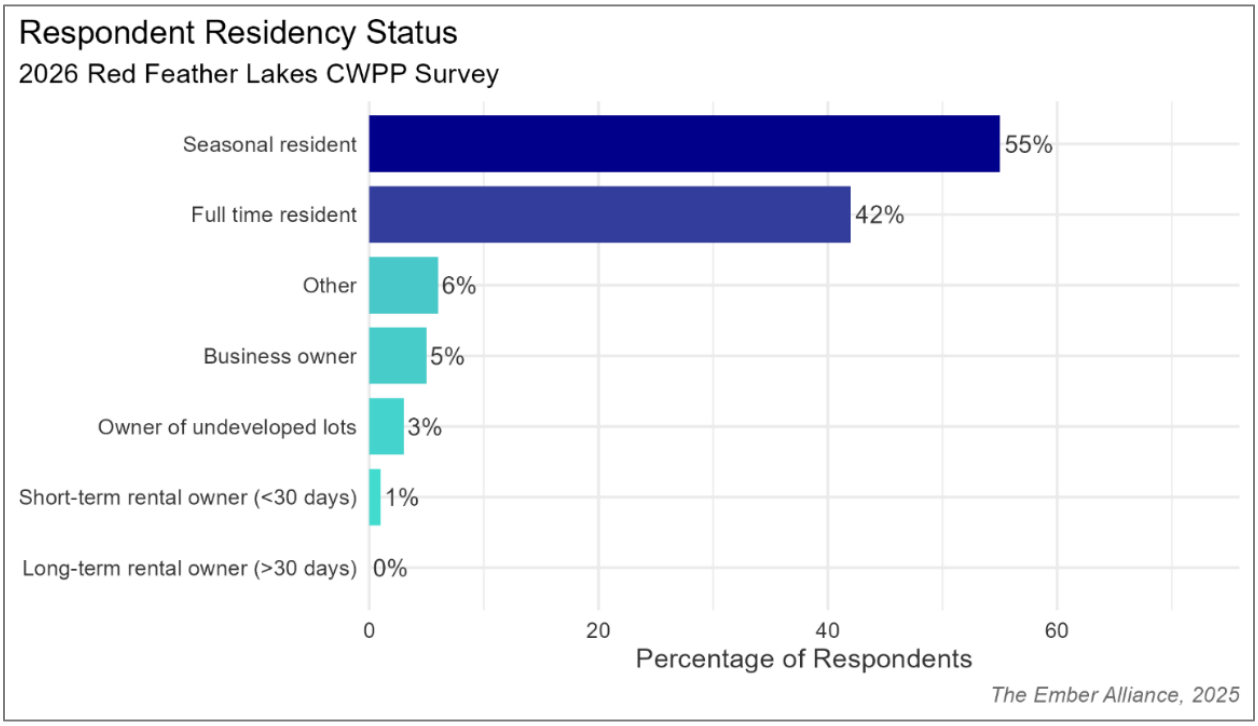
2. Do you rent or own the place where you live / operate your business in Red Feather Lakes? Check all that apply.



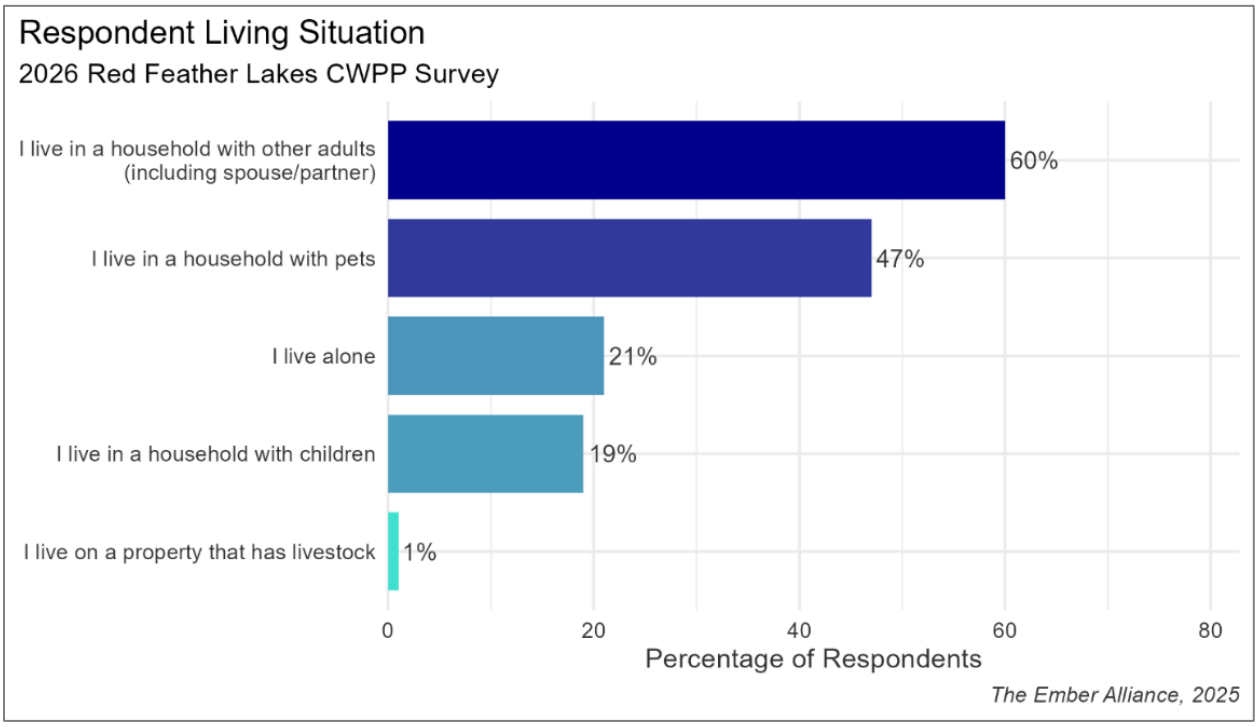
3. How would you describe your residence or business in Red Feather Lakes? If "Other" please specify. Check all that apply.



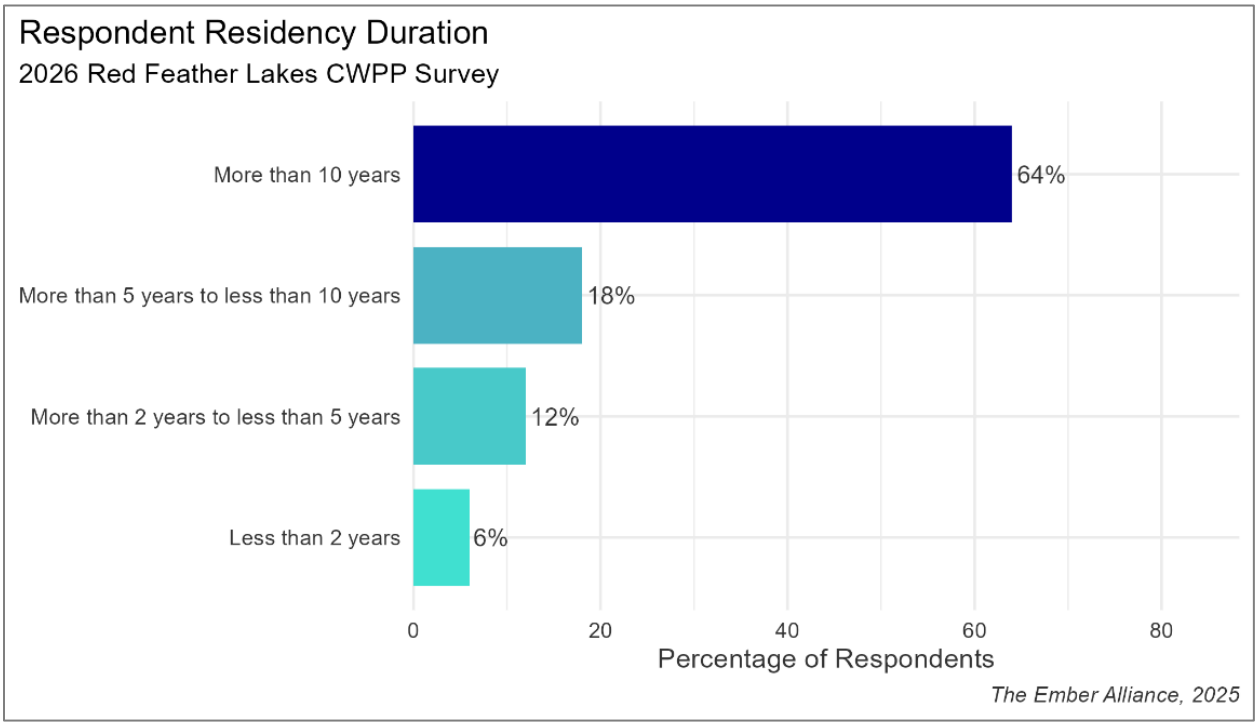
4. What is your residency status in Red Feather Lakes? If "Other" please specify. Check all that apply.



5. Describe your current living situation in Red Feather Lakes. Please check all that apply.



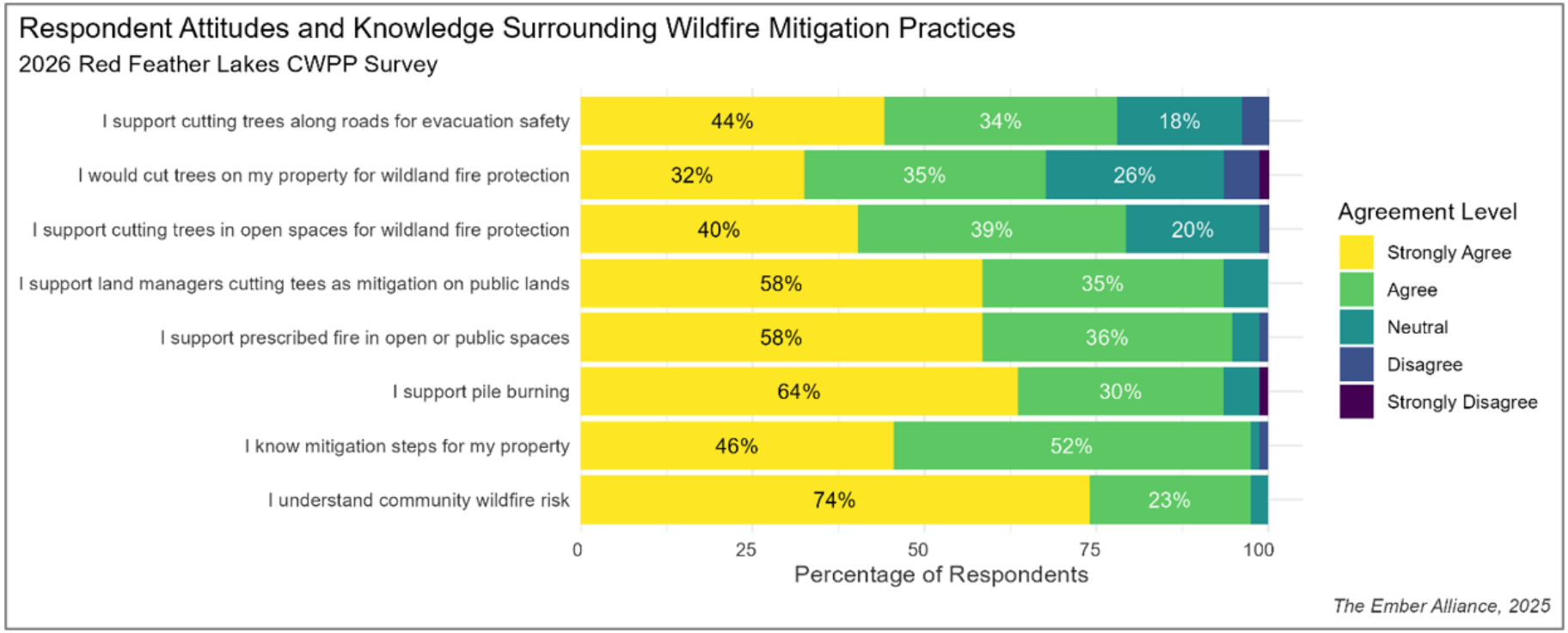
6. How long have you lived or owned a business in Red Feather Lakes? (If you've lived and owned a business in Red Feather, choose the longer of the two).



7. If you would like to receive more information regarding updates and events related to the Community Wildfire Protection Plan, please provide your email address.

Answers to this question were confidential and so are not included here.

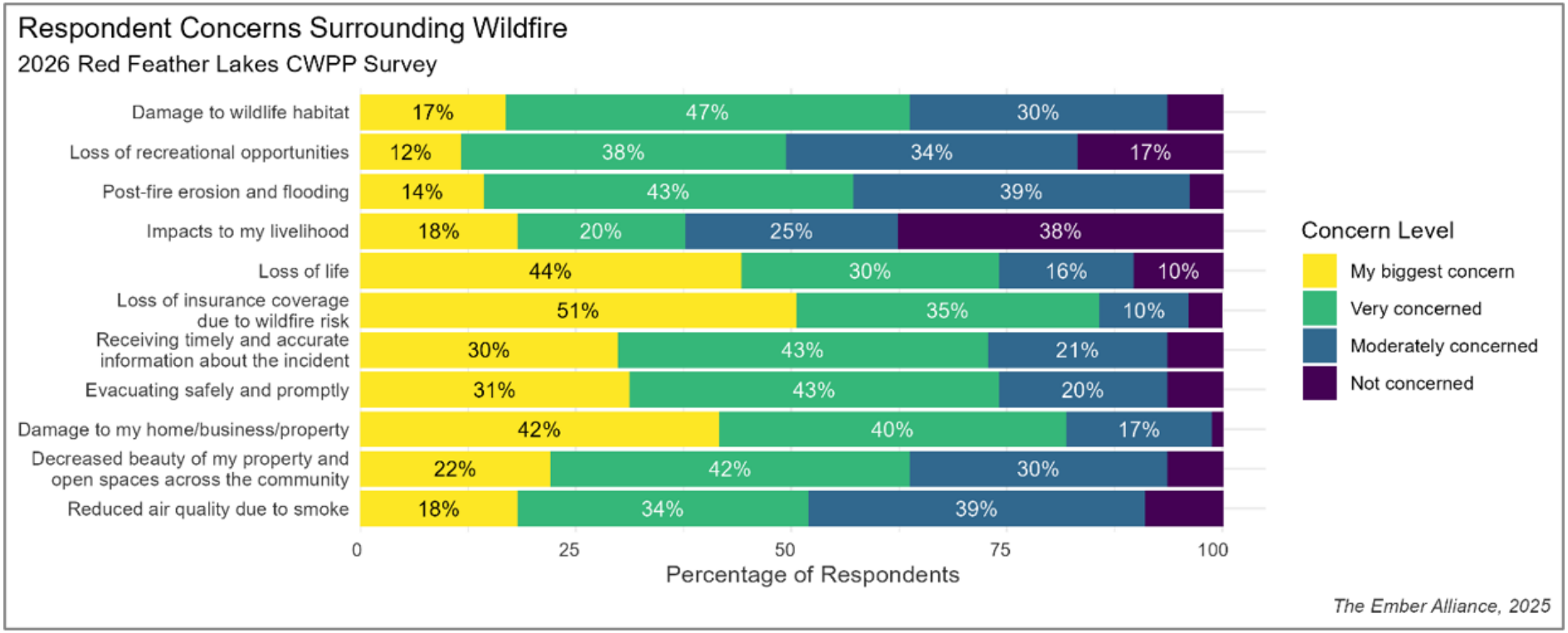
8. Please read each statement and select the degree to which you agree or disagree.



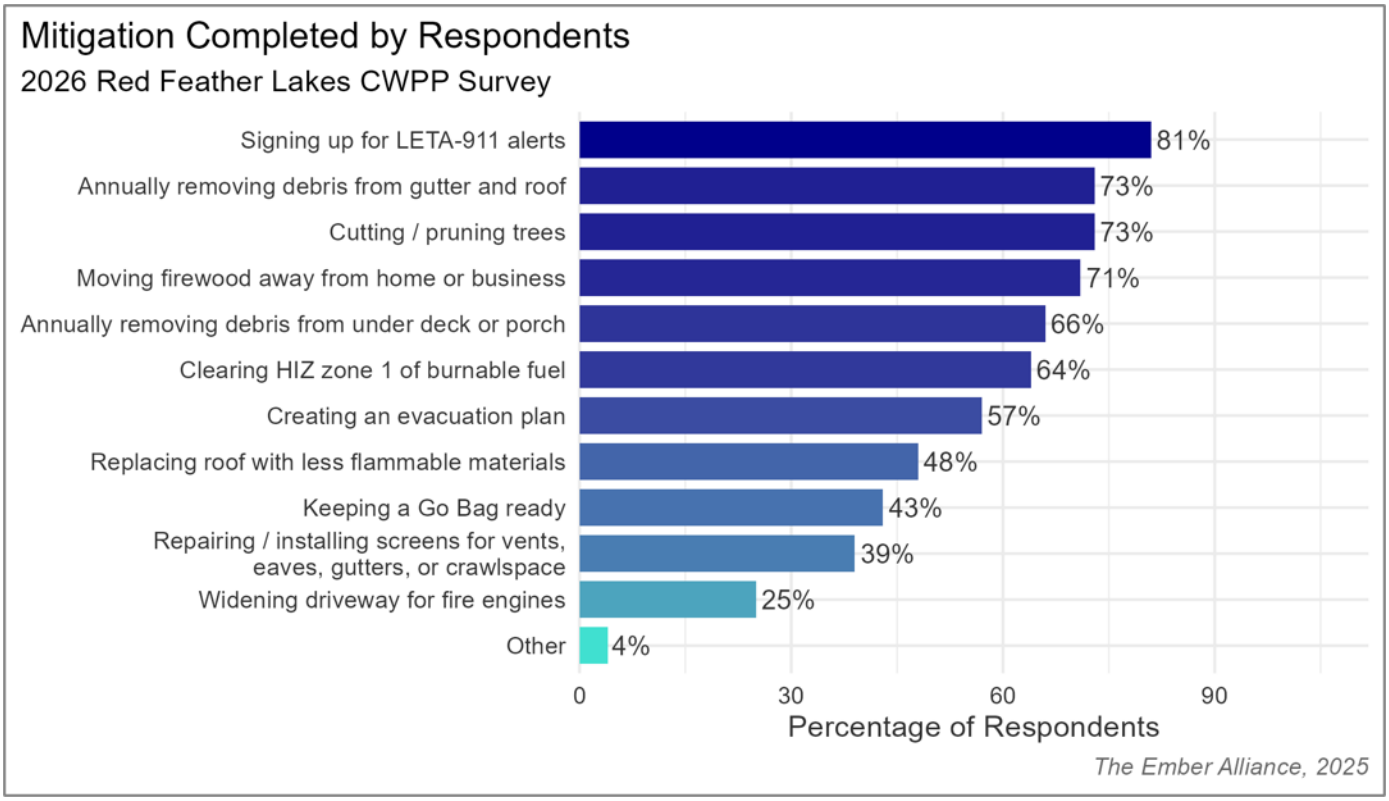
Statements from the survey were shortened for the sake of clarity in the above figure. Actual statements appeared as below (ordered as they were in the survey):

- I understand the degree to which the Red Feather Lakes community is at risk from wildfires.
- I know steps I can take to reduce wildfire hazards on and around my home / business / property.
- I would consider cutting trees for wildland fire protection on my own property.
- I support cutting of trees for wildland fire protection on open spaces across the Red Feather Lakes community.
- I support cutting of trees along roads to enhance the safety of roads in case of an evacuation.
- I support land managers such as the U.S. Forest Service cutting trees to mitigate wildfire risk on public land around the Red Feather Lakes community.
- I support pile burning to eliminate woody material created by fire mitigation actions.
- I support prescribed (controlled) burning to reduce wildfire risk in open or public spaces around or adjacent to the Red Feather Lakes community.

9. How concerned are you about the following if a wildfire were to occur in the Red Feather Lakes community?



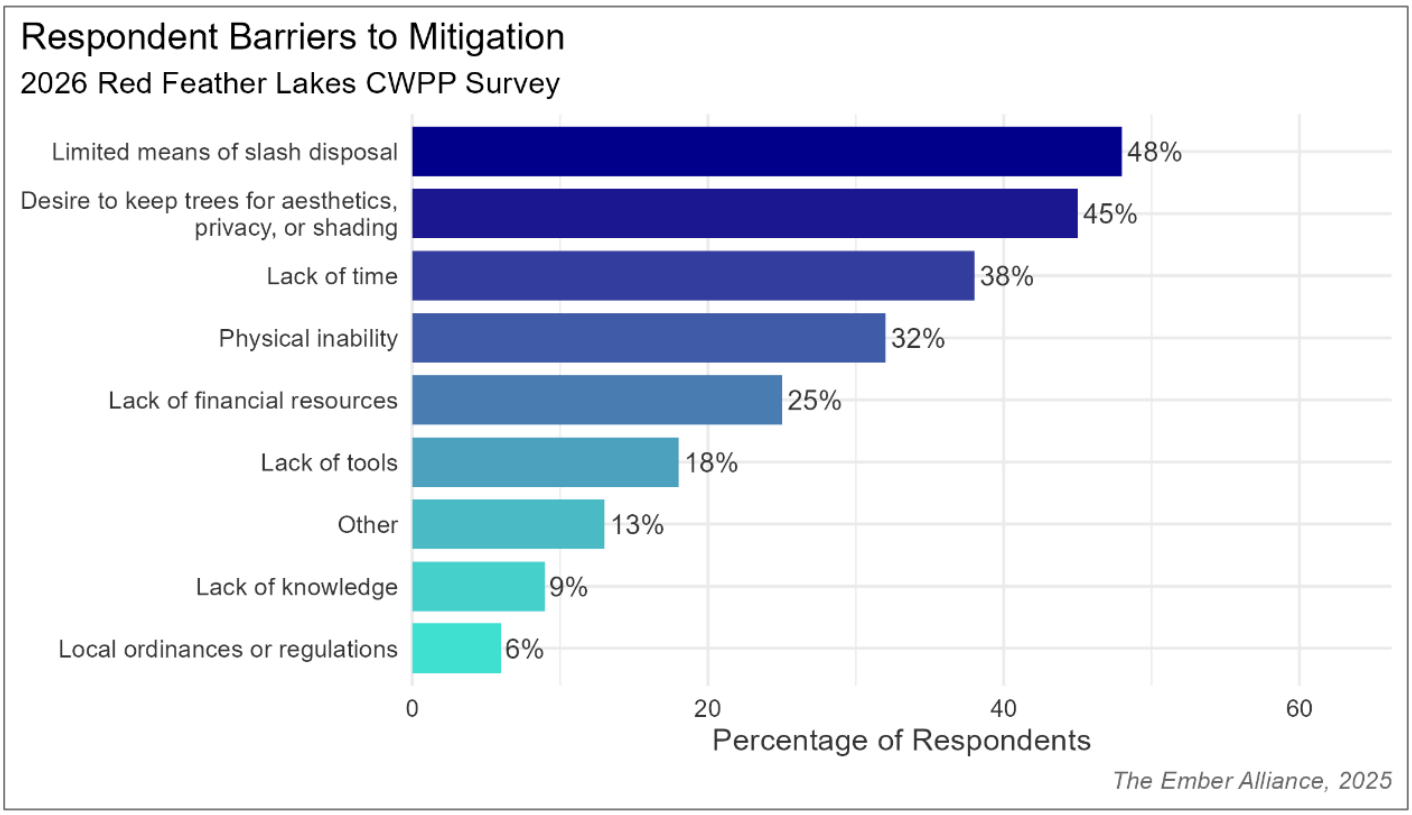
10. I have completed the following work to my home, business, or property to lessen the risk of wildfire and prepare for potential evacuations: If "Other" please specify. Check all that apply.



Statements from the survey were shortened for the sake of clarity in the above figure. Actual statements appeared as below (ordered as they were in the survey):

- Cutting trees or removing low limbs on trees near my home/business
- Annually removing debris (dead vegetation, pine needles) from my gutter and roof
- Annually removing debris (dead vegetation, pine needles, mulch) from under my balcony, deck, or porch
- Removing all burnable fuel (mulch, grass, flammable furniture) from within 5 ft around the base of my home
- Moving firewood away from my home/business and not storing it under my balcony, deck, or porch
- Repairing or installing screens to block embers from entering vents, eaves, gutters, or crawlspace
- Replacing my roof with less flammable materials
- Widening my driveway so fire engines could access my property
- Signing up for LETA-911 alerts to receive emergency notifications during wildfire incidents
- Creating an evacuation plan for myself and others at my residence
- Keeping a Go Bag with important documents, survival gear, medications, etc. at the ready in case of an evacuation
- Other

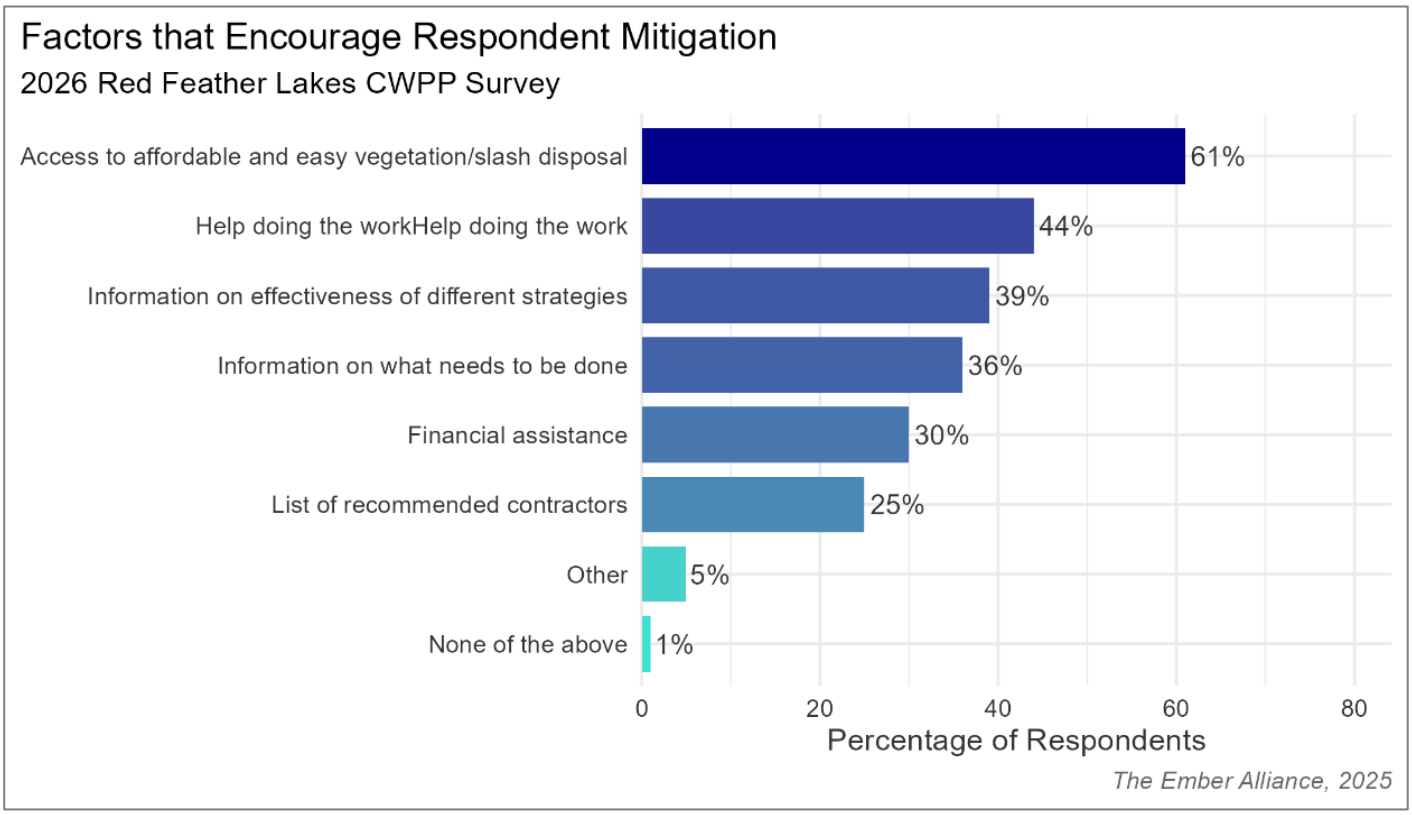
11. Which of the following factors keep you from undertaking actions to reduce the wildfire risk on your property? If "Other" please specify. Check all that apply.



Statements from the survey were shortened for the sake of clarity in the above figure. Actual statements appeared as below (ordered as they were in the survey):

- Lack of knowledge about effective methods to reduce hazards
- Lack of financial resources
- Lack of tools to complete the work
- Physical inability to complete the work
- Limited means to dispose of downed trees, limbs, and other slash material
- Desire to keep trees near homes/businesses for aesthetic reasons, shading, or privacy
- Local ordinances and regulations that prohibit certain modifications to homes/ businesses and surrounding property
- Other

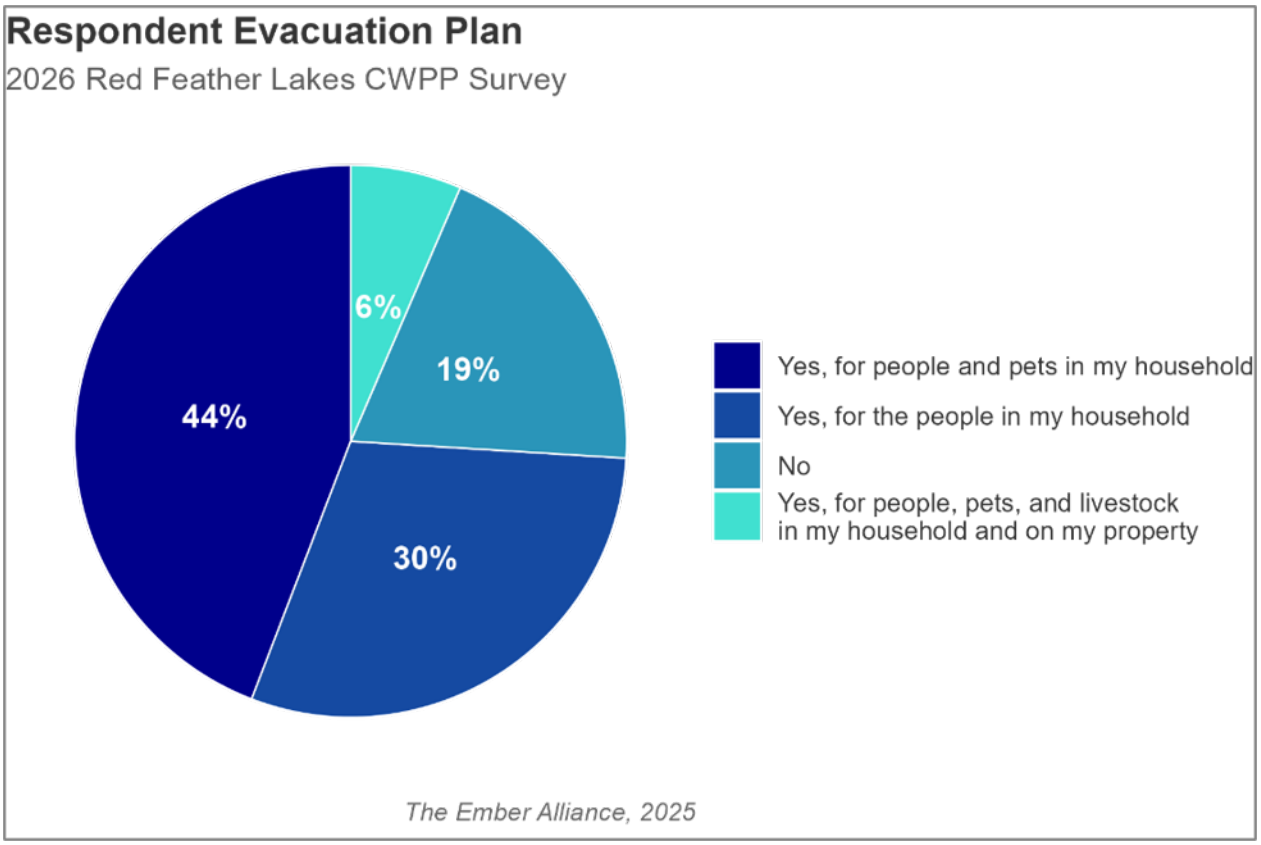
12. Which of the following would encourage and enable you to take actions to reduce the wildfire risk on your property? If "Other" please specify. Check all that apply.



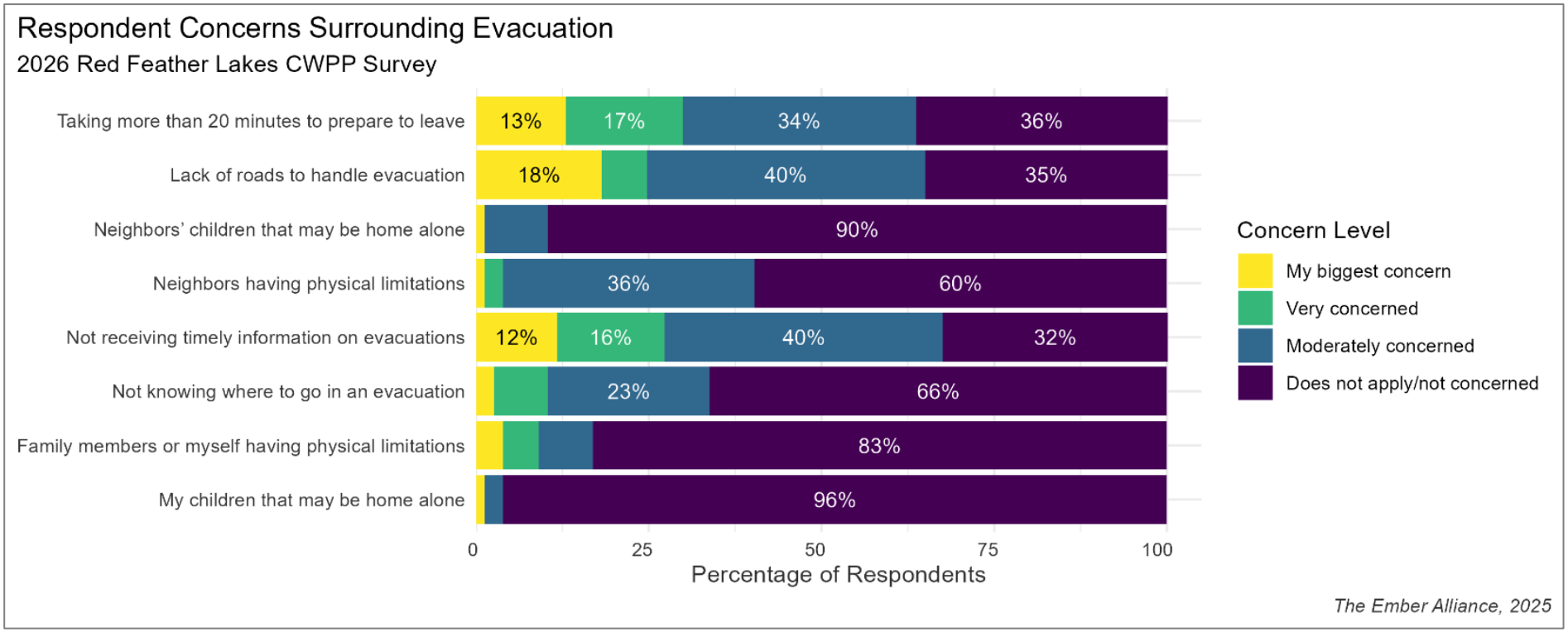
Statements from the survey were shortened for the sake of clarity in the above figure. Actual statements appeared as below (ordered as they were in the survey):

- Financial assistance
- Access to inexpensive/easy means of disposing vegetation from mitigation work
- Specific information about what needs to be done
- Information on the effectiveness of different strategies to reduce the wildfire risk
- Help doing the work (e.g., someone to thin trees and vegetation and/or remove debris)
- A list of recommended contractors that could be hired to do the work
- None of the above--I am not interested in these actions
- Other

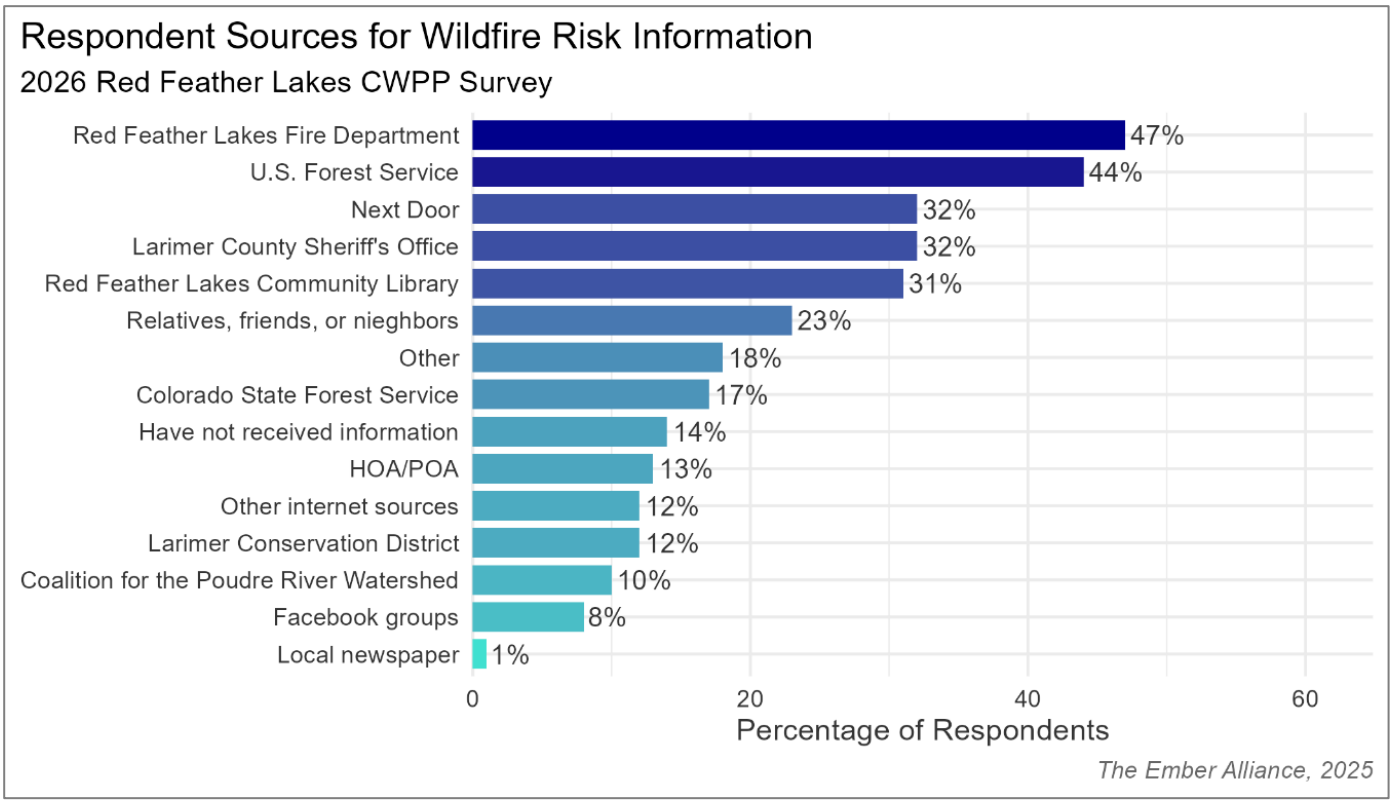
13. Do you/your family/your household have an evacuation plan for your residence if a wildfire were to occur in the community?



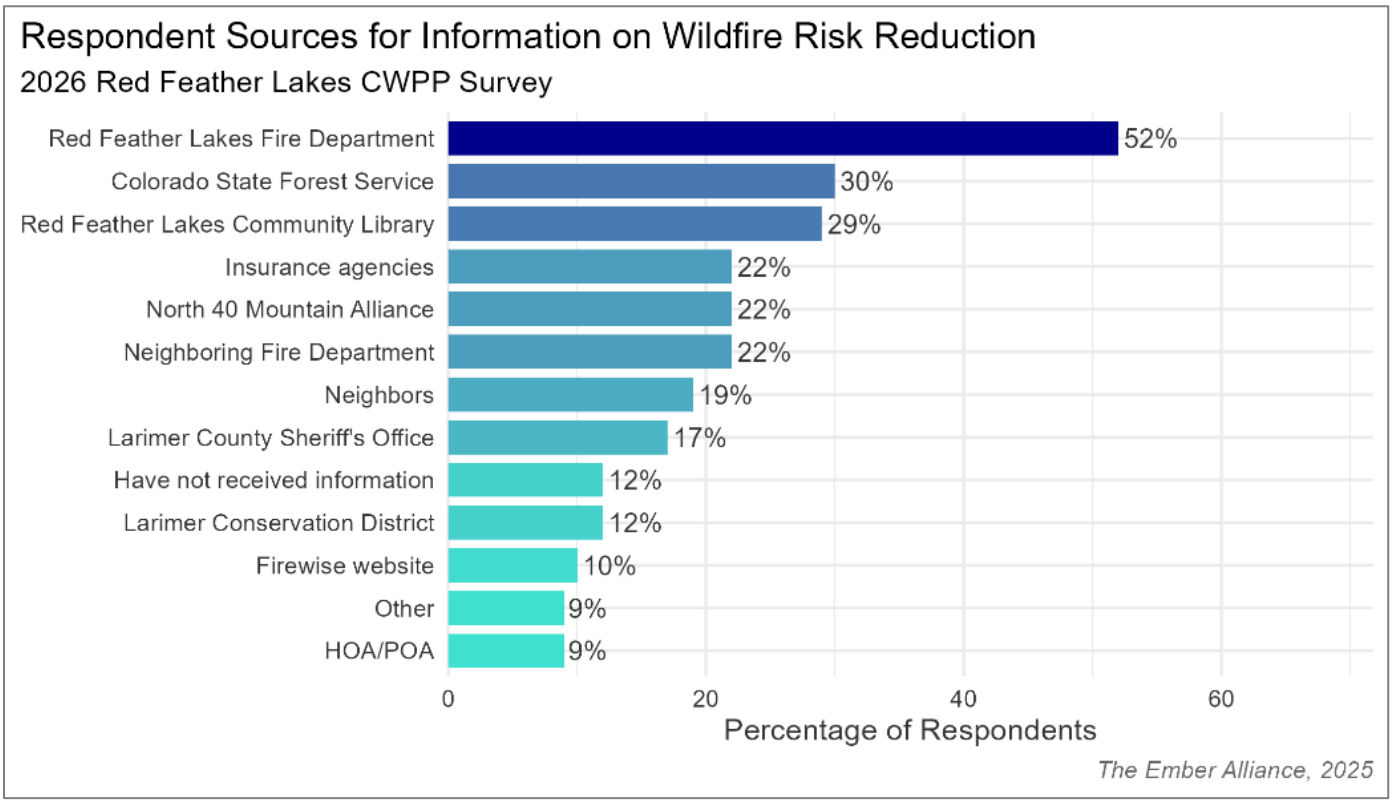
14. If there were an evacuation in the Red Feather Lakes community because of wildfire, how concerned are you about the following issues?



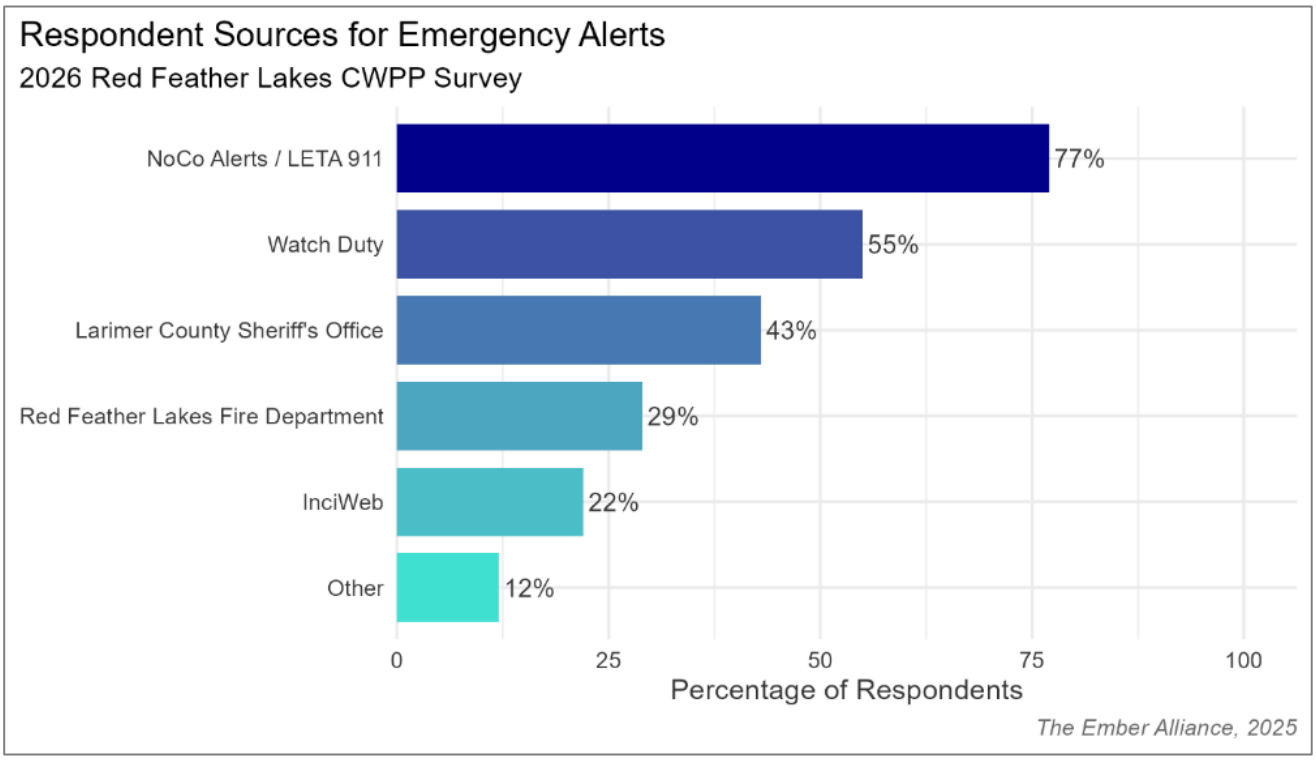
15. If you have received information about wildfire risk in the Red Feather Lakes area, who has provided this information to you? If "Other" please specify. Check all that apply.



16. From whom do you get information on fire safety/actions you can take to reduce your wildfire risk? If "Other" please specify. Select all that apply.



17. If you have received emergency alerts regarding ongoing wildfire incidents facing the Red Feather Lakes area, from which source(s) did you receive this information? If "Other" please specify. Check all that apply.



18. Would you attend an educational event about fire safety in Red Feather Lakes? If yes, what would draw you to such an event?

Answers to this question were confidential and so are not included here.

19. What methods are best to communicate with you? If "Other" please specify. Check all that apply.

