



# J E F F E R S N

COUNTY COLORADO



## COMMUNITY WILDFIRE PROTECTION PLAN 2024 UPDATE



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# ACRONYMS AND ABBREVIATIONS

CEMP EA	Comprehensive Emergency Management Plan Evacuation Annex
CSFS	Colorado State Forest Service
CWPC	Community Wildfire Planning Center
CWPP	Community Wildfire Protection Plan
DMP	Denver Mountain Parks
FAC	Fire Adapted Community
FEMA	Federal Emergency Management Agency
FPD	Fire Protection District
Jeffco	Jefferson County
HOA	Homeowner's Association
HUC	Hydrologic Unit Code
HVRA	Highly Valued Resources and Assets
IRPG	Incident Response Pocket Guide
JCD	Jefferson Conservation District
JCOS	Jefferson County Open Space
JCP&Z	Jefferson County Planning & Zoning
JCSO	Jefferson County Sheriff's Office
MMWMC	Mountain Metro Wildfire Mitigation Council
NWCG	National Wildfire Coordinating Group
PBC	Pile Burn Cooperatives
PODs	Potential Operational Delineations
SIZ	Structure Ignition Zone
SLASH	Sustainable Lands and Safer Homes (SLASH) program
TEA	The Ember Alliance
USFS	U.S. Forest Service
WUI	Wildland-Urban Interface

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

# EXECUTIVE SUMMARY

Jefferson County, Colorado is one of the highest risk counties in Colorado for wildfire risk and impacts; see the **Wildfire Risk Assessment** for more details. Not only will fires impact residents through evacuation disruption and property loss but wildfires in this area can have severe effects on air quality in the Denver metro area, watershed health and access to clean drinking water, recreation, and local business interruption. Significant efforts have been made to reduce the hazards and reduce risk by residents, land managers, and business owners; however there needs to be a coordinated and concerted effort led by the County to address gaps in wildfire response, planning, and mitigation actions. This plan outlines a holistic approach that the County and partners need to take to build capacity and acquire funding to implement the necessary risk reduction projects.

This Community Wildfire Protection Plan (CWPP) is the culmination of 18 months of public outreach and engagement, wildfire modelling and analysis, stakeholder meetings, and review and feedback from both wildfire and forestry professionals and County residents. Read about public engagement and feedback in **Appendix C. Summary of Public Feedback**. This plan aligns with many other local and national wildfire mitigation and planning efforts, including the [National Cohesive Wildland Fire Management Strategy](#), Colorado's [Forest Action Plan](#), Jefferson County Open Space's [Forest Health Plan](#), and many of the county's fire protection district and department CWPPs. It was completed in coordination with the [TogetherJeffco](#) project, which allowed it to align with and inform the County's Comprehensive Emergency Management Plan Evacuation Annex, Comprehensive Plan, Transportation and Mobility Plan, and Unified Land Use Code.

This planning process redefined the wildland-urban interface (WUI) for the County, expanding it to include more lands within the foothills and grasslands where many wildland fires have burned in the past decades. If the redefined WUI is incorporated into building and land use regulations, it will become regulatory and impact land use decisions. Detailed recommendations for updates to these codes were created by the Community Wildfire Planning Center and may be reflected in the CWPC report (available later in 2024) and the County's updated Unified Land Use Code. Learn more about the WUI definition in the section **Wildland-Urban Interface** and understand the methods and reasoning behind this decision in **Appendix A. Wildland-Urban Interface Methodology**.

This plan covers all of Jefferson County and includes general information and recommendations for hardening homes and other structures and mitigation within the structure ignition zone. **Becoming a Fire Adapted Community** has information on these actions; however, residents are encouraged to reference the [Community Wildfire Protection Plan that their local fire protection district or fire department](#) has for priority recommendations for their homes and neighborhoods. Up-to-date fire district-level plans are the best resource for residents of the County who are looking to take action to reduce their wildfire risk. Residents who do not live within the boundaries of a fire protection district or fire department, or whose fire district CWPP is more than ten years old should use this countywide CWPP and the resources it references as their guide.

The Jefferson County Sheriff's Office houses the Emergency Services Section and the County's Fire Duty Officer, who is the party responsible for managing wildfires and evacuations in the county. Staff within



the Emergency Services Section collaborated with dozens of partners including local fire protection districts and fire departments, Colorado State Forest Service, watershed organizations and water providers, transportation agencies, land management agencies, and County contractors. The knowledge and experience of these partners built on existing local plans to create an action plan that will best serve the County, its residents, and their partners.

The priority actions outlined in this plan are:

1. **Action 1: Create a Wildland Fire Management Program** – to enable the County to better respond to wildfires and support local fire districts.
2. **Action 2: Stand-Scale Fuel Treatments and Ecological Restoration** – to reduce fuels (trees, shrubs, grasses) on the landscape so fires burn less severely or more slowly in strategic areas.
3. **Action 3. Increase the Judicious Use of Broadcast Prescribed Burning** – to return fire and a land management tool to Jefferson County in a responsible and effective way.
4. **Action 4: Roadside Fuel Treatments** – to reduce fuels along roadways to increase evacuation safety, firefighter access and safety, visibility, and support future fire suppression strategies.
5. **Action 5: Jeffco Community Wildland Fire Program** – to create a unified program to support residents in mitigating wildfire risk on their properties and neighborhoods.
6. **Action 6: Slash Management** – to enable residents and communities to easily dispose of slash throughout the spring and summer.
7. **Action 7: County Evacuation Preparedness** – to work with communities to prepare for evacuations and increase resources for livestock evacuations.
8. **Action 8: Spatial Data Coordination** – to enable the sharing of and access to up-to-date geospatial data to most effectively coordinate fuels treatments and other mitigation actions.

Completing these actions will not remove all wildfire risk within the county, but will place the County in a position where they are able to adequately respond to active wildfire threats, coordinate and support partner work in and around the county, address service gaps between fire protection districts, and reduce the risk of wildfire affecting ecological processes, infrastructure, and residents.

This document should be updated every five years to maintain its accuracy and to ensure that the priority actions are relevant to the community.

# INTRODUCTION

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*“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*

## Purpose and Need for a County CWPP

Community Wildfire Protection Plans (CWPPs) help communities assess local hazards and identify strategic investments to mitigate risk and promote preparedness. Assessments and discussions during the planning process help residents, first responders, land managers, and other partners develop a shared understanding of risk and a shared commitment to strategic action. These plans also assist with funding gaps for fire adapted communities, including the implementation of fuel treatments, since many grants require recipients to have a recent, approved CWPP.

Since wildfires do not recognize jurisdictional boundaries, neither can wildfire mitigation and preparedness. Promoting fire adaptation and resilience in at-risk communities requires planning and action at local, county, regional, state, and federal levels. Some actions are most effective at local scales, such as neighborhood ambassador programs, and others are the legal responsibility of the county, like evacuation planning and execution and the enforcement of planning and zoning codes. For these reasons, the county- and fire district-level CWPPs have a different scale of assessment, different types of recommendations, and different organizations responsible for implementation, while also supporting each other and serving interrelated functions (**Table 1**).

The 2024 CWPP for Jefferson County is a robust update to the 2011 CWPP that takes advantage of recent advances in fire science and addresses changes to fire risk, building construction techniques and materials, and other characteristics of the community. The CWPP includes a wildfire risk analysis, prioritization of mitigation activities, and program recommendations to make Jefferson County a safer and more resilient community to wildfire. A key objective of the CWPP was to update the wildland-urban interface boundary for Jefferson County based on best-available science and observations of fire behavior along the Colorado Front Range.

Jefferson County contains 17 fire response agencies—14 fire protection districts (FPDs), 2 city fire departments, and 1 metro fire department—and 12 incorporated cities: Arvada, Edgewater, Golden, Lakewood, Littleton, Westminster, Wheat Ridge, Bow Mar, Lakeside, Morrison, Mountain View, and Superior (**Figure 1**). There are also 21 additional unincorporated communities and census-designated places in the county. Jefferson County Open Space, Pike and Arapaho National Forests, Colorado Parks and Wildlife, Denver Mountain Parks, National Renewable Energy Lab, Department of Energy’s Legacy Management also own and manage land within the county.

Most FPDs in Jefferson County recently updated their CWPPs or are in the process of updating them. The Jefferson County CWPP compliments CWPPs developed at the FPD-level and in no way supersedes them. FPD-level CWPPs are vital for inspiring resident action and local investments in risk mitigation



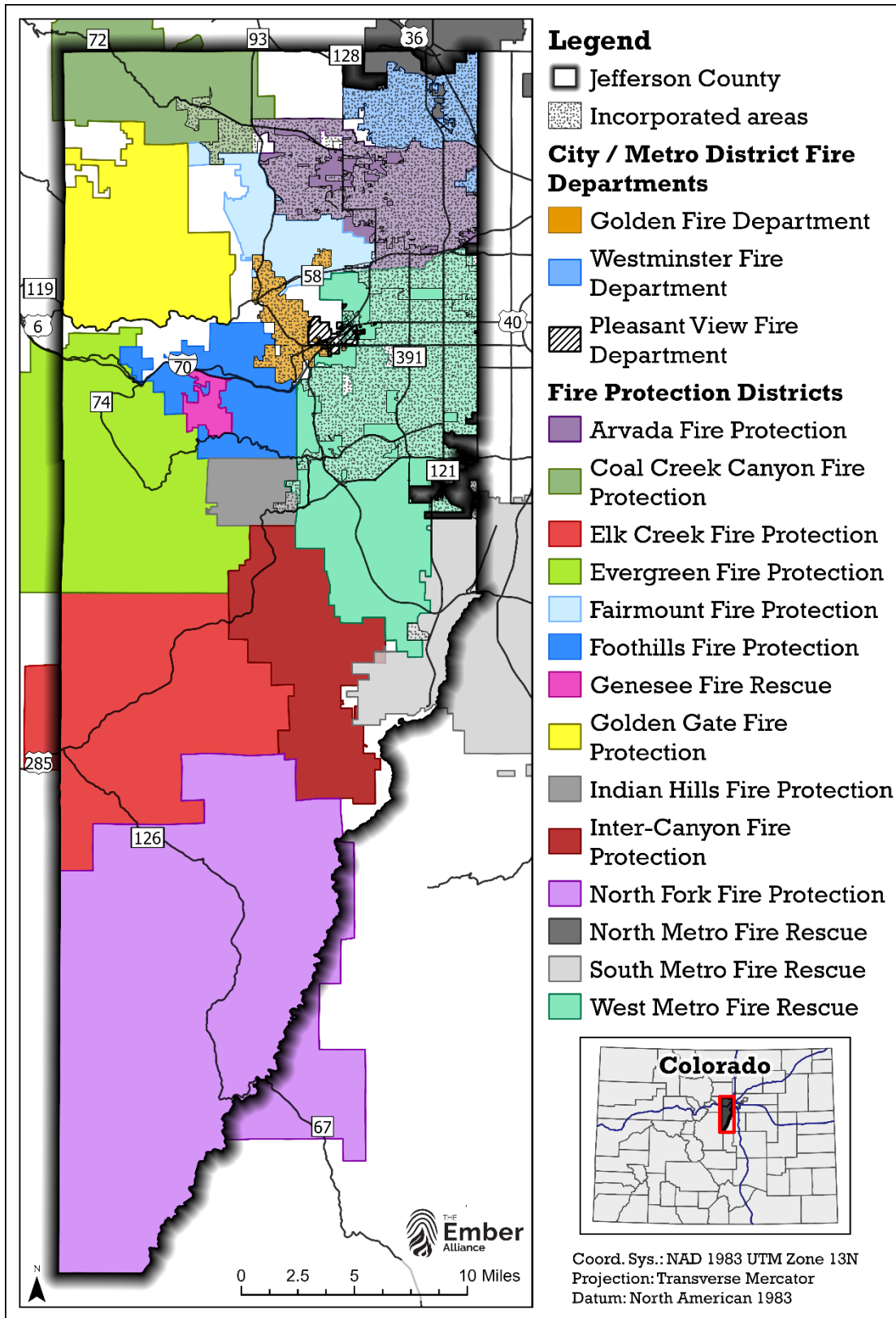
and emergency preparedness. Residents will find more targeted recommendations and actions for themselves, their neighborhood, their community organizations, and their local first responders in their local CWPP. FPD-level CWPPs provide insights to the County CWPP about local values, capacities, and needs.

The countywide CWPP was developed to compliment and support local CWPPs. The Jefferson County CWPP Advisory Committee reviewed information and recommendations from each FPD-level CWPP, and representatives from FPDs were involved in the advisory committee for the countywide CWPP. The countywide CWPP assesses risk across the entire county and includes recommendations for countywide programs targeted at areas of highest risk and/or with highest need for additional capacity. The County CWPP provides context to FPD-level CWPPs about their risk relative to other portions of the county and it creates an opportunity for FPDs to coordinate their action with the support of county resources.

**Table 1.** CWPPs at the local FPD-scale and County-scale serve distinct but interrelated functions.

	<b>FPD-level CWPP</b>	<b>Countywide CWPP</b>
<b>Primary responsibilities for implementation</b>	<ul style="list-style-type: none"> <li>Residents, neighborhoods, and community organizations</li> <li>Local fire departments</li> <li>Local and county land management agencies</li> </ul>	<ul style="list-style-type: none"> <li>Board of County Commissioners, county departments and agencies</li> <li>FPD Chiefs and fire mitigation specialists</li> <li>Local, state, and federal land managers</li> </ul>
<b>Scale of risk assessment</b>	<ul style="list-style-type: none"> <li>CWPP plan units, also called hazard zones or neighborhoods</li> </ul>	<ul style="list-style-type: none"> <li>Regional action areas across the county</li> </ul>
<b>Examples of recommendations</b>	<ul style="list-style-type: none"> <li>Local programs to support resident action</li> <li>Suggestions for County-level actions to address issues beyond the scope of an FPD</li> </ul>	<ul style="list-style-type: none"> <li>Countywide programs targeted at areas of highest risk and/or with highest need for additional capacity</li> <li>Coordinated fuel treatments across FPD or other jurisdictional boundaries</li> <li>Standardized tools for communication and outreach around wildfire risk and mitigation</li> </ul>
<b>Interrelationship between CWPPs</b>	<ul style="list-style-type: none"> <li>Provide insights to the County CWPP about local values, capacities, and needs</li> <li>Define where and how County-level programs might be implemented locally</li> <li>Outline specific treatment priorities that will inform annual prioritization for the entire county</li> </ul>	<ul style="list-style-type: none"> <li>Provide context to FPD-level CWPPs about their risk relative to other portions of the county, which can be useful when FPDs apply for grants</li> <li>Provide guidance to FPDs for standardized approaches to hazard mitigation</li> <li>Outline the County's approach to evacuations, which can create consistent messaging in FPD-level CWPPs</li> <li>Outline a process for FPD involvement in fuel treatment prioritization for the entire county</li> <li>(needs refinement) Provide data and risk layers and maps to support future FPD CWPP revisions.</li> </ul>





**Figure 1.** Boundaries of fire protection districts and incorporated areas in Jefferson County, Colorado. Source: Colorado Department of Local Affairs and Jefferson County GIS Open Data.

## ***Wildland-Urban Interface at the County and FPD Levels***

Under the Healthy Forest Restoration Act of 2003, communities can develop their own wildland-urban interface (WUI) definition and map to meet their local conditions and needs in their CWPP. The Jefferson County CWPP delineates the WUI for the purpose of enforcing planning and zoning codes. FPD-level CWPPs in Jefferson County can develop different WUI maps for the purpose of identifying areas of high risk and prioritizing fuel treatments; however, these local WUI maps do not impact where WUI planning and zoning codes apply in Jefferson County.

## ***Plan Units and Regional Action Areas***

CWPPs at the FPD-level organize the community into smaller areas known as plan units, hazard zones, or neighborhoods, depending on the CWPP. Plan units are areas with shared fire risk where residents can organize and support each other to undertake strategic and coordinated action. FPDs can target limited resources at plan units with higher relative risk. Plan units are delineated by CWPP Core Teams based on factors that can include fuel types, topography, neighborhood organization (e.g., homeowners associations), development patterns, roadway networks, and landownership.

Plan units are extremely valuable for inspiring local action in FPDs across Jefferson County. Evergreen, Coal Creek Canyon, Elk Creek, Inter Canyon, North Fork, and Genesee FPDs all have neighborhood ambassador programs organized by CWPP plan unit. Relative risk ratings of plan units can help FPDs target limited resources in the highest-risk parts of their community (**Figure 2**).

The Jefferson County CWPP organizes the community into 98 regional action areas (**Figure 3**). Regional action areas do not follow plan unit boundaries for several important reasons:

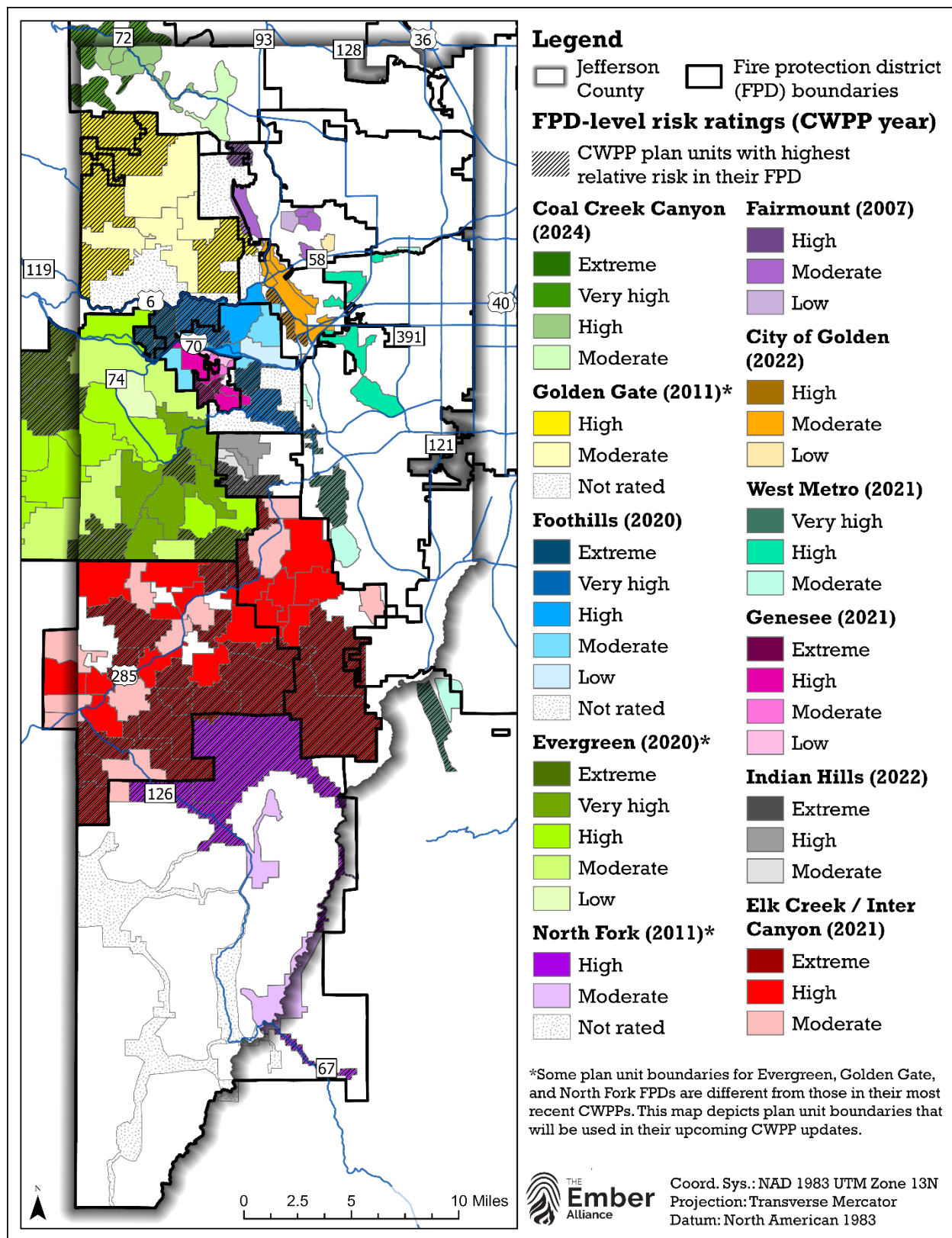
- Relative risk ratings of plan units in FPD-level CWPPs are specific to that FPD and cannot be compared among FPDs. Therefore, relative risk ratings from FPD-level CWPPs cannot be used to compare relative risk across the entire county.
- The methods for delineating plan units are necessarily unique to each FPD because the purpose is to meet their own needs and local context.
- Most plan units stop at the boundaries of FPDs, and the countywide CWPP is an opportunity to assess risk and prioritize action across all jurisdictions. There are portions of Jefferson County that are not a part of any incorporated community or fire protection district; the Jeffco CWPP is the best opportunity to ensure these areas are reviewed for their wildfire risk and included in risk reduction projects.

Jefferson County regional action areas primarily correspond to the boundaries of potential operational delineations (PODs) from the Arapaho-Roosevelt and Pike-San Isabel National Forests. PODs are topographic areas bounded by features suitable for fire control (e.g., ridgetops and roads) that can be used for tactical operations during wildfire events and serve as management units for proactive ecological restoration and wildfire risk mitigation; in other words they are polygons drawn based on existing landscape features that are places that firefighters have a good chance of slowing or stopping a wildfire, if mitigated and used. PODs are collaboratively developed by fire and fuel managers with local, county, state, and federal agencies. Adjustments were made to a handful of POD boundaries to follow potential control lines in closer proximity to the boundary of Jefferson County. The U.S. Forest

Service and its partners have not developed POD boundaries for the eastern portion of Jefferson County, so the CWPP Core Team developed regional action areas that followed the updated WUI boundary and major roadways.

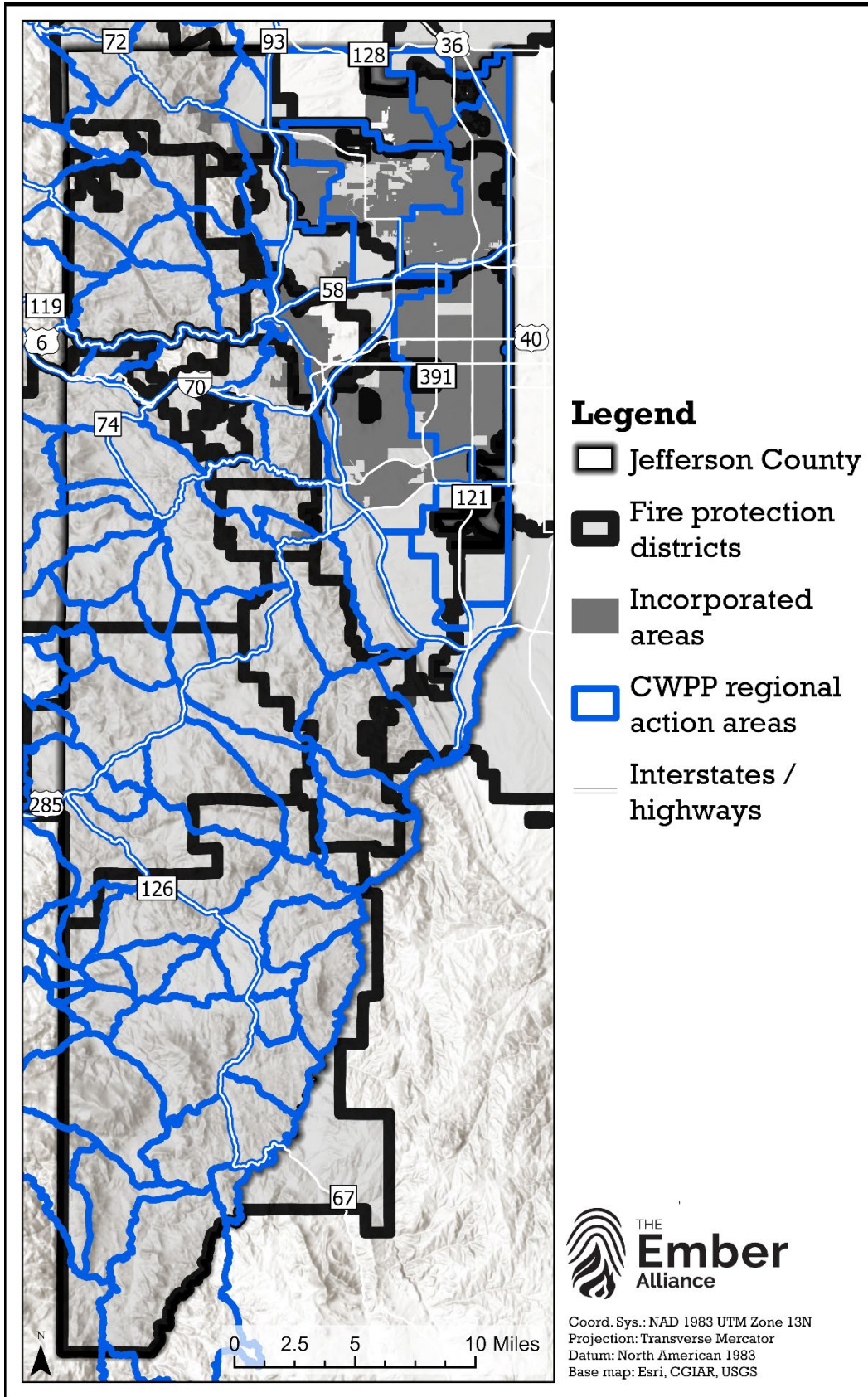
Using PODs as the basis for regional action areas was a strategic decision to align the Jefferson County CWPP with other regional efforts to coordinate wildfire risk mitigation. PODs are an important unit of analysis and implementation for the U.S. Forest Service's [Wildfire Crisis Strategy](#), which was developed to increase the pace and scale of forest health treatments to support wildfire risk mitigation. The Colorado Front Range—which includes Jefferson County—was identified as one of 21 high-priority landscapes in the country. Substantial federal funding, research, and coordination are being focused on this area, so using PODs for the Jefferson County CWPP facilitates the County's involvement in the Front Range Wildfire Crisis Landscape, as well as with ongoing efforts by the Northern Colorado Fireshed and Central Colorado Forest Collaborative.

The Jefferson County CWPP still acknowledges FPD-level plan units because of their importance for local action. FPD-specific relative risk ratings from their CWPPs can also help the County distribute resources across FPDs. Some recommendations in this CWPP encourage the County to work with FPDs to enable action in the highest-risk plan units. Other recommendations in the Jefferson County CWPP are strategically targeted at the highest-risk regional action areas.



**Figure 2.** Plan units for fire protection districts within Jefferson County and relative risk ratings from their most recent CWPPs. Relative risk ratings are specific to each FPD and not suitable for comparing relative risk among FPDs.





**Figure 3.** Regional action areas for the Jefferson County CWPP follow potential operational delineations and the updated Jefferson County WUI, and they span boundary FPDs, which can encourage cross-boundary collaboration.

## Community and Partner Engagement

Collaboration is an essential part of CWPPs. Community engagement, partner commitment, and follow-through are what make a CWPP successful and effective. The Ember Alliance—a Colorado nonprofit dedicated to fire management and community resilience—worked with Jefferson County to write this CWPP as part of the broader TogetherJeffco project. TogetherJeffco is a planning process that updated the County’s Comprehensive Plan (CP), Transportation and Mobility Plan (TMP), Community Wildfire Protection Plan (CWPP), Comprehensive Emergency Management Plan Evacuation Annex (CEMP EA), and development regulations to create a Unified Land Use Code (ULUC) all within the same two-year period. This allowed the exchange of ideas, recommendations, and engagement with partners and the public in an efficient and collaborative process. The Ember Alliance, partner contractors, and representatives from Jefferson County engaged partners from across the County to develop the recommendations set forth in this CWPP. They incorporated lessons learned from challenging recent wildfire seasons in Colorado and considered valuable insights shared by community members and other partners.

Recommendations in this CWPP also consider overlapping and related plans, prioritization processes, and risk assessments in the area. This includes:

- CWPPs for local fire departments and fire protection districts in Jefferson County
- Jefferson County Wildfire Risk Reduction Task Force recommendations
- 2022 Jefferson County Hazard Mitigation Plan
- Community Wildfire Planning Center’s 2024 WUI recommendations for Jefferson County
- 2021 Jefferson County Open Space (JCOS) Forest Health Plan
- Upper South Platte wildfire/watershed assessment
- Denver Water Zones of Concern
- 2020 Colorado State Forest Service (CSFS) Forest Action Plan and Colorado Wildfire Risk Assessment (CO-WRA)
- U.S. Forest Service (USFS) Wildfire Crisis Strategy’s priority landscapes
- USFS Forest 2 Faucets analysis
- 2022 USFS Colorado All-Lands (COAL) wildland fire assessment
- Arapaho-Roosevelt and Pike-San Isabel National Forests’ Potential Operational Delineations (PODs)
- 2022 Colorado Water Conservation Board’s statewide post-wildfire susceptibility analysis
- 2021 Upper Clear Creek Watershed pre-wildfire planning study

The Ember Alliance and Jefferson County would like to thank the following partners for their time and effort in developing, providing data, providing feedback, and planning implementation projects for this CWPP:

- Arapaho-Roosevelt National Forest
- Arvada Water
- Arvada Fire Protection District
- City of Golden Fire Department
- City of Westminster Fire Department
- Coal Creek Fire Protection District

- Colorado Forest Restoration Institute
- Colorado Parks and Wildlife
- Colorado State Forest Service
- Community Wildfire Planning Center
- Denver Mountain Parks
- Denver Water
- Elk Creek Fire Protection District
- Evergreen Fire Protection District
- Fairmont Fire Protection District
- Foothills Fire Protection District
- Genesee Fire Rescue
- Golden Gate Fire Protection District
- Indian Hills Fire Protection District
- Inter Canyon Fire Protection District
- Jefferson Conservation District
- Jefferson County Board of County Commissioners
- Jefferson County Office of Emergency Management
- Jefferson County Open Space
- Jefferson County Planning and Zoning
- Jefferson County Road and Bridge
- Jefferson County Transportation and Engineering
- Jefferson County Wildfire Commission
- Mountain Metro Wildfire Mitigation Council
- North Fork Fire Protection District
- Pike-San Isabel National Forest
- Upper South Platte Partnership
- West Metro Fire Rescue

The Ember Alliance and Jefferson County conducted extensive community and partner engagement to gain a better understanding of the community's current knowledge of wildfires, assess their concerns and needs, and learn about ongoing mitigation work. A summary of public feedback and survey findings are presented in **Appendix C. Summary of Public Feedback**. Engagement for the CWPP included:

- Three resident and community open houses in October 2023, held in tandem with other Together Jeffco planning processes.
- Three resident and community open houses in March 2024, held in tandem with other Together Jeffco planning processes.
- Two online surveys administered as part of the Together Jeffco effort in summer 2023 and winter/spring 2024.
- An online, interactive map available for residents as part of the Together Jeffco effort.
- CWPP/Evacuation Annex (EA) Advisory Committee Meetings
  - June 13, 2023
  - October 25, 2023
  - April 24, 2024
  - May 22, 2024
  - May 28, 2024
  - June 4, 2024
- List of Board of County Commissioners meetings
  - August 1, 2023
  - November 7, 2023
  - February 6, 2024
  - May 7, 2024
  - August 6, 2024
  - October 2024
- List of other major partner meetings.
  - Wildfire Commission, August 3, 2023
  - Wildfire Commission, November 2, 2023
  - Wildfire Commission, February 8, 2024
  - Jeffco Planning Commission February 14, 2024



- Wildfire Commission, June 13, 2024
- Together Jeffco Partner Roundtables Session
  - Together Jeffco Partner Roundtable Session June 20-21, 2023
  - Together Jeffco Partner Roundtable Session June 25, 2024



Jefferson County staff and fire protection district staff meet outside near an open space. Photo credit: The Ember Alliance.



# JEFFERSON COUNTY: BACKGROUND

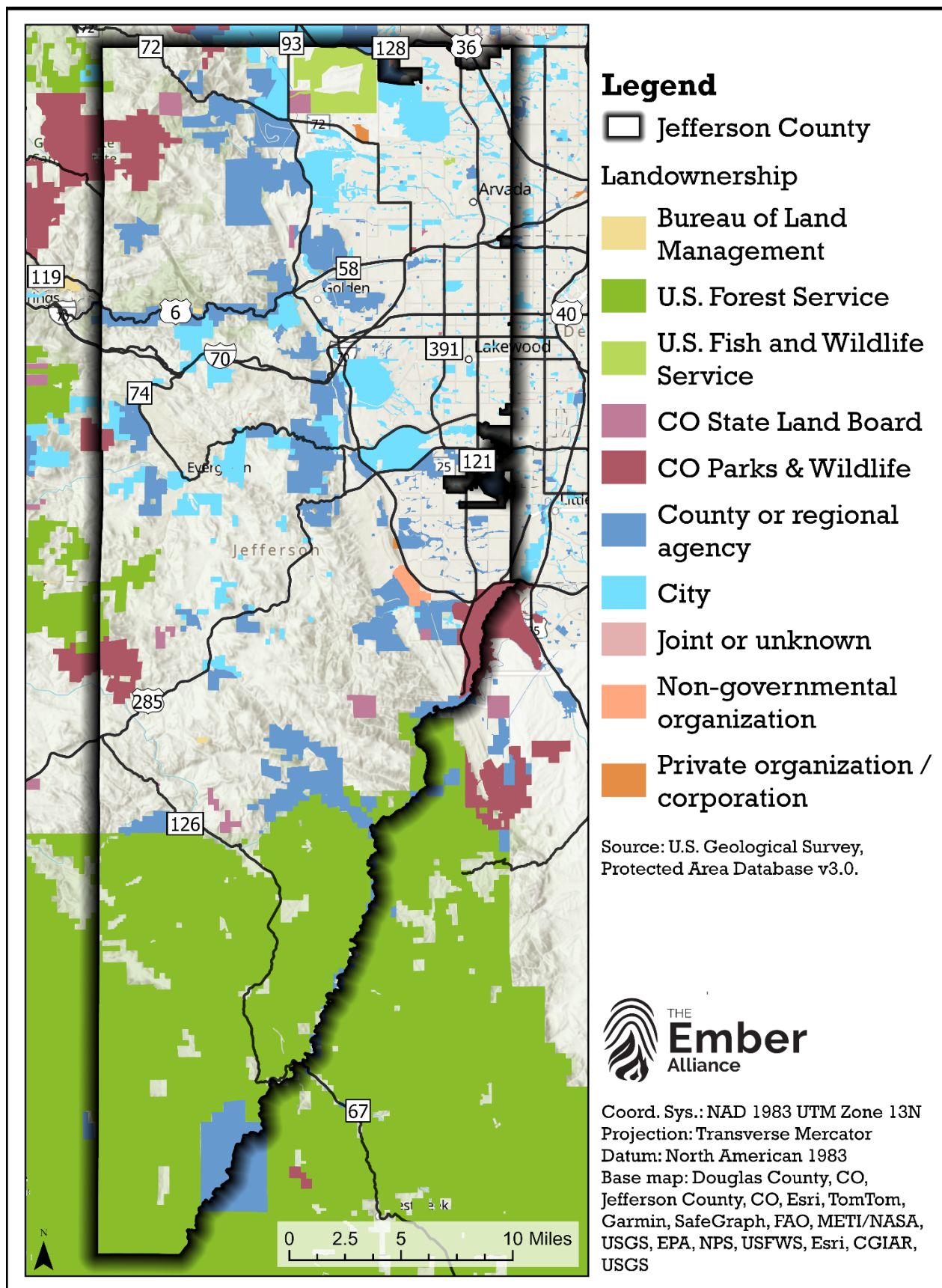
## General Description

Jefferson County covers 773 square miles of the Front Range foothills, nestled between the capital city of Denver to the east and the mountain town of Idaho Springs to the west. It runs from the Rocky Flats Wildlife Refuge to the north down to Cheeseman Reservoir in the south. This area is the ancestral lands of hinono'eino' biito'owu' (Arapaho), Očhéthi Šakówinj, Núu-agma-tuvu-pu (Ute), and Tsésthó'e (Cheyenne).

It is the fourth most populated county in the state with 579,654 residents as of 2021, and the County hosts many tourists and visitors all year long. As of 2022, 18% of residents are over the age of 65, and 18% are under the age of 18. 11% of residents have a disability, 7.3% of residents live below the poverty line, and 29% of residents rent the place they live. Approximately 0.5% of residents have no telephone service available at their home, 6% have no broadband internet, and 4.5% have no computer in their home (U.S. Census Bureau, 2022). To view updated demographics, visit [Jefferson County's Demographics website](#).

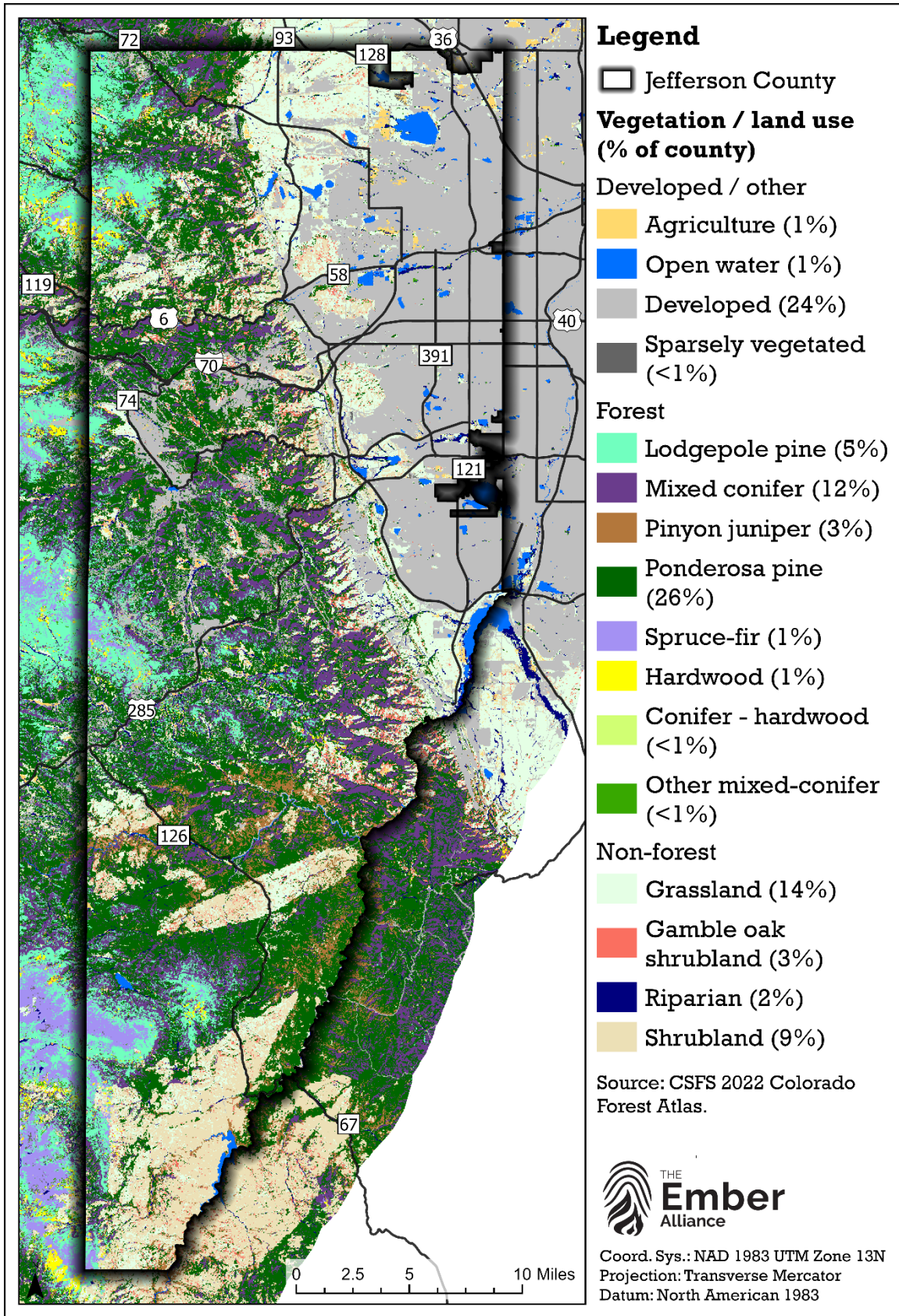
Approximately 40% of Jefferson County land is publicly managed land (**Figure 4**). Jefferson County is home to many popular parks and open spaces, including the Rocky Flats and Two Ponds National Wildlife Refuges, Red Rocks Park and Amphitheater, portions of Golden Gate Canyon, Staunton, and Chatfield State Parks, and portions of the Arapaho-Roosevelt and the Pike-San Isabel National Forests. Jefferson County Open Space manages 57,000 acres of preserved land, with 27 parks and 269+miles of trails open to the public. Denver Mountain Parks manages 9,790 acres of preserved land across 35 properties in Jefferson County.

Vegetation varies vastly across Jefferson County, from primarily grasslands at lower elevations to dense lodgepole pine forests at higher elevations in the west. Almost half of the county is forested, a quarter is developed, about 15% is grassland, and 12% is shrubland (**Figure 5**). The most abundant forest types are ponderosa pine, mixed conifer, and lodgepole pine. The variation in vegetation equates to highly variable fuel conditions across Jefferson County (**Figure 6**), and in combination with complex topography and variable wind and fire weather, this can result in highly diverse fire behavior.



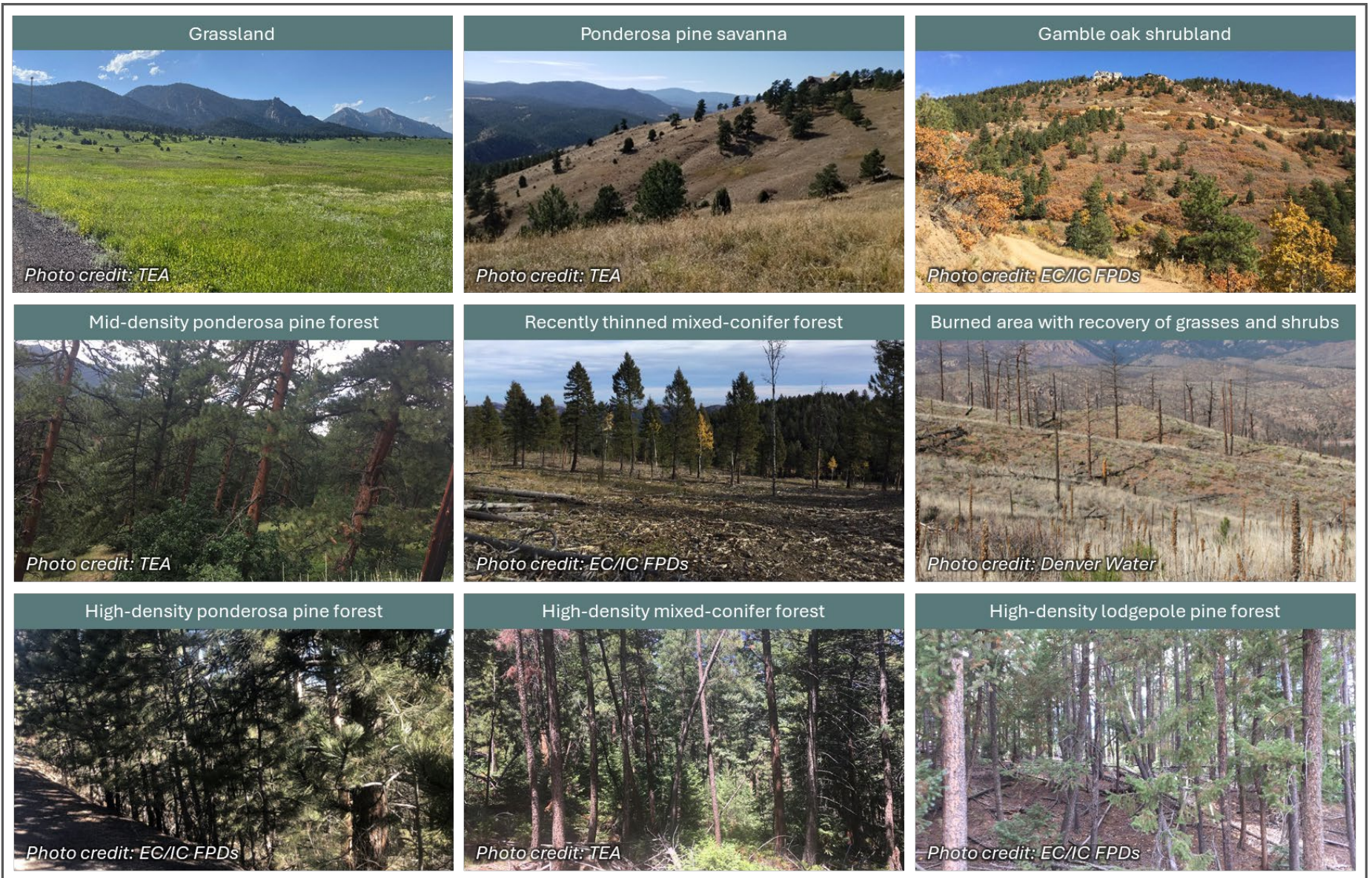
**Figure 4.** Publicly owned land across Jefferson County. Source: U.S. Geological Survey, Protected Areas Database of the United States.





**Figure 5.** Map of vegetation types across Jefferson County. Almost half of the County is forested, a quarter is developed, about 15% is grassland, and 12% is shrubland Source: Colorado State Forest Service, [Colorado Forest Atlas](#).





**Figure 6.** Vegetation types and fuel loads are highly variable across Jefferson County, ranging from grasslands and agricultural lands with scattered trees to open forests with moderately spaced trees and few ladder fuels to dense forests with abundant ladder fuels. Fuel type and fuel loads greatly influence fire behavior, intensity, and rate of spread. All photographs were taken in Jefferson County.



# Wildfire History in Jefferson County

## Wildfires Prior to Euro-American Colonization

Wildfires and cultural burning heavily influenced Colorado's Front Range before the era of fire suppression. Many Indigenous peoples utilized fire to steward the land, including the Cheyenne and Ute First Nations who hold much of the Colorado Front Range as their ancestral land (Wright, 2016). Frequent, low-severity fires were common in grasslands, shrublands, ponderosa pine and dry mixed-conifer forests before European settlement in the 1850's. Other forest types, particularly lodgepole pine and subalpine forests at higher elevations, experienced infrequent but high-severity wildfires. Some plant species have evolved adaptations to wildfire. Examples of these adaptations include the heat from wildfires opening the cones of lodgepole pine or the mortality of Gambel oak and aspen due to wildfire triggering healthy resprouting. 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). The following infographics from the Colorado Forest Restoration Institute depict variation in fire behavior and recovery in forests of the Colorado Front Range.

### 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.



# 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.



*Historical Fire Regime*



*Recent Fire Regime Trend*



# Lodgepole pine

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

**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.



*Fire Behavior*



*After Fire*



## Subalpine forests

**Species:** Subalpine fir and Engelmann spruce with occasional blue spruce, aspen, and lodgepole, limber, and bristlecone pine

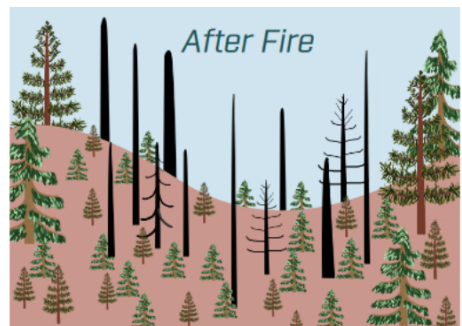
**Typical elevation:** 9,000-11,000 ft

**Fire return interval:** 100 to 600 years (infrequent)

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

Subalpine forests are the wettest and densest forests in Colorado. When extended dry conditions occur in these forests, dead trees and other fuels that have accumulated over long periods of time dry out, creating conditions ripe for fire. Fires are infrequent, stand-replacing, and often synchronous across the region tied to widespread drought.

More research is needed to understand forest recovery following the combination of drought, climate change, spruce beetle mortality, and recent wildfires.



## Sprouting species - Aspen and Gambel oak

**Species:** Aspen occur in pure stands of aspen or in forests with ponderosa pine, lodgepole pine, blue spruce, and other conifers

Gambel oak occur in pure stands of oak or as components of mixed conifer forests and montane shrublands

**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 recover quickly via sprouting. This sun-loving species experiences reduced competition from conifers after fire, further creating opportunities for aspen stands to expand.

Gambel oak have low resistance and high resilience to fire. They can be a heavy and continuous fuel source that contributes to fast-moving and intense wildfires. They are readily killed by fire but recover quickly via sprouting. Their acorns provide an important food source for wildlife.





## **Wildfires in the 20<sup>th</sup> and 21<sup>st</sup> Centuries**

Wildfire behavior in many ecosystems along the Colorado Front Range is vastly different today than it was over a century ago. As the initial ranching and logging activities of Euro-American settlers subsided in the region and government-mandated fire suppression began in the late 1800's, forests began to fill in with trees (**Figure 7**) (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 (Battaglia et al., 2018). Although many residents consider dense forest as “natural,” these conditions are vastly different from the fire-resilient ecosystems that existed before.

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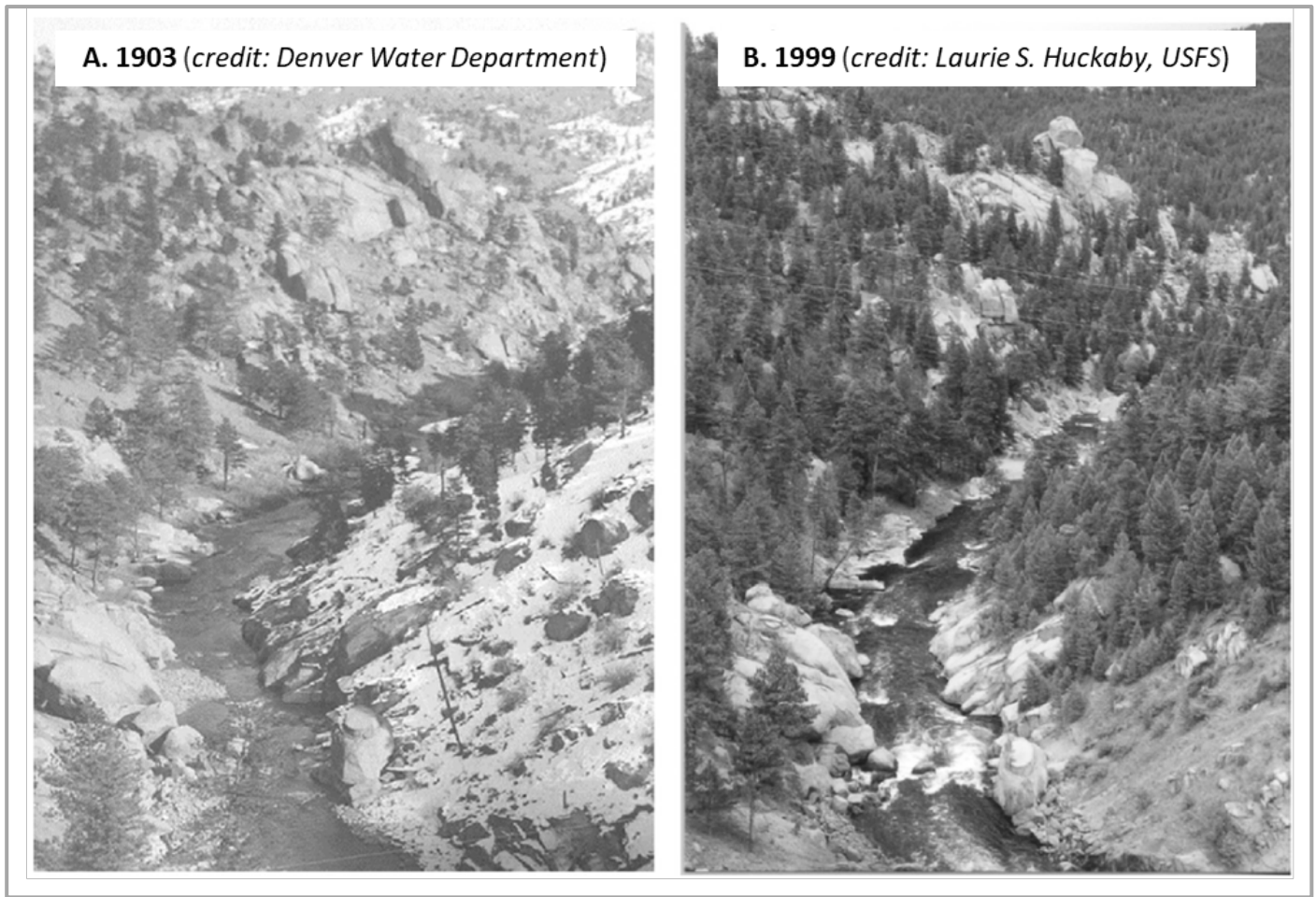
*“We’ve come to realize that fire doesn’t have a “season” in Colorado. Our weather patterns combined with persistent drought and dry fuels (vegetation) are why. In West Metro’s district, much of the vegetation is grass and small plants, what firefighters refer to as light or “flashy” fuels. They’re much more receptive to fire, burn faster, and are harder to contain. That’s why we have so many days of high, very high or even extreme fire danger.” –West Metro Fire Rescue post on Instagram on May 8, 2024*

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 (Caton et al., 2016; Haas et al., 2015). Climate change is making high-severity wildfires more frequent, intense, and larger in extent, and the concept of a “fire season” has morphed into the reality of year-round fire risk (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).

Jefferson County has experienced several significant wildfires in the past several decades. From 1970-2023, 15% of the county (75,125 acres) burned at least once during a wildfire (**Figure 8**). The largest wildfire in Jefferson County was the 2002 Hayman Fire, which was also the largest wildfire in Colorado’s recorded history until surpassed by three larger fires in 2020. The Hayman Fire impacted over 138,000 acres, claimed six lives, destroyed 600 structures, resulted in \$42 million of residential damages, and small businesses nearby lost 50% of revenue that summer due to public land closures and fire impacts (“Case Study,” n.d.; Graham, 2003). The Hayman and Buffalo Creek fires required \$27 million in drinking water infrastructure remediation and water quality treatment. The 2020 Cameron Peak Fire, 2020 East Troublesome Fire, and 2021 Marshall Fire occurred in similar fuel types and wildland-urban interface environments to those found in Jefferson County. The Cameron Peak Fire destroyed 469 homes and structures, and the 2021 Marshall Fire destroyed over 1,000 structures.

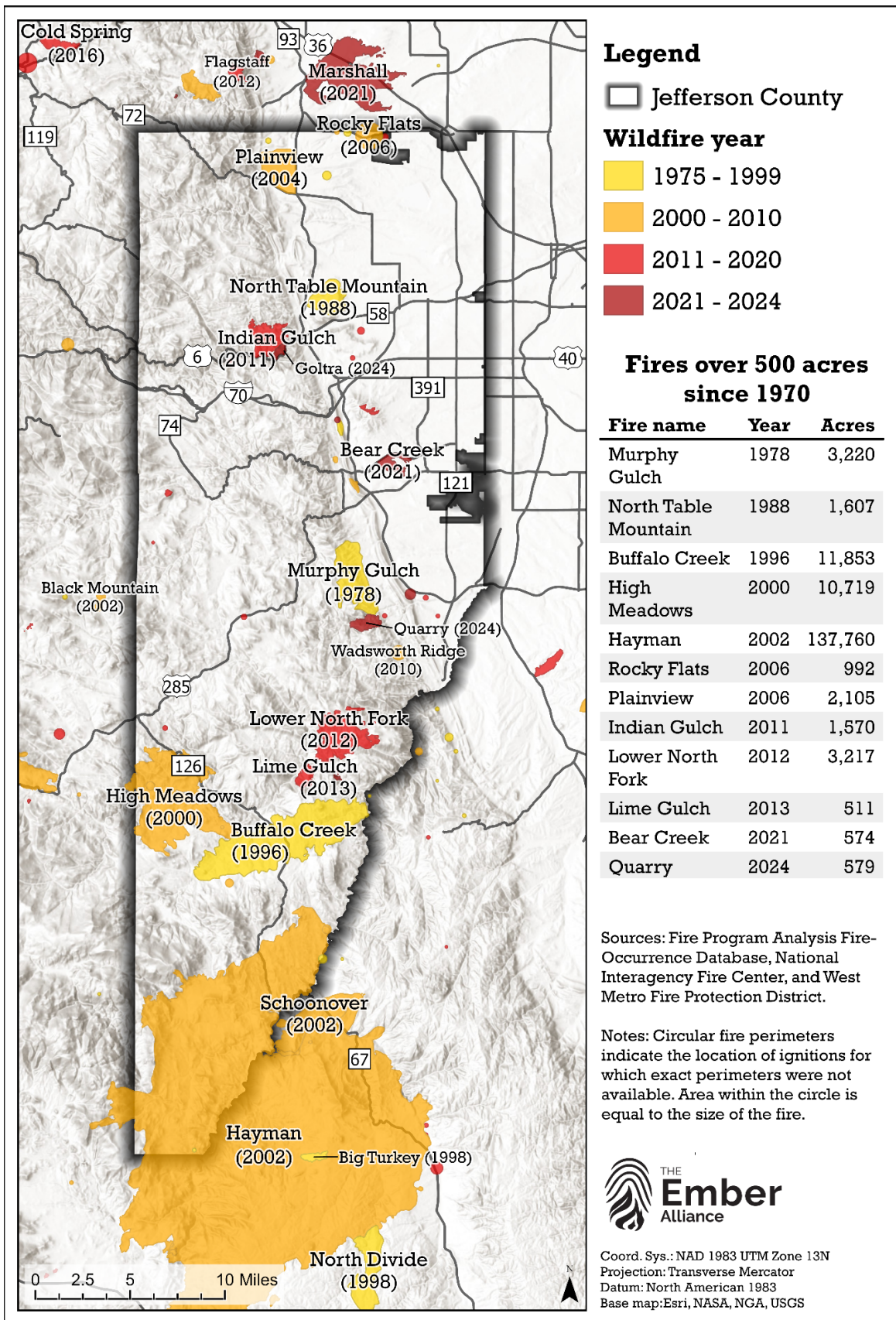
Other major fires in Jefferson County since 2000 include the 2024 Quarry Fire, 2012 Lower North Fork, 2011 Indian Gulch, and 2000 High Meadows fires. Wildland firefighters suppress a vast majority of ignitions in Jefferson County before they exceed 0.25 acres in size, but fires can escape the initial capacity of firefighters under hot, dry, and windy conditions. Human-caused ignitions predominate in

Jefferson County, with the most human- and lightning-caused ignitions occurring in June and July (Figure 9).



**Figure 7.** Tree densities in many ponderosa pine and mixed-conifer forests are higher today than they were historically in part due to fire suppression, as demonstrated by these paired photographs along the South Platte River on the Pike National Forest, Colorado. Source: (Battaglia et al., 2018).





**Figure 8.** Wildfire history in Jefferson County since 1970. Sources: Fire Program Analysis Fire-Occurrence Database, National Interagency Fire Center, and West Metro Fire Protection District.

# WILDFIRE IGNITIONS IN JEFFERSON COUNTY

## FIRE IGNITIONS

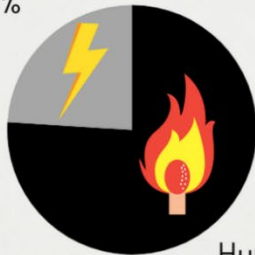
Fire management agencies reported 1,575 ignitions in Jefferson County between 2000-2020 (average of 75/year) that could have spread through wildland vegetation and/or adjacent neighborhoods.\*



87% of ignitions were quickly extinguished at <0.25 acres

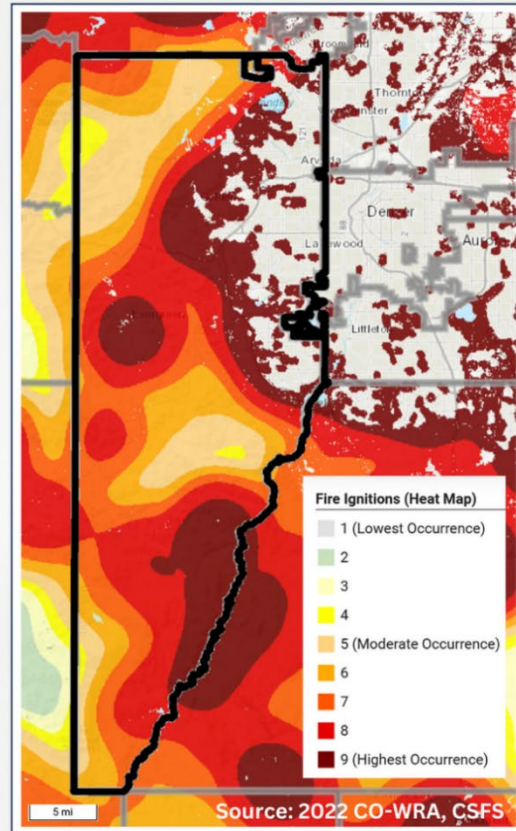
## IGNITION CAUSES

Lightning  
24%

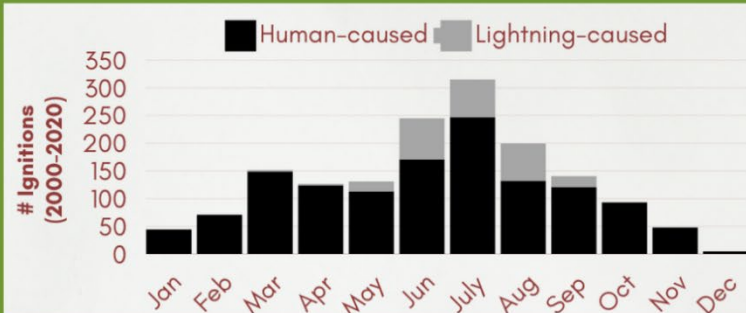


Human activities were the primary cause of ignitions, such as accidental ignitions from vehicles, equipment, and campfires.

## IGNITION HOT SPOTS



Most ignitions occur along the Front Range and in recreation areas, such as Elephant Butte and on the Pike National Forest along CO Hwy 67.



\*Note: Ignition locations from the Fire Program Analysis fire-occurrence database, 6th edition (Short, 2022) were filtered to include only those between 2000-2020 in burnable areas per the 2022 Colorado Wildfire Risk Assessment (CO-WRA).



**Figure 9.** Historic wildfire ignitions (2000-2020) in Jefferson County. Understanding when, why, and where ignitions occur can inform fire prevention campaigns and planning for firefighter staffing and equipment needs. Sources: (CSFS and Technosylva, 2023a; Short, 2022). Infographic by The Ember Alliance.



## Wildland-Urban Interface

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*Defining and mapping the wildland-urban interface (WUI) is a critical component of Community Wildfire Protection Plans (CWPPs) and has implications for building code, planning, and zoning, qualification for grant funding, fuel treatment prioritization, environmental analysis requirements on federal land, and pre-planning by wildland firefighters.*

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).

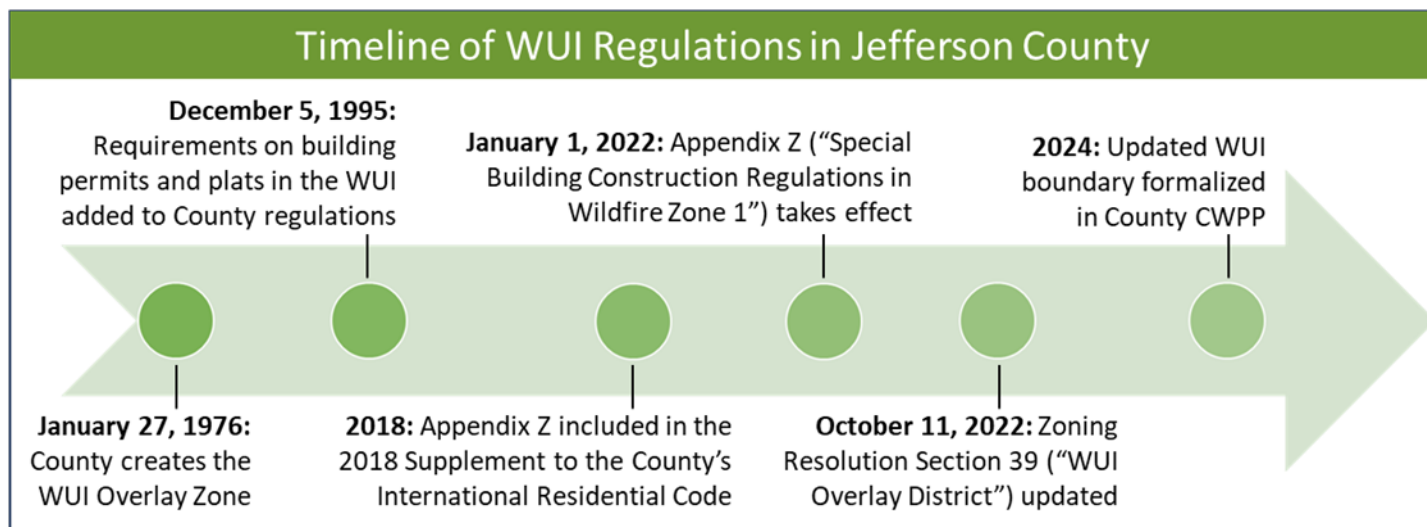
The WUI is any area where the built environment meets wildfire-prone areas—places where wildland fire can move between natural vegetation and the built environment and result in negative impacts on the community (Mowry and Johnston, 2018). The built environment includes homes, businesses, infrastructure,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

Demarcating the WUI is vital for conducting wildfire risk assessments, prioritizing mitigation work, directing grant funding to at-risk areas, developing policies for zoning and building codes, and planning future growth in a way that promotes fire resilience. The Healthy Forest Restoration Act of 2003 allows for expedited environmental review for vegetation management in WUI areas to protect communities from wildfire (*Healthy Forest Restoration Act*, 2003).

There is no single, “true” WUI area. Mapping the WUI requires decisions about how to characterize human habitation and infrastructure, wildland vegetation, and proximity of vegetation to highly valued resources and assets (Johnston, 2018). WUI mapping should be guided by research on wildland fires in the WUI, context-specific purposes for mapping the WUI, and data availability (Bar-Massada, 2021; Stewart et al., 2009). Under the Healthy Forest Restoration Act of 2003, communities can develop their own wildland-urban interface (WUI) definition and map to meet their local conditions and needs in their CWPP. The Jefferson County CWPP delineates the WUI for the purpose of enforcing planning and zoning codes. FPD-level CWPPs in Jefferson County can develop different WUI maps for the purpose of identifying areas of high risk and prioritizing fuel treatments; however, these local WUI maps do not impact where WUI planning and zoning codes apply in Jefferson County.

The purposes of WUI demarcation for the Jefferson County CWPP are to (1) guide implementation of zoning and building codes to reduce the ignitability of structures, (2) prioritize fuel treatments to protect lives, property, infrastructure, and resources, (3) identify areas eligible for WUI-specific grant funding, and (4) fulfill CWPP requirements set forth by the Colorado State Forest Service. The WUI definition in Jefferson County has had implications for zoning and building regulations since 1995.

The previous WUI map for Jefferson County was developed in 1976 (**Figure 10**), and a key component of the 2024 CWPP was updating the County’s WUI map. The previous WUI map for Jefferson County was inadequate because it excluded non-forested areas that could transmit wildfires into the built environment. Wildfires in grasslands and shrublands destroy more homes in the WUI than wildfires in forests across the United States (Radeloff et al., 2023b). The 2021 Marshall Fire demonstrates that wildfires can burn through grasslands and into the built environment, morphing into an urban conflagration with uncontrollable structure-to-structure ignitions (Giammanco et al., 2023).



**Figure 10.** Timeline of WUI regulations in Jefferson County. The Jefferson County website provides information on [Appendix Z](#) and [Section 39](#).

The updated WUI map for Jefferson County expands upon previous approaches for delineating the WUI by incorporating recent research on structure loss during WUI fires and on-the-ground experiences of Fire Chiefs and wildland mitigation specialists in Jefferson County (**Table 2**; see detailed methodology in **Appendix A. Wildland-Urban Interface Methodology**). The WUI map was reviewed by the CWPP Core Team, CWPP / Evacuation Annex Advisory Committee, Mountain Metro Wildfire Mitigation Council, Jefferson County Emergency Managers, Fire Marshals, Fire Chiefs, and the Community Wildfire Planning Center (CWPC), the Board of County Commissioners, and numerous Jefferson County departments and divisions.

The updated WUI map for Jefferson County encompasses 91% of the land area and 53% of structures in the County (**Figure 11**). WUI areas are highly variable in the County and exist along a continuum of wildland to urban densities (**Figure 12**). There is the potential for fires to transition from vegetation into neighborhoods, from home to home, and from homes to vegetation in all these WUI areas.

Jefferson County WUI includes undeveloped areas that could become developed in the future, as well as protected areas that are vital for human habitation due to their provisioning of clean surface drinking water. Protecting watersheds from severe wildfire is vital to residents in the WUI and beyond.

Jefferson County WUI is subdivided into three types: predominately intermix, predominately interface perimeter, and predominately interface interior. WUI types were determined following methodology

from the National Institute of Science and Technology that incorporates structure separation distance (Maranghides et al., 2022).

- WUI intermix refers to places where the built environment intermingles with wildland vegetation and where homes are primarily exposed to embers and radiant and convective heat from burning vegetation.
- WUI interface perimeter falls adjacent to wildland vegetation where homes can be exposed to embers and radiant and convective heat from burning vegetation and adjacent homes. These areas have the potential for wildland fires to transition into urban conflagrations.
- WUI interface interior is farther away from wildland vegetation where homes are primarily exposed to radiant heat and embers from adjacent homes as well as embers from burning vegetation. These areas have the potential for urban conflagrations.

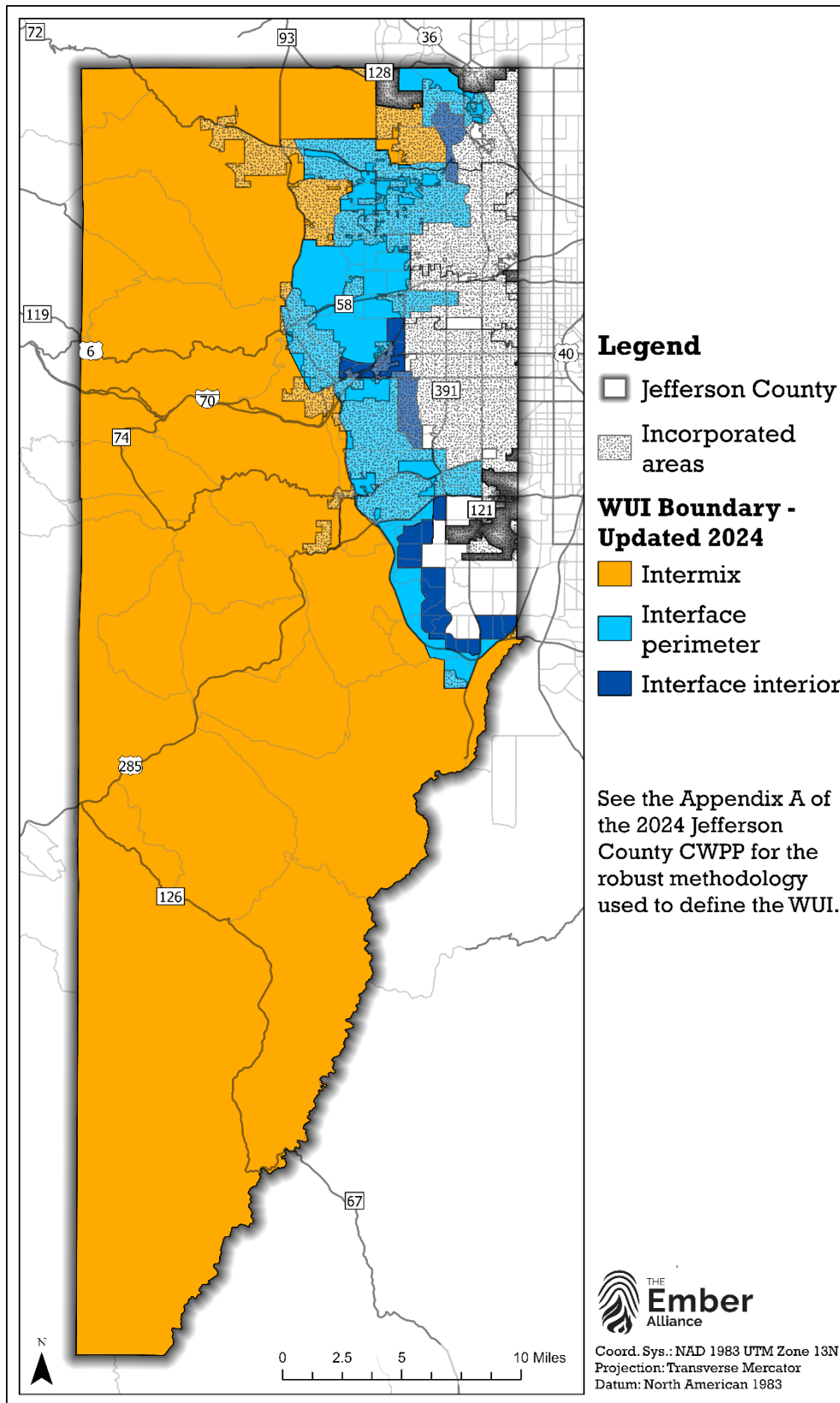
Recommendations for specific WUI regulations in this CWPP and the CWPC report are stratified by WUI type due to differences in the potential for structure-to-structure ignitions and the potential effectiveness of structure hardening and mitigating hazards around structures. The WUI types will require different mitigation approaches, requirements for building material and mitigating hazards around structures, and public messaging from the County.

In low- and moderate-density neighborhoods, structure hardening and removal of flammable material 0-5 feet from the structure can greatly reduce the likelihood of ignition. In high-density neighborhoods, the likelihood of structure ignition from nearby structures is only reduced if structure hardening is practiced by nearly all property owners (Maranghides et al., 2022). Mitigation actions in interface WUI, especially in perimeter interface, can decrease the chances of a wildland fire becoming an urban conflagration (Giammanco et al., 2023). Greater structure separation distance in the interface and intermix can create a more fire resilient community by reducing the potential for home-to-home ignitions. (Giammanco et al., 2023).



Table 2. Approach used to delineate the WUI for the updated CWPP in Jefferson County. See Appendix A. Wildland-Urban Interface Methodology for details.

Component of WUI definition	Approach for Jefferson County CWPP
Human habitation and infrastructure	<p>Include all land as potential candidates for WUI regardless of current housing density due to the potential for future development and/or high to very high importance for surface drinking water.</p>
Wildland vegetation	<p>Include vegetation that could burn with moderate to high fire intensity according to the 2022 Colorado Wildfire Risk Assessment (CO-WRA) and that occur in:</p> <ol style="list-style-type: none"> <li>1. Large patches of vegetation at least 5 km<sup>2</sup> (1,236 acres) in size, or</li> <li>2. Occluded patches of vegetation between 0.7 km<sup>2</sup> (175 acres) and 5 km<sup>2</sup> in size and that contain at least 0.3 km<sup>2</sup> (75 acres) of vegetation capable of burning with moderate to high fire intensity.</li> </ol> <p>Exclude agriculture and golf courses unless there was a potential for moderate to high fire intensity according to the 2022 CO-WRA.</p>
Buffer distance	<p>Buffer vegetation that could burn with moderate to high fire intensity in large patches of vegetation by 1,625 meters (about 1.0 mile).</p> <p>Buffer vegetation that could burn with moderate to high fire intensity in occluded patches of vegetation by 400 meters (about 0.25 miles).</p> <p>Modify the eastern boundary of the WUI to follow roadways or the edges of subdivisions to assist the County with enforcement of zoning and building codes. Roadways can slow the spread of fire and assist with fire suppression, making them meaningful WUI boundaries.</p> <p>Extend the eastern boundary of the WUI along Clear Creek to encompass the WUI as defined by the 2021 West Metro CWPP for consistency.</p>



**Figure 11.** The updated WUI map for Jefferson County encompasses 91% of the land area and 53% of structures in the County, all of which are exposed to elevated wildfire risk. See **Appendix A. Wildland-Urban Interface Methodology** for the robust methodology used to define the WUI.

Coal Creek Canyon FPD



City of Westminster



Genesee FPD



City of Golden



Elk Creek FPD



Indian Hills FPD



Evergreen FPD



West Metro FPD



Figure 12. Examples of diverse WUI conditions across Jefferson County in terms of development patterns, home densities, and the types and extent of interspersed and/or adjacent vegetation. There is the potential for fires to transition from vegetation into neighborhoods, from home to home, and from homes to vegetation in all these WUI areas, Photos taken by The Ember Alliance except where indicated.



## 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 on properties with abundant hazards around structures and with inadequate 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).

Do not count on firefighters staying to defend homes or other structures—structures should be able to stand strong on their own during a wildfire. There are never enough firefighters to stay and defend every single home during large incidents. The section titled **Mitigate the Structure 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.



Homes that survived wildfire due to a combination of structure hardening practices, structure ignition zone mitigation, and the actions of firefighters. Photo credit: Michael Rieger/FEMA.



## Wildfire Risk Assessment

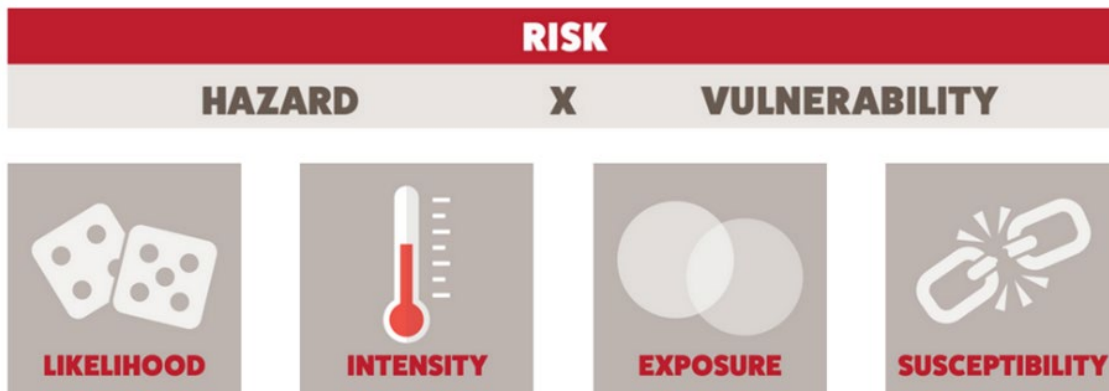
Jefferson County has some of the highest wildfire risk in the state of Colorado, and extreme fire behavior could threaten critical infrastructures, homes, and the lives of residents, visitors, and firefighters. There is an immediate need for many communities in Jefferson County to undertake proactive measures and mitigate wildfire risk to protect lives and property.

According to the 2024 Wildfire Risk to Communities, an analysis by the U.S. Forest Service, Jefferson County has the second highest wildfire risk of all counties in Colorado and greater risk to wildfire than 98% of counties in the United States (Scott et al., 2024). The Colorado Front Range—which includes Jefferson County—was identified as one of 21 high-priority landscapes for the U.S. Forest Service’s Wildfire Crisis Strategy due to high fire risk and the abundance of highly valued resources & assets (HVRAs) along the Colorado Front Range.

A comprehensive and high-quality wildfire risk assessment is a key component of a CWPP to (1) communicate a realistic sense of urgency to residents, land managers, local and county-level agencies, and other partners and (2) feed into strategic prioritization of fuel treatments and other actions to mitigate wildfire risk and increase emergency preparedness. The assessment for the Jefferson County CWPP incorporates findings from five existing analyses that evaluate different components of risk: the 2022 Colorado Wildfire Risk Assessment (2022 CO-WRA) from the CSFS, the 2021 Jefferson County Open Space Forest Health Plan, the 2022 USFS Colorado All-Lands (COAL) assessment, the USFS Forest 2 Faucets Assessment, and the 2022 Colorado Water Conservation Board’s statewide post-wildfire susceptibility analysis. Additional analyses were also conducted specifically for the Jefferson County CWPP to supplement these other assessments. See **Appendix B. Risk Assessment Methodology** for descriptions of these different assessments.

### Components of Wildfire Risk

Wildfire risk is composed of hazard (likelihood of wildfire and potential intensity of wildfire) and vulnerability (exposure of highly valued resources and their susceptibility to damage). The Jefferson County CWPP utilizes the best available wildfire risk assessments to explore the likelihood of wildfire, potential intensity of wildfire, exposure of highly valued resources, and susceptibility to damage.



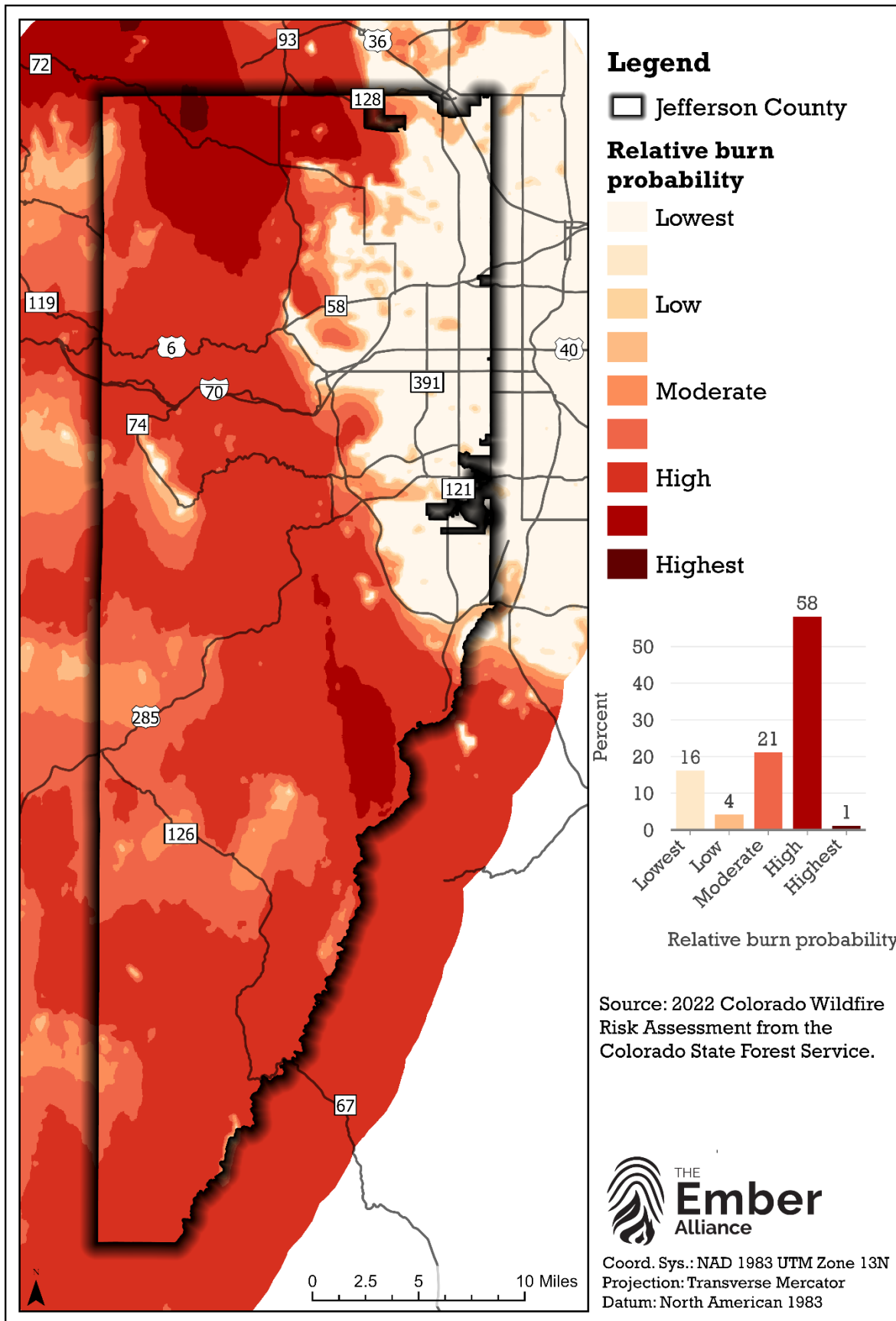
Components of wildfire risk as described by the US Forest Service. Source: USFS Wildfire Risk to Homes.

## ***Likelihood of Wildfires***

Burn probability is the annual probability of any location burning due to a wildfire. The 2022 CO-WRA presents burn probability relative to the entire state, ranging from lowest values in the state to highest in the state. Almost 60% of Jefferson County falls into the high to highest relative burn probability categories (**Figure 13**).

The highest relative burn probabilities in Jefferson County occur in the northern part of the county in Coal Creek Canyon and Golden Gate Fire Protection Districts where there is the potential for rapid rates of fire spread across steep, complex terrain covered in grasslands, shrublands, and forests with low to moderate tree densities and abundant understory vegetation. Rocky Flats National Wildlife Refuge also has elevated relative burn probabilities because large grasslands in the area could experience rapid rates of spread (**Appendix B, Figure B.3**). Elevated burn probabilities also occur in the steep slopes and complex terrain between Sheep Mountain and the town of Phillipsburg in the North Fork Fire Protection District in the southeastern portion of the County. This part of the County also has a higher density of historic ignitions (**Figure 9**), which was a factor used for determining burn probabilities for the 2022 CO-WRA.

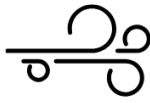
Another metric of the likelihood of wildfires is the frequency of days with weather conducive to large-scale fire growth. Days with red flag warnings indicate severe fire weather and require extra vigilance by fire departments and residents. Hot, dry, and windy conditions on red flag days can lead to exceptionally fast fire growth and high fire intensity that exceeds the ability of firefighters to quickly suppress the blaze. The occurrence of red flag warnings is highly variable from year to year due to regional weather patterns and weather anomalies such as El Niño and La Niña. On average, Jefferson County experiences 15 days/year with weather conditions that qualify as red flag warnings, ranging from 0 to 31 between 2006 and 2023 (**Figure 14**). Climate change will further increase the number of days with very high fire weather danger, potentially by 11 days/year based on predictions of future vapor pressure deficit from the [Climate Toolbox's Future Climate Scatter](#) and research by (Seager et al., 2015).



**Figure 13.** Almost 60% of Jefferson County falls into the high to highest relative burn probability categories under high to extreme weather conditions. Source: 2022 CO-WRA.



# FIRE DANGER IN JEFFERSON COUNTY



During red flag warnings, all residents need to follow fire restrictions from Jefferson County Sheriff's Office and be prepared in the case of a wildfire.



## RED FLAG CRITERIA

Red flag days are warnings issued by the National Weather Service 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.

Jefferson County falls within the Denver/Boulder Forecast Office, which has two options for red flag criteria:

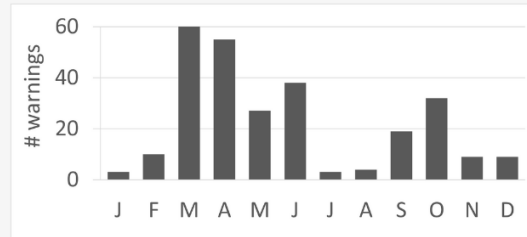
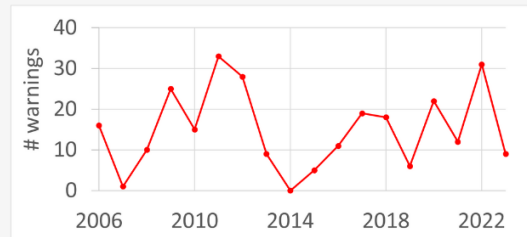
Option 1	Option 2
Relative humidity $\leq$ 15%	Widely scattered dry thunderstorms
Wind gusts $\geq$ 25 mph	Dry fuels
Dry fuels	

### Many large wildfires in Jefferson County occurred during red flag warnings:

2000 High Meadows	2011 Indian Gulch
2002 Hayman	2012 Lower North Fork
2006 Rocky Flats	2021 Bear Creek

## WARNINGS FROM 2006-2023

The National Weather Service issued on average 15 red flag warnings/year for the fire weather zones that intersect Jefferson County, with as many as 33 in 2011. Red flag conditions most often occurred in March, April, and June.



## CLIMATE CHANGE MEANS MORE FIRE DANGER AHEAD



Hotter and dryer conditions due to climate change could result in **11 more days/year** with very high fire weather danger in Jefferson County.



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. See restricted activities and sign up for alerts through the Jefferson County Sheriff's Office.

<https://www.jeffco.us/511/Fire-Restrictions-Bans>



Sources: Historic red flag warnings for from Iowa Environmental Mesonet at Iowa State University. Future fire danger from <https://climatetoolbox.org>.

Figure 14. Many of the large wildfires in Jefferson County have occurred on days that have high fire weather danger, and climate change will further increase the number of days with high fire weather danger. Sources: Iowa State University, [Iowa Environmental Mesonet](https://www.iowaenviro.org/) and the [Climate Toolbox's Future Climate Scatter](https://climatetoolbox.org/). Infographic by The Ember Alliance.

### ***Potential Wildfire Intensity***

Steep topography, dense fuels, and the potential for hot, dry, and windy conditions combine to create a potential for an elevated fire intensity scale across a vast majority of Jefferson County (**Figure 15**). The 2022 Colorado Wildfire Risk Assessment (2022 CO-WRA) from the Colorado State Forest Service predicts that almost 90% of Jefferson County can experience moderate or high fire intensity scales, which are associated with the potential for harm or damage to life and property (**Table 3**).

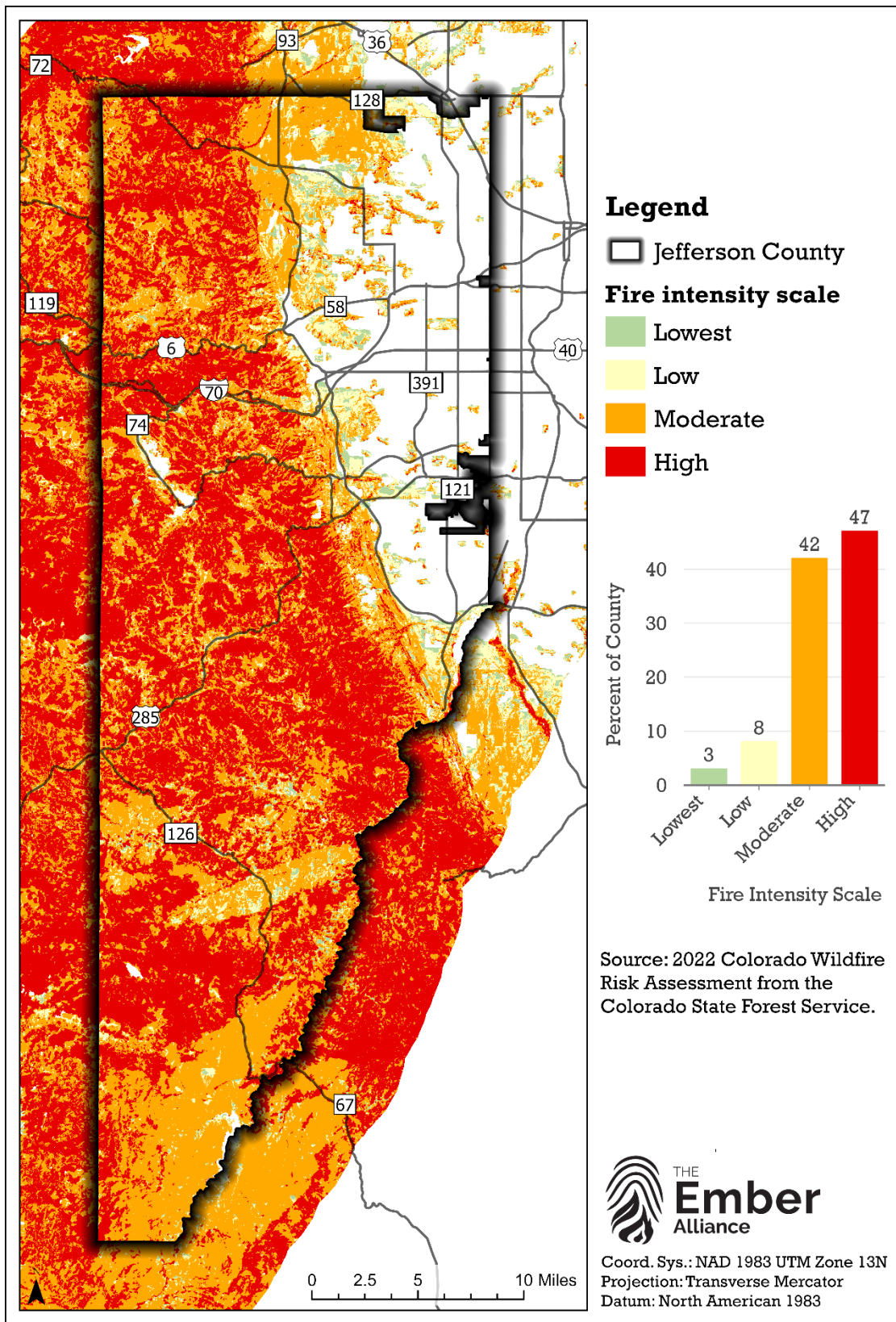
High fire intensity scales are prevalent in forested areas in the western portion of Jefferson County. However, fires with significant potential for harm or damage to life and property are not limited to dense forests. High fire intensity is possible on steep slopes with shrubs and widely spaced trees on the hogback ridges west of C-470 and in dense vegetation along the South Platte River south of Chatfield Lake.

Moderate fire intensity scales also pose a potential for harm or damage to life and property, and these conditions occur in many non-forested areas of Jefferson County. Notable areas of moderate fire intensity scales include burned areas from the 2002 Hayman Fire and the 1996 Buffalo Creek Fire in the southern portion of Jefferson County, which are still mostly unforested.

Large swaths of grasslands and shrublands along the Front Range could also experience fast-moving wildfires with moderate fire intensity scales. The 2021 Marshall Fire, which claimed the lives of two residents, destroyed over 1,000 homes (Holstrom et al., 2023), and burned 6,080 acres just north of Jefferson County in grasslands and wildland-urban interface that are similar to conditions along the foothills in Jefferson County.



The Elephant Butte Fire in July 2020 burned dense forest on steep slopes outside of Evergreen in Jefferson County. Photo Credit: Jason Hamburg, Jefferson County Open Space.



**Figure 15.** Steep topography, dense fuels, and the potential for hot, dry, and windy conditions combine to create a potential for an elevated fire intensity scale across almost 90% of Jefferson County. Predictions used high to extreme weather conditions. **Table 3** includes a description of fire intensity scale classes. Source: 2022 CO-WRA.



**Table 3.** Fire intensity scale quantifies potential fire intensity based on high to extreme weather conditions, fuels, and topography. Much like the Richter scale used to quantify the magnitude of earthquakes, each subsequent category of FIS represents a meaningful ten-fold increase in fireline intensity (measured as kilowatts/meter). Each class of the fire intensity scale is associated with different fire behavior, suppression opportunities, and potential consequences. Source: (CSFS and Technosylva, 2023a).

Fire Intensity Scale	Fireline intensity	Flame lengths	Fire behavior	Suppression opportunities	Potential consequences	Percent area in Jeffco
<b>Lowest</b>	10 kW/meter	<1 foot	Very low rate of spread; No spotting	Easy to suppress by firefighters by with basic training and non-specialized equipment	Very low potential for harm or damage to life and property.	3%
<b>Low</b>	100 kW/meter	<2 feet	Small amount of short-range spotting possible	Easy to suppress by trained firefighters with protective equipment and specialized tools.	Low potential for harm or damage to life and property	8%
<b>Moderate</b>	1,000 kW/meter	<8 feet	Short-range spotting possible	Trained firefighters will find these fires difficult to suppress without support; dozer and plows are generally effective.	Increasing potential for harm or damage to life and property.	42%
<b>High</b>	10,000 kW/meter	<30 feet	Short-range spotting; Medium-range spotting possible	Direct attack by trained firefighters, engines, and dozers is generally ineffective. Indirect attack may be effective.	Significant potential for harm or damage to life and property.	47%
<b>Highest</b>	100,000 kW/meter	<150 feet	Profuse short-range spotting; Frequent long-range spotting; Strong fire-induced winds	Indirect attack marginally effective at the head of the fire.	Great potential for harm or damage to life and property.	0%

## ***Potential Impacts to the Community***

Wildfire can threaten homes, critical infrastructure, and life-safety in Jefferson County. Yet not all wildfire is damaging and destructive. Many ecosystems along the Colorado Front Range have been shaped by wildfire for centuries with fire, helping to maintain healthy forests, grasslands, and watersheds, and wildfire creates important habitat for wildlife by removing trees and promoting the growth of a diversity of grasses and forbs. In certain vegetation types, areas burned by wildfires may be able to serve as fuel breaks for decades afterwards and reduce the potential for damaging wildfire both in the burned area and surrounding landscape; however, encroaching noxious weeds such as cheatgrass can negate this if left unmitigated. Beneficial fire is more likely in areas without homes and where expected fire behavior is moderate (**Figure 16**).

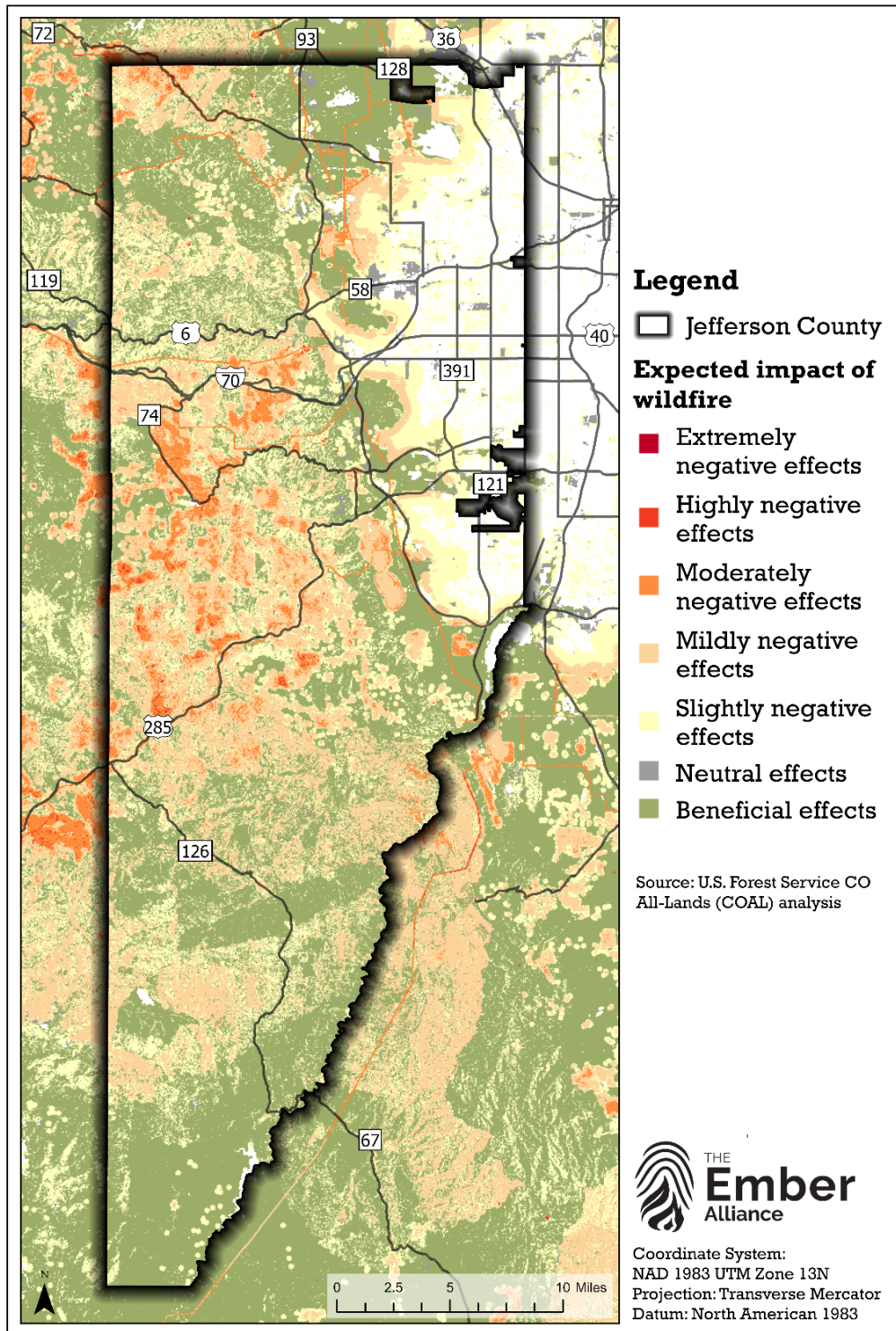
**In the WUI, there is an urgent need for homeowners and businessowners to mitigate wildfire risk on their property.** On days with high to extreme fire weather conditions, 81-100% of structures could be exposed to embers from burning vegetation, and many of the structures with a lower exposure to embers could be exposed to embers from nearby burning structures (**Figure 17**). Some structures in densely populated portions of the WUI are close enough to receive abundant embers from over 80 nearby structures (**Appendix B, Figure B.10**).

Based on an analysis that considers both exposure of homes to burning vegetation and the potential for home-to-home ignitions, home exposure is extremely high in regional action areas in the central portion of Jefferson County that fall in Evergreen, Indian Hills, Elk Creek, and Inter Canyon FPDs, in the northern portion of the county that includes Wondervu and Crescent Village in Coal Creek Canyon FPD, and western Golden (**Figure 18**; see methodology in **Appendix B. Risk Assessment Methodology**). Home exposure is also high in the southern part of West Metro FPD and portions of Arvada and Fairmont FPDs due to the potential for fire to move rapidly through grasslands and shrublands and to spread from home-to-home in neighborhoods with moderate to high densities.

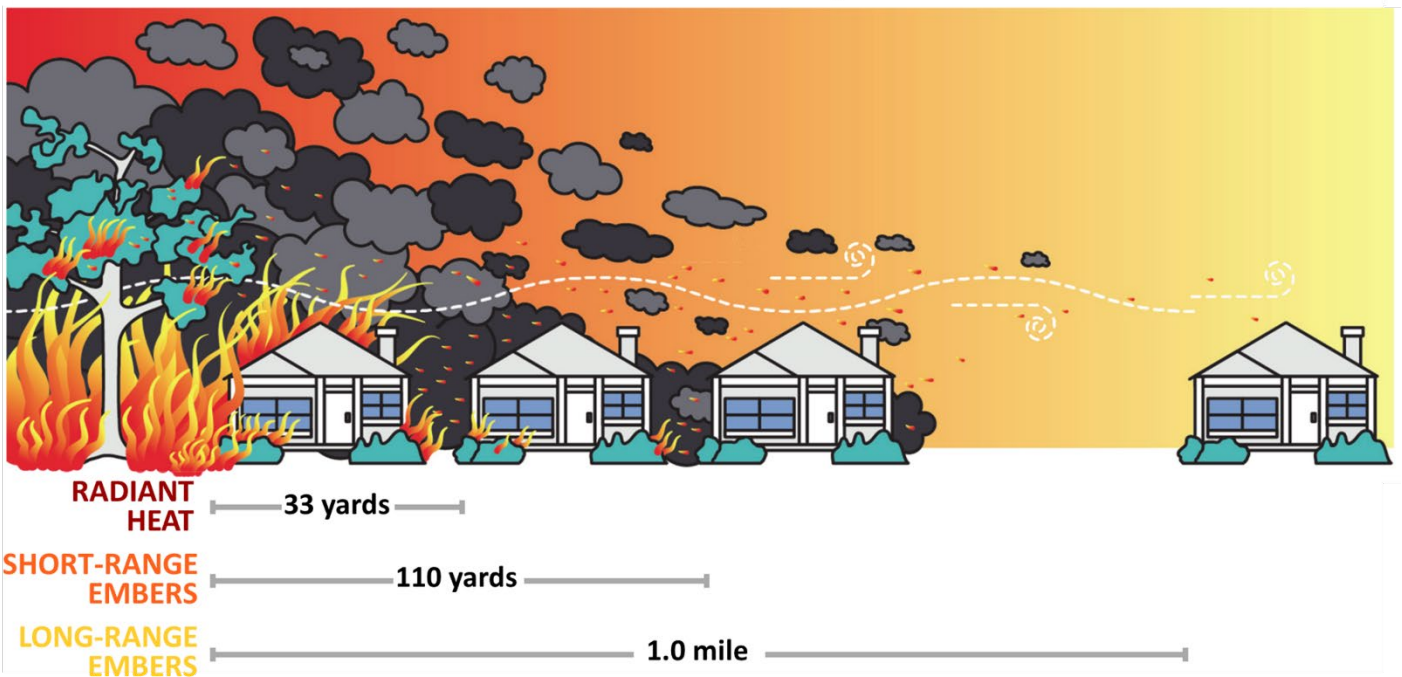
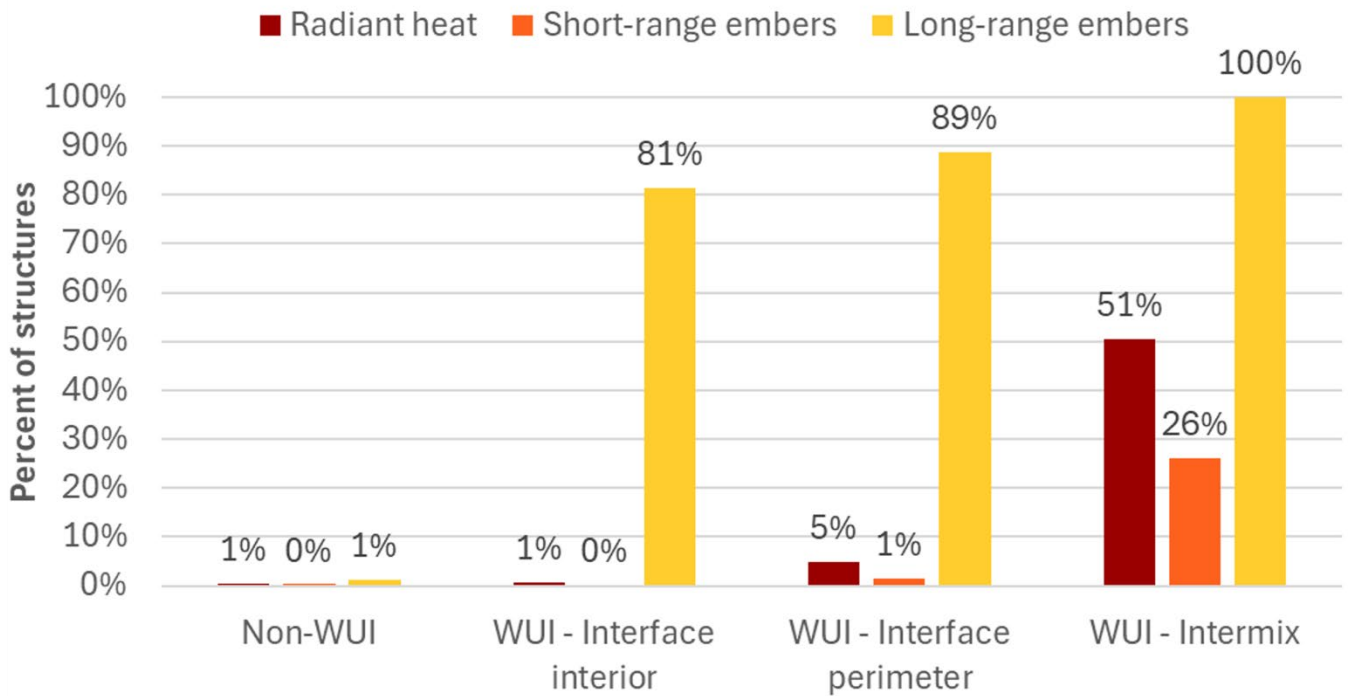
Keep in mind that this analysis is relative to the rest of Jefferson County. Even areas that have low to moderate relative risk contain homes that could be lost during wildfire. Actions to mitigate risk in the structure ignition zone are important for all homes in the WUI in Jefferson County (see **Recommendations for Residents**).

Regional action areas in the northwestern and central portions of the county have the highest potential for negative impacts to HVRAs, which include homes, critical infrastructure (e.g., government buildings, schools, utility infrastructure, communication sites), ecosystem health, and surface drinking water (**Figure 18**; see methodology in **Appendix B. Risk Assessment Methodology**). The highest risk regional action areas fall in Coal Creek Canyon, Golden Gate, Foothills, Genesee, Evergreen, Elk Creek, Inter Canyon, West Metro, and South Metro FPDs. The northwestern portion of the county has very high relative burn probability and the potential for extreme fire behavior that could expose homes, communication towers, and critical infrastructure to extreme radiant heat and ember cast. The central portion of the county has numerous homes, communication towers, schools, fire stations, utility infrastructure, and other HVRAs that could be damaged from wildfire (**Appendix B, Figure B.11**). Fuel

treatments and other recommendations in this CWPP seek to reduce this exposure and protect critical resources in Jefferson County.

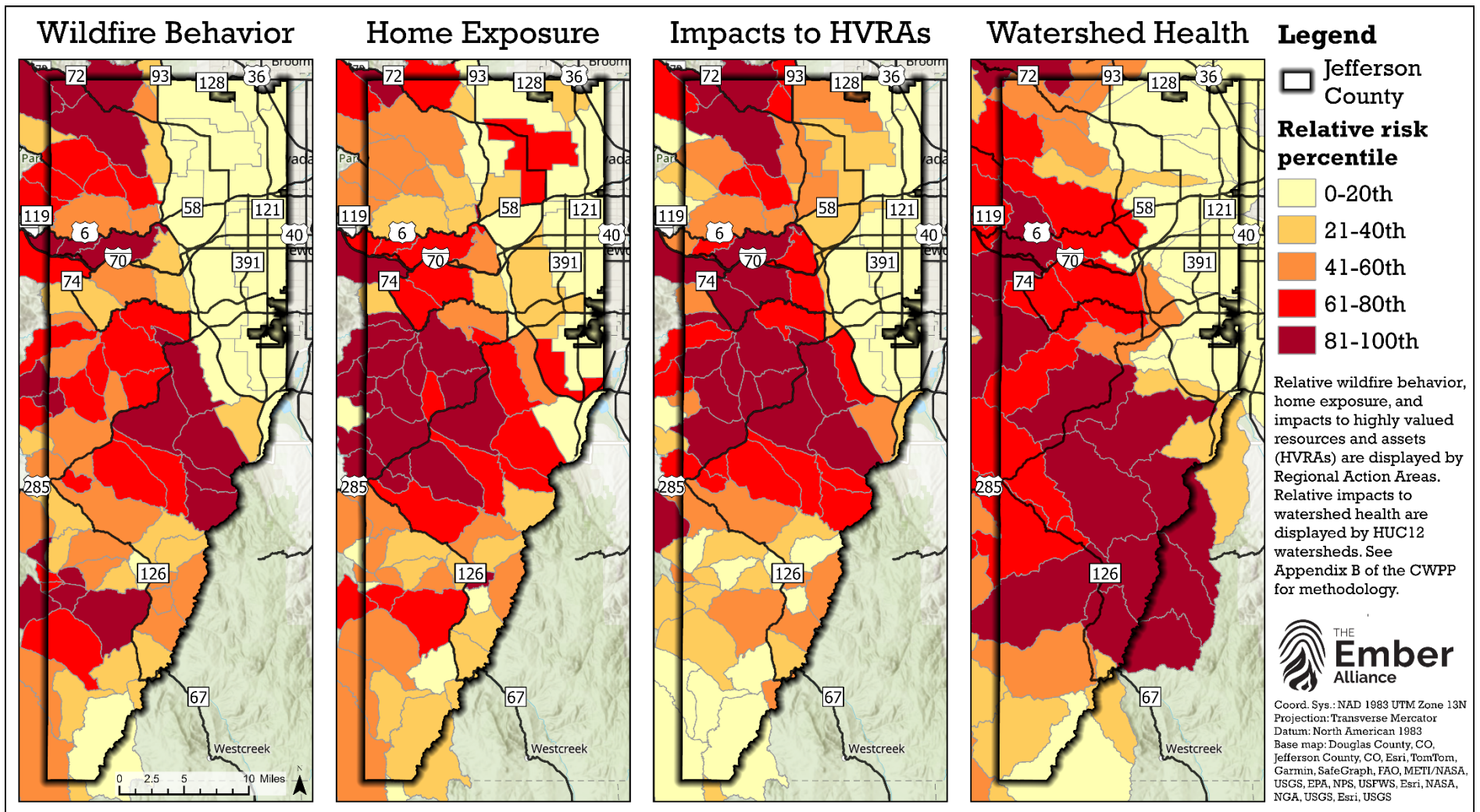


**Figure 16.** According to an analysis by the U.S. Forest Service for the state of Colorado, wildfire and/or broadcast prescribed burning could benefit portions of Jefferson County by restoring ecological conditions and reducing fuel loads. The analysis considered potential fire behavior, likelihood of wildfire, exposure of values at risk, relative importance of values, and sensitivity of values to different types of fire behavior. Source: (Napoli et al., 2022b).



**Figure 17.** Percentage of structures in Jefferson County with different types of exposure to wildfire under extreme fire weather conditions. Radiant heat from burning vegetation can ignite nearby structures, and embers emitted from burning vegetation or other structures can travel long distances and ignite vegetation and structures away from the main fire. Analysis based on research by Beverly et al. (2010) and Caggiano et al. (2020) (see **Appendix B. Risk Assessment Methodology** for details). Lower image modified from [Reducing Brushfires Risks](#) by the Victorian Auditor-General’s Office.





**Figure 18.** Relative wildfire behavior, home exposure, impacts to highly valued resources and assets (HVRAs), and watershed health were summarized from a variety of analyses conducted by the U.S. Forest Service, Colorado State Forest Service, Colorado Forest Restoration Institute, Colorado Water Conservation Board, and The Ember Alliance. Wildfire behavior, impacts to HVRAs, and home exposure are summarized by regional action areas and watershed health is summarized by HUC12 watersheds. Percentiles are relative to the rest of Jefferson County. See **Appendix B. Risk Assessment Methodology** for detailed methodology.

## ***Potential Post-Fire Impacts***

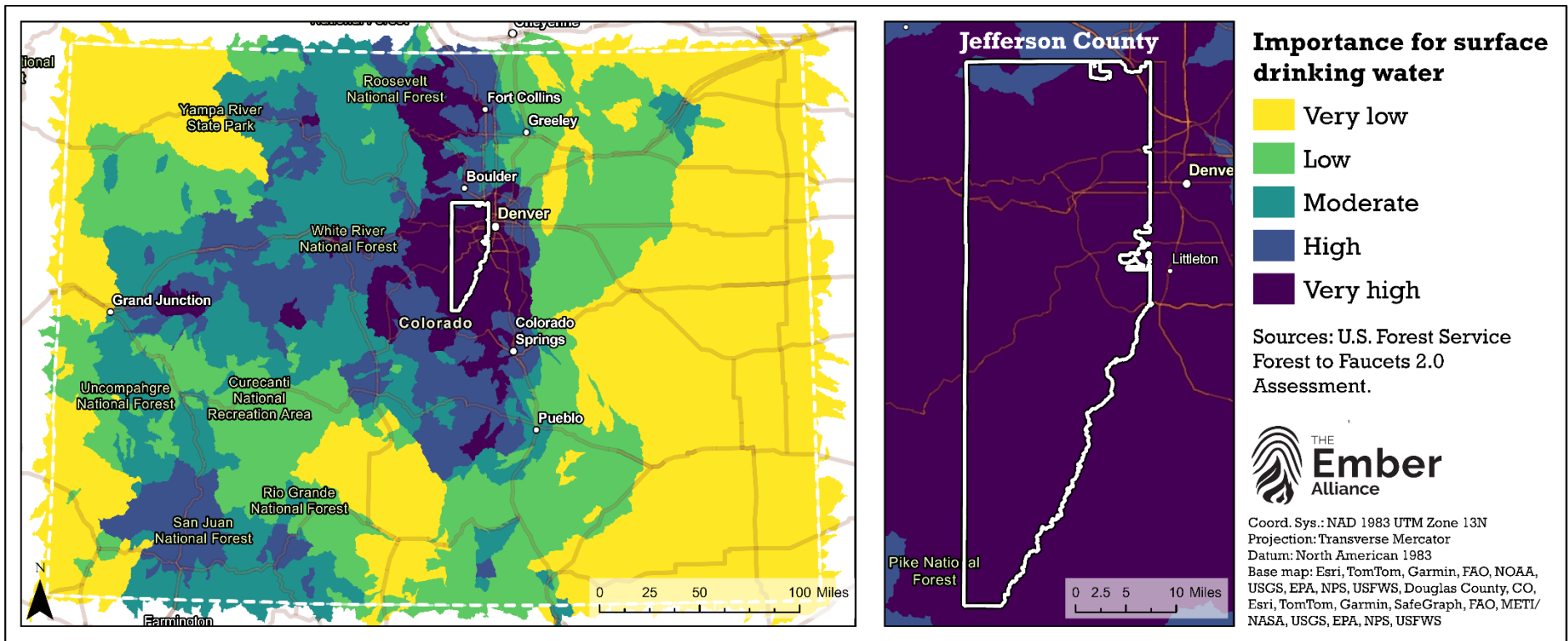
Impacts of wildfires do not end once the flames extinguish. Intense rainfall events can result in flash floods, erosion, sediment delivery and debris flows the first few years following a wildfire (Neary et al., 2005). Erosion and sedimentation are natural processes that shape streams, transport soil and nutrients across a landscape and create diversity in streams and riparian habitats. However, extreme post-fire sediment delivery and debris flows can damage and destroy homes, community assets, infrastructure, fisheries, and riparian vegetation.

According to the U.S. Forest Service Forest to Faucets 2.0 Assessment, all watersheds in Jefferson County have high to very high importance for the provisioning of clean surface drinking water (**Figure 19**). Surface water flowing out of watersheds in Jefferson County serves over 35% of residents in the state of Colorado (2.1 million people) (Mack et al., 2022).

Findings from several analyses of post-fire impacts to watershed health, roads, and other infrastructure were combined and summarized by HUC12 watersheds<sup>1</sup>. Post-fire impacts could be particularly extreme in the northern part of Clear Creek Canyon FPD, the central part of Jefferson County in Evergreen and Golden Gate FPDs, the southwestern part of Jefferson County in Elk Creek, Inter Canyon, and North Fork FPDs, and the southern portion of West Metro FPD (**Figure 18**). These areas have the potential for high-severity fire, topography and soil textures conducive to post-fire debris flows and sedimentation, and critical infrastructure that could be damaged by post-fire events.

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<sup>1</sup> A watershed is an area of land where all precipitation falling in that area drains to the same location. Smaller watersheds are nested in larger watersheds. The U.S. Geological Survey has mapped watersheds across the United States and organized them into a hierarchy of scales referenced by unique hydrologic unit codes (HUC). HUC12 watersheds are hydrologic units with a twelve-digit code. HUC12 watersheds in Jefferson County range in size from 14 to 78 square miles.



**Figure 19.** Watersheds in Jefferson County are exceptionally important for the provisioning of clean surface drinking water in the state of Colorado. Source: U.S. Forest Service Forest to Faucets 2.0 assessment (Mack et al., 2022).



### Examples of post-fire impacts in Jefferson County

Two months after the 1996 Buffalo Creek Fire in southern Jefferson County, a severe thunderstorm caused erosion and flooding that resulted in the death of two residents, washed out County Road 126, damaged the City of Buffalo Creek's potable water supply and telephone facilities, and inundated Strontia Springs Reservoir with sediment (Agnew et al., 1997).

Denver Water reports spending over \$27 million recovering from the Buffalo Creek and Hayman wildfires, \$18.5 million of which was spent on a dredging effort to remove sediment from Strontia Springs. Research from the Colorado Forest Restoration Institute indicates that Denver Water's wildfire mitigation efforts could result in \$147-234 million return on investment by reducing the potential for high-severity fires and post-fire damages (Jones et al., 2021).



## Mitigating Wildfire Risk with Fuel Treatments

Fuel treatments reduce the amount of fuel in strategic locations, reducing fire hazard to nearby communities and creating tactical opportunities for wildland firefighters to engage with wildland fires. In many cases, fuel treatments and ecological restoration objectives and outcomes overlap; fuel treatments can create healthy, restored forest conditions with abundant understory plants, improved wildlife habitat, and lower the potential of high-severity wildfires. 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 (Agee et al., 2000; Jain et al., 2021). Fuel treatment methods include tree thinning, patch cutting, pruning, pile burning, broadcast prescribed burning, grazing, and fuel mastication. Details about these fuel treatment methods are provided in Appendix D.

Public land managers and private residents in and around Jefferson County have conducted strategic fuel treatments on about 31,350 acres between 2000-2023 to reduce wildfire risk and/or restore ecosystem health (**Figure 20**). Thinning without burning was the primary mode of fuel treatment, accounting for 80% of treated acres. The U.S. Forest Service treated 45% of treated acres between 2000-2023 and the Colorado State Forest Service treated 35% (**Figure 21**).

The pace and scale of fuel treatments was outpaced by the size of wildfires in Jefferson County between 2000-2023; wildfires burned 2.5 times more area than fuel treatments mitigated. Burned areas can serve as an effective fuel treatment modifying wildfire behavior for years to come, as evidenced by reduced fire severity in the areas burned by the 1996 Buffalo Creek and 2002 Hayman Fires (**Figure 15**).

Unfortunately, one of the large wildfires between 2000-2023 was caused by an escaped prescribed burn. The 2012 Lower North Fork Fire was a tragic example of an escaped prescribed burn that killed three residents, destroyed 22 homes, and burned 4,140 acres. Less than 1% of prescribed burns escape containment lines (Weir et al. 2019), but when they do, the wildland fire community soberly reviews those escapes to produce lessons learned (Dether 2005). The prescribed burn community conducted a review of the Lower North Fork Fire, and major changes were made to prescribed burn policies and procedures in the state of Colorado to reduce the likelihood of future escapes.

Broadcast prescribed burning is a necessary and extremely effective method to reduce hazardous fuels and restore ecological conditions across a variety of grassland, shrubland, and forest ecosystems (Stephens et al. 2009; Paysen et al. 2000). Broadcast prescribed burning (also called broadcast burning, underburning, prescribed fire, or controlled fire) is defined as wildland fire originating from a planned ignition in accordance with applicable laws, policies, and regulations to meet specific objectives.

Broadcast prescribed burning 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, reduces surface fuels and ladder fuels, 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).



Before Treatment



Immediately After Treatment



1 Year After Treatment



Jefferson Conservation District removed trees to create a healthy, restored ponderosa pine forest with abundant understory plants and a lower chance of high-severity wildfires off Pine Country Lane south of Conifer. Photo credit: Jefferson Conservation District.

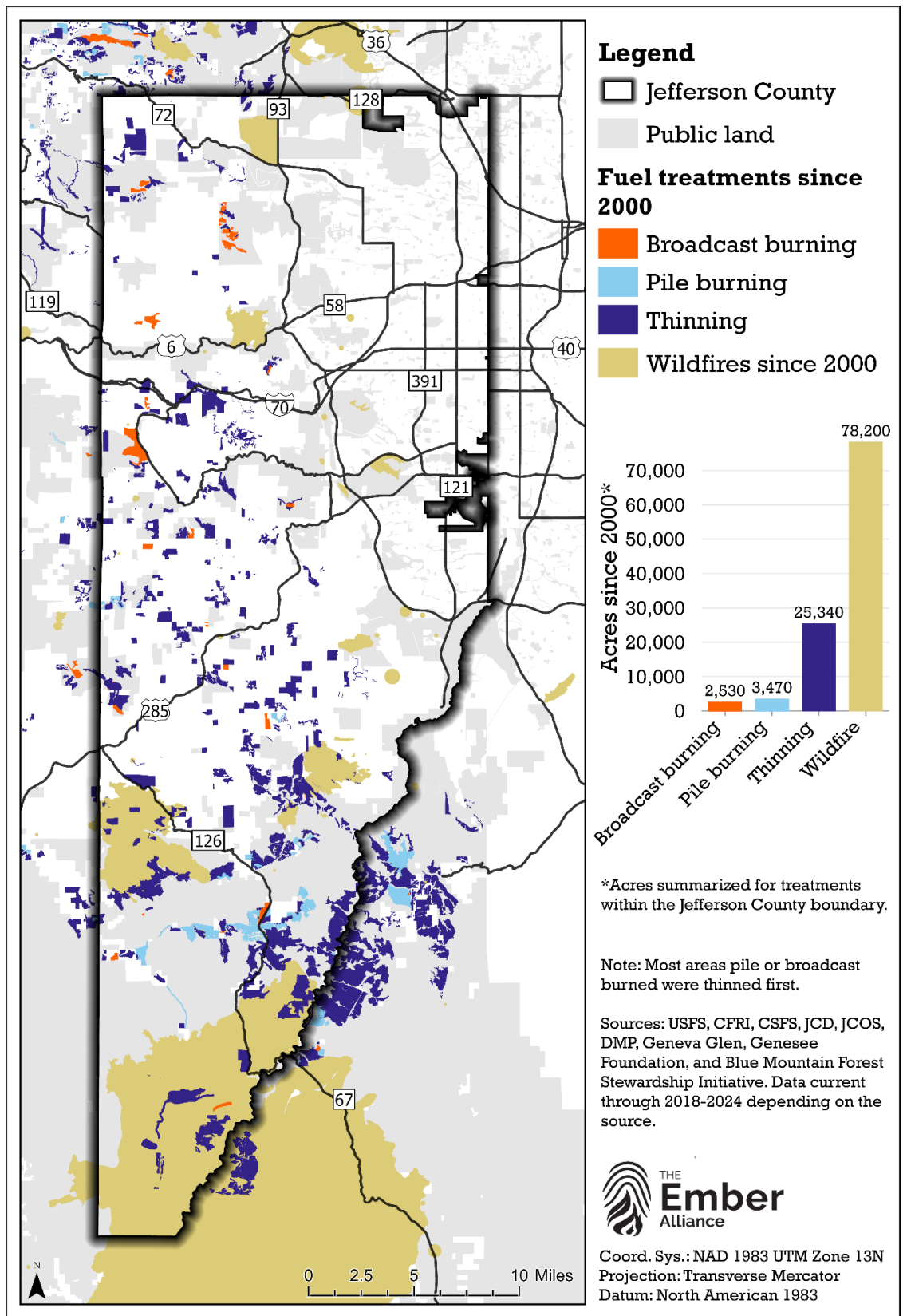


Broadcast prescribed burning can be used following mechanical treatments to magnify and maintain treatment impacts. When implemented together, thinning and burning treatments tend to achieve fuel reduction objectives and modify fire behavior to a greater extent than thinning alone (Fulé et al., 2012; Prichard et al., 2020). Regular spring burning can also help restore short-grass prairie ecosystems by 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).

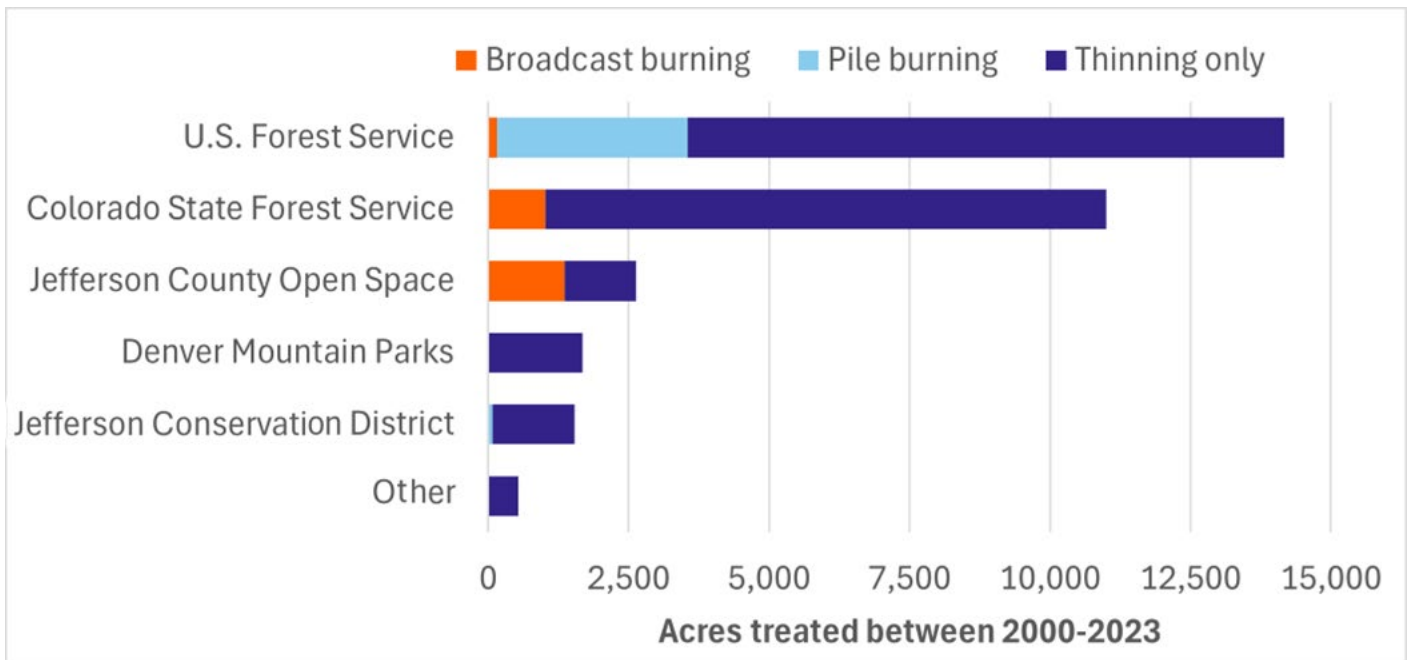
With proper planning and implementation, qualified firefighters can safely conduct appropriate broadcast prescribed burning in the WUI (Hunter and other 2007, Dether and other 2006), and prescribed burns can reduce property and natural resource damage during future wildfires (Loomis and others 2019). The planning document for any prescribed broadcast burn, called a burn plan, takes significant investments of time and knowledge to complete, including resource management and prescribed fire objectives, a detailed understanding of the fuels, modeled fire behavior, topography, necessary weather conditions, what staff and qualifications are needed as well as what equipment will be required. Burn plans may need to have detailed maps showing the area that will be burned, any values of concern (infrastructure, smoke-sensitive populations or receptors) and control features to support operations. Crews may need to do work on the ground well ahead of the burn date to prepare holding lines and mitigate areas of concern. The plans are drafted and edited over the course of months to years and are reviewed by qualified prescribed fire practitioners and must obtain agency-specific administrative approval before the burn can be implemented. Life safety is always the top consideration when developing and conducting prescribed burns.



Broadcast prescribed burning can be safely conducted in the WUI in Jefferson County. West Metro Fire Rescue completed prescribed fire on approximately 30 acres of land in Beak Creek Lake Park in September 2023. Photo credit: West Metro Fire Rescue.



**Figure 20.** Fuel treatments and wildfires in Jefferson County since 2000. Many areas that were pile burned or broadcast prescribed burned were thinned first. Sources: USFS, CFRI, CSFS, JCD, Jefferson County Open Space, Denver Mountain Parks, Geneva Glen, Genesee Foundation, and Blue Mountain Forest Stewardship Initiative. Data are current through 2018-2024 depending on the source.



**Figure 21.** Acres treated by different methods by agency/organization between 2000-2023 in Jefferson County. Many areas that were pile burned or broadcast prescribed burned were thinned first.



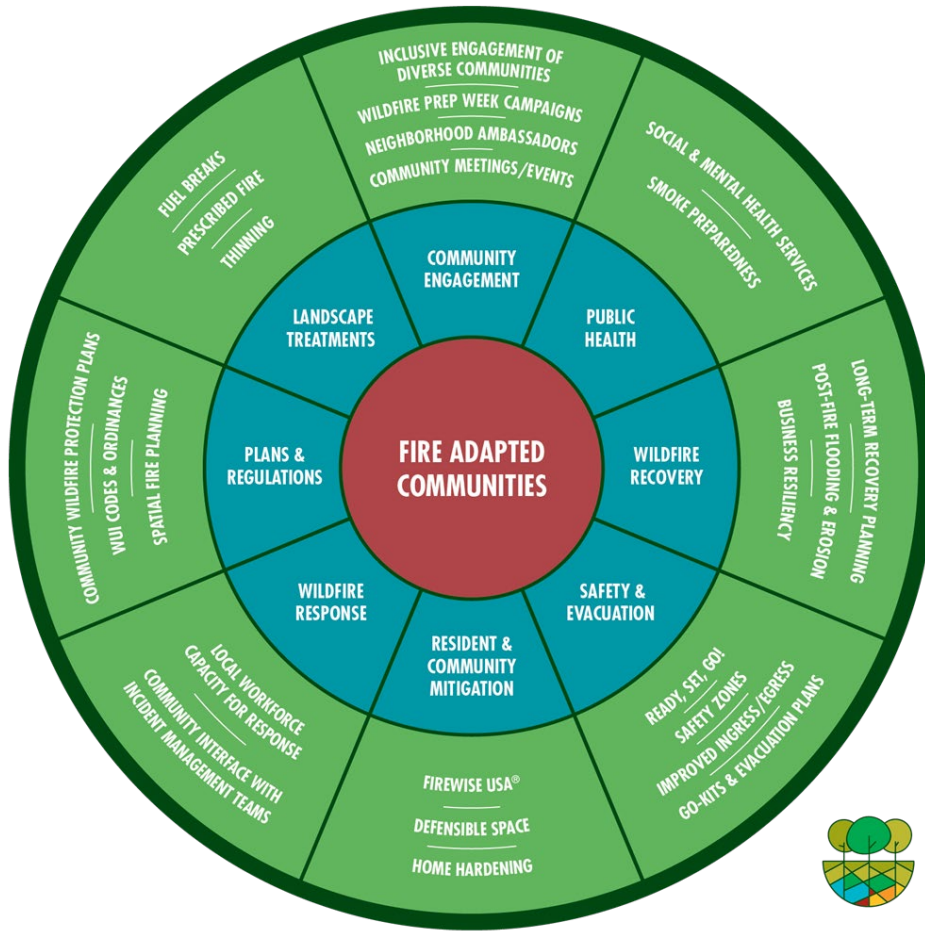
# BECOMING A FIRE ADAPTED COMMUNITY

The County, residents, business owners, and other partners should embrace the concept of Fire Adapted Communities (FAC), which is defined by the National Wildfire Coordinating Group 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 22**).

Local CWPPs for FPDs and the County CWPP set the stage for fire adaptation, and the next step is on-the-ground action and an ongoing commitment to risk mitigation at all levels of the community, from individuals to neighborhoods and HOAs, to Jefferson County, land managers, and other partners. This section of the CWPP includes recommendations and resources for mitigating wildfire risk and enhancing emergency preparedness. Jefferson County and public land managers have an important role to play in implementing the recommendations in this CWPP, and they have made commitments to take on-the-ground action.

Individual homeowners, neighborhoods, and HOAs also have a vital role to play in addressing shared wildfire risk. Action and community-building centered around mitigation have reduced wildfire risk and increased community resilience across the mountain west. Mitigation work by residents can spur mitigation by their neighbors (Brenkert-Smith et al., 2013). The cumulative impact of linked structure ignition zone mitigation across private properties can improve the likelihood that homes stand strong against wildfire and protect firefighters (Jolley, 2018; Knapp et al., 2021).

Residents that live within a fire protection district or fire department jurisdiction that have a CWPP that has been updated within the last ten years should first read and reference that document for what actions they should take to reduce wildfire risk in their home and neighborhood. These documents tend to be more specific to neighborhoods and reference resources that the local community and fire district have available to residents. Residents that do not have another local CWPP that is less than ten years old should read this CWPP first and follow the guidance in this section, as well as in the resources that are referenced and linked throughout. The County and the local fire districts use the same standards and general recommendations for resident mitigation; both follow the Colorado State Forest Service’s guidance on mitigation and preparedness.



**Figure 22.** 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](#).

## Recommendations for Residents

*People can increase the likelihood that their homes and other structures remain undamaged during wildfire and help protect the safety of firefighters by reducing hazards around their structures, replacing or altering building materials to make homes and other structures less susceptible to ignition, and increasing firefighter access along driveways.*

### **Mitigate the Structure Ignition Zone**

During catastrophic wildfires, property loss happens mostly due to conditions in the **structure ignition zone** (SIZ; formerly called the home ignition zone, HIZ, or defensible space)<sup>2</sup>. The SIZ includes the structure itself (homes, sheds, garages, businesses, etc.) and the area within 100 feet of each structure. Firefighter intervention, adequate structure ignition zone mitigation, and structure hardening measures are common factors for homes that stand strong during major wildfires (IBHS, 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 SIZ. Structure-to-structure ignition is a major concern in high-density 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 structure ignition zone.

**Structure 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. Structure hardening involves reducing this risk by changing building materials, installation techniques, and structural characteristics of a home. Structure 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).

**The structure ignition zone** 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. Residents are strongly encouraged to mitigate within their SIZ so their homes may not get damaged during a wildfire without relying upon limited firefighter resources.

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<sup>2</sup> The National Wildfire Coordinating Group recently transitioned to the term structure ignition zone (SIZ), but guidance published by the Colorado State Forest Service and other agencies use the term home ignition zone (HIZ). The term SIZ recognizes that mitigation measures are relevant to all structures, including sheds, garages, businesses, RVs, campers, rental units, etc., and not just to homes. The use of SIZ instead of HIZ is an intentional semantic change that does not change anything about the concepts, guidance, best practices, and importance of mitigating hazards around homes, sheds, garages, and structures. The term HIZ appears in the 2024 Jefferson County CWPP only when referring to the CSFS guidance document called "The Home Ignition Zone."



Respondents to the TogetherJeffco surveys and open houses indicated that they agree that individual landowners are responsible for wildfire mitigation efforts. Residents should follow the structure ignition zone and structure hardening recommendations from the CSFS, as outlined below to continue increasing their home's chances of standing strong during a wildfire.



Mitigation in the structure ignition zone allowed firefighters to protect this home during the 2016 Cold Springs Fire near Nederland, CO. Photo credit: [Wildfire Partners](#).

## **Structure Hardening**

Buildings cannot be made fireproof, but the chance of a home or other structure surviving a wildfire increases when its ignitability is reduced through structure hardening and mitigation within the SIZ. Research from the Insurance Institute for Business & Home Safety clearly illustrates the benefits of structure hardening for reducing the chance of home ignition from embers (watch a video of the research [here](#)). During the Marshall Fire, embers were responsible for 70% of recorded structure damage – the other 30% were damaged from direct flame contact (Holstrom et al., 2023). Structure hardening is the only defense against embers.

Almost all structures in Jefferson County WUI are at risk of long-range embers, and half of structures in the WUI-intermix are at risk of radiant heat from burning vegetation under high to extreme fire weather conditions (**Figure 17**). Portions of the county with high density of structures, such as Evergreen, Conifer, Golden, and parts of West Metro, Arvada, and Fairmont FPDs have increased risk for home-to-home ignition from radiant heat and embers. Reducing the ability of embers to penetrate and ignite homes is recommended for everyone in Jefferson County WUI.

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

- **Roofs** should be made of noncombustible materials<sup>3</sup> 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 homes and other buildings. 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 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-wide fences; see [research](#) from the National Institute of Science and Technology for more information). Fences can serve as pathways for fire 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.

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<sup>3</sup> See the **Glossary** on page 106 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).

There are many low-cost actions residents can start with to harden their home (**Figure 23**). Keep home-hardening practices in mind and use ignition-resistant materials when replacing a hail-damaged roof or remodeling. In January 2020, Jefferson County approved [new building construction regulations](#) for homes in the WUI. New construction and replacement construction that require a building permit must comply with the new building standards. This 2024 CWPP redefines the WUI for the County, which affects building and land use codes and may affect Planning & Zoning decisions. Detailed recommendations for updates to these codes were created by the CWPC and may be reflected in the CWPC report (available later in 2024) and the County's updated Unified Land Use Code (to be completed in 2025).

### **Structure Hardening Requirements in Jefferson County**

**In January 2020, Jefferson County approved new building construction regulations for homes in the WUI to help address the high potential for home loss in the WUI. New construction and replacement construction that require a building permit must comply with the new building standards.**

### ***WUI Residents and Grassland Fuels***

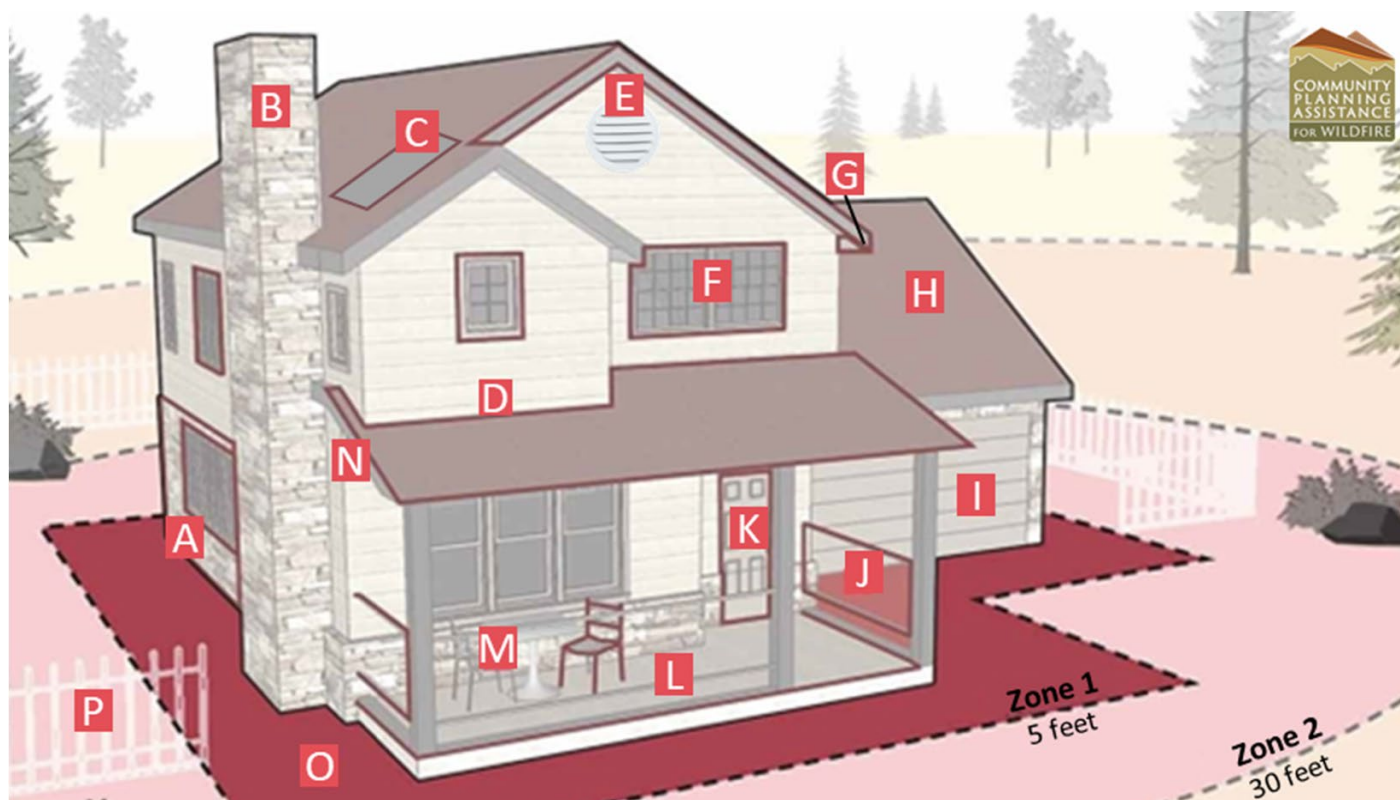
Residents that are not surrounded by forests can still be part of the wildland-urban interface. Grassland fuels can spread fires to neighborhoods and initiate home-to-home spread, as seen in the 2021 Marshall Fire. Wildfires in grasslands and shrublands destroy more homes in the WUI than wildfires in forests across the United States (Radeloff et al., 2023b). Homeowners living adjacent to grasslands can take action to harden their homes and mitigate within their SIZ to reduce the risk of ignition from wind-driving wildfires in grasslands and suburban and urban neighborhoods.

Structure hardening is the highest priority action for residents in urban and WUI Intermix portions of Jefferson County. Mitigation work in zone 1 (within 5 feet of the home) is the second highest priority. This work will reduce the chances that flames and embers from nearby homes and grasses can ignite homes and other structures. See the new [online resource](#) from CSFS for additional information on grass-dominated landscapes, fuels management, and defensible space creation in grasslands.





Homes adjacent to large grasslands in Westminster, CO. Photo source: Melissa Kole.



#### Low-cost actions:

**B.** Cover chimneys and stovepipe outlets with 3/8<sup>th</sup> to 1/2 inch corrosion-resistant metal mesh.

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

**E.** Cover vent openings with 1/16<sup>th</sup> to 1/8<sup>th</sup> 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 furniture.

**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 and cover soffits.

**P.** Replace wooden fences within 8 feet of the home with noncombustible materials (at least 20 feet away for double-wide fences).

**Figure 23.** (previous page) A home or other structure can never be made fireproof, but structure hardening practices decrease the chance that flames, radiant heat, and embers will ignite homes and other structures. Infographic by [Community Planning Assistance for Wildfire](#) with modifications from The Ember Alliance to include information from CALFIRE 2019 and Maranghides et al. 2022.

### **Structure Ignition Zone 1 and 2**

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

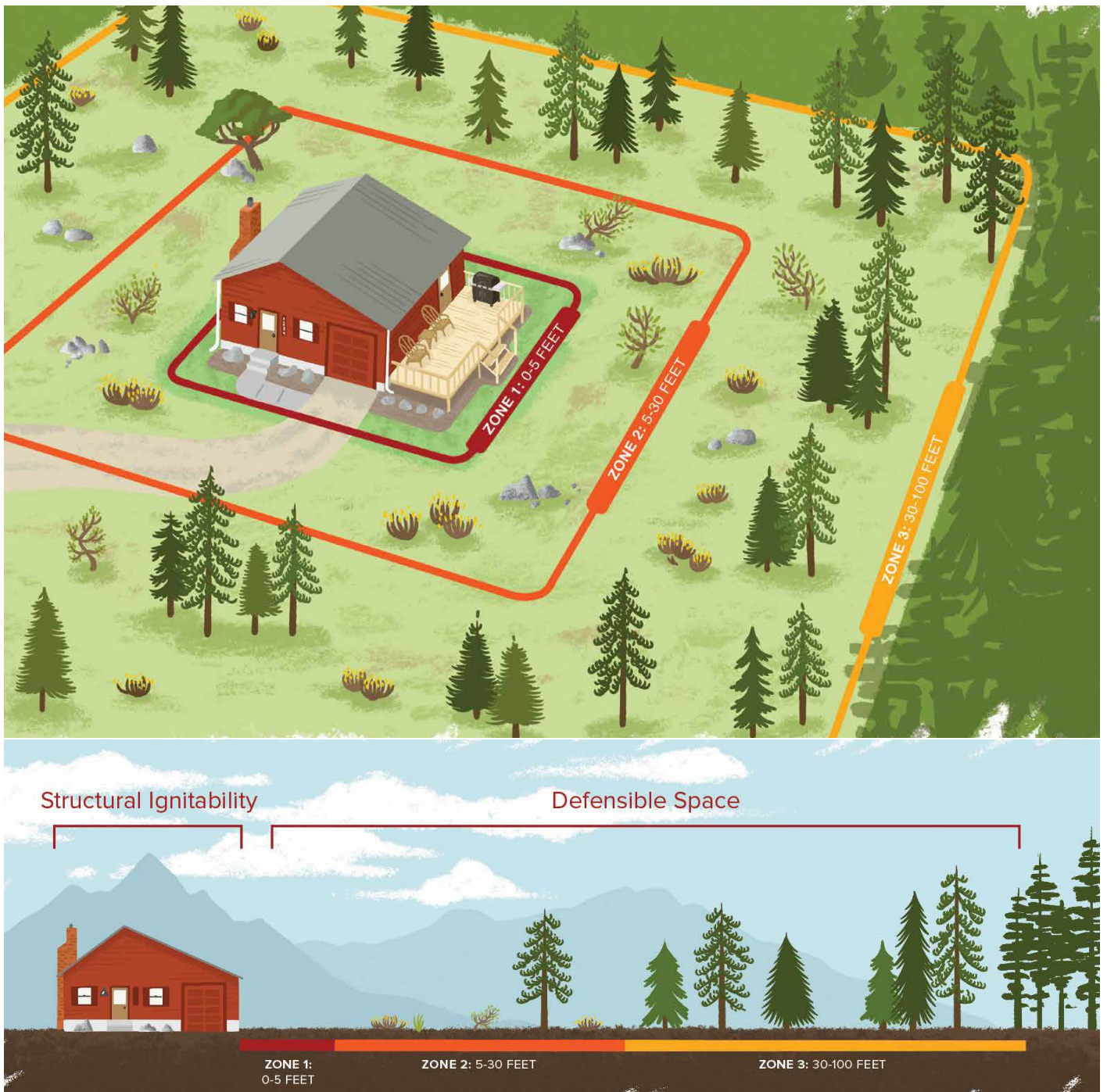
The structure ignition zone (SIZ) consists of both the structure itself and the area within 100 feet of the structure. Structure hardening is the primary defense against the loss of homes or other structures due to wildfire, and mitigation within the SIZ creates a buffer between structures and grass, trees, and shrubs that could ignite during a wildland fire. A properly mitigated SIZ can slow the spread of wildfire, prevent direct flame contact, reduce the chance that embers will ignite material on or near homes and other structures, and provide firefighters with suppression opportunities (Hakes et al., 2017). Substantially reducing vegetation within the SIZ and removing vegetation that overhangs decks and roofs can reduce structure loss, especially for structures on slopes (Syphard et al., 2014).

The SIZ includes the home/other structure and the surrounding 100 feet, which is divided into three zones around the structure, and recommended practices vary among zones. The Colorado State Forest Service (CSFS) defines Zone 1 as 0 to 5 feet from the home, Zone 2 as 5 to 30 feet from the home, and Zone 3 as 30 to 100 feet from the home (**Figure 24**).

Property owners should mitigate the SIZ around each building on their property, including campers / RVs, detached garages, storage buildings, barns, and other structures. RVs are highly flammable and can emit embers that might ignite nearby homes and vegetation. Removing all vegetation under and around campers in Zone 1 is crucial. Campers / RVs, boats, detached garages, storage buildings, barns, and other large structures should be placed at least 50 feet away from primary structures to prevent structure-to-structure fire spread or mitigated to the same standard as the primary structure (Maranghides et al., 2022). Where this distance is not feasible, structure hardening and removing all flammable vegetation and combustible materials from around the structures is necessary.

A 2021 study from the University of Colorado-Boulder showed that homeowners living in the WUI in Bailey, CO typically underestimated the level of risk their home is at due to wildfire, and tended to overestimate the amount of work they have done to protect their property (Simpkins, 2021). Residents should learn about best practices for protecting their homes and other structures. See the CSFS publication [The Home Ignition Zone](#) for recommendations in each zone.





**Figure 24.** 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 the chance that structures stand strong during a wildfire. Source: CSFS 2021, [The Home Ignition Zone](#).





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 roofs or the ground within 5 feet of structures. Photo credit: Fire Adapted Colorado.

Some homeowners in the WUI are concerned that removing trees will destroy the forest and reduce the aesthetic and monetary value of their property. In fact, many dense ponderosa pine and dry mixed-conifer forests are unhealthy and greatly diverged from historical conditions that were maintained by frequent wildfires. The reality is that nothing will decrease the aesthetic and monetary value of a home as much as a high-severity wildfire burning all the vegetation in the community, even if a home survives the fire. Forest management can look messy and impactful 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. It might even be said that the more trees you cut, the more trees you save from wildfire.

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. Properly maintained forests are healthier and thus more resistant to disease and insect attacks, especially during prolonged periods of drought, which ultimately helps properties maintain tree cover in the long-term. Reducing fuel loads and increasing the spacing between trees increases the chance that homes across a neighborhood will stand strong during a wildfire, and most importantly, it increases the safety of wildland firefighters working to protect the community.

## ***Structure Ignition Zone 3 Recommendations by Vegetation Type***

**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, contact the CSFS, JCD, or other wildfire mitigation specialists. CSFS provides [guidance for how to select a contractor for forest management](#), and the CSFS Golden Field Office provides a list of local forest agriculture contractors on their [website](#).

Fuel treatment methods include tree thinning, patch cutting, pruning, pile burning, broadcast prescribed burning, grazing, and fuel mastication. Details about these fuel treatment methods are provided in Appendix D.

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 vegetation 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 Zone 3, but this tree arrangement would not be appropriate for restoration-style fuel treatments. Grazing coupled with broadcast prescribed burning might be appropriate for restoring ecosystem conditions and mitigating wildfire risk in large grassland ecosystems, but these approaches might not be feasible in Zone 3 around homes.

Depending on the ecosystem type and treatment specifications, management in Zone 3 (30-100 feet away from the home) can restore historical forest structure in some ecosystems, but it is most important to focus on reducing wildfire risk to the home, creating safer conditions for fire fighters, and increasing the visibility of homes from the roadway 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. Zone 3 often 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. Slash management can include pile burning, burning slash in air curtain burners, chipping fuel and removing chips from the site, and dropping slash off at community slash sites. See **Action 6: Slash Management** for a description of pros and cons of different slash management techniques.

Mitigating the impacts of tree removal on soil compaction and erosion is also important when treatments occur near streams and riparian ecosystems. The Colorado State Forest Service 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's always a good idea to take pictures of treatments before and after to help evaluate effectiveness and monitor changes over time.



The following illustrations provide general recommendations for treatments in Zone 3 and stand-scale fuel treatments and ecological restoration by vegetation types. Guidance for the structure ignition zone is summarized from the CSFS publication [The Home Ignition Zone](#). It is important to work with a forester that has experience mitigating within the SIz so they can help design an effective treatment specific to vegetation type, slope, and other site conditions.

## Grasslands

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

**Typical elevation:** 4,000-6,500 ft

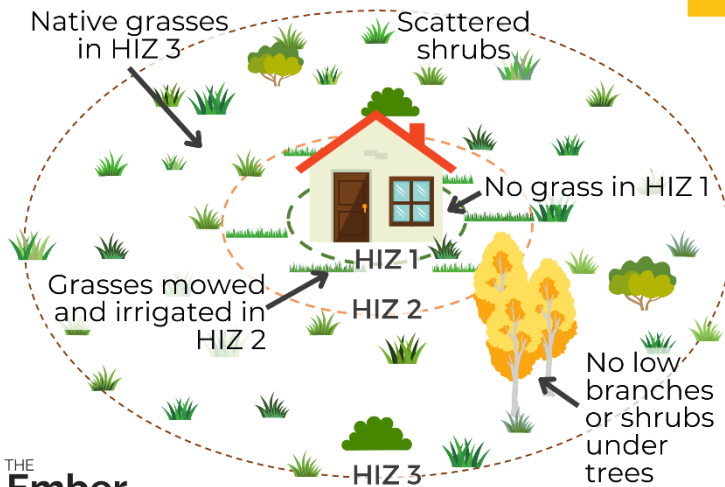
**Fire return interval:** 2 to 20 years (frequent)

**Fire severity:** Low severity

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

### Management in Home Ignition Zone 3

- Homeowners adjacent to grasslands should focus their efforts in HIZ 1 and 2.
- Mowing grass is not required in HIZ 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.



Sources: CSFS Home Ignition Zone; Grassland Management in Boulder

# Shrublands

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

**Typical elevation:** 4,000-9,000 ft

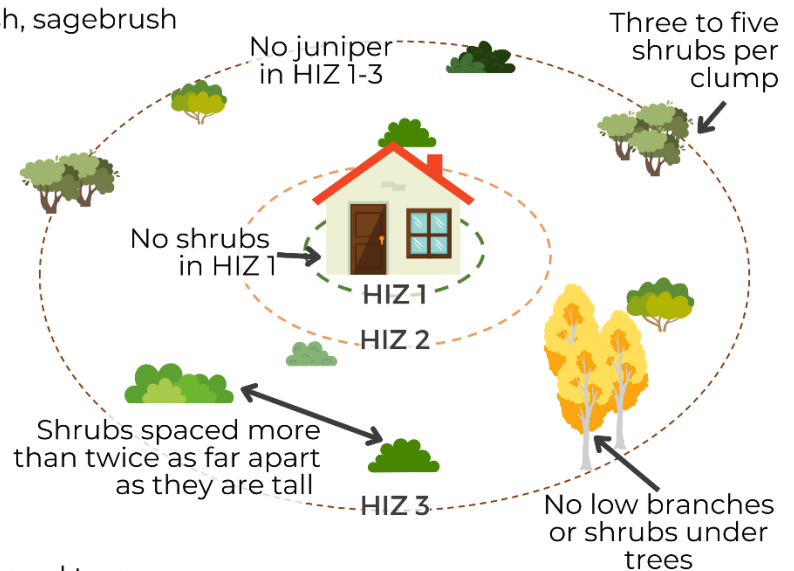
**Fire return interval:** 2-30 years (frequent)

**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 Home Ignition 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.



THE  
**Ember**  
Alliance

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.

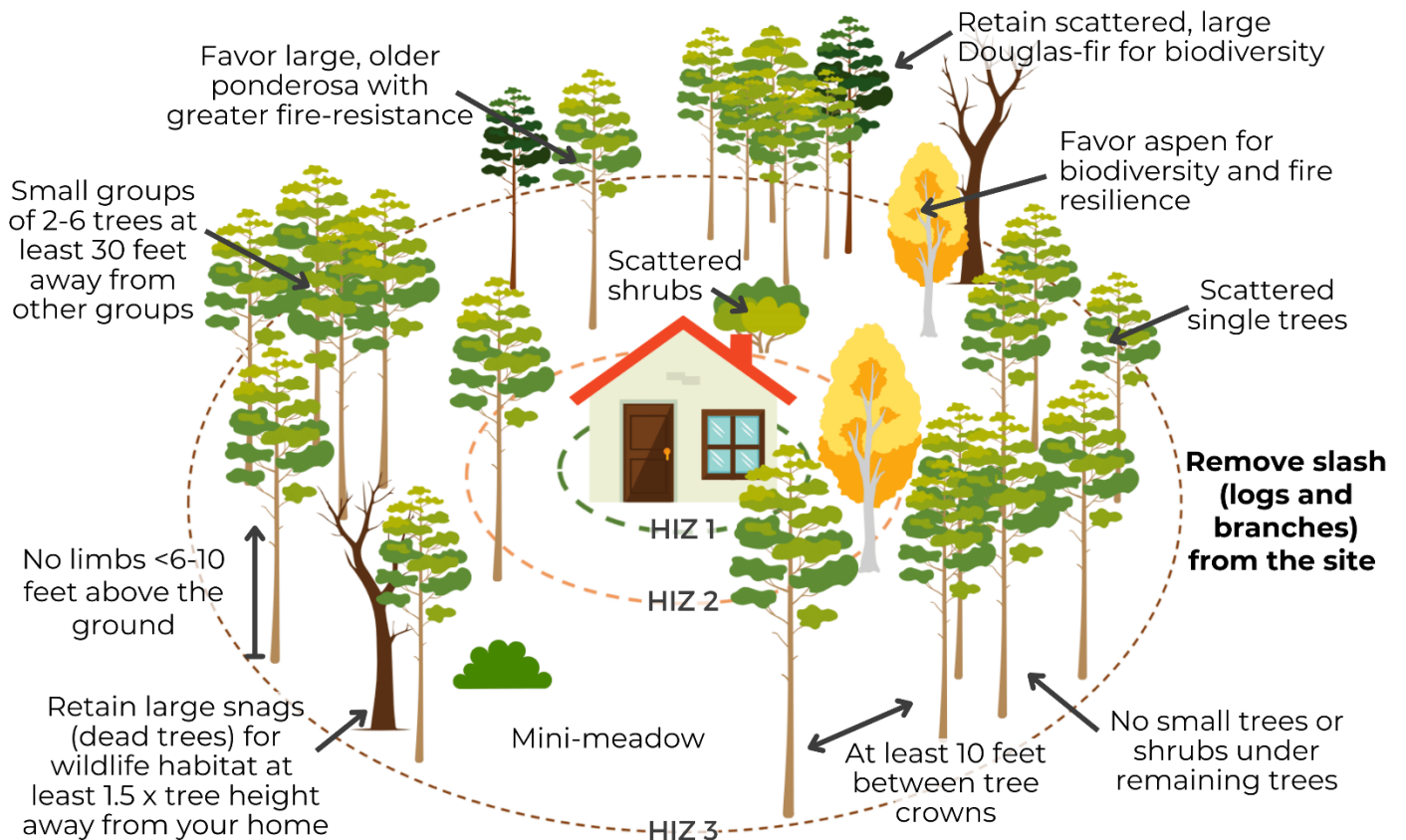


Human management activities (grazing, logging, fire suppression) have resulted in unnaturally dense forests. During extreme weather, high winds can easily spread fire between tree crowns, resulting in very large high-severity wildfires where most trees are killed. This is not always the case but is a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



## Management in Home Ignition 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 HIZ 3 (15-40 trees within 30 to 100 feet of your home) and create mini-meadows for grasses, wildflowers, and scattered shrubs.





# Douglas-fir mixed conifer

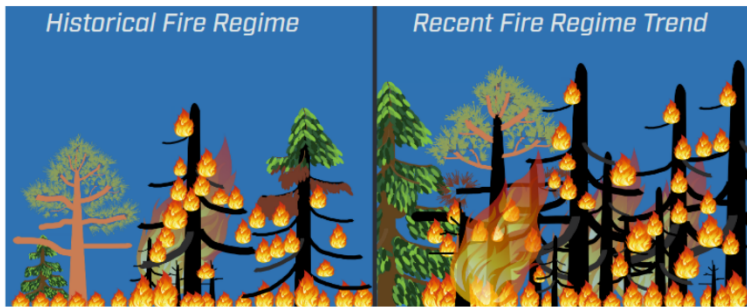
**Species:** Douglas-fir, ponderosa pine, lodgepole, aspen, white fir, occasional spruce, limber pine, gamble oak

**Typical elevation:** 6,000-9,500 ft

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

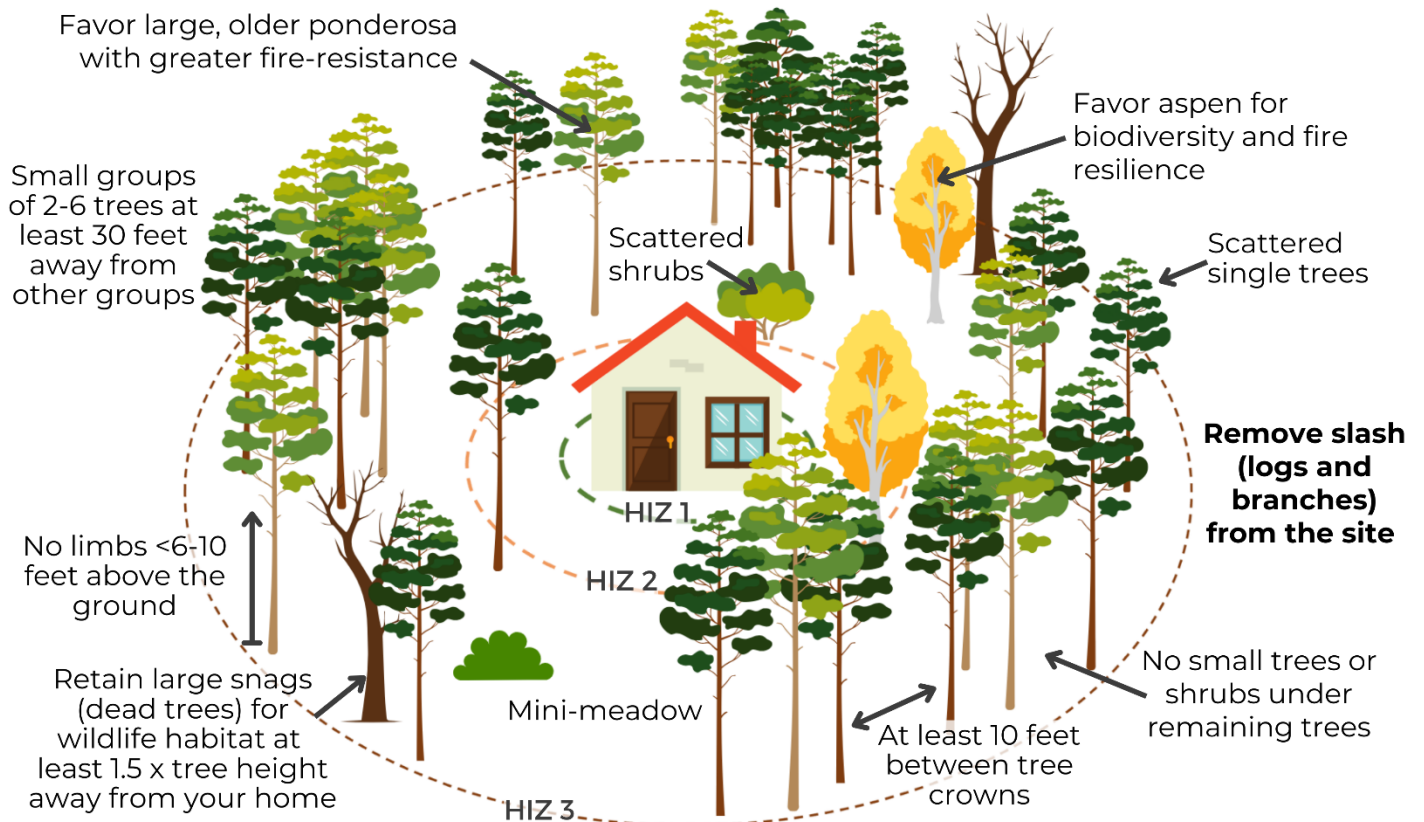
**Fire severity:** Moderate-severity with patches of stand-replacing fire where most or all trees die

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.



## Management in Home Ignition 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 HIZ 3 (15-40 trees within 30 to 100 feet of your home) and create mini-meadows for grasses, wildflowers, and scattered shrubs.



# Aspen forests

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

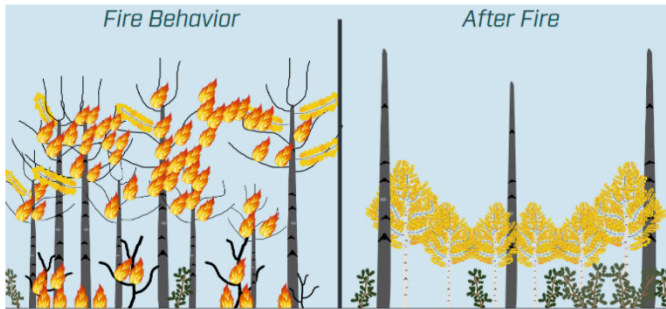


**Typical elevation:** Highly variable

**Fire return interval:** Highly variable

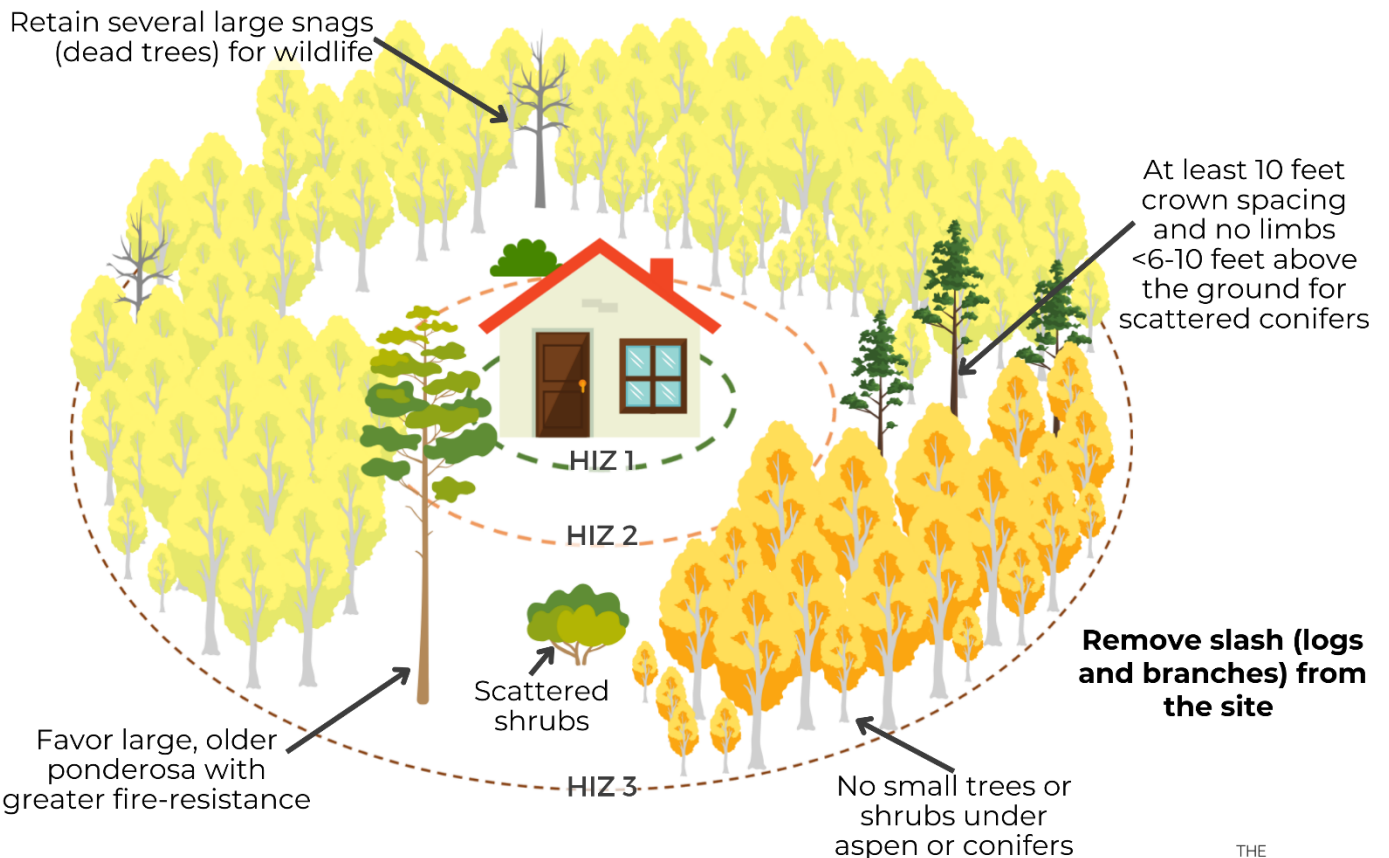
**Fire severity:** Slow and creeping or, during drought, stand-replacing fire where most or all trees die

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 Home Ignition Zone 3

Aspen trees do not need to be removed from HIZ 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

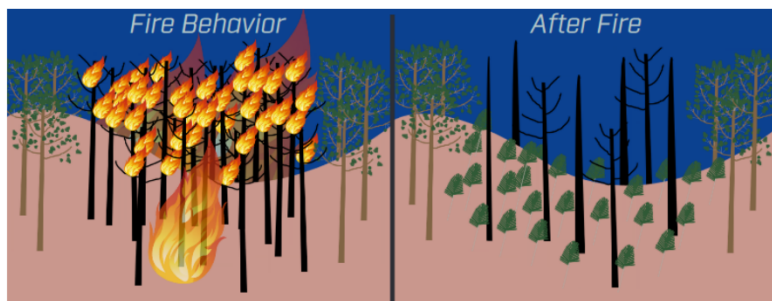


**Typical elevation:** 8,000-10,000 ft

**Fire return interval:** 75 to 300 years (infrequent)

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

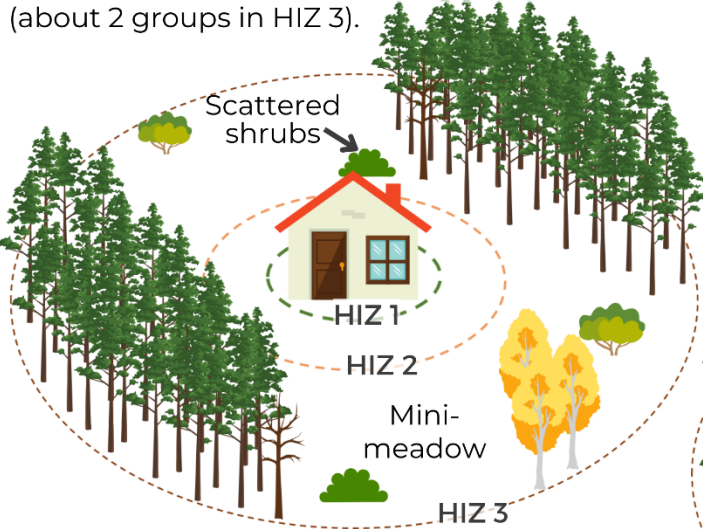
Lodgepole pine forests naturally grow densely, so fire spreads easily from tree crown to tree crown, resulting in patches where most trees are killed. Lodgepole pine also can have serotinous cones, which open and release seeds when heated by fire. These seeds then readily regenerate the new forest. More 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)**



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



# Subalpine forests

**Species:** Subalpine fir and Engelmann spruce; occasional blue spruce, aspen, and lodgepole, limber, and bristlecone pine

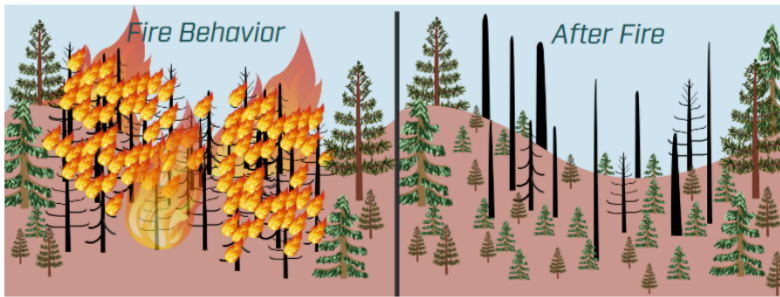
**Typical elevation:** 9,000-11,000 ft

**Fire return interval:** 100 to 600 years (infrequent)

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



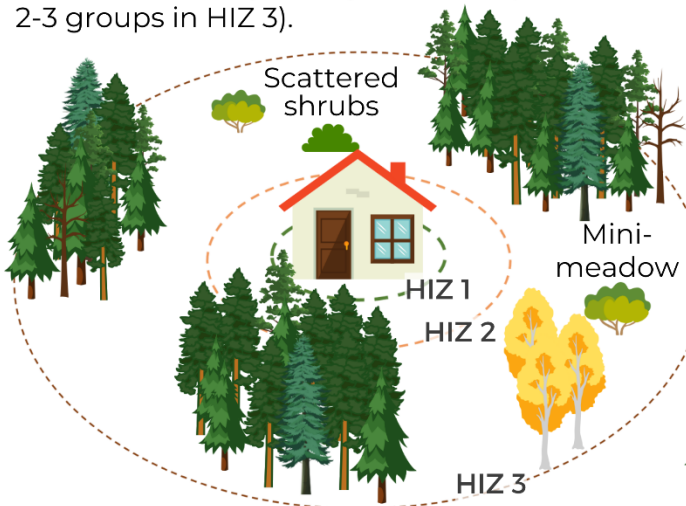
Subalpine forests are the wettest and densest forests in Colorado. When extended dry conditions occur in these forests, dead trees and other fuels that have accumulated over long periods of time dry out, creating conditions ripe for fire. Fires are infrequent, stand-replacing, and often synchronous across the region tied to widespread drought. More research is needed to understand forest recovery following the combination of drought, climate change, spruce beetle mortality, and recent wildfires.



## Management in Home Ignition Zone 3

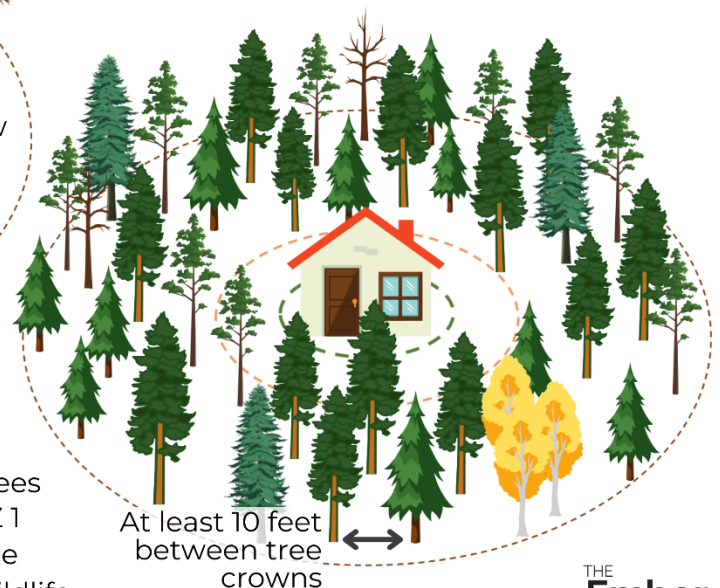
Spruce and fir trees can blow over if too many neighboring trees are removed before they can adapt to the wind. There are two options for managing spruce-fir in HIZ 3 to increase your home's chance of standing strong during a wildfire and to reduce windthrow:

**Option 1:** Leave groups of 15-30 trees at least 30-50 feet apart from other groups and at least 30 feet away from your home (about 2-3 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)**



Sources: CSFS Home Ignition Zone; CSFS Spruce Beetle Quick Guide FM 2014-1.

## ***Annual Safety Measures and Home Maintenance***

Reviewing safety protocols, mitigating in the SIZ, and hardening homes and other structures are not one-time actions, but part of *annual* home maintenance when living in the WUI. During a wildland fire, homes that have well-mitigated SIZs are identified as sites for wildland firefighters to engage in structure protection, and properties with abundant fuels and other hazards, including highly flammable structures will not usually receive firefighter resources. See [Home Ignition Zone checklists](#) from the CSFS for annual safety and maintenance activities.

## ***Accessibility and Navigability for Firefighters***

### ***Address Signs***

Installing reflective address numbers can save lives by making it easier for firefighters to find homes at night and under smokey conditions. Many FPDs in Jefferson County offer low-cost reflective address signs for residents—contact local FPDs for more information and check with county regulations and building codes for the latest guidance on address signs. Mount reflective address signs near driveways 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 properties. Make sure the numbers are clearly visible from both directions on the roadway. Ask local jurisdictions to install reflective metal street signs on maintained roadways where missing or damaged; roadways that are not maintained by a city or county are the responsibility of the landowner or road association to maintain and install appropriate signs.

### ***Driveways***

It is important to ensure emergency responders can locate and access homes, rentals, and businesses. Narrow driveways without turnarounds, tree limbs hanging over the driveway, and dead and down trees may make it unsafe for firefighters to defend properties during a wildfire event (Brown, 1994).



Some driveways in Jefferson County are long, narrow, steep and lined by dense vegetation, which can create challenges for emergency response vehicles during wildfires. Photo credit: The Ember Alliance.



Some driveways and private roadways in Jefferson County have accessibility and navigability issues, such as narrow widths, steep grades, inadequate vertical clearance for engines, and heavy fuel loading on the sides of the roadway. These unsafe roadway and driveway conditions could turn firefighters away from attempting to defend homes. According to the National Fire Protection Association, driveways and roadways should have a minimum of 20 feet of horizontal clearance and 13.5 feet of vertical clearance to allow engines to safely access roadways (O'Connor, 2021). Residents should remove trees and low-hanging limbs along driveways to facilitate firefighter access, as well as removing all dead trees that could fall across the driveway and block access.

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 mitigate their SIZ. Some actions to increase access to homes, rentals, and businesses are simple, such as installing reflective address numbers; others take time and investment, such as widening driveways and extending culverts to accommodate fire engines.

If property owners have 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 homes and other structures.

### ***Resident Preparedness for Evacuations***


Top issues shared by residents regarding evacuations in Jefferson County are a lack of roadways in many communities, concerns about receiving timely evacuation orders, uncertainty about evacuation routes, and concerns for children, pets, or livestock that might be home alone (**Figure 25; Figure 26**). Residents have a principal role to play in emergency preparedness for their families. While the Jefferson County Sheriff's Office is the lead agency for evacuation of citizens in unincorporated areas during natural or human-made disasters, successful evacuation operations are dependent upon citizen preparedness, awareness and responsiveness. Learn about JCSO's approach to [Wildland Fire Evacuations on their website](#). The section **Action 7: County Evacuation Preparedness** includes recommendations for Jefferson County Sheriff's Office and partner agencies to increase their evacuation planning and capacity. The following are key recommendations for residents, businessowners, and visitors of Jefferson County:

**Sign up for emergency notifications:** Sign up for local emergency notifications, become familiar with evacuation protocols in Jefferson County, prepare go-bags and family emergency plans, and follow evacuation etiquette. These simple and crucial actions can save lives and address many of the concerns expressed by residents. See the 1-page document [Wildland Fire Evacuation](#) from the Jefferson County Sheriff's Office for more information on how the County approaches and manages evacuations.

Register both cell phones and email addresses through Lookout Alert—the official emergency notification system for Jefferson County. Residential landlines are automatically registered in Lookout Alert unless their phone uses VoIP (voice-over internet protocol). Phones registered through the previous notification system were automatically transferred to Lookout Alert, but all residents should still check and update their information with Jeffcom regularly. If residents live in areas with poor cell



coverage, they should consider purchasing a landline for the purpose of receiving emergency notifications. Residents near county boundaries are advised to sign up for emergency notifications from adjacent counties as well.



**[Click here to sign up for Lookout Alert](#)**

For more information, visit the Jefferson County Sheriff's Office website on [emergency notifications](#).

**Understand types of emergency notifications:** Residents should also understand the types of emergency notifications they might receive during an incident. In Jefferson County, these are advisory messages and instruction messages, which include pre-evacuation, evacuation, and shelter in place.

Notification Terminology	Jefferson County Sheriff's Office Use Case
Advisory messages	Advisories provide information but do not require any action on your part.
Instruction messages	Instruction messages provide information AND require you to take some action to be safe. There are three types of standard instructions: shelter in place, pre-evacuation, and evacuation.
Pre-evacuation	There is a hazard in your area that may require you to evacuate in the near future. Everyone should be prepared to leave at a moment's notice. <b>If you feel you are in danger and want to leave, do so.</b> If you need additional time to evacuate, you should consider leaving now. If you need to arrange for transportation assistance, you should do so immediately. If you have livestock or other large animals, you should consider removing them from the hazard area now.
Evacuation	There is a hazard in your area, and you have been ordered to evacuate immediately. If you need assistance evacuating yourself or need help evacuating animals, call 911. You may be provided with the safest escape routes known, or directed by Sheriff Office deputies at roadway intersections so make sure you follow the instructions as other routes may be closed or unpassable. You may also be told where an evacuation point has been established to provide information and a safe place if you have nowhere else to go. <b>Do not delay - evacuation means you need to leave immediately!</b>
Shelter in place	There is a hazard in your area, and you should remain or go indoors, not go outdoors, and not evacuate the area. This may be the safest strategy for hazardous materials, law enforcement, or other incidents wherein an evacuation could actually increase the danger to you.

**Develop evacuation plans:** Residents need to prepare a go-bag and family emergency plan **before** the threat of wildfire. Develop specific emergency plans that address unique needs of family members and neighbors with physical limitations who might struggle to evacuate in a timely manner. Parents should work with their neighbors to develop a plan for how to evacuate children that might be home alone.

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 roadways for other residents during a mandatory evacuation. It is important to have a plan for where to take livestock to reduce some of the uncertainty created by wildfire evacuations. FEMA provides [tips](#) for protecting livestock during a disaster. Information on large-animal evacuations in Jefferson County are available on the Jefferson County Sheriff's Office [website](#). See the section **Action 7: County Evacuation Preparedness** for recommendations to the County and partner organizations to support large-animal evacuations. Visit websites from [Rotary Wildfire Ready](#), [Ready.gov](#), [Jefferson County Emergency Management Wildfire Information and Resources](#), and [Ready, Set, Go!](#) to learn more about go-bags and evacuation planning.

**Develop familiarity with egress routes:** Many communities in Jefferson County have the potential to experience evacuation congestion due to the densities of dwellings, limited roadway networks, and prevalence of narrow roadways. Many of these neighborhoods were established in the early- to mid-1900s before developers, planners, emergency managers, and residents had a grasp of wildfire risk in Jefferson County and before population growth boomed across the county. If a community has limited roadways, residents need to be knowledgeable of all potential evacuation routes, even if not the most direct route, and be prepared to leave early during an evacuation.

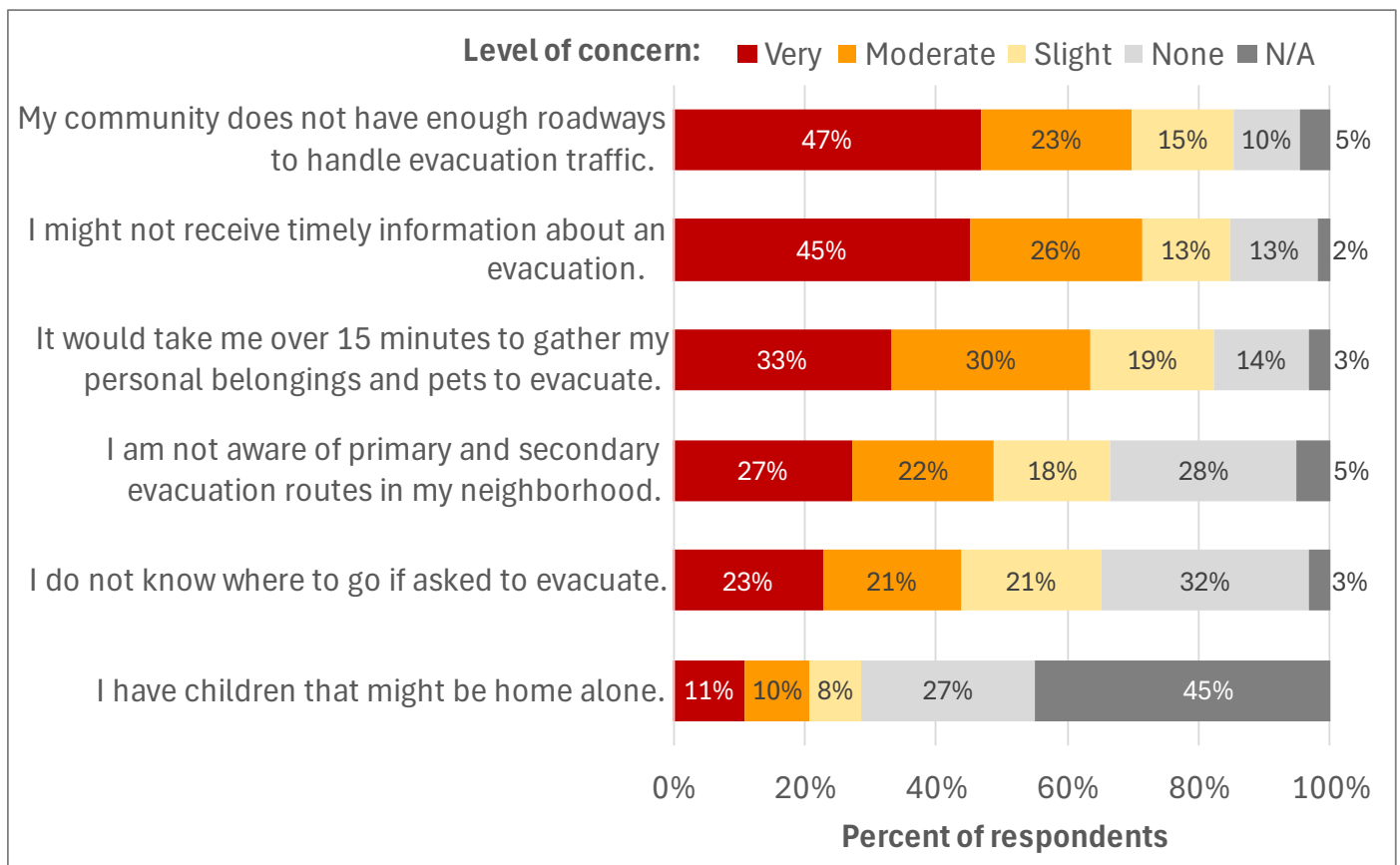
Due to the dynamic and complex nature of wildland fire, it is impossible for the Sheriff's Office to determine pre-scripted evacuation routes. Therefore, residents need to identify several routes they might use during evacuations—routes that allow them to exit their community in different directions and not delay in evacuating if there is a threat in order to reduce traffic congestion. Residents should practice driving on these roadways under various weather conditions and at night. Residents that live in communities with just one roadway in and out are encouraged to leave early when a wildfire is near due to the potential for extra congestion and limited egress options.

**Follow evacuation etiquette:** During a wildfire emergency, residents need to follow evacuation etiquette to increase the chance of everyone exiting their community in a safe and timely manner:

- Leave when you feel unsafe.
- Leave as quickly as possible after receiving an evacuation notice. Failing to leave in a timely manner during a wildfire emergency can put you, your family and first responders at risk.
- 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

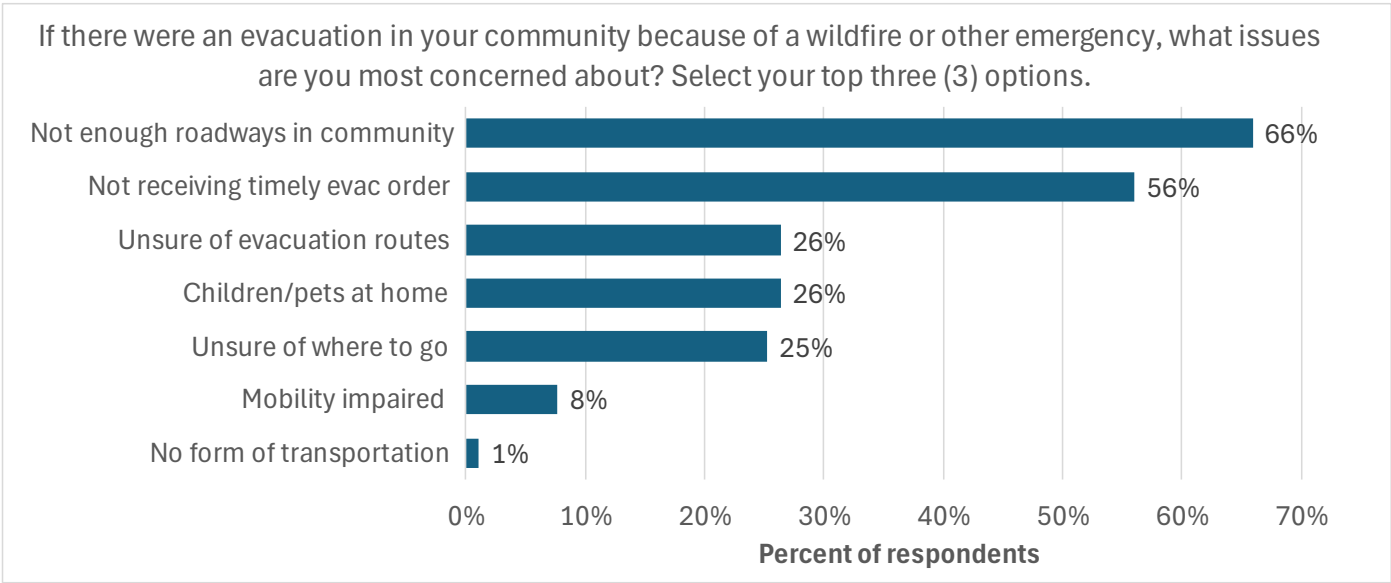
- pictures.
- Yield to emergency vehicles.
- Follow directions of law enforcement officers and emergency responders.

**Improve roadway conditions:** Residents can work with their HOAs or appropriate agencies to pursue opportunities to widen roadways and create pull-outs and to write grants to support roadside fuel mitigation. See the section **Process for Identifying Priority Treatment Areas** for details on how to request roadside fuel mitigation from the county. Understand that the county maintains hundreds of miles of roadways, and not all roadways can be mitigated immediately. The area that needs to be treated along roadways is rarely owned by the County, so treatments would require surveying and agreements with private landowners, utilities companies, and/or public land management agencies.



**Figure 25.** On round 1 of the Together Jeffco survey, residents were asked “If there were an evacuation in the community because of wildfire, how concerned are you about the following issues?” The top concerns of residents were not enough roadways in their community and not receiving timely evacuation orders. See **Appendix C. Summary of Public Feedback** for additional findings about evacuation concerns from the Together Jeffco community surveys and outreach events.





**Figure 26.** On round 2 of the Together Jeffco survey and open houses, top concerns of residents were not enough roadways in their community and not receiving timely evacuation orders, consistent with **Figure 25**.

# RECOMMENDATIONS FOR THE COUNTY AND PARTNERS

Throughout the process of this CWPP, the County identified eight main areas for the County to begin or improve work that would address the most common concerns and issues that community members and the County's partners face. These eight areas and their associated recommendations are detailed out in the sections below and provide a pathway for Jefferson County to lead and support the County's residents and organizations in creating a community that is proactively addressing its risks and ability to bounce back from wildfires.

The following eight main actions are detailed below showing the purpose, need, implementation actions, and benefits of these actions:

1. Create a Wildland Fire Management Program
2. Stand-Scale Fuel Treatments and Ecological Restoration
3. Increase the Judicious Use of Broadcast Prescribed Burning
4. Roadside Fuel Treatments
5. Jeffco Community Wildland Fire Program
6. Slash Management
7. County Evacuation Preparedness
8. Spatial Data Coordination

## Action 1: Create a Wildland Fire Management Program

The recommendations under this action are high priority to the CWPP Advisory Committee, central to the Jeffco Wildfire Safe Initiative recommendation in the 2023 Wildfire Planning Assessment, high priority to the community, recommended by the Jefferson County Wildfire Commission, recommended in the 2024 Jefferson County CWPC report (AP-1, AP-2, AP-3, PC-1, PC-2, PC-3, PC-4), and a priority action in the County's Hazard Mitigation Plan goals 22 and 29.

### ***Purpose and Need***

Jefferson County needs to build capacity within its Wildland Fire Management Program (WFMP), both for fire preparedness and incident response. A comprehensive Wildland Fire Management Program requires sustained investments in staffing, equipment, facilities, and other program components. These investments are crucial for addressing the county's fire risk and for effectively protecting the safety of Jefferson County's citizens. Investments in the wildland fire mitigation aspect of the program should include hiring staff with expertise in fire planning, education and outreach, GIS, technology, and mitigation crews. These staff members would lead or assist partners in implementing strategic risk reduction projects. Additionally, the county should consider staffing fire response crews and acquiring equipment to support fire protection districts and departments with incident response

throughout the county. Investing in mitigation and response crews, as well as equipment, would enhance wildfire response and expand the county's capacity for proactive risk mitigation and other fire prevention components.

In 2023, the county worked with the consulting firm Coreflexion (formerly hrQ) to assess the county's existing wildland fire management program. The assessment made numerous recommendations to build the necessary capacity at the county level. These recommendations addressed organizational structure, staffing, and coordination requirements across county departments and divisions. Since then, a new position has been added to the county WFMP, with renewed emphasis on placing the program within the Emergency Services Section of the Sheriff's Office. Additional investments are needed to ensure the program's operational status and to support the action items recommended in this CWPP.

Furthermore, funding for the program must be permanent and sustainable, providing competitive wages to attract qualified and committed employees. The wildland fire environment is highly structured and demands specific skills and qualifications that take many years to acquire. Recent challenges in recruiting and retaining staff have affected many state and federal agencies due to high job demands, non-competitive compensation packages, and the extensive experience required. Consequently, relying on grant funding alone will limit the county's ability to attract the necessary personnel and to commit to mitigating fire risk and responding to incidents effectively.

A comprehensive Wildland Fire Management Program involves many facets, including wildland fire incident response, comprehensive fire mitigation and response planning, risk mitigation work, fire education and outreach programs, and partner engagement and support. Within Jefferson County, there are multiple existing programs addressing risk mitigation and wildfire response, but these are managed by different county departments (e.g., Open Space with the Sustainable Lands and Safer Homes (SLASH) program, Building and Planning & Zoning with WUI building codes, and Road & Bridge and Transportation & Engineering with travel corridor and evacuation route impacts). The proposed organization would build capacity and administrative functions within the Sheriff's Office, Emergency Services Section to lead and oversee the county's Wildland Fire Management Program. The proposed Wildland Fire Management organization would not result in moving any existing county programs into the Emergency Services Section, but proposes that this section would have the capacity to facilitate and coordinate various components of a comprehensive fire management program under its leadership. This approach was also part of the 2023 Wildfire Planning Assessment and is supported by the operational models of neighboring counties.

In addition, the WFMP positions should be filled as permanent full-time positions which reflects the year-round nature of the work and aligns with the trend among state and federal agencies to build a competent, reliable, and professional workforce. Facilities are another important component and necessary aspect to building a successful and effective program. Facility needs to support the WFMP should be incorporated into current Emergency Services Section (ESS) program needs, which is taking a comprehensive "All-Hazards" approach to designing office space and facilities (Emergency



Operations Center, warehouse, indoor vehicle storage, workshops, etc.) to meet the full needs of the Wildland Fire Management Program.

## **Recommendations**

The county WFMP would benefit most, and be in a position to support its partners best, if the program were staffed in its entirety immediately. Given the fire risk, challenges, and needs across Jefferson County, a stable, capable and effective program would be able to take immediate actions and support the action items identified in this CWPP to help mitigate fire risk and coordinate with FPDs and other land management agencies to build an effective and efficient Wildland Fire Management Program in the near term. Positions identified in this proposal represent a starting point and minimum qualified staff to support the WFMP. Positions identified as part of this program are linked to additional action items to highlight the role and support function they would play. Alternatively, given budget, hiring and other constraints, the program could be developed in phases over a three-year process as identified below:

### **Phase 1: Building Risk Mitigation Implementation Capacity**

Objective: Establish foundational elements for risk mitigation and fire response.

- Staffing:
  - Hire an additional FMO to oversee the implementation of risk mitigation strategies and program management. This position would also add capacity during fire season when complex or multiple incidents occur and be in a position to better support the FPDs and other fire response agencies within the county.
  - Hire one Fire Prevention, Mitigation & Education Specialist to focus on fire prevention strategies and mitigation planning. This position would also take a leadership role in the development and oversight of the Jeffco Community Wildland Fire Program (Action Item 5).
  - Hire an eight-person wildfire risk mitigation crew to support partner work and carry out on-the-ground mitigation work. This would directly support work in Action Items 2, 3, 4 and 5.
  - Hire a four-person wildland fire engine (type 6) crew for both fire mitigation and fire response actions. This would directly support work in Action Items 2, 3, 4 and 5.
- Equipment:
  - Purchase necessary gear for the engine and mitigation crews. A non-exhaustive list of gear includes: Nomex shirts and pants, hats, gloves, and other personal protective equipment; line packs, fire shelters, and first aid kits; radios, satellite phones, computers, and tablets; hand tools, chainsaws and maintenance equipment, and drip torches.
- Vehicles:
  - Purchase administrative and crew support vehicles to support field operations.
  - Purchase a Type 6 wildland fire engine to support both fire response and mitigation efforts. Depending on the crew size and work, an additional crew truck or a utility task vehicle (UTV) may be necessary.

- Purchase mitigation equipment such as a chipper, skid-steer with masticating head, trailers and other support vehicles and equipment.

### ***Phase 2: Expanding Administrative and Specialist Roles***

Objective: Enhance program capabilities through the addition of specialized administrative and technical staff.

- Staffing:
  - Hire a GIS Specialist to manage geospatial data and support county response mapping needs. This position would take a lead role in supporting Action Item 8 and also expand County Emergency Services Section all-hazard response and coordination.
  - Hire a Fire Planner and Recovery Specialist to develop recovery plans and integrate them into overall fire management strategies. This position would take a lead role in supporting Action Items 2, 3, 4, 5, and 7. The position would also be critical to supporting FPDs throughout the county in their fire risk mitigation planning and CWPP revision efforts.
- Equipment:
  - The GIS Specialist may need a special computer and technology for geospatial analysis.
- Vehicles:
  - Purchase administrative and crew support vehicles to support field operations.

### ***Phase 3: Fulfilling the Program's Potential***

Objective: Complete the program's setup with additional risk mitigation capacity.

- Staffing:
  - Hire a second eight-person mitigation crew to increase the program's capacity for mitigation and response.
- Equipment:
  - Purchase additional personal protective equipment, tools and gear to support the second mitigation crew.
  - Consider purchasing a second chipper and support equipment for mitigation work.
- Vehicles:
  - Purchase crew support vehicles to support field operations.

Each phase will build upon the previous one, ensuring a structured and scalable development of the Wildland Fire Management Program.

## Action 2: Stand-Scale Fuel Treatments and Ecological Restoration

The recommendations under this action are high priority to the CWPP Advisory Committee, high priority to the community, recommended in the 2024 Jefferson County CWPC report (PC-2 and PC-3), aligns with the Jefferson County Open Space 2022 Forest Health Plan Wildfire Risk Priorities, and a priority action in the County's Hazard Mitigation Plan goal 10.

### ***Purpose and Need***

Fuel treatments are a management tool for both public and private landowners that reduce wildfire hazard by decreasing the amount and altering the distribution of wildland fuels. Common goals of 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 tree thinning, pruning, pile burning, broadcast prescribed burning, and fuel mastication.

Ecological restoration is the process of assisting the recovery of an ecosystem that has been damaged, degraded, or destroyed (SER, 2004). Many forests in the western United States have been degraded because of changes to their historical fire regimes following Euro-American colonization.

In some cases, fuel treatments can achieve both ecological objectives and wildfire risk reduction. Restoration treatments in dry mixed-conifer and ponderosa pine forests tend to achieve both fuel treatment and ecological restoration objectives. In contrast, 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 most forest types. Mowing grasslands to reduce fuel load might reduce potential flame lengths but will not restore short-grass prairie ecosystems without also conducting regular prescribed burns and seeding with native species. More information on Stand-Scale Fuel Treatment Effectiveness and Methods can be found in Appendix D.

The proposed Fire Planner and Recovery Specialist position identified in Action Item 1 would play a lead role in helping the county and its partners identify, prioritize, plan and facilitate implementation of stand scale fuel treatments. This position would facilitate the counties efforts to bring partners together for treatment prioritization as identified below. With county leadership facilitating this work, it would help build efficiencies and effectiveness in risk mitigation work across the county regardless of jurisdiction or responsibility.

Strategically located, high-quality fuel treatments can create tactical options for fire suppression (Jolley, 2018; Plucinski, 2019; Reinhardt et al., 2008). Fuel treatments along trails, ridgelines, and other features can allow firefighters opportunities to use direct or indirect suppression techniques to contain fire spread. 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).



Strategic fuel treatments, in tandem with work by individual residents to mitigate hazards in their structure ignition zone, can help protect life and property. Land management agencies in and around Jefferson County are actively reducing wildland fuels (**Figure 20**), and the fire and fuel management community are using the concept of potential operational delineations (PODs) to guide the strategic placement of treatments (see more information on PODs in Appendix D). Based on responses to the CWPP survey for Jefferson County, many residents are supportive of fuel treatments and engaged in work to mitigate wildfire risk across Jefferson County:

- 60% of residents believe removing trees is necessary for wildfire protection on their property.
- 59% of residents agree that removing trees along roadways is necessary to enhance safety of evacuation
- 56% of residents are supportive of pile burning and 73% of broadcast prescribed burning when done with care by trained professionals (see all survey results in **Appendix C. Summary of Public Feedback**).

### ***Process for Identifying Priority Treatment Areas***

**Responsible parties:** Jefferson County Sheriff's Office to organize the meetings with participation of other County departments and partner agencies. Implementation responsibility will vary by project.

The County will convene an annual meeting (more frequent if needed) with partners to assess the availability of funding and resources and determine County-level fuel treatment priorities for the coming year. These will include stand-scale treatments, roadside treatments, and other strategic linear fuel treatments. The outcomes of these annual meetings will be a list and/or map of priority project locations for work and acquiring funding in the coming year, lead agencies involved in the work, treatment types, and plans for how to coordinate, fund and accomplish those projects.

The purpose of developing annual county-level priorities is to determine where the County will dedicate its resources to support treatments, which might include financial support or on-the-ground assistance with project implementation.

The prioritized list will also serve as a resource to pre-identify collective partner support for new and on-going grant opportunities. Partners should still utilize their own planning documents and processes to guide local project priorities and implementation, for example CWPPs for fire districts and the Forest Health Plan for Jefferson County Open Space. This meeting is a chance for coordination across agencies to strategically link projects, coordinate efforts, increase efficiencies and effectiveness, share resources, and maximize treatment impacts on the landscape.

### **Sources of information for prioritizing stand-scale fuel treatments and ecological restoration:**

- Relative wildfire risk, structure exposure, and impacts to HVRAs by regional action areas / PODs and relative post-fire effects by HUC12 watershed (Figure 18).
- Priority landscapes and project areas identified by FPDs, collaborative groups, and local,

state, and federal agencies (Figure 28). All involved participants will provide spatial information on treatments they have conducted and those they plan to conduct to Jefferson County Sheriff's Office prior to the meeting. Updating and maintaining GIS data is another priority action in this CWPP, and details of this process need to be worked out by various Jefferson County agencies (see Action 7: Spatial Data Coordination).

- Locations of overlap among partner priorities, as well as areas with high wildfire risk that are not currently prioritized by partners (Figure 29).
- Locations of HVRAs that could be exposed to damaging radiant heat and/or short-range embers and might benefit from stand-scale fuel treatments or targeted SIZ mitigation (Appendix B, Figure B.11).
- Annually updated maps of completed fuel treatments (Figure 20).
- Potential treatment suitability based on vegetation type, slope, and distance from homes (Figure 30).

**Partners to involve in the prioritization process:**

- |  |  |
|--|--|
| <ul style="list-style-type: none"> <li>• Jefferson County Sheriff's Office</li> <li>• Jefferson County Open Space</li> <li>• Fire protection districts</li> <li>• Denver Mountain Parks</li> <li>• Jefferson Conservation District</li> <li>• Upper South Platte Partnership</li> <li>• Clear Creek Watershed &amp; Forest Health Partnership</li> <li>• Coalition for the Upper South Platte</li> </ul> | <p>Partnership</p> <ul style="list-style-type: none"> <li>• Northern Colorado Fireshed Initiative</li> <li>• Central Colorado Forest Collaborative</li> <li>• U.S. Forest Service</li> <li>• Denver Water</li> <li>• Jefferson County Road &amp; Bridge</li> <li>• Colorado State Forest Service</li> <li>• Utility companies; specifically power companies</li> </ul> |
|--|--|

**Meeting logistics:**

Meetings could be held every January so projects can be discussed and prioritized in time to submit applications for funding from the Colorado Strategic Wildfire Action Program (COSWAP), Forest Restoration and Wildfire Risk Mitigation (FRWRM) grant program, and other funding opportunities. Ahead of the meeting, attendees would need to submit GIS data of their completed fuel treatments and planned treatments to Jefferson County Sheriff's Office. This CWPP recommends that relevant Jefferson County departments create a Jefferson County Spatial Data Technical Group that can create a workflow for submitting standardized GIS data to inform planning processes (see the section **Action 8: Spatial Data Coordination**). At this time, a discussion of capacity, gaps, and resources may be helpful in guiding the coming year's actions.

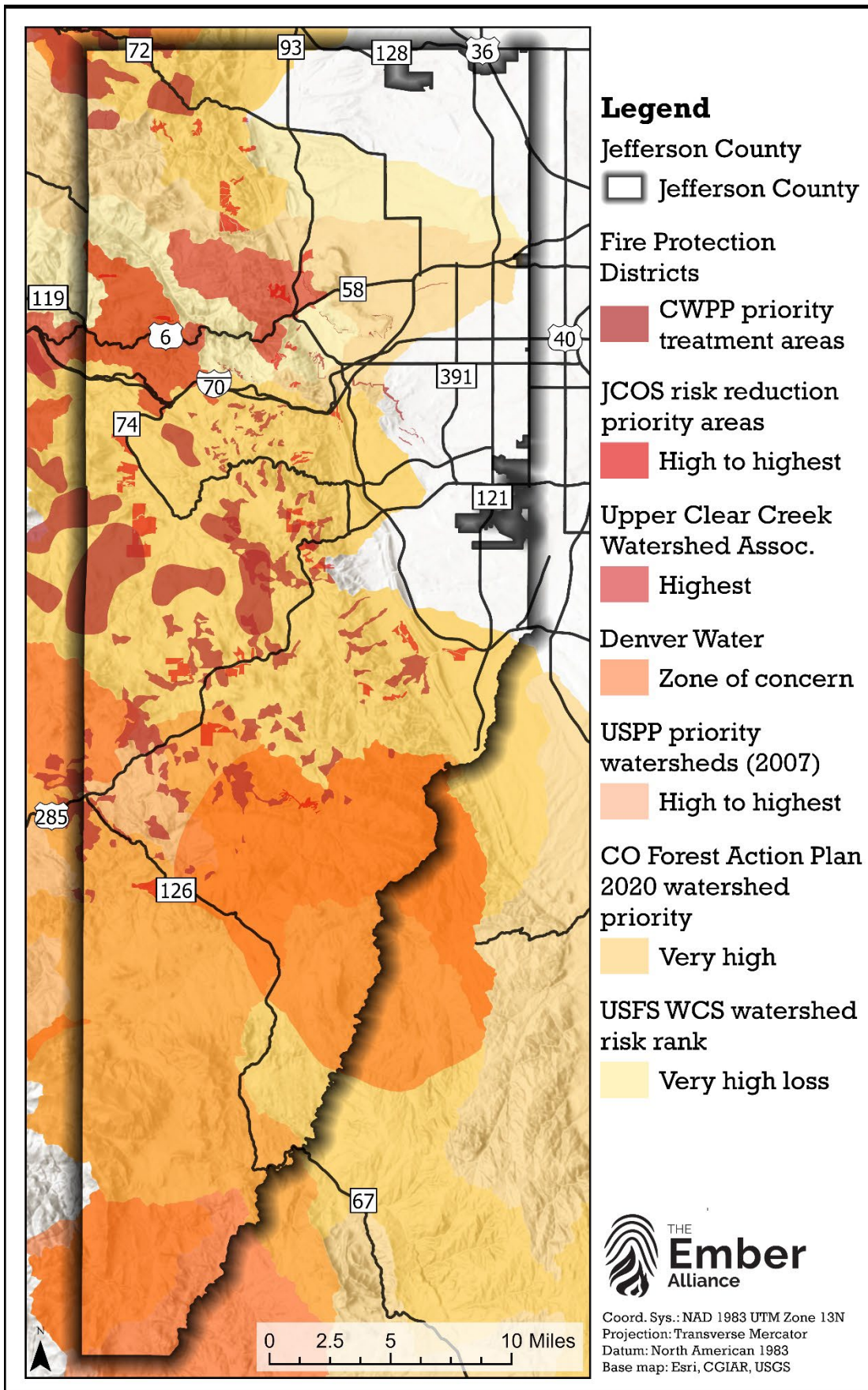
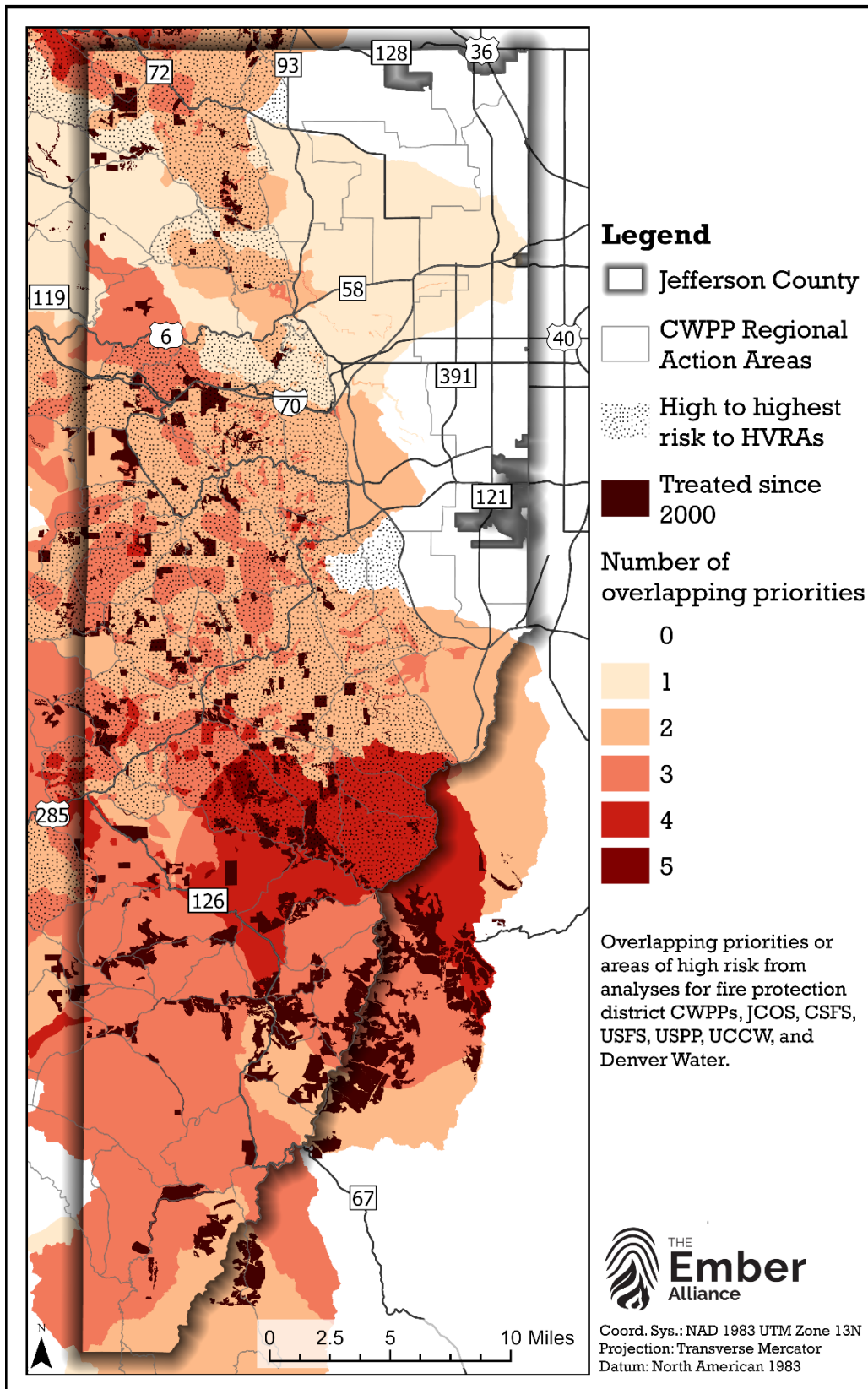
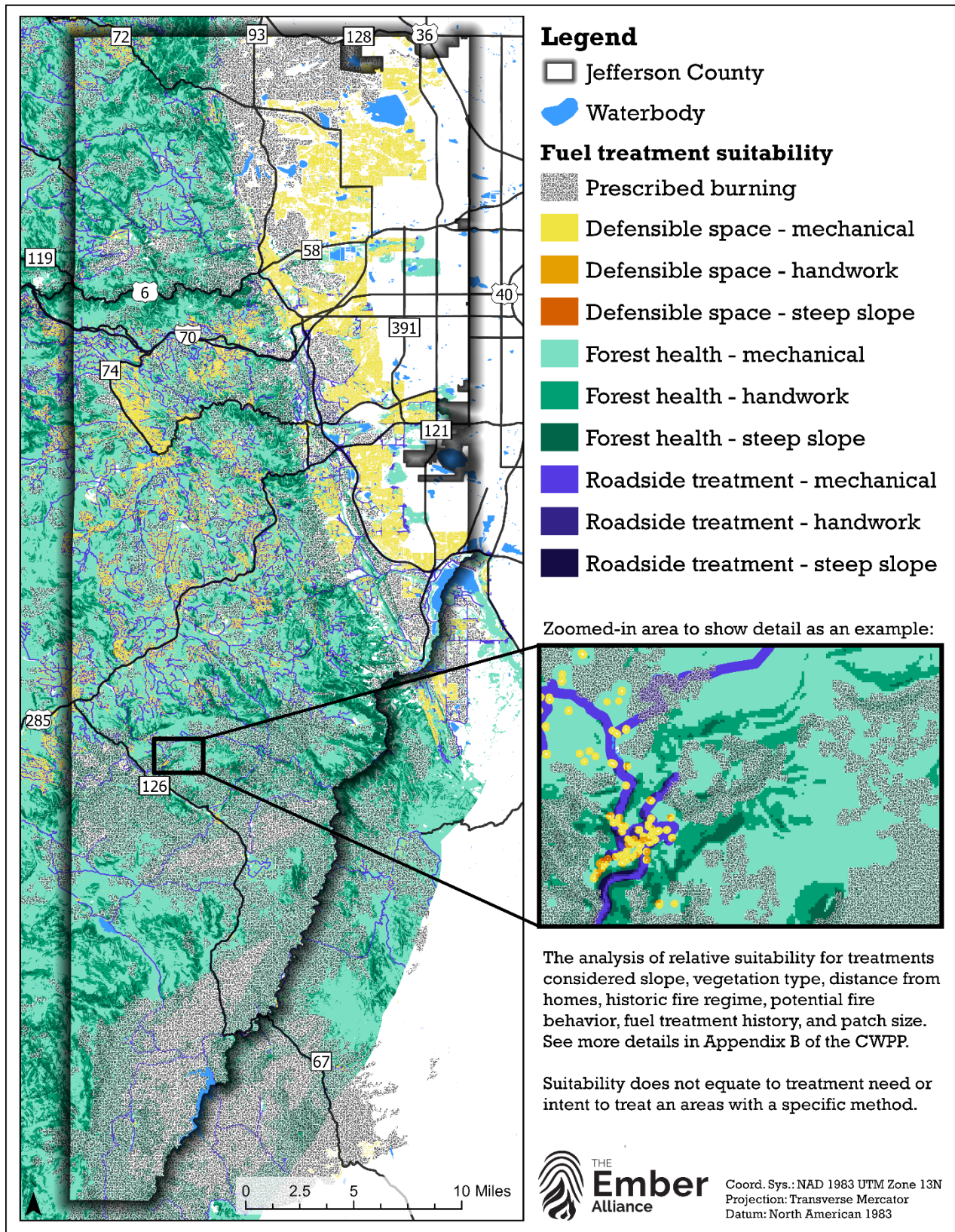


Figure 27. Priority landscapes or treatment locations for various partners operating in Jefferson County.





**Figure 28.** Areas of overlapping priorities for FPDs, Jefferson County Open Space, CSFS, USFS, USPP, UCCW, and Denver Water overlaid by areas that have been treated since 2000 and those with high to highest risk to HVRAs. This map can assist with County-level prioritization planning by depicting areas of common interest as well as areas that have high risk but have not been prioritized.



**Figure 29.** Suitability of land for different treatment types based on slope, vegetation type, distance from homes, historic fire regime, potential fire behavior, fuel treatment history, and patch size. Suitability for grazing is not included. See more details in **Appendix B. Risk Assessment Methodology**. Suitability does not equate to treatment need or intent to treat an area with a specific method.



## Action 3. Increase the Judicious Use of Broadcast Prescribed Burning

The recommendations under this action are high priority to the CWPP Advisory Committee, high priority to the community, recommended in the 2024 Jefferson County CWPC report (PA-2 and PA-3), aligns with the Jefferson County Open Space 2022 Forest Health Plan Prescribed Fire Opportunities, and is a priority action in the County's Hazard Mitigation Plan goal 10.

### *Purpose and Need*

As described in the section **Treatment Methods**, broadcast prescribed burning is an essential part of a wildfire mitigation and forest health management plan for ecosystems in Jefferson County. Many grasslands, shrublands, and ponderosa pine and dry mixed-conifer forests in this area historically experienced frequent, low intensity fires and require the regular disturbance of fire to reduce fuel loads, recycle nutrients, promote the regeneration of fire adapted trees and understory plants, and create important habitat for some wildlife species. An analysis by CFRI for the Jefferson County Open Space Forest Health Plan found that broadcast prescribed burning alone and/or following thinning could reduce wildfire risk and maintain healthy long-term conditions for forests over a greater area of Jefferson County than the use of thinning alone (JCOS, 2022).



Broadcast prescribed burning is a critical management tool for restoring ecosystem processes and reducing fuel loads. Photo credit: The Ember Alliance.

Qualified firefighters can safely conduct prescribed burns with proper planning and implementation, even in the WUI (Hunter et al., 2007). Life safety is always a top consideration when developing and conducting prescribed burns. Less than 1% of prescribed burns escape containment lines, and most of these are rapidly suppressed (Weir et al., 2019). Unfortunately, the 2012 Lower North Fork Fire was a



tragic example of an escaped prescribed burn that exceeded containment efforts. The wildland fire community soberly reviews prescribed burn escapes, such as the Lower North Fork Fire, to improve prescribed burn policies and procedures and reduce the likelihood of future escapes (Dether, 2005).

Broadcast prescribed burning is carefully regulated in Colorado by the Division of Fire Prevention and Control, the Colorado Department of Public Health and Environment, local sheriff's offices, and fire departments as outlined in the [Colorado Prescribed Burning Act of 2013](#) and the [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 National Wildfire Coordinating Group.

While an important management tool, broadcast prescribed burning is also challenging. Some years, there are few opportunities to conduct burns because of adverse weather or environmental conditions such as drought, and sometimes firefighters are on wildfire assignments and unavailable to conduct burns. Burning in the WUI is complex due to public concerns about risks from flames, embers, and smoke. However, 73% of residents who responded to the CWPP surveys support broadcast prescribed burning in Jefferson County to mitigate wildfire risk (see **Appendix C. Summary of Public Feedback**).

## ***Recommendations***

**Responsible Parties:** Jefferson County Sheriff's Office, Jefferson County Open Space, FPDs, JCD, Denver Mountain Parks, and the Colorado Division of Fire Prevention & Control

- Jefferson County Sheriff's Office should hire an individual qualified as a prescribed burn boss 2 (RXB2) to help FPDs write, review and implement burn plans. Many FPDs have qualified individuals to assist with broadcast prescribed burns but lack personnel with the RXB2 qualification. Additionally, as part of a comprehensive county wildland fire management program, additional investments in staffing and equipment capacity in support of prescribed fire application qualifications should be pursued.
- Jefferson County Sheriff's Office should remain engaged in state-wide efforts to address barriers associated with prescribed fire application by participating in the State Wildfire Commission's prescribed fire subcommittee, and advocate for legislative solutions to support and encourage the use of prescribed fire as a forest restoration and fire risk reduction tool by working with partners and legislators to find solutions to common prescribed fire issues such as liability insurance.
- Jefferson County Open Space should continue coordinating with Jefferson County Sheriff's Office to reestablish the use of broadcast prescribed burning as a management tool—a desired future condition identified in the Jefferson County Open Space Forest Health Plan. From 1999 to 2012, Jefferson County Open Space routinely conducted broadcast prescribed burns with CSFS, but this practice ceased after the 2012 Lower North Fork Fire. Barriers to the ability of Jefferson County Open Space to engage in broadcast prescribed burning are a lack of trained and qualified staff and administrators and limited staff to engage in outreach and education with the public before, during and after burns. To address these barriers, Jefferson County Open Space could begin with lower complexity burns to build internal

capacity and external partnerships. Trained individuals with Jefferson County Sheriff's Office and FPDs could help conduct burns on Jefferson County Open Space properties with support from agencies such as the Colorado Division of Fire Prevention & Control and the U.S. Forest Service. Jefferson County Open Space would also need to hire and train staff to be qualified and experienced in conducting prescribed burns in these landscapes, coordinate with Jefferson County Sheriff's Office personnel to prepare burn plans and apply for burn and smoke permits, and increase the amount of outreach they do with neighboring landowners, residents, and recreators to build trust and awareness about broadcast prescribed burning.

- Engage in robust communication outreach months before conducting broadcast prescribed burns to communicate the purpose of the burn, outline safety measures in place, and provide information on how to reduce health effects of smoke. Follow-up with residents the week before and day before a burn, every day of the burn, and when the burn is complete. Utilize social media, electric sign boards, and other communication tools.
- Provide educational resources to citizens on how to mitigate air quality impacts from prescribed burns and how to obtain air quality sensors and air purifiers to mitigate smoke impacts during broadcast prescribed burns if they have health concerns.
- JCD should serve as a bridge between landowners of large private properties and groups of neighboring properties to connect them with prescribed fire practitioners and to encourage the judicious use of broadcast prescribed burning. JCD can help communicate with landowners that broadcast prescribed burning is both a forest health and fire mitigation action and a maintenance tool for restoration investments.
- JCD, in combination with other county and state prescribed fire oversight agencies, should work with landowners interested in becoming a certified burner or explore agreements and other mechanisms that would allow for agency support of prescribed fire application on private lands.
- The Jefferson County Sheriff's Office and Jefferson County Open Space should understand and recognize the distinction between broadcast prescribed burning and cultural burning<sup>4</sup>, and they should recognize the sovereignty and rights of Tribes to conduct cultural burning. Jefferson County lies in the ancestral lands of the Arapaho, Ute, and Cheyenne Tribes. Offer assistance with burn planning and implementation if requested by Tribes. Engage Tribes in broadcast prescribed burning on Jefferson County Open Space properties as opportunities for collaboration and partnership building. Review the Good Fire II report written by the Karuk Tribe for more insights about barriers to cultural burning and meaningful ways to support change so Tribes and cultural fire practitioners can engage in the use of cultural burning.

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<sup>4</sup> As described in the [Good Fire II](#) report written by the Karuk Tribe, "cultural burning is separate and distinct from prescribed fire. While both forms of beneficial fire are essential to restoring resiliency to the landscape, cultural burning has history, motivation, and meaning which includes but also goes beyond wildfire protection benefits to include highly sophisticated ecological and cultural benefits."

## Action 4: Roadside Fuel Treatments

The recommendations under this action are high priority to the CWPP Advisory Committee, high priority to the community, recommended in the 2024 Jefferson County CWPC report (PA-2, PA-3, RU-1), and a priority action in the County's Hazard Mitigation Plan goals 6, 10, 20 and 23.

### ***Purpose and Need***

Conditions along roadways must be safe during wildfires for residents and first responders. Some neighborhoods in Jefferson County have limited roadway networks, and there is a potential for heavy congestion during evacuations. Many roadways throughout the county are lined with dense vegetation that could create hazardous conditions. Dead trees could fall across roadways and block traffic, and dense vegetation on steep slopes could fuel intense wildfire.

Treatments along roadsides are needed to:

- Dramatically reduce or eliminate surface and canopy fuels.
- Reduce the likelihood of hazardous conditions along roadways during wildfires.
- Create tactical opportunities for suppression.
- Increase the visibility of structures from roadways to assist wildland firefighters.

More information on **Roadside Fuel Treatment Methods** can be found in Appendix D.

### ***Process for Identifying Priority Treatment Areas***

**Responsible parties:** Jefferson County Sheriff's Office to organize the meetings with participation of partner agencies. Implementation responsibility will vary by project.

As described in Action 1, the County will convene an annual meeting with partners to assess the availability of funding and resources and determine County-level fuel treatment priorities for the coming year. These will include stand-scale treatments, roadside treatments, and other strategic linear fuel treatments. The outcomes of these annual meetings will be a map of priority project locations, lead agencies involved in the work, treatment types, and plans for how to fund and accomplish those projects.

### **Sources of information for prioritizing roadside fuel treatments:**

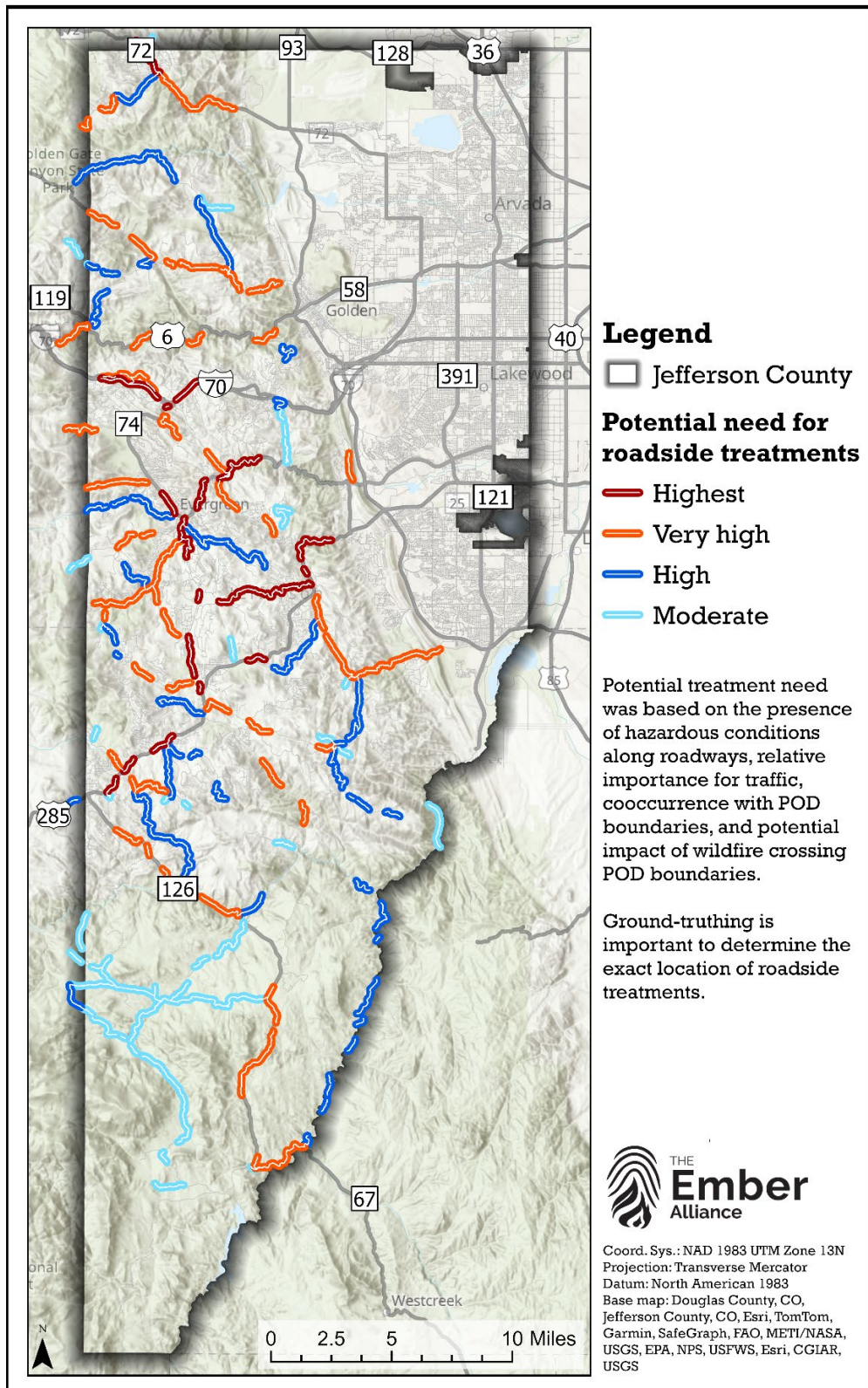
- Potential need for roadside fuel treatments based on the presence of hazardous conditions along roadways, relative importance for traffic, cooccurrence with POD boundaries, and potential impact of wildfire crossing POD boundaries (**Figure 30**; see methods in **Appendix B. Risk Assessment Methodology**). Consider fuel pathways that cross roadways, such as irrigation ditches and wildlife crossings.
- Annually updated roadside treatment priorities from FPD-level CWPPs (**Figure 31**). FPDs will provide spatial information on treatments they have conducted and those they plan to conduct to Jefferson County Sheriff's Office prior to the meeting. Updating and maintaining GIS data is another priority action in this CWPP, and details of this process need to be worked out by various Jefferson County agencies (see **Action 8: Spatial Data Coordination**).



- Annually updated roadside treatment priorities from other agencies like the U.S. Forest Service and collaborative groups like the Northern Colorado Fireshed and Central Colorado Forest Collaborative.
- Regularly updated areas of resident concern (**Figure 31**). Residents can follow the process outlined below to work with their FPD and share areas of concern with the County.
- Annually updated maps of overlap between treatment needs, partner priorities, and resident concerns (**Figure 32**).
- Annually updated maps of completed fuel treatments (**Figure 20**).

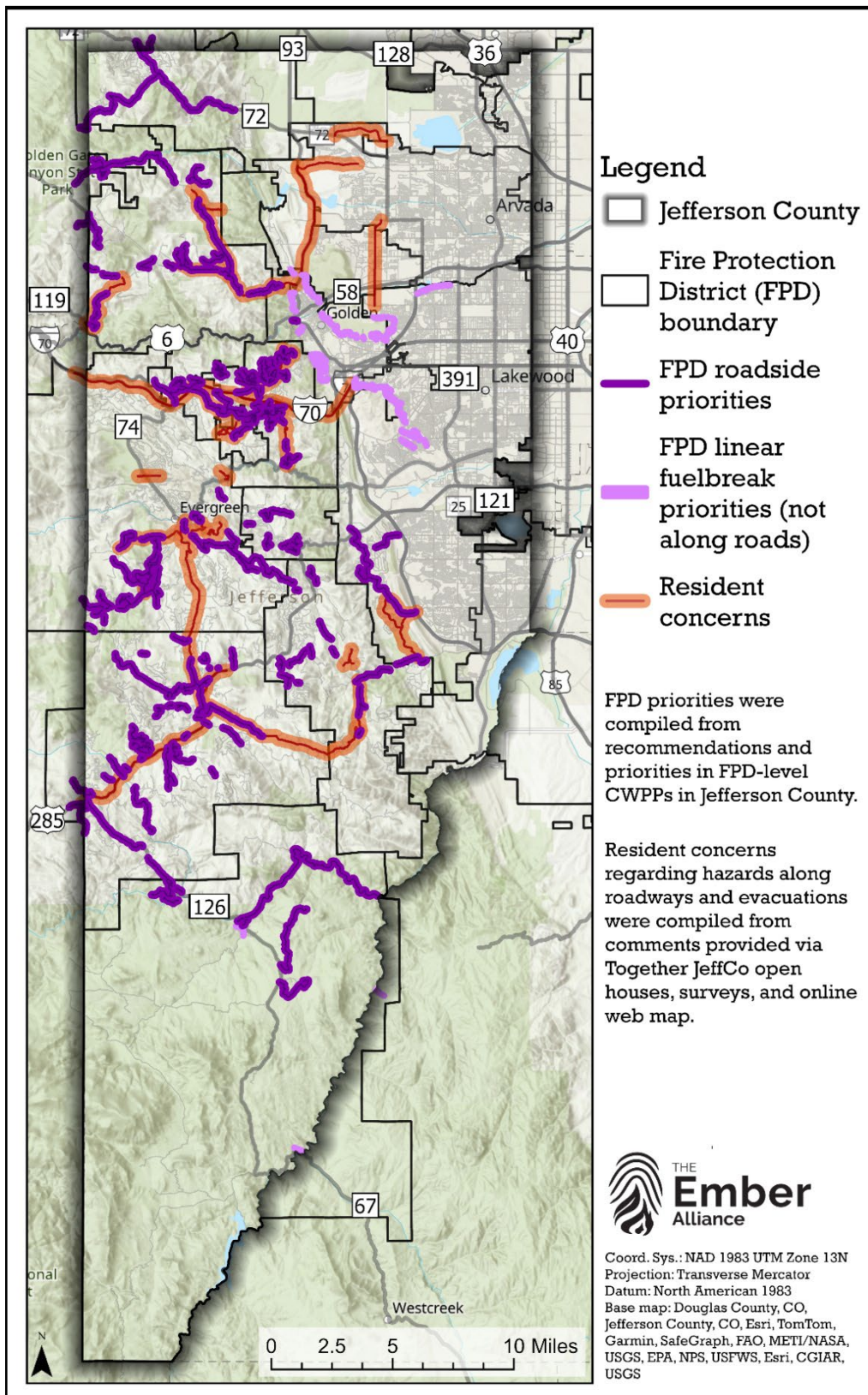
**Partners to involve in the prioritization process:**

- Jefferson County Sheriff's Office
- Jefferson County Open Space
- Jefferson Conservation District
- Jefferson County Road and Bridge
- Jefferson County Transportation and Engineering
- Fire protection districts
- Local road associations
- Colorado Department of Transportation
- U.S. Forest Service



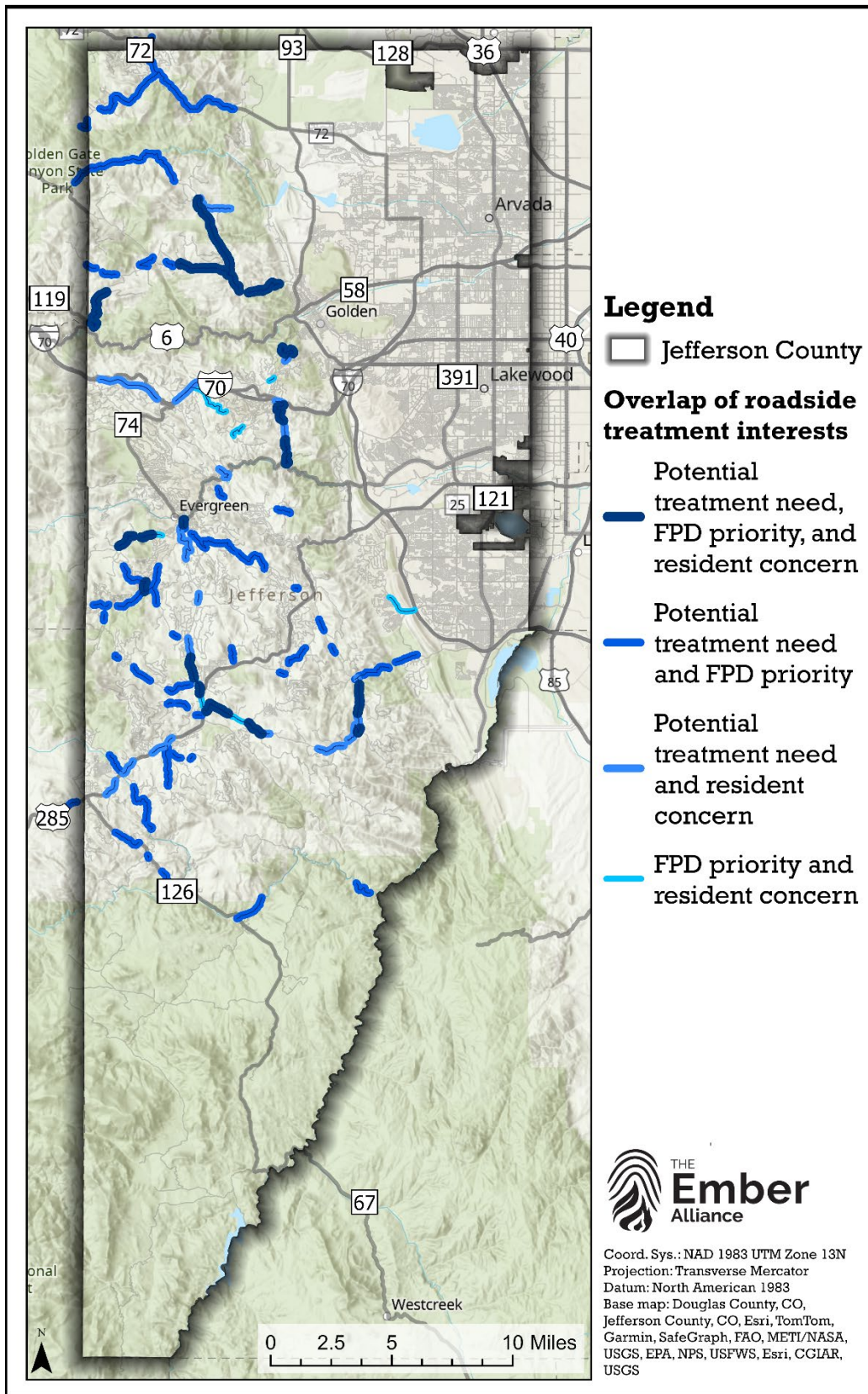
**Figure 30.** Potential need for roadside fuel treatments was based on the presence of hazardous conditions along roadways, relative importance for traffic, cooccurrence with POD boundaries, and potential impact of wildfire crossing POD boundaries (see methods in **Appendix B. Risk Assessment Methodology**). On-the-ground assessments are vital to verify the need for roadside fuel treatments and to develop specific plans for mitigation.





**Figure 31.** Locations of roadside and linear fuel treatment priorities for FPDs in Jefferson County based on their most recent CWPPs and areas of resident concern regarding roadways conditions as compiled from Together Jeffco open houses, surveys, and online web map. These locations can be regularly updated to assist with annual roadside fuel treatment prioritization in the county.





**Figure 32.** Locations of overlap between the assessment of potential roadside treatment need (Figure 30), FPD roadside treatment priorities, and resident concerns (Figure 31). These locations can be regularly updated to assist with annual roadside fuel treatment prioritization in the county.

## ***Process for Residents to Request Roadside Treatments***

Resident concern and engagement with wildfire mitigation is essential to success. When residents are concerned about the conditions along the roadways near their land, they should consult their local fire protection district's CWPP to see their district's priorities. Residents can follow up with their community ambassadors, road association, and neighbors to address their concerns and mitigate along the roadways.

Residents can also reach out to their local fire protection district to discuss their concerns. When it is necessary, the fire districts can elevate these concerns to the County and other partners during the annual priority meeting discussed above. It is important to remember that the County and their partners have limited resources and will direct those resources to the places that have the highest risk and need first.

## **Action 5: Jeffco Community Wildland Fire Program**

The recommendations under this action are high priority to the CWPP Advisory Committee, high priority to the community, part of the Jeffco Wildfire Safe Initiative in the 2023 Wildfire Planning Assessment, recommended by the Jefferson County Wildfire Commission, recommended in the 2024 Jefferson County CWPC report (AP-1, AP-2, AP-3, RU-1, RU-2, RU-3, PC-1, PC-2, PC-3, PC-4), and a priority action in the County's Hazard Mitigation Plan goals 22 and 29.

### ***Purpose and Need***

Among the partner recommendations and community needs identified throughout the CWPP process, there is a consistent demonstrated need and desire for multiple types of support for residents and community leaders that work with residents on wildfire mitigation. To ensure a well-rounded and multi-prong approach to Jefferson County's support of resident mitigation work, a program should be established that encompasses and is responsible for all of the recommended actions related to supporting resident mitigation and preparedness. For the purposes of this document, we will refer to this program as the Jeffco Community Wildland Fire Program, though a formal name may be changed/adopted later.

The Jeffco Community Wildland Fire Program's mission will be to provide wildfire risk mitigation and preparedness education, support, and resources to residents and community groups within Jefferson County. This program will also lead in supporting and coordinating inter-departmental/division planning and implementation work related to risk mitigation activities throughout Jefferson County. The design of this program pulls from existing programs in other communities such as Boulder and Larimer Counties' Wildfire Partners programs, Grand County Wildfire Council, Eagle County Wildfire Collaborative, and others in the state.

The Jeffco Community Wildland Fire Program will be housed within the Jefferson County Sheriff's Office Emergency Services Section, within the proposed Wildland Fire Management Program.

### ***First Year Program Tasks:***

## **Acquire Funding**

**Responsible parties:** Jefferson County Sheriff's Office

Funding for this program will need internal County support for sustainability and continuity of service, but can be supported by external grants and funding sources to build out the programs and service offerings.

Initial funding needs to cover the Fire Prevention and Mitigation Specialist position identified in Action Item 1 for the first year, then additional staff to support home assessments, grant management, and enforcement as those sections of the program are developed. Other funding may need to include outreach and education materials, training, and services such as chipping or slash hauling.

## **Hire Staff**

Responsible parties: Jefferson County Sheriff's Office

The proposed Wildland Fire Management Program recommends one Fire Prevention, Mitigation & Education Specialist that serves under the Wildland Fire Program Manager. This staff will manage the creation and execution of the Program. Additional staff may be needed later in the program's development.

## **Adopt a Comprehensive WUI Code**

**Responsible parties:** Jefferson County Board of County Commissioners, Jefferson County Sheriff's Office, Jefferson County Planning & Zoning (JCP&Z)

This action is intended to address new developments and significant remodels. It may be applied to existing structures if the County chooses to adopt the code with that zoning and enforcement goal. Codifying structure hardening and SIZ mitigation can encourage adoption of the practice and provide landlords an incentive to implement these practices, thereby protecting renters. Incorporate the WUI regulations as outlined in the CWPC 2024 report (coming out in late 2024) created for the County into updated building and land use regulations. Consider amending the code recommendations to match current research recommendations, if they do not (Maranghides et al., 2022):

- Home and structure building setbacks should be structure-centric, not parcel-centric. Cross-boundary structure separation should always be a consideration.
- Existing high-density housing areas should prioritize structure hardening as opposed to further distances of SIZ mitigation.
- New high-density developments should have well-mitigated SIZs and buildings that are extremely resistant to ignition. They should have HOAs or other forms of financial and regulatory collaboration set up to maintain community wildfire protection.
- Replace wooden fences with noncombustible materials and keep at least 8 feet away from the home. Keep double-wide fences at least 20 feet away from the home (see [research](#) from the National Institute of Science and Technology for more information). Wood fences can serve as pathways for wildfire to travel between vegetation and structures and from structure to structure.



- Utilize the new WUI map in this CWPP to implement building and planning requirements within different areas of the WUI. Implement all recommendations from CPWC, such as structure hardening and structure ignition zone mitigation. Consider expanding the requirements to cover roadway accessibility and water availability in new subdivisions.

### ***Connect Short-Term Rental Certification to Short-Term Rental Permitting***

**Responsible parties:** Jeffco Community Wildland Fire Program, JCP&Z

This action is intended to address existing buildings. Short-term rentals (STR) are home or apartment rentals that are leased for 30 days or less at a time, usually called vacation rentals, Airbnb's, or VRBOs. Local governments have struggled to regulate short-term rentals; a study published in 2018 found that 20% of short-term rentals in the U.S. did not have smoke detectors and 58% didn't have fire extinguishers (Kennedy et al., 2018). Visitors are often unaware of the risks that come with their vacation location. Short term rentals without SIZ mitigation, clearly defined escape routes, or basic fire safety measures put visitors and neighbors at high risk in the event of a wildfire. Through its adoption of a short-term rental licensing program, the County can incorporate recommended WUI regulations into the licensing requirements.

Create a reasonable phased implementation timeline. For example, within one year of the program being announced, all rentals need to register with the County and must have smoke detectors, fire extinguishers, and printed, multi-lingual information for residents about evacuation notifications, wildfire prevention, and fire bans. The following years can include additional requirements for rentals to continue to operate, such as limited fire pits, neighborhoods having more than one egress route, annual SIZ management, and structure hardening requirements that align with new building WUI Code regulations. A phased approach over a period of four years would require setting clear expectations about the phases and timelines from the start, and would give STR operators time to make the required changes to their properties, or choose to take them off the STR market if they are unwilling/unable to provide the required safety measures for their visitors. Example mitigation goals are provided in **Table 5**.

This will also require staff for enforcement, with increasing workloads for the duration of the phased implementation. STR regulations were widely supported by both residents and partners within the County. This will require collaboration with JCP&Z, Jefferson County Sheriff's Office, and local jurisdictions to encourage them to adopt similar measures, if they have not already.

**Table 4.** Recommended mitigation goals for obtaining Short Term Rental Permits in Jefferson County. Goals are adapted from [Firewise USA](#).

Action	Goals
Structure Ignition Zones	Update the required SIZ mitigation measures for homes and outbuildings to follow the CSFS HIZ Guidelines and/or the updated WUI regulations recommended in the CWPC 2024 report for Jefferson County.
Landscaping	Maintain Zone 1 (0-5 feet from the home) to clean, unburnable conditions with litter and duff removed regularly.
Roofing and Vents	Install and maintain a Class-A roof with mesh covers on vents.
Decks and Porches	Keep decks free of flammable materials such as propane tanks or firewood piles. Use non-combustible deck materials when possible.
Siding and Windows	Clean and maintain windows and siding. Use ignition-resistant siding and tempered multi-paned windows when building or remodeling.
Emergency Responder Access	Maintain a 20-foot-wide driveway with 13.5 feet of overhead clearance for emergency vehicles. Ensure that street and house numbers are clearly marked from the road, and there is enough turnaround space for fire trucks in front of houses and rentals. Refer to Jefferson County design and enforcement manuals for the most up-to-date requirements for road access.
Informed Renters	Provide roadway maps to renters that show multiple ways out of the neighborhood. Require renters to sign up for emergency alerts while they are visiting. Share current fire ban information with renters before they visit, and close off outdoor fire pits when they are not allowed to be used.

**Connect with Insurance Companies**

**Responsible parties:** Jeffco Community Wildland Fire Program

One of the major successes of the Boulder Wildfire Partners program is their connection with insurance companies. Their work with these companies does not guarantee anyone home insurance, but builds trust between the County and the companies and supports the interests of both.

The County can increase the chance that homes within their jurisdiction are able to survive a wildfire and that their homeowners can access insurance, and the insurance companies have advocates for

better home constructions and safety and have a known and trusted partner that is verifying the SIZ mitigation and structure hardening work that homeowners complete.

Program staff in Jeffco will connect with insurance company representatives, working with neighboring counties when needed, to develop relationships and agreements that can benefit the County, residents, and the insurance companies.

### ***Create a Jefferson County Wildfire Committee***

**Responsible parties:** Jefferson County Sheriff's Office, Jeffco Community Wildland Fire Program

Create a committee of representatives from various departments and divisions within Jefferson County to meet regularly and work collaboratively on actions that the county can take to reduce risk and support residents. The Jefferson County Sheriff's Office, MMWMC, Jefferson County Wildfire Commission, and Fire Chiefs are all involved in wildfire preparedness.

The Hazard Mitigation Plan further calls for the development of a Local Hazard Mitigation Committee, and the CWPC report calls for a dedicated County Wildland Fire Committee. It is important to define roles and responsibilities of these organizations to create synergy and avoid duplicated efforts.

### ***Ongoing Program Tasks:***

#### ***Advocate for Homeowner Insurance Solutions***

**Responsible parties:** Jeffco Community Wildland Fire Program

The State of Colorado is actively working on understanding and creating solutions to the ongoing insurance issues that many homeowners across the state are experiencing. To ensure that the perspectives and experiences of Jefferson County residents are heard and included in those discussions, send representatives to state-level efforts to develop solutions for securing insurance coverage in high-risk communities.

Encourage short-term and long-term solutions such as requiring insurance companies to give more advanced notices of policy cancellations, requiring mediation time for homeowners to address wildfire-risk based policy cancellations, or tax credit-based incentives for insurance companies working in high-risk areas.

#### ***Support a Home Assessment Program***

**Responsible parties:** Jeffco Community Wildland Fire Program

This action is intended to address existing buildings. Face-to-face interaction is frequently the most effective tool for communicating wildfire risk and mitigation actions for residents of the WUI. Neighborhood ambassador programs connect community leaders with the fire district to enable them to do outreach and support community action for wildfire mitigation. Many fire districts in the county have active home assessment programs that are tailored to suit their communities' needs, but some districts do not have those programs established and may not have the resources to create them in the near future. The County should work with each district to assess how their program works and if



one common and standardized assessment program for the county can be adopted. If one standardized program is not supported, then work with FPDs to ensure their home assessment program supports and complements the district programs and does not create extra work or confusion for residents or fire district staff.

Create a voluntary program for homeowners within the WUI that aligns with the building and WUI codes that are set for new construction. This can be modelled on the Boulder Wildfire Partners program that has been in place since 2014, and other programs around the state. The goal of this program is to provide homeowners with standardized education about structure hardening and mitigation within the structure ignition zone, offer personalized recommendations and action plans to residents for their properties, and recognize the work that residents put in to making high quality mitigated structure ignition zones by certifying the property as a part of the program.

This program may be able to offer incentives for residents that are in the process of becoming certified or have been certified. Incentives could potentially include access to free slash management tools such as chippers, signs in residents' yards to highlight that they are an active part of the program, or small property tax credits.

### ***Conduct Outreach and Education***

**Responsible parties:** Jeffco Community Wildland Fire Program

Jefferson County should continue to engage with community members using a variety of methods, including community ambassadors, social media, and education materials for visitors of short-term rentals. This includes the adoption of standardized outreach and educational materials to be provided to and utilized by all wildland fire mitigation partners within the county. Many of these materials are already created, such as the CSFS HIS Guide. As part of the program, the county should pursue grants to obtain and maintain an inventory of printed and other outreach materials that are made available to FPDs and other partners assisting in outreach and educational activities.

### ***Provide Neighborhood Ambassador Training***

**Responsible parties:** Jeffco Community Wildland Fire Program

Neighborhood ambassador programs have been adopted by many fire districts and have sparked coordinated action and positive change in Jefferson County. The neighborhood ambassador approach requires engaged volunteer ambassadors and a dedicated lead coordinator.

The County could provide resources for fire protection districts' **Neighborhood Ambassador Programs** to help train ambassadors, support program leaders, and coordinate knowledge sharing among participants.

See the guide [\*Fire adapted communities neighborhood ambassador approach: Increasing preparedness through volunteers\*](#) for effective activities that neighborhood ambassadors can undertake (Wildfire Adapted Partnership, 2018).

The County could create a micro-grant fund that Community Ambassadors can apply for in collaboration with their FPD. Funding could be used for events, training, on-the-ground projects, etc.

### ***Offer Community Preparedness Grants***

**Responsible parties:** Jeffco Community Wildland Fire Program

Financial barriers are one of the most common barriers to wildfire mitigation and especially to hardening homes and other structures within Jefferson County. The State of Colorado offers tax credits and there are other grants available; these are typically applicable to landscape and vegetation SIZ work and not structure hardening. Especially in the WUI Interface, hardening homes and other structures can be more important than vegetation management but is often more expensive. Typically, there are limited grants and program funds for structure hardening financial aid. Homes that have not been hardened produce significantly more embers than trees and other vegetation and are more likely to ignite other homes nearby, so supporting structure hardening is not only benefitting the homeowners, but also all the neighbors in that area.

Create a mitigation grant fund to provide financial aid to residents to support hardening homes and other structures and SIZ mitigation, with certain requirements for financial need, level of wildfire risk, and verification of accomplishments through home assessments. This could be modelled after Douglas County's mitigation funding model.

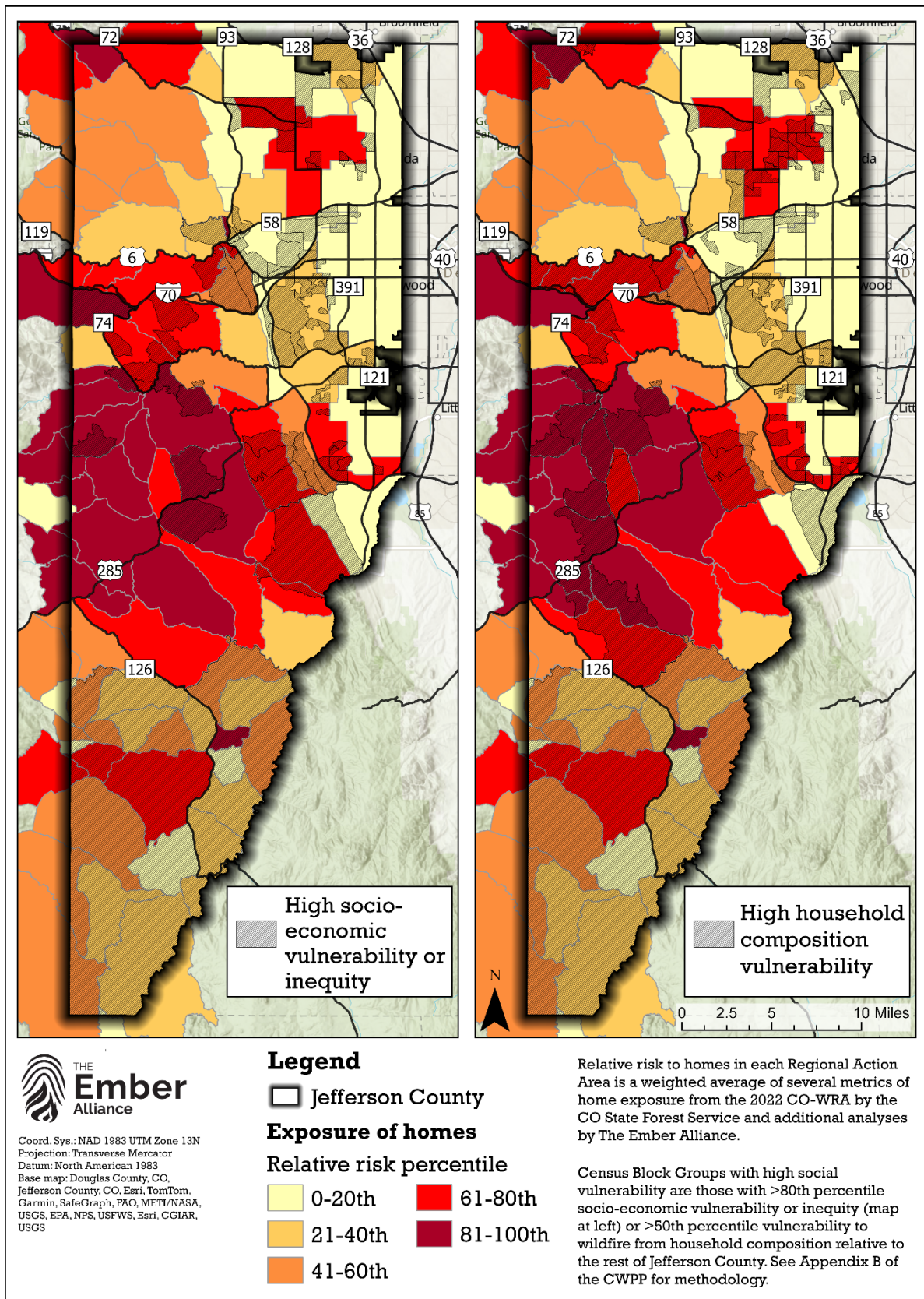
### ***Enable the County to Acquire Non-Federal Grant Funding***

**Responsible parties:** Jeffco Community Wildland Fire Program, Big Horn Group, residents

Educate residents about the impact of TABOR on the ability of the County to serve as a fiduciary agent on State or private grants in order to support ongoing efforts by the Big Horn Group to revise or repeal TABOR in the County. As it stands, FPDs often have to apply for grant money on behalf of the County. Some grants require local governments or NGOs to apply for grants, which prohibits some community groups from accessing that money. It would help if the County were able to receive State or private grant money without it counting against their funding cap.

### ***Priority Areas***

The Jeffco Community Wildland Fire Program will initially serve the portion of Jefferson County designated as WUI in this CWPP. Actions like adopting the WUI Code and short-term rental certification will apply to all areas of the WUI, but for specific actions and efforts, the County may use the regional action areas to determine where to direct limited funds or resources. For example, a grant program to help residents and business owner harden structures efforts may be directed to areas with high wildfire risk and high socio-economic vulnerability. The County may choose to open up that grant funding option to only landowners within areas that meet those criteria based on the map in **Figure 33**.



**Figure 33.** Relative exposure of homes to wildfire within Jefferson County. Higher risk percentile indicates more exposure. Each map is overlaid with census block groups that have high vulnerability in a relevant category – socioeconomic vulnerability or vulnerability based on household composition.



## Action 6: Slash Management

Responsible parties: Jefferson County Sheriff's Office, Jefferson County Parks & Conservation.

This action is a high priority to the CWPP Advisory Committee, part of the Jeffco Wildfire Safe Initiative in the 2023 Wildfire Planning Assessment, a moderate priority to the community, and a priority action in the County's Hazard Mitigation Plan goal 17.

### *Purpose and Need*

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. 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.

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 roadways can serve as highly effective holding features for controlled burning of grass in the spring and fall and pile burning in the winter.

Slash removal in this part of Colorado is quite difficult due to limited biomass and timber industries. Residents in Jefferson County have experienced difficulties with slash management, like many other communities in Colorado. During the community engagement process for this CWPP, residents shared that lack of access to inexpensive/easy means of slash disposal is the second most common obstacle to completing wildfire mitigation around their homes (**Figure 34**).

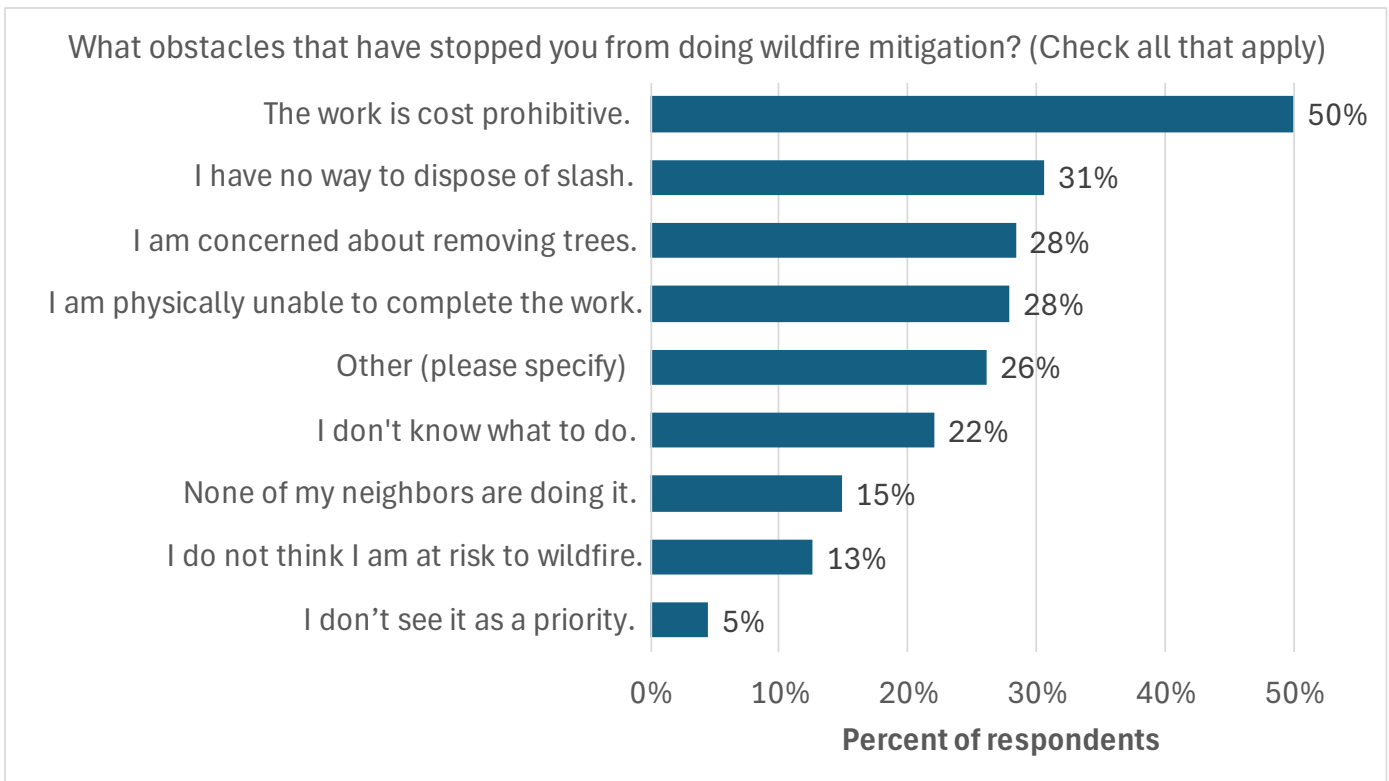
Methods for managing slash come with different benefits and challenges (**Table 6**). For example, lop-and-scatter and mastication do not remove surface fuels from the site, they only rearrange them. It can take a decade or more for slash to decompose to a point where it no longer poses a significant fire hazard. Broadcast prescribed burning is most effective at removing surface fuels, but requires extensive planning and expertise to conduct properly, and may not be appropriate until slash is removed or piled and burned.

Jefferson County and their partners should work together to further develop the Sustainable Lands and Safer Homes (SLASH) program in the county. This can and should include a combination of slash management techniques.

**Table 5.** Many methods are available to remove slash created by forest thinning, each with their own benefits and challenges.

Method	Removes surface fuel from site	Restores 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	\$\$\$\$	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
Hauling material away	✓			Low to moderate	High	\$\$ - \$\$\$	Weeks to months
Utilizing material for firewood	(✓)			Low	Low to moderate	\$	Days to weeks

**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.



**Figure 34.** On round 1 of the Together Jeffco survey, residents identified slash disposal as the second biggest obstacle preventing them from undertaking wildfire mitigation actions. 222 individuals responded to this question.

### ***Slash Management Program Recommendations***

#### ***Enhance Community Slash Yards and Collection Sites***

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. 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.

Jefferson County’s Sustainable Lands and Safer Homes (SLASH) program operates seasonally between May and October, typically on weekends. Three sites are open periodically across the county in Coal Creek Canyon, Evergreen, and Pine, and the new permanent Tincup Ridge Slash Yard in Golden. These four sites cover a variety of communities within the county, but residents have expressed concerns that they are unable to transport their material to the sites if they do not live close and that the cost to drop slash off (\$24 per six cubic yards in 2024) is cost prohibitive.



## Recommendations to improve community slash yards and collection sites:

- Jefferson County should consider making the slash disposal sites free to residents. Free use of the slash sites and hauling program could be an incentive offered to residents who participate in the county's community wildfire program; residents who have received a home assessment and are working on a mitigation work plan, or those who have received certification and are completing regular maintenance of their land could have free access to the slash yards. This would both encourage residents to dispose of their slash more quickly and effectively and give them an opportunity to hear about mitigation from a local knowledgeable professional.
- SLASH sites should be opened year-round. Residents often complete mitigation work during mild winters and need a place to dispose of their slash. This would require additional funding and staffing for the SLASH sites.
- The SLASH program or FPDs should provide programs to pick up slash from communities and bring it to the slash disposal site. Some FPDs already do this in Jefferson County and have found it reduces barriers for residents who do not own trucks or trailers. Other FPDs are interested in these programs but do not currently have the capacity to implement them.
- Neighborhoods should organize events with Scout Troops and other volunteer groups to aid with collecting and delivering slash to slash yards.

### ***Encourage the Safe and Appropriate Use of Pile Burning***

Pile burning involves the controlled use of fire to consume piles of fuel that were created by hand or by machines. Pile burning is different from broadcast prescribed 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 can be the best and sometimes only option for slash removal in steep, inaccessible areas.



Left: Pile burning can be a safe and effective method to consume slash created by thinning operations. Right: A pile build workshop that The Ember Alliance hosted in Coal Creek Canyon FPD. Photo credit: The Ember Alliance

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 moistures, 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).

Challenges with pile burning can include public concerns about risk from flames, embers, and smoke. There are often limited opportunities to conduct pile burns because of requirements for snowpack and atmospheric ventilation. 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).

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 Colorado Division of Fire Prevention & Control 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 smoke permits](#) from the Colorado Department of Public Health and open burn permits from the Jefferson County Department of Public Health to burn fewer than 50 piles. Burning more than 50 piles requires a smoke management permit from the Colorado Department of Public Health and Environment. Jefferson County Sheriff's Office does NOT allow open burning during fire restrictions and fire bans. Pursuant to Colorado House Bill 22-1132 ([Darcy's Last Call Act](#)), individuals must contact their local fire department before burning.

The Colorado Division of Fire Prevention & Control 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.

### **Recommendations to encourage the safe and appropriate use of pile burning:**

- Jefferson County Sheriff's Office and local fire protection districts should encourage and facilitate the participation of residents in the Colorado Division of Fire Prevention & Control's [certified burner program](#)—a rigorous training and certification program that provides civil liability protection to individuals if burns are properly planned, approved, and executed but smoke or flames cause damage.
- Agencies that conduct pile burns need to engage in robust communication outreach months before conducting the burns to communicate the purpose of the burn, outline safety measures in place, and provide information on how to reduce health effects of smoke. Follow-up with residents the week before and day before a burn, every day of the burn, and when the burn is complete. Utilize social media, electric sign boards, and other

communication tools. Fire Adapted Colorado hosts a [website](#) with educational information and resources to help communities be “Smoke Ready”.

- FPD neighborhood ambassador programs can facilitate the creation of pile burn cooperatives (PBC) with support from the districts and Jefferson County Sheriff’s Office. PBCs are groups of neighbors that get together to help burn slash piles, often with support from their local fire protection district. The Ember Alliance hosts workshops on pile building and burning to assist communities who are interested in forming PBCs. Visit [The Ember Alliance’s website](#) to learn more about PBCs in Colorado.

### ***Coordinate the Use of Air Curtain Burners***

**Responsible parties:** Jefferson County Sheriff’s Office, FPDs, Colorado Division of Fire Prevention & Control, Northern Colorado Fireshed, Central Colorado Forest Collaborative, Colorado Prescribed Fire Council

Air curtain burners are machines that burn woody material cleanly in a contained space. They typically consist of a box or trench into which slash is loaded and ignited. A strong fan blows air over the burning material in a way that keeps oxygen flowing through the fire and reduces smoke emissions.

Air curtain burners can be an acceptable form of slash removal where there is no social license for pile or broadcast prescribed burning. They produce significantly less smoke than pile burning or wildfires, and they 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 prescribed 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.

Challenges with air curtain burners include their substantial upfront cost and the need for professional operators. Small air curtain burners can cost as low as \$100,000, and larger burners with more capacity cost \$700,000 or more, plus there are costs for towing the burner and operating it. They also come with effort to haul slash from treatment areas to the site of the air curtain burner or needed equipment to load the burner. Nutrients are permanently removed from the treatment site, but they can be returned to the ground if ash from the burner is removed and spread out. The use of air curtain burners also comes with an administrative cost—it takes a lot of time and effort to coordinate with the Colorado Department of Public Health & Environment to secure burn and smoke permits.





Air curtain burners efficiently consume woody fuel while emitting a fraction of the smoke emitted by pile burning or wildfires. Photo: The Ember Alliance.

#### **Recommendations to support the use of air curtain burner:**

- Jefferson County Sheriff's Office could acquire a large, stationary air curtain burner for the county permanent community SLASH sites and a smaller, mobile air curtain burner that FPDs and communities can rent. Jefferson County Sheriff's Office could be responsible for the burn and smoke permit process with the Colorado Department of Public Health & Environment.
- Jefferson County Sheriff's Office and FPDs should coordinate with the Colorado Division of Fire Prevention & Control to utilize their air curtain burner for large slash disposal events.
- Jefferson County Sheriff's Office and FPDs should partner with groups like the Northern Colorado Fireshed, Central Colorado Forest Collaborative, and Colorado Prescribed Fire Council to seek policy and legislative fixes that would reduce the requirements for burn and smoke permits from the Colorado Department of Public Health & Environment and U.S. Environmental Protection Agency for the use of air curtain burners, which emit much less smoke than open burning.

#### **Support Community Mastication / Chipping Programs**

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).

However, unless material is hauled away after treatment or eliminated through a follow-up broadcast burn 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). Additionally, fuels left behind in mastication and chipping treatments are deeper and more compact than natural fuels (Kreye et al., 2014). Thus, they can impede plant regeneration, particularly when the depth of masticated and chipped fuels exceeds 4 inches (Jain et al., 2018). For detailed information on chipping and mastication, refer to [CFRI's Mulching Knowledge Summary](#).

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 then be hauled away more easily. The County can support community chipping programs through education and outreach, staff support, or equipment sharing to communities without the means to purchase a chipper.

### ***Priority Areas***

Locations for expanded slash management support within the county include a combination of the communities that are furthest away from any county slash collection site such as Golden Gate or Deer Creek Mesa, communities that have high socio-economic vulnerability and may be most affected by the cost of slash collection such the southern quarter of the county, S Maxwell Hill Road area, or Soda Creek area, and areas with the highest risk of wildfire affecting homes or infrastructure, such as most of the Elk Creek and Inter Canyon Fire Protection Districts. These areas are mapped in **Figure 35**

## **Action 7: County Evacuation Preparedness**

Recommendations under this action are high priority to the CWPP Advisory Committee, high priority to the community, a priority action in the County's Hazard Mitigation Plan goal 14, and a priority in the 2024 CWPC report RU-1.

### ***Purpose and Need***

Evacuation can weigh heavily on the minds of residents in Jefferson County due to neighborhoods in areas with high fire danger, limited roadway capacity, and dense fuels along roadways (**Figure 25; Figure 26**). The Jefferson County Sheriff's Office is the lead agency for evacuation of citizens in unincorporated areas during natural or human-made disasters, and evacuation preparedness is the responsibility of each resident in Jefferson County. The section **Resident Preparedness for Evacuations** covers recommendations for residents to increase their emergency preparedness. Below are recommendations to increase the County's capacity to plan for evacuations, and recommendations for various partners to support livestock evacuations.

### ***Enhance County Evacuation Planning and Capacity***

**Responsible parties:** Jefferson County Sheriff's Office, in coordination with fire protection districts, incorporated communities, and Jeffco Road & Bridge

The CWPP defers to the evacuation planning and preparedness recommendations in the 2024 Comprehensive Emergency Management Plan Evacuation Annex (CEMP EA). Portions of the CEMP EA

that are particularly relevant to wildfire evacuation are described in the sections pertaining to evacuation of school children, adults with disabilities and functional needs, transient populations, parks and open spaces, medical facilities and residents with durable medical equipment required to stay with them, and incarcerated residents.

### **Additional recommendations for wildfire evacuations in Jefferson County:**

- Jefferson County Sheriff's Office should work with FPDs, HOAs, and other community groups to offer simulated evacuation drills using SimTables or novel approaches such as [board games to improve evacuation preparedness](#).
- Jefferson County Sheriff's Office should work with FPDs to create pre-defined evacuation zones within each district. Some fire districts have already created these zones, or use the 'plan units' in their CWPPs as evacuation zones. Each fire district can work with the Sheriff's Office to ensure these zones make sense for evacuations and the Sheriff's Office can ensure these are shared with Jeffcom each time they are reviewed or updated so emergency alerts can be sent out quickly and efficiently when needed.
- Jefferson County Sheriff's Office should encourage residents to work with their FPDs and/or HOAs to develop evacuation plans for their community. Jefferson County Sheriff's Office could even provide a template for these plans, which should address alternative evacuation routes, for example, securing permission from private landowners for temporary use of private roadways during evacuations, and establish a protocol for identifying and supporting residents who need additional care during evacuations.
- Jefferson County Sheriff's Office should educate residents about warning systems, protocols for evacuation orders, go-bags, and family emergency plans. Increase resident participation in Lookout Alert. If staff are hired for a Jefferson County Wildfire Partners Program, they could work with FPDs, JeffCom, and neighborhood ambassadors to conduct educational campaigns about Lookout Alert.
- Jefferson County Sheriff's Office should ensure warnings and alerts can be understood by all residents, including those who do not speak English and those with hearing impairments. Work with JeffCom to create alternate language emergency alert options.
- Jefferson County Sheriff's Office should support FPDs that choose to explore alternate methods of warnings and alerts, such as warning sirens.
- The County could explore incentives for private landowners who agree to allow emergency evacuation traffic to cross their properties. Incentives could include property tax reductions. This would require legal and insurance issues to be addressed.

### ***Provide Support for Livestock Evacuations***

**Responsible parties:** Jefferson County Horse Council, Jefferson County Horse Evacuation Assistance Team (HEAT), Front Range Animal Evacuation Team (FRAET), Large Animal Emergency Evacuation Team, Jefferson County Animal Control Rescue Team (J-CART), and Jefferson County Sheriff's Office

The County can work with partners to increase the presence of and quality of evacuation education for residents with large pets and livestock. Safe and effective evacuation of livestock requires planning and coordination from both the County and residents who own such livestock. There are several

agencies and organizations available to support large-animal evacuation, and coordination among these groups is important to maximize their impacts.

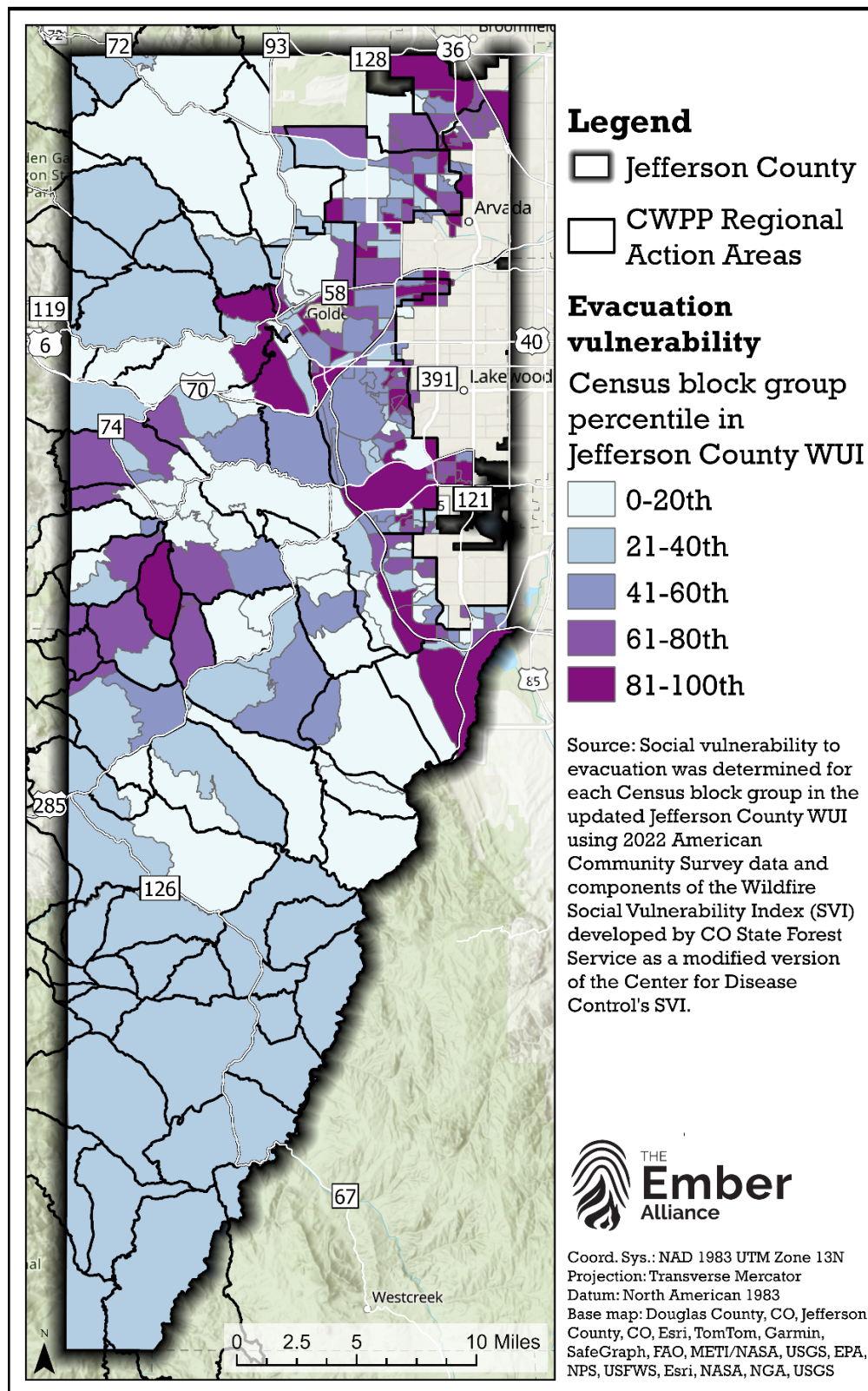
**Recommendations to improve livestock evacuations in the CEMP EA include:**

- Ensure all animals have some form of identification.
- Evacuate animals earlier, when possible. Map out primary and secondary routes in advance.
- Have available the vehicles and trailers needed for transporting and supporting each type of animal. Also have experienced handlers and drivers.
- Ensure destinations have food, water, veterinary care and handling equipment.
- For those livestock and large animal owners who are unable to evacuate and house their animals, the Animal Control Unit will manage a livestock evacuation and sheltering function during an emergency with the assistance of Jefferson County Animal Response Team (J-CART), the Jefferson County Fairgrounds and other partners.

***Priority Areas***

Most of the County evacuation recommendations will benefit all residents, especially those within the WUI. However, priority areas for education and resources can be focused on areas with higher social vulnerability to evacuations, as shown in **Figure 35**. The majority of neighborhoods with higher social vulnerability to evacuations are within the Interface area of the WUI, in the foothills.





**Figure 35.** Evacuation vulnerability by Census Block Group in Jefferson County. Evacuation vulnerability highlights where there is a relatively higher percent of residents who have a disability, live in single-parent households, speak English less than “well”, or have no access to transportation. Source: 2016-2022 American Community Survey analyzed using an approach and code developed by the CSFS (Dimke and Bayham, 2020). See methods in **Appendix B. Risk Assessment Methodology.**

## Action 8: Spatial Data Coordination

This action is a high priority to the CWPP Advisory Committee, recommended by the Jefferson County Wildfire Commission, part of the Jeffco Wildfire Safe Initiative in the 2023 Wildfire Planning Assessment, and a priority action in the County's Hazard Mitigation Plan goal 16.

### ***Purpose and Need***

High-quality, up-to-date, and consistent geospatial data are crucial for effective planning and emergency response to wildfires and other natural hazards. Such data includes the location of fuel treatments, wildfires, fire ignitions, HVRAs, and roadways. Two actions in the 2021 Hazard Mitigation Plan for Jefferson County pertain to the development and maintenance of GIS data to build collective knowledge, prioritize mitigation efforts, and enhance collaboration regarding public and private land mitigation efforts (HMP actions 16 and 35). There are ongoing efforts by Jefferson County, FPDs, watershed and Fireshed collaboratives, state agencies, and the U.S. Forest Service to collect high-quality GIS data and develop GIS clearing houses. It is vital to create a process to share data among entities in Jefferson County and leverage processes at the state and federal level to avoid redundancies.

The GIS and Technology Specialist position identified in Action Item 1 would play a lead role in this spatial data collection and management effort. This position would work with partners and their existing efforts to evaluate what method of collection and management is best suited for county efforts and serve as the WFMP data manager for ensuring data is collected, edited, managed and made available to partners. This position would also be responsible for developing a platform in which GIS data is stored and made available to partners to assist them in their GIS needs. Additionally, this position would provide GIS support to the FPDs in their GIS needs as most of them lack this critical skill set.

Several challenges must be addressed in order to maintain and share high-quality GIS data that can support wildfire planning and emergency response:

- Lack of coordination among ongoing efforts at the local, county, state, and federal levels.
- Limited GIS capacity for many FPDs in Jefferson County, including limited access to GIS software and training.
- Limited capacity at the county-level to oversee and coordinate GIS data management.
- Lack of a clear process for FPDs and contractors to share GIS data collected as part of CWPPs and other planning efforts with Jefferson County.
- Inconsistent data sharing from contractors, FPDs, and county agencies.
- Inconsistent schema for metadata, naming, and organizing GIS data.
- Differing needs from many involved partners can make it difficult to have a product or tool that meets everyone's needs.
- Recommendations
- Establish a formal Jefferson County Spatial Data Technical Group with representatives from Jefferson County OEM, Jefferson County Sheriff's Office, Jefferson County Business

Innovation and Technology GIS Team, Jefferson County Communications Center Authority (Jeffcom 911), and the MMWMC.

- Send a representative from Jefferson County to meetings with partners where GIS data and online platforms are being discussed. These types of conversations are occurring among the CSFS, CFRI, U.S. Forest Service, Northern Colorado Fireshed, Central Colorado Forest Collaborative, Upper South Platte Partnership, Clear Creek Watershed and Forest Health Partnership, and other organizations.
- Develop an understanding of ongoing efforts to compile and maintain GIS data in Jefferson County. This includes the development of a GIS data portal by the North Central Region of Homeland Security, as well as the Critical Infrastructure and Key Resources (CIKR) effort by Jefferson County OEM, Jefferson County GIS Team, Jeffcom 911, and the City and County of Denver.
- Produce a diagram to illustrate existing and missing connections between these efforts.
- Inventory existing GIS data pertinent to wildfire risk mitigation and emergency response in Jefferson County. Data compiled for the Jefferson County CWPP by The Ember Alliance is being provided to the county, and this can serve as a starting place for identifying authoritative data sources for the County.
- Develop a process to maintain common master datasets with standardized metadata. This should include a workflow, schema, and platform for sharing data.
- Help FPDs understand the importance of acquiring data produced during CWPP development. This might require specific clauses in contracts about the types, format, and metadata of data that will be provided. The Jefferson County Spatial Data Technical Group can create a process by which FPDs can share this data with the county for archival and use in other planning efforts.

## Equity in Wildfire Mitigation Recommendations

Social factors influence how impacted an individual or a community may be in the event of wildfire. This is called social vulnerability and is due to a lack of access to resources and less ability to be resilient to wildfire impacts. The resources that are lacking can include infrastructure, social support, health, and financial means (Cutter et al., 2003). While Jefferson County at large may be well prepared for wildfire after engaging in this CWPP planning process, there is potential for some to fall through the cracks or struggle to engage in necessary mitigation and preparation work which makes them more at risk in the event of a fire.

Poverty, racial and ethnic discrimination, age, and physical ability are frequently factors that are associated with social stratification and result in resource inequity (Crowley, 2020; Cutter et al., 2003; Davies et al., 2018; Emrich et al., 2020; Hewitt, 2013; Ojerio et al., 2008). Thus, it is important to consider how to ensure that all community members can participate in the wildfire preparedness actions outlined in this CWPP.

Vulnerable populations that live in the WUI in Jefferson County tend to be concentrated in the southern third of the county and in certain neighborhoods that lie closer to the urban core of the county (**Figure 36; Figure 37**). The County has existing programs that support people experiencing homelessness and there are many regional and state programs based in and around Denver that serve people with physical and intellectual disabilities, aging residents, and people with food insecurity or living in poverty. However, a wildfire may be a rapid and acute incident that requires specific actions for populations that may need additional support. The County can be prepared to take those actions by planning ahead and supporting populations that are disproportionately affected by wildfire before and after the incident.

The CWPP uses the [Centers for Disease Control and Prevention's \(CDC\) Social Vulnerability Index \(SVI\)](#), which is one way of assessing relative social vulnerability in four different categories using census data. Overall social vulnerability in the SVI is composed of four parts: Socioeconomic Status, Household Characteristics, Racial & Ethnic Minority Status, and Housing Type & Transportation. Each of these four components is calculated using the following inputs:

- Socioeconomic Status:
  - Below 150% Poverty
  - Unemployed
  - Housing Cost Burden
  - No High School Diploma
  - No Health Insurance
- Household Characteristics:
  - Aged 65 & Older or Aged 17 & Younger
  - Civilian with a Disability
  - Single-Parent Households
  - English Language Proficiency
- Racial & Ethnic Minority Status:
  - Hispanic or Latino; Black and African American; American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander; Two or More Races; Other Races
- Housing Type & Transportation:
  - Multi-Unit Structures
  - Mobile Homes
  - Group Quarters or Crowding
  - No Vehicle



The socio-economic equity map is an additional metric of vulnerability proposed by the Colorado State Forest (Dimke and Bayham, 2020) to evaluate income and education disparity. The socio-economic equity index helps account for the areas that have significant stratification between high income and low-income residents and/or stratification between levels of education. See Appendix B for more information on social vulnerability indices.

### ***Pre-fire***

Before a fire, it is important to ensure that preparation and potential evacuation communication materials are available in non-English languages spoken in Jefferson County. Sole use of English in materials makes it difficult for people with lower proficiency in English to understand. This includes children, people with low literacy, and people who primarily speak other languages. Materials that use images and diagrams rather than words can make sure the broadest audience can understand any materials that Jefferson County distribute about wildfire.

Some efforts are underway to increase accessibility of publications in Spanish. The Colorado State Forest Service recently made their [Home Ignition Zone Guide available in Spanish](#). The Jefferson County Sheriff's Office has made some resources on emergency preparedness available in Spanish, including a webpage about [Lookout Alert](#). The County should continue efforts to translate important information about emergency preparedness and wildfire risk mitigation to the other three most spoken languages in the county: Spanish, Russian, and Vietnamese. Bi-lingual publications are one of the goals in the County's 2021 Hazard Mitigation Plan. When working in areas with higher proportions of Spanish-speaking residents, ensure that staff that are working with the public or at events have proficiency in Spanish or provide interpreters at events where there may be no Spanish-speaking staff.

Accessibility to resources is also a need and requirement. All documents, websites, and other resources should be made accessibly to those with disabilities and should meet regulatory standards including those described in the Americans with Disabilities Act, Section 508, Web Content Accessibility Guidelines, and Colorado House Bill 21-1110. Public events should have American Sign Language interpreters when requested, or provided when there is no early RSVP option to request one.

Another major barrier is the ability to do the work recommended for homeowners and residents. Populations that may be impacted by this include those in lower income brackets who don't have the resources to harden their homes (i.e., by replacing their roofs, siding, and decks with ignition-resistant construction materials), those who rent their homes and cannot make modifications, and those with physical disabilities or impairments that keep them from doing the physical labor often involved in preparation and mitigation actions themselves. A CWPP is a great way to begin addressing economic disparity because it can provide a basis for Jefferson County and their partners to apply for grant funding to support mitigation work on behalf of the community.

To truly reduce the economic barrier at a community level, community leaders must design programs that are accessible for all income brackets. For example, providing mitigation services such as a community chipping program that is free for residents who fall within lower income brackets can encourage those residents to mitigate their properties when they may have otherwise found it

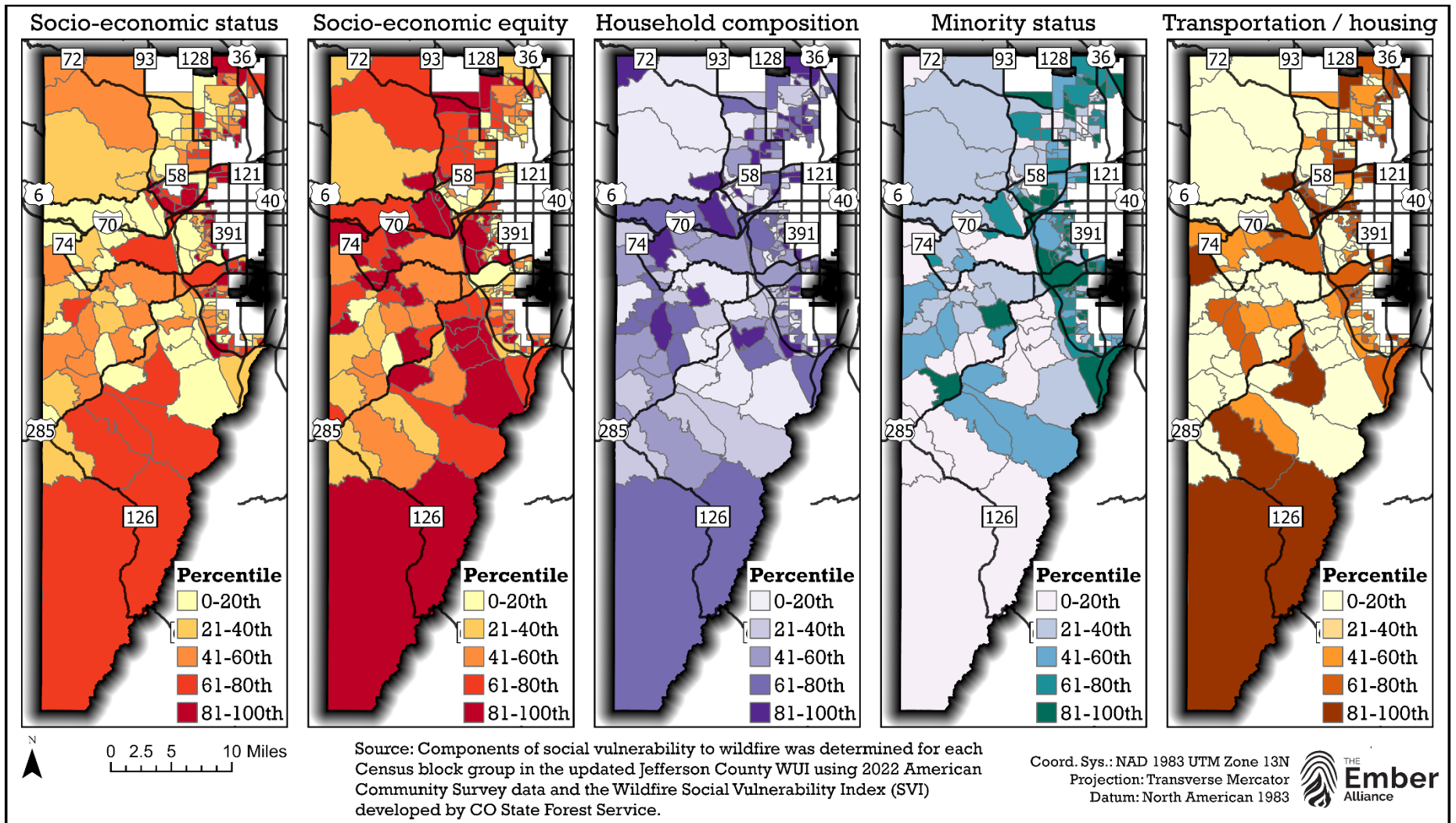
inaccessible, as is discussed in the Community Wildfire Program recommendation above. Similarly, supporting neighborhood ambassadors who can effectively plan and host volunteer days can help those who are not physically able to engage in pre-fire protection of their home by connecting them with physically able community members to help harden their homes and other structures and engage in SIZ mitigation. Ultimately the ability to serve all residents equitably within the county will require supporting residents directly where possible and relying on communities to support and assist their neighbors as well.

Planning and preparing for supporting less mobile residents during an evacuation is essential to ensuring that the County can serve them equitably during a wildfire event. Identifying resources to transport disabled, hospitalized, young, and elderly residents as well as tourists and residents who do not own cars is a task that can be addressed with partners before wildfires break out and is recommended in **Action 7: County Evacuation Preparedness** and in the Jefferson County 2024 Evacuation Annex.

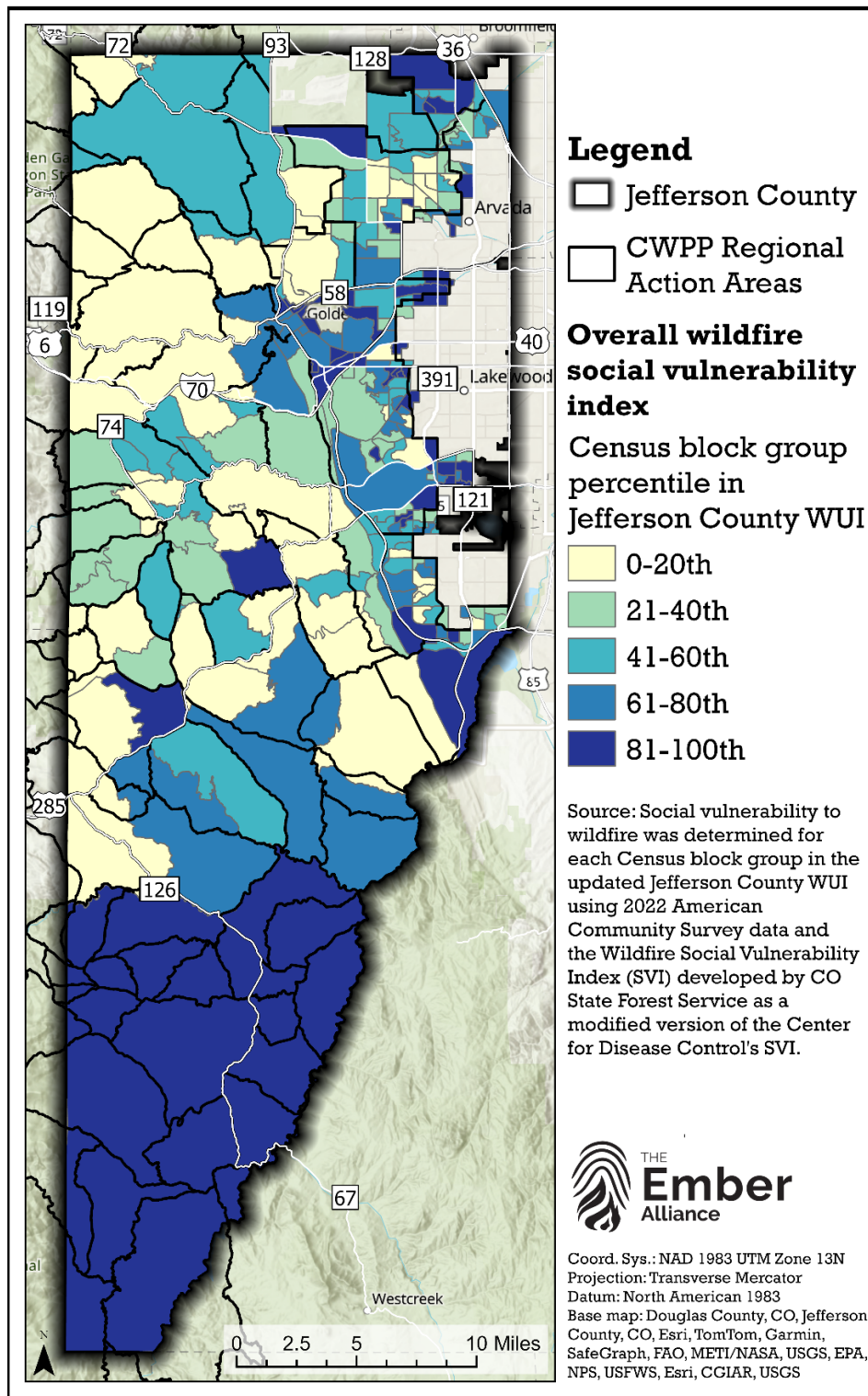
### ***Post-fire***

Following a fire, households are often solely responsible for their own recovery. While challenging for everyone, this is a particular issue for those without equal access to the social aid that is available like FEMA recovery funds, information on the internet, and claims for insurance (Laska and Morrow, 2006; Méndez et al., 2020). Groups impacted by this can include older adults, undocumented folks, and those who speak English as a second language or not at all.

While planning for post-fire is less of a focus of this CWPP, it is worth mentioning that community ties are as important after a fire as they are in trying to reduce the impact of potential fire. Communities that consider who will need the most assistance after a fire ahead of time are better able to get those folks the help they need quickly.



**Figure 36.** Aspects of the wildfire social vulnerability for Census Block Groups in the WUI portion of Jefferson County. Block Groups falling in higher percentiles have more vulnerable populations compared to the rest of the county. Note that populations are smaller in the larger Block Groups in southern Jefferson County, so these Block Groups might have a high percentage of vulnerable individuals but not a high number of vulnerable individuals. Learn about the aspects of social vulnerability from the [Centers for Disease Control and Prevention](#). Source: 2016-2022 American Community Survey analyzed using an approach and code developed by the CSFS (Dimke and Bayham, 2020). See methods in **Appendix B. Risk Assessment Methodology**.



**Figure 37.** Overall wildfire social vulnerability for Census Block Groups in the WUI portion of Jefferson County. Block Groups falling in higher percentiles have more vulnerable populations compared to the rest of the county. Note that populations are smaller in the larger Block Groups in southern Jefferson County, so these Block Group might have a high percentage of vulnerable individuals but not a high number of vulnerable individuals. Source: 2016-2022 American Community Survey analyzed using an approach and code developed by the CSFS (Dimke and Bayham, 2020). See methods in **Appendix B. Risk Assessment Methodology.**



## Additional Implementation Activities and Responsibilities

There are many ideas and recommendations to make Jefferson County a place where residents are educated about wildfire, where there are resources and tools for residents to take action and mitigate their own property, and where fire districts, land managers, and the Sheriff's Office have the resources needed to effectively and efficiently manage wildfire and support prescribed fire within the county. The eight most important actions were highlighted and discussed in the previous sections.

The other actions that will help Jeffco move towards being a fire adapted community are detailed below. These actions are very important for the County and community, but may not be the first tasks that the County should focus on. When the eight other recommendations have been completed, or if the opportunity arises to address any of the following, the County and partners should pursue these recommendations. The County will lead and coordinate efforts to find solutions and implement recommendations for the following actions, with support from partners.

Recommendation	Goals	Partners and Contributors
<p><b>Increase availability of water for suppression response</b></p> <p><b>This recommendation is a priority for the CWPP Advisory Committee and a high priority recommendation in the 2024 CWPC report (RU-1)</b></p>	<p>Adopt consistent requirements determining adequacy of access and water supply requirements for developments. Develop a plan to prioritize and approve fire-suppression ponds for fire response. Help FPDs apply for grants to fund community cisterns. Evaluate water pressure issues across the County and develop a plan to help FPDs and water utilities address issues.</p>	<p>Jefferson County Sheriff's Office, FPDs, Jefferson County Planning &amp; Zoning, water providers, watershed partnerships and collaboratives, city agencies</p>
<p><b>Increase FPD response capabilities</b></p> <p><b>This recommendation is a high priority for the community.</b></p>	<p>Track grant opportunities that can enhance FPD response capabilities and share these with Fire Chiefs and the MMWMC.</p>	<p>Jefferson County Sheriff's Office, FPDs, DFPC, federal fire response agencies</p>
<p><b>Maintain up-to-date information on HVRAs and critical infrastructure from FPDs</b></p>	<p>Have County GIS specialists work with FPDs to acquire GIS data gathered as part of CWPPs or other efforts regarding the location of HVRAs and critical infrastructure. Make FPDs aware of available data sources from the County to create</p>	<p>Jefferson County Sheriff's Office, FPDs, Jefferson County GIS, JeffCom, Denver Water, Arvada Water, other local</p>

Recommendation	Goals	Partners and Contributors
	<p>consistency in GIS data used in CWPPs and on strategic/tactical maps.</p>	<p>utility providers, watershed partners and collaboratives, federal and state land management agencies, city local governments</p>
<p><b>Coordinate evacuation preparedness with JCOS</b></p>	<p>Incorporate JCOS in discussions about evacuation planning. JCOS already takes several actions to address evacuation concerns on their property, such as closing parks during days with high fire risk. Additional efforts could be made to encourage out-of-town recreators to sign up for LookoutAlerts. Conduct an analysis to determine which JCOS properties have recreation populations that could exacerbate evacuation challenges and develop a plan for mitigating these issues, such as prohibiting overflow parking along roadways, mitigating fuels along roadways and around parking lots, or acquiring funding to widen roadways near high-use recreation areas.</p>	<p>Jefferson County Open Space, Jefferson County Sheriff's Office, Jefferson County Road &amp; Bridge, Jeffcom911, FPDs with jurisdictional authority, local police departments, Denver Mountain Parks</p>
<p><b>Increase visibility of roadways and addresses</b></p>	<p>Ensure all county-maintained roadways have reflective street signs, and install reflective guardrails where appropriate. Ensure all county facilities have clear and reflective address signs. Encourage all FPDs to provide low-cost reflective address signs to residents.</p>	<p>Colorado Department of Transportation, Jefferson County Road &amp; Bridge, FPDs, private property owners</p>

Recommendation	Goals	Partners and Contributors
<p><b>Add considerations of fire risk to standards for roadway design</b></p> <p><b>This recommendation is a priority from the 2024 CWPC Report (RU-3)</b></p>	<p>Create specific standards for roadway design in areas with high fire risk to protect evacuees and increase accessibility for fire engines. See recommendations in the CWPC report (available later in 2024).</p>	<p>Jefferson County Transportation &amp; Engineering, Jefferson County Road &amp; Bridge, Jefferson County Planning &amp; Zoning</p>
<p><b>Increase availability of ingress / egress points</b></p> <p><b>This recommendation is a high priority for both the CWPP Advisory Committee and the community.</b></p>	<p>Provide financial incentives to residents who agree to permit emergency traffic to temporarily pass along their private roadways during an evacuation. Create a process to ensure that liability concerns are addressed and damages incurred from evacuation traffic can be addressed. Work with the USFS, JCOS, DMP, and other land management agencies to maintain or build roadways that could be used as temporary evacuation routes across their properties.</p>	<p>Jefferson County Sheriff's Office, Jefferson County Open Space, Denver Mountain Parks, USFS, FPDs, other partners, residents</p>
<p><b>Promote post-fire preparation</b></p> <p><b>This recommendation is a high priority for both the CWPP Advisory Committee and the community.</b></p>	<p>Coordinate completion and regular updating of the Colorado Post-Fire Playbook and Wildfire Ready Action Plans by the County, FPDs, municipalities, Denver Water, water providers, and other entities. Include information on flood insurance and other steps to prepare for post-fire flooding, sedimentation, and debris flows on the JCSO website. Work with municipalities and County Planning &amp; Zoning to develop plans for how to support rebuilding after a wildfire. Utilize the Colorado Statewide Post-Wildfire Susceptibility Analysis and the Colorado Geological Survey's Debris Flow Susceptibility Map of Jefferson County to identify areas at high-risk of post-fire flooding to prioritize preparedness actions.</p>	<p>Jefferson County Sheriff's Office, Jefferson County Planning &amp; Zoning, FPDs, municipalities, Denver Water, water providers, other partners</p>

Recommendation	Goals	Partners and Contributors
<p><b>Create capacity for JCSO, JCOS, and FPDs to conduct prescribed burns</b></p> <p><b>This recommendation is a high priority for both the CWPP Advisory Committee and the community.</b></p>	<p>Increase capacity at the County (JCSO and JCOS) and FPD-scale to implement prescribed burning.</p>	<p>Jefferson County Open Space, Jefferson County Sheriff's Office, FPDs, DFPC</p>
<p><b>Evaluate the ability to amend JCOS's charter to permit strategic, cross-boundary work with private landowners</b></p> <p><b>This recommendation is a moderate priority for the CWPP Advisory Committee</b></p>	<p>Evaluate the need and potential to amend JCOS's charter to permit JCOS foresters and grassland managers to implement cross-boundary projects with private landowners adjacent to priority JCOS properties. An amendment would require a vote by the public.</p>	<p>Jefferson County Open Space</p>



## CWPP as a Living Document

CWPPs are a guide and a plan for action. They should be revisited and reviewed annually, at minimum, by Jefferson County and the Jefferson County Wildfire Committee. 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.
- 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.

Annual plans for Action 2 and Action 4 can and should be added to this document annually.

# GLOSSARY

**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).

**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<sup>2</sup>/acre (USFS, 2021).

**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, 2021).

**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.

**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, 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).

**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).

**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).

**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).

**Fuelbreak:** A natural or human-caused change in fuel characteristics which affects fire behavior so that fires burning into them can be more readily controlled. Fuelbreaks differ from firebreaks due to the continued presence of vegetation and organic soil. Trees in shaded fuelbreaks 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 manufactured 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).

**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).

**High valued resources and assets (aka, 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).

**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 fuelbreaks 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).

**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).

**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 structure ignition zone, and structural changes to increase the chance a structure will stand strong during a wildfire (aka, structure 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).

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

**Patch cut:** A fuel treatment where all or nearly all trees within portions (patches) of delineated stands have been removed through hand cutting or mechanical cutting. This type of fuel treatment is used in Colorado to mimic high-severity stand-replacing wildfires in ecosystems that are adapted to that kind of fire regime, such as lodgepole pine or some spruce-fir forests.

**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 roadways) 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 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).

**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 which affects fire behavior so that fires burning into them can be more readily controlled, firefighter access is enhanced, and conditions are safer for evacuees (NWCG, 2018b).

**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 fuelbreaks; they are greatly enlarged areas which can be used with relative safety by firefighters without the use of a fire shelter (NWCG, 2018b).

**Shaded fuelbreak:** 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 roadway 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, 2021).

**Structure 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. Structure hardening involves reducing structure ignitability by changing building materials, installation techniques, and structural characteristics of a home (California Fire Safe Council, 2020). Homes and other structures can never be made fireproof, but structure hardening practices in conjunction with vegetation management within the SIZ increases the chance that a structure will be undamaged during a wildfire.

**Structure ignition zone (SIZ):** The characteristics of a structure itself (homes, sheds, garages, and other structures) and the area within 100 feet of the structure. Conditions in the HIZ principally determine home ignition potential from radiant heat, convective heat, and ember cast (NWCG, 2018b). It is encouraged that residents and business owners mitigate hazards in the SIZ so that structures can stand alone without relying upon limited firefighter resources. The Colorado State Forest Service defines three zones within the SIZ: Zone 1 as 0 to 5 feet from the home, Zone 2 as 5 to 30 feet from the home, and Zone 3 as 30 to about 100 feet from the home (CSFS, 2021).

**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).

**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). Strategic wildfire mitigation across the WUI can increase the safety of residents and wildland firefighters and reduce the chances of home loss. See **Appendix A. Wildland-Urban Interface Methodology** for methodology used to develop the updated Jefferson County WUI.

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# APPENDIX A. WILDLAND-URBAN INTERFACE METHODOLOGY

The WUI map for Jefferson County combines aspects of existing approaches to WUI mapping, recent research on structure loss during WUI fires, and on-the-ground experiences of Fire Chiefs and wildland mitigation specialists in Jefferson County.

## Components of WUI Definitions

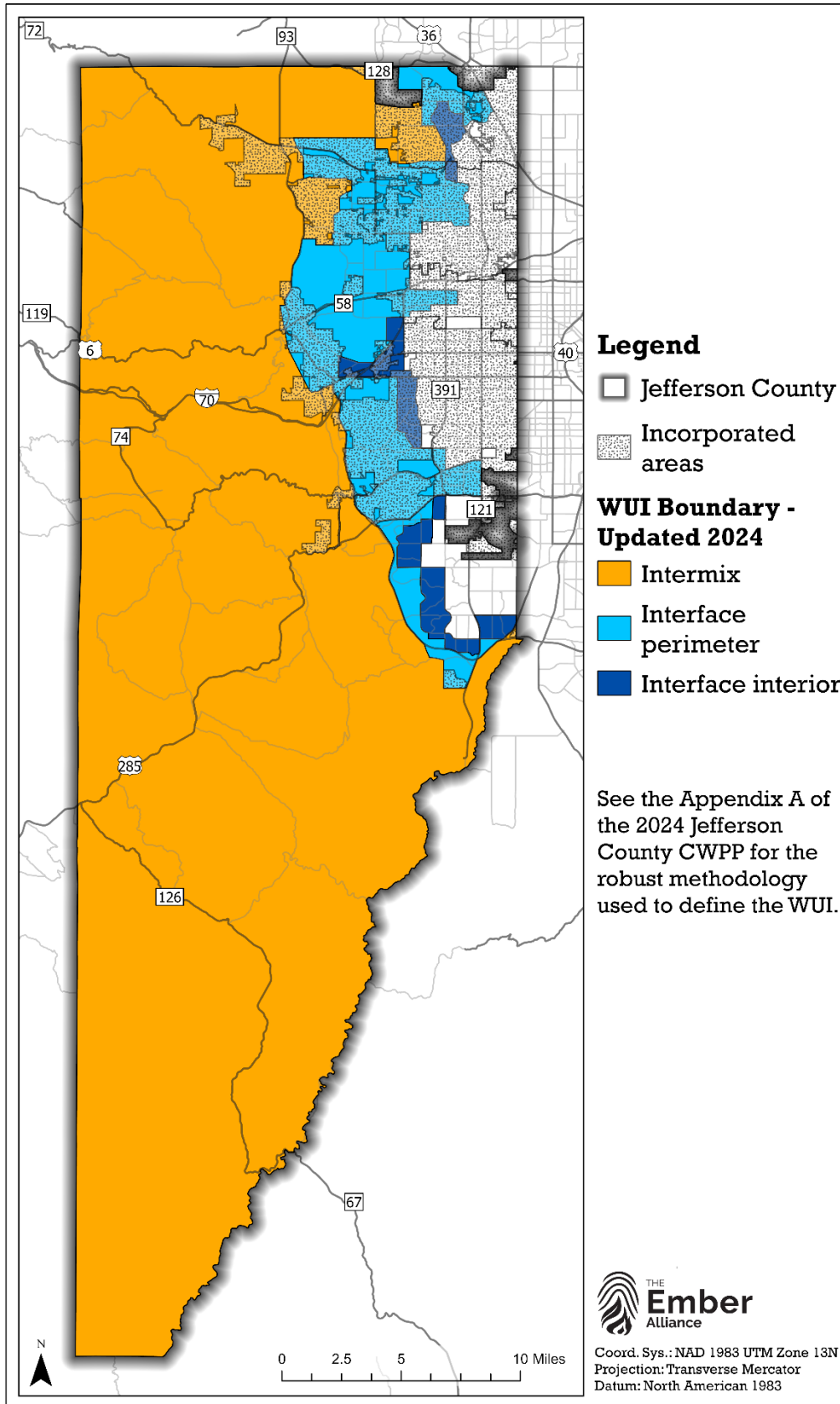
Demarcating the boundary of the WUI is vital for conducting wildfire risk assessments, prioritizing mitigation work, directing grant funding to at-risk areas, developing policies for zoning and building codes, and planning future growth in a way that promotes fire resilience. The Healthy Forest Restoration Act of 2003 allows for expedited processes to approve vegetation management in WUI areas to protect communities from wildfire. WUI mapping typically requires characterization of three parameters (Johnston, 2018):

1. **Human habitation / infrastructure:** usually quantified by housing density or population density, but can also include infrastructure, services such as utilities, and public roadways per the Healthy Forest Restoration Act of 2003.
2. **Wildland vegetation:** usually quantified by one or more factors including type of vegetation, cover of vegetation, size of vegetation patch, and/or potential fire behavior.
3. **Buffer distance:** distance between vegetation and the built environment, often considering the potential exposure of structures to embers ahead of a wildfire.

The previous WUI Overlay Zone for Jefferson County (also referred to as the Wildfire Zone 1, Wildfire Hazard Overlay, and Mountain Front) defined all areas located above 6,400 feet in elevation as WUI. This WUI map was inadequate because it excluded non-forested areas that could transmit wildfires into the built environment. Wildfires in grasslands and shrublands destroy more homes in the WUI than wildfires in forests across the United States (Radeloff et al., 2023b). The 2021 Marshall Fire demonstrates that wildfires can burn through grasslands and into the built environment, morphing into an urban conflagration with uncontrollable structure-to-structure ignitions (Giammanco et al., 2023).

Existing WUI maps from the U.S. Forest Service and Colorado State Forest Service were not adequate for the Jefferson County either. These maps did not sufficiently capture fire risk in grasslands and suburban areas, did not include areas with low housing development that could still experience damages to homes or infrastructure during a wildfire, and did not include areas that are not currently developed but could be in the future (see below for a comparison of WUI methodology). A new WUI methodology was developed for the Jefferson County CWPP that combines aspects of existing approaches to WUI mapping, recent research on structure loss during WUI fires, and on-the-ground experiences of Fire Chiefs and wildland mitigation specialists in Jefferson County. The updated WUI is depicted in **Figure A.1**.





**Figure A.1.** The updated WUI map for Jefferson County encompasses 91% of the land area and 53% of structures in the County, all of which are exposed to elevated wildfire risk.

## ***Human Habitation / Infrastructure***

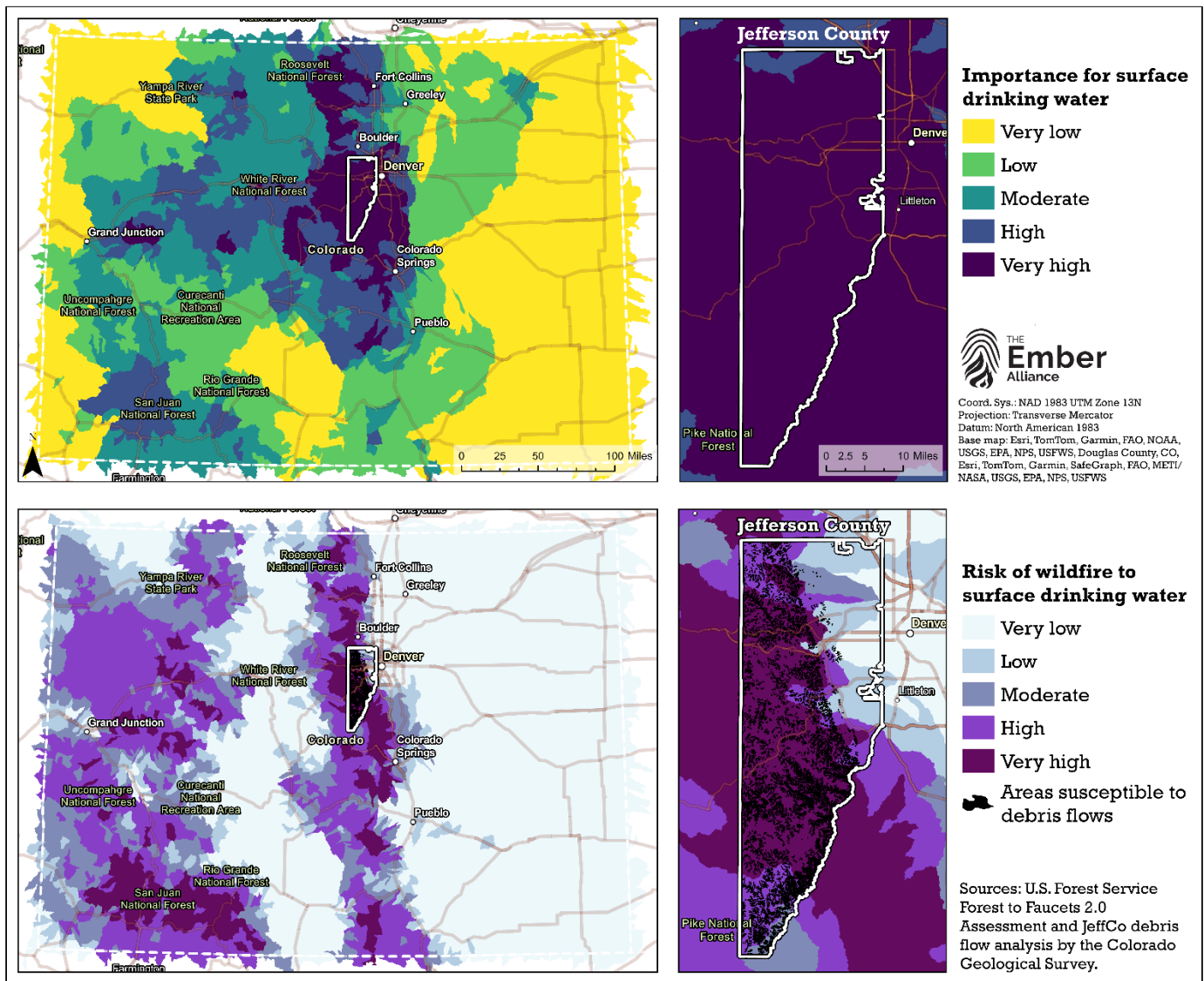
It was vital that the WUI map for Jefferson County accounts for the location and density of current structures *and* considers where structures might be built in the future. Common approaches for mapping the WUI focus on the current location of structures and exclude areas with no structure or low structure density (less than 6.17 houses/km<sup>2</sup> or 1 house/40 acres) (Caggiano et al., 2020; Carlson et al., 2022; Radeloff et al., 2005). We did not utilize a lower cutoff for housing density because human lives and property are still at risk when wildfires burn in low density areas (Caggiano et al., 2020; Kramer et al., 2018; Syphard et al., 2023). If feasible, wildland firefighters would still engage in structure protection in these areas. Homes still can be lost to wildfire even when structure densities are low. Research demonstrates that the use of a lower density threshold for mapping the WUI excludes structures that are lost by wildfire.

The updated WUI map for Jefferson County includes all land as potential candidates for WUI regardless of current housing density. Currently undeveloped areas have a potential for future development, and all of Jefferson County has high to very high importance for surface drinking water.<sup>5</sup> According to the U.S. Forest Service Forest to Facets 2.0 assessment, 97 percent of Jefferson County falls within watersheds that have very high importance to surface drinking water, with the remaining 3 percent having high importance (Mack et al., 2022) (**Figure A.2**). Surface water flowing out of watersheds in Jefferson County serves over 35% of residents in the state of Colorado (2.1 million people).

Wildfires can significantly impair water quality and impact water infrastructure. Denver Water spent over 27 million dollars recovering from the 1996 Buffalo Creek and 2002 Hayman Fires in southern Jefferson County. Protecting watersheds from severe wildfire is vital to residents in the WUI and beyond.

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<sup>5</sup> The 2003 Health Forest Restoration Act states that an at-risk community can include areas with basic infrastructure and services such as utilities and transportation routes (16 U.S.C. Ch. 84 §6511(2003)). Clean drinking water from watersheds is an important resource for human communities.



**Figure A.2.** Watersheds in Jefferson County are particularly important for providing clean surface drinking water, and many of these watersheds have an elevated risk to wildfires that can impair surface drinking water. Source: U.S. Forest Service, Forest to Faucets 2.0 Assessment (Mack et al., 2022).

### Wildland Vegetation

Wildland vegetation was defined as vegetation that could burn with moderate to high fire intensity according to the 2022 Colorado Wildfire Risk Assessment (CO-WRA). Vegetation that could experience a moderate or high fire intensity scale can produce flames lengths greater than 8 feet and produce short-range spotting. Heavy machinery is usually required to suppress wildfires with moderate intensity, and direct attack with machinery is ineffective for high intensity wildfires, resulting in a significant potential for harm or damage to life and property (CSFS and Technosylva, 2023a).

Vegetation included (1) large patches  $\geq 5 \text{ km}^2$  (1,236 acres) in size, or (2) occluded patches between  $0.7 \text{ km}^2$  (175 acres) and  $5 \text{ km}^2$  in size that contained at least  $0.3 \text{ km}^2$  (75 acres) of vegetation capable of

burning with moderate to high fire intensity (**Figure A.3**). Vegetation excluded agriculture and golf courses unless there was a potential for moderate to high fire intensity according to the 2022 CO-WRA.

The vegetation patch size cutoff of 5 km<sup>2</sup> is commonly used for delineating the Federal definition of WUI (Carlson et al., 2022; Caggiano et al., 2020; Radeloff et al., 2005). There is limited scientific guidance for the size of occluded vegetation that could transmit wildfire into surrounding homes and infrastructure. The approach used for Jefferson County was based on observations from Fire Chiefs and wildfire mitigation specialists with Fire Protection Districts in the County.

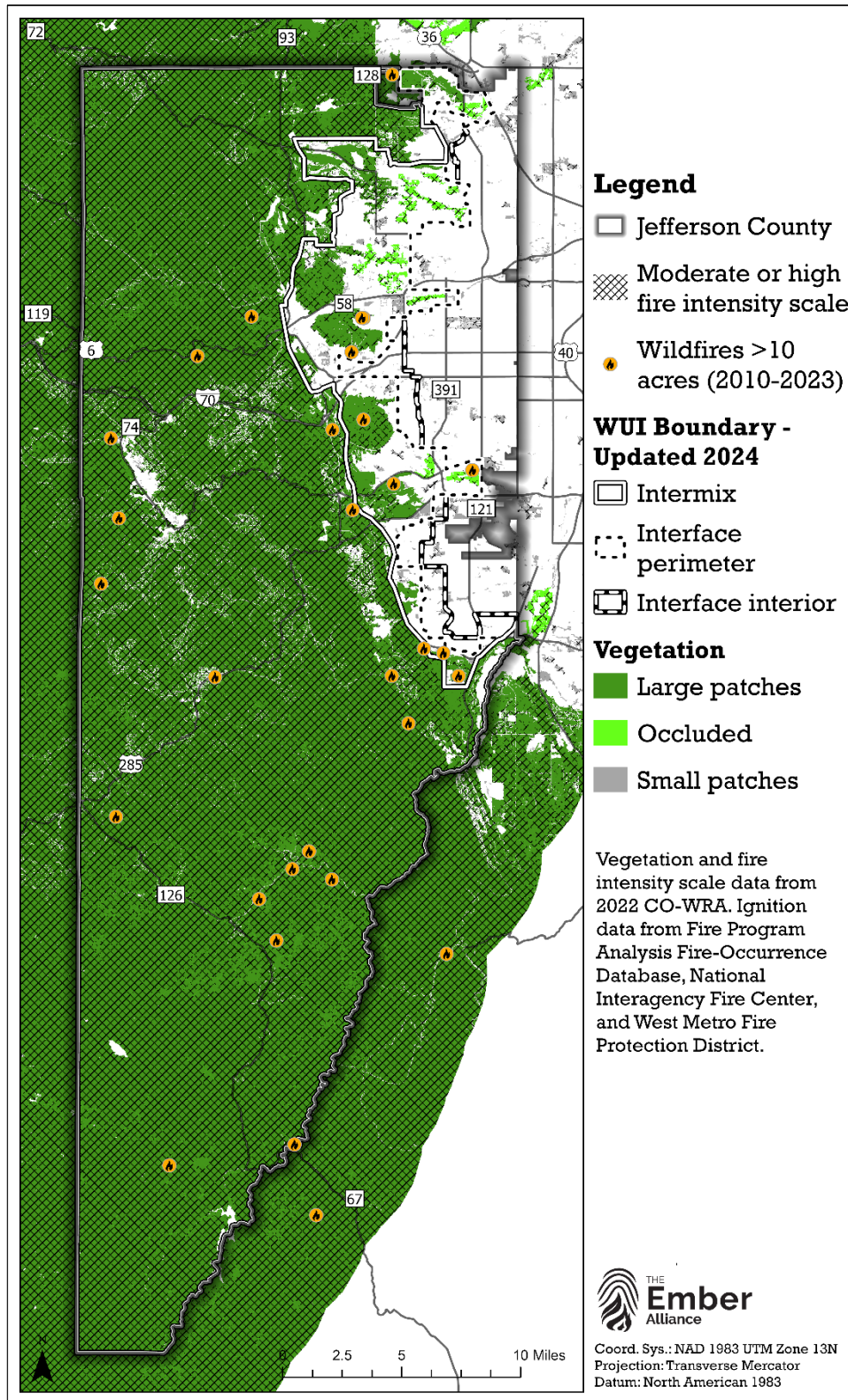
### ***Buffer Distance***

A buffer distance of 1,625 meters (about 1.0 mile) was used for large patches of vegetation and 400 meters (about 0.25 miles) for occluded patches of vegetation. The buffer distance of 1,625 meters was the median between the typical distance used to delineate the WUI (2,400 meters or about 1.5 miles) (Carlson et al., 2022; Radeloff et al., 2005) and 850 meters (about 0.5 miles), which was the maximum distance between vegetation and homes destroyed during WUI fires in the United States between 2000-2018 (Caggiano et al., 2020). A buffer distance of 1,625 meters is appropriate for Jefferson County based on local WUI fires—homes lost during the 2021 Marshall Fire occurred up to 1,160 meters (0.72 miles) away from large patches of vegetation.

The buffer distance of 400 meters for occluded vegetation was the maximum penetration distance used by the 2022 CO-WRA to model fire spread into urban areas (CSFS and Technosylva, 2023a). A distance of 400 meters is also used by the National Institute of Science and Technology (NIST) to differentiate between the perimeter and interior of interface WUI (Maranghides et al., 2022). A smaller buffer distance was used for occluded vegetation than large patches of vegetation because there is a lower chance of abundant ember production and radiant heat buildup in smaller patches of vegetation (Giammanco et al., 2023).

To assist the County with the enforcement of zoning and building codes in the WUI, the eastern boundary of the WUI was modified to follow roadways or the edges of subdivisions. Roadways can slow the spread of fire and assist with fire suppression, making them meaningful WUI boundaries. For consistency, the eastern boundary of the WUI along Clear Creek was extended to encompass all the WUI as identified in the 2021 West Metro CWPP.





**Figure A.3.** Vegetation that could burn with moderate or high fire severity in large patches or occluded patches of vegetation were used to identify WUI in Jefferson County. All wildfire ignitions between 2010 and 2023 in Jefferson County that grew to at least 10 acres in size occurred within the updated WUI boundary. Sources: 2022 CO-WRA, Fire Program Analysis Fire-Occurrence Database, National Interagency Fire Center, and West Metro Fire Protection District.

## ***WUI Types***

The WUI in Jefferson County was subdivided into three types: predominately intermix, predominately interface perimeter, and predominately interface interior. WUI type was based on the classification of structures in Jefferson County per methodology from NIST (Maranghides et al., 2022) (**Table A.1; Figure A.4**). Microsoft building footprint data circa 2018 was used to determine structure separation distance and the distance between structures and large patches of vegetation or occluded vegetation. Structures included primary buildings and auxiliary structures such as sheds and garages. Structure density was determined in a 500-meter radius area following the research of Carlson et al. (2022). Percent cover of vegetation was determined in a 100-meter radius area following the research of Caggiano et al. (2020). Structures in areas with greater than or equal to 50 percent cover were candidates for intermix designation (Caggiano et al., 2020; Carlson et al., 2022; Radeloff et al., 2005).

Some homes identified as WUI according to the NIST approach did not fall within the updated WUI for Jefferson County. The NIST approach considers distance to vegetation regardless of potential fire intensity, whereas the updated WUI was created by buffering only the portions of large or occluded vegetation that could burn with moderate or high intensity. In addition, the NIST approach does not differentiate between large patches of vegetation and occluded vegetation.

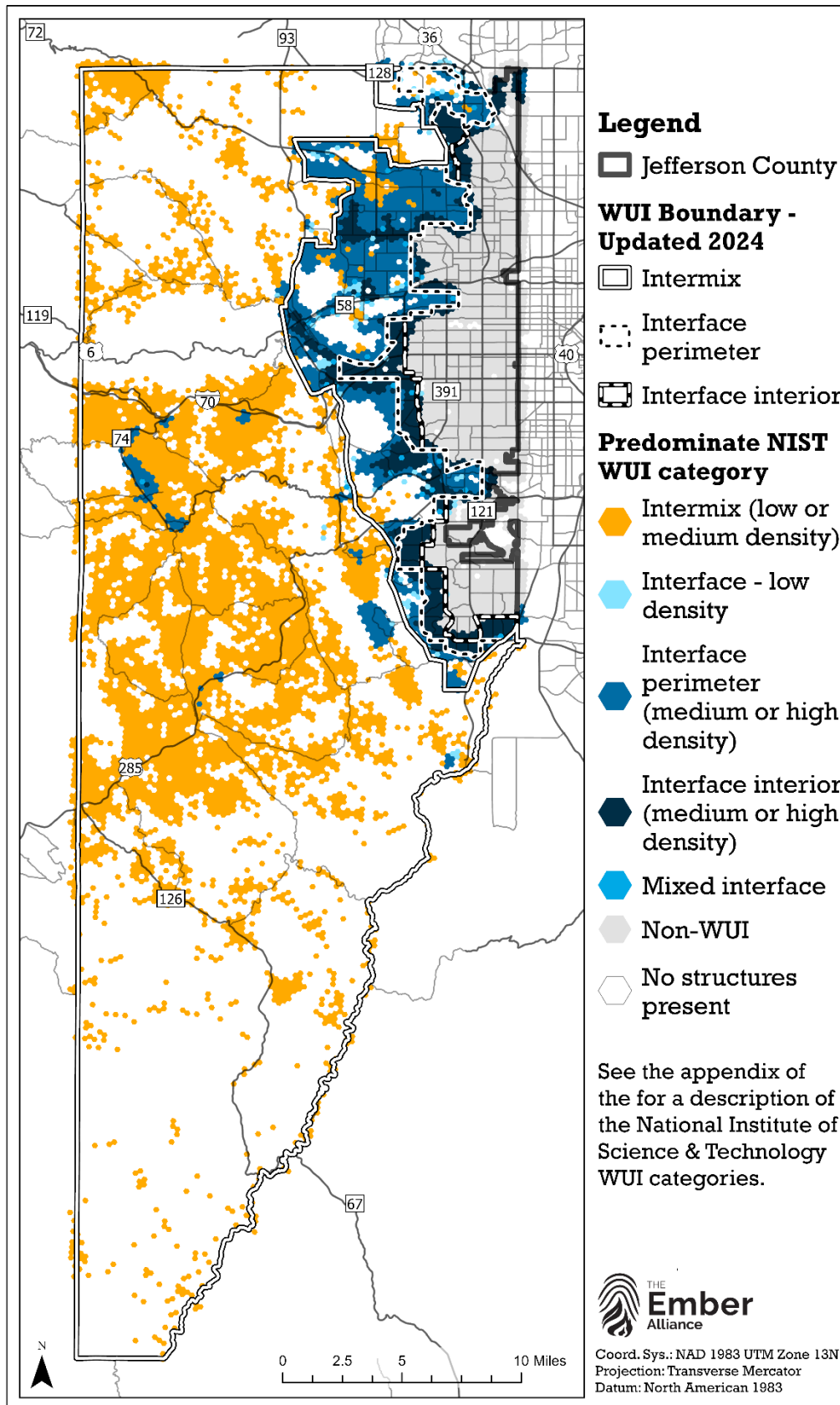
Populated parts of the County were subdivided into hexagons, and the dominant NIST WUI type was identified in each area. The boundary of updated WUI types did not strictly follow the NIST WUI types in several notable areas. The Ken Caryl subdivision and all of Evergreen were included in the intermix WUI even though much of these areas were classified as interface WUI following the NIST approach. Vegetation and development in Ken Caryl were similar to the intermix WUI around Red Rocks Country Club and west of Stafford Hogback. The density of trees interspersed among structures across Evergreen made this area more akin to intermix WUI than interface WUI.

**Table A.1.** Structure-level WUI type based on research from the National Institute of Science and Technology (Maranghides et al., 2022). Structure separation distance was determined using Microsoft building footprint data circa 2018, which included auxiliary structures such as sheds and garages.

NIST WUI Type	Structure separation distance	Housing density <sup>1</sup>	Cover of vegetation <sup>2</sup>	Distance from large patches of wildland vegetation
High density interface – perimeter	<30 feet	>2 structures/acre	<50%	<400 meters (0.25 miles)
High density interface – interior	<30 feet	>2 structures/acre	<50%	400 - 1,625 meters (1.0 mile)
Medium density interface – perimeter	30 to <100 feet	1-2 structures/acre	<50%	<400 meters (0.25 miles)
Medium density interface – interior	30 to <100 feet	1-2 structures/acre	<50%	400 - 1,625 meters (1.0 mile)
Medium density intermix	30 to <100 feet	1-2 structures/acre	≥50%	<1,625 meters (1.0 mile)
Low density interface	≥100 feet	<1 structure/acre	<50%	<1,625 meters (1.0 mile)
Low density intermix	≥100 feet	<1 structure/acre	≥50%	<1,625 meters (1.0 mile)

<sup>1</sup> Housing density was determined in a 500-meter radius area around each structure using Microsoft building footprint data (circa 2018) following Carlson et al. (2022).

<sup>2</sup> Vegetation cover was determined in a 100-meter radius area around each structure using fuels data from the 2022 CO-WRA with a 50 percent cover cutoff for intermix versus interface following Caggiano et al. (2020) and Carlson et al. (2022).



**Figure A.4.** Dominant WUI type in 28-acre hexagons based on the NIST categorization of structures as outlined in **Table A.1.**



## Comparing WUI Methodology

Four different WUI maps were readily available for Jefferson County, and a fifth approach was developed specifically for the updated CWPP (**Table A.2**). Existing WUI maps were available from the U.S. Forest Service and SILVIS Lab at the University of Wisconsin-Madison (USFS-SILVIS) using two different methodologies and from the Colorado State Forest Service's 2022 Colorado Wildfire Risk Assessment (CO-WRA).

**Existing WUI maps were not adequate for the Jefferson County CWPP. These maps did not adequately capture fire risk in grasslands and suburban areas, did not include areas with low housing development that could still experience damages to homes or infrastructure during a wildfire, did not include areas that are not currently developed but could be in the future, and did not include all parts of the county critical for the provision of clean surface drinking water. A new methodology was developed for the updated Jefferson County CWPP to address these limitations.**

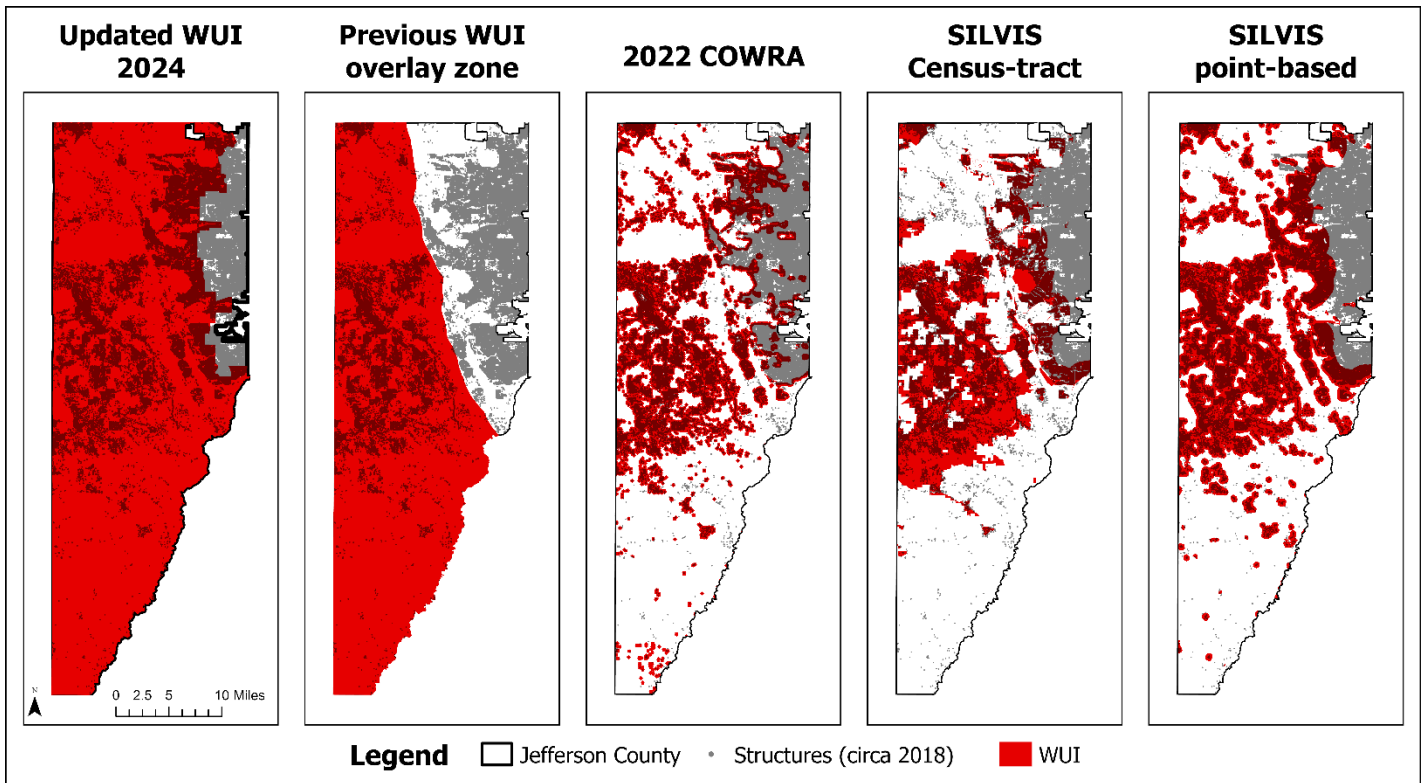
Methodology significantly impacts how much of and what parts of Jefferson County qualify as WUI (**Figure A.5**). About 70 percent of Jefferson County's land area and 13 percent of structures were mapped as WUI following the County's previous, elevation-based approach. The WUI maps from CO-WRA and the USFS-SILVIS classified between 32 and 40 percent of the County's land area and between 38 and 46 percent of structures as WUI. The updated WUI map for Jefferson County encompasses 91% of the land area and 53% of structures in the County (**Figure A.6**).

Following a discussion with representatives from the Jefferson County Sheriff's Office, Jefferson County Office of Emergency Management, Elk Creek Fire Protection District, the Community Wildfire Planning Center, and The Ember Alliance, it was decided that none of the existing approaches met the needs of the Jefferson County CWPP. The elevation-based approach excluded all parts of the County in the northeast, even areas where wildfires could transition from large grasslands and shrublands into neighborhoods. The USFS-SILVIS and 2022 CO-WRA approaches did not adequately capture parts of the County that are not currently developed but could be developed in the future, and they excluded areas with low housing density from the WUI. The USFS-SILVIS and 2022 CO-WRA approaches also did not include southern portions of the county that are critical for the provision of clean surface drinking water. The updated WUI map for Jefferson County is a significant improvement by addressing all key issues posed by other approaches.

**Table A.2.** Methodology, pros, and cons of different strategies used to delineate the WUI.

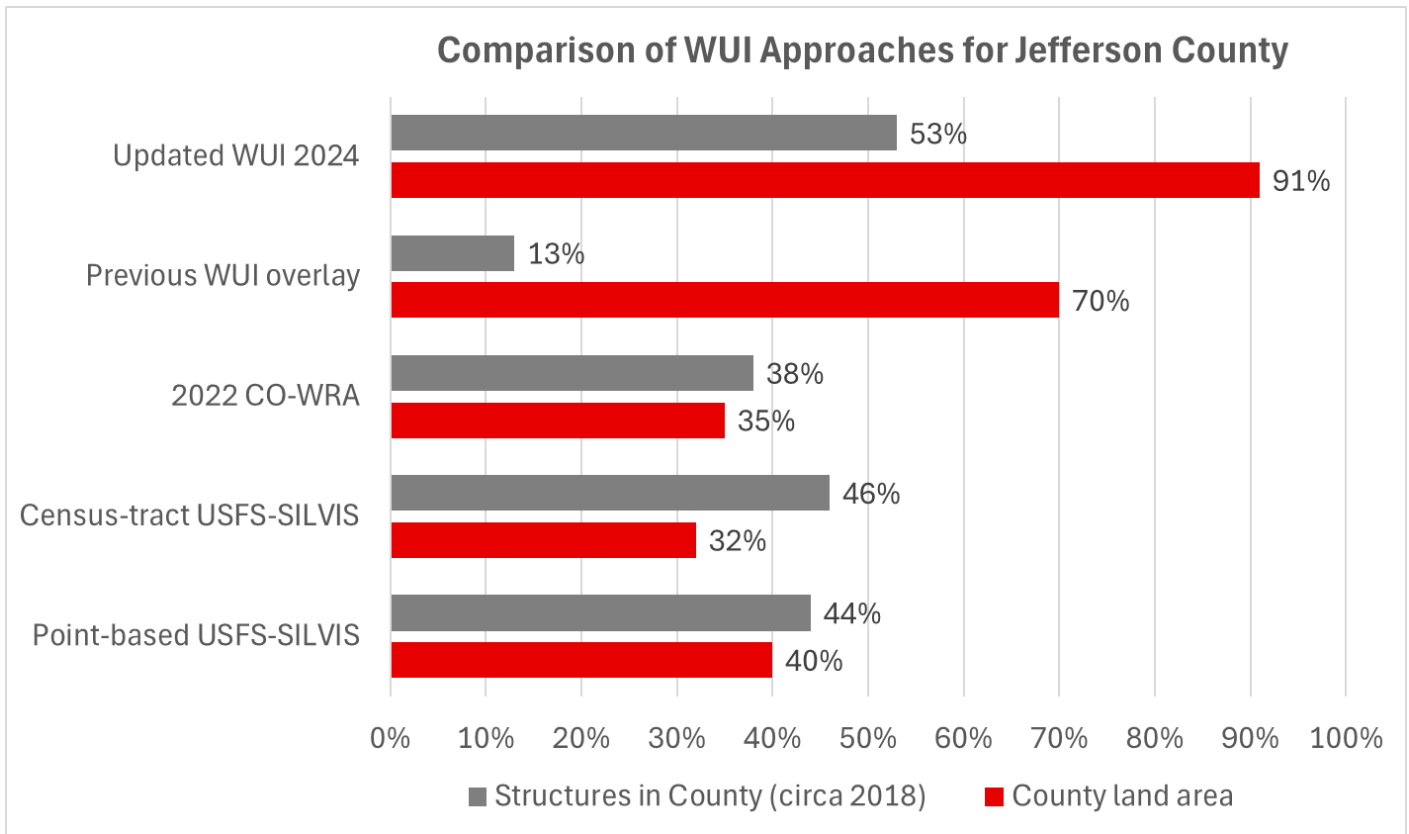
WUI map	Methodology	Data	Pros	Cons
Updated WUI for Jefferson County (2024 CWPP)	<p>WUI = any area within 1,625 meters of vegetation that could burn with moderate or high intensity in large patches of vegetation (&gt;5 km<sup>2</sup>) or within 400 meters of vegetation that could burn with moderate or high intensity in occluded patches of vegetation that are 0.7-5 km<sup>2</sup> and contain at least 0.3 km<sup>2</sup> of vegetation that could burn with moderate or high intensity.</p> <p>Eastern boundary modified to follow roadways or edges of subdivisions.</p>	<p><b>Housing data:</b> Microsoft building footprints circa 2018</p> <p>Vegetation data: 2022 CO-WRA</p>	<p>Includes currently undeveloped areas and areas with low structure density.</p> <p>Includes auxiliary structures.</p> <p>Incorporates information on potential fire intensity.</p> <p>Includes occluded vegetation patches.</p> <p>Includes grassland areas.</p> <p>Includes watersheds critical for surface drinking water.</p> <p>Differentiates between WUI intermix, interface perimeter, and interface interior based on research from NIST (Maranghides et al., 2022).</p>	<p>Limited scientific guidance on how to define occluded vegetation.</p> <p>Ability to update map depends on the availability of new Microsoft building data and CO-WRA vegetation data.</p> <p>Minor errors in Microsoft building data.</p>
Previous Jefferson County WUI overlay zone	<p>WUI = areas above 6,400 feet in elevation.</p>	<p>N/A</p>	<p>Simple to explain and map.</p> <p>Captures currently undeveloped areas in the mountains.</p> <p>Includes watersheds critical for surface drinking water.</p>	<p>Arbitrary elevation threshold.</p> <p>Doesn't incorporate typical components of a WUI definition.</p> <p>Excludes grassland areas.</p> <p>Does not differentiate between WUI interface and intermix.</p>
2022 CO-WRA (CSFS and Technosylva, 2023a)	<p>WUI = areas with &gt;6.17 houses/km<sup>2</sup> and &lt;0.25 miles from burnable vegetation. Unknown patch size cutoffs.</p>	<p><b>Housing data:</b> 2021 LandScan</p> <p>Vegetation data: 2022 CO-WRA</p>	<p>Includes grassland areas.</p> <p>CSFS plans to update map every 3-5 years.</p>	<p>Vague methodology.</p> <p>Excludes undeveloped areas.</p> <p>Only considers primary structures.</p>

WUI map	Methodology	Data	Pros	Cons
				<p>Does not differentiate between WUI interface and intermix.</p> <p>Does not include watersheds critical for surface drinking water.</p>
Census-tract USFS-SILVIS WUI maps (Radeloff et al., 2023a)	<p>Intermix WUI = areas with &gt;6.17 houses/km<sup>2</sup> and &gt;50% cover of wildland vegetation.</p> <p>Interface WUI = areas within 2.4 km of large vegetation patches &gt;5 km<sup>2</sup></p>	<p>Housing data: 2020 Census</p> <p><b>Vegetation data:</b> 2019 USGS National Land Cover Dataset</p>	<p>Follows the widely accepted, federal definition of WUI.</p> <p>Classifies intermix vs. interface by three density classes (low, medium, and high).</p>	<p>Excludes undeveloped areas and areas of low housing density.</p> <p>Does not include watersheds critical for surface drinking water.</p> <p>Spatial unit is Census-tract.</p> <p>Only considers primary structures. Only updated every 10 years (plus analysis delay of 1-3 years).</p>
Point-based USFS-SILVIS WUI maps (Carlson et al., 2022)	<p>Intermix WUI = areas with &gt;6.17 houses/km<sup>2</sup> and &gt;50% cover of wildland vegetation.</p> <p>Interface WUI = areas within 2.4 km of large vegetation patches &gt;5 km<sup>2</sup></p>	<p><b>Housing data:</b> Microsoft building footprints circa 2015</p> <p><b>Vegetation data:</b> 2016 USGS National Land Cover Dataset</p>	<p>Follows the widely accepted, federal definition of WUI.</p> <p>Classifies intermix vs. interface.</p> <p>WUI maps using point-level data better align with building loss in WUI wildfires than census-tract level data (Caggiano et al. 2020).</p> <p>Includes auxiliary structures.</p>	<p>Excludes undeveloped areas and areas of low housing density.</p> <p>Does not include watersheds critical for surface drinking water.</p> <p>Minor errors in Microsoft building data.</p> <p>Ability to update map depends on availability of new Microsoft building data.</p>



**Figure A.5.** Methodology significantly impacts how much of and what parts of Jefferson County qualify as WUI (methods outlined in **Table A.2**). Mapping and analysis of these different types of WUI was completed by The Ember Alliance.





**Figure A.6.** Percent of Jefferson County land area and structures defined as WUI based on different approaches outlined in **Table A.2**. Structures include both primary and auxiliary structures such as sheds and other outbuildings.

# APPENDIX B. RISK ASSESSMENT METHODOLOGY

## Wildfire Risk Assessments

The Jefferson County CWPP leveraged several existing wildfire risk assessments for analyses presented in this document. Here we provide a brief overview and citations for these assessments.

**2022 CO-WRA:** The 2022 CO-WRA, available through the [Colorado Forest Atlas](#), is the most recent and advanced version of the wildfire risk assessment. 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. 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 (a model that utilizes similar equations as FlamMap). Other layers include building loss factor and SIZ risk. The assessment also utilizes flame length and burn probability predictions from FlamMap and combines these predictions with potential sensitivity of highly valued resources and assets (HVRAs) to different fire intensities and the relative importance of HVRAs, wildfire risk to the WUI, and wildfire risk to various HVRAs. HVRAs included in the assessment were building density, population density, WUI, watershed protection areas, forest assets, and riparian assets. Details on the 2022 CO-WRA are provided by (CSFS & Technosylva 2023a, 2023b). The Ember Alliance utilized fire behavior predictions from 2022 CO-WRA for secondary analyses described below.

**2024 Wildfire Risk to Communities:** The U.S. Forest Service and partners developed the [Wildfire Risk to Communities assessment and website](#) under the direction of Congress in the 2018 Consolidated Appropriations Act. The assessment is intended to identify communities with high wildfire hazards and help prioritize mitigation efforts. An advanced wildfire model, FSim, was used to predict wildfire risk to current and potential future structures based on fire intensity, burn probability, and sensitivity of structures to different fire intensities. The tool also provides information on social vulnerability as it pertains to wildfire response, for example, areas with greater percentages of individuals who might need special assistance during an evacuation. Details on the Wildfire Risk to Communities assessment are provided by (Scott et al., 2024).

**2022 Jefferson County Open Space (Jefferson County Open Space) Forest Health Plan (FHP):** The Colorado Forest Restoration Institute (CFRI) conducted a wildfire risk assessment across Jefferson County as part of the 2022 Jefferson County Open Space FHP to help inform treatment prioritization on Jefferson County Open Space properties. The wildfire risk assessment predicts the degree of potential positive or negative impacts of wildfire and different management actions on various HVRAs, as well as the potential ecological benefits and feasibility of different management actions. The assessment utilized flame length and burn probability predictions from FSim and combined these predictions with potential sensitivity of HVRAs to different fire intensities and the relative importance of HVRAs. HVRAs included in the assessment were evacuation routes, infrastructure (power lines,

communication sites, occupied buildings, and structures), drinking water protection, vegetation cover, adjacent private property, wildlife habitat, and recreation infrastructure. Details on the 2022 Jefferson County Open Space FHP are provided by (JCOS, 2022).

**2022 Colorado All-Lands (COAL) fire risk assessment:** The U.S. Forest Service Rocky Mountain Region contracted Pyrologix to develop a wildfire risk assessment for all of Colorado. The wildfire risk assessment predicts the degree of potential positive or negative impacts of wildfire on various HVRAs. The assessment utilized flame length and burn probability predictions from FSim and combined these predictions with potential sensitivity of HVRAs to different fire intensities and the relative importance of HVRAs. HVRAs included in the assessment were housing density, electric transmission lines, communication sites, powerplants, substations, ecosystem function, and surface drinking water. Details on the COAL assessment are provided by (Napoli et al., 2022b, 2022a).

**2021 Colorado Wildfire Ready Watersheds Post-Fire Assessment:** The Colorado Water Board created the [Wildfire Ready Watersheds \(WRW\) program](#) in 2021 to assess the susceptibility of watersheds to post-fire hazards (hydrologic change, flooding, sediment yield, debris flows, and fluvial geomorphic hazards), support development of pre-fire and post-fire mitigation plans, and help prepare communities for these impacts. The Colorado Water Board assessed conditions in HUC-12 watersheds across the state using FlamMap to predict wildfire behavior and various post-fire models to predict relative susceptibility of various HVRAs. HVRAs included in the assessment were storage reservoirs, built flowlines, decreed water rights, municipal water intake watersheds, aquatic resources, and roadway crossings. Details on the 2021 Colorado Wildfire Ready Watersheds Post-Fire Assessment are provided by (CWCB, 2021).

**2022 Forest to Faucets 2.0:** The U.S. Forest Service conducted the Forest to Faucets version 2.0 assessment to identify HUC12 watersheds that are most important to surface drinking water and assess potential threats to water yield from insects and diseases, wildfire, land use, and climate change. Wildfire impacts used predictions of wildfire hazard potential from the 2018 U.S. Forest Service Wildlife Risk to Communities analysis. Details on the 2022 Forest to Faucets version 2.0 assessment are provided by (Mack et al., 2022).

### ***Fire Behavior 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. 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. Exceptional hot, dry, and windy conditions are increasingly common due to climate change and could result in even more extreme fire behavior than predicted by the analyses conducted by CSFS, USFS, CFRI, and the Colorado Water Board.

Fire behavior analyses are useful for assessing relative risk across the county and are not intended to assess specific fire behavior in the vicinity of individual homes. It is not feasible to predict every

combination of fire weather conditions, ignition locations, and suppression activities that might occur during a wildfire. Uncertainty will always remain about where and how a wildfire might behave until a fire occurs, and even then, fire behavior can be erratic and unpredictable.

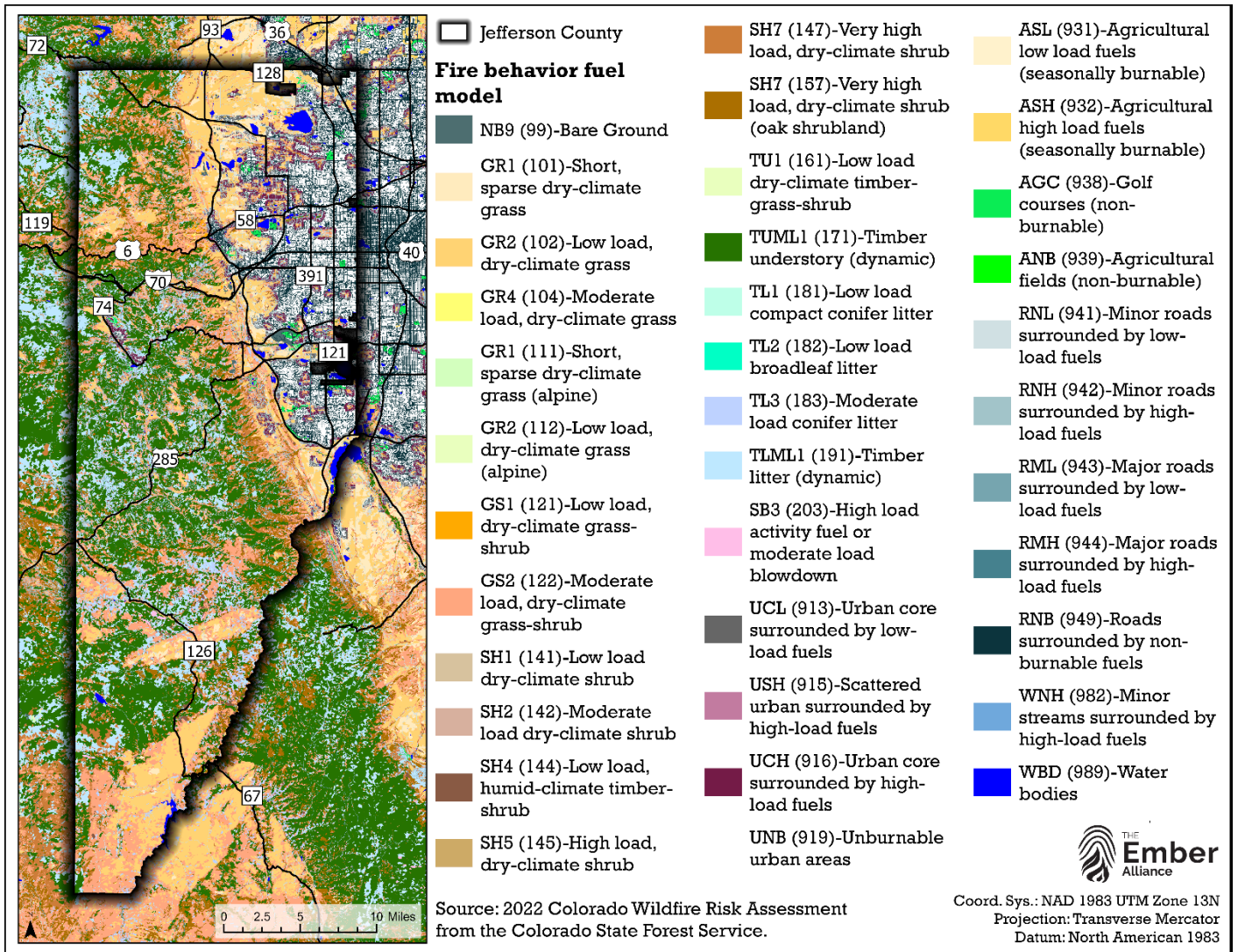
### ***2022 CO-WRA Wildfire Behavior Predictions***

The fire behavior model utilized by CSFS and Technosylva for the 2022 CO-WRA requires 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. **Figure B.1** depicts the fire behavior fuel models present across Jefferson County. Timber understory (TU1) and the custom timber understory model (TUML1) were the most common fire behavior fuel models in Jefferson County. Between 10-15% of the county was classified as grass-shrub, grass, unburnable, shrub, or timber litter fuel models (**Table B.1**).

Fire behavior predictions from the 2022 CO-WRA include flame length (**Figure B.2**), rate of spread (**Figure B.3**), crown fire activity (**Figure B.4**), fire intensity scale (**Figure B.5**), spotting distance (**Figure B.6**), and burn probability (**Figure B.7**). Several of these predictions of fire behavior were used by secondary analyses by The Ember Alliance to predict radiant heat and ember cast exposure and hazards along roadways.

The map of flame length is classified following the Haul Chart that is used by wildland firefighters to guide tactical decisions (**Table B.2**). 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. Flame length is an indicator of fireline intensity—the amount of energy released by a fire.





**Figure B.1.** Fire behavior fuel models used by the Colorado State Forest Service and Technosylva to model wildfire behavior for the 2022 CO-WRA. See (CSFS and Technosylva, 2023b) for detailed methodology. Source: 2022 CO-WRA.

**Table B.1.** Timber understory were the most common fire behavior fuel models in Jefferson County based on the 2022 CO-WRA. Source: 2022 CO-WRA.

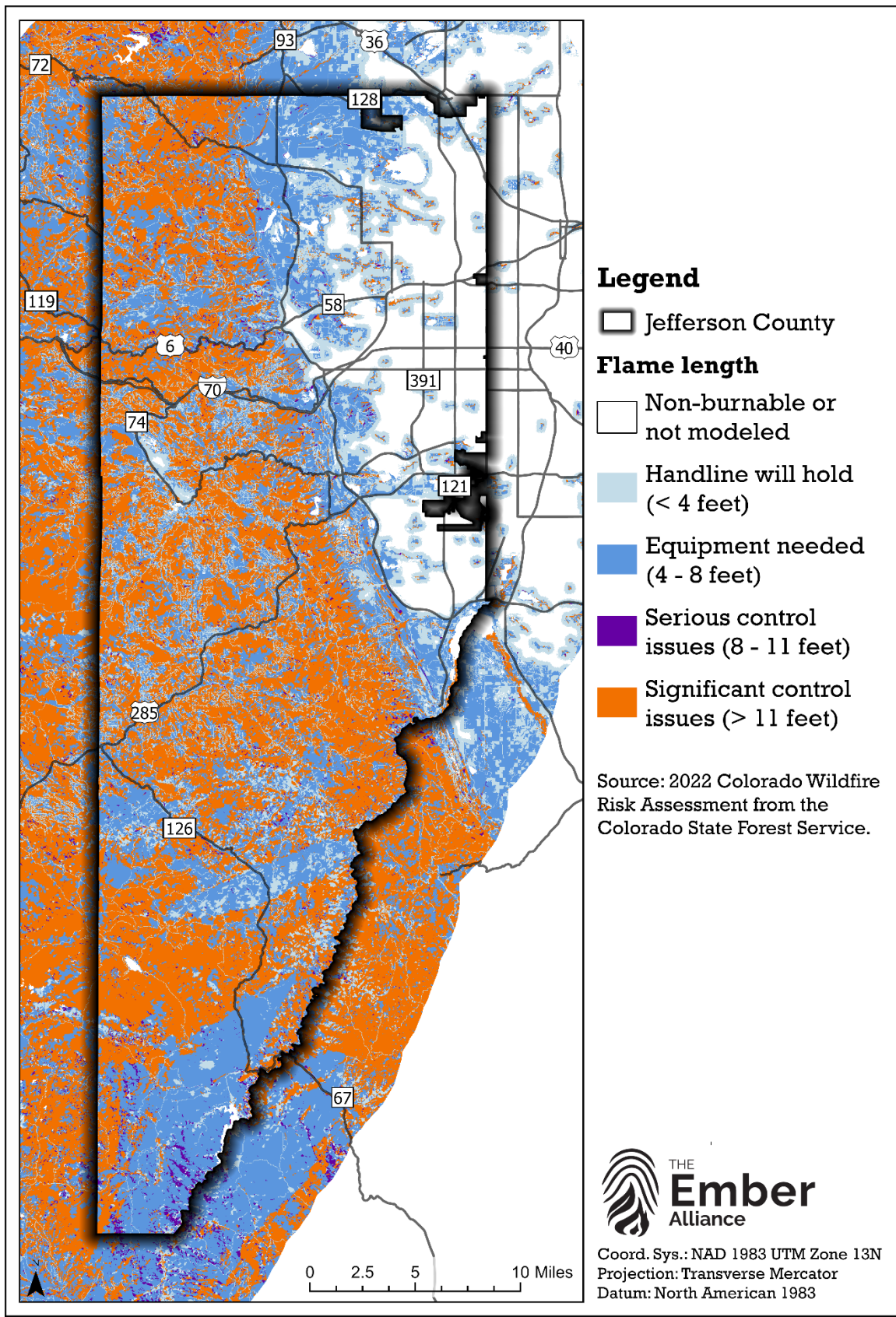
Fire behavior fuel model	Percent of county
Timber understory (TU1 , TUML1)	24%
Grass-shrub (GS1, GS2)	15%
Grass (GR1, GR2, GR4)	13%
Unburnable (Bare, UNB, AGC, ANB, RNB, WBD)	12%
Shrub (SH2, SH4, SH5, SH7, SH7-oak)	11%
Timber litter (TL1, TL2, TL3, TLML1)	10%

Fire behavior fuel model	Percent of county
Roadway surrounded by burnable fuel (RNL, RNH, RML, RMH)	9%
Roadway surrounded by burnable fuel (UCL, USH, UCH)	3%
Agriculture with seasonally burnable conditions (ASL, ASH)	<1%
Slash blowdown (SB3)	<1%

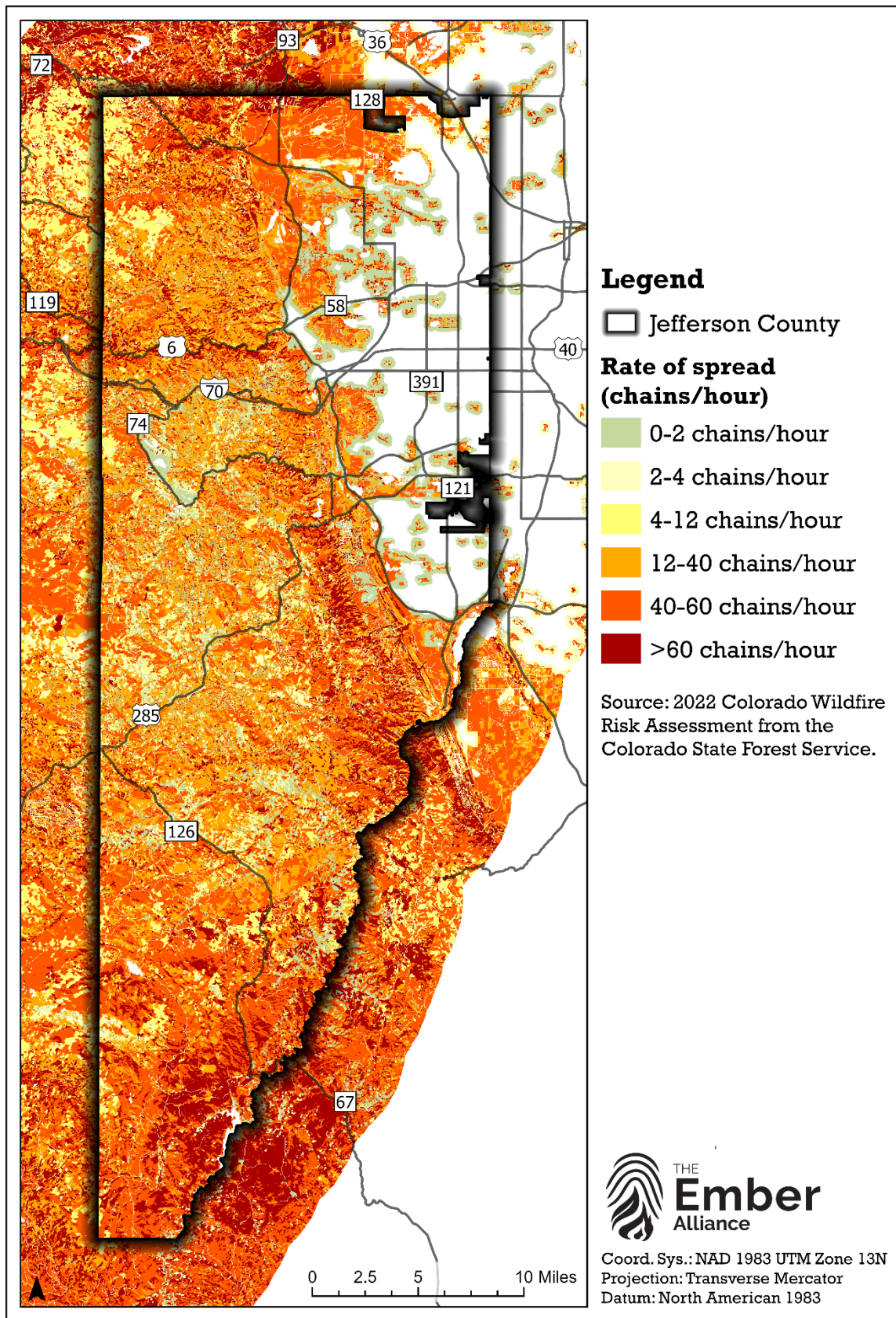
**Table B.2.** Description of fire behavior and tactical interpretations for firefighters from the Haul Chart (NWCG, 2019).

Fire behavior class	Flame length (feet)	Tactical interpretation
Very low, smoldering	<1	Fire is not spreading and has limited flaming. Fire can be attacked at the head or flanks by persons using handtools. Handline will hold the fire.
Low, creeping, spreading	1-4	Fire can be attacked at the head or flanks by persons using handtools. Handline should hold the fire.
Moderate, running	4-8	Fires are too intense for direct attack on the head of the fire by persons using handtools. Handline cannot be relied on to hold fire. Equipment such as dozers, engines, and retardant aircraft may be effective.
High, torching and spotting	8-11	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	Crowning, spotting, and major fire runs are expected. Control efforts at the head of the fire are ineffective.
Extreme and erratic	>25	Extreme intensity, turbulent fire, and chaotic spread. Escape to safety should be considered.





**Figure B.2.** Flame lengths in Jefferson County categorized by the Haul Chart and determined from a weighted average of predictions under low, moderate, high, and extreme weather conditions. Source: 2022 CO-WRA.



**Figure B.3.** Maximum rates of spread at the fire front determined from a weighted average of predictions under low, moderate, high, and extreme weather conditions. Note: 1 chain/hour = 1.1 feet/minute. Source: 2022 CO-WRA.



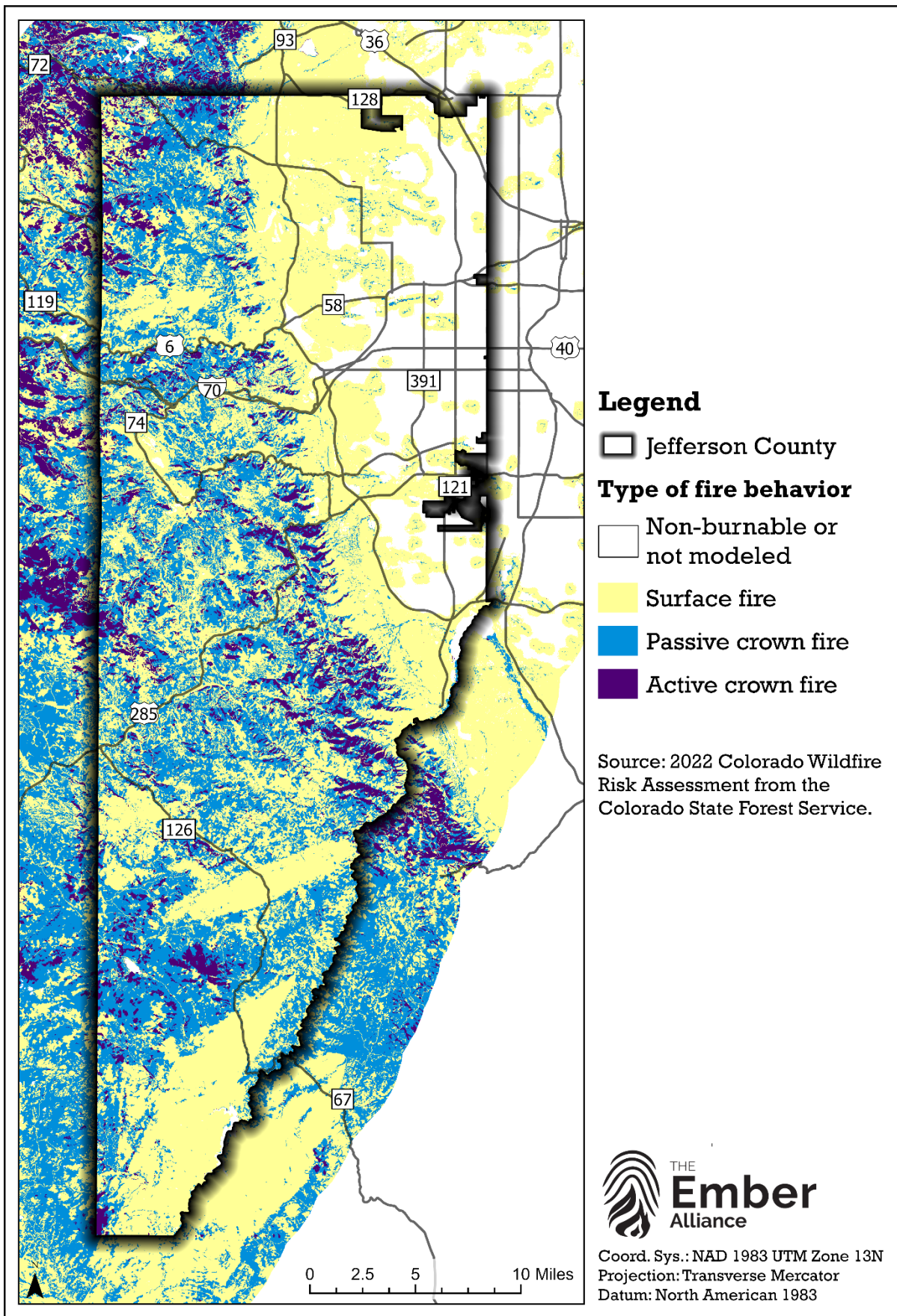
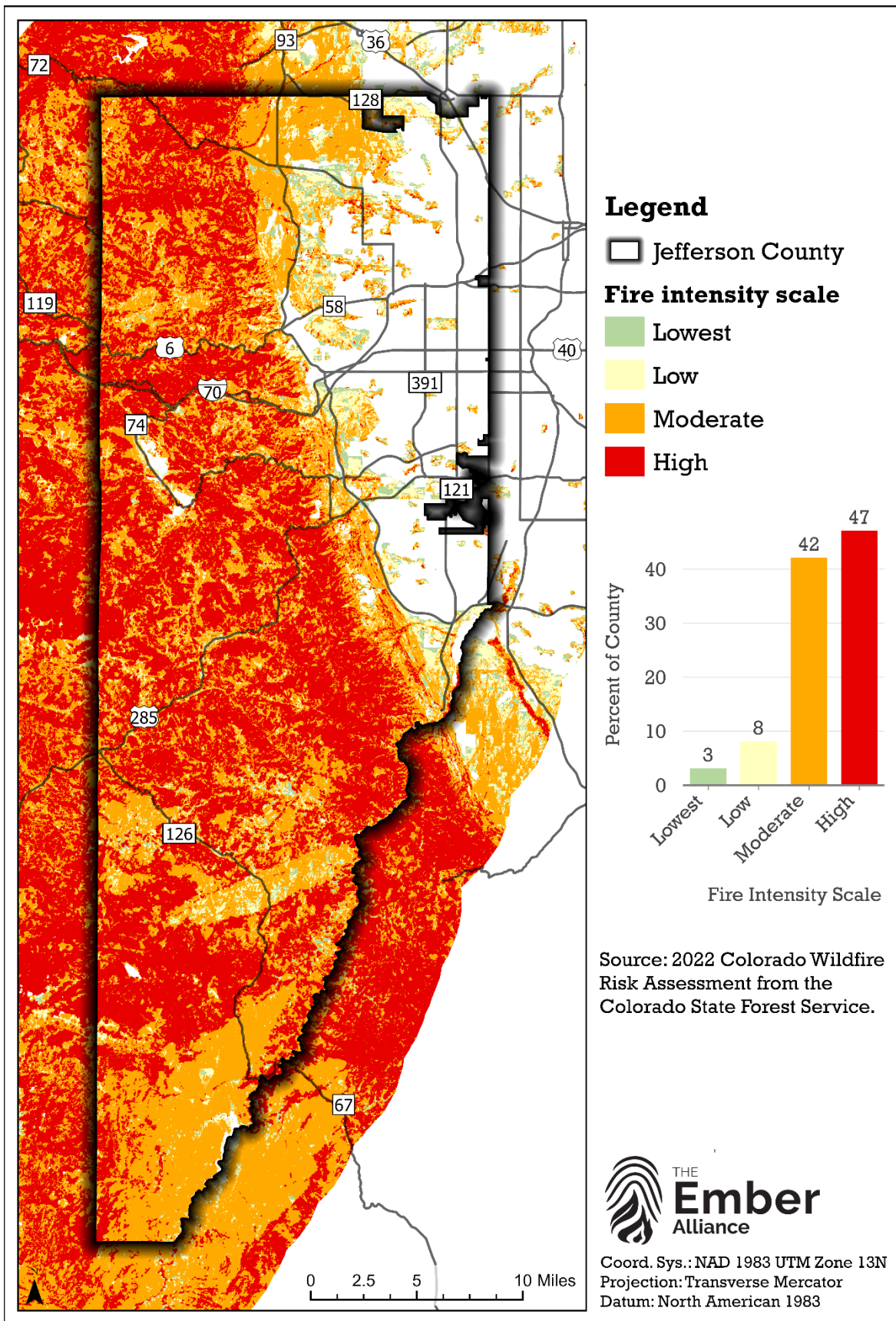
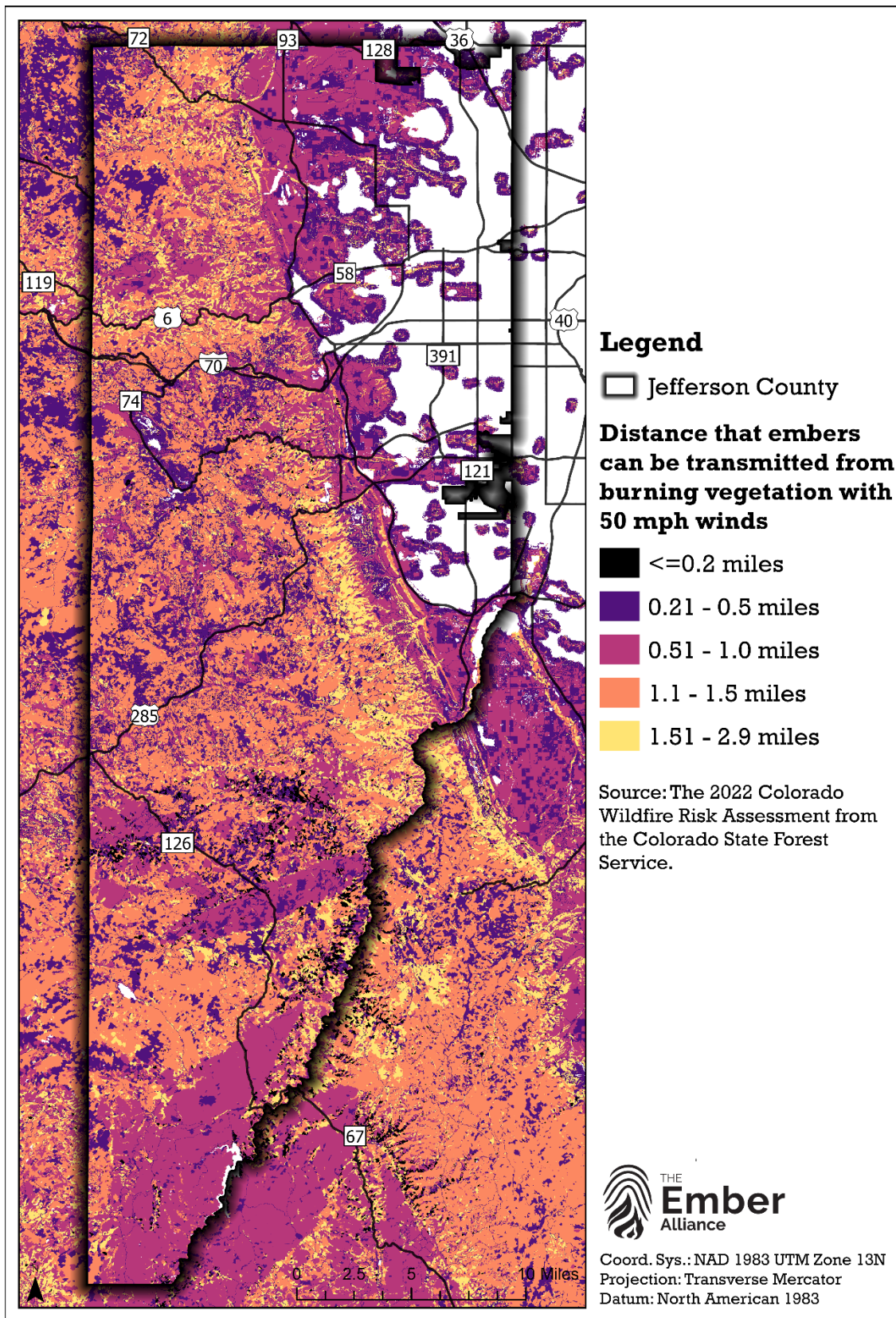


Figure B.4. Crown fire activity in Jefferson County. Source: 2022 CO-WRA.

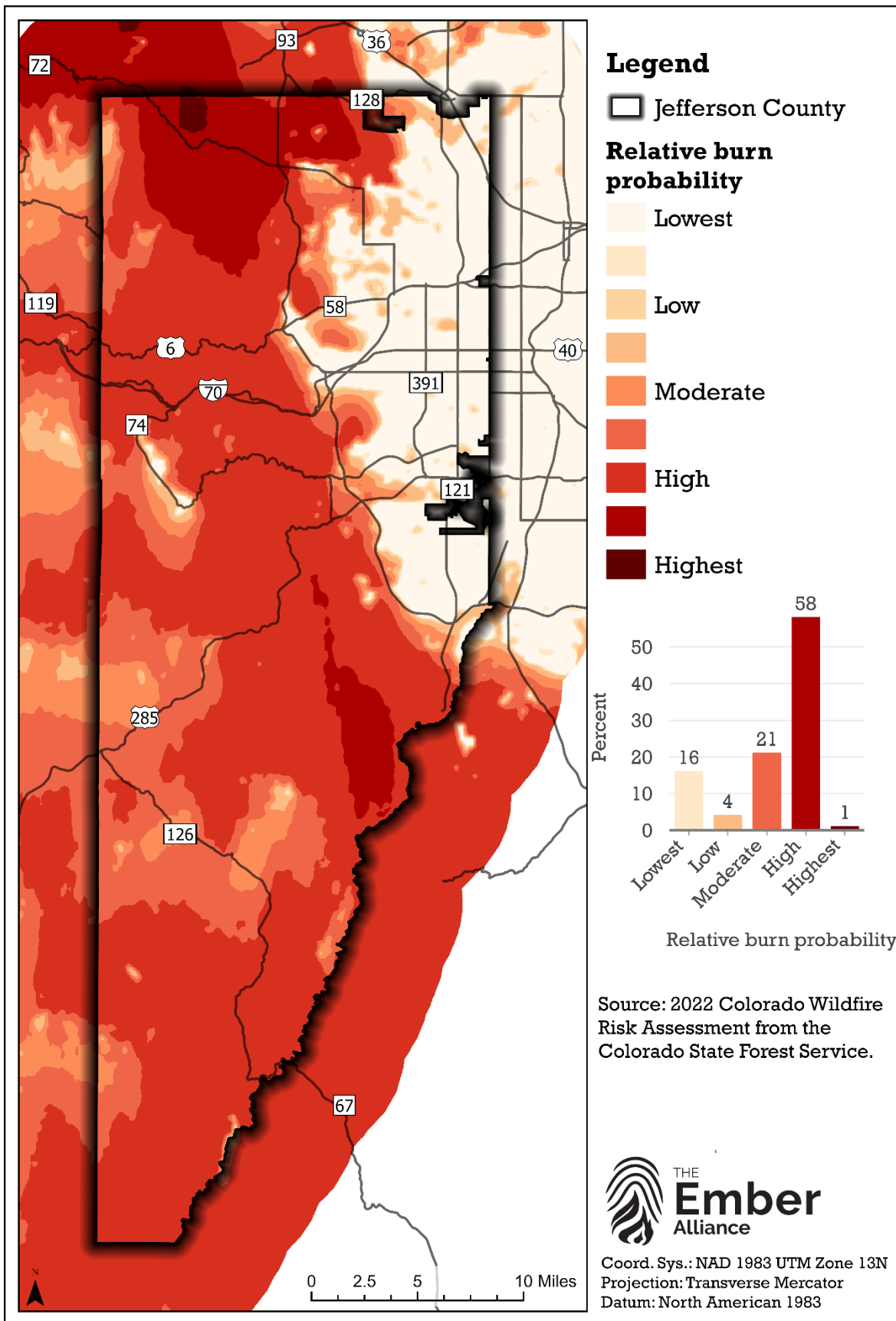


**Figure B.5.** Fire intensity scale combine predictions of flame length and crown fire activity following the classification in **Table 3** in the main body of the CWPP. Source: 2022 CO-WRA.





**Figure B.6.** Predicted distance that embers could be transmitted from burning vegetation (also known as spotting distance) with 50 mph winds. For example, an area with a spotting distance of 1.0 miles could transmit embers up to 1.0 miles away. Shrublands with high flame lengths are predicted to have the greatest spotting distances. Source: 2022 CO-WRA.



**Figure B.7.** Almost 60% of Jefferson County falls into the high to highest relative burn probability categories under high to extreme weather conditions. Source: 2022 CO-WRA.



# Radiant Heat and Ember Cast Exposure

## Radiant Heat and Ember Cast Exposure

Embers can ignite homes and other structures even when the flaming front of a wildfire is far away. Fuel treatments within SIZs and surrounding undeveloped areas could help reduce the exposure of structures to radiant heat and short-range ember cast. All homes and other structures (e.g., rentals, businesses, sheds, garages) in the Jefferson County WUI should be built and upgraded with ignition-resistant materials.

See **Recommendations for Residents** for tangible and relatively simple steps to harden homes and other structures against embers. Mitigation practices, such as removing pine needles from gutters and installing covers over vents, can make ignition less likely, increase the chance that homes and other structures stand strong against wildfire, and reduce the change that structures initiate structure-to-structure ignitions.

The Ember Alliance used predictions of crown fire behavior and flame length from the 2022 CO-WRA to assess the risk that radiant heat and short-range and long-range ember cast can pose to structures (**Figure B.8**). The production, transport, and ability of embers to ignite recipient fuels are guided by complex processes, so we utilized a simplified approach that assumes:

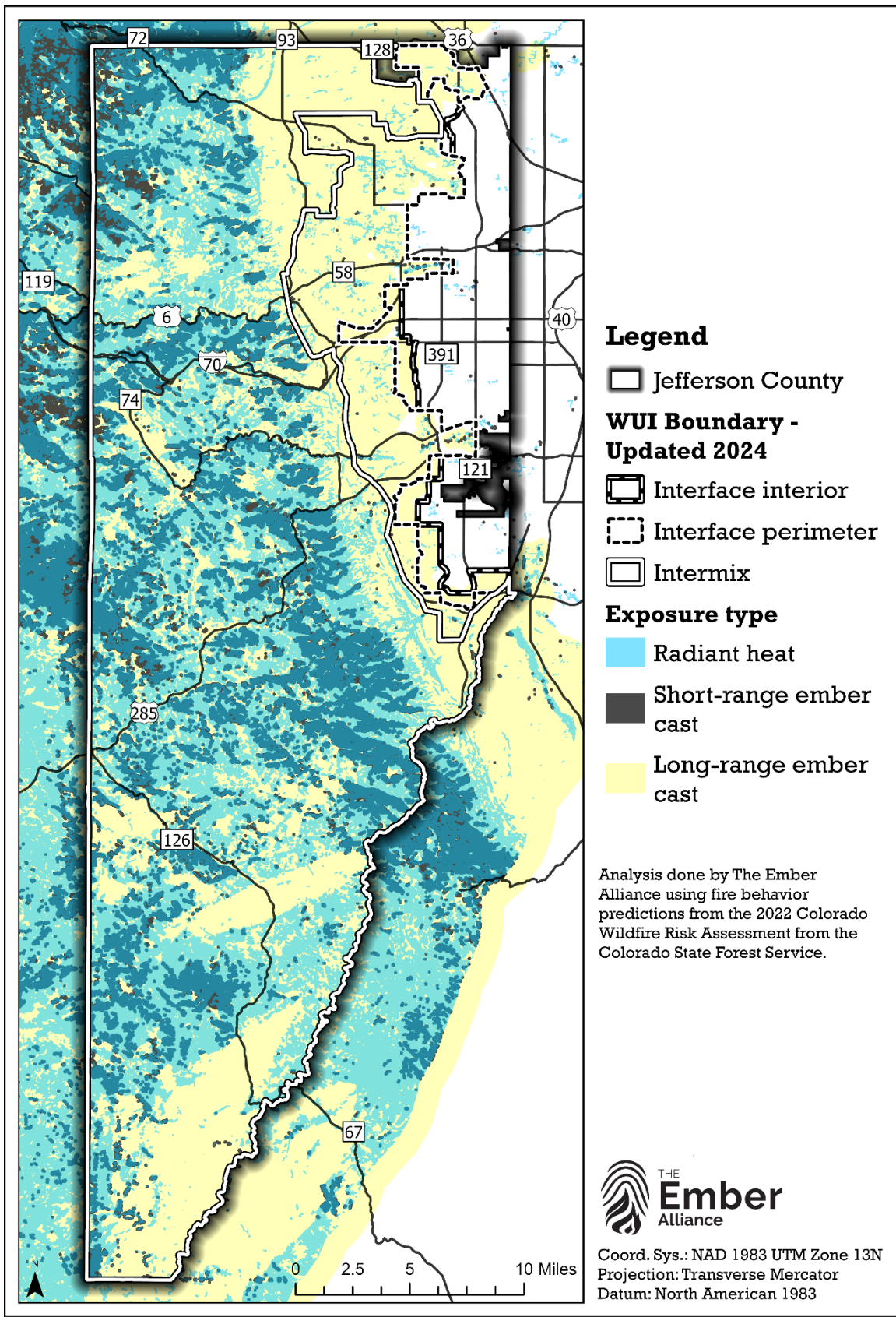
- Radiant heat can ignite structures when extreme fire behavior (flame lengths greater than 12 feet) occurs within 33 yards (30 meters) of structures. Observations from wildfires suggest that 80-100% of structures can be destroyed when exposed to greater than 12-foot flame lengths (Abo El Ezz et al., 2022). The distance cutoff for radiant heat comes from [Beverly et al. \(2010\)](#).
- Short-range embers can ignite homes within about 110 yards (100 meters) of active crown fires. The distance cutoff for short-range comes from [Beverly et al. \(2010\)](#). [Caggiano et al. \(2020\)](#) also found that a vast majority (95%) of home losses during WUI fires occurred within 100 m of wildland vegetation.
- Long-range embers can ignite homes within 1.0 mile (1,625 meters) of active crown fires. The distance cutoff for long-range embers is the same as that used for defining the WUI in Jefferson County based on research by [Caggiano et al. \(2020\)](#) and [Radeloff et al. \(2005\)](#).

This analysis is designed to assess relative risk across the county and not to evaluate absolute risk to individual homes. The fire behavior model used by the 2022 CO-WRA and the approach outlined above cannot account for mitigation within the SIZ, 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.

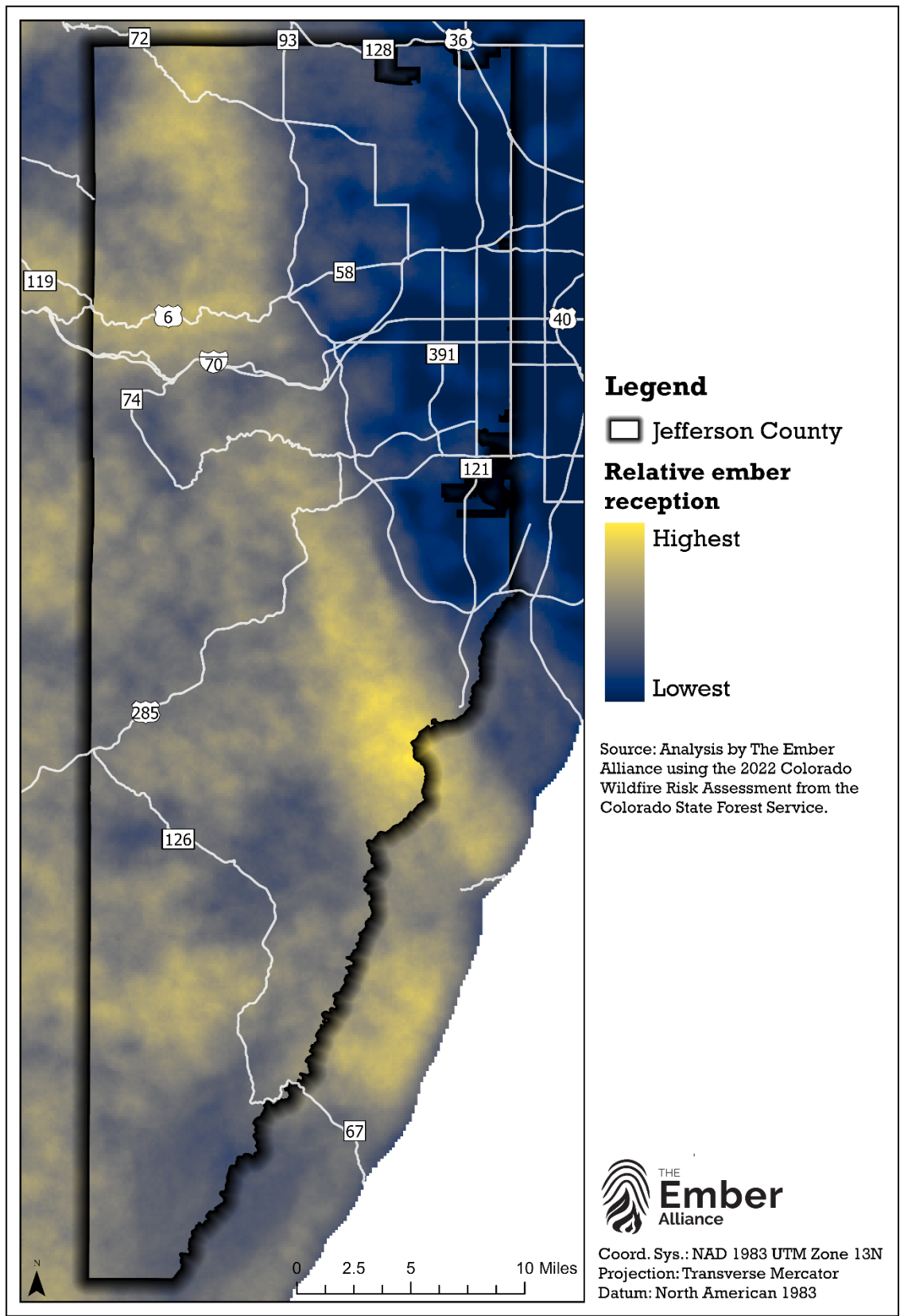
We also used predictions of spotting distance with 50 mph winds from the 2022 CO-WRA (**Figure B.6**) to determine relative ember reception across the county (**Figure B.9**). We assumed that a pixel could transmit embers in a circular area with a radius equal to the spotting distance. The strongest winds often blow out of the west along the Front Range of Colorado, but winds can blow from any direction

during a wildfire, so a circular buffer depicts places where embers could be transmitted under every different wind scenario. We determined the number of potential ember sources for each pixel, with higher values indicating that more embers could potentially reach that pixel, and then relativized the output so values range from 0 (no ember reception) to 1 (highest ember reception in the county).

We also determined the number of structures that could contribute short-range embers to each structure assuming a distance cutoff of 110 yards. Most structures in Jefferson County WUI (97%) could be exposed to short-range ember cast from at least one other structure, and 82% could be exposed to short-range ember cast from at least five other structures (**Figure B.10**). This creates the opportunity for home-to-home ignitions, especially if homes are not mitigated or hardened (Maranghides et al., 2022; Syphard et al., 2012).

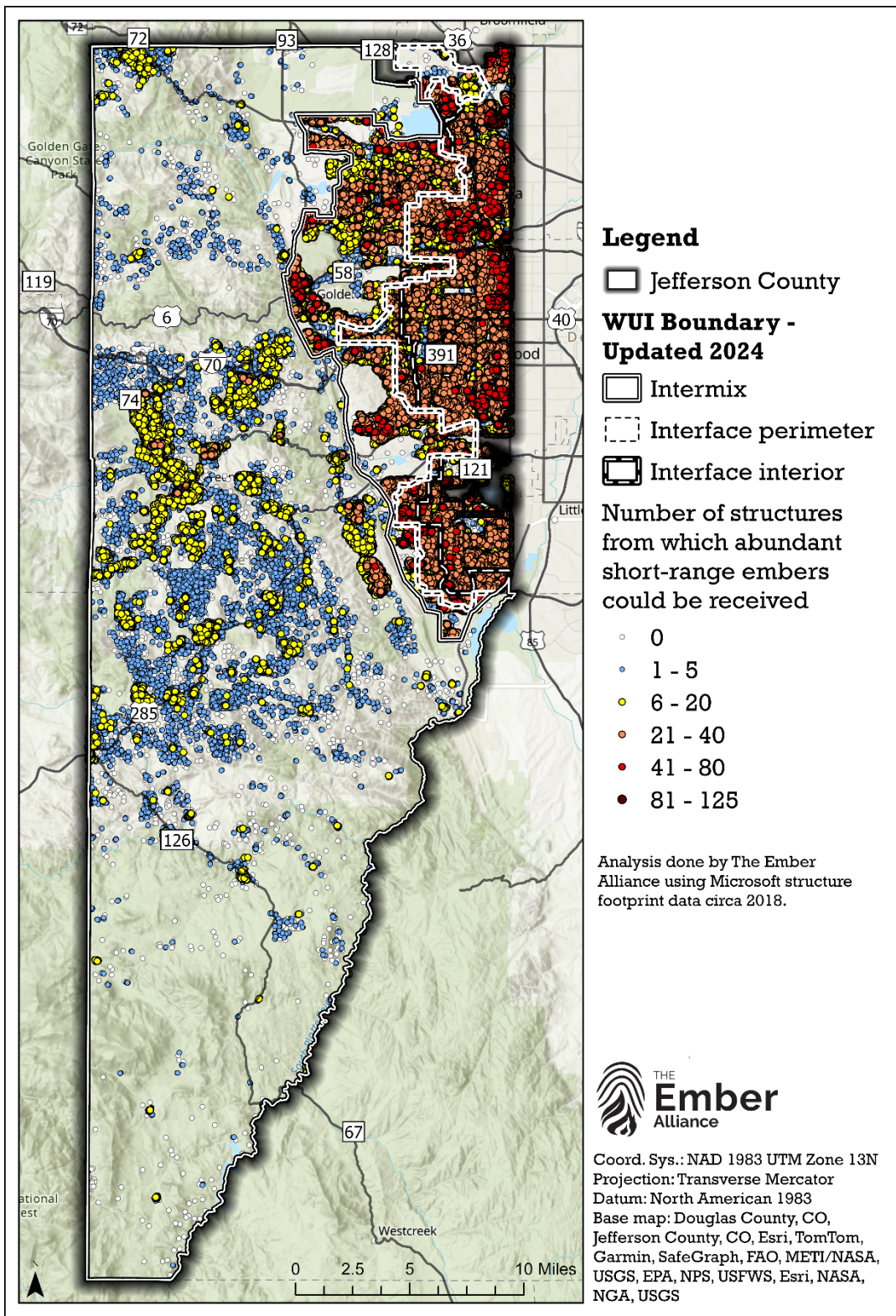


**Figure B.8.** Predicted exposure to short and long-range ember cast and radiant heat across Jefferson County. Source: Analysis by The Ember Alliance using predictions of flame length and crown fire activity from the 2022 CO-WRA (Figure B.2; Figure B.4).



**Figure B.9.** Relative ember reception in Jefferson County. Areas with the highest values could receive the most embers from burning vegetation based on spotting distances under 50 mph winds. Analysis by The Ember Alliance using predictions of spotting distance from the 2022 CO-WRA (**Figure B.6**).





**Figure B.10.** 97% of structures in Jefferson County WUI could be exposed to short-range ember cast from at least one nearby structure, and 82% could be exposed to short-range ember cast from at least five nearby structures. On average, homes in the Jefferson County WUI could be exposed to short-range ember cast from 18 other homes, with some homes exposed to as many as 80 other homes. This creates the opportunity for home-to-home ignitions, especially if homes are not mitigated or hardened (Maranghides et al., 2022; Syphard et al., 2012).

## Exposure of Highly Valued Resources and Assets

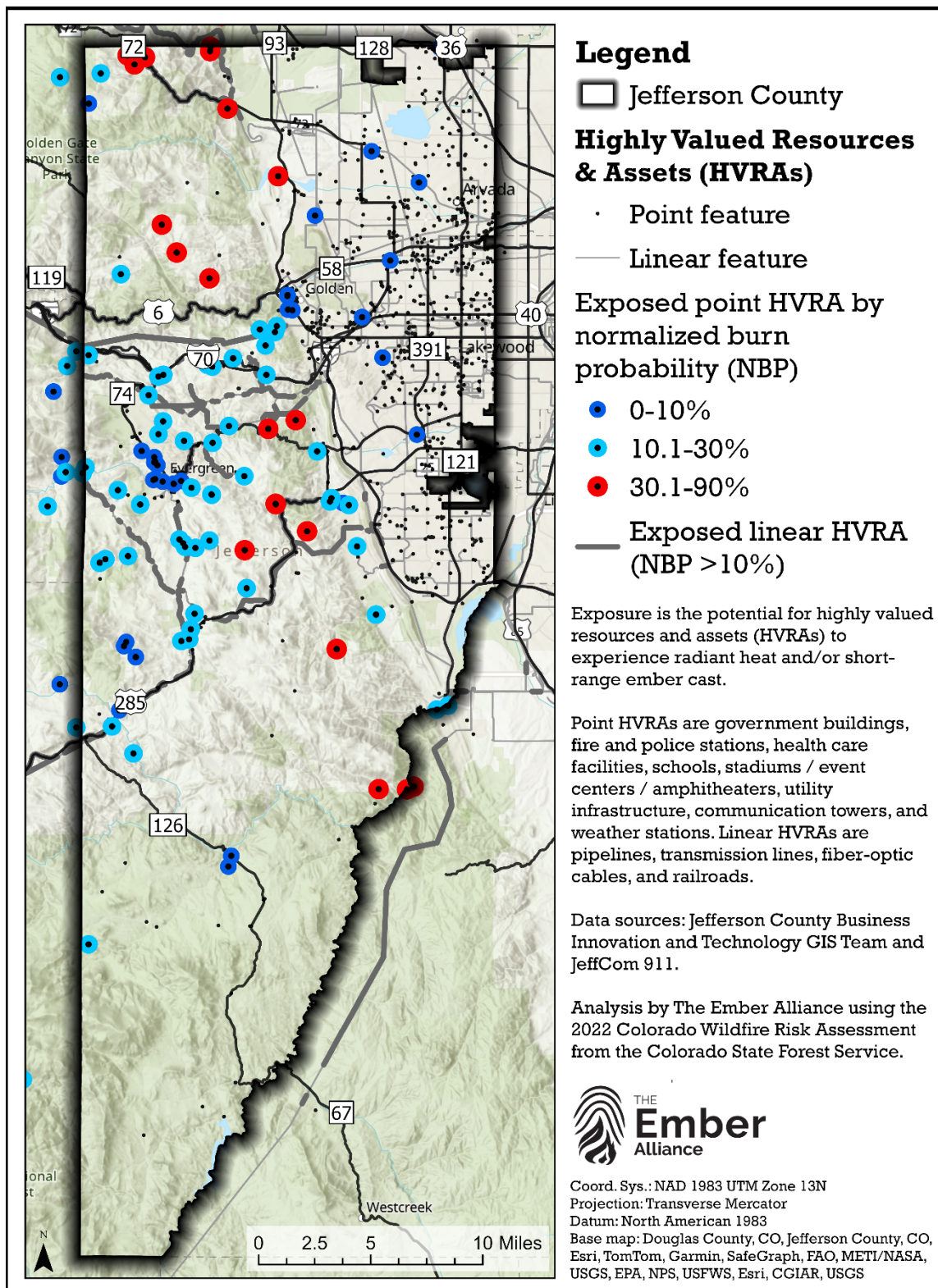
We identified non-residential HVRAs in areas that could experience damaging radiant heat and/or short-range ember cast in Jefferson County. We further stratified point-based HVRAs by normalized burn probability to further help the County and partners prioritize fuel treatments and SIZ mitigation to protect critical infrastructure. Linear features were considered exposed if they fell in areas with greater than 10% normalized burn probability. HVRAs likely vary in their sensitivity to radiant heat and/or short-range ember cast, for example, a wooden schoolhouse is more likely to be damaged by wildfire than buried gas lines. However, an analysis of sensitivity was outside the scope of this analysis, and these differences can be addressed with expert opinion when it comes time to implement mitigation actions.

HVRAs considered for this analysis were airports, railroads, communication towers, health care facilities (urgent care and hospitals), safety and security facilities (fire stations, police stations, and jails), government buildings and services (court houses, agency maintenance facilities, agency headquarters, libraries, schools, post offices, food banks, and welfare services), utility infrastructure (power plants, wind turbines, landfills, dams, water treatment facilities, utility buildings, electric transmission lines, gas lines, and fiber-optic cables), weather stations, and large venues (e.g., event centers, amphitheaters, fairgrounds, and stadiums). Spatial data came from Jefferson County Business Innovation and Technology GIS Team and JeffCom 911.

HVRAs with exposure to radiant heat and/or short-range ember cast are scattered across the County (**Figure B.11**). Those with a higher normalized burn probability, and therefore a higher likelihood of encountering wildfire, fall along the transition from foothills to mountains. A list of point-based HVRAs with potential exposure is provided in **Table B.3**. Across the county, 19 miles of gas lines, 56 miles of fiber-optic cables, 42 miles of electric transmission lines, and 4.5 miles of railroad could experience exposure to radiant heat and/or short-range ember cast in areas with greater than 10% normalized burn probability.

**On-the-ground assessments are vital to verify exposure of HVRAs and to develop specific plans for mitigation.** CO-WRA fire behavior predictions 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.





**Figure B.11.** Predicted exposure of non-residential HVRAs to radiant heat and/or short-range ember cast in Jefferson County. HVRAs in areas with higher normalized burn probabilities have a higher likelihood of encountering wildfire. Site-level assessments are vital to verify exposure of highly valued resources and develop specific plans for mitigation. Source of data: Jefferson County Business Innovation and Technology GIS Team and JeffCom 911. Analysis by The Ember Alliance using 2022 CO-WRA fire behavior predictions.

**Table B.3.** Non-residential HVRAs in areas that could experience damaging radiant heat and/or short-range ember cast in Jefferson County stratified by normalized burn probability. HVRAs in areas with higher normalized burn probabilities have a higher likelihood of encountering wildfire. Site-level assessments are vital to verify exposure of highly valued resources and develop specific plans for mitigation. Locations of some HVRAs infrastructure are generalized for security, but this data has been securely shared with the County.

Description	Normalized burn probability
<b>Communication towers</b>	
Communication tower in Elk Creek FPD	<=10%
Communication towers on Bear Mountain, Centennial Peak, Doublehead Mountain, and Lookout Mountain	>10-30%
Communication towers on Eldorado Mountain, Guy Hill, Mount Morrison, and in Inter Canyon FPD	>30%
<b>Government buildings and services</b>	
R1 School Administration Building 21st Century Virtual Academy Creighton Junior High CSM Early Childhood Center Evergreen School of Music Great Escape School Lincoln Academy Wheat Ridge Head Start	<=10%
Colorado Department of Transportation State Shop on Highway 74 Child Development Center on Genesee Trail Road Children's World Learning Centers Elk Creek Elementary School Evergreen Academy Marshdale Elementary School Montessorri School of Evergreen Peak Learning System West Jefferson Middle School Windy Peak Outdoor Lab Genesee Post Office Conifer Library Evergreen Library	>10-30%
Idledale Post Office	>30%



Description	Normalized burn probability
Indian Hills Post Office Coal Creek Canyon Elementary School University of Denver on N. Turkey Creek Road	
<b>Health care facilities</b>	
Evergreen Health Urgent Care - South Office	>10-30
<b>Large venues</b>	
Evergreen Lake House / Evergreen Rink Marv Kay Stadium	<=10
<b>Safety and security facilities</b>	
Coal Creek Canyon Fire Station 4 Elk Creek FPD Station 3 Evergreen Fire & Rescue Station 1 Fairmont FPD Station 32 U.S. Forest Service Division 11	<=10
Evergreen Fire & Rescue Station 8 Foothills Fire & Rescue Rainbow Hills Station Foothills Fire & Rescue Grapevine Station Genesee Fire Station 2 Highland Rescue Team Inter Canyon Fire & Rescue Station 4 West Metro Fire Rescue Station 11	>10-30
Coal Creek Canyon Fire Station 1 Coal Creek Canyon Fire Station 3 Inter Canyon Fire & Rescue Station 2	>30
<b>Utility infrastructure</b>	
Public utility building in Evergreen Water treatment facilities in Arvada, Evergreen, and West Metro FPDs	<=10
Powerplant in Evergreen FPD Solid waste landfill on County Highway 73 Water treatment facilities in Elk Creek, Evergreen, Indian Hills, and West Metro FPDs	>10-30
Powerplant in North Fork FPD Water treatment facility in Coal Creek Canyon	>30
<b>Weather station</b>	

Description	Normalized burn probability
Weather stations in Elk Creek and North Fork FPDs	<=10
Weather stations in Coal Creek Canyon, Elk Creek, Evergreen, and Foothills FPDs	>10-30
Weather stations in Coal Creek Canyon, Inter Canyon, Fairmont, and Golden Gate FPDs	>30

## Relative Risk Assessment

A comprehensive and high-quality wildfire risk assessment is a key component of a CWPP to (1) communicate a realistic sense of urgency to residents, land managers, local and county-level agencies, and other partners and (2) feed into strategic prioritization of fuel treatments and other actions to mitigate wildfire risk and increase emergency preparedness. We compared the *relative* risk of wildfire and post-fire effects in 98 regional action areas across Jefferson County and in 39 HUC12 watersheds. Regional action areas range in size from 0.3 to 46 square miles, and HUC12 watersheds in Jefferson County range in size from 14 to 78 square miles.

Jefferson County regional action areas primarily correspond to the boundaries of potential operational delineations (PODs) from the Arapaho-Roosevelt and Pike-San Isabel National Forests (**Figure B.12**). PODs are topographic areas bounded by features suitable for fire control (e.g., ridgetops and roadways) that can be used for tactical operations during wildfire events and serve as management units for proactive ecological restoration and wildfire risk mitigation. PODs are collaboratively developed by fire and fuel managers with local, county, state, and federal agencies. Adjustments were made to a handful of POD boundaries to follow potential control lines in closer proximity to the boundary of Jefferson County. The U.S. Forest Service and its partners have not developed POD boundaries for the eastern portion of Jefferson County, so the CWPP Core Team developed regional action areas that followed the updated WUI boundary and major roadways.

Using PODs as the basis for regional action areas was a strategic decision to align the Jefferson County CWPP with other regional efforts to coordinate action within PODs, such as the Front Range Wildfire Crisis Strategy Landscape, Northern Colorado Fireshed, and Central Colorado Forest Collaborative.

The assessment for the Jefferson County CWPP incorporates findings from five existing analyses that evaluate different components of risk: the 2022 Colorado Wildfire Risk Assessment (2022 CO-WRA) from the CSFS, the 2021 Jefferson County Open Space Forest Health Management Plan, the 2022 USFS Colorado All-Lands (COAL) assessment, the USFS Forest 2 Faucets assessment, and the 2022 Colorado Water Conservation Board's statewide post-wildfire susceptibility analysis. Additional analyses were also conducted specifically for the Jefferson County CWPP to supplement these other assessments. Leveraging existing wildfire risk assessments helps align the Jefferson County CWPP with ongoing efforts by partners to prioritize risk mitigation activities.

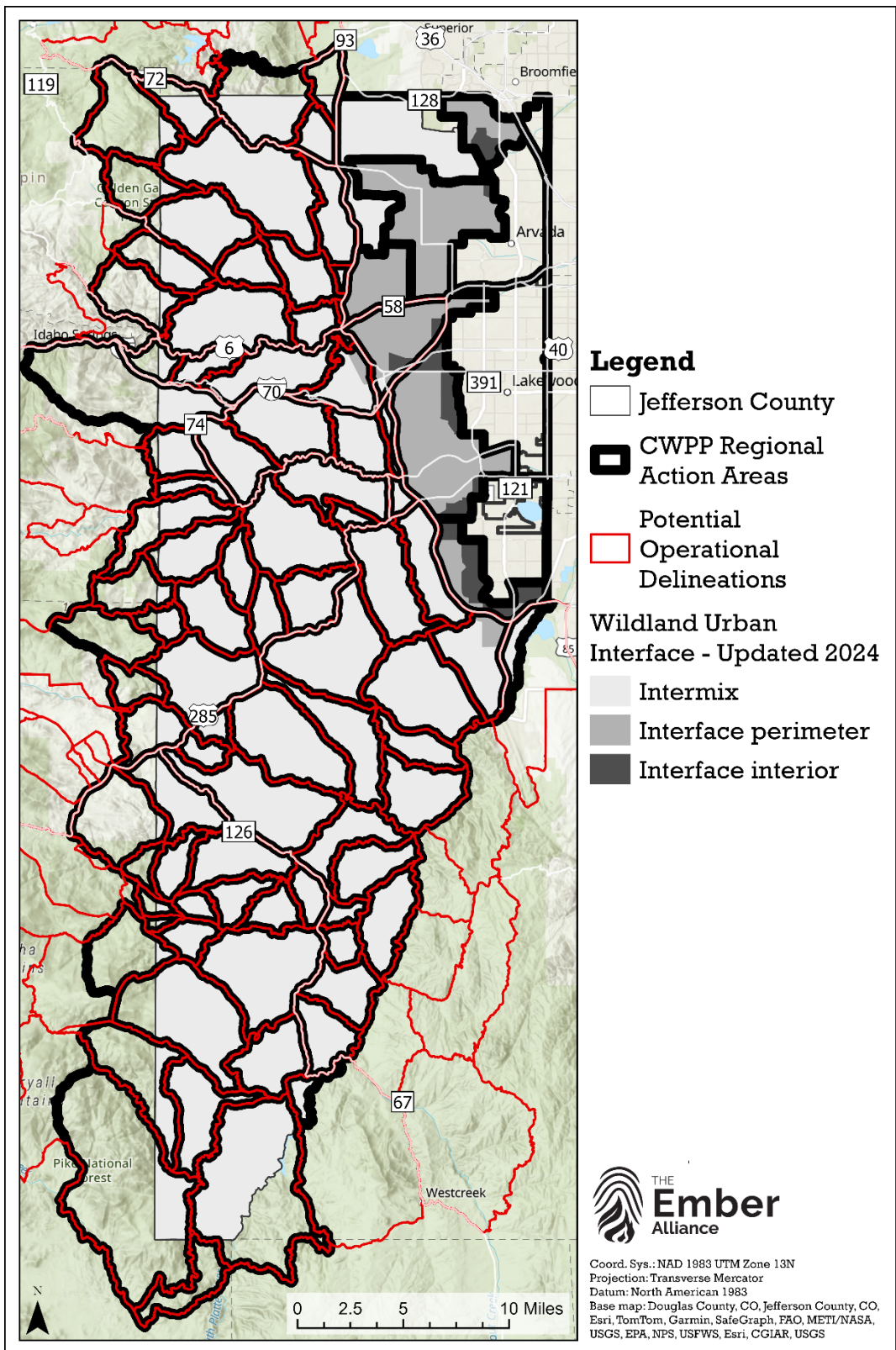
We compared wildfire behavior, exposure of homes, and impacts to HVRAs among regional action areas and post-fire effects among HUC12 watersheds (**Figure 18**). The 2022 Forest 2 Faucets 2.0 assessment and the 2021 Colorado Wildfire Ready Watersheds Post-Fire Assessment summarize risk to HUC12 watersheds, with watersheds being the most meaningful unit of analysis for impacts related to post-fire sediment delivery, debris flow, and hydrological change.

Metrics from the different assessments were selected for the four risk categories (wildfire behavior, structure exposure, impacts to HVRAs, and post-fire impacts) and summarized by regional action area of HUC12 watershed. Values were normalized for each metric so they ranged from 0 to 1. We assigned weights to each metric within their category and calculated a weighted average of the metrics. The

weighted averages were percentile ranked so we could present relative risk across Jefferson County in five percentiles (0-20<sup>th</sup>, 20-40<sup>th</sup>, 40-60<sup>th</sup>, 60-80<sup>th</sup>, and 80<sup>th</sup>-100<sup>th</sup>). See **Table B.4** for details.

We developed relative risk ratings specifically for Jefferson County, so this assessment is not suitable for comparing this county to other counties in Colorado or the United States. The U.S. Forest Service [Wildfire Risk to Communities](#) analysis is useful for comparing Jefferson County to other counties in Colorado and in the United States, and the CSFS [2022 CO-WRA](#) is useful for comparing Jefferson County to other counties in Colorado.





**Figure B.12.** The Jefferson County CWPP compares relative wildfire behavior, exposure of structures, and risk to HVRAs among 98 regional action areas. Boundaries of regional action areas primarily follow PODs from the Arapaho-Roosevelt and Pike-San Isabel National Forests in the western part of the county and boundaries of the Jefferson County WUI and major roadways in the eastern part of the county.

**Table B.4.** Metrics and weighting used to produce relative risk ratings of wildfire behavior, structure exposure, impacts to HVRAs, and post-fire impacts for Jefferson County.

Metric	Source	Weight in Category	Map in CWPP
<b>Fire behavior</b>			
Relative ember reception	TEA analysis with 2022 CO-WRA	25	<b>Figure B.9</b>
Percent area with active crown fire	2022 CO-WRA	25	<b>Figure B.4</b>
Percent area with high fire intensity scale	2022 CO-WRA	25	<b>Figure B.5</b>
Average burn probability	2022 CO-WRA	25	<b>Figure B.7</b>
<b>Exposure of homes</b>			
Percent of homes exposed to radiant heat and/or short-range embers	TEA analysis with 2022 CO-WRA	20	<b>Figure B.8</b>
Average building loss factor	2022 CO-WRA	20	
Percent area with high or highest WUI risk	2022 CO-WRA	20	
Average defensible space risk	2022 CO-WRA	20	
Percent of homes in high-density WUI	TEA analysis	20	<b>Figure A.4</b>
<b>Exposure of combined VARs</b>			
Percent area with high or highest risk for HVRAs	2022 CO-WRA	25	
Average expected net value change to HVRAs	2022 JCOS Forest Health Plan	25	
Average expected net value change to HVRAs	2022 USFS COAL	25	
Number of point HVRAs exposed to radiant heat or short-range ember cast	TEA analysis with 2022 CO-WRA	12.5	<b>Figure B.11</b>
Miles of linear HVRAs exposed to radiant heat or short-range ember cast	TEA analysis with 2022 CO-WRA	12.5	<b>Figure B.11</b>
<b>Post-fire hazards / watershed health</b>			
Average relative impact of wildfire to surface drinking water	2022 Forests 2 Faucets	50	<b>Figure A.2</b>
Average relative impact of post-fire hazards on all HVRAs	2021 CO Wildfire Ready Watersheds	25	
Sum of expected net value change to watershed health	2022 JCOS Forest Health Plan	25	

## Potential Roadside Fuel Treatment Need

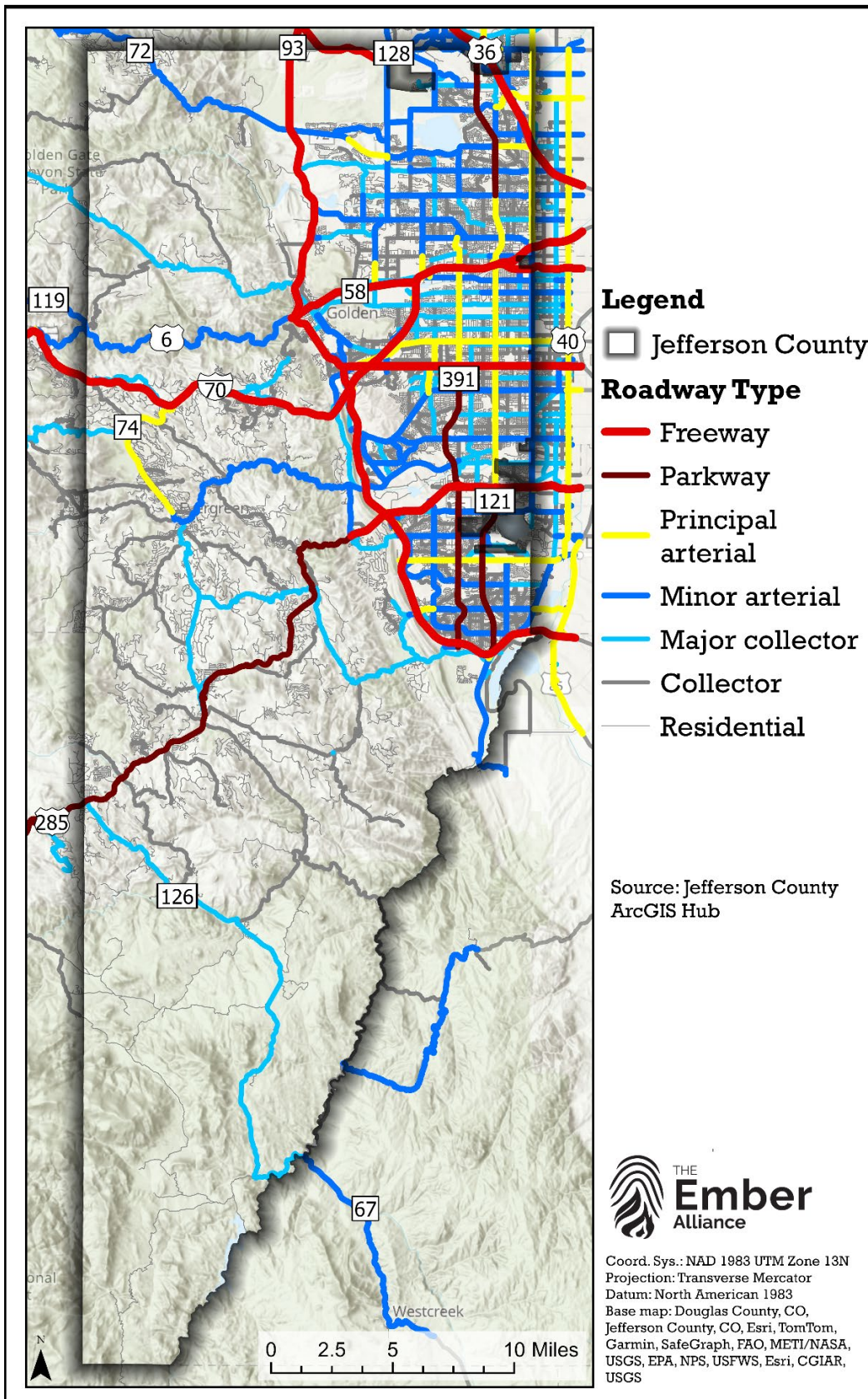
We determined the relative need for roadside fuel treatments across Jefferson County based on the presence of hazardous conditions along roadways (areas with greater than 8-foot flame lengths according to the 2022 CO-WRA), roadway type (a proxy for the relative importance of a roadway for traffic) (**Figure B.13**), cooccurrence with POD boundaries, and relative impact to people and property if wildfire were to cross a potential control line (unpublished analysis by Dr. Scott Ritter with CFRI using data from the 2022 COAL) (**Figure B.14**). We used roadway data from Jefferson County ArcGIS Hub.

**Table B.5** outlines the approach used to determine the relative need for roadside fuel treatments. **Figure B.15** depicts the relative treatment need as of the time of this analysis using 2022 CO-WRA data. This analysis predicts that 26 miles of roadways fall into the category with the highest need for roadside fuel treatments and 71 miles fall into the category with very high need. Maintenance responsibility for roadway surfaces in the highest and very high treatment need categories are almost exclusively the State and County (**Table B.6**). However, maintenance responsibility for the roadway surface does not translate into responsibility for roadside fuel treatments. Rights-of-way and easements vary across the county and need to be determined by surveyors.

On-the-ground assessments are vital to verify the need for roadside fuel treatments and to develop specific plans for mitigation. CO-WRA fire behavior predictions 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.

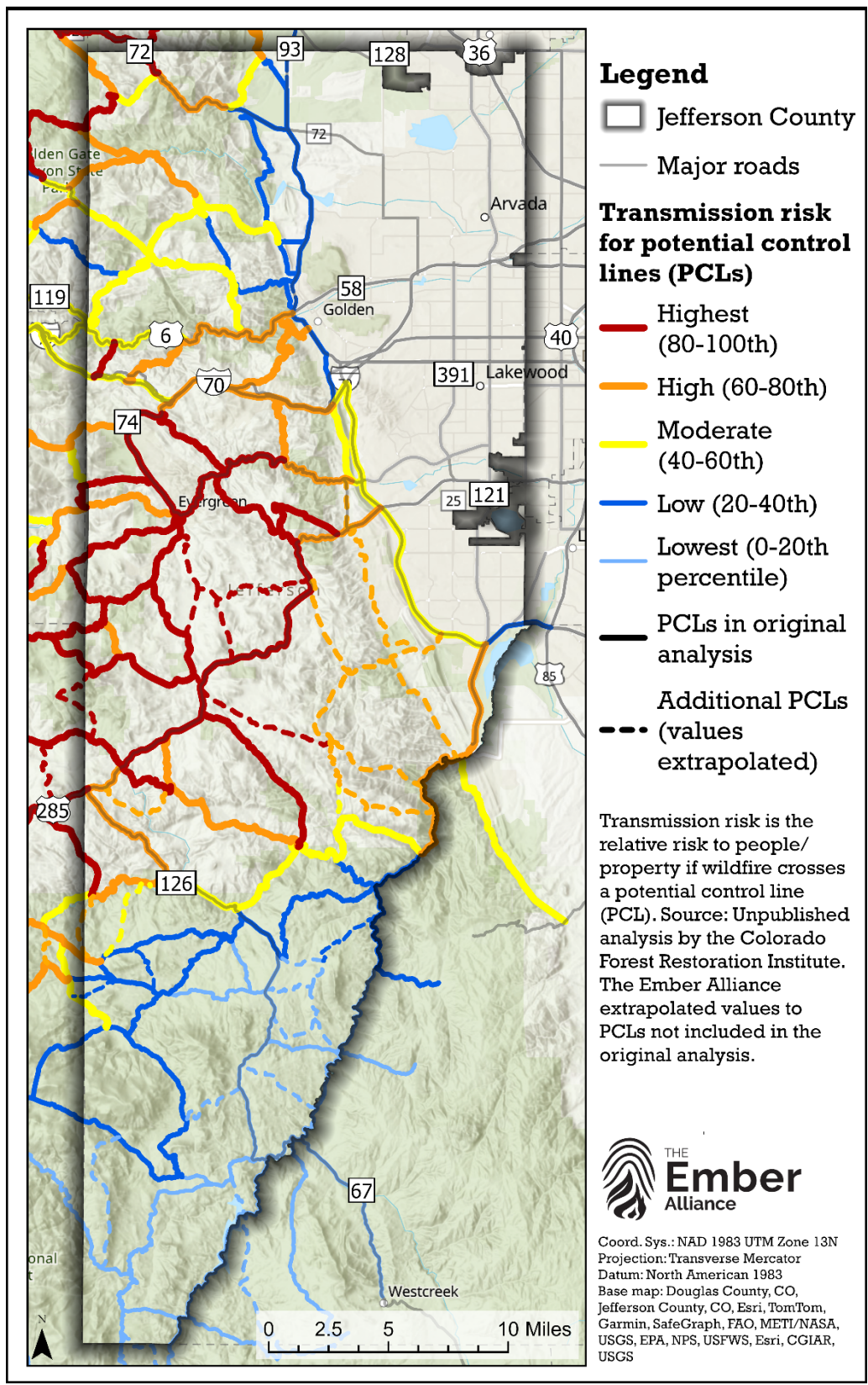
This analysis is one source of information for Jefferson County and partners to use when prioritizing roadside fuel treatments on an annual basis. See the section **Process for Identifying Priority Treatment Areas** for a description of the approach the County will use to acquire updated spatial data and meet with partners to prioritize work on an annual basis.





**Figure B.13.** Roadway type was used as a proxy for the relative importance of a roadway for traffic, which can relate to the potential for evacuation congestion during a wildfire. Source: Jefferson County ArcGIS Hub.



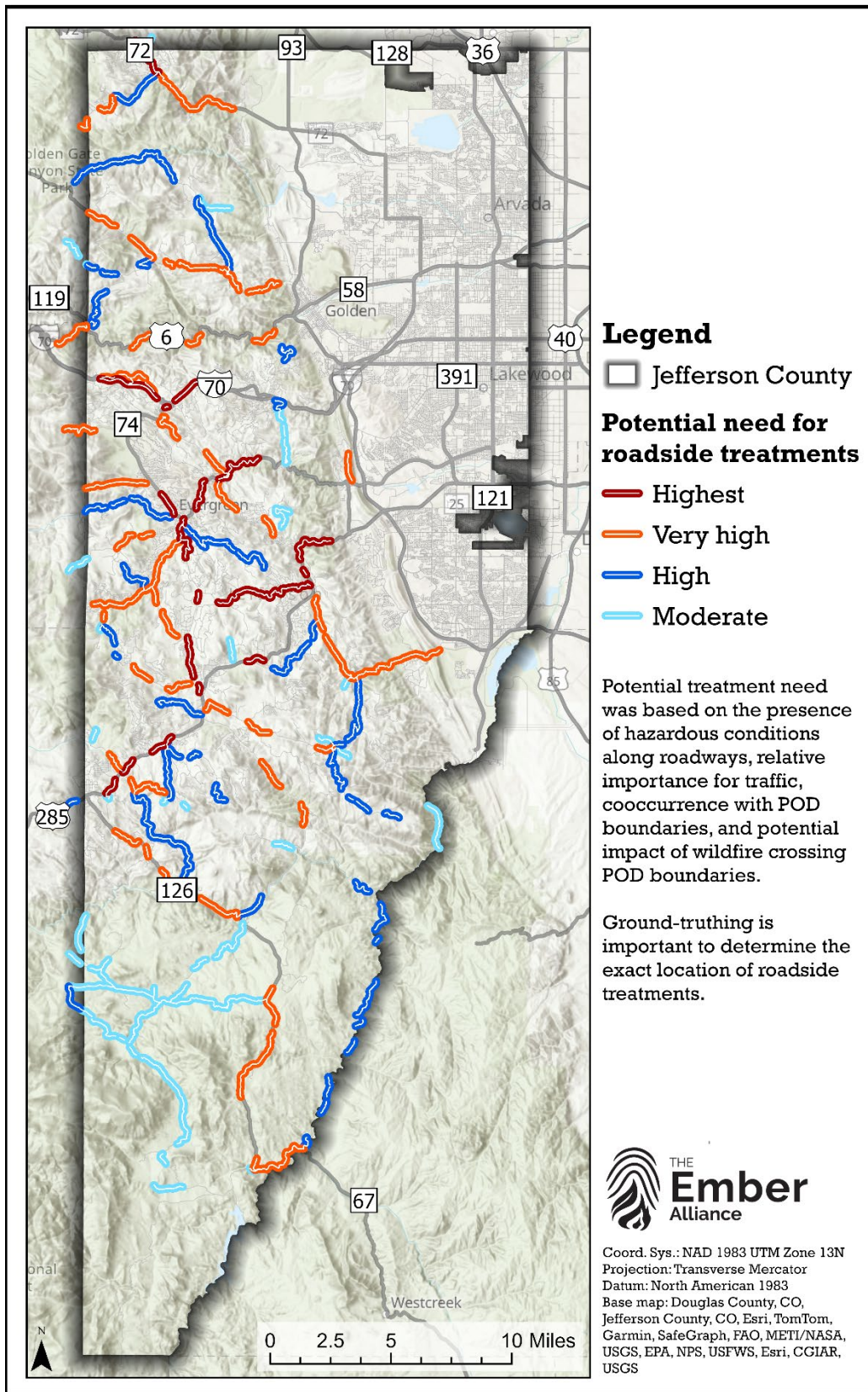


**Figure B.14.** Relative impact to people and property if wildfire were to cross a potential control line (PCL). Source: Unpublished analysis by Dr. Scott Ritter with CFRI using data from the 2022 COAL. Some PCLs in Jefferson County were not included in the analysis, so The Ember Alliance extrapolated values to those PCL boundaries. These boundaries are indicated with dashed lines.

**Table B.5.** Methodology for ranking potential need for roadside treatments to mitigate fire hazards along roadways in Jefferson County.

Potential treatment need	Roadside fuel hazards	Relative importance for traffic and POD conditions
<b>Highest</b>	Yes	<p><u>Highest</u> importance for traffic (freeway, parkway, and principal arterial)</p> <p>OR</p> <p><u>High</u> importance for traffic (minor arterial and major collector) that cooccurs with a POD boundary having the <u>highest</u> relative risk to people/property if wildfire crosses that boundary</p>
<b>Very high</b>	Yes	<p><u>High</u> importance for traffic (minor arterial and major collector) not captured by the first-priority category</p> <p>OR</p> <p><u>Moderate</u> importance for traffic (collector classes) that cooccurs with a POD boundary having the <u>highest</u> relative risk to people/property if wildfire crosses that boundary</p>
<b>High</b>	Yes	<p><u>Moderate</u> importance for traffic (collector) not captured by the “very high” treatment need category</p> <p>OR</p> <p>Cooccurrence with a POD boundary that is not captured by the “very high” or “highest” treatment need category</p>
<b>Moderate</b>	Yes	<p><u>Low</u> importance for traffic (residential) that cooccurs with a POD boundary that is not captured by the “high”, “very high”, or “highest” treatment need category</p>





**Figure B.15.** Potential need for roadside fuel treatments was based on the presence of hazardous conditions along roadways, relative importance for traffic, cooccurrence with POD boundaries, and potential impact of wildfire crossing POD boundaries. On-the-ground assessments are vital to verify the need for roadside fuel treatments and to develop specific plans for mitigation.

**Table B.6.** Miles of roadway by potential treatment need category in Jefferson County and percent of these miles with state, county, private, or unknown maintenance responsibility. Maintenance responsibility for the roadway surface does not translate into responsibility for roadside fuel treatments. Rights-of-way and easements vary across the county and need to be determined by surveyors. Source of data on maintenance responsibility: Jefferson County ArcGIS Hub.

Treatment need	Total length (miles)	Maintenance responsibility for roadway (percent of roadways by treatment need)			
		State	County	Private	Unknown
Highest	26	63%	36%	0%	2%
Very high	71	17%	79%	1%	3%
High	66	1%	85%	1%	13%
Moderate	48	0%	16%	71%	12%

## Treatment Suitability

We assessed the suitability of land for mechanical thinning, hand thinning, and broadcast prescribed burning based on slope, vegetation type, distance from homes, historic fire regime, potential fire behavior, fuel treatment history, and patch size. We classified thinning treatments as SIZ mitigation, forest health, or roadside treatments. Suitability indicates the type of method that might be utilized in an area, and it does not equate to treatment need or intent to treat an area with a specific method. The following assumptions were made to determine treatment suitability for thinning treatments:

- SIZ mitigation treatments were located in a 100-foot buffer around structures, which equates to SIZ 3 from the CSFS.
- Roadside fuel treatment were located 150-feet off either side of the road, which is the general distance recommended for roadside fuel treatments by the CSFS (Dennis, 2005). This recommended distance most often extends into private or public lands.
- Forest health treatments were located in areas with greater than 0% canopy cover.
- Mechanical treatments were considered feasible on ground with less than 40% slope. This slope cutoff was recommended by foresters with JCD.
- Hand treatments were considered feasible on ground with 40 to 60% slope.

We modified the approach used by (Addington et al., 2020) to determine suitability for broadcast prescribed burning using data from the 2022 CO-WRA to produce an output with a resolution of 20-meters. Factors considered were vegetation type, historical fire regimes, fuel treatment history, distance from homes, and potential fire behavior during broadcast prescribed burning conditions. We created rasters with 20-m resolutions for each of these factors with values between 0 to 1 based on specific conditions, and each factor was assigned a relative weight (**Table B.7**). Pixels were considered suitable for broadcast prescribed burning if their weighted average was greater than 0.42 (the median



value across the county). We eliminated areas less than 40 acres because small prescribed burns are less cost-effective and less feasible to implement.

We needed to align vegetation type with fire behavior predictions, but the fuel layers from the 2022 CO-WRA did not align with the vegetation layer available from the 2022 Colorado Forest Atlas. The 2022 CO-WRA utilized an object based image analysis to identify polygons with similar fuel characteristics (CSFS and Technosylva, 2023b), whereas the vegetation layer was raster-based and at a different spatial resolution than the fuels data. To create a layer of vegetation types that historically experienced frequent fires, we determined the percent of each CO-WRA fuel polygon classified as different vegetation types from the 2022 Colorado Forest Atlas. Fire-prone vegetation was considered ponderosa pine, mixed conifer, shrublands, Gamble oak shrublands, and grasslands.

We followed the approach of (Sherriff et al., 2014) to predict historic fire regime based on vegetation type, elevation, and slope. Sherriff et al., (2014) applied their predictions to a subset of LANDFIRE existing vegetation types, so we cross-walked existing vegetation types with vegetation types from the 2022 Colorado Forest Atlas. We included fuels polygons that had at least 50% of their area covered in ponderosa pine, lodgepole pine, mixed conifer, conifer, conifer-hardwood, grassland, or shrubland vegetation types.

Fuel treatment data came from USFS, CFRI, CSFS, JCD, Jefferson County Open Space, Denver Mountain Parks, Geneva Glen, Genesee Foundation, and Blue Mountain Forest Stewardship Initiative, and wildfire history data from Fire Program Analysis Fire-Occurrence Database, National Interagency Fire Center, and West Metro Fire Protection District. Fuel treatments from 2000-2023 are shown in **Figure 20**, but for this analysis, we also considered treatments between 1994 and 2000.

We used surface fuel, canopy fuel, and topographic layers from the 2022 CO-WRA and the fire behavior model FlamMap to predict flame lengths under the same fuel moisture and wind speed scenarios as (Addington et al., 2020). Fuel moistures approximate weather conditions that might be appropriate for a broadcast prescribed burn (7% fuel moisture for 1-hour fuels, 8% for 10-hour fuels, 9% for 100-hour fuels, 50% for live herbaceous fuels, and 150% for woody fuels). Fire behavior was estimated under 20-foot wind speeds of 10 and 20 mile per hour assuming wind blowing uphill.

**Table B.7.** Factors used to determine potential suitability for broadcast prescribed burning.

Factor	Condition	Raster value	Relative weight	
Percent area covered in fire-prone vegetation	≥75% fire-prone vegetation	1	20%	
	50 to <75% fire-prone vegetation	0.5		
	25-50% fire-prone vegetation	0.25		
	0.01-25% fire-prone vegetation	0.1		
	Unburnable vegetation types	0		
Historical fire regime based on approach of <u>Sherriff et al., (2014)</u>	Low-severity fire regime	1	20%	
	Mixed-severity fire regime	0.75		
	Vegetation types not included in the research by <u>Sherriff et al., (2014)</u>	0.2		
Most recent fuel treatment or wildfire	Thinning or pile burning between 2004 and 2024	1	20%	
	Broadcast prescribed burning or wildfire between 2004 and 2013	0.9		
	Broadcast prescribed burning or wildfire between 2014 and 2021	0.8		
	Broadcast prescribed burning or wildfire between 2022 and 2024	0.7		
	Thinning, pile burning, or broadcast prescribed burning between 1994 and 2003	0.7		
	Thinning or broadcast prescribed burning with unknown year	0.6		
	No treatment or treatment occurring before 1994	0.6		
Distance from structures	>300 feet from structures	1	Binary variable	
	≤300 feet from structures	0		
Potential flame length under broadcast prescribed burning conditions	10 mph wind speed^	20 mph wind speed^	40%	
	<4-foot flames	<4-foot flames		1
	<4-foot flames	4- to 8-foot flames		0.8
	<4-foot flames	>8-foot flames		0.2
	4- to 8-foot flames	4- to 8-foot flames		0.6
	4- to 8-foot flames	>8-foot flames		0.1
	>8-foot flames	>8-foot flames		0

## Social Vulnerability Index

CSFS developed a modified version of the Center for Disease Control's Social Vulnerability Index (SVI) called the Wildfire SVI (Dimke and Bayham, 2020). The Wildfire SVI includes a subset of components of the original SVI that specifically pertain to a household's or individual's vulnerability to wildfire in the categories: socioeconomic status, household composition/disability, minority status/language, and housing/transportation. The Wildfire SVI includes an additional metric of socioeconomic inequality—the Gini index based on income and years of schooling. Average socioeconomic status in some Census block groups can mask the presence of individuals in lower income brackets or with less education, so the inequality metric helps highlight these areas. We also created a metric specific to an individual's or household's vulnerability to evacuations using a subset of the Wildfire SVI metrics. **Table B.8** shows the metrics and weighting developed by (Dimke and Bayham, 2020).

We utilized code developed by CSFS and made available on [GitHub](#) by J. Bayham to determine Wildfire SVI in Census Block Groups that intersect the Jefferson County WUI. We used the U.S. Census Bureau's American Community Survey data from 2016 to 2022. We percent ranked the variables independently across all Census Block Groups in the Jefferson County WUI, found the weighted average by category and across all categories, and percent ranked the category values again. Block groups with higher values have a greater percentage of households or individuals with conditions that might increase their vulnerability to wildfire. The analysis is specific to Jefferson County and is not useful for comparing vulnerability in Jefferson County to other parts of Colorado or the United States.

**Table B.8.** Metrics and weighting used to calculate Wildfire Social Vulnerability for Jefferson County following the approach of (Dimke and Bayham, 2020). The four metrics indicated with an asterisk (\*) were included in our estimate of evacuation vulnerability. We weighted these four metrics equally.

<b>Metric</b>	<b>Relative weight</b>
<b>Socioeconomic status</b>	<b>39%</b>
Percent of individuals below the poverty line	12.2%
Percent of the civilian labor force that is unemployed	7.31%
Median household income <sup>1</sup>	12.2%
Percent of adults over 25 without a high school diploma	7.31%
<b>Household composition/disability</b>	<b>12.2%</b>
Percent of people over the age of 65	2.44%
Percent of people under the age of 18	2.44%
*Percent of the poverty status determined population above 18 with a disability <sup>2</sup>	2.44%
*Percent of households with a male or female householder, no spouse present, with children under 18	2.44%
<b>Minority status/language</b>	<b>17.1%</b>
Percent of the population that are of minority status (non-white or Hispanic)	12.2%
*Percent of the population that speaks English less than “well”	4.88%
<b>Housing/transportation</b>	<b>7.32%</b>
Percent of housing units that are mobile homes	4.88%
*Percent of households with no vehicle	2.44%
<b>Socioeconomic equity</b>	<b>24.4%</b>
Gini coefficient <sup>3</sup> of income	12.2%
Gini coefficient <sup>3</sup> of years of schooling/education	12.2%

<sup>1</sup> The original SVI uses per capita income.

<sup>2</sup> The original SVI included those over 5 years of age, but this data is not included in the American Community Survey

<sup>3</sup> The Gini coefficient measures variation and inequality among a population in terms of variables like income or education. A Gini coefficient of 0 indicates perfect equality where all income or education values are the same, while a Gini coefficient of 1 indicates maximum inequality where a single individual has all the income and others have none.



# APPENDIX C. SUMMARY OF PUBLIC FEEDBACK

**Public engagement is a critical component of actionable CWPPs. Local concerns, values, and needs should inform priority actions to promote wildfire adaptation and enhance emergency preparedness across the community. Consulting with the public can help identify barriers to wildfire risk mitigation and result in creative solutions that empower shared action by residents, businessowners, agencies, and other partners.**

## Overview

The following document summarizes feedback received from residents and other stakeholders of Jefferson County (e.g., agency employees who work but might not live in Jefferson County) pertaining to the Community Wildfire Protection Plan (CWPP) as part of the Together JeffCo efforts. We would like to recognize the important contribution of the [Wildfire Research Center](#) (WiRē) in developing questions that help us understand community perceptions of wildfire risk and emergency preparedness. Public feedback on the CWPP was solicited in the following ways:

**Resident survey, round 1:** An online survey was administered as part of Together JeffCo in summer of 2023, and 554 residents submitted responses between June 15<sup>th</sup> and September 1<sup>st</sup>. Between 100 and 286 residents responded to the various questions pertaining to the CWPP.

**Resident survey, round 2:** A second online survey was administered as part of Together JeffCo in winter/spring of 2024, and 680 residents submitted responses. Between 52 and 120 residents responded to the various questions pertaining to the CWPP.

**Open houses, round 1:** Three open houses were held in October 2023 to introduce the public to the Together JeffCo effort: October 10th in Arvada, October 12th in Littleton, and October 16th in Golden. Participants were invited to respond to several open-ended questions regarding wildfire risk and emergency preparedness.

**Open houses, round 2:** Three open houses were held in March 2024 to discuss plans and alternative actions as part of the Together JeffCo effort: March 4th in Golden, March 5th in Evergreen, and March 7th in Golden. Forty-two residents responded to a questionnaire distributed at the CWPP table.

**Interactive online map:** An online map was available for residents to post the location of specific concerns as part of the Together JeffCo effort. Sixteen of the comments posted between June 2023 and June 6, 2024, pertained directly to wildfires or evacuation.

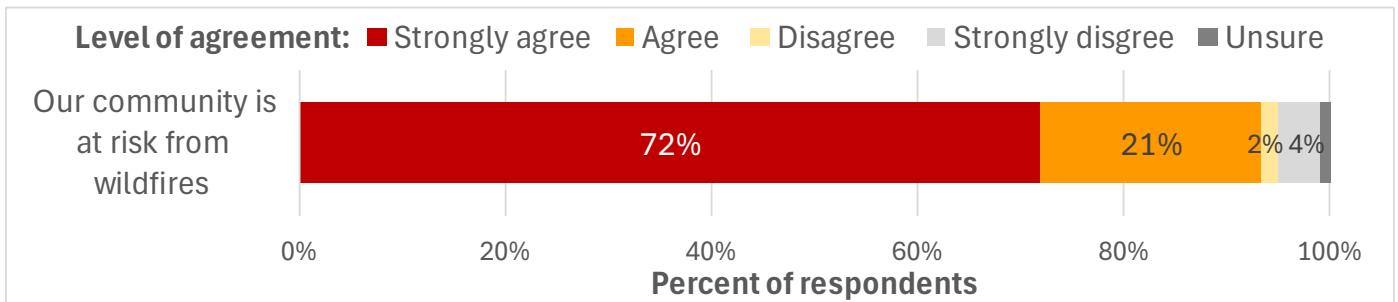
A total of 645 individual comments pertaining to wildfires and evacuation were received across the resident surveys, open houses, and interactive online map. All these comments were collated, read,

and organized by general topics and themes. Topics described below are numbered in order of those that received the most individual comments to the least.

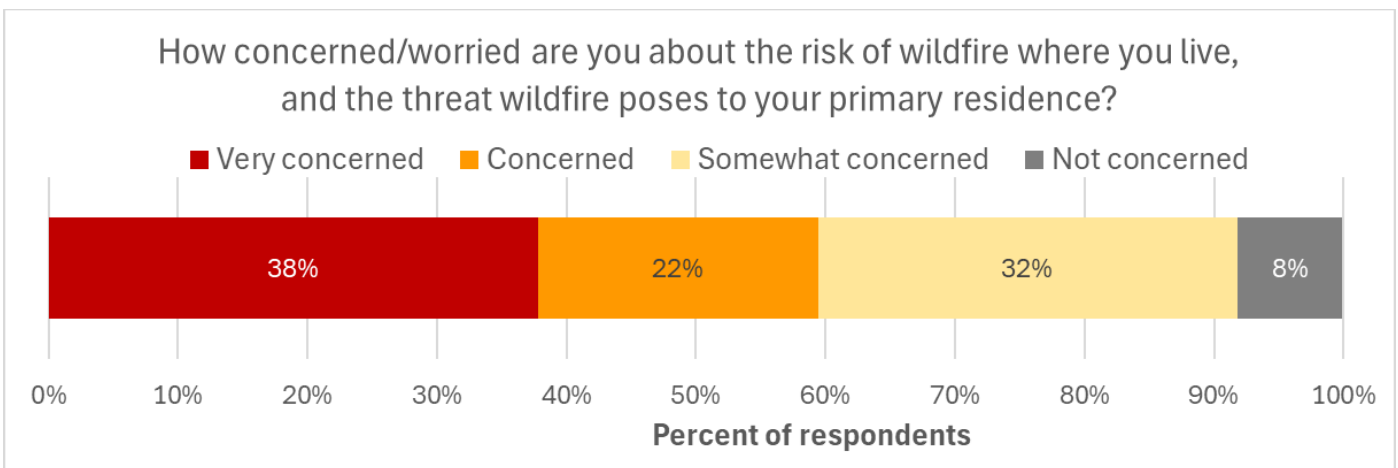
## Resident Awareness of Wildfire Risk

Jefferson County residents are keenly aware of the wildfire risk in the county. A vast majority (93%) of residents responding to the Together JeffCo survey 1 agreed or strongly agreed that Jefferson County is at risk from wildfires (Figure C.2), and almost 60% or residents responding to the 2<sup>nd</sup> survey expressed being concerned to very concerned about the threat that wildfire poses to their primary residence (Figure C.3). Wildfires are by far and wide the hazard that residents are most concerned about relating to the potential need for an evacuation (Figure C.4). Over half of residents responding to the 2<sup>nd</sup> survey feel very familiar to expert in their knowledge of wildfires (Figure C.5).

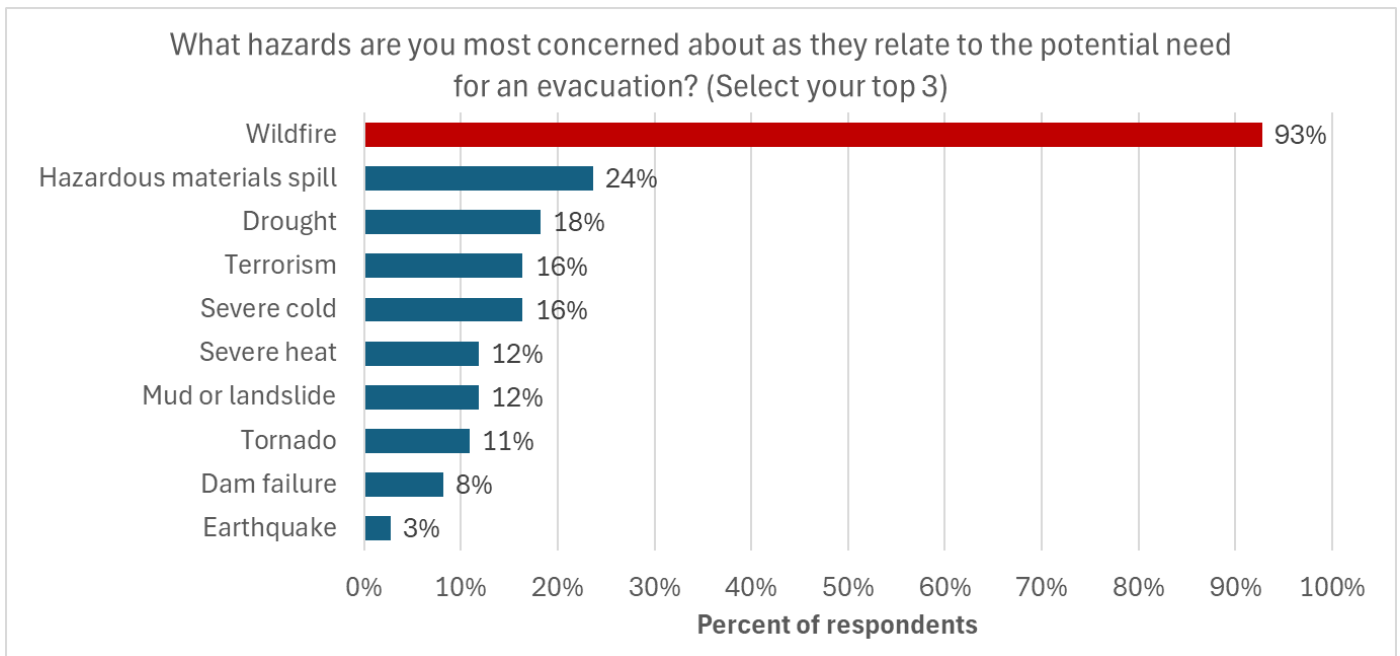
The greatest percentage of survey respondents felt it is most important for Jefferson County to manage wildfire risk to protect drinking water quality and quantity. About an equal percentage of residents felt it is most important or moderately important to manage wildfire risk to protect drinking water, evacuation routes, and infrastructure such as powerlines and communications towers (Figure C.6).



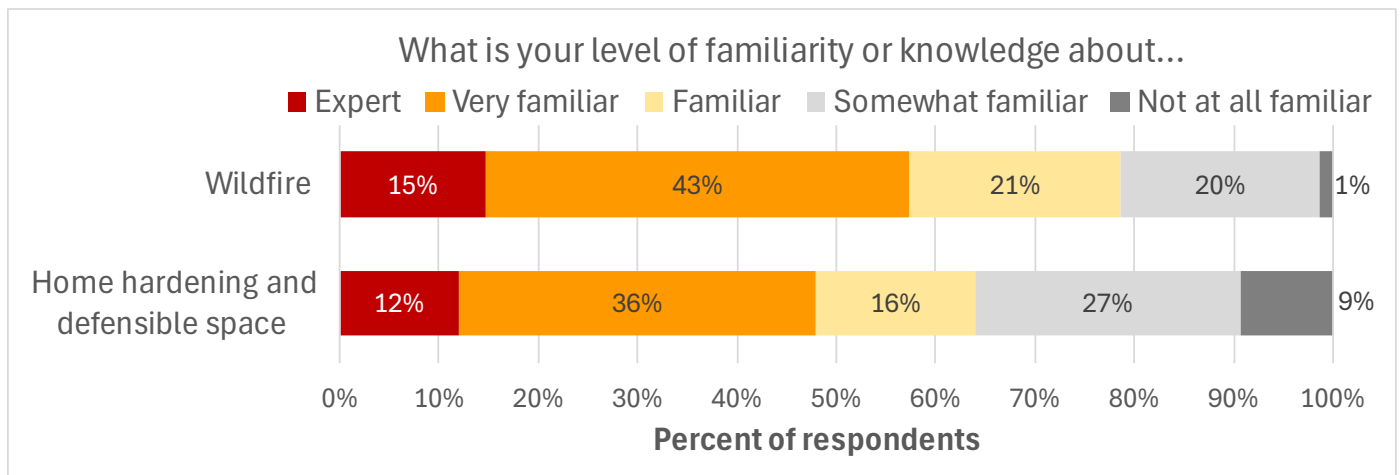
**Figure C.1.** On round 1 of the Together JeffCo survey, a vast majority of respondents agreed or strongly agreed that Jefferson County is at risk from wildfires. 285 individuals responded to this question.



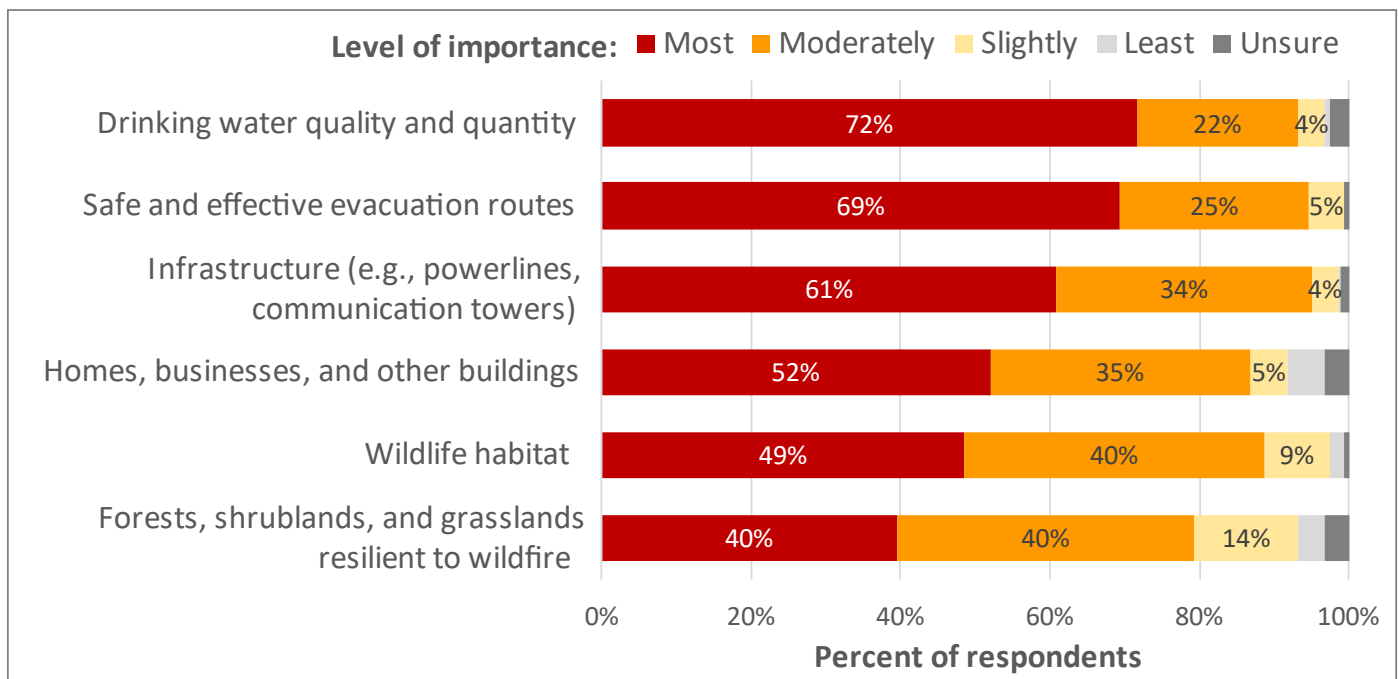
**Figure C.2.** On round 2 of the Together JeffCo survey, almost 60% of residents expressed being concerned to very concerned about the threat that wildfire poses to their primary residence. 74 individuals responded to this question.



**Figure C.3.** On round 1 of the Together JeffCo survey, wildfire was by far the primary hazard that concerned residents regarding the potential need for evacuation. 110 individuals responded to this question.



**Figure C.4.** On round 2 of the Together JeffCo survey, 58% of residents reported being very familiar or an expert in their knowledge about wildfire and 48% reported being very familiar or expert in their knowledge about home hardening and defensible space. 75 individuals responded to these questions.



**Figure C.5.** The greatest percentage of residents responding to the round 1 of the Together JeffCo survey thought it is most important or moderately important for Jefferson County to manage wildfire to protect drinking water quality and quantity, safe and effective evacuation routes, and infrastructure. 285 individuals responded to this question.

## Resident Recommendations

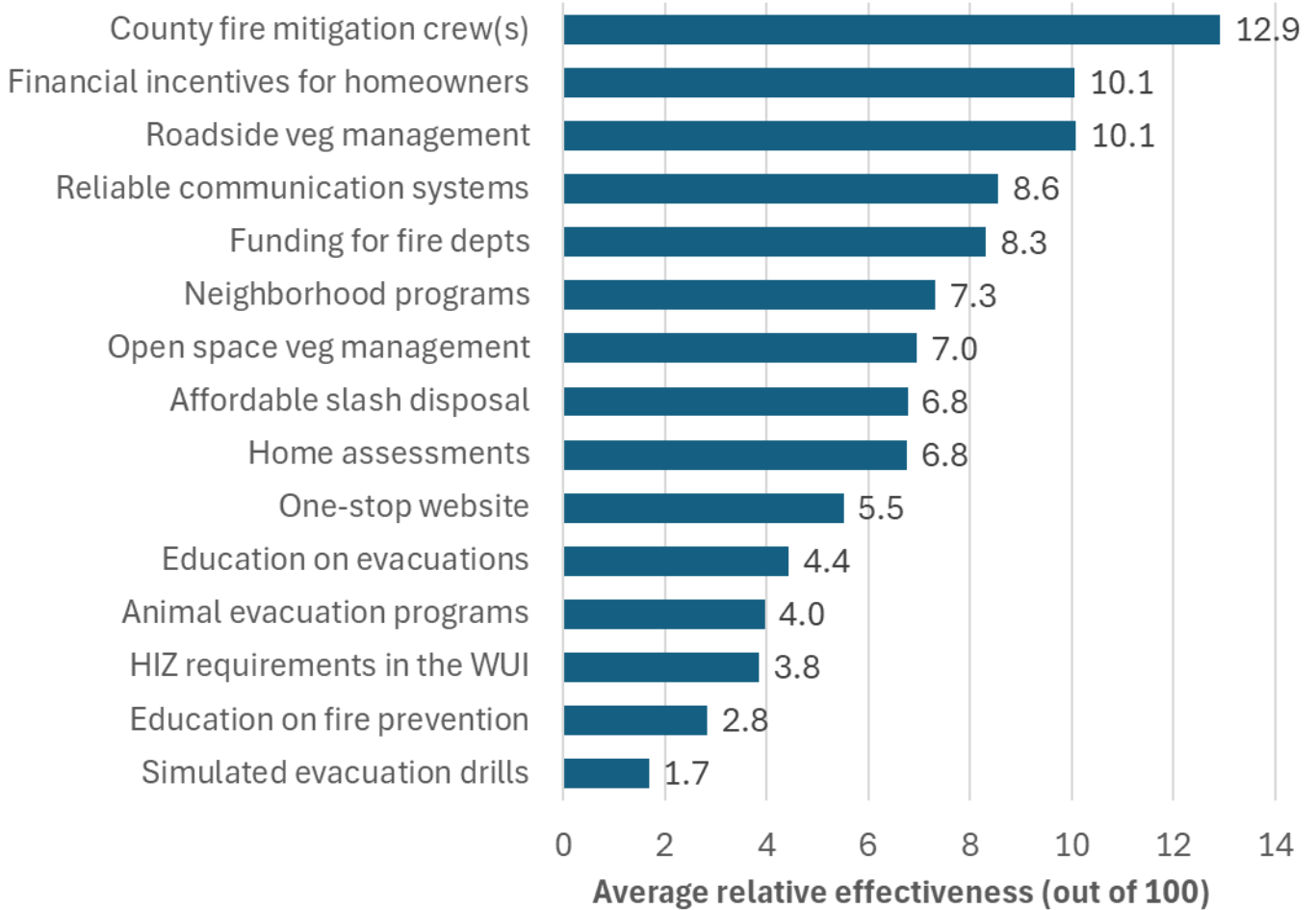
Here we present recommendations emerging from questions on the survey and questionnaire. Additional recommendations emerging from public comments are summarized by topic and theme below. Residents responding to the questionnaire at round 2 of the open houses felt that County-level fire mitigation crew(s) would be the most effective method for promoting wildfire adaptation and enhancing emergency preparedness (**Figure C.7**). Residents rated financial incentives for homeowners and vegetation management along roadsides as the next most effective actions.

Residents responding to the Together Jeffco survey 1 and 2 were mixed on whether they agreed or disagreed that the county should establish ordinance requiring wildfire mitigation or provide financial assistance to support wildfire mitigation (**Figure C.8**; **Figure C.9**). Residents rated additional regulations for structure ignition zones (SIZs) in the wildland urban interface (WUI) as less effective than other actions the County could undertake (**Figure C.7**), but numerous residents provided comments on the survey that called for expanded WUI regulations (see topic 4, theme 2).

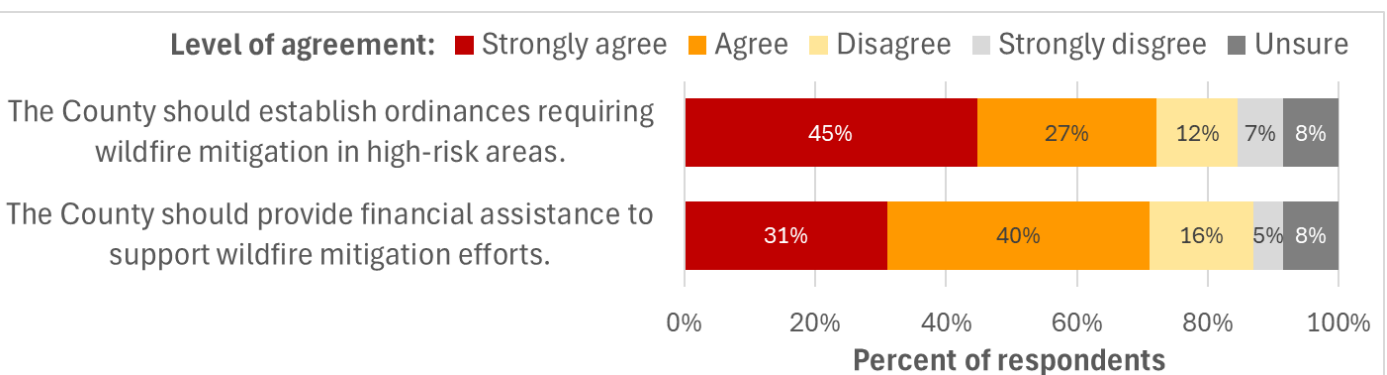
Resident responses demonstrate a sense that the community has a shared responsibility for wildfire preparedness and risk mitigation. Over 90% of residents feel that it is the responsibility of individuals and 80% feel that it is also the responsibility of local governments and fire protection districts. Residents also see a role for HOAs, community groups, state government, and federal land management agencies (**Figure C.10**). Residents identified home assessments and publications as the most effective ways for residents and communities to become more aware of wildfire risks (**Figure C.11**).



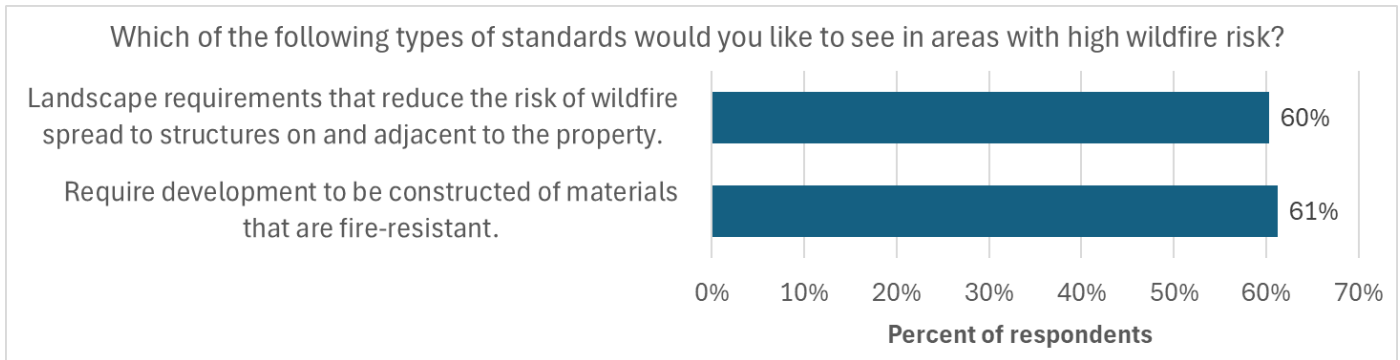
How would you allocate 100 “effectiveness points” to the following actions the county could potentially take to mitigate wildfire risk and enhance emergency preparedness?



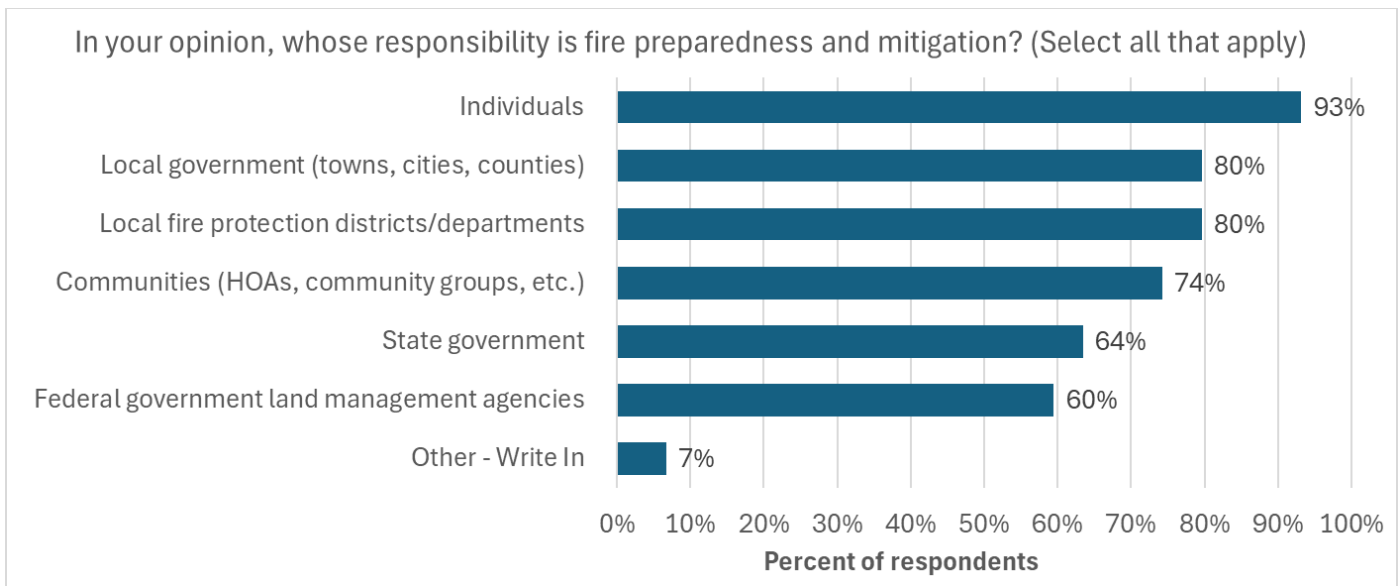
**Figure C.6.** At round 2 of open houses, residents rated county fire mitigation crew(s), financial incentives, and roadside vegetation management as the most effective actions the county could potentially take to mitigate wildfire risk and enhance emergency preparedness. Relative effectiveness was averaged across responses from all 42 residents who responded to the questionnaire.



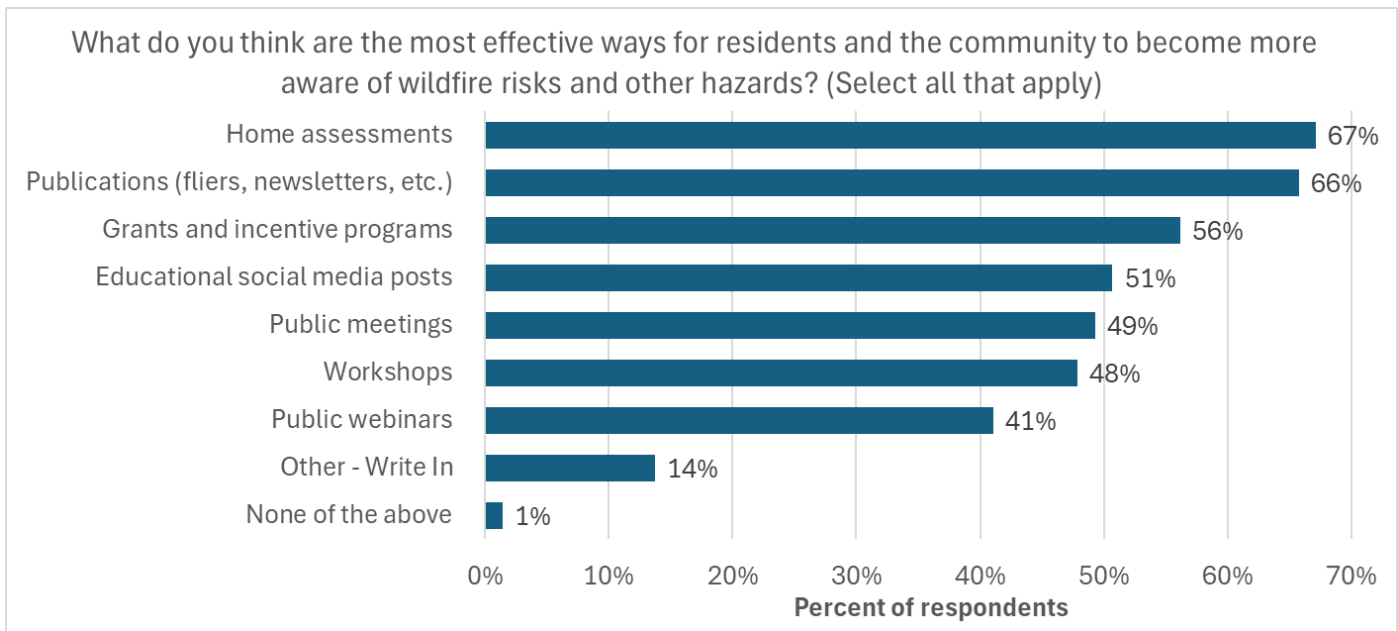
**Figure C.7.** Residents responding to round 1 of the Together JeffCo survey were mixed on whether they agreed or disagreed that the county should establish ordinance requiring wildfire mitigation or provide financial assistance to support wildfire mitigation. 286 individuals responded to this question.



**Figure C.8.** Residents responding to round 2 of the Together JeffCo survey were mixed on whether they thought that the county should establish ordinances requiring wildfire mitigation in high-risk areas. 116 individuals responded to this question.



**Figure C.9.** Residents responding to round 2 of the Together JeffCo survey demonstrate a sense that the community has a shared responsibility for wildfire preparedness and risk mitigation. 74 individuals responded to this question.



**Figure C.10.** Residents responding to round 2 of the Together JeffCo survey identified home assessments and publications as the most effective ways to become more aware of wildfire risks. Grants and incentive programs were selected by 56% of respondents. 72 individuals responded to this question.

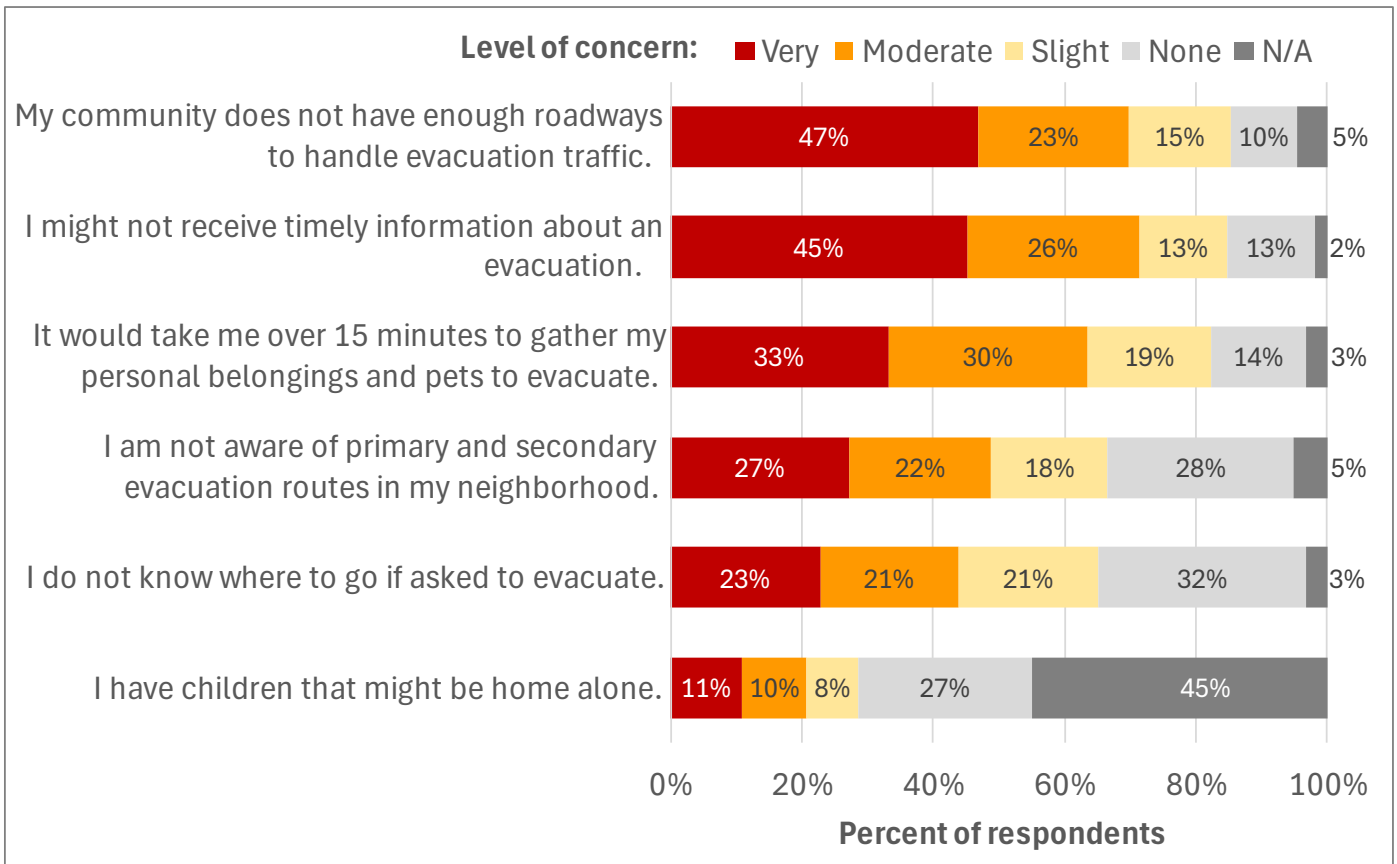
### Topic 1. Evacuation Concerns

**Theme 1:** Residents are concerned that communities have inadequate roadway networks to handle potential congestion during an evacuation (**Figure C.12; Figure C.13; Figure C.14**). Some are concerned that agencies do not account for the dangers that additional development could cause in areas with limited evacuation routes. Some residents are concerned about congestion caused by visitors at high-use recreational areas. Residents recommend limiting development in areas with limited evacuation capacity and creating additional evacuation routes, potentially by incentivizing citizens to make private roadways available during emergencies. Some residents indicated specific locations that they feel could experience congestion and might need secondary evacuation routes (**Figure C.15**).

**Theme 2:** Residents are concerned that there are no plans in place to address evacuation in the County, and if there are plans, they are concerned that there is no public awareness or understanding of the plans (**Figure C.14**). Some residents expressed concern that there is little coordination among entities responsible for evacuation. Citizens want the county to develop an evacuation plan, in coordination with adjacent counties and first responders, and to communicate the plan to residents. Some citizens want the plans to include marked evacuation routes. Some residents think evacuation drills can increase emergency preparedness, and others recommend educating residents about what they can personally do to prepare for an evacuation (**Figure C.7; Figure C.16**).

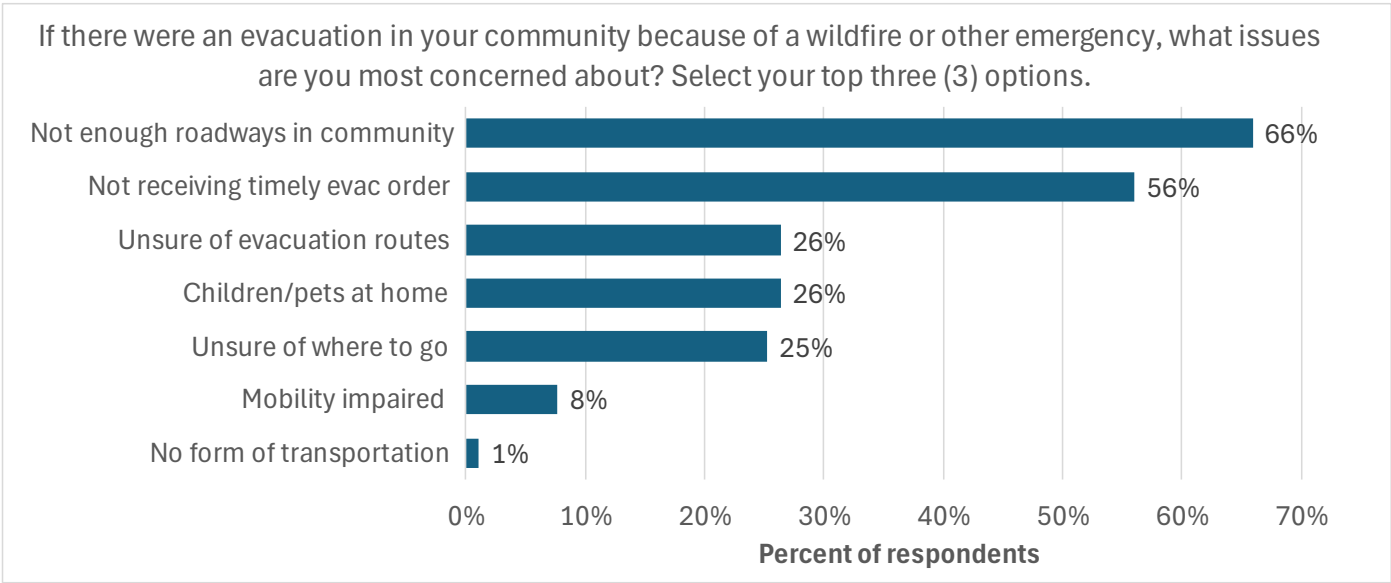
**Theme 3:** Residents are concerned that emergency alerts are unreliable, especially in areas with limited communication infrastructures (**Figure C.12; Figure C.13**). Some residents do not know where to get real-time updates during emergencies. Residents rated reliable communication systems as highly effective relative to other actions the County could undertake (**Figure C.7; Figure C.16**). Residents identified texts to cell phones as the preferred method of communication for emergency alerts, and many indicated that calls to cell phones or warning sirens are also effective (**Figure C.17**).

**Theme 4:** Some residents are concerned about evacuations happening when kids, pets, and/or livestock are home alone (**Figure C.12; Figure C.13**). Some residents are concerned that they might not receive evacuations early enough to facilitate evacuation of livestock, and that there are not enough places to take large animals. Information and programs for evacuating livestock was selected by 23% of residents as important for improving residents’ ability to effectively evacuate (**Figure C.16**). Residents recommend retaining the fairgrounds as a location for evacuating large animals, increasing awareness about existing programs, and coordinating with various agencies that assist with livestock evacuations.

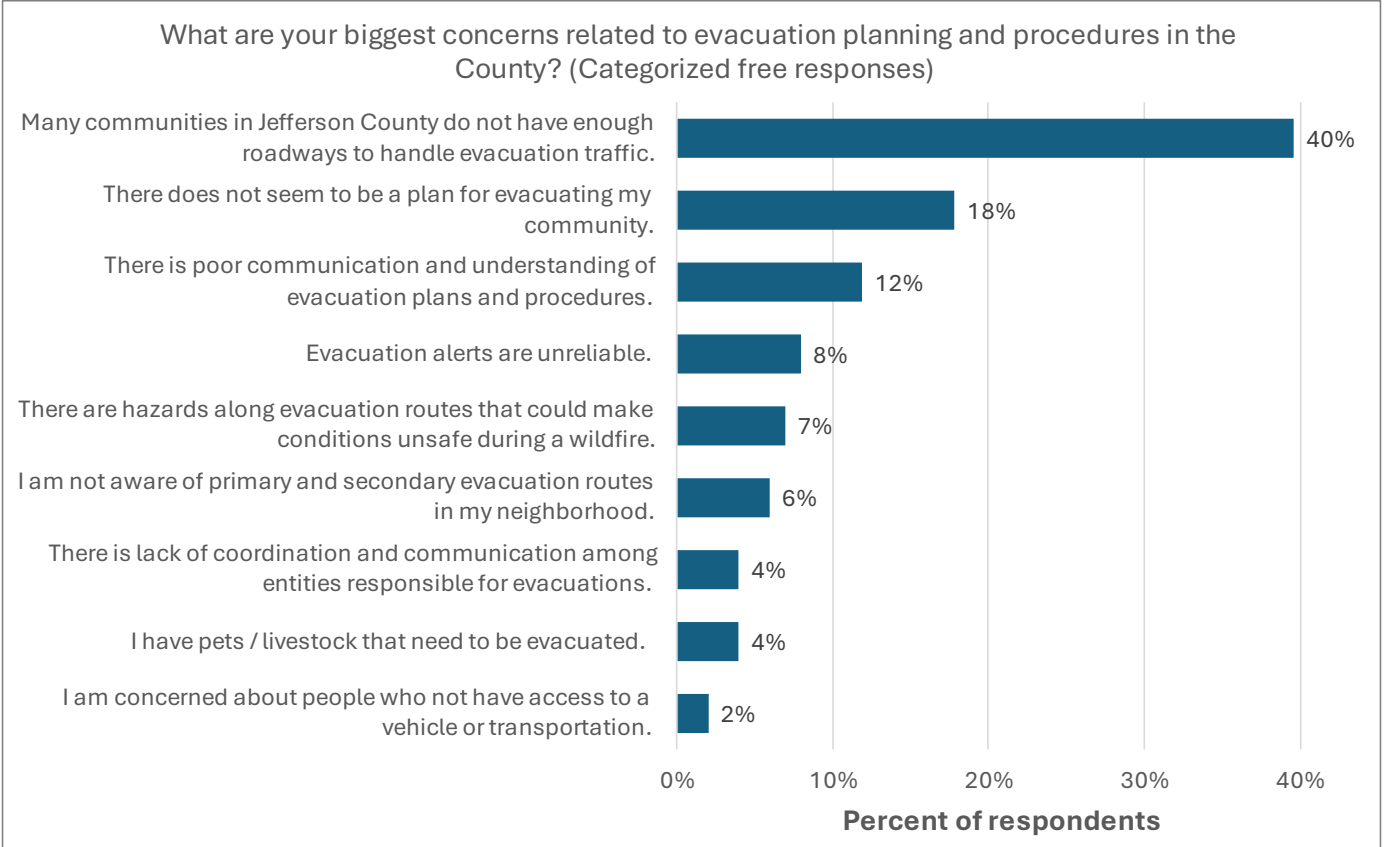


**Figure C.11.** On round 1 of the Together JeffCo survey, residents were asked “If there were an evacuation in the community because of wildfire, how concerned are you about the following issues?” The ability of roadway networks to handle evacuation traffic and receiving timely information about evacuations were the greatest concerns of residents. 286 individuals responded to this question.





**Figure C.12.** On round 2 of the Together JeffCo survey and open houses, top concerns of residents were not enough roadways in their community and not receiving timely evacuation orders, consistent with **Figure C.12**. This question was answered by 91 residents between the survey and open houses.



**Figure C.13.** On round 1 of the Together JeffCo survey, the most common category of concern related to evacuation was that communities in Jefferson County do not have enough roadways to handle evacuation traffic. 101 individuals provided open-ended responses to this question.

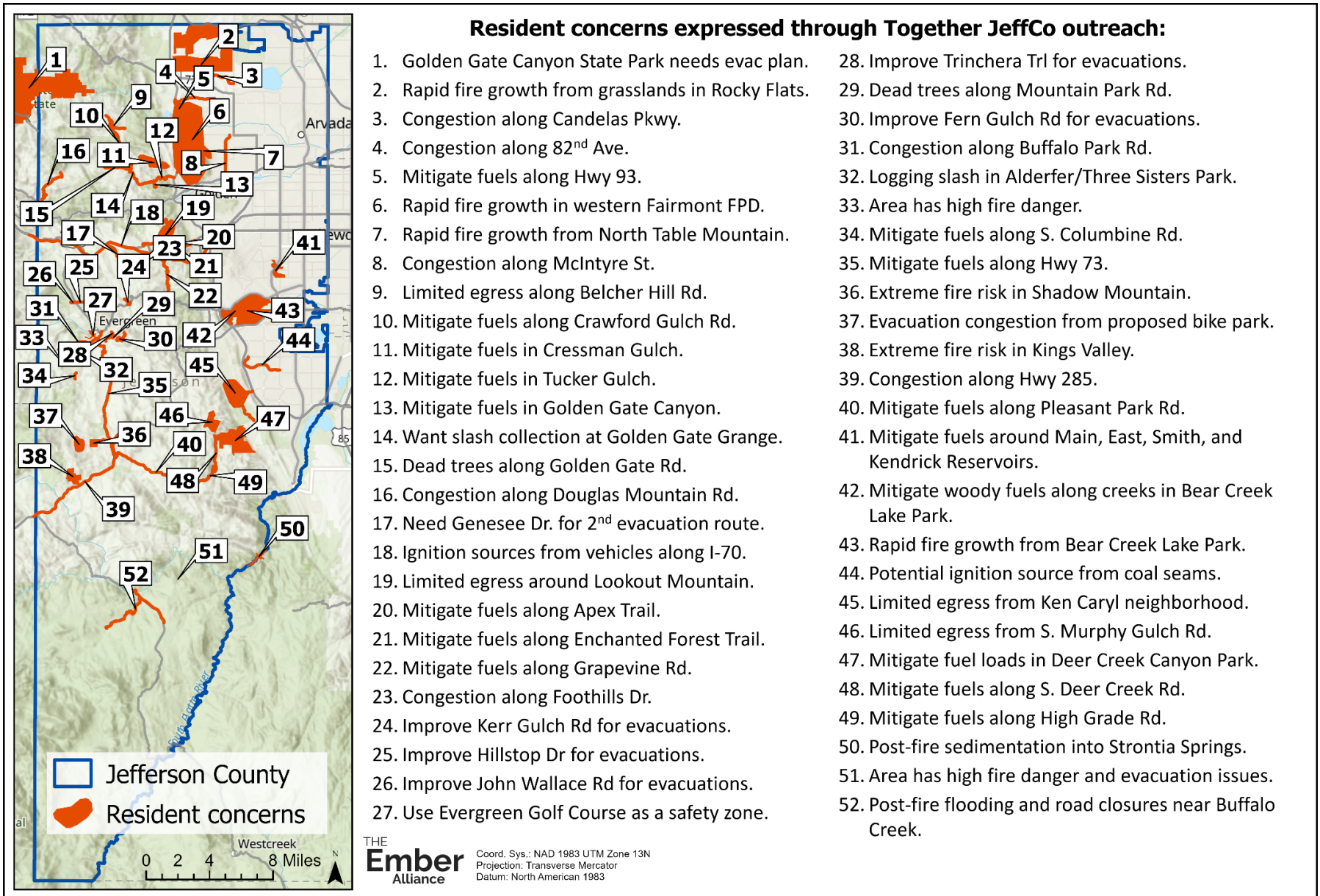
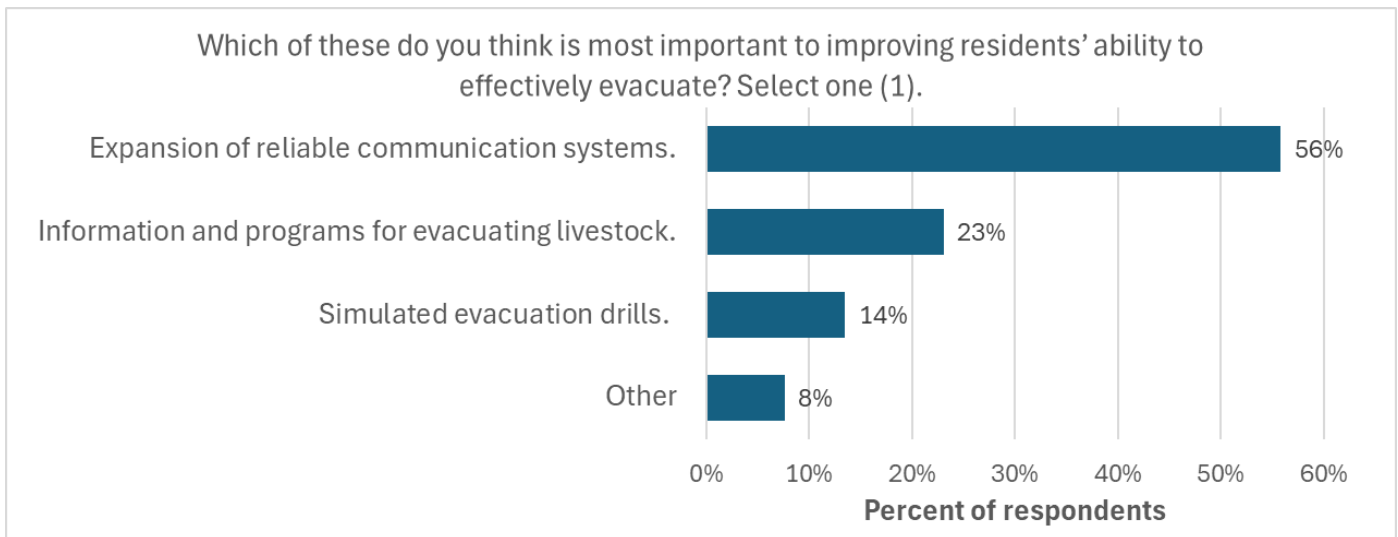
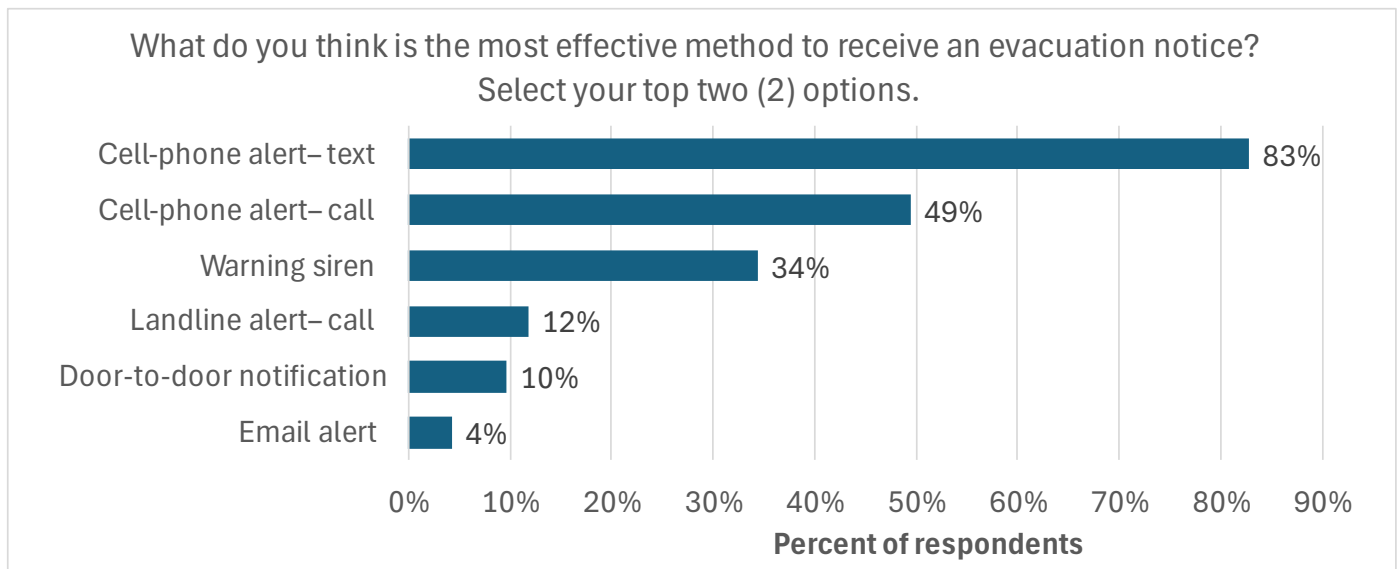


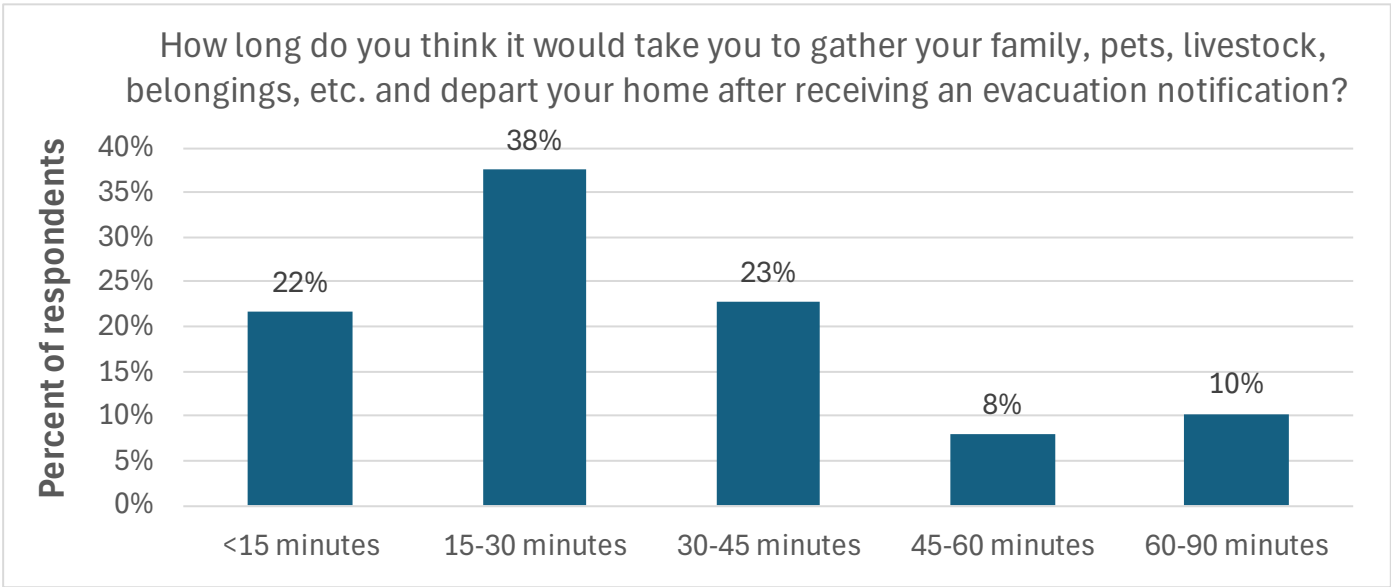
Figure C.14. Locations of wildfire- or evacuation-related concerns expressed by residents on the Together JeffCo surveys, open house questionnaires, and online interactive map.



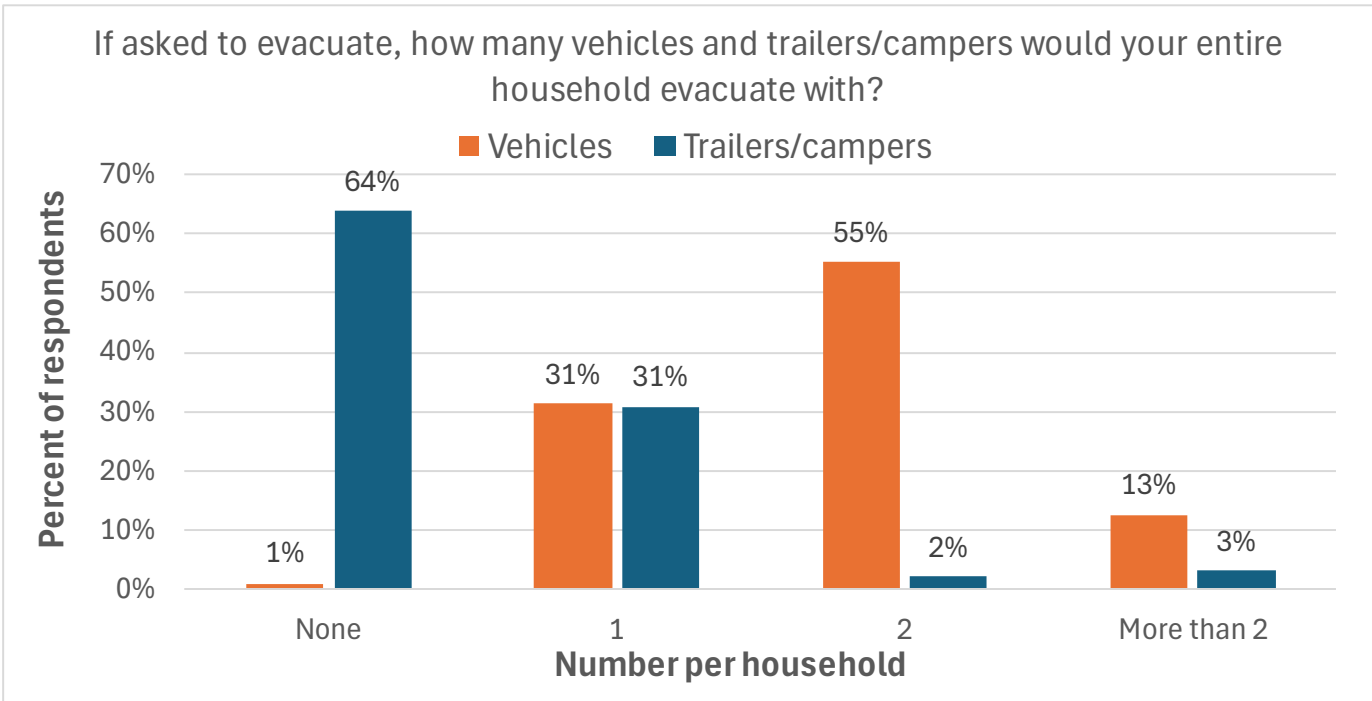
**Figure C.15.** On round 2 of the Together JeffCo survey, over half of residents responded that expanding reliable communication systems is important for improving residents' ability to effectively evacuate. This question was answered by 52 residents.



**Figure C.16.** On round 2 of the Together JeffCo survey and open houses, residents responded that cell-phone alerts via text are the most effective method to receive an evacuation notice, followed by cell-phone alert via calls. Three individuals answered “resident-to-resident phone tree” on the open house questionnaire, but this option was not offered on round 2 of the survey. This question was answered by 93 residents between the survey and open houses.



**Figure C.17.** On round 2 of the Together JeffCo survey and open houses, the vast majority of residents responded that they could gather their family, pets, livestock, belongings, etc. and depart their home within 45 minutes after receiving an evacuation notification. Five residents answered “greater than 90 minutes” on the open house questionnaire, but since this option was not offered on round 2 of the survey, these responses were combined with “60-90 minutes.” This question was answered by 93 residents between the survey and open houses.



**Figure C.18.** On round 2 of the Together JeffCo survey and open houses, residents were asked to respond to the questions “If asked to evacuate, how many vehicles would you and your household evacuate with?”



and “If asked to evacuate, would your household evacuate with any of the following [trailers and/or campers]?” These questions were answered by 95 residents between the survey and open houses.

## Topic 2. Structure Ignition Zone Hazards

**Theme 1:** Almost 90% of residents responding to the Together JeffCo survey feel that they understand how to mitigate wildfire risks on their property (**Figure C.5; Figure C.20**); however, many residents also report needing more information on what to do on their property—see topic 2, theme 3. Over 70% of survey respondents reported taking steps to mitigate their structure ignition zone, but few feel like their neighbors have done an adequate job mitigating risk on their properties (**Figure C.20; Figure C.21**). Almost 60% of survey respondents have thinned vegetation and removed slash around their properties (**Figure C.22**); however, 32% disagree or strongly disagree that removing trees is necessary for wildfire protection on their property (**Figure C.20**).

**Theme 2:** Many residents feel that financial incentives, such as grants or tax incentives, are important to motivate homeowners to mitigate their structure ignition zone (**Figure C.7**). However, some residents feel like mitigation of personal property is a responsibility that should not be subsidized by the government. Half of residents taking the Together JeffCo survey identified cost as a barrier to wildfire mitigation on their property (**Figure C.23**). Many residents (72%) reported being unaware of or unfamiliar with state or federal grant programs that provide funding to assist homeowners in wildfire risk reduction work on private property and around homes (**Figure C.22**).

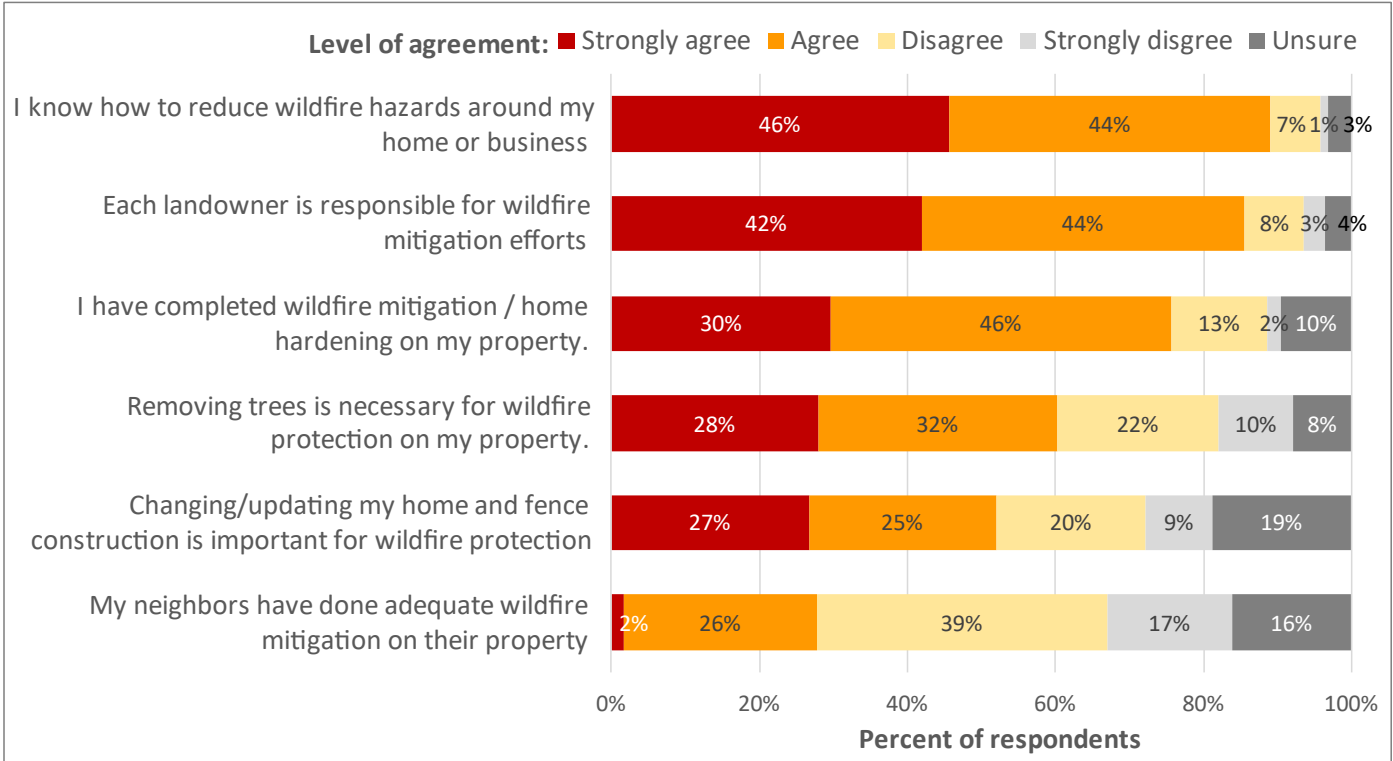
**Theme 3:** Although many residents report understanding how to mitigate wildfire risks on their properties (**Figure C.5; Figure C.20**), 22% of residents identified lack of knowledge and awareness as a barrier to wildfire mitigation (**Figure C.23**). Resident recommendations included educational events, access to home hazard assessments, and regular reminders to encourage mitigation by homeowners. Residents rated home assessments as moderately effective relative to other actions the County could undertake (**Figure C.7**), but they rated it as one of the best methods for residents and the community to become more aware of wildfire risks and other hazards (**Figure C.11**).

**Theme 4:** Additional barriers to action identified by residents include prohibitive HOA guidelines<sup>6</sup>, limited time, physical inability to do the work, inability to do the work as a renter, and aesthetic impact of mitigation (**Figure C.23**).

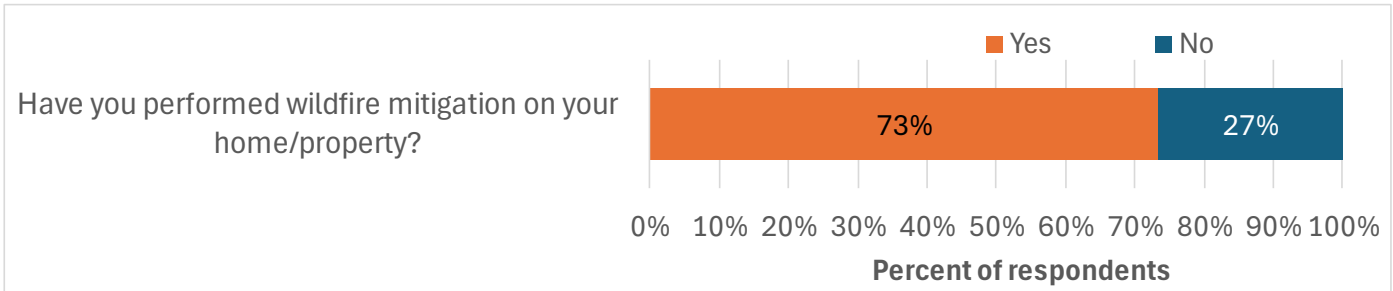
**Theme 5:** In addition to financial incentives, residents recommended that Jefferson County can support mitigation in structure ignition zones by hiring County fire crew(s), hiring a forester to write prescriptions for community grant applications, educating contractors about home hardening practices, and promoting coordination among neighbors, communities, and adjacent public land.

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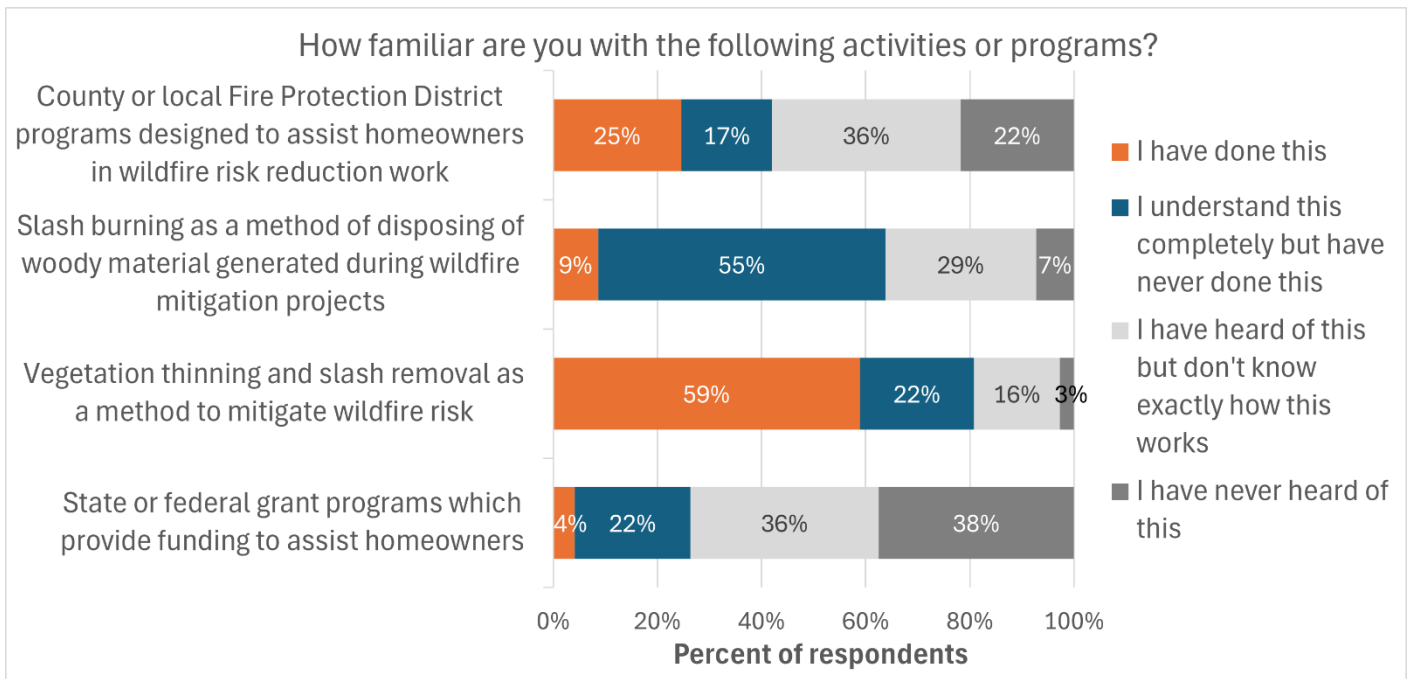
<sup>6</sup> Colorado HB24-1091 (Fire-Hardened Building Materials in Real Property) was signed into law on March 12, 2024, and limits the ability of HOAs to prohibit some structure hardening measures.



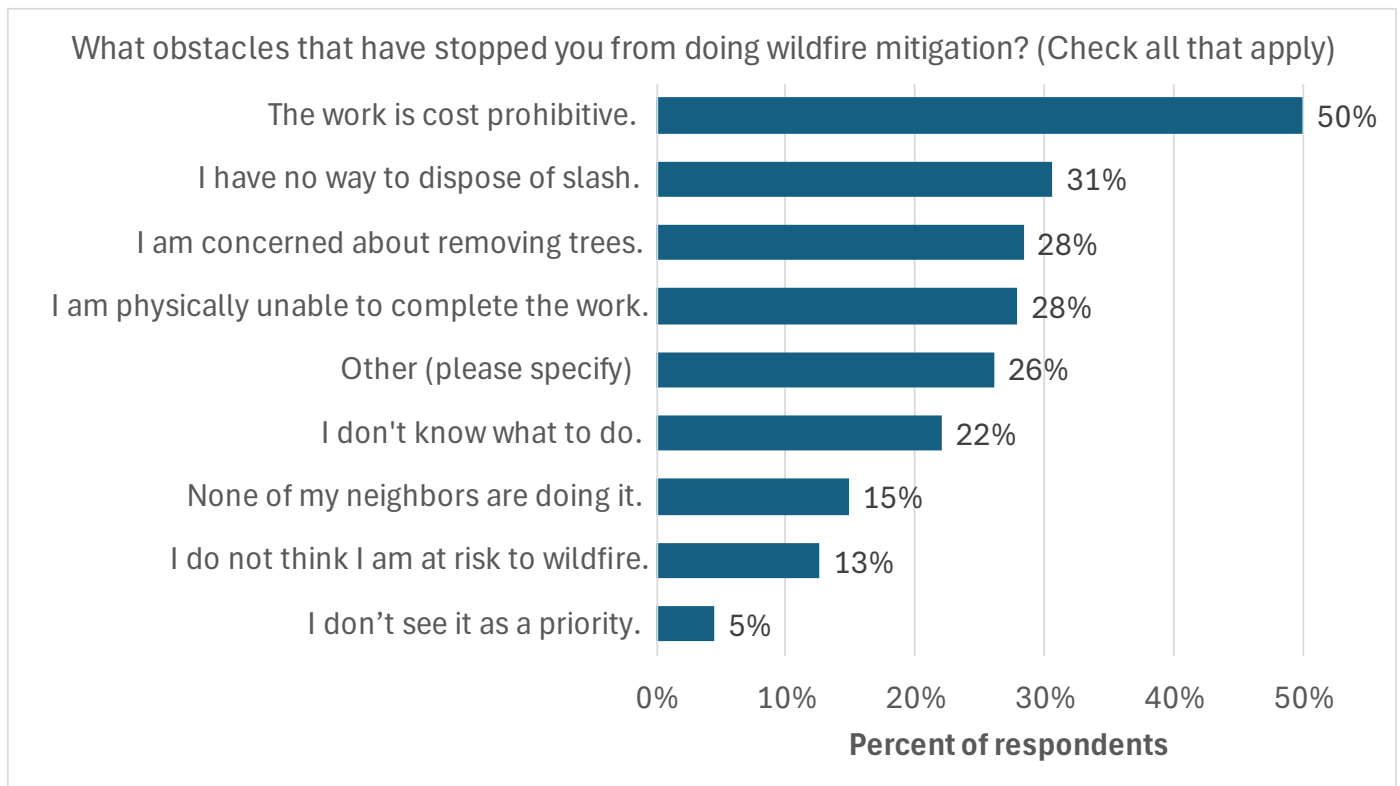
**Figure C.19.** On round 1 of the Together JeffCo survey, residents were asked the degree to which they agree or disagree to a series of statements pertaining to wildfire risk mitigation. 286 individuals responded to this question.



**Figure C.20.** On round 2 of the Together JeffCo survey, 73% of residents reported performing wildfire mitigation on their home/property. 75 individuals responded to this question.



**Figure C.21.** On round 2 of the Together JeffCo survey, residents were mixed in their use of and/or understanding of different activities or programs for mitigating risk in the structure ignition zone. 72 to 74 individuals responded to these questions.

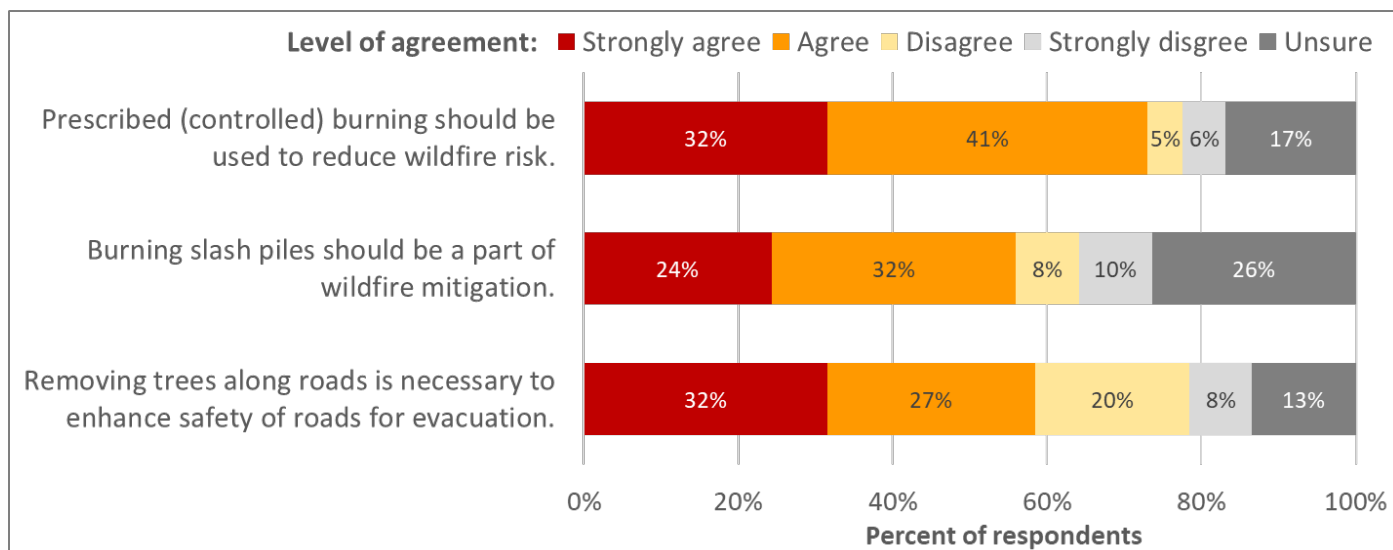


**Figure C.22.** On round 1 of the Together JeffCo survey, residents identified cost as the top obstacle preventing them from undertaking wildfire mitigation actions. 222 individuals responded to this question.

### Topic 3. Fuels Mitigation

**Theme 1:** Many residents are concerned about hazardous conditions along roadways and feel that mitigating fuels along roadways should be a top priority for action (**Figure C.7**). Almost 60% of residents agree or strongly agree that removing trees along roadways is necessary for safety (**Figure C.24**). Residents recommend a coordinated effort to mitigate fuels along roadways, including clear guidance for how residents and communities can manage vegetation along roadways. Several residents indicated specific roadways where they would like to see vegetation removed (**Figure C.15**).

**Theme 2:** Resident acceptance of fuel mitigation in natural areas, parks, and along trails is highly varied. Some residents feel that fuel mitigation is ecologically damaging and decreases the aesthetic beauty of their community. Other residents feel that Jefferson County Open Space and other agencies must do more to mitigate fire risk by cutting trees, mowing grass, grazing, and/or prescribed burning. Residents rated vegetation management in open spaces as moderately effective relative to other actions the County could undertake (**Figure C.7**). Resident support for prescribed burning is high—73% of residents responding to the Together JeffCo survey agree or strongly agree that prescribed burning should be used to reduce wildfire risk (**Figure C.24**). Several residents indicated specific locations where they would like to see land managers reduce wildfire risk on public lands (**Figure C.15**).



**Figure C.23.** On round 1 of the Together JeffCo survey, residents were asked the degree to which they agree or disagree to a series of statements pertaining to wildfire risk mitigation. 286 individuals responded to this question.

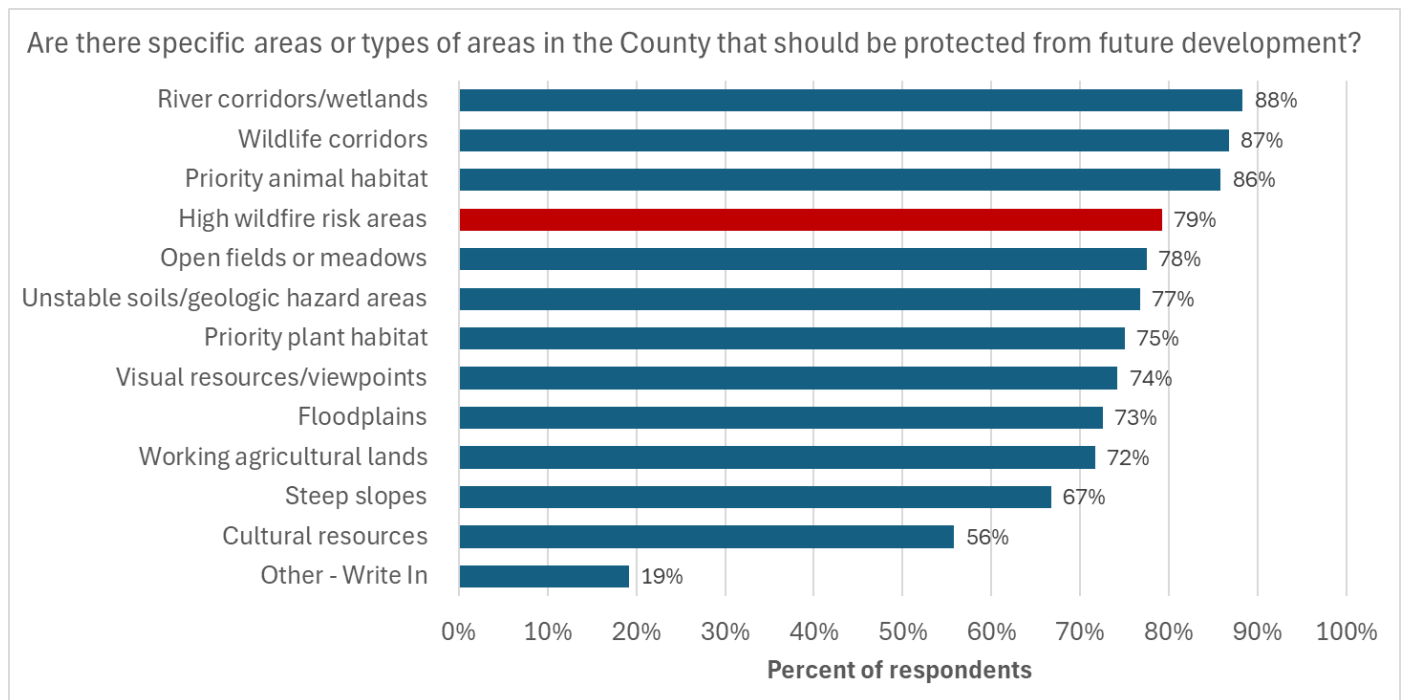


#### Topic 4. WUI Development, Code, and Planning

**Theme 1:** Overall, residents who viewed the draft WUI map were supportive of expanding the WUI. Several residents mentioned concerns about how the new map might impact insurance costs.

**Theme 2:** Residents are concerned about continued development in areas with high wildfire risk, and many recommend limiting development in these areas (**Figure C.25**). Some residents recommend requiring considerations of evacuation when approving new developments, short-term rental regulations in areas with high fire risk, adopting more expansive WUI code, enforcement of current requirements, and using risk assessments to guide planning and zoning. However, acceptance of stronger regulations in the WUI were mixed (**Figure C.7; Figure C.8; Figure C.9**).

**Theme 3:** Residents are concerned that wildfire risk in Jefferson County will prohibit their ability to acquire affordable home insurance (**Figure C.26**).

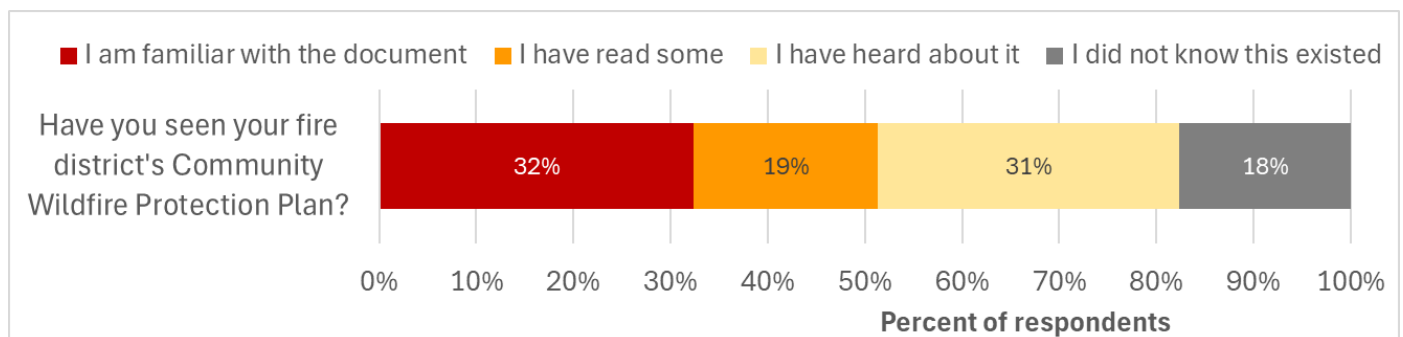


**Figure C.24.** On round 2 of the Together JeffCo survey, 79% of residents responded that areas with high wildfire risk should be protected from future development. A higher percentage of residents responded that habitat-related areas should be protected from future development. 120 individuals responded to this question.

## Topic 5. Outreach and Communication

**Theme 1:** Some residents feel that members of the community have a lack of awareness about wildfire risk and emergency preparedness in Jefferson County (also see topic 2, themes 1 and 3). Some residents feel like awareness is particularly lacking in areas east of the foothills. Residents identified home assessments and publications as the most effective ways for residents and the community to become more aware of wildfire risks and other hazards (**Figure C.11**). Other recommendations include a statewide website for information, additional funding to neighborhood ambassador programs, a county-wide wildfire partners program, and targeted information on mitigating wildfire risk in grasslands. Residents rated neighborhood programs as moderately effective relative to other actions the County could undertake and websites and educational events as relatively less effective than other actions (**Figure C.7; Figure C.11**).

**Theme 2:** Residents are mixed in their awareness of their local Community Wildfire Protection Plans (CWPPs) (**Figure C.27**). CWPPs are an excellent way to engage residents in conversations and productive solutions around wildfire risk mitigation and emergency preparedness. A couple of residents mentioned interest in having their local CWPP updated or expressed a desire for coordination among CWPPs at the local and county level.



**Figure C.25.** On round 2 of the Together JeffCo survey, about half of residents reported being familiar with or having read some of their local Community Wildfire Protection Plan. 74 individuals responded to this question.

## Topic 6. Slash Management

**Theme 1:** Some residents (about 30%) reported that they need increased access to affordable slash disposal (**Figure C.23**), and residents rated affordable slash disposal as moderately effective relative to other actions the County could undertake (**Figure C.7**). Residents recommended increased hours of operation at slash collection sites, additional slash collection sites, year-round slash collection, and alternative means of slash disposal. Residents have mixed feelings about burning slash piles—about 56% agree or strongly agree that burning slash piles should be part of wildfire mitigation, 18% disagree or strongly disagree, and 26% are unsure (**Figure C.24**). Only 8% of residents reported burning slash to dispose of woody material (**Figure C.22**).

**Theme 2:** Some residents are concerned about slash generated and left behind on public land and would like agencies to remove slash, potentially with support from volunteers. Several residents indicated specific locations where they would like slash removed (**Figure C.15**).

## Topic 7. Emergency Response and County Capacity

**Theme 1:** Some residents feel that emergency response capacity should be enhanced at the level of the County and fire protection districts. Recommendations include addressing organization and staffing of the Sheriff's Office, additional funding to fire protection districts, and installation of community cisterns. Residents rated funding to fire protection districts as highly effective relative to other actions the County could undertake (**Figure C.7**).

**Theme 2:** Some residents would like to see the County leading the way with grants for wildfire mitigation and emergency preparedness. Residents are concerned that current procedures in the County require non-governmental agencies or small fire protection districts to administer grants that might be better managed at the county level. Several residents recommended hiring a County forester to help communities write treatment prescriptions for grant applications.

## Topic 8. Other

**Theme 1:** Some residents are concerned about the prevalence of human-caused ignitions, particularly from short-term rentals, people experiencing homelessness, fireworks, general carelessness, and utility infrastructure. Residents recommend greater enforcement of fire bans, clear communication of fire restrictions, restrictions on short-term rentals, and remote monitoring for early identification of ignitions. Residents rated educational events on fire prevention as relatively less effective than other actions the County could undertake (**Figure C.7**).

**Theme 2:** Some residents are concerned that climate change will further exacerbate wildfire risk. Several residents are concerned that wildfire mitigation can contribute to climate change by removing trees that sequester carbon.

## Survey Questions

### *Resident Survey #1—Survey Questions Pertaining to the CWPP*

- What are your biggest concerns related to evacuation planning and procedures in the County? (Please provide 1 – 2 sentences). **Number of responses: 101**
- Please read each statement and select the degree to which you agree or disagree with it. **Number of responses: 286**
  - Our community is at risk from wildfires.
  - I know how to reduce wildfire hazards around my home or business.
  - Each landowner is responsible for wildfire mitigation efforts.
  - I have completed wildfire mitigation at my home including vegetation management and/or home hardening.
  - My neighbors have done adequate wildfire mitigation on their property.
  - The County should provide financial assistance to support wildfire mitigation efforts.
  - The County should establish ordinances requiring wildfire mitigation work in high-risk areas.
  - Changing/updating my home and fence construction is important for wildfire protection.
  - Removing trees is necessary for wildfire protection on my own property.
  - Removing trees along roadways is necessary to enhance safety of roadways for evacuation.
  - Burning slash piles should be a part of wildfire mitigation.
  - Prescribed (controlled) burning should be used to reduce wildfire risk.
- How important is it to you that Jefferson County manages wildfire to protect or enhance the following social, ecological, and economic values? **Number of responses: 285**
  - Safe and effective evacuation routes.
  - Infrastructure (powerlines/ communication towers).
  - Drinking water quality and quantity.
  - Forest shrubland and grasslands resilient to wildfire.
  - Homes, businesses, and other buildings.
  - Wildlife habitat.
  - Recreation opportunities (campgrounds, trails, and picnic areas).
- If there were an evacuation in the community because of wildfire, how concerned are you about the following issues? **Number of responses: 286**
  - I have children that might be home alone.
  - My community does not have enough roadways to handle evacuation traffic.
  - I do not know where to go if asked to evacuate.
  - I am not aware of primary and secondary evacuation routes in my neighborhood.
  - I might not receive timely information about an evacuation.
  - It would take me over 15 minutes to gather my personal belongings and pets to evacuate.
- What hazards are you most concerned about as they relate to the potential need for an evacuation? (Select your top 3). **Number of responses: 110**



- Terrorism
- Severe heat
- Severe cold
- Drought
- Tornado
- Earthquake
- Dam failure
- Hazardous material spill
- Wildfire
- Mud or landslide
- What obstacles have stopped you from doing wildfire mitigation? (Check all that apply) **Number of responses: 222**
  - I do not think I am at risk to wildfire.
  - Concerns about tree screening, scenery, and forest ecology.
  - I don't see it as a priority.
  - I have no way to dispose of slash (tree, limbs, etc.).
  - I am physically unable to complete the work.
  - None of my neighbors are doing it.
  - Cost/financial aspect.
  - Lack of knowledge.
  - Other (please specify). Number of responses: 58
- Do you have any other thoughts or concerns relating to wildfire and wildfire hazard and mitigation in your community? **Number of responses: 126**

***Resident Survey #2—Survey Questions Pertaining to the CWPP***

- Are there specific areas or types of areas in the County that should be PROTECTED from future development? (Choose all that apply). **Number of responses: 120**
  - High wildfire risk areas
  - Wildlife corridors
  - Working agricultural lands
  - Open fields or meadows
  - River corridors/wetlands
  - Priority animal habitat
  - Priority plant habitat
  - Steep slopes
  - Unstable soils/geological hazard areas
  - Floodplains
  - Visual resources/viewpoints
  - Cultural resources
  - Other

- -write in
- Where development occurs in or near areas identified as priority natural resources, habitat, or hazards...which of the following types of standards would you like to see in the County? [Only wildfire-related options shown below]. **Number of responses: 116**
  - Require development in areas of high wildfire risk to be constructed of materials that are fire-resistant.
  - Require development in areas of high wildfire risk to meet landscape requirements that reduce the risk of wildfire spread to structures on and adjacent to the property.
- Do you live within the Wildland Urban Interface (WUI)? **Number of responses: 73**
  - Yes
  - No
- Have you performed wildfire mitigation on your home/property? **Number of responses: 75**
  - Yes
  - No
- Have you had difficulty obtaining or retaining insurance for your home(s) due to wildfire risk? **Number of responses: 75**
  - Yes
  - No
- What is your level of familiarity or knowledge about wildfire? **Number of responses: 75**
  - Not at all familiar
  - Somewhat familiar
  - Familiar
  - Very familiar
  - Expert
- Have you seen your fire district's Community Wildfire Protection Plan? **Number of responses: 74**
  - I did not know this existed.
  - I have heard about it.
  - I have read some of it.
  - I am familiar with the document.
- How concerned/worried are you about the risk of wildfire where you live, and the threat wildfire poses to your primary residence? **Number of responses: 74**
  - Not concerned
  - Somewhat concerned
  - Concerned
  - Very concerned
- In your opinion, whose responsibility is fire preparedness and mitigation? (Select all that apply). **Number of responses: 74**
  - Individuals
  - Communities (HOAs, community groups, etc.)
  - Local fire protection districts / departments

- Local government (towns, cities, counties)
- State government
- Federal governmental land management agencies
- Other
- Home hardening is the concept of implementing fire-resistant upgrades to your home. Are you familiar with "home hardening" or "defensible space" concepts and how they pertain to residential property (i.e., the physical structure itself, including mesh vents, siding, roof types, eaves, windows, chimneys, fences, etc.)? **Number of responses: 75**
  - Not at all familiar
  - Somewhat familiar
  - Familiar
  - Very familiar
  - Expert
- What do you think are the most effective ways for residents and the community to become more aware of wildfire risks and other hazards? (Select all that apply). **Number of responses: 73**
  - Workshops
  - Publications (fliers, newsletters, etc.)
  - Grants and incentive programs
  - Home assessments
  - Public meetings
  - Public webinars
  - Educational social media posts
  - Other
  - None of the above
- Are you aware of state or federal grant programs which provide funding to assist homeowners in wildfire risk reduction work on private property and around homes? **Number of responses: 74**
  - I have never heard of this.
  - I have heard of programs but don't know exactly how they work.
  - I understand it completely but have never applied for grants.
  - I have participated or benefited from grant programs to complete wildfire risk mitigation work.
  - Other
- Are you familiar with vegetation thinning and slash removal as a method of disposing of woody material to mitigate wildfire risk? **Number of responses: 74**
  - I have never heard of this.
  - I have heard of it but don't know exactly how it works.
  - I completely understand but have never done it.
  - I have participated in or completed vegetation thinning projects.
  - Other

- Are you familiar with slash burning as a method of disposing of woody material generated during wildfire mitigation (forest thinning) projects? **Number of responses: 74**
  - I have never heard of this.
  - I have heard of it but don't know exactly how it works.
  - I completely understand but have never done it.
  - I have burned slash.
  - Other
- Are you aware of County or local Fire Protection District programs designed to assist homeowners in wildfire risk reduction work on private property and around homes? **Number of responses: 72**
  - I have never heard of this.
  - I have heard of programs but don't know exactly how they work.
  - I completely understand but have never done it.
  - I have participated or benefited from County or Fire Protection District risk mitigation programs and assistance.
  - Other
- Which of these do you think is most important to improving residents' ability to effectively evacuate? Select one (1). **Number of responses: 52**
  - Expansion of reliable communication systems and hardware, such as cell towers, to alert residents of evacuations.
  - Practice evacuation drills (led by qualified staff) at community meetings using simulation technology.
  - Expanded programs and awareness of existing programs to support the evacuation and housing of livestock during emergencies.
  - Other.
- How long do you think it would take you to gather your family, pets, livestock, belongings, etc. and depart your home after receiving an evacuation notification? Select one (1). **Number of responses: 52**
  - Less than 15 minutes
  - 15-30 minutes
  - 30-45 minutes
  - 45-60 minutes
  - 60-90 minutes
- What do you think is the most effective method to receive an evacuation notice? Select your top two (2) options. **Number of responses: 52**
  - Cell-phone alert—call
  - Cell-phone alert—text
  - Email alert
  - Landline alert—call
  - Door-to-door notification
  - Warning siren
- If there were an evacuation in your community because of a wildfire or other emergency,



what issues are you most concerned about? Select your top three (3) options. **Number of responses: 52**

- I have children that might be home alone.
  - I or a family member are mobility impaired and would need assistance with evacuating or extra time to prepare.
  - I do not have access to a vehicle or transportation.
  - My community does not have enough roadways to handle evacuation traffic.
  - I do not know where to go if asked to evacuate.
  - I am not aware of primary and secondary evacuation routes in my neighborhood.
  - I might not receive an evacuation order in a timely fashion.
  - Other.
- If asked to evacuate, how many vehicles would you and your household evacuate with? Select one (1). **Number of responses: 54**
    - One vehicle for my entire household.
    - Two vehicles for my entire household.
    - More than two vehicles for my entire household.
- If asked to evacuate, would your household evacuate with any of the following? Select one (1). **Number of responses: 53**
    - One trailer or camper.
    - Two trailers or campers.
    - Does not apply to me and my household.

### Open Houses Round 1—Open-ended Prompts for Participants

- What are the top issues facing unincorporated JeffCo today in relation to wildfire risk and other hazards that relate to the potential need for evacuation?
- What are your biggest concerns related to wildfire and evacuation planning and procedures?
- What other hazards are you concerned about as they relate to the potential need for an evacuation?
- What and where are the County’s (future) opportunities for reducing risk related to wildfire and improving evacuation (if necessary)?
- Is there anything else that you’d like to share with us today? Open Houses Round 2—Questionnaire for Participants

1. There are many programs that Jefferson County could develop or expand to reduce wildfire risk and increase evacuation preparedness. For this exercise, we are giving you 100 “effectiveness points” to allocate among the following programs. You have 100 points total. When you assign more points to an idea, it indicates that you think it has a greater potential to reduce wildfire risk and/or increase evacuation preparedness. You do not need to assign points to all 15 ideas, only those that you think are effective and important. As you go through the list, pretend that ample funding and resources are available for any of these programs. **Number of responses: 42**

Action	Effectiveness Points
One-stop website for information on how you can reduce your wildfire risk and increase your evacuation readiness.	
Access to trained individuals who can conduct wildfire assessments on your property and provide recommendations for mitigating wildfire risk.	
Educational campaigns to increase awareness about how to prepare for evacuations for wildfire and other emergencies.	
Educational campaigns to increase awareness about how to prevent human-caused wildfire ignitions.	
Funding and resources to support wildfire mitigation planning, education, and mitigation within your neighborhood, such as a neighborhood ambassador program.	
Financial incentives to subsidize the cost of actions you can take on your property to increase the likelihood of your home or business standing strong against wildfire.	
County-run fire mitigation crew(s) with trained individuals who can help neighborhoods, HOAs, Fire Protection Districts, and other organizations to remove trees and other vegetation and reduce the risk of damaging wildfire.	

Management of vegetation along roadways to reduce the potential for hazardous conditions to develop along roadways during wildfires.	
Management of vegetation in open spaces to reduce the potential for large and intense wildfires by reducing the amount of vegetation available to burn.	
Improved access to affordable means to dispose of woody material removed from your property, such as limbs, tree stems, and branches.	
Expansion of requirements for the use of non-flammable building materials on new homes and remodels and the removal of flammable material around homes (also known as defensible space) in areas with elevated wildfire risk	
Additional training, personnel, and/or equipment to county and local fire departments to enhance their ability to respond to wildfires.	
Expanded programs and awareness of existing programs to support the evacuation and housing of livestock during emergencies.	
Expansion of reliable communication systems and hardware, such as cell towers, to alert residents of evacuations.	
Practice evacuation drills at community meetings using simulation technology.	
<b>TOTAL</b>	<b>100</b>

2. How long do you think it would take you to gather your family, pets, livestock, belongings, etc. and depart your home after receiving an evacuation notification? Select one (1). **Number of responses: 41**

- Less than 15 minutes
- 15-30 minutes
- 30-45 minutes
- 45-60 minutes
- 60-90 minutes
- More than 90 minutes

3. What do you think is the most effective method to receive an evacuation notice? Select your top two (2) options. **Number of responses: 41**

- Cell-phone alert – call
- Cell-phone alert – text
- Email alert
- Landline alert – call
- Resident to resident phone tree
- Door-to-door notification
- Warning siren
- Other:

4. If there were an evacuation in your community because of a wildfire or other emergency, what issues are you most concerned about? **Number of responses: 39**

- I have children that might be home alone.
- I or a family member are mobility impaired and would need assistance with evacuating or extra time to prepare.
- I do not have access to a vehicle or transportation.
- My community does not have enough roadways to handle evacuation traffic.
- I do not know where to go if asked to evacuate.
- I am not aware of primary and secondary evacuation routes in my neighborhood.
- I might not receive an evacuation order in a timely fashion.

5. If asked to evacuate, how many vehicles would you and your household evacuate with? Select one (1). **Number of responses: 41**

- One vehicle for my entire household.
- Two vehicles for my entire household.
- More than two vehicles for my entire household.

6. If asked to evacuate, would your household evacuate with any of the following? Select one (1).

**Number of responses: 41**

- One trailer or camper.
- Two trailers or campers.
- More than two trailers or campers.
- Does not apply to me and my household.

7. The County is updating the boundary used to define the wildland urban interface (WUI), which are areas where wildland fire can move between natural vegetation and the built environment and result in negative impacts on the community. The draft WUI boundary was created with a rigorous analysis of best-available science regarding home loss in the WUI, aspects of existing approaches to WUI mapping, and on-the-ground experiences of Fire Chiefs and wildland mitigation specialists in Jefferson County. What are your reactions to the draft WUI map? How might the new WUI boundary impact you and your community?

8. What are your big ideas and big solutions for effective wildfire mitigation and enhanced evacuation readiness in the years to come?



# APPENDIX D: REFERENCES AND BACKGROUND INFORMATION

## Reference Materials For Residents and Landowners:

[TogetherJeffco Project](#)

Colorado State Forest Service's [Home Ignition Zone Guide](#)

Colorado State Forest Service's [online grassland resource](#)

[LookoutAlert Signup](#)

Jefferson County Sheriff's Office [Be Your Own Hero Campaign](#)

[Ready, Set, Go!](#)

[Firewise USA](#)

[Preparing for Emergencies for People with Disabilities](#) from FEMA

Jefferson County Open Space [Forest Health Plan Executive Summary](#)

[Map of Fire Protection Districts in Colorado](#)

[CWPPs in Colorado](#) – including Jefferson County

## Reference Materials for Agency Staff:

[GTR 373: Principles and practices for the restoration of ponderosa pine and dry mixed-conifer forests of the Colorado Front Range](#)

[NIST Technical Note 2205](#) on WUI layout, structure separation distance, and fuel pathways

Jefferson County Open Space [Forest Health Plan \(PDF\)](#)

[Lodgepole Pine Management Guidelines](#)

[Boulder County Wildfire Partners](#)

[DFPC Certified Burner Program](#)

## Stand-Scale Fuel Treatment Background:

### *Fuel Treatment Effectiveness*

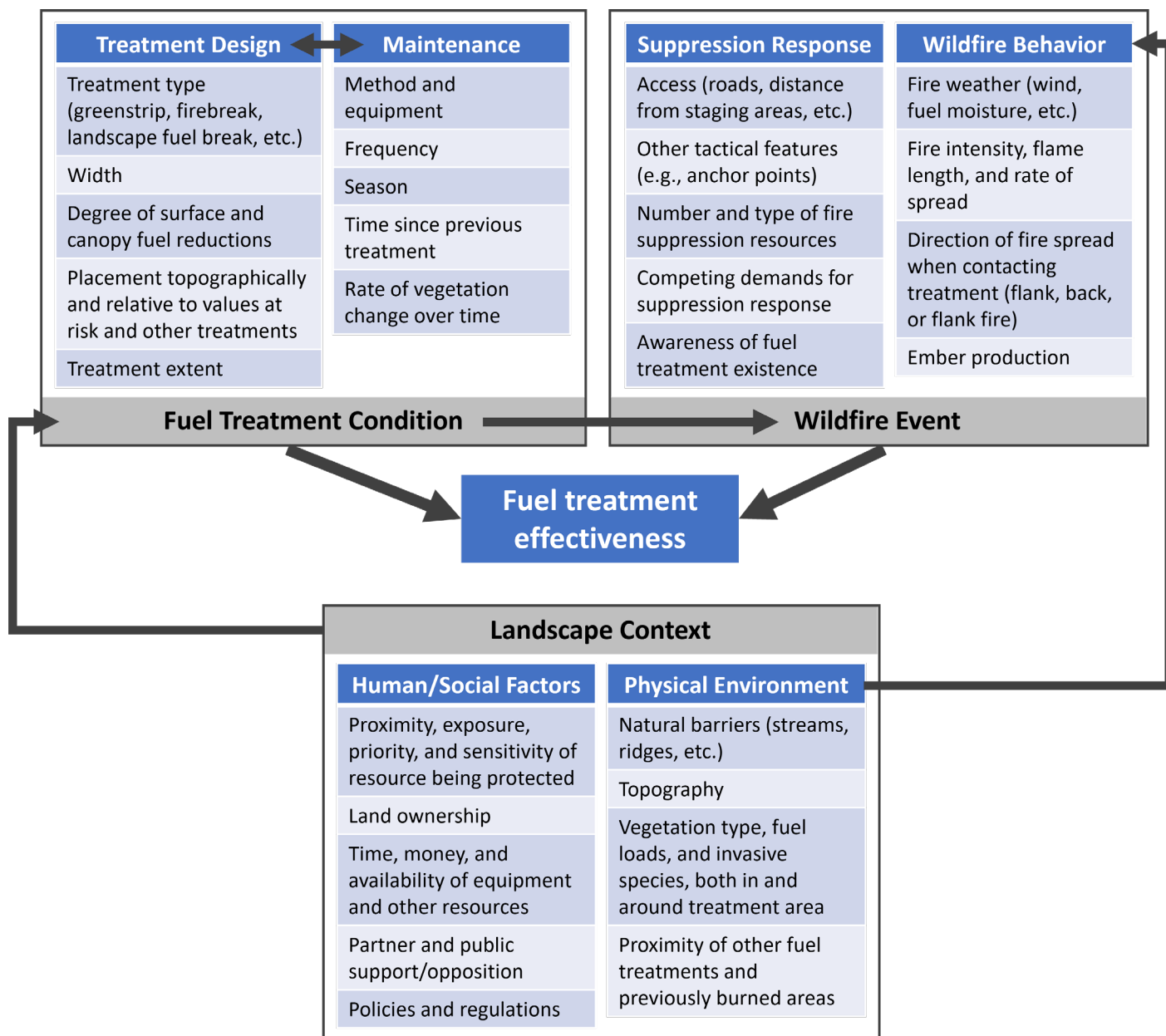
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*“Given the right conditions, wildlands will inevitably burn. It is a misconception to think that treating fuels can ‘fire-proof’ important areas... Fuel treatments in wildlands should focus on creating conditions in which fire can occur without devastating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

The 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 27**). 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 and landscape impacts regardless of fuel treatments.

Benefits of fuel treatments are not permanent and decrease overtime, with treatment “lifespan” depending on vegetation type, topography, rates of seedling regeneration (which is often influenced by precipitation), and the number of trees removed during treatments. Many forests require more than one treatment to reduce fuels and restore 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).



**Figure D.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 The Ember Alliance based on (Jain et al., 2021; Trauernicht and Kunz, 2019)

## Treatment Methods

### Mechanical Thinning

Trees can be removed manually or mechanically, with the most suitable method depending on slope, roadway access, cost, and potential damage to soil. Use of mechanical equipment is often infeasible on slopes greater than 35-40% (Hunter et al., 2007). Workers 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 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).

### ***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). Often, due to decades of fuel accumulation, mechanical treatments are necessary before broadcast burning can safely and effectively be implemented. Broadcast prescribed burning can also be used following mechanical treatments to magnify treatment impacts. Thinning and burning treatments tend to achieve fuel reduction objectives and modify fire behavior to a greater extent than thinning alone (Fulé et al., 2012; Prichard et al., 2020). Prescribed burns can reduce property damage during wildfires because they are so effective at reducing fuel loads (Loomis et al., 2019).

Broadcast prescribed burning 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). Regular spring burning can also help restore short-grass prairie ecosystems by 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). See the section **Action 2. Increase the Judicious Use of Broadcast Prescribed Burning** for more information and recommendations pertaining to broadcast prescribed burning and pile burning.





## **Mowing / Grazing**

Mowing involves using equipment or grazing animals to trim the height of grasses and forbs. Some equipment and livestock (particularly goats) can reduce the height and volume of shrubs and small saplings. Mowing and grazing can decrease flame length by reducing the height and volume of fine flashy fuels (Harper, 2011). The creation of “rangeland greenstrips” through mowing, burning, grazing, and seeding with native plants can reduce the chance of wildfires damaging properties while also restoring ecological conditions in grassland ecosystems (Miller, 2006).

Grazing by ungulates (i.e., hooved animals) is a natural process in grasslands and can promote biodiversity and heterogeneity in habitat conditions. Targeted grazing can reduce fuel load, height, and connectivity, resulting in reduced flame length and rates of spread (Clark et al. 2023; Marchetto et al., 2021). Grazing must be carefully managed to avoid negative impacts to native vegetation, human-livestock conflicts, and damage to riparian areas. Coupled systems of grazing and prescribed burning can restore grassland ecosystems and create less continuous fuel conditions, thereby interrupting potential fire pathways (Weir et al., 2013).

Mowing is primarily used to reduce flashy fuels in Zones 1 and 2 and along roadways, railways, and powerlines. Some open space managers have started mowing fuelbreaks in grasslands adjacent to the WUI in communities along the Colorado Front Range, but there are pros and cons to this approach. Mowing grasslands along the border of communities can reduce the exposure of adjacent homes to long flame lengths, create opportunities for fire suppression, and stimulate the regeneration and growth of some native plants. However, mowing can promote the spread and growth of non-native grasses, grass clippings can serve as readily burnable fuel if retained on site, regular mowing requires substantial staff time, mowed fuelbreaks can fragment wildlife habitat, and mowed fuel breaks can become social trails that reduce privacy for adjacent homeowners. Land management agencies may have conservation, aesthetic, and recreation objectives that do not align with mowing and grazing, so these approaches are not appropriate for all grasslands.

See the new [online resource](#) from CSFS for additional information on grass-dominated landscapes, fuels management, and defensible space creation in grasslands.



Photo credit: Gates Frontiers Fund Colorado Collection, Carol M. Highsmith Archive, Library of Congress.

## Potential Operational Delineations (PODs)

Containing and fighting a fire in the wildlands, especially in mountainous areas, requires strategic and thoughtful placement of potential control lines, which are the places along a landscape where firefighters can prepare a holding line that is intended to stop the fire from crossing. These often lie along rivers, ridges, and roadways. These potential control lines have often been delineated by incident command leadership when a fire starts and are modified as needed over the course of the fire.

However, many times the firefighters and incident management teams that are working on large fires are not necessarily local to the area of the fire and do not have the knowledge and background on the landscape that local land management practitioners and local firefighters do. Rather than relying on teams and locals to gather and share this knowledge at the time of a fire to make the best decisions, the USFS began identifying and mapping these potential control lines and creating a network of them across forests. By connecting many of the lines, polygons are created and these polygons are called Potential Operational Delineations, or PODs. The potential control lines that encompass these PODs are called POD boundaries. Now when fires are being managed, any team can access the PODs that were identified by local professionals before the fire and see what the best potential control lines are in the area, if they have a network of PODs.

Both the Arapaho-Roosevelt and Pike-San Isabel Forests have identified PODs that cover a significant portion of western Jefferson County. These PODs exist as a suppression resource but are more likely to be successful if they have mitigation along the POD boundary. There is a current effort to mitigate along many of the POD boundaries in preparation for fire suppression or prescribed fire, so that limited resources on fires have a greater chance of holding the fire because much of the work was completed before the fire started.

The USFS and many partners in Jefferson County have adopted the PODs framework and are working together to treat along the POD boundaries within and around the county. POD boundary treatments are varied and should look different depending on the landscape. The USFS and partners wrote a guide on [PODs in Practice](#) to demonstrate the different ways PODs can be treated.

## Roadway Fuel Treatment Background:

### *Treatment Methods*

Treatments along roadways (sometimes referred to by one of the types of treatments called shaded fuelbreaks) require a dramatic reduction of fuels to create safer conditions for evacuees and first responders. This includes removing most trees adjacent to the roadway, limbing remaining trees, and regularly mowing grass and shrubs.

The width of an effective roadside fuel treatment (distance to the left and right of a roadway) is dependent on slope and type of fuel. CSFS recommends that treatments extend 150 to 240 feet off the downhill side of the roadway and 100 to 150 feet off the uphill side, which may extend beyond the right-of-way maintained by the County or other entities, and therefore, creation of effective roadside

treatments can require partnerships with private or public landowners. 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**) (Dennis, 2005). Narrow treatments are unlikely to alter fire behavior or create tactical opportunities for firefighters. Research by the U.S. Forest Service, The Ember Alliance, CSFS, and CFRI is ongoing to improve guidance for roadside fuel treatments and should be available in the next few years.

Important aspects of all roadside fuel treatments include:

- Removing limbs overhanging the roadway to create at least 13.5-feet of vertical clearance.
- Removing trees alongside the roadway to create at least 20-feet of horizontal clearance.
- Removing trees to create at least 10-foot crown spacing between remaining trees within the roadside treatment zone specified in **Table 4**.
- Removing all dead trees that could fall across the roadway and block traffic.
- Removing shrubs and regeneration that can serve as ladder fuels.
- Mowing grasses adjacent to the roadway.
- Remove slash from the site following fuel treatments.

Roadside treatments should be more aggressive along roadways that could experience extreme congestion and consist of near removal of all trees within at least 30 feet of roadways. Clearcutting along roadways 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.

The responsibility for conducting roadside fuel treatments depends on the location of the roadway. Landowners are responsible for treatments along their private driveways. HOAs and improvement associations can treat roadways they manage. The Colorado Department of Transportation can mitigate in the rights-of-ways along major roadways that they manage like state highways, but the width of these rights-of-ways vary. Jefferson County Road and Bridge Department can conduct treatments in the right-of-way along roadways they manage, but they have limited capacity for implementation. Coordination with the County Wildland Fire Management Program risk mitigation crews, if funded, could provide an opportunity for county maintained right of way risk mitigation work when regular roadway maintenance and construction is planned. Jefferson County Open Space and USFS often cut trees along roadways on properties that they manage. Cooperation from private property owners is necessary for effective roadside fuel treatments; roadway and utility easements are rarely wide enough to satisfy the minimum of 150 feet treatment depth on each side of roadways.

The cost for roadside fuel treatments is highly variable and depends on the width of the treatment, slope, type of equipment used, slash removal techniques, and current conditions and desired post-treatment conditions. Fuel treatments require regular maintenance and are not a one-time investment. According to the CSFS Golden Office, low-complexity treatments in this part of Colorado tend to cost \$2,500 to 4,000 per acre (J. White, CSFS Supervisory Forester, personal communication). However, treatment costs can be much higher. Denver Mountain Parks paid \$13,000 per acre for hand thinning on 10-acres of steep slopes around Highway 103 (A. Perri, Denver Mountain Parks Forester).



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. Roadside treatments must dramatically reduce fuel loads to be effective.

**Table 6.** Minimum fuel treatment width uphill and downhill from roadways depends on the slope along the roadway<sup>1</sup>. 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

<sup>1</sup>Measurements are from the toe of the fill for downhill distances and above the roadway cut for uphill distances. Distances are measured parallel to flat ground, not along the slope.



Effective roadside fuel treatments remove enough trees to result in widely space crowns, remove ladder fuels (seedlings, saplings, shrubs, and low limbs), and reduce surface fuels. More dramatic tree removal along roadways can create even safer roadside conditions where appropriate. Photo credits: Genesee Foundation.





Trees lining roadways can pose a hazard to residents and first responders and should be removed in areas with high fire risk and of strategic importance for evacuation and/or fire suppression. Photo credits: David Cawrse/USDA.