

APRIL 2024

CITY OF BOULDER

COMMUNITY WILDFIRE PROTECTION PLAN

Working together to build
fire adapted communities,
resilient to wildfire



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ENVIRONMENTAL CONSULTANTS

The City of Boulder would like to formally thank the Core Team, the public, and all stakeholders for contributing their time and expertise throughout the planning process. Your participation has contributed to creating resilient landscapes, implementing public education, reducing structural ignitability, and ensuring safe and effective wildfire response.

For additional information, questions, or concerns regarding this project, please contact the Project Manager, Arianna Porter at arianna.porter@swca.com.

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DISCLAIMER

The purpose of the risk assessment contained in this plan is solely to provide a community and landscape-level overview of general wildfire risks within the assessment area as of the date hereof, and to provide a potential resource for community pre-fire planning. This risk assessment is premised on various assumptions and models which include and are based upon data, software tools, and other information provided by third parties (collectively, "Third-Party Information and Tools"). SWCA, Incorporated., doing business as SWCA Environmental Consultants ("SWCA") relied upon various Third-Party Information and Tools in the preparation of this risk assessment and SWCA shall have no liability to any party in connection with this risk assessment including, without limitation, as a result of incomplete or inaccurate Third-Party Information and Tools used in the preparation hereof. SWCA hereby expressly disclaims any responsibility for the accuracy or reliability of the Third-Party Information and Tools relied upon by SWCA in preparing this risk assessment. SWCA shall have no liability for any damage, loss (including loss of life), injury, property damage, or other damages whatsoever arising from or in connection with this risk assessment, including any person's use or reliance on the information contained in this risk assessment. Any reproduction or dissemination of this risk assessment or any portion hereof shall include the entirety of this plan disclaimer.

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CORE TEAM

The entities listed below participated in the development of, and/or reviewed and are in support of the 2024 City of Boulder CWPP Update and agree that the CWPP is viable, complete, and realistic in terms of risk reduction and implementation.

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EXECUTIVE SUMMARY

WHAT IS THE GOAL OF A CWPP?

The goal of a community wildfire protection plan (CWPP) is to enable local communities, civic groups, businesses, and governments to improve their wildfire-mitigation capabilities and capacity, while working with fire protection agencies to identify high fire risk areas and prioritize regions for structure hardening, mitigation, fire suppression, and emergency preparedness projects. Another goal of the CWPP is to enhance public awareness by helping residents, visitors, and homeowners better understand the natural- and human-caused risks of wildland fires that threaten lives, safety, and the local economy.

The CWPP must also meet the minimum standards of the Healthy Forests Restoration Act of 2003 (HFRA) and Colorado State Forest Service (CSFS) by being developed collaboratively between local, state, and federal agencies, as well as other interested parties; including priority areas for hazardous fuel reduction treatments; and recommending measures that homeowners and communities can take to reduce structural ignitability (CSFS 2022c; Society of American Foresters [SAF] 2004).

Recommendations included in the CWPP should be informed by a wildland-urban interface (WUI) delineation and subsequent Quantitative Wildfire Risk Assessment that covers fuel hazards, fire history, structure vulnerability, and protective community values. More information regarding CWPP minimum standards is available at https://csfs.colostate.edu/wp-content/uploads/2022/03/2022-CSFS_CWPP_Min_Standards.pdf.

The CWPP should be treated as a living document intended to be updated every 5 years and reviewed annually or immediately following a significant fire event to ensure the document is up to date. The plan should continue to be revised to reflect changes, modification, or new information such as projects completed and lessons learned from public education and project implementation. Chapter 5 provides an evaluation framework that can help guide the CWPP update process.

WHAT IS A QUANTITATIVE WILDFIRE RISK ASSESSMENT?

The Colorado All Lands (COAL) Quantitative Risk Assessment serves as a tool to model, visualize, and assess the risk of wildland fires within the planning area. The Quantitative Risk Assessment is the result of a collaborative effort that combines a geographic information system (GIS) model of wildfire hazard based on calibrated fuel models, severe weather conditions, and topography to map burn probability and other factors (for more information, see Chapter 3). These modeling outputs are utilized alongside data pertaining to highly valued resources and assets (HVRAs) and the WUI, which are established by wildfire professionals across Colorado in conjunction with the Core Team, to create comprehensive wildfire risk products to inform all stakeholders as well as this CWPP's risk reduction recommendations (see Chapter 4).

WHAT ARE THE STRATEGIES TO ADDRESS WILDFIRE HAZARDS?

The Wildland Fire Leadership Council created a National Cohesive Wildland Fire Management Strategy (Cohesive Strategy) that aims “to safely and effectively extinguish fire when needed; use fire where allowable; manage our natural resources; and as a nation, to live with wildland fire” (Forests and Rangelands 2021). In 2013, the Western Regional Action Plan, which outlines a regional approach to achieving the goals of the Cohesive Strategy, was adopted (Western Regional Strategy Committee [WRSC] 2013). This CWPP is aligned with the Cohesive Strategy and utilizes framework from the Western Regional Action Plan.

Goal 1 of the Cohesive Strategy/Western Regional Action Plan is to **Restore and Maintain Resilient Landscapes**: Landscapes, regardless of jurisdictional boundaries are resilient to fire, insect, disease, invasive species, and climate change disturbances in accordance with management objectives.

Recommendations for hazardous fuels treatments include the following:

- Implement cross-boundary fuel treatments.
- Reduce fuels in proximity to power lines.
- Conduct targeted fuel management in shrub and grasslands.
- Conduct vegetation management along key evacuation routes.
- Safeguard critical drinking water and wastewater infrastructure.
- Utilize controlled, prescribed fire strategically across the landscape.

Goal 2 of the Cohesive Strategy/Western Regional Action Plan is **Fire-Adapted Communities**: Human populations and infrastructure are as prepared as possible to receive, respond to, and recover from wildland fire.

Recommendations for public engagement and decreasing structural ignitability include the following:

- Provide resources and guidance on home hardening and defensible space practices.
- Gather input and raise awareness on City projects to mitigate wildfire risk.
- Enhance emergency notification and evacuation systems.
- Conduct comprehensive home wildfire risk assessments.
- Explore the adoption and enforcement of defensible space and building codes.
- Host community awareness events.
- Explore community-based leadership programs such as a community ambassador approach.

Goal 3 of the Cohesive Strategy/Western Regional Action Plan is **Wildfire Response**: All jurisdictions participate in making and implementing safe, effective, efficient, risk-based wildfire management decisions:

Recommendations for improving fire response capabilities include the following:

- Create a fire response plan and team with a focus on wildland fire and urban conflagration.
- Establish and advertise temporary refuge areas for community members.
- Secure annual funding for the Boulder Wildland Fire Incident Management Type 3 Team.

- Address the effects of extreme wind on wildfire response capabilities.
- Establish control features and structure protection protocols in the WUI.

WHAT IS THE PURPOSE OF THIS CWPP?

The purpose of the 2024 City of Boulder CWPP update is to

- facilitate a cohesive wildfire risk assessment to identify preparedness and risk reduction actions at a citywide scale;
- bring together all responsible land-use planning, wildfire management, and suppression entities in the planning area to address the identified needs;
- provide a framework for future planning and implementation of necessary mitigation measures;
- provide information to inform future land-use planning, building codes, and wildfire mitigation and prevention related ordinances; and
- provide guidance on educational opportunities and resources that the community can engage.

The table below depicts key deliverables and milestones for the 2024 plan.

Table ES.1. Key deliverables from the 2024 CWPP

Topic	Deliverable
Public Involvement	Public open house (August 5, 2023; CWPP Open House City of Boulder (bouldercolorado.gov)) Public webinar (November 2, 2023; recording) Public open house (March 16, 2024) Project webpage (project webpage) Story map (City of Boulder CWPP (arcgis.com)) Public survey (results in Appendix H) Project tracker (coming June 2024)
Risk-Hazard Assessments	Ember load index (Figure 3.5) Wildfire hazard (Figure 3.7) Risk to assets and structures (Figures 3.9 and 3.10) Social vulnerability index (Figures 3.12–3.16) Community Risk-Hazard Assessment for seven communities (Figure 3.17)
Mitigation Strategies	Resilient Landscapes 13 high-level recommendations (Table 4.1) 51 specific fuel treatment projects (Table 4.3) Fire-Adapted Communities 12 high-level recommendations (Table 4.4) 25 specific practices for homeowners (Table 4.5) Safe and Effective Wildfire Response Nine high-level recommendations (Table 4.6)

WHERE IS THE PLANNING AREA?

The planning area includes Boulder, an associated source water protection zone, and other lands owned or managed by City of Boulder entities (Figure ES.1). The source water protection zone is to the west of the city, includes the community of Nederland, and encompasses a large portion of the municipal watershed.

Boulder sits at the interface of several different topographic and vegetative zones referred to as the Rocky Mountain Front Range. Moving east or west, elevation, precipitation, vegetation, and most importantly, fire regimes change dramatically over a short distance due to the rapid change from mountainous to grassland ecosystems. Fire regimes refer to the characteristic frequency, intensity, and severity of wildfires within a specific area, influenced by factors such as climate, vegetation type, and human activities. Wildfire risk also changes with these factors, and it is important to understand where your home and your community is situated in relation to wildfire risk on this diverse landscape.

Residents located in the forested foothills to the west, within the grasslands to the east, or those situated at an intersection between the two, face distinct wildfire hazards and risks. These risks are heightened during extreme fire weather events like red flag conditions and high winds. It is important to recognize the wildfire hazards specific to each area, such as high fuel loading and rapid grass fire spread. Mitigation strategies tailored to each hazard, such as maintaining defensible space and implementing home hardening upgrades, are crucial for reducing the risk of wildfire damage to homes and communities.

In the Boulder area, the wildfire season is year-round, and it is important to recognize and understand weather forecasts as they relate to wildfire danger. Constantly being prepared, informed, and ready for the wildfire behavior forecasted in your area is the best way to protect yourself, your property, and your community.

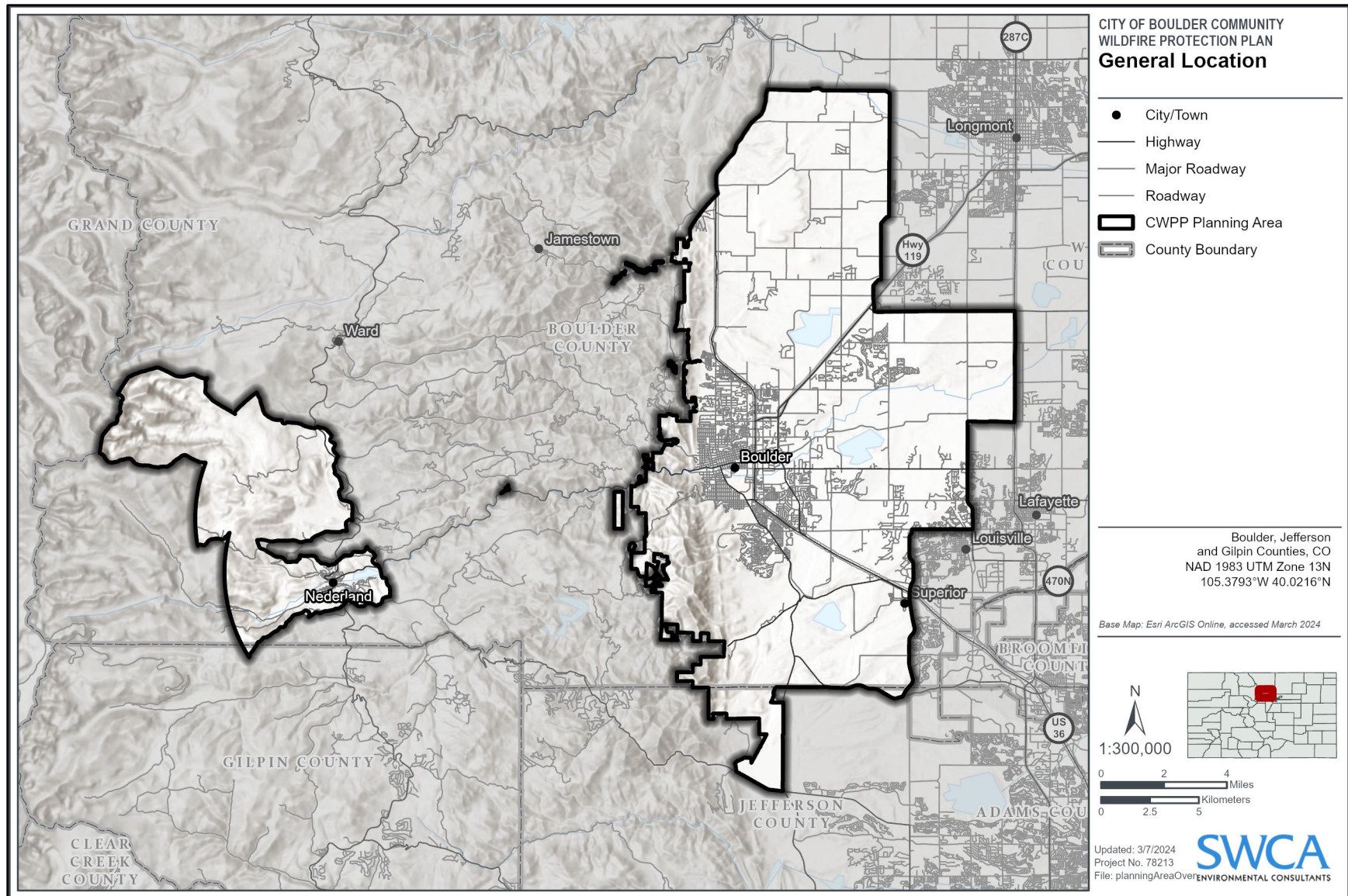


Figure ES.1. City of Boulder CWPP planning area.

HOW WAS THE 2024 CITY OF BOULDER CWPP DEVELOPED?

The CWPP planning process was multifaceted and relied heavily on modeling and mapping wildfire hazards and identifying physical characteristics that increase the threat of wildfire to communities. This allowed the Core Team, a diverse group of relevant project stakeholders, to prioritize treatments tailored for each community to reduce fire risk. Public engagement also played a crucial role in the 2024 CWPP update, with community members actively providing input through various outreach events and engagement through online surveys. See the CWPP Public Involvement section of Chapter 1 to learn more about the CWPP development process.

The CWPP is broken into chapters and appendices as shown below. In-depth background information is housed in the appendices.

Chapter 1 provides a general overview of CWPPs, the Core Team, the planning area, land ownership, and public involvement.

Chapter 2 presents an overview of the WUI, fire environment, and specific information about vegetation and fire history, as well as fire management and response.

Chapter 3 describes the Quantitative Risk Assessment, results of the assessment, and community values at risk.

Chapter 4 provides mitigation strategies in accordance with the National Cohesive Wildfire Strategy, as well as post-fire protocols and rehabilitation strategies.

Chapter 5 presents monitoring strategies to assist in tracking project progress and in evaluating work accomplished.

Appendix A contains additional background and resources for community members, covering a variety of topics.

Appendix B contains background information on the planning area including fire policy, past planning efforts, and federal and state land management practices.

Appendix C displays the results from the on-the-ground community assessments carried out within the planning area.

Appendix D outlines modeling and geographic information system (GIS) processes and methodologies.

Appendix E details potential fuel treatment types and methods for application.

Appendix F provides resources for property owners on preparing their houses and properties for wildfire.

Appendix G contains information on recovery and restoration following a wildfire.

Appendix H presents information on public outreach and engagement with regard to this CWPP.

Appendix I provides additional mapping.

Appendix J details funding opportunities.

WHAT PUBLIC ENGAGEMENT OCCURRED DURING THE CWPP PROCESS?

The City of Boulder implemented extensive public outreach throughout the development of this CWPP. Starting in the summer of 2023, the Core Team began various initiatives, including updates on the City website, press releases, flyers, and open house events. In addition, a public webinar was hosted in the fall of 2023, and resulting news coverage highlighted the City's progress on the CWPP, coinciding with the Marshall Fire anniversary. The City also utilized an interactive [project webpage](#) and online story map to engage the public throughout the project, presenting information on the purpose, project history, scheduled events, community survey, and key resources. The story map features tabs on fire environment, risk assessment, mitigation strategies, and monitoring and evaluation strategies.

From June 2023 to April 2024, the community provided valuable feedback through a public survey, with 1,123 responses collected, which resulted in adaptations and additions to the CWPP content. Additionally, written public feedback was solicited during open house events and responses were used to inform community concerns and priorities. See the CWPP Public Involvement section in Chapter 1 to learn more about how the public contributed to the development of the CWPP.

HOW DOES THIS CWPP ALIGN WITH OTHERS IN THE REGION?

Wherever possible, CWPP Core Teams work collaboratively to align planning efforts with others in surrounding regions. In a region such as the Colorado Front Range, there may be many overlapping CWPPs encompassing a variety of geographic scales. CWPPs serve different operational purposes based on their planning scales. Because of this, maps and data throughout this plan will differ from those in other CWPPs covering the same region. Community members should reach out to local experts with questions and if presented with conflicting information, err on the side of caution with the goal of preparedness in all possible outcomes.

WHO PARTICIPATED IN DEVELOPING THE PLAN?

Land managers, government representatives, and local representatives from across the City of Boulder and source water protection zone participated in this CWPP planning process. Organizations, municipalities, and agencies such as the City of Boulder, CSFS, U.S. Forest Service (USFS), Boulder County, and the Boulder Office of Disaster Management (ODM) served as the Core Team for this CWPP and drove the decision-making processes. Please refer to Table ES.2 for the Project Core Team list, which outlines the individuals involved in the development of the plan.

Members of the public also participated in developing the plan through public meetings, online webinars, and surveys, the results of which were used to shape and develop the draft and final versions of the CWPP update.

Table ES.2. 2024 City of Boulder CWPP Core Team

Name	Organization	Title	Project Role
Brian Oliver	Boulder Fire-Rescue	Wildland Fire Division Chief	Core Team Member
Kerry Webster	Boulder Fire-Rescue	Wildland Fire Operations Specialist	Core Team Member
Paul Dennison	City of Boulder, OSMP	Wildland Fire Senior Program Manager	Core Team Member
Chris Wanner	City of Boulder, OSMP	Vegetation Stewardship Senior Manager	Core Team Member
Danielle McNutt	Boulder Fire-Rescue	Community Risk Reduction Senior Program Manager	Core Team Member
Jamie Barker	City of Boulder Communications and Engagement	Public Information Officer	Core Team Member
Ben Pfohl	CSFS	Supervisory Forester	Core Team Member
Meg Halford	Boulder County	Senior Forest Health Planner/Special Projects Coordinator	Core Team Member
Kate Dunlap	City of Boulder	Source Water Quality Program Manager	Core Team Member
Regina Elsner	City of Boulder, Parks & Recreation	Senior Manager of Natural Resources	Core Team Member
Monika Weber	Boulder Office of Disaster Management	Emergency Management Coordinator	Core Team Member
Steve Orr	Boulder Fire-Rescue	Community Risk Reduction Specialist	Core Team Member
Victoria Amato	SWCA	Principal Fire Planner	Plan Preparer
Arianna Porter	SWCA	Project Manager	Plan Preparer
Liz Hitzfelder	SWCA	Lead Geospatial Scientist	Plan Preparer
Sam Lashley	SWCA	Assistant Project Manager	Plan Preparer
Mitch Burgard	SWCA	Subject Matter Expert	Plan Preparer
Ryan Saggese	SWCA	Fire Planner	Plan Preparer
Eleanor Fuchs	SWCA	Fire Planner	Plan Preparer
Mallory Phillips	SWCA	Fire Planner	Plan Preparer

WHO WILL LEAD THE IMPLEMENTATION OF THIS CWPP?

Implementation of most projects identified in this CWPP will require the collaboration and cooperation of multiple individuals and entities such as community residents, private organizations, the City of Boulder, Boulder County, state, and federal agencies. The CWPP **does not require** implementation of any of the recommendations; however, the most effective fire mitigation is achieved through the joint actions of individual homeowners and government agencies. To ensure that projects move forward, the plan will be governed by the City of Boulder and will require coordination with Boulder Office of Disaster Management and other neighboring emergency management entities adjacent to the planning area. See Chapter 4 for proposed agencies to lead implementation of recommended projects.

INTERACTIVE TOOL DEVELOPMENT

The City of Boulder opted to develop a story map (online web content) that presents the CWPP in a web layout with accompanying web maps. The purpose of the story map is to disseminate information to the public and allow for public input. In addition to facilitating information sharing, the story map also provides a platform that can be readily revised to keep the CWPP document current. The CWPP is shared on the City of Boulder website: <https://bouldercolorado.gov/guide/community-wildfire-protection-plan-cwpp>.

For additional information on this project, please contact Project Manager Arianna Porter at arianna.porter@swca.com.

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CHAPTER 1 – INTRODUCTION

The United States is facing urgent forest and watershed health concerns. Indeed, the number of annual wildfires throughout the United States has been slightly increasing in recent years (58,100 in 2018 and 50,000 in 2019 vs. 59,000 in 2021 and 69,000 in 2022). Similarly, the number of acres burned has been on the rise (Congressional Research Service [CRS] 2023). An average of 7 million acres is burned every year due to wildfire, more than doubling the annual average of acres burned in the 1990s (CRS 2023).

Communities are seeing the most destructive wildfire seasons in history. The 2015 fire season had the most acreage impacted in a single year since 1960 at 10.13 million acres. Following closely, 2020 was the second most extensive year for wildfire with 10.12 million acres burned (CRS 2023). However, it is essential to recognize that 2023 (see Figures 2.14–2.20 in Chapter 2 for additional data on Colorado's fire history) saw a relatively low acreage burn year nationwide (National Centers for Environmental Information [NCEI] 2023). Nonetheless, this did not mitigate the occurrence of deadly wildfires, such as the Marshall Fire in Colorado or the Lahaina Fire in Maui, during unexpected times of year, prompting questions about the evolving nature of these disasters (U.S. News 2023). Despite the Marshall Fire in 2021 occurring during a low burn year, the USFS and U.S. Department of the Interior spent almost twice as much on fire suppression resources in 2021 than the previous year in 2020 (~\$2.3 billion spent in 2020 and ~\$4.4 billion spent in 2021) (NIFC 2022). These statistics demonstrate that wildfires are becoming more severe, increasingly destructive, and harder to control.

Colorado's 2020 Forest Action Plan states that forests and grasslands in Colorado, like other western states, face serious issues concerning longer fire seasons and uncharacteristic fire behavior that threaten the sustainability and ecological function of the state's ecosystems. Figure 1.1 illustrates how wildfires around the state are burning larger, with the largest wildfires in 2020 combined burning more acreage than the largest fires combined from 2002 to 2016. These issues require an analysis of the current gap between existing and necessary wildland fire management strategies. A top priority in Colorado is coupling current and future wildland fire management strategies with wildland fire and fuel priority areas to guide federal, state, and private program funds towards projects that restore natural forest conditions, help communities live with wildfire, protect watersheds, conserve wildlife, and enhance the public benefits from trees and forests (Colorado State Forest Service [CSFS] 2020).

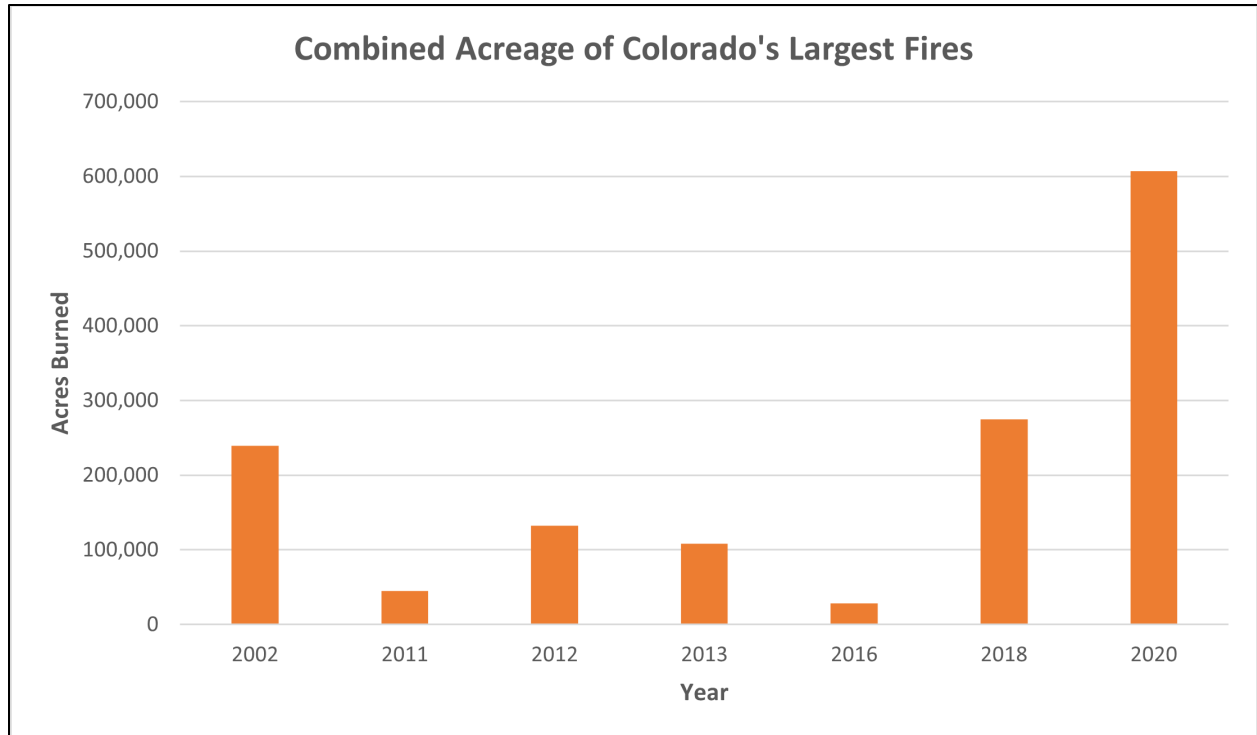


Figure 1.1. Chart of the combined acreage burned by Colorado's largest* wildfires from 2002 to 2020 Source: Colorado Division of Fire Prevention and Control (n.d.).

*Criteria for a "large" wildfire in the western United States is >1,000 acres burned.

Comprehensive wildland fire and forest management strategies are necessary for adapting to a changing climate and its effects on natural fire regimes. Frequent drought, tree mortality, and climate change have all worked together to increase wildfire likelihood and community vulnerability to wildfire (CSFS 2020). These factors have interacted to increase the risk of uncharacteristically large and high-severity fires (CSFS 2020). In the past few years, fires have grown to record sizes in Colorado and are burning longer, hotter, and more intensely than they have in the past (CSFS 2021).

As wildfire severity and extent increases, communities need a plan to help prepare for, reduce the risk of, and adapt to wildland fire events. While the expansion of wildfires poses a significant threat, it's crucial to recognize the accompanying rise in severity, which compounds the dangers faced by communities. This heightened severity not only places strain on emergency response resources but also elevates the potential for substantial property damage, and most critically, for injury and/or loss of life (WFC 2024). See Chapter 2, Fire Environment, and the Environmental Challenges section in Appendix A to learn more about the effects of climate change on wildfire. Community wildfire protection plans (CWPPs) help accomplish these goals. A CWPP provides recommendations that are intended to reduce, **but not eliminate**, the extreme severity or risk of wildland fire.

The development of the CWPP is rooted in meaningful collaboration among many stakeholders, including local, state, and federal officials. The planning process involves looking at past fires and treatment accomplishments using the knowledge and expertise of the professional fire managers who work for the various City of Boulder agencies and governing entity. From there, the CWPP ultimately identifies the current local wildfire risks and needs that occur in the city, which is further supported with relevant science and literature from the western region of the United States.

This 2024 update to the 2007 City of Boulder CWPP reviews and verifies prior recommendations and completed projects, while also identifying additional priority areas, outreach strategies, and mitigation measures to protect irreplaceable life, property, and critical infrastructure in the planning area. However, this CWPP does not mandate the type and priority for treatment projects to be carried out by the land management agencies and private landowners. The responsibility for implementing wildfire mitigation treatments lies at the discretion of the landowner, resource owner, land manager, etc.; the 2024 City of Boulder CWPP will only identify potential treatments and strategies and provide a suggested priority for these projects.

GOAL OF A COMMUNITY WILDFIRE PROTECTION PLAN

The goal of a CWPP is to enable local communities to improve their wildfire-mitigation capacity, while working with government agencies to identify high fire risk areas to prioritize for mitigation, fire suppression, and disaster preparedness. Another goal of the CWPP is to enhance public awareness by helping residents better understand the natural and human-caused risk of wildland fires that threaten lives, safety, and the local economy. The minimum requirements for a CWPP, as stated in the Healthy Forests Restoration Act of 2003 (HFRA), are the following:

Collaboration: Town, county, and state government representatives, in consultation with federal agencies or other interested groups, must collaboratively develop a CWPP (Society of American Foresters [SAF] 2004).

Prioritized Fuel Reduction: A CWPP must identify and prioritize areas for hazardous fuels reduction and treatments and recommend the types and methods of treatment that will protect one or more communities at risk (CARs) and their essential infrastructures (SAF 2004).

Treatments of Structural Ignitability: A CWPP must recommend measures that local governments, homeowners, and communities can take to reduce the ignitability of structures throughout the area addressed by the plan (SAF 2004).

It is the intent of this 2024 CWPP to provide a citywide scale of wildfire risk and protection needs and bring together all responsible wildfire management and suppression entities in the City of Boulder to address the identified needs, and to support these entities in planning and implementing the necessary mitigation measures. Additional information on the planning process is available in Appendix B.

ALIGNMENT WITH COHESIVE STRATEGY

The 2024 CWPP is aligned with the Cohesive Strategy and its Phase III Western Regional Action Plan by adhering to the nationwide goal “to safely and effectively extinguish fire, when needed; use fire where allowable; manage our natural resources; and collectively, live with wildland fire.”

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

- **Resilient Landscapes** – Landscapes, regardless of jurisdictional boundaries are resilient to fire, insect, disease, invasive species and climate change disturbances, in accordance with management objectives.

- **Fire Adapted Communities** – Human populations and infrastructure are as prepared as possible to receive, respond to, and recover from wildland fire.
- **Safe, Effective, Risk-based Wildfire Response** – All jurisdictions participate in making and implementing safe, effective, efficient risk-based wildfire management decisions.

For more information on the Cohesive Strategy, please visit:

<https://www.forestsandrangelands.gov/documents/strategy/natl-cohesive-wildland-fire-mgmt-strategy-addendum-update-2023.pdf>

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

In addition to aligning with the Cohesive Strategy, the CWPP also incorporates information on post-fire recovery, the significant hazards of a post-fire environment, and the risk that post-fire effects pose to communities (Figure 1.2).



Figure 1.2. The CWPP incorporates the three primary goals of the Cohesive Strategy with post-fire recovery to serve as holistic plan for fire prevention and resilience.

ALIGNMENT WITH PLANS AND AGREEMENTS

This CWPP is aligned with multiple local, state, and federal planning documents including the Boulder County, Mountain View Fire Protection District, Nederland-Timberline, and Coal Creek Canyon Fire Protection District CWPPs. Alignment with these CWPPs was achieved through literary reviews, collaborative meetings, and authorship collaboration to ensure that CWPPs are cohesive across overlapping planning areas.

This CWPP also aligns with several interdepartmental agreements currently in place within the planning area. For all wildfire hazards that are, or may become, declared emergencies or major disasters under the Stafford Act, the State of Colorado (specifically the CSFS and the Colorado Division of Fire Prevention and Control [DFPC]) has entered into a cooperative wildland fire management agreement with multiple federal agencies (e.g., Bureau of Land Management [BLM], U.S. Forest Service [USFS], National Park Service (NPS), U.S. Fish and Wildlife Service (USFWS), and Bureau of Indian Affairs). The purpose of this agreement is to improve wildfire response and management efficiency by facilitating the coordination and exchange of equipment, personnel, supplies, services, and funds among the parties in the agreement. The details of this agreement are described in the *Colorado Cooperative Wildland Fire Management and Stafford Act Response Agreement* (available at <https://gacc.nifc.gov/rmcc/administrative/docs/COAgreement.pdf>).

Additionally, in 2018 the USFS released its national Shared Stewardship strategy that contains the following main goals: determine management needs on a state level, do the right work in the right places at the right scale, and use all available tools for active management. The strategy is based on the USFS seeking out state, tribal, and local input to best determine land management needs. The Shared Stewardship agreement was formalized in Colorado in 2019, establishing a Shared Stewardship framework between CSFS, Department of Natural Resources, Colorado DFPC, and other state agencies (Colorado Department of Natural Resources 2022).

Additional documents, fire policy, and legislative direction aligned with this CWPP are summarized in Appendix B.

PLANNING AND REGULATORY BACKGROUND

Detailed information regarding planning and regulatory background and land management strategies can be found in Appendix B, Planning and Policy Background.

SUSTAINABILITY, EQUITY, AND RESILIENCE

This CWPP is aligned with the City of Boulder's vision to prioritize equitable access to health, prosperity, and fulfillment, irrespective of demographic factors (City of Boulder 2022b). The 2024 City of Boulder CWPP promotes measures to ensure that wildfire preparedness and response efforts are inclusive and address potential vulnerabilities faced by all community members. This involves tailoring communication strategies to socially vulnerable communities, including individuals living with poverty, minority populations, individuals without vehicles, individuals with disabilities, older adults, and people with limited English proficiency, which may increase their vulnerability in the event of an emergency. This requires the consideration of socioeconomic disparities in access to resources and incorporating measures that account for varying abilities. The CWPP focuses not only the physical aspects of wildfire management but

also aims to combat and eliminate any associated inequities, aligning with Boulder's commitment to social, economic, and environmental justice.

PLANNING AREA

The planning area includes the entirety of the city of Boulder and several other bodies of land under local, state, federal, and private ownership (Figure 1.3). Boulder and additional lands covered by the planning area span approximately 190 square miles, extending across Boulder County. This area incorporates diverse landscapes, including urban and rural environments; local, state, and federally protected natural lands; working agricultural lands; foothills; grasslands; riparian areas; and valleys, with access to various recreation opportunities. While a significant portion of the city is fully developed, certain areas within the planning area are situated along the wildland-urban interface (WUI), representing the zones where wildlands are situated adjacent to human development. For additional details, refer to Appendix A, Community Background and Resources.

LAND OWNERSHIP

Land ownership in the City of Boulder CWPP planning area is varied, with lands under the management of both private entities and various government agencies. (Figure 1.4). Privately owned land (including conservation easements) comprises 42.9% of the planning area, closely followed by land owned by the City of Boulder (32.7%) and Boulder County (15.6%). Federally owned land, including that managed by the USFS, National Oceanic and Atmospheric Administration, and BLM, constitutes another 8.7% of land in the planning area. State-owned land accounts for 0.1% of the planning area.

Additional details regarding land in the planning area, such as topography and land management direction, are summarized in Appendix A.

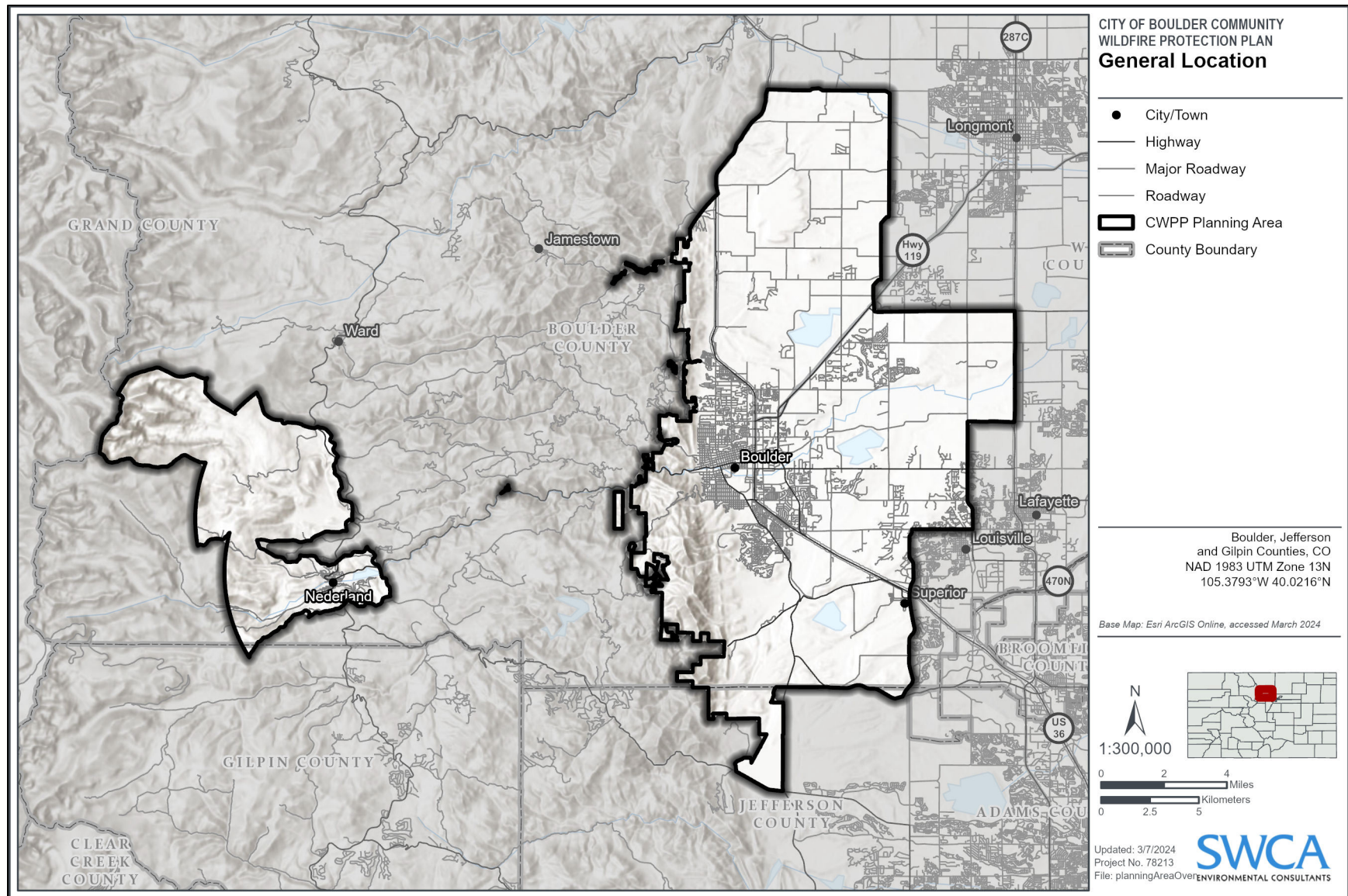


Figure 1.3. City of Boulder general location.

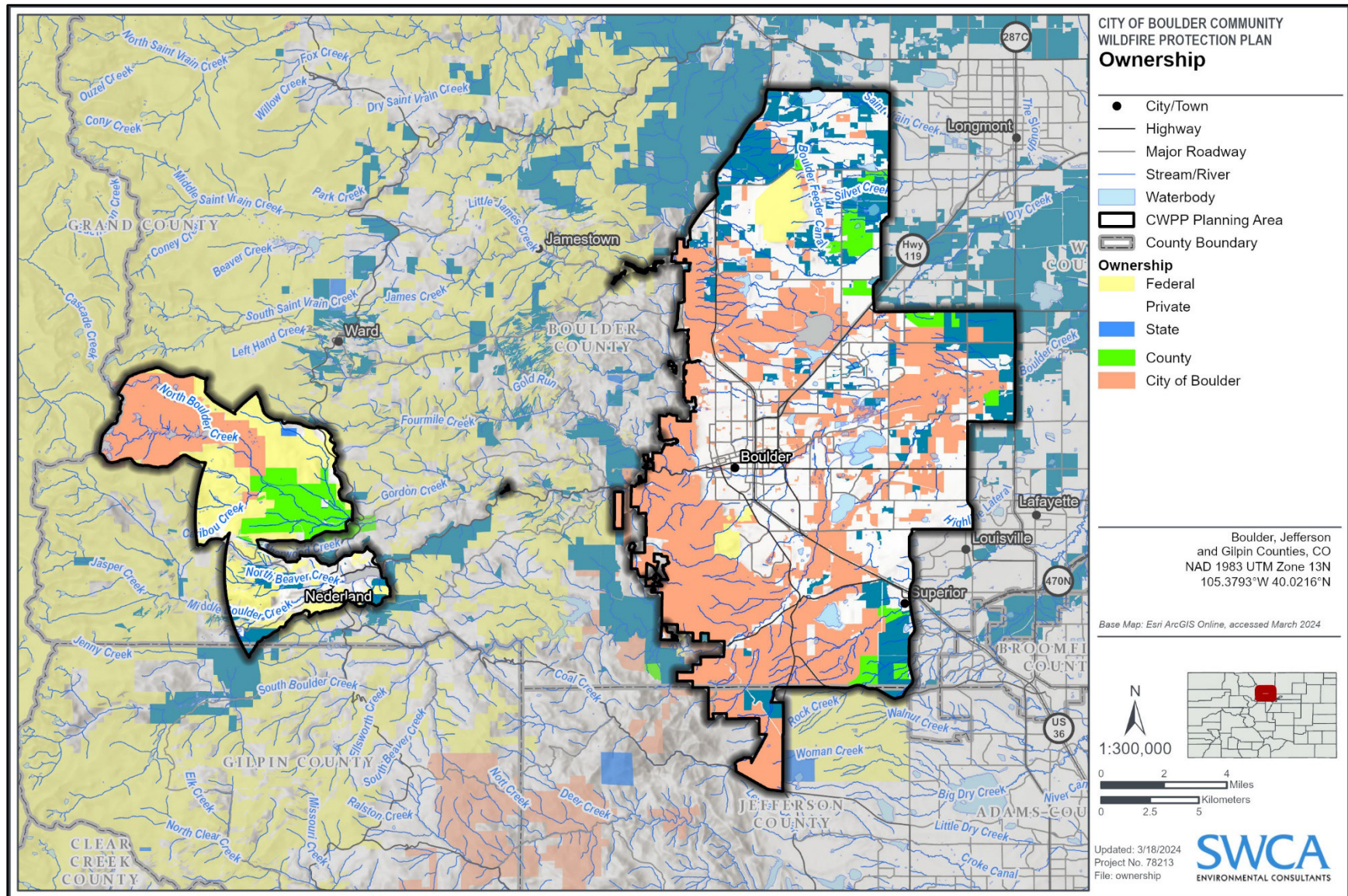


Figure 1.4. City of Boulder CWPP planning area land ownership.

EXISTING WILDFIRE MITIGATION MEASURES

PAST AND ONGOING MITIGATION

The City of Boulder's previous CWPP was completed in 2007. In the last 17 years, the City of Boulder has taken great strides toward addressing wildfire risk. Examples of wildfire resilience and community mitigation accomplishments within the planning area are shown below in Table 1.1.

Table 1.1. Wildfire Resilience and Community Mitigation Accomplishments

Year Completed	Entity	Project Name	Project Details
Ongoing	Boulder Fire-Rescue (BFR)	Curbside home assessments	BFR Wildland Division conducts curbside home assessments from the viewpoint of streets, sidewalks, or public property. These initial curbside assessments are designed to capture a general impression of wildfire preparedness at the parcel level. BFR currently is re-evaluating homes on a 3-year cycle.
Ongoing	BFR	Detailed home assessments (DHAs)	BFR Wildland Division also offers free detailed home assessments for homeowners and renters who want to improve their curbside assessment rating or learn more about wildfire preparedness. These assessments focus largely on the high risk WUI areas in the city and are part of an effort to catch up with the backlog of requests received after the Marshall Fire.
2023	City of Boulder	Mile High Youth Corps fuels reduction	The Mile High Youth Corps completed two mitigation projects in the fall of 2023, partnering with Boulder Watershed Collective (BWC), Parks & Recreation, Climate Initiatives, Boulder Fire, and the Devil's Thumb and Wonderland Lake 3 and 4 HOAs; BWC was the project lead. Accomplishments include removing junipers on private, city and HOA properties in Wonderland Lake, and conducting brush thinning on Devil's Thumb HOA properties in the summer and fall of 2023. Community education also occurred in both of these communities.
2023	City of Boulder, Boulder Office of Disaster Management (ODM), BWC	Preparedness Day	Emergency preparedness and wildfire resilience events were conducted with Crestview and Devil's Thumb neighborhood residents. These events included wildfire preparedness education, a detailed home assessment demonstration, information on wildfire resources, and a Q&A session with fire experts.
2023	BFR	HOA assessments	BFR met with HOA board members and management to perform DHAs of common areas and townhouse buildings to provide preparedness education, structure hardening and defensible space recommendations. BFR also attended HOA meetings and provided a summary of their recommendations to residents.

Year Completed	Entity	Project Name	Project Details
Ongoing	City of Boulder Open Space and Mountain Parks (OSMP)	Forest health and wildfire mitigation projects	City of Boulder OSMP continues to implement portions of the Forest Ecosystem Management Plan on an annual basis. To date, a total of approximately 2500 acres have been thinned on OSMP lands. Roughly 80% of all projects outlined in the Forest Ecosystem Management Plan are complete.
2023	City of Boulder OSMP	Wildfire risk reduction staffing and capacity improvement	City of Boulder OSMP increased Forestry Crew staffing to enhance planning and implementation of forest health and fire mitigation projects and create a more stable resource for implementing prescribed fire on OSMP lands. Increased staffing also allows for increased project implementation in the WUI, where OSMP lands abut residential communities.
Ongoing	City of Boulder OSMP	Shanahan Ridge tall oatgrass grazing	City of Boulder OSMP established grazing in the Shanahan Ridge area to address the spread of tall oatgrass and grass fuel loads. Grazing was expanded to over 500 acres in 2020 and roughly 75 head of cattle graze the area every spring. Monitoring data shows a decrease in overall tall oatgrass abundance and a 30% decrease in litter thickness in grazed areas.
Ongoing	City of Boulder OSMP	Forest health and fire mitigation grants	Since 2009, City of Boulder OSMP has been awarded over \$780,000 in state and federal grant dollars to implement forest health and fire mitigation projects related to the City's Forest Ecosystem Management Plan and CWPP.
2023	City of Boulder OSMP and BFR	Prescribed burn planning	City of Boulder OSMP and BFR completed the Flatirons Vista Area Prescribed Burn Plan. The plan covers more than 1,800 acres of grassland and forest south of the City of Boulder. OSMP and BFR testified the need for wildfire mitigation on ditches and prescribed burn flexibility to the Legislative Wildfire Matters Committee.
2023	City of Boulder OSMP	Fire-specific staffing enhancements	In 2023, City of Boulder OSMP added several standard positions to address fire-related issues on City lands. The department added a Wildland Fire Senior Program Manager, a Water Resources Maintenance and Fuels Mitigation Program Manager, and three standard Assistant Crew Lead positions on the OSMP Forest Management Crew.
2023	City of Boulder	Climate Tax Fund	City of Boulder chartered an interdepartmental Wildfire Resilience Team to enhance collaborations and partnerships around identifying and implementing wildfire resiliency strategies and to assist in decision making around work planning and budget priorities.
2023	City of Boulder OSMP	Grassland fire research	City of Boulder OSMP sponsored and funded several grassland fire research studies.
2023	BFR	Early detection	Boulder County partnered with BFR on an automatic, camera-based fire detection system that covers most of the City and all of the mountain backdrop.
2023	City of Boulder OSMP	HIZ implementation	City of Boulder OSMP began assessing OSMP structures and developing home hardening and defensible space prescriptions to reduce risk to OSMP structures in the WUI.

OUTREACH AND EDUCATION PROGRAMS

The City of Boulder also has a multitude of wildfire outreach and education resources available to the public. Table 1.2 lists local outreach and education programs currently being implemented within the planning area. **Please see Appendix A for more details on existing outreach programs concerning wildfire.**

Table 1.2. City of Boulder Public Outreach and Programs Regarding Wildfire

Agency/ Organization	Program/ Outreach Tool	Description
City of Boulder	Webpage	The City of Boulder's "Guides to Boulder" webpage provides information on emergency preparedness with an emphasis on extreme weather events like wildfires, blizzards, and flash flooding. The page offers resources on emergency notification systems and creating emergency plans. It also outlines the City's emergency response protocol, risk factors associated with the planning area, and the impact of climate change on natural hazards.
	Boulder Emergency Preparedness Guide	The City of Boulder Emergency Preparedness Guide provides Ready, Set, Go! steps for residents to prepare for wildfires and information on defensible space and home ignition zones (HIZs).
	Community Connectors	The Community Connectors Program helps connect underrepresented voices with government agencies. Community
Boulder Fire-Rescue	Community Events	Boulder Fire-Rescue is available to attend community events upon request. Have a Boulder fire engine come by for a visit to your community event. This is a great opportunity to ask the firefighters questions and see the fire engine up close.
	Detailed Home Assessments	Boulder Fire-Rescue is happy to conduct a free on-site assessment of your home and property to help protect it and your family from a wildfire. The program is available only to residents within the City of Boulder. These are conducted by trained and qualified Community Risk Reduction Specialists.
	Curbside Assessments	Boulder Fire-Rescue is continuing to conduct curbside assessments of homes and structures along the western edge of the City. These provide valuable data to residents, homeowners, and emergency responders regarding the preparedness level of each home in the WUI.
	Public education and engagement	Boulder Fire-Rescue Community Risk Reduction staff are available to attend HOA meetings, help conduct community preparedness events, and assist with projects that are intended to increase wildfire resilience and reduce risk.
Boulder Office of Disaster Management (ODM)	Webpage	Boulder ODM hosts a webpage offering extensive educational resources on disaster preparedness, covering topics such as emergency alerts, hazard awareness, disaster planning, and emergency guidance on evacuation.
	Disaster Strong Preparedness Series	Boulder ODM has created the Disaster Strong Preparedness Series, which consists of workshops and resources to increase the public's disaster preparedness. New topics are continually added to meet the needs of the community.

Agency/ Organization	Program/ Outreach Tool	Description
Boulder Watershed Collective (BWC)	Community Engagement and Project management	BWC has been an important non-profit partner in the City, providing community engagement through event organization and project development and management.
City of Boulder Open Space and Mountain Parks (OSMP)	Wildfire Mitigation and Research	City of Boulder OSMP preserves and protects the natural environment and land resources that characterize Boulder. OSMP conducts research and implements various projects with community volunteers for preserving and protecting more than 46,640 acres of land.
Wildfire Partners	Community Chipping Program and HOA Grants	Boulder County Wildfire Partners is a wildfire mitigation and preparedness program funded by Boulder County, CSFS, and FEMA. City of Boulder residents are eligible for their Community Chipping Program and the Strategic Fuels Mitigation Grant Program, for which HOAs are eligible for funding.
	Firewood Program	Wood generated by the City of Boulder's forest management operations is made available to contract-holding members of the public. The firewood program incentivizes the reduction of hazardous wildland fuels on OSMP lands while providing firewood to local contract holders.

CWPP PUBLIC INVOLVEMENT

A key element in the CWPP process is the meaningful discussions it generates among community members regarding their priorities for local fire protection and forest management (SAF 2004). The City of Boulder implemented extensive public outreach throughout the development of the CWPP, all of which directly contributed to the content of this plan. Starting in the summer of 2023, the Core Team began various initiatives, including updates on the City of Boulder website, press releases, flyers, and open house events. Additionally, a public webinar was hosted in the fall of 2023, coinciding with the Marshall Fire anniversary, resulting in news coverage of the CWPP's progress (Table 1.3).

Utilizing an interactive [project webpage](#) and online story map, the City of Boulder engaged the public by presenting information on the purpose, project history, scheduled events, community survey, and key resources. This interactive platform featured tabs on fire environment, risk assessment, mitigation strategies, and monitoring and evaluation strategies. From June 2023 through April 2024, the community provided valuable feedback through a public survey, with 1,123 responses collected thus far, influencing adaptations and additions to the CWPP content. Additionally, written public feedback was gathered during open house events; comments were used to guide plan content and recommendations in conjunction with Core Team input. **In general, the community advocated for fuels management with a focus on protecting natural resources, improving evacuation route signage, and incorporating home hardening guidance into community planning. For more information on public involvement and outreach, please refer to Appendix H.**

The draft CWPP is available for public review from March 25, 2024, through April 8, 2024. Comments and concerns regarding the draft CWPP will be gathered and used to make changes to the document's language and content. Table 1.3 summarizes the public outreach completed as part of the CWPP development.

Table 1.3. Public Outreach Resources

Outreach Type	Location	Date(s)	Description
Webpage	City of Boulder Website	May 2023 to Present	A webpage hosted by the City of Boulder describing the CWPP planning process, funding sources, and CWPP goals. The page includes: • Public event updates and announcements • Description and explanation of a CWPP • Core objectives • Timeline • Elements of a CWPP • Homeowner resources (videos, guides, links, conversations)
Community Survey	City of Boulder Website	June 2, 2023	A public survey available to the community soliciting input for the draft CWPP. The survey was linked in several press releases and advertised on the webpage listed above. Concerns, comments, and ideas from the community were compiled and incorporated into the final CWPP.
Press Release	City of Boulder Website	June 5, 2023	An announcement for the collaborative development of the CWPP that highlights plans to include recommendations to reduce hazardous fuels and enhance public outreach.
Article	<i>Boulder Weekly</i>	June 8, 2023	An article entitled “Living with Fire,” published in <i>Boulder Weekly</i> that discusses fire risk and the importance of CWPPs.
Article	City of Boulder Website	June 28, 2023	An article entitled “Boulder Seeks Community Participation for Wildfire Protection Plan” that requests public participation in CWPP development.
Press Release	City of Boulder Website	July 26, 2023	An announcement for the public open house on August 5, 2023, that highlights the WUI delineation and CWPP process.
Flyer	City of Boulder	August 2023	A flyer outlining goals of the CWPP and encouraging the public to take part in the community survey (linked to flyer).
News Story	Daily Camera Website	August 5, 2023	A news story by Celia Frazier describing the City of Boulder open house event and providing an explanation of the CWPP planning process within the context of Boulder’s fire history.
Public Engagement Event	2520 55th Street, Boulder, CO	August 5, 2023	An open house hosted by the City of Boulder OSMP and SWCA from 9 a.m. to 11 a.m. to provide an update on the 2024 CWPP and solicit public input.
Article	City of Boulder Website	October 26, 2023	An announcement for the online public webinar describing the CWPP update that includes a recording of the webinar.
Article	ABC Denver Channel 7 Website	November 2, 2023	An article titled “Boulder making headway on Community Wildfire Protection Plan as Marshall Fire anniversary nears,” that highlights the CWPP process.

Outreach Type	Location	Date(s)	Description
Online Public Webinar	Hosted by City of Boulder Online	November 2, 2023	A public webinar hosted from 5 p.m. to 6 p.m. for community members to learn about the CWPP, interact with City of Boulder staff and other experts, and learn how to provide comments to inform CWPP development.
Press Release	City of Boulder Website	March 8, 2024	An announcement for the public open house on March 16, 2023, with a description of the event. The event was also used to advertise the public review period.
Public Engagement Event	2520 55th Street, Boulder, CO	March 16, 2024	An open house hosted by the City of Boulder OSMP and SWCA from 9 a.m. to 11 a.m. to provide an update on the 2024 CWPP and solicit public input.
Public Review Period	Online	March 25, 2024–April 8, 2024	The public was invited to review and comment on the draft CWPP. The City of Boulder reviewed public comments and incorporated them into the final draft plan.
Public Engagement Event Feedback Survey	Public Engagement Events	N/A	A short survey to provide feedback on what community members learned at public engagement events and voice concerns and ideas regarding the development of the CWPP document.



WILDLAND-URBAN INTERFACE

The WUI is defined as an area where human habitation and development meet or intermix with wildland fuels (U.S. Department of the Interior and U.S. Department of Agriculture [USDA] 2001:752–753). Intermix areas are those areas where structures and other human developments meet or intermingle with wildland vegetation. These areas create an environment in which fire can move quickly between structural and vegetative fuels and have become increasingly prevalent as human development has progressed into the region's wildland areas.

According to the HFRA, a CWPP offers the opportunity for collaboration of land managers to establish a definition and a boundary for the local WUI; to better understand the unique resources, fuels, topography, and climatic and structural characteristics of the area; and to prioritize and plan fuels treatments to mitigate for fire risks. For this CWPP, the WUI was derived from several collaboratively created data layers provided by the Colorado All Lands (COAL) Quantitative Risk Assessment, as described below, and adjusted as needed based on Core Team input.

While the Core Team has developed an established WUI delineation for the planning area, it must be acknowledged that extreme weather events can impact the extent of these boundaries. The interface of the built environment with wildland fuels increases in size as fire behavior becomes more extreme. This is exemplified by the Marshall Fire, where sustained high flame lengths and rates of spread carried fire into areas that, under typical conditions, were not delineated as WUI. The City of Boulder WUI boundary is based on wildfire models accounting for high to extreme wildfire behavior.

The City of Boulder WUI map (Figure 2.1) was created in collaboration with SWCA, utilizing the Burn Probability Layer from the COAL Risk Assessment, along with spatial housing density and fuels data. The mapping process involved considering areas with higher landscape burn probabilities and incorporated weather data from remote automated weather stations (RAWS) across Colorado and gridded weather data at a 4-m resolution, indicating the potential for wildland fuel and fire. Notably, the boundaries were established using landscape burn probabilities. Areas not designated as WUI were identified based on factors such as the absence of fuels, few structures, or non-threatening burnable fuels.

It is essential to note that WUI boundaries presented in CWPPs are developed at the community scale, offering information at the subdivision and neighborhood levels as opposed to the parcel level. Distinct agencies, such as fire protection districts or counties, may interpret WUI differently based on their unique environmental factors, topography, weather conditions, and fuel types, resulting in variations in fire probabilities and intensities. Consequently, WUI definitions may differ slightly, reflecting the diverse perspectives and considerations of the protection agency responsible for the plan and the overall planning area's size and environmental characteristics. However, most agencies use WUI delineations for a similar purpose, to prioritize treatments and recommendations on the landscape.

For more information on methodology behind developing the WUI boundary, see Appendix C.

WILDLAND-URBAN INTERFACE LAND USE

Cities and counties are continuously challenged to accommodate both current and future residents in need of safe and affordable housing. Between 2010 and 2020, Colorado's population increased by nearly 745,000 people, while the development of new housing has not increased at the rate needed to meet this demand (U.S. Census Bureau 2020). Over the past few decades, jurisdictions across the state have approved numerous new housing units, many of which are within or near wildland areas to accommodate the public's desire to be adjacent to open space land. Such housing units result in WUI conditions, and today, more than 46 million residences in 70,000 communities across the United States are at risk for WUI fires (U.S. Fire Administration [USFA] 2021a). When it comes to wildfire, this trend is of special concern since WUI conditions are linked with an increased risk of loss of human life, property, natural resources, and economic assets.

URBAN CONFLAGRATION

In addition to understanding and delineating the WUI, it is crucial to address the potential risk of urban conflagration within these interface zones. Urban conflagration refers to the rapid and widespread ignition and combustion of structures and vegetation within urban environments, often exacerbated by the proximity of structures and the presence of flammable fuels (USDA 2023).

An urban conflagration refers to a large-scale and uncontrollable fire that rapidly spreads through populated urban areas, causing destruction to buildings, infrastructure, and human lives. These fires often overwhelm local firefighting resources and can result in catastrophic losses (National Fire Protection Association [NFPA] 2020).

Urban conflagrations continue to pose significant threats to communities across the United States as shown by the Camp Fire, Marshall Fire, and Lahaina Fire. Factors such as drought, high winds, dense urbanization, expansion of development into the WUI, aging infrastructure, and climate change contribute to the frequency and severity of urban conflagrations (Bowman et al. 2017).

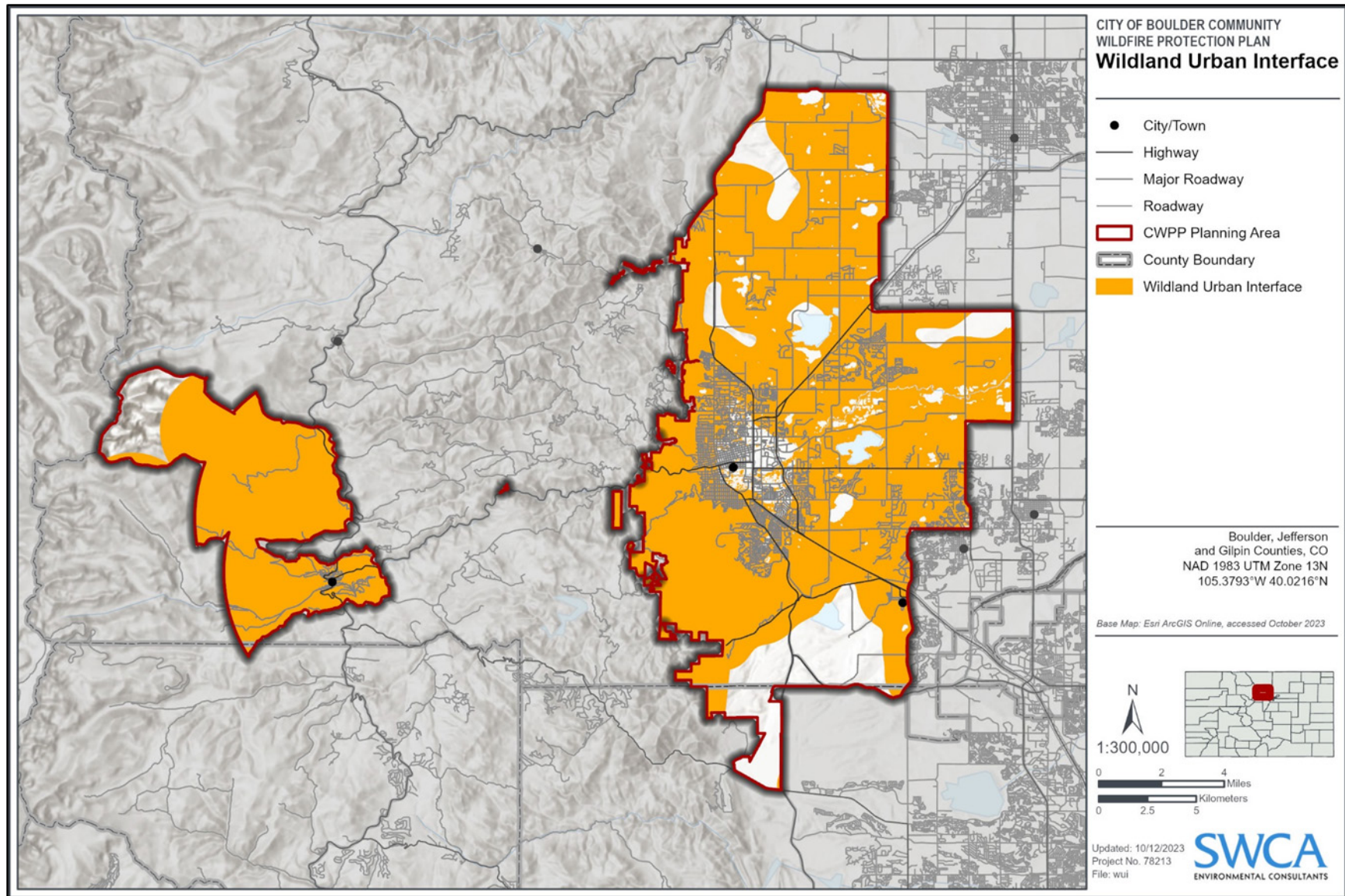


Figure 2.1. City of Boulder CWPP planning area WUI map.

Communities can address potential devastating impacts of urban conflagrations by implementing mitigation in the WUI as well as community preparedness and response measures. To enact these measures, communities must use proactive and collaborative planning, effective policy, and ensure robust operational capability (United Nations Office for Disaster Risk Reduction 2019).

The City of Boulder employs a multifaceted approach to managing conflagration risk, including wildfire mitigation efforts, land-use planning, community outreach, fire department response, and collaboration with regional stakeholders. These proactive measures aim to reduce ignition sources, enhance defensible space around properties, and improve emergency preparedness among residents.

CAUSES OF URBAN CONFLAGRATION

There are several factors that contribute to the occurrence and escalation of urban conflagrations. The four factors listed below are the primary causes identified within the planning area.

1. **Wildland fuels:** wildland fuels in close proximity and near continuous fuels adjacent to the urban built environment create ember showers that impact structures.
2. **Urban built environment:** structures that are less than 50 feet apart, combustible materials creating sustained heat exposure, flammable vegetation covering the property, connective fuels to structures, variable home age and maintenance, openings in the structure where embers can travel interior, and fire spread from radiant and convective heat all contribute to urban conflagration.
3. **Weather:** drought conditions, high winds sustained above 30 mph, and low humidity dry out vegetation, as well as building materials and fencing, within the built urban environment.
4. **Firefighting:** firefighting suppression operations capabilities, limited water supply, access challenges, and inability to establish congruent operational command across multiple agencies are common with urban conflagration.

IMPACTS OF URBAN CONFLAGRATION

1. **Loss of life:** conflagrations can result in fatalities and injuries among firefighters, residents, and wildlife.
2. **Property damage:** homes, businesses, infrastructure, and natural resources are often destroyed or severely damaged by conflagrations, leading to substantial economic losses.
3. **Environmental degradation:** conflagrations disrupt ecosystems, damage habitats, and release harmful pollutants into the air and water.
4. **Social disruption:** displacement of communities, evacuation orders, and psychological trauma are common consequences of conflagrations, straining emergency response systems and social cohesion.

Mitigation Strategies

Prevention: public education campaigns, fire safety regulations, and land-use planning can reduce the likelihood of conflagrations by minimizing ignition sources and promoting responsible behavior.

Preparedness: investing in early warning systems, firefighting equipment, and emergency response training enhances the capacity to detect and contain conflagrations effectively.

Suppression: tactically deploying firefighting crews and aerial resources and using strategies such as prescribed burns and firebreaks can limit the spread and intensity of conflagrations, safeguarding lives and property.

Resilience: building resilient communities through disaster preparedness initiatives, insurance coverage, and post-fire recovery efforts strengthens the ability to recover from conflagrations and adapt to future threats.

Specific mitigation actions to consider:

- Develop projects in the WUI to manage vegetative and man-made fuels to reduce the rate of fire spread, fire intensity, and reduce the likelihood of wildfire transitioning into the built environment.
- Build with at least 50 feet of building space between structures.
- Increase tree canopy spacing within the Home Ignition Zone.
- Conduct vegetation management within the Home Ignition Zone.
- Adopt building codes requiring non-combustible construction materials.

CURRENT TRENDS AND CLIMATE CHANGE

With the ongoing effects of climate change, the risk of urban conflagrations is expected to escalate in the future. Rising temperatures, prolonged droughts, and extreme weather events increase the likelihood of fire incidents and intensify their impacts to urban environments. Addressing this growing threat requires proactive measures in preparedness, mitigation, and response to safeguard communities and infrastructure.

Effective planning plays a crucial role in mitigating conflagration risks by identifying vulnerable areas, implementing land-use policies that prioritize fire resilience, and integrating fire mitigation strategies into community development plans (European Commission 2021). By incorporating risk assessments and emergency preparedness measures into urban planning processes, cities can better anticipate and respond to conflagration threats (Pyne 1997). Addressing the conflagration problem requires a holistic approach encompassing proactive planning, effective policies, and robust operational capabilities. By prioritizing risk reduction, fostering collaboration, and harnessing technological innovations, communities can enhance their resilience to urban conflagrations and safeguard lives, property, and the environment.

SOCIAL VULNERABILITY CONSIDERATIONS

It is important to acknowledge that socially vulnerable populations exist throughout the planning area. Large wildfires can be transboundary in nature and may negatively impact many different demographic groups over varying time scales (Palaiologou et al. 2019). Individuals with disabilities, unhoused individuals, non-English speaking individuals, individuals without access to a vehicle, and other groups with functional and/or access needs are often located in areas of existing high fire risk. These individuals may use open flames for warmth and cooking, contributing to elevated fire risks exacerbated by factors such as dense vegetation or neglected buildings (Klampe, M. 2023). Therefore, it is important that local land managers, fire response agencies, and community resource groups are prepared to mitigate wildfire

hazards in vulnerable communities and establish programs to help those that are the most susceptible to drastic life changes due to a wildfire disaster.

This CWPP used social vulnerability index (SVI) data acquired from the Centers for Disease Control and Prevention (CDC) and the Agency for Toxic Substances and Disease Registry (ATSDR). These data are derived from the U.S. Census Bureau's 2020 American Community Survey 5-year estimates (CDC 2023).

More information on mapping and methodology pertaining to social vulnerability can be found in Chapter 3.

Although socially vulnerable populations were considered while drafting this plan through public engagement and outreach, this CWPP does not attempt to identify all the socially vulnerable populations in the planning area. Additional information on how wildfire may affect socially vulnerable populations can be found at Wildfire Risk to Communities here: <https://wildfirerisk.org/>.

VEGETATION AND LAND COVER

Vegetation zones within the planning area are primarily a function of elevation, slope, aspect, substrate, associated climatic regimes, and land use. Since a broad range in elevation and topography exists across the planning area, characteristics in vegetative communities are variable (Figure 2.2).

Dominant vegetation types within the planning area are described based on a large spatial scale and represent the overall vegetation community structure, which plays a general role in fire occurrence and behavior. Although the vegetation types are outlined for the planning area, site-specific evaluations of the vegetative composition and structure should be taken into consideration when planning fuels treatments.

According to LANDFIRE's 2022 vegetation and landcover update (LANDFIRE) (2022), the dominant vegetation types in the planning are Great Plains Foothill and Piedmont Grassland, Temperate Pasture and Hayland, Developed Roads, Rocky Mountain Ponderosa Pine Woodland, and Rocky Mountain Lodgepole Pine Forest.

FUELS AND TOPOGRAPHY

The diverse topography of the planning area results in significant variations in climate, weather, and vegetation. Shifts in elevation coupled with the presence of flammable wildland fuels (e.g., Flatirons, near Eldorado Canyon, and various grasslands) can impact local communities by promoting hazardous fire conditions and behavior. Many communities in the planning area are surrounded by either grasslands or rangelands and montane foothills that display contoured terrain conducive to fire spread.

Fuels in the planning area were estimated using the updated Scott and Burgan (2005) 40 fuels model (Table 2.1). Most of the planning area is composed predominantly of grass (GR) and burnable urban (BU) (Pyrologix 2022b), with smaller components of timber litter (TL) and timber understory (TU). The grass fuels are typically associated with native grasslands, which are often grazed, and occur through the topographically flat areas of the planning area, as well as sparsely in more sloped areas. Exhibiting a highly varied topography, the western portions of the planning area that extend past the Rocky Mountain foothills are occupied by grass-shrub (GS) fuels, timber-understory (TU) fuels, timber-litter (TL) fuels, and non-burnable (NB) fuels. The areas with high percentages of conifer timber litter (TL) fuels are characterized by rising elevation montane forests, while the non-burnable areas are largely composed of inflammable, rocky surfaces on hill faces and peaks.

Figure 2.3 illustrates the Scott and Burgan 40 fire behavior fuel models throughout the planning area. It should be noted that Figure 2.3 includes data prior to 2021 and does not illustrate the impacts of the 2021 Marshall Fire.

To learn more about the how the wildfire hazard was measured, please visit:

http://pyrologix.com/reports/COAL_HazardReport.pdf

Additional information on fuels within the planning area is in Appendix D, Fire Behavior Modeling/GIS Background and Methodology.

DRAFT

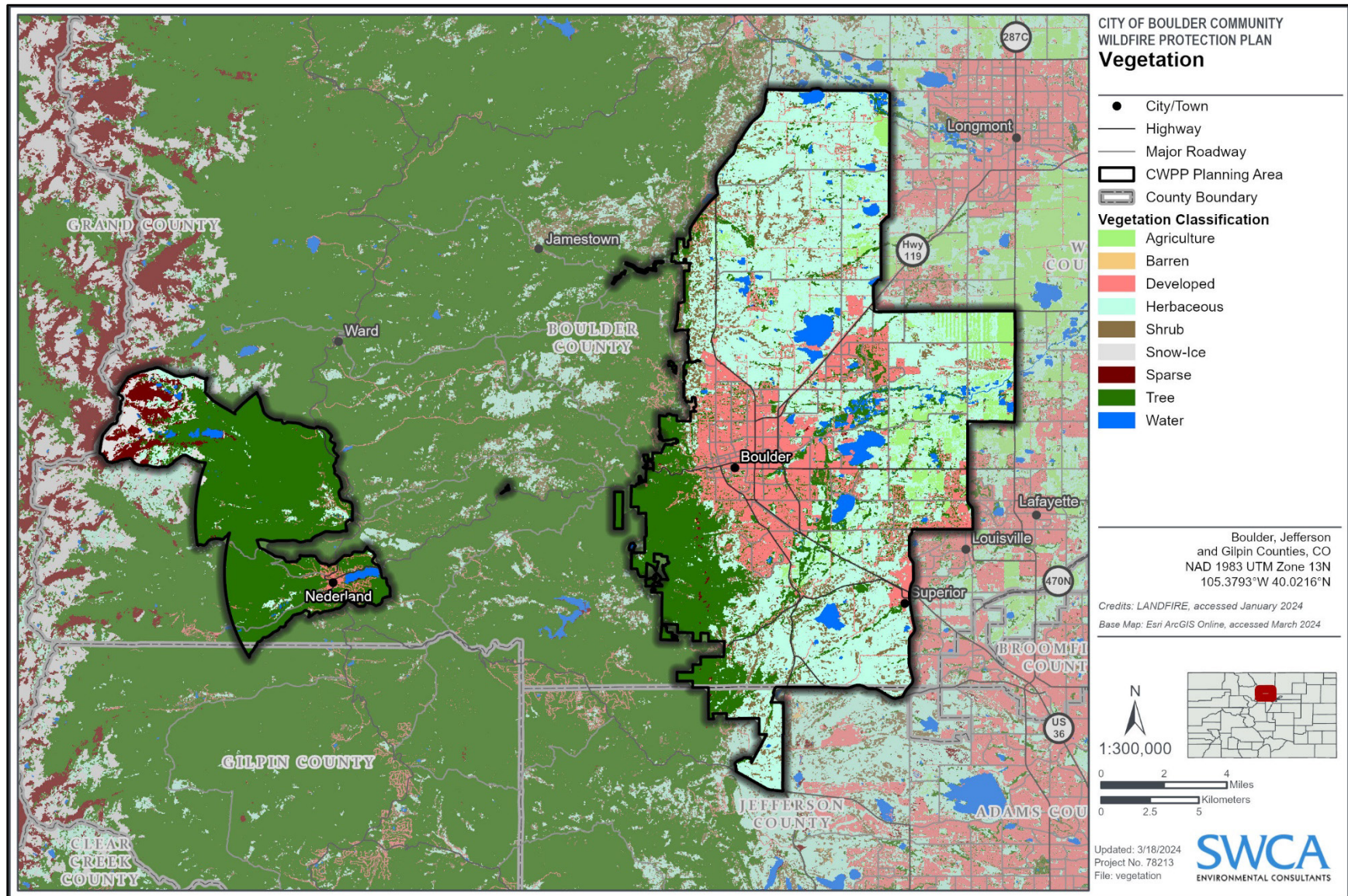


Figure 2.2. Estimated vegetation types (recent to 2021) in the City of Boulder CWPP planning area.

Table 2.1. Most Common Fuel Types in the Planning Area

Existing Fuel Type	Acres	Percent
GR2 – Grass, moderately coarse continuous grass, average depth about 1 foot. Spread rate high (20–50 chains/hour); flame length moderate (4–8 feet); fine fuel load (1.10 tons/acre).	43,425.94	35.8
BU1* – Burnable developed areas.	13,814.86	11.4
GS2 – Grass-shrub, shrubs are 1 to 3 feet high, moderate grass load. Spread rate high (20–50 chains/hour); flame length moderate (4–8 feet); fine fuel load (2.1 tons/acre).	8,183.84	6.7
GR1 – Grass, short, patchy, and possibly heavily grazed. Spread rate is moderate and flame length is low.	7,057.88	5.8
TL5 – Timber Litter, high load conifer litter; light slash or mortality fuel. Spread rate low; flame length low.	6,583.20	5.4
TU1 – Timber Understory, fuel bed is low load of grass and/or shrub with litter. Spread rate low (2–5 chains/hour); flame length low (1–4 feet); fine fuel load (1.3 tons/acre).	5,471.56	4.5
TU175* – Timber Understory	4,343.22	3.6
NB8 – Non-Burnable, open water.	4,022.30	3.3
TU5 – Timber Understory, fuel bed high load conifer with shrub understory. Spread rate moderate (5–20 chains/hour); flame length moderate (4–8 feet).	3,913.55	3.2
NB3 – Non-Burnable, agricultural field, maintained in non-burnable condition.	3,620.62	3.0
TL8 – Timber Litter, long needle litter; long needle fuel. Spread rate moderate (5–20 chains/hour); flame length low (1–4 feet).	3,004.62	2.5
TL3 – Timber Litter, moderate load conifer litter. Spread rate very low; flame length low.	2,966.33	2.4
BU2* – Burnable roads.	2,038.52	1.7
NB9 – Non-Burnable, bare ground.	1,875.70	1.5
GS1 – Grass-shrub, shrubs are about 1-foot high, low grass load. Spread rate moderate (5–20 chains/hour); flame length low (1–4 feet); fine fuel load (1.35 tons/acre).	1,623.04	1.3
TU2 – Timber Understory, moderate litter load with shrub component. High extinction moisture. Spread rate is moderate; flame length is low.	1,592.25	1.3
TL2 – Timber Litter, low load, compact. Spread rate very low; flame length very low.	1,382.15	1.1
NB2 – Non-Burnable, snow/ice.	1,379.77	1.1
TL1 – Timber Litter, light to moderate load, fuels 1 to 2 inches deep. Spread rate very low; flame length very low.	1,246.26	1.0
Other – Various Fuel Types.	3,761.45	3.1
Total	121,307.05	100

*Fuel types created from the contemporary wildfire hazard models developed by Pyrologix for the State of Colorado.

Source: Scott and Burgan 200), Pyrologix (2022b)

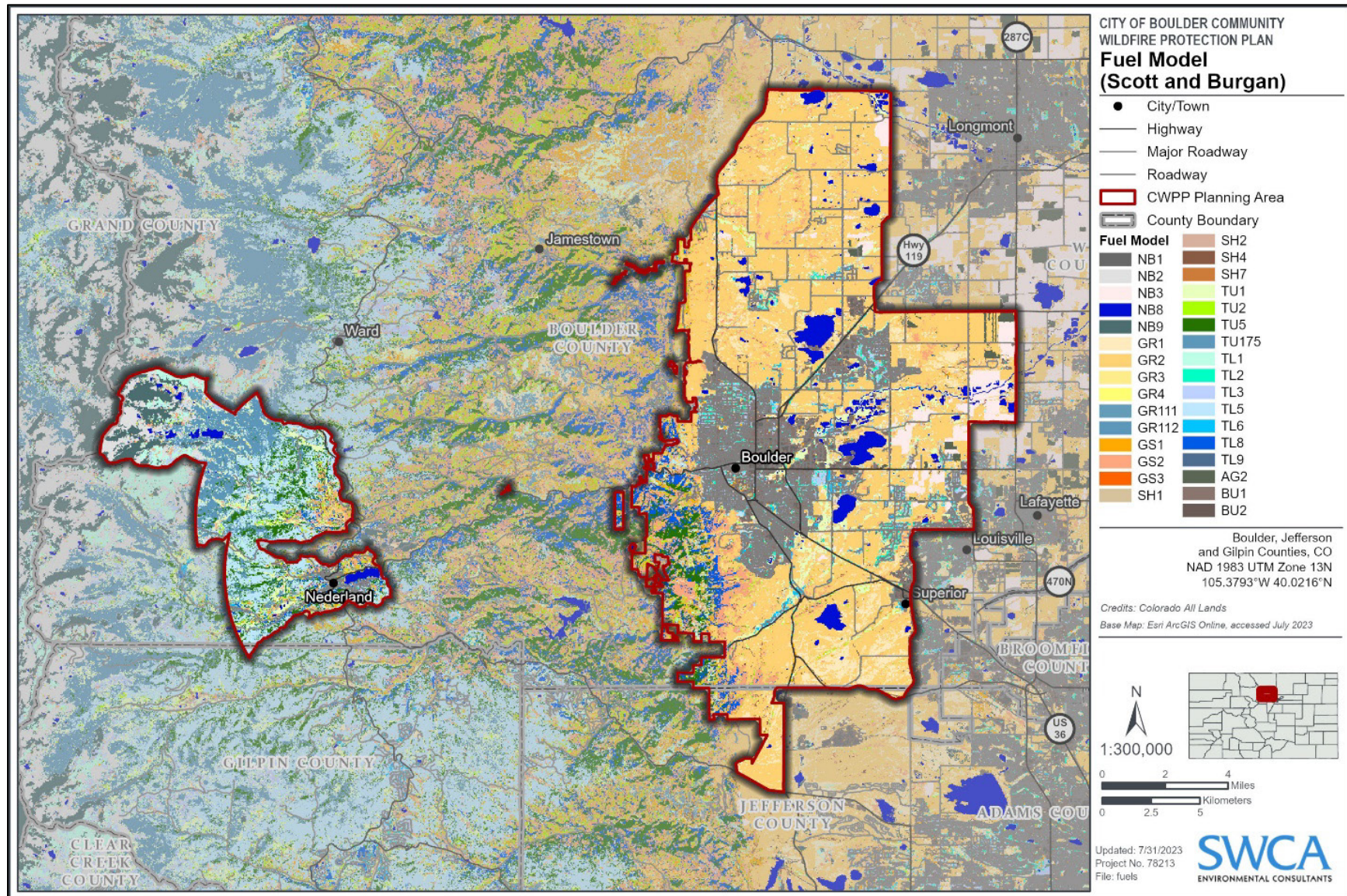


Figure 2.3. Scott and Burgan 40 fire behavior fuel models within the planning area.

FIRE ECOLOGY

Fires are characterized by their intensity, the frequency with which they occur, the season in which they occur, their spatial pattern or extent, and their type. Combined, these attributes describe the fire regime. The varied vegetation types on a landscape typically come with varied fire regimes. Knowing about fire regimes across fuel types in the planning area (see Figure 2.3) can help practitioners classify, prioritize, and plan for fuels treatments across a fire management region.

Historically, much of the planning area reflected high plains mixed-grass prairie vegetation types. The historical fire regimes in these grasslands were frequent occurrences of fire, strongly associated with cycles of moisture and drought (USDA 2005a). In more recent times, fire suppression and changes to land use have altered the fire return interval and likely limited the size of wildfires when compared to historic conditions (NatureServe 2023). Presently, a significant portion of the grasslands within the planning area serves agricultural purposes, as illustrated in Figure 2.4.



Figure 2.4. Photograph highlighting the complexity within agricultural landscapes in the planning area, featuring a well-implemented road fuel break with mowed shoulders and demonstrating a proactive measure in mitigating fire risk.

The agricultural landscape within the planning area is vast and diverse, with much of the land dedicated to irrigated and native (non-irrigated) grasslands. It is noteworthy that the irrigated grasslands typically deviate from natural fire regimes. However, although a substantial portion of these grasslands is employed for agricultural practices, the majority remains unirrigated and characterized by native grasses. More broadly, wildfire risk in grasses varies significantly depending on land use, the timing of management methods, the growing and curing cycle of species, and other interrelated factors. In fact, practices such as grazing and irrigation can mitigate wildfire risk across the landscape.

Another common vegetation type in the planning area is Invasive Perennial Grasslands (Figure 2.5). Here, species such as smooth brome (*Bromus inermis*) and crested wheatgrass (*Agropyron cristatum*) are the dominant species (LANDFIRE 2022). Extensive grass cover from a rhizomatous species, such as smooth brome, can result in above-normal fine dead fuel loading, which may result in faster rates of spread than traditional shortgrass prairie (Colorado DFPC 2022a).

Fires can and do occur on farmlands, especially during hot and dry conditions (Western Farm Press 2017).



Figure 2.5. Perennial grassland, commonly observed in the eastern portion of the planning area.

The western part of the planning area is in the Rocky Mountain Front Range foothills (Figure 2.6) and is characterized by Rocky Mountain ponderosa pine woodlands (a fire-adapted forest community), mixed-conifer forests, and subalpine forests with spruce-fir (LANDFIRE 2022) depending on elevation. Starting at lower elevations, fire regimes in Rocky Mountain ponderosa pine woodlands can vary from low-severity to mixed-severity events. Studies conducted along the Front Range estimate that most ponderosa pine woodlands historically have mixed-severity events with variable return frequencies that are typically greater than 30 years (McKinney 2019). Low-severity and more frequent (less than 30 years) fire events

typically occur in ponderosa pine woodlands at lower elevations bordering more fire-prone grasslands (McKinney 2019).

Moving higher, mid-elevation mixed-conifer fire regimes vary by site, but typically are low frequency and mixed severity, with an average historical return interval of 10 to 55 years (USFS 2012). As a result of more recent fire suppression policies, many of these forests are dense with higher dead fuel loads, greatly increasing the chances for high-intensity, stand-replacing wildfire than historical conditions.

Specifically, elevations in the planning area between 9,000 and 11,000 feet are typically occupied by subalpine ecosystem consisting of subalpine fir (*Abies lasiocarpa*) and Engelmann spruce (*Picea engelmannii*), as well as varying densities (intermingled to pure stands) of lodgepole pine (*Pinus contorta*) in previously burned areas (NPS 2022). Unlike many Colorado forest types, spruce-fir forests (occurring at higher elevations in the planning area) are not fire-adapted due to thin bark and persistence of dead lower limbs, increasing susceptibility to fire and crown fire potential. In stand-replacing fires, spruce-fir can take as long as 300 to 400 years to regenerate (CSFS 2022b).



Figure 2.6. Lower montane ponderosa pine and Douglas-fir stand on northern aspects, with open grass-shrub fuels on the southern aspects in the western portion of the planning area. .

The historical fire regime of lodgepole pine is characterized by moderate- to high-severity, stand-replacing fires. These fires typically occur with a frequency or return interval ranging from several decades to over multiple centuries (LANDFIRE 2012). Stand-replacing fires in lodgepole pine forests are essential for the natural regeneration of the ecosystem. Lodgepole pinecones remain closed and serotinous until exposed to the high temperatures of a wildfire, at which point they open and release their seeds, promoting the establishment of a new generation of trees (CSFS 2022d). In the absence of fire, shade-tolerant spruce and fir species may become more dominant, leading to more dense vegetation (NPS 2022).

CLIMATE AND WEATHER PATTERNS

Substantial variations in topography throughout the planning area contribute to the varied climate and weather patterns presented in this section. Below, there is information about both the high elevations and low elevations to reflect these variations in the planning area. Low elevation rangelands and plains are comparatively warm and dry compared with the higher-elevation areas, which are generally cooler and receive more precipitation.

The Boulder weather station is positioned in the center of the city at the mountain-grassland interface at the base of the foothills (Table 2.2). The Boulder14 W station serves as a local climatological data station located just north of Nederland, capturing weather data in the western regions with diverse topography and elevated terrains. Areas near Nederland experience on average almost 40% more precipitation than the Boulder area. The city tends to reach higher temperatures than areas at high elevations, which from 1991 to 2020 had mean annual temperatures approximately 30% lower than the mean annual temperatures in the city (NOAA 2022a).

Table 2.2. Mean Annual Temperature and Precipitation by Station in the Planning Area

Station	Period of Record	Mean Annual Precipitation (Inches)	Mean Annual Temperature (°F)		
			Max	Min	Mean Annual
Boulder	1991–2020	21.2	65.7	37.4	51.5
Boulder 14 W	1992–2020	33.9	45.5	25.0	35.2

Source: NOAA (2022a).

July is typically the hottest month of the year in the city, with average July maximum temperatures reaching 88°F. December is usually the coldest month, with average December minimum temperatures reaching 21.1°F, while the month with the highest average snow fall is March (NOAA 2022a).

Annual precipitation in Boulder peaks in May with an average of 3.21 inches, followed by April with an average of 3.05 inches. The winter and spring months are usually the wettest months of the year in the high-elevation montane areas. June is typically the driest month of the year in the region. Precipitation totals in June average at 1.95 inches in Boulder. Particularly dry summer months can exacerbate fire risk, especially in years with a weak monsoon effect in July and August.

Monthly climate normal (30-year averages) for Boulder (Figure 2.7) and the western portion of the planning area near Nederland (Figure 2.8) are depicted below.

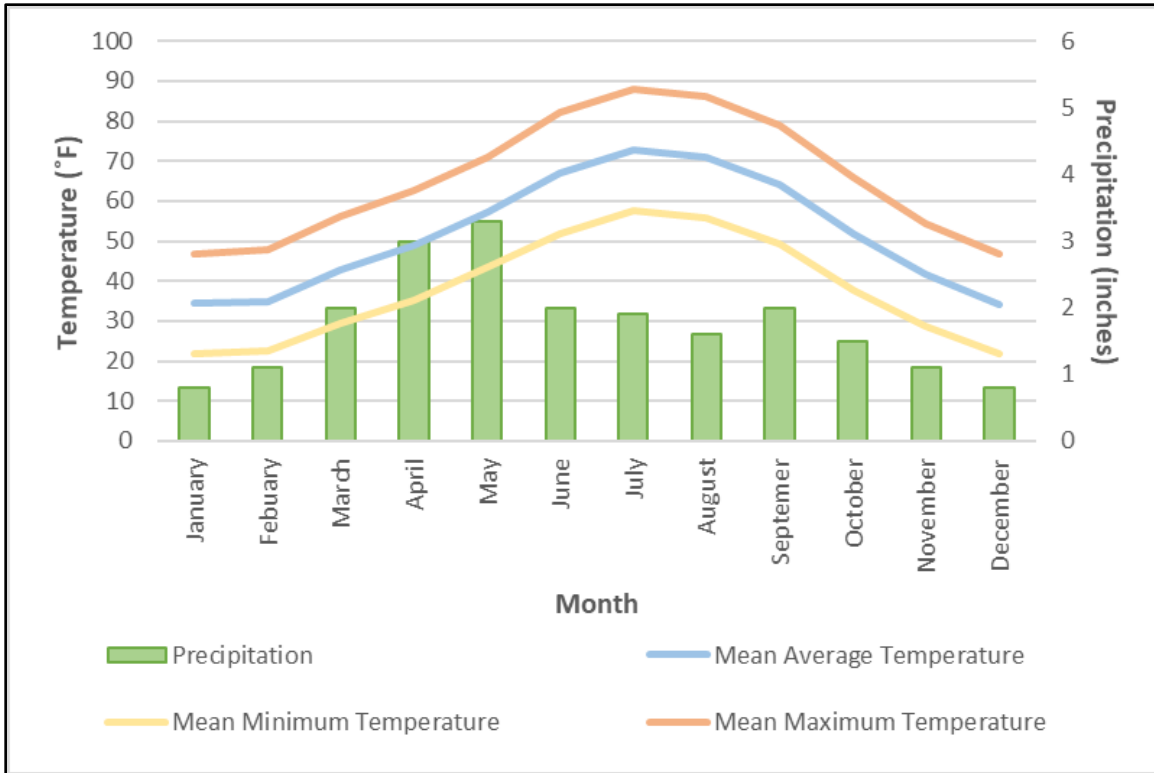


Figure 2.7. Monthly climate averages for Boulder, 1991–2020. Source: NOAA (2022a).

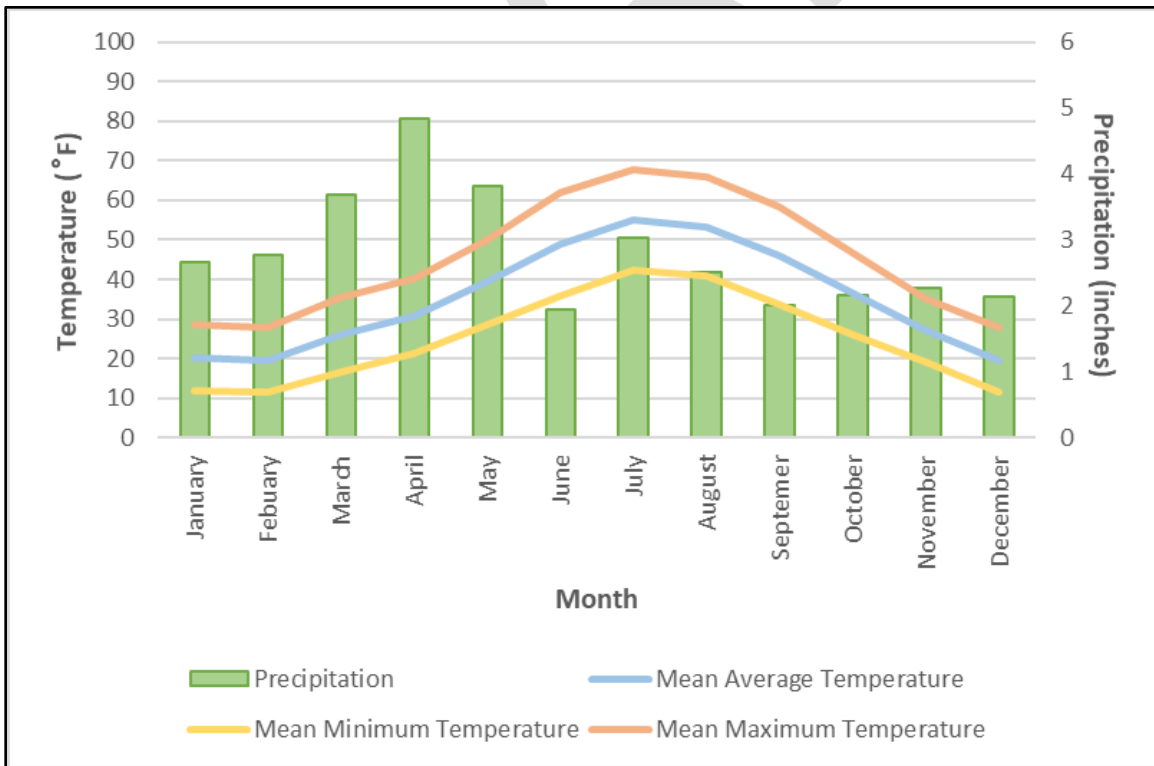


Figure 2.8. Monthly climate averages for the Nederland area, retrieved from the Boulder 14 W, Colorado, station, 1991–2020. Source: NOAA (2022a).

It should be noted that, with climate change, Colorado is expected to experience significant changes in weather, which will likely exacerbate the behavior of future fires. Specific to wildfires, under all climate change scenarios, Colorado is expected to have increased summer temperatures and lengthening of the fire season. Precipitation totals are less likely to change, but the timing and duration of precipitation events will be more variable (Colorado Water Conservation Board 2023). Overall, the warmer temperatures will bring about drier weather in Boulder, which will exacerbate the fire risk.

WIND

Wind is an important and unpredictable factor in determining fire behavior. Wind can be influenced by pressure systems, orography, time of day, and even wildfires themselves. High winds are often responsible for fast rates of spread, long flame lengths and high fireline intensity, which greatly reduce the ability for emergency resources to suppress these fast-moving, wind-driven fires. Under extremely windy conditions wildfires are often difficult or nearly impossible to suppress. Even moderate winds can create dangerous conditions that prevent aerial resources (helicopters and planes) from taking off and providing support.

A recent example of this occurring near the Boulder is the Marshall Fire in 2021. The winds during the Marshall Fire were from the prevailing direction (Figure 2.9) but were much greater than the average windspeed (Figure 2.10). The prevailing wind direction (west) is where the highest wind speeds originate from (Figure 2.11). High winds will increase rates of spread and flame lengths in all fuel types, as was seen in grass fuels during the Marshall Fire (Figure 2.12). Every notable fire in the Boulder area since 1989 has been caused or fueled by high winds. These include the Cal-Wood and Lefthand Canyon Fires (Boulder County 2023d), Cold Spring Fire, Fourmile Canyon Fire, Overland Fire, Olde Stage Road Fire, and Black Tiger Fire.

In the cases of the Marshall, Olde Stage Road, and Overland Fires, high winds were responsible for knocking down power lines, which ultimately ignited the wildfires (5280fire 2009; Boulder County 2023d; Wildfire Today 2016). The occurrence of many of the fires listed above, such as the Marshall Fire in late December, the Olde Stage Road Fire in early January, and the Overland Fire in late October, highlight the fact that wildfires can happen beyond the boundaries of traditional fire seasons. During these atypical months, when vegetation may not be as dry as during the peak summer season, the influence of wind becomes even more significant in fueling fire behavior. The timing of these events emphasizes the critical recognition of wind-driven occurrences as a year-round risk factor for wildfire occurrence and spread.

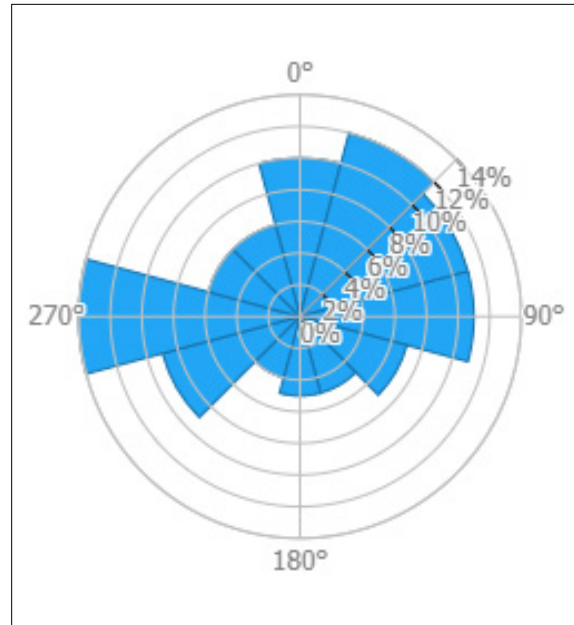


Figure 2.9. Wind frequency rose showing the prevailing wind direction as an average percentage of daily wind direction. 14% of the wind blowing in immediately west of the City of Boulder comes from 270° west. Source: Global Wind Atlas (2023).

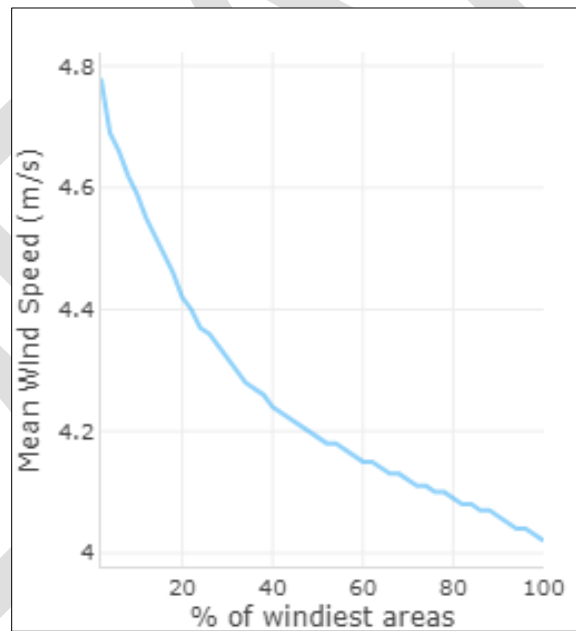


Figure 2.10. Mean wind speed (in meters per second) for different percentiles of windy areas within Boulder. The average wind speed in the windiest areas of the planning area is about 4.1 m/s, (9 miles per hour) while the average windspeed for most of Boulder is about 3.7 m/s (8 miles per hour). Source: Global Wind Atlas (2023).

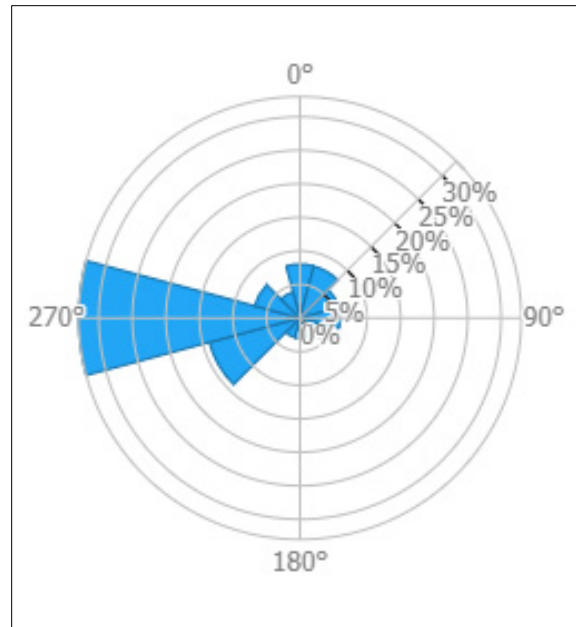


Figure 2.11. Wind speed rose showing the direction from which different percentages of wind speed prevail. 35% of the total wind speed experienced by Boulder prevails from 270° west.
Source: Global Wind Atlas (2023).

Wind data, as shown in Figures 2.9, 2.10, and 2.11, and wind speeds recorded during past fires provide evidence to suggest that the most dangerous and destructive fires in the planning area are **fast-moving, wind-driven fires that travel from forested regions in the west to grasslands in the east** (Figure 2.12) (5280fire 2009; Wildfire Today 2016).



Figure 2.12. A tall and fast-moving flaming front caused by high winds during the Marshall Fire. Source: Mountain View FPD (2021).

FIRE HISTORY

Fire is a natural part of Colorado's diverse landscapes and is essential to many ecosystems across the state. Almost all of Colorado's diverse ecosystems are fire-dependent or fire-adapted. For centuries, many Colorado Native American tribes recognized this interdependence between fire and the ecosystem and used prescribed fire and other traditional cultural practices to maintain and restore ecosystem health. However, in the 1800s, a shift in management actions—settlers began enforcing strict fire suppression regimes—led to challenges such as dense stand conditions, unhealthy grasslands, and increased ecosystem and community vulnerability to fire.

PAST FIRE MANAGEMENT POLICIES AND LAND MANAGEMENT ACTIONS

In the 1970s, modern forest management research aligned with long founded Indigenous knowledge confirming that wildfire plays a natural and pivotal role in these ecosystems, and by the turn of the century, complete fire suppression tactics on publicly managed land were mostly replaced with a combination of suppression, containment, and mitigation measures such as fuel treatments and prescribed fire (Forests and Rangelands 2021).

Although these practices now protect and restore public lands through methods grounded in science, some areas in Boulder and the foothills have excessive fuel buildups, dense and continuous vegetative cover, and tree and shrub encroachment into previously open grasslands, a result of historic suppression strategies (USFS 1997).

There is also evidence that wildland fire suppression may be impacting the city's forest and grassland ecosystem health, agricultural water infrastructure, and causing departure from historic conditions (City of Boulder 2024b). Other actions such as human expansion into wildlands, climate change, and forest health degradation have likely resulted in an imbalance between wildfire and ecosystem interactions (Higuera et al. 2021).

RECENT FIRE OCCURRENCE

Colorado's fire season has been estimated to occur between mid-May and mid-October (Wei et al. 2016). However, as the Marshall Fire shows, fires can occur at any time of the year when dry conditions, extreme wind and burnable fuel is present. It is important to note that the largest fires that have occurred in the planning area have not occurred during typical fire season months.

Marshall Fire: On December 30, 2021, the Marshall Fire ignited near the intersection of Colorado State Highway 93 and Eldorado Springs Drive and comprised two separate fires that later merged (Boulder County 2023b, 2023c). Now known to be largest and most destructive wildfire to occur in the Boulder area, the Marshall Fire resulted in 6,026 acres burned, over 1,000 homes and commercial structures destroyed or damaged, and two fatalities (Boulder County 2023a). Extremely high winds and cured dry winter grass fuels contributed to rapid spread and long flame lengths. The National Renewable Energy laboratory recorded 111 separate wind gusts exceeding 75 mph on December 30, 2021 (Boulder County 2023c). Under these conditions, wildfire suppression was extremely difficult, and evacuations became a priority.

Cal-Wood Fire: The Cal-Wood Fire began October 17, 2020, outside of Jamestown near the Cal-Wood Education Center property off County Road 87. The fire burned 35 acres per minute for over 3 hours after the initial ignition, pushed by low- humidity, heavy west winds and dry conditions (Colorado Public Radio 2020). Investigators did not establish a known cause but determined where the fire started within a 500-foot radius. There were no fatalities, but 26 structures were lost or damaged and the cost of suppression resources is estimated at \$6.6 million (Boulder County Sheriff's Office 2021).

NCAR Fire: On March 26, 2022, a human-caused ignition started the NCAR Fire less than 100 feet inside the city limits of Boulder (Boulder County's Sheriff's Office 2022). The origin of the fire was determined to be just a few feet off of the Bear Canyon Trail on the Boulder Open Space and Mountain Parks (OSMP) property south of the NCAR facility. Before it was contained, the NCAR Fire burned almost 200 acres, causing evacuations of 1,629 people, 699 housing units, and 836 buildings (Garrison 2022).

Figures 2.13 through 2.20 display historical wildfire data and statistics in the planning area. Figure 2.13 shows fire history in the planning area using fire perimeter data. Figure 2.19 shows fire history in the planning area using ignition point data. Both maps are included due to the tendency for perimeter data to underrepresent the number of fires that have occurred given that polygons are not created for very small fires.

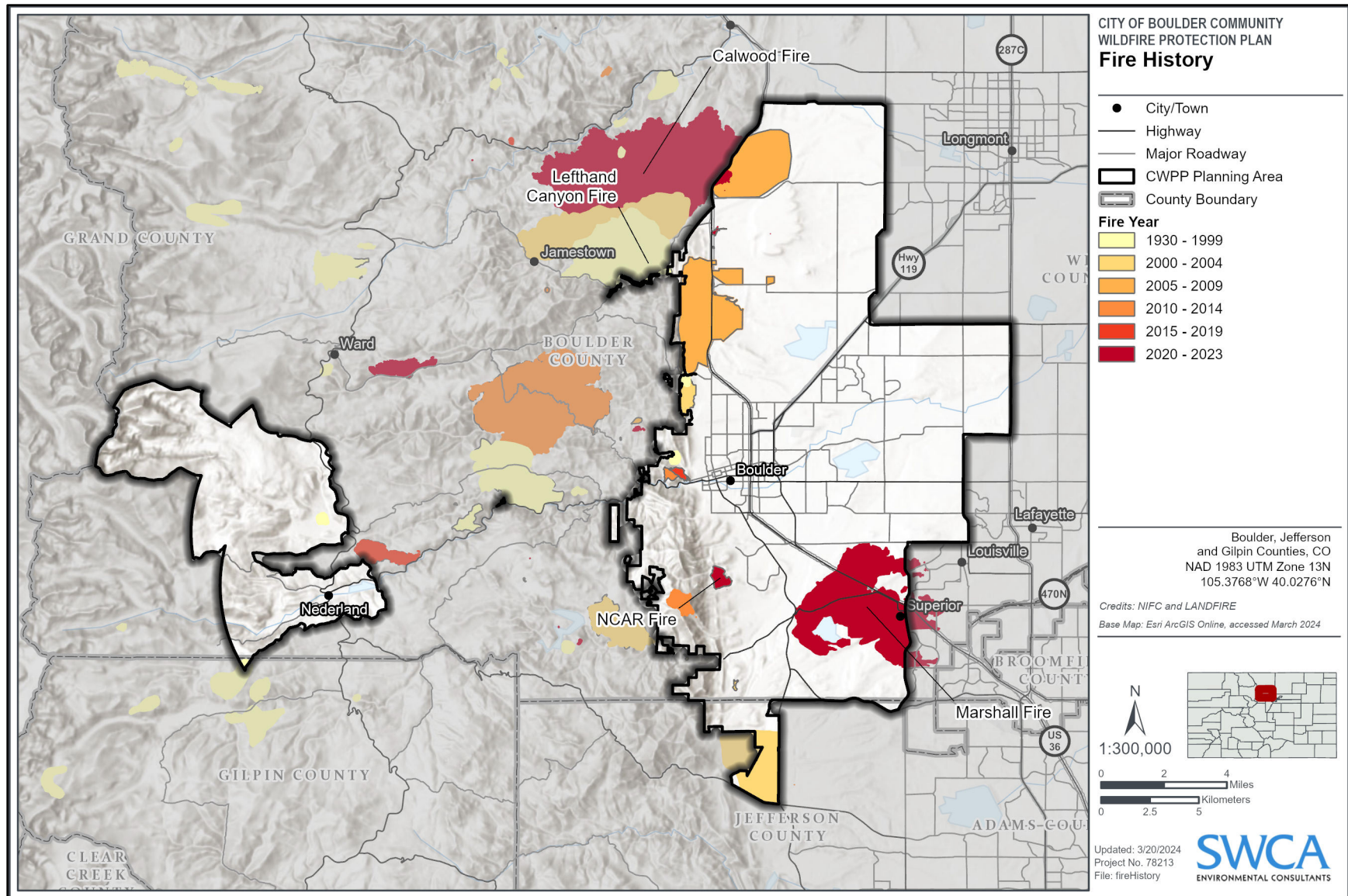


Figure 2.13. Recent wildfire history in the City of Boulder CWPP planning area.

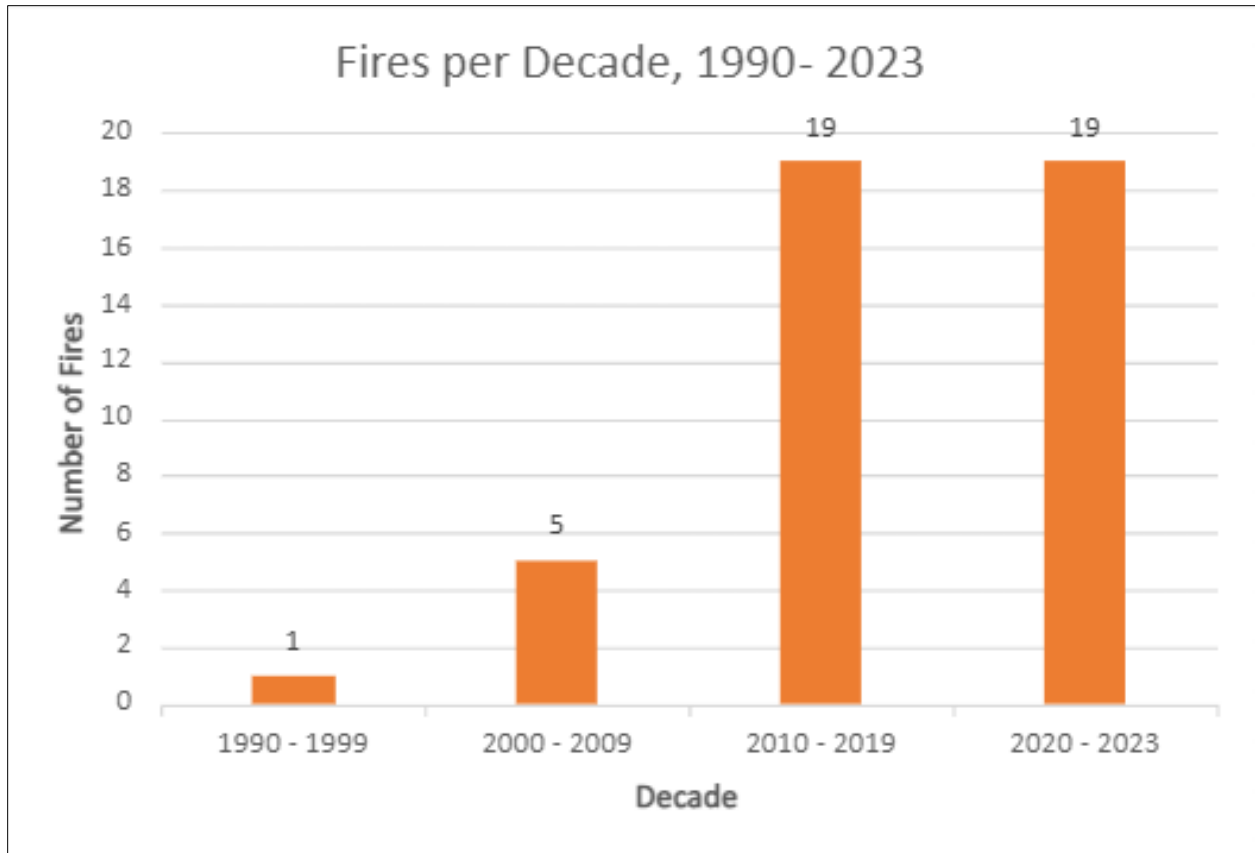


Figure 2.14. Wildfire frequency for the planning area emphasizing the increase in wildfires over the period of record. Graph based on available decadal data from 1990 to 2019 and including data from 2020 through 2023 to show recent context.

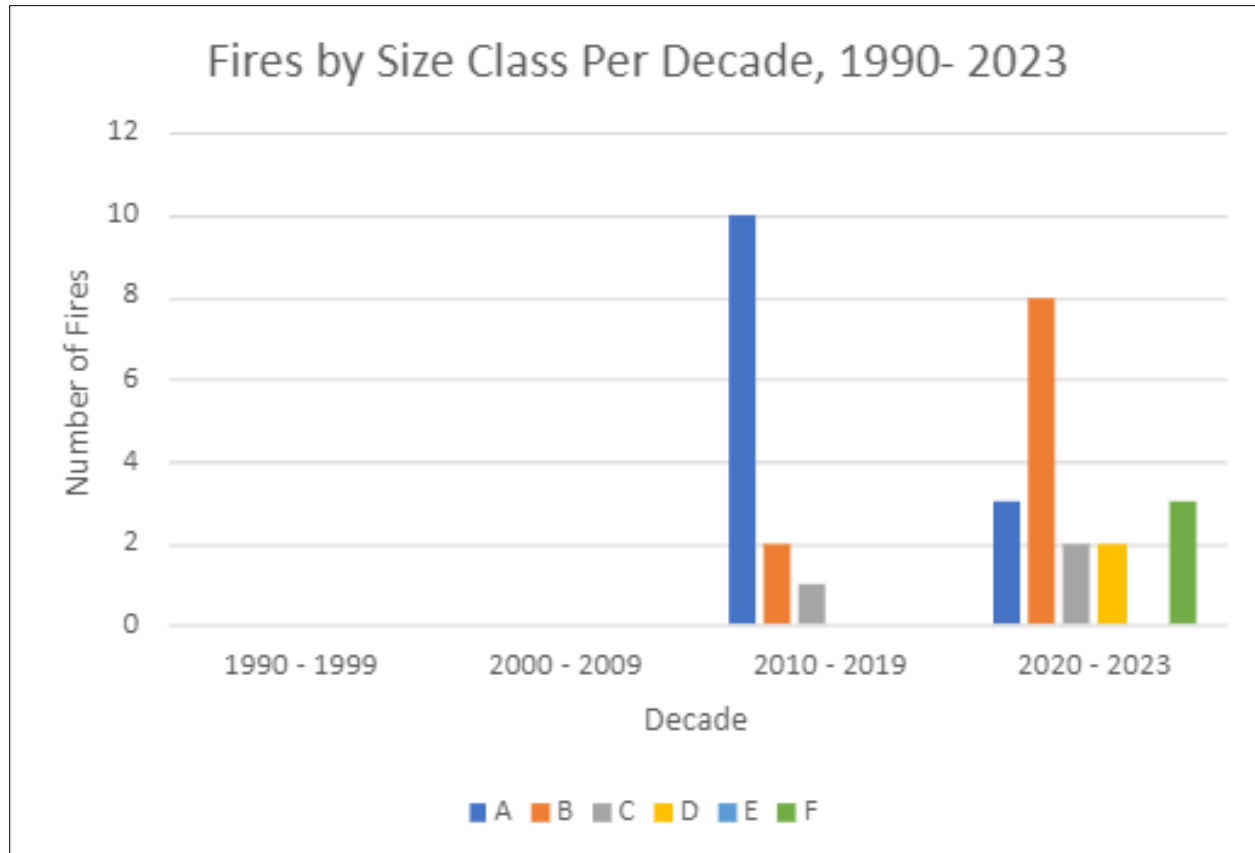


Figure 2.15. Fire size class statistics for the planning area based on fire history decadal data from 1990 to 2019 and including data from 2020 through 2023 to show recent context. See Table 2.3 for NWCG standard fire class sizes and descriptions.

Table 2.3. NWCG Fire Size Class Code Standard Data Values and Descriptions

Fire Size Class	Fire Size (acres)
A	0–0.25
B	0.26–9.9
C	10–99.9
D	100–299
E	300–999
F	1,000–4,999

Source: NWCG (2009).

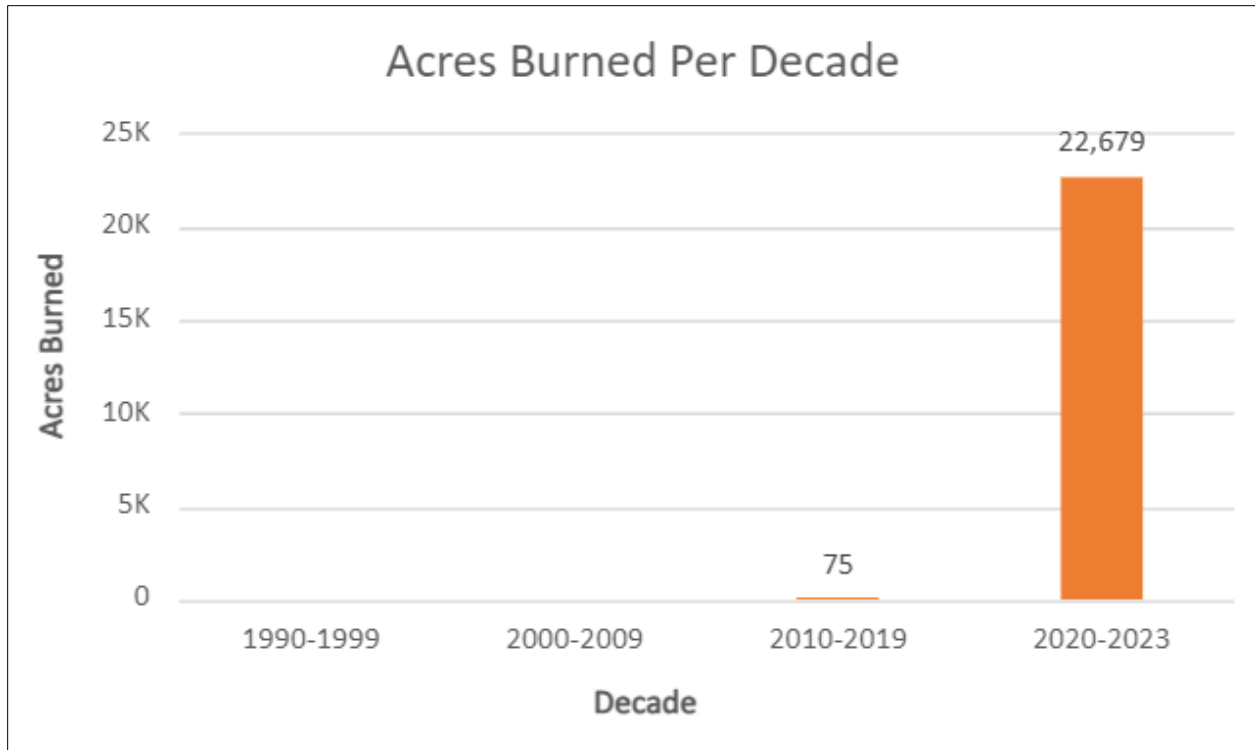


Figure 2.16. Acres burned per decade for the planning area based on fire history data from decades 1990 to 2019, as well as data from 2020 to 2023 to provide recent context.

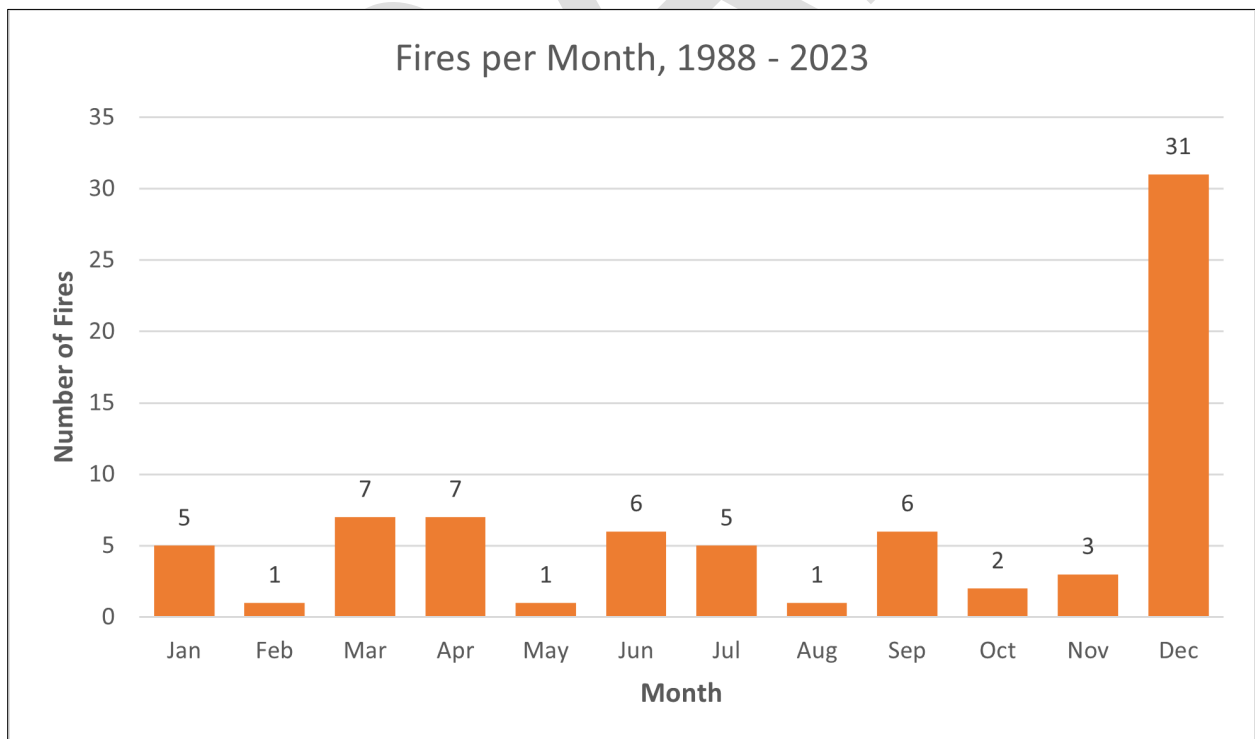


Figure 2.17. Number of recorded fires per month in the planning area from 1988 through 2023.

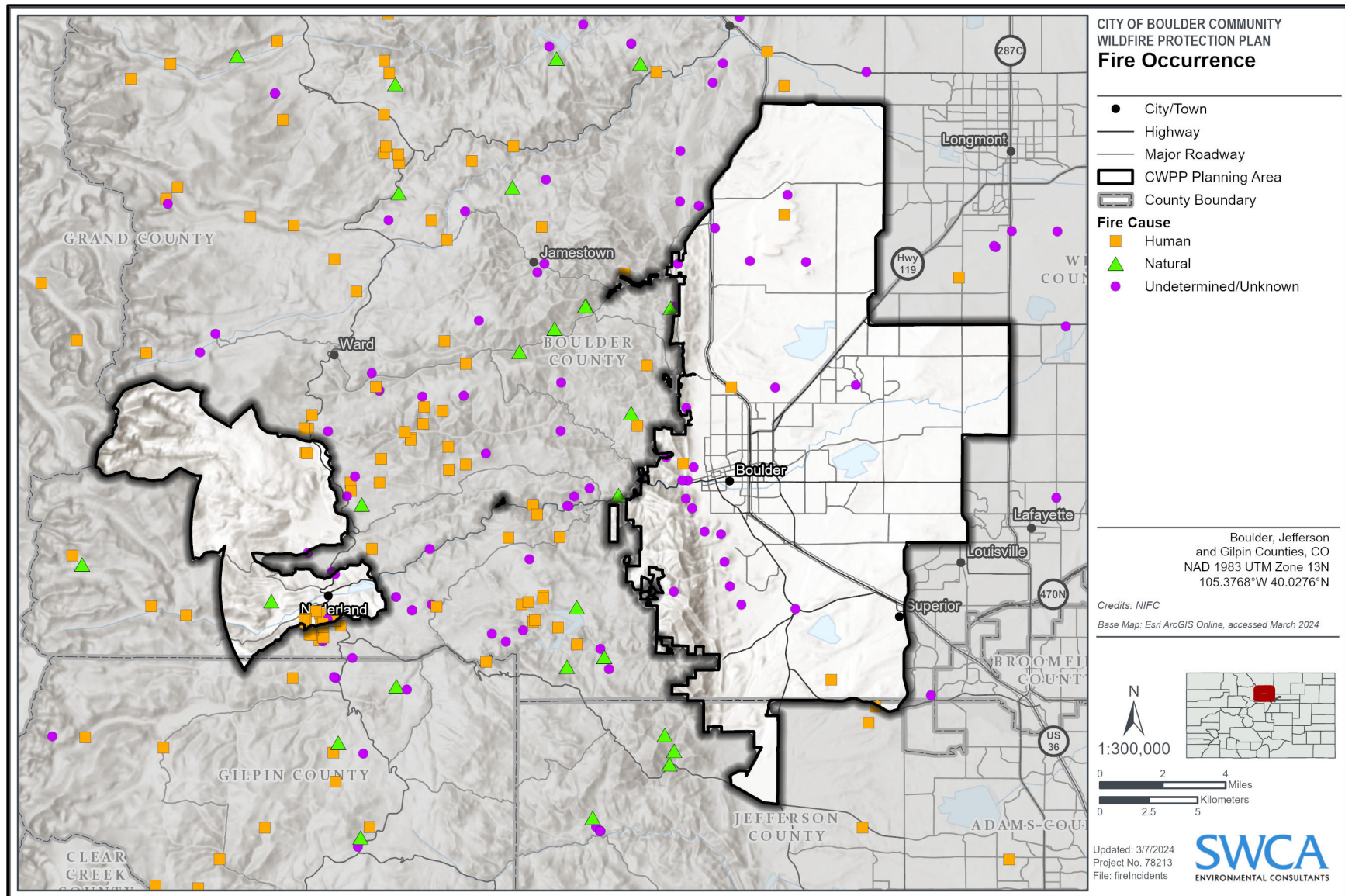


Figure 2.19. Location of wildfire occurrences in the planning area.

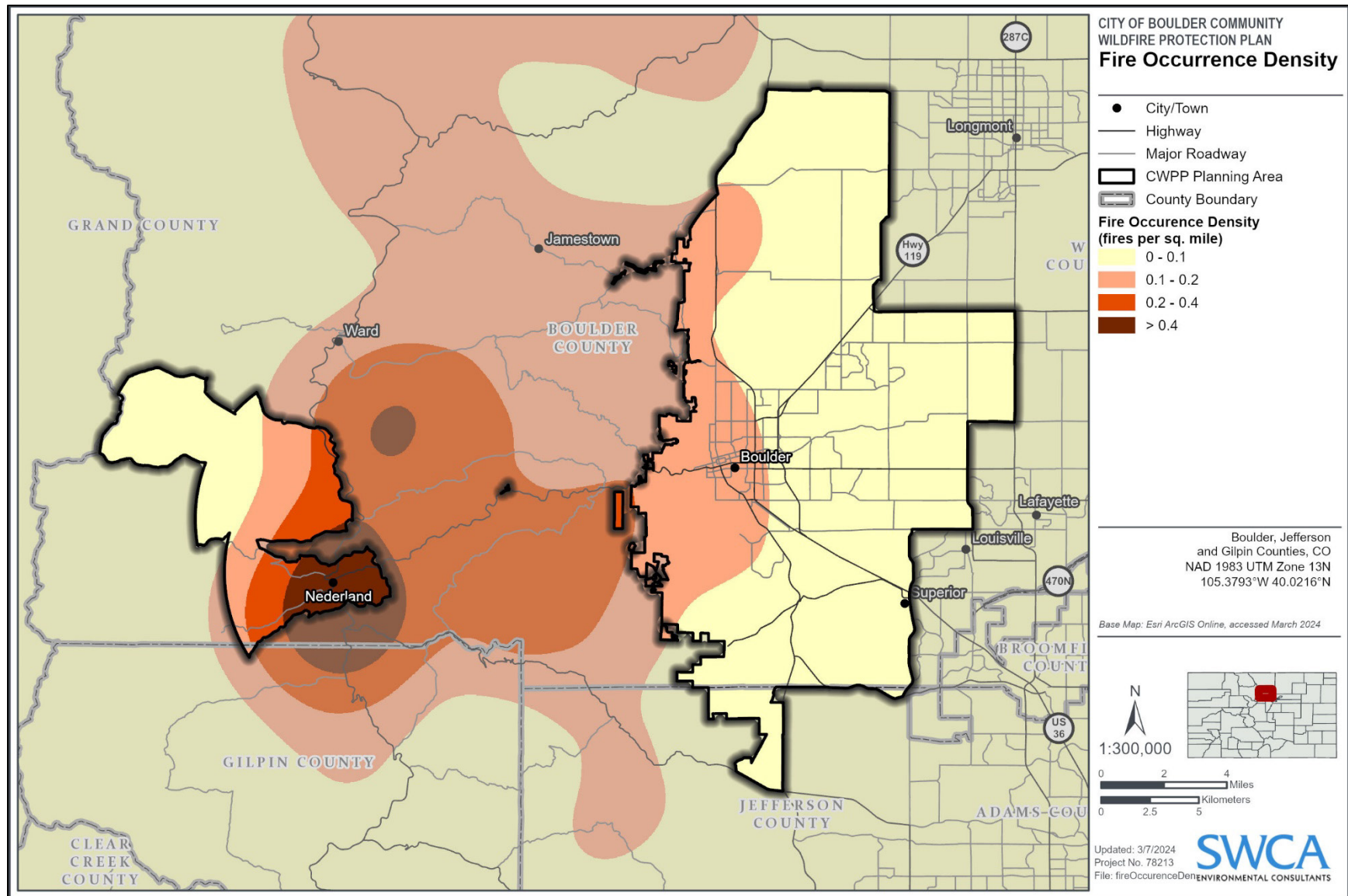


Figure 2.20. Fire occurrence densities in the planning area.

FIRE RESPONSE CAPABILITIES

PLANNING DECISION AND SUPPORT

A primary emergency management tool utilized by all levels of government, nongovernmental organizations, and private sectors, is the National Incident Management System (NIMS). NIMS, established by the Federal Emergency Management Agency (FEMA), is a standard that works to prevent, respond, mitigate, and recover from incidents (FEMA 2008). In the context of incident response, the NIMS Incident Command System (ICS) plays a pivotal role in ensuring a coordinated effort. It enables effective collaboration between businesses and public agencies involved in activities such as firefighting and property conservation (Ready 2023).

Wildfires have continued to grow in size and severity over the last decade, requiring fire managers to institute more robust pre-fire planning as well as adaptive and improved decision-making tools in order to reduce risk to fire responders and the public.

In the event of an incident, activities such as firefighting and property conservation may be ongoing at the scene, while others involved in incident stabilization, business continuity, or crisis communications report to an Emergency Operations Center (EOC). The EOC serves as a critical component triggered in response to major incidents that cause significant property damage or disruption to local businesses or that pose potential impacts to the community (Ready 2023). It provides a space for decision-makers to gather, receive up-to-date information, and make informed decisions. The EOC, whether physical or virtual, serves as the central hub for coordinating and supporting incident management activities.

Along with the efficiency of NIMS and ICS, the City of Boulder benefits from a local Incident Management Team (IMT), a vital component in the region's emergency management structure. Established in 2010, the Boulder IMT has responded to significant emergencies over the years, including the Fourmile Canyon and Dome Fires in 2010, the September 2013 floods, the Cold Springs Fire in 2016, the Sunshine Fire in 2017, and various other smaller incidents (Boulder IMT 2024). For more information on the local IMT, see below.

FIRE RESOURCES

Fire management in Colorado is accomplished through a cooperative interagency partnership among federal, state, and local entities. Regional wildland fire response is directed and managed by regional interagency fire centers in Colorado. These dispatch centers are part of the larger Rocky Mountain Area Coordination Center. The dispatch centers in Colorado include Fort Collins, Craig, Grand Junction, Montrose, Durango, and Pueblo Interagency Dispatch Centers. Wildfire response in Boulder is largely an interagency cooperative effort, where initial fire response in the City of Boulder is dispatched through the city and typically through the Fort Collins Interagency Dispatch for resource ordering in the event of large fires (Geographic Area Coordination Centers [GACC] 2022). The City of Boulder has numerous fire stations within the planning area. Boulder Fire-Rescue has Stations Nos. 1, 2, 3, 4, 5, and 7 within Boulder. City of Boulder Station 8, near the Boulder Reservoir, houses the Wildland Division. The planning area also includes Mountain View Fire Rescue Stations Nos. 9 and 10, volunteer technical

rescue specialist department, and the Boulder City Government Fire Department. In more rural regions of the planning area, staffing availability can vary and there is an established cooperative response effort, for example, fire districts outside of the planning area can assist with response and vice versa.

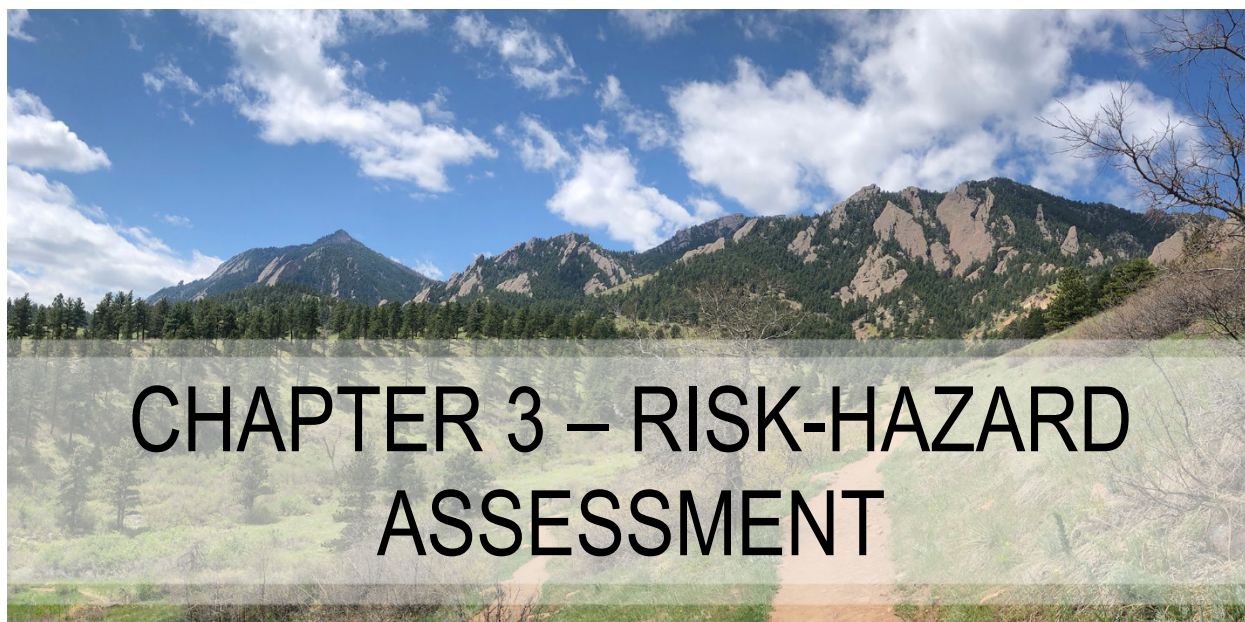
Individuals seeking fire resources can explore the Boulder Fire-Rescue Department's Wildland Division website (<https://bouldercolorado.gov/boulder-fire-rescue-department-wildland-division>), which serves as an excellent local resource for collaborative education and action on wildfire prevention, mitigation, and community preparedness. In addition, community members who are interested in joining wildland fire crews or volunteering at a fire department can take National Wildfire Coordinating Group (NWCG) classes (<https://www.nwcg.gov/publications/training-courses>) to obtain the necessary certifications.

Incident Management Team

In addition to numerous response agencies and first responders, the City of Boulder and Boulder County jointly support a Type 3 IMT. The Boulder IMT is a multi-agency organization with members that have the necessary qualifications, training, and experience to respond to, manage, and support escalating wildfire incidents.

The mission of the Boulder IMT is to provide enhanced management capacity and incident support during wildfires in Boulder County and potentially beyond. As an incident escalates, the Boulder IMT is an additional resource that can be activated at the request of the Sheriff's Office or local Incident Commander. The Boulder IMT provides enhanced incident safety, operational coordination, management support, and fiscal accountability. While the intent is to be activated before transitioning to a higher complexity (regional/national) IMT, Boulder IMT has shown to be of particular benefit during incidents that require response and management for multiple operational periods, when higher complexity support is not necessary. While the intent is to be activated before transitioning to a higher-complexity (regional/national) IMT, Boulder IMT has shown to be of particular benefit during incidents that require response and management for multiple operational periods, when higher-complexity support is not necessary. The team is a critical link between the ongoing wildfire incident and Boulder Office of Disaster Management (ODM).

To build depth and expertise, the Boulder IMT continuously recruits new members and provides internal and external training opportunities, whether through out of area assignment or courses through FEMA or NWCG. Beyond training, there is a significant variety of technical equipment required to support an incident, which is included when the Boulder IMT is activated. Financial support is imperative to ensure the team can continue to provide the high-level services that are expected from the team.



Disclaimer

The purpose of this risk assessment is solely to provide a community and landscape-level overview of general wildfire risks within the assessment area as of the date hereof, and to provide a potential resource for community pre-fire planning. This risk assessment is premised on various assumptions and models that include and are based on data, software tools, and other information provided by third parties (collectively, “Third-Party Information and Tools”). SWCA, Incorporated, doing business as SWCA Environmental Consultants (“SWCA”), relied on various Third-Party Information and Tools in the preparation of this risk assessment, and SWCA shall have no liability to any party in connection with this risk assessment including, without limitation, as a result of incomplete or inaccurate Third-Party Information and Tools used in the preparation hereof. SWCA hereby expressly disclaims any responsibility for the accuracy or reliability of the Third-Party Information and Tools relied on by SWCA in preparing this risk assessment. SWCA shall have no liability for any damage, loss (including loss of life), injury, property damage, or other damages whatsoever arising from or in connection with this risk assessment, including any person’s use or reliance on the information contained in this risk assessment. Any reproduction or dissemination of this risk assessment or any portion hereof shall include the entirety of this plan disclaimer.

PURPOSE

Upon completion of a Quantitative Wildfire Risk Assessment for the planning area, land use managers, fire officials, planners, and others can begin to prepare strategies and methods for reducing the threat of wildfire, as well as work with community members through outreach and education regarding methods for reducing the damaging consequences of fire. A Quantitative Risk Assessment can also aid in the identification and prioritization of fuel treatments based on where wildfire risk is greatest. The fuels reduction treatments can be implemented on both private and public land, so community members can actively apply the treatments on their properties, as well as support treatments on public land that they care about. For more information about fuels treatments, see Chapter 4, Mitigation Strategies.

For this CWPP update, areas of high wildfire hazard and risk are identified using the COAL Quantitative Risk Assessment through the modeling and mapping of fire behavior, analysis of highly valued resources and assets (HVRAs), and incorporation of stakeholder and expert input.

Detailed information on the modeling process is provided in Appendix D.

EMBER IGNITION HAZARDS

Ember exposure from wildland fires can pose a significant threat to homes and other structures in the WUI (Maranghides and Mell 2013). Spotting occurs when embers travel in advance of the flaming front; long-range spotting can be miles ahead of the main fire (Figure 3.1). Many factors determine whether an ember will result in an ignition (firebrand source and size, wind, receiving materials, exposure duration, etc.). Burning structures and other materials (vehicles and ornamental vegetation) have been identified as another source of embers that can ignite additional combustible materials in the WUI, particularly when there is a low structure separation distance (Maranghides et al. 2022; Suzuki and Manzello 2021).

Canopy characteristics of tree stands, including species, height, and tree trunk size affect the quantity and size of embers produced during a wildfire (NWCG 2021). Embers from thick-barked species like ponderosa pine and Douglas-fir travel shorter distances compared to those from species with lighter bark like subalpine fir and spruce. Additionally local topography influences where embers may land. Ridges can catch embers, and steep valleys tend to collect embers. A combination of wind, slope angle, and the positioning of structures can all impact ember production and potential ignitions.

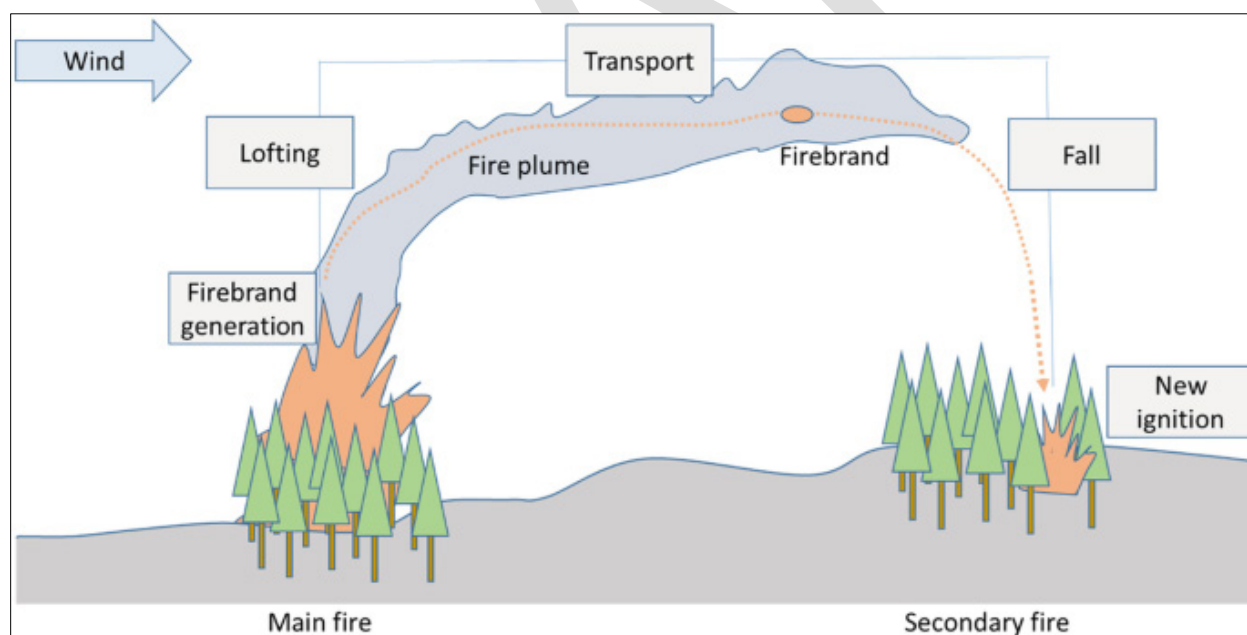


Figure 3.1. Factors associated with embers (firebrands) on the landscape. Vegetation type, wind, and topography all influence ember production and travel distances. Source: Martin and Hillen (2016).

Land managers and homeowners should take note of vegetation, landscape, and atmospheric conditions that are conducive to ember production and travel distance as these directly influence spot fire behavior. Strategic landscape fuel reduction activities such as fuel breaks and thinning can help reduce the likelihood of ember production and spotting. Homeowners should note surrounding vegetation (trees, grasses, shrubs, and vegetation litter or debris) and implement home hardening practices, such as installing ember-resistant vent covers and removing leaf litter from decks, gutters, roofs, and the base of combustible materials such as wood siding and fences to reduce structural ignitions from ember showers. Programs to aid landowners in preventative efforts and cases of wildfire are provided in Appendix F, Homeowner Resources.

MODELING THE FIRE ENVIRONMENT

The wildland fire environment consists of three factors that influence the spread of wildfire: fuels, topography, and weather (see Chapter 2). Understanding how these factors interact to produce a range of fire behavior is fundamental to determining treatment strategies and priorities in the WUI. In the wildland environment, vegetation is synonymous with fuels. When sufficient fuels for continued combustion are present, the level of risk for those residing in the WUI is heightened.

To understand wildfire modeling it is important to be aware of how wildfire spreads. Wildfire spreads via surface fire (Figure 3.2), crown fire (Figure 3.3), and spotting (Figure 3.4) with all three commonly occurring during red flag conditions. Active crown fire is when surface fire “ladders” up into the upper levels of the forest canopy and spreads through the tops (or crowns) independent of, or along with, the surface fire, and is often beyond the capabilities of suppression resources. There are two types of crown fire: active and passive. Active crown fire (see Figure 3.3) is when fire spreads actively from tree to tree. Passive crown fire is when ground fuels establish in ladder fuels and torch or burn individual tree crowns.

Surface fires are when the flaming front remains on the ground surface (in grasses, shrubs, small trees, etc.) and control is significantly more manageable than active crown fires.

Active crown fires are extremely difficult to control. Removing ladder fuels and reducing fuel loading near communities before a fire ignites is the best way to limit crown fire and reduce wildfire risk.



Figure 3.2. A low-intensity surface fire. Source: photograph by Brandon Oberhardt, USFS (2016).



Figure 3.3. Active crown fire. Source: photograph by Mike McMillan, USFS (2013).



Figure 3.4. Spotting, in which embers are lifted and carried with the wind ahead of the main fire and ignite receptive fuels, including homes. Source: photograph by Noah Berger, Associated Press (2018).

If embers are plentiful and/or long range (>0.5 mile), rates of spread and resistance to control can be very high. Ember load index throughout the planning area is quantified and illustrated in Figure 3.5. An ember load index is a value describing the relative load of embers a pixel on the landscape experiences given landscape burn probability, weather, topography, and fuels. See Appendix D for a more detailed description of modeling methodology.

Crown fire and spotting activity have been a concern for fire managers, particularly under extreme weather conditions. In areas where homes are situated close to timber fuels and/or denser shrubs and trees, potential spotting from intensely burning fuels to adjacent fuels should always be acknowledged (see Figure 3.4). See the Ember Ignition Hazard subsection and Appendix A for a diagram and explanations describing the factors that affect ember production and travel.

Embers cause up to 90% of home and business ignitions during wildfire events (IBHS 2019). Is your home located in a steep drainage? Near conifer trees or downwind of conifer trees? Structures located in areas predicted to experience high ember load should implement defensible space and home hardening upgrades.

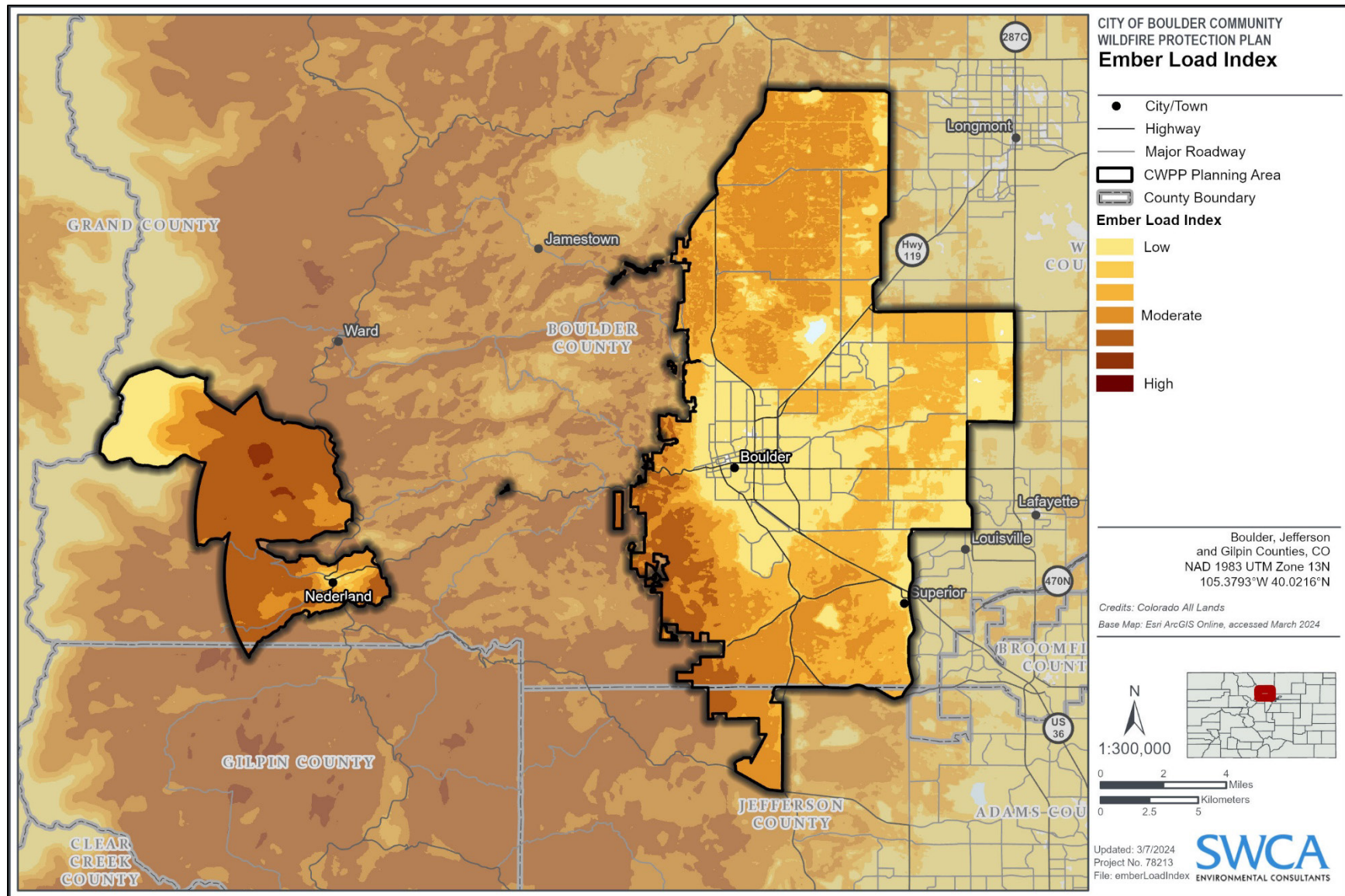


Figure 3.5. Ember load index values for the planning area.

COLORADO ALL LANDS QUANTITATIVE RISK ASSESSMENT

The COAL Quantitative Risk Assessment developed by Pyrologix was created collaboratively with CSFS and USFS experts. The purpose for developing this risk assessment was to provide the communities of Colorado with a standardized assessment of hazard, vulnerability, and risk across the landscape using state-of-the-art modeling methods and up-to-date source data on existing conditions. This allows officials and land managers to compare risk across jurisdictional boundaries and apply successful strategies in reducing wildfire risk in multiple communities throughout Colorado. Many of the shortcomings of previous wildfire risk assessments have been addressed and accounted for in the COAL Risk Assessment.

Important examples include:

- Recalibrating the Colorado fuelscape to account for past disturbances (wildfires)
- Recalibrating the burnability of urban and agricultural fuels in fire behavior modeling
- Removing data seam lines
- Utilizing a set of collaboratively approved HVRAs standardized across Colorado

The COAL Quantitative Wildfire Risk Assessment is a unique tool for evaluating the risk of wildland fires to communities within the WUI areas of Boulder and beyond. In the context of wildfire risk modeling, risk is a combination of hazard and vulnerability. Although many definitions for risk exist, for the purpose of this document, risk is a product of four factors defined by the Quantitative Wildfire Risk Framework (Figure 3.6):

Burn probability is the likelihood of 30-square-meter pixel burning.

Intensity is a combination of wildfire behavior metrics such as flame length, crown fire activity, and rate of spread.

Exposure is the proximity of an HVRA to hazards on a landscape (e.g., homes in the WUI or a source watershed in an alpine environment).

Susceptibility is a measure of how easily an HVRA is damaged by wildfire. Resiliency is a common term used to describe the susceptibility of a HVRA.

Quantitative Wildfire Risk Assessment Framework



Figure 3.6. Pyrologix's Quantitative Wildfire Risk Framework for the COAL Quantitative Risk Assessment, derived from Scott et al. (2013).

A detailed methodology of the COAL Quantitative Risk Assessment can be found in Appendix D, Fire Behavior Modeling/GIS Background and Methodology.

An overview of wildfire **hazards** (frequency and severity) can be found below in Figure 3.7. Notice that wildfire hazard is greatest in areas with steep topography and high fuel loading such as the steep forested slopes of the Front Range.

Looking at **vulnerability**, the above equation is a function of the exposure and susceptibility of values on the landscape, based on their position and the intensity of expected fire.

Efforts to reduce wildfire risk should primarily prioritize the forests and grasslands located within or adjacent to the WUI that show the potential for high wildfire hazard.

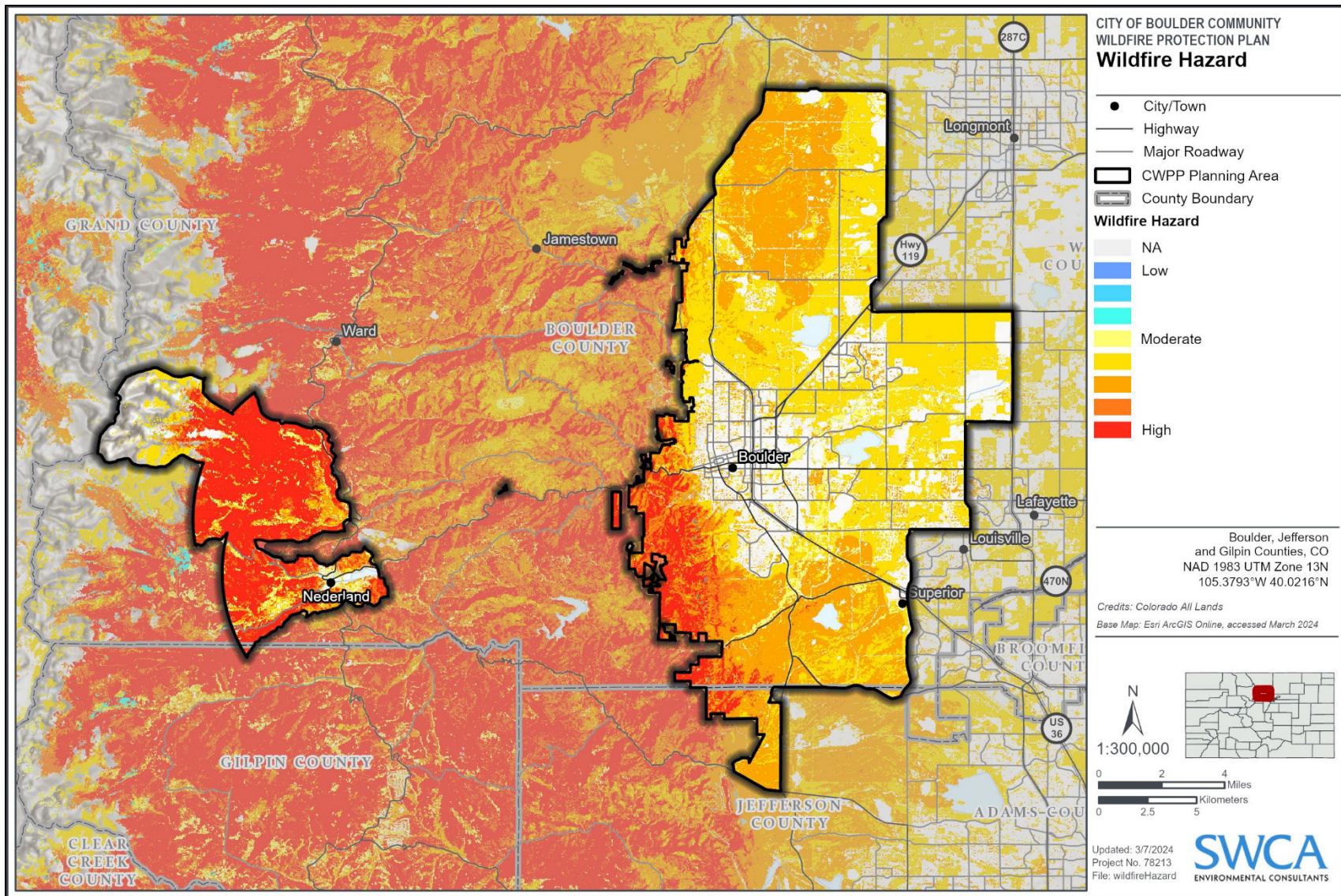


Figure 3.7. Wildfire hazard across the City of Boulder CWPP planning area. Wildfire hazard is modeled from the probability of the landscape burning and the predicted fire behavior when it does. See Appendix D for a detailed modeling methodology. Source: COAL Quantitative Risk Assessment (Pyrologix 2022a).

WILDFIRE RISK IN THE CITY OF BOULDER

Quantitative assessments of wildfire **risk** depend heavily on three factors: 1) the probability of fire occurring 2) the range of expected fire intensity 3) the location of assets and their proximity to vegetative fuels. HVRAs are included in wildfire risk assessments to determine how wildfire hazards influence wildfire risk to different assets across a landscape. The HVRAs included in the COAL Quantitative Risk Assessment were determined for the state of Colorado by an interagency group of statewide representatives and wildfire experts during a two-part fire effects workshop held in July 2021.

HVRAs were identified based on readily available national spatial datasets that were evaluated for response to wildfire. The resources and assets included in the risk analysis for the COAL Quantitative Risk Assessment are people and property, infrastructure, water, and vegetation. See below for a brief explanation of each HVRA.

- **People and Property (PP)** – This data represents housing data calculated from building footprints and U.S. Census Bureau 2018 county population estimates and census block level datasets.
- **Infrastructure (INFRA)** – This data represents high- and low-voltage electric transmission lines, communication sites, and power infrastructure (power plants and substations) all sourced from the Homeland Infrastructure Foundation-Level Data (HIFLD) program.
- **Water** – This data represents surface drinking water protection areas sourced from the U.S. Environmental Protection Agency (EPA) Source Water Protection Area program. Potential watershed impacts were evaluated based on intake location and population served.
- **Vegetation (VEG)** – This data represents ecosystem function sourced from LANDFIRE's 2016 biophysical setting layer.

Additionally, line officers, area fire management officers, and interagency leadership placed relative importance (RI) values on each HVRA for the purpose of weighting and ranking HVRAs (Figure 3.8). RI allows all of the HVRAs to increase or decrease wildfire risk depending on the RI of that value or asset. HVRAs and their RI fulfill the vulnerability side of the risk equation.

In Figure 3.9, the areas where the HVRAs overlap with high wildfire hazard are shown as high risk. This figure is important for risk managers and practitioners for determining areas of concern (see Figure 4.3 in Chapter 4) and priority project areas. Figure 3.9 illustrates how fuels, community development, and fire behavior in the planning area directly influence the wildfire risk to assets. See Chapter 4 for project recommendations.

Woodlands and grasslands located in the interface with Boulder are areas of high wildfire hazard and risk. This is because grass and shrub fuels can promote rapid fire spread, usually with shorter flame lengths. However, under windy conditions, grass-fueled fires can spread extremely quickly with intense flames. Extreme fire weather, also known as red flag conditions, can cause extreme fire behavior. Under red flag conditions wildfire risk is much higher in areas adjacent to wildland spaces. Thus, it is crucial to establish defensible spaces around properties, implement effective alert systems, and have well-defined evacuation protocols.

Wildfire risk is highest where highly valued resources and assets such as homes are closest to high wildfire hazards like dense and tall trees, continuous grass, areas downwind of open spaces and steep slopes.

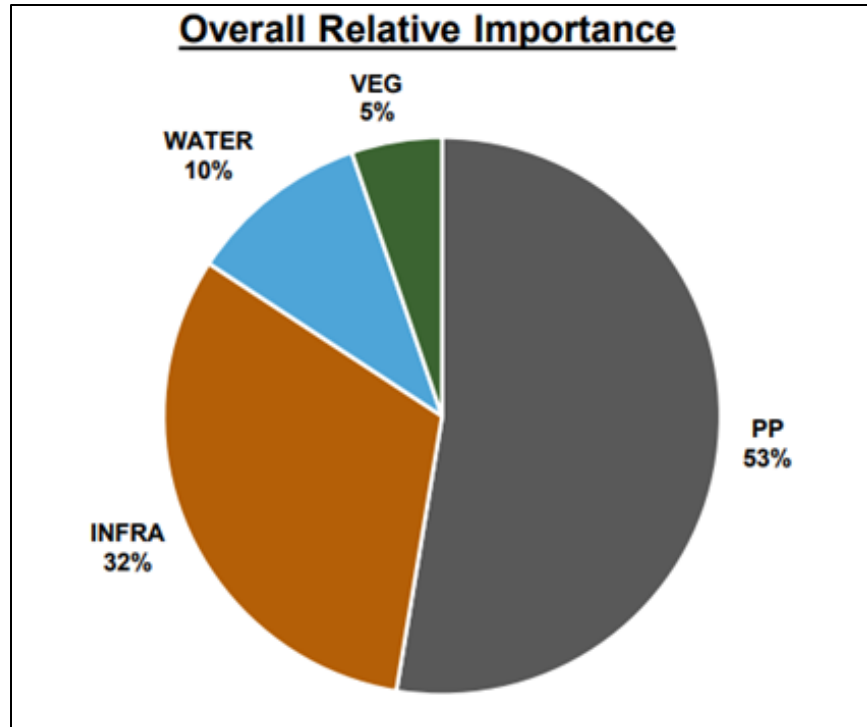


Figure 3.8. Overall RI weighting (ranking) of collaboratively determined HVRAs for the state of Colorado. Source: Pyrologix (2022).

Recently burned areas, rangelands, and agricultural lands generally have a low to moderate level of wildfire risk. Areas with the lowest wildfire risk are typically situated far away from the interface between developed areas and wild landscapes. These regions might encompass bodies of water and densely populated urban zones.

The risk to assets map is useful when trying to understand wildfire risk to existing HVRAs such as people and property across the landscape. However, it is also important to look at wildfire risk comprehensively across the landscape in open space areas as well as developed zones.

The Expected Risk to Structures dataset allows this analysis (Figure 3.10). This map allows land managers to compare areas on the landscape that are currently developed to those that are not directly. The expected risk to potential structures map is created by multiplying flame lengths and probability to determine for every pixel on the landscape if structure loss is expected if a structure were to be there. Low to moderate risk to potential structures dominates the planning area due to wildfire behavior models basing results on given weather conditions. Under more extreme model parameters such as lower fuel moisture content and high winds, high to extreme risk can be likely. No HVRA data are incorporated into this map except for implied building locations as a result of urban development fuel models. Keep in mind that, even in densely urban areas, wildfire risk is low but never zero.

Expected Risk to Structures:
For every place on the landscape, it poses the hypothetical question, "what would be the relative risk to a house or other structure if one existed here?" This allows comparison of wildfire risk in places where homes already exist to places where new construction may be proposed.

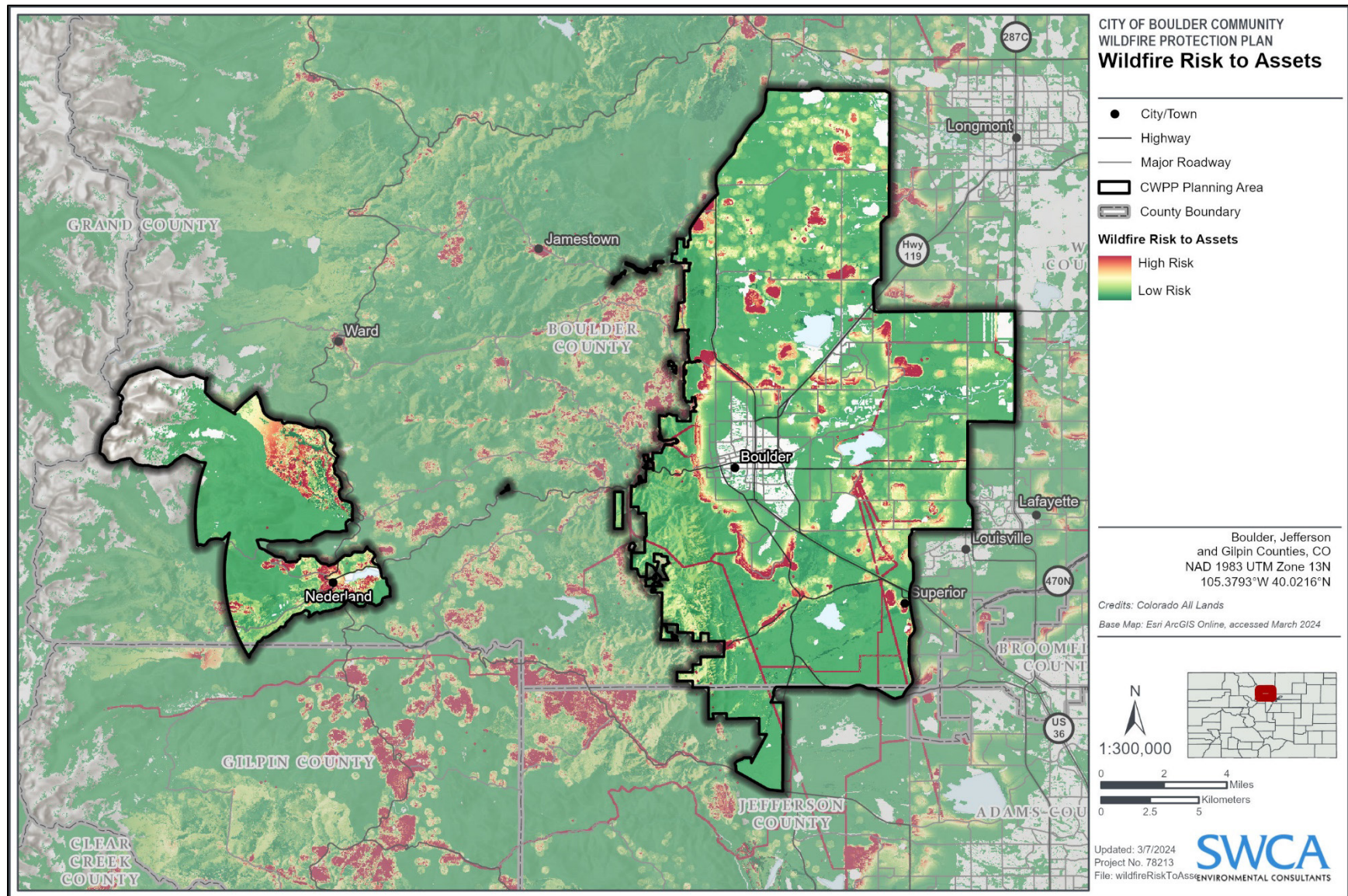


Figure 3.9. Wildfire risk to assets in the City of Boulder CWPP planning area. Source: Pyrologix (2022a).

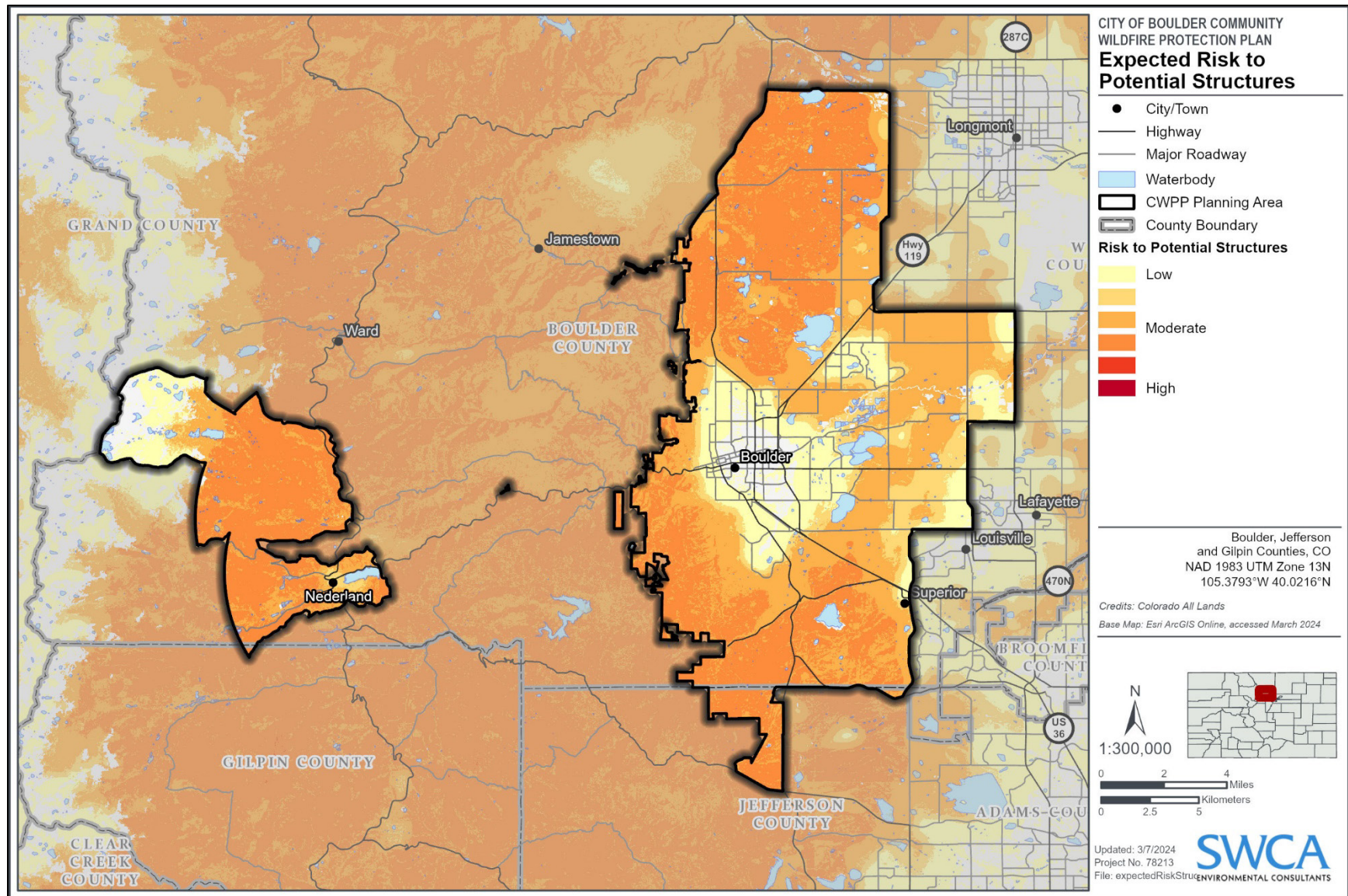


Figure 3.10. Expected risk to potential structures.

SOCIALLY VULNERABLE POPULATIONS

This CWPP aligns with the City of Boulder's sustainability equity, and resilience framework (City of Boulder 2022b) by emphasizing inclusive wildfire preparedness measures that address potential vulnerabilities, tailor communication strategies, and consider socioeconomic disparities. It is essential to identify socially vulnerable populations accurately and comprehensively within Boulder when considering wildfire risk. Vulnerable groups include individuals with disabilities and the elderly among others who often face additional hardships regarding evacuations and elevated health impacts from smoke inhalation (Palaiologou et al. 2019).

Such populations can be assessed using an SVI, which approximates the social vulnerability of a location based on multiple indicators (Figures 3.12–3.16). SVI data used in this CWPP is sourced from the CDC/ATSDR Social Vulnerability Index, which utilizes the U.S. Census Bureau's 2020 American Community Survey 5-year estimates (CDC 2023). Wildfire can disproportionately affect the underserved due to factors such as inadequate housing, social exclusion, lack of property, and inability to evacuate effectively (Fothergill and Peek 2004).

Figure 3.11 shows the American Community Survey datasets that were used to calculate total social vulnerability values across the United States. It is important to consider all indicators of social vulnerability, which can be understood using the CDC/ATSDR overall SVI in Figure 3.12. However, certain indicators of social vulnerability have more implications for residents in the context of wildfire disasters. These indicators have been displayed in Figures 3.13 through 3.16.

Quantifying complex constructs such as social vulnerability or community resilience is challenging. There are several widely recognized limitations of social indices including:

- **Data availability and reliability:** regularly collected, high-quality social and economic data available to inform indices are difficult to obtain. The U.S. Census Bureau's American Community Survey is one of the few national surveys of socioeconomic and demographic data, and because of sampling error inherent to the process, data can be especially unreliable in rural or small population areas.
- **Spatial Scale:** existing indices have focused on using administrative boundaries utilized by the U.S. Census Bureau, most notably counties and census tracts. However, census geographies are limited in their ability to represent communities for many reasons. Counties are legal divisions of most states and can be rather large, encompassing multiple communities. Census tracts and block groups, both subdivisions of counties, are designed to have roughly the same number of people, resulting in units that vary widely in size depending on population density. Therefore, results of assessments may vary depending on the scale at which data is aggregated and displayed.
- **Selection of Indicators:** one commonly cited critique of nearly all social indices is that the individual indicators included have not necessarily been empirically tested for their positive or negative contribution to vulnerability or resilience but are instead grounded in theory and expert knowledge. This makes it difficult to have confidence that indices truly reflect the social vulnerability or resilience of a given place.

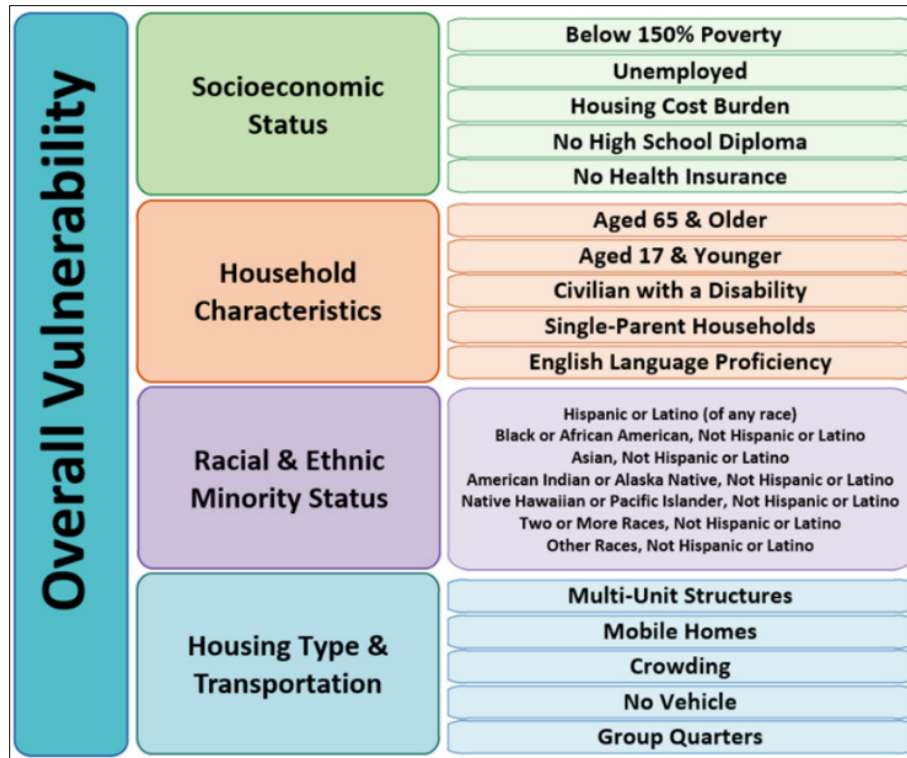


Figure 3.11. CDC/ATSDR indicators of social vulnerability. Source: CDC (2023).

Socially vulnerable populations were considered while drafting this plan through public engagement and outreach; however, this CWPP does not attempt to identify all the socially vulnerable populations in the planning area. Additional information on how wildfire may affect socially vulnerable populations can be found at Wildfire Risk to Communities here: <https://wildfirerisk.org/>.

Poverty percentages are derived from the 2020 federal 150% poverty level determinations for the contiguous United States. See Table 3.1 for 150% federal poverty levels per household size.

Table 3.1. 2020 Poverty Guidelines For CDC/ATSDR Social Vulnerability Indicators

Household Size	2020 150% Federal Poverty Line (dollars)
1	19,140
2	25,860
3	32,580
4	39,300
5	46,020
6	52,740
7	59,460
8	66,180
9	72,900
10	79,620

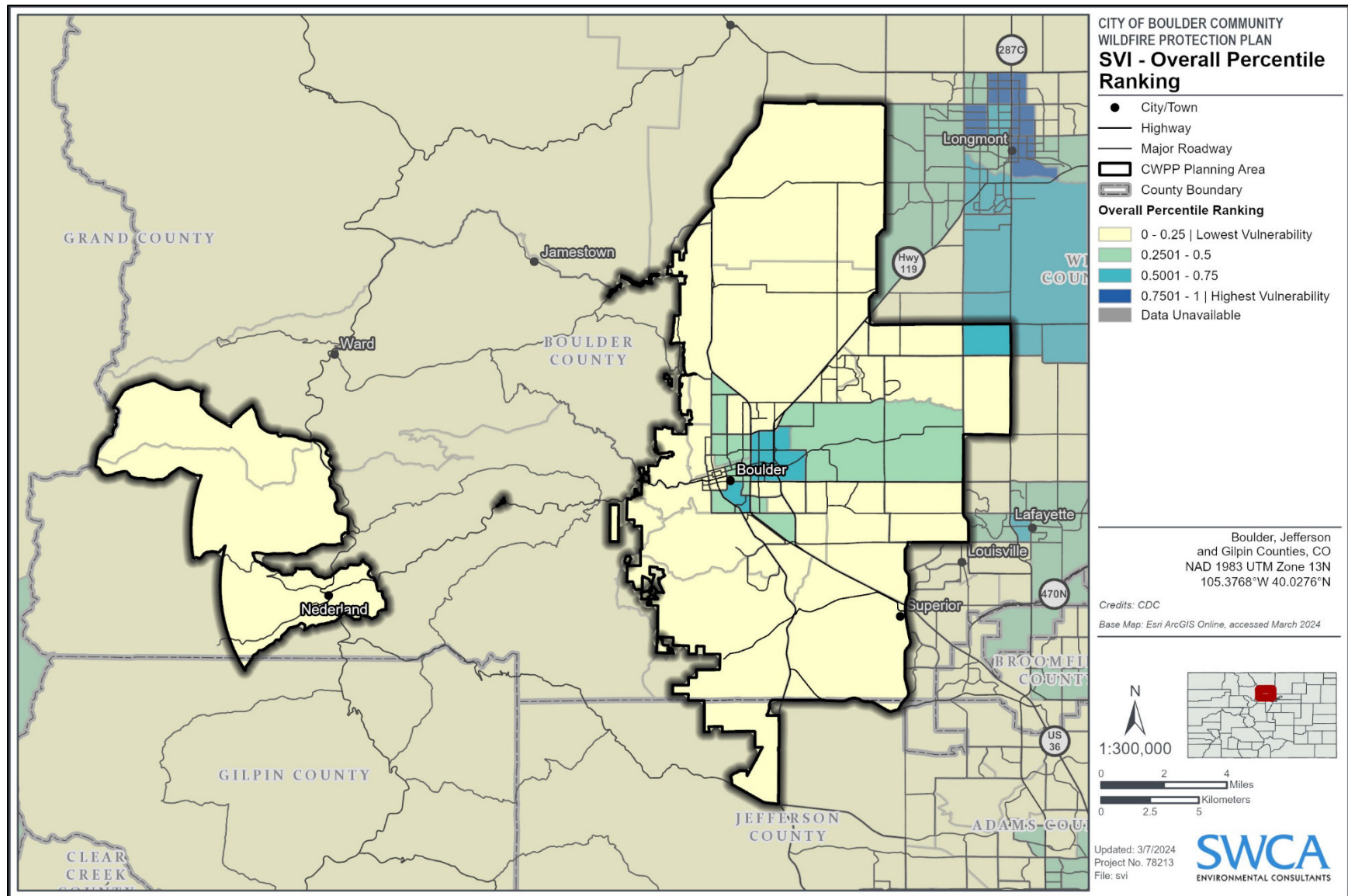


Figure 3.12. Overall SVI percentile ranking for the planning area. Source: CDC (2023).

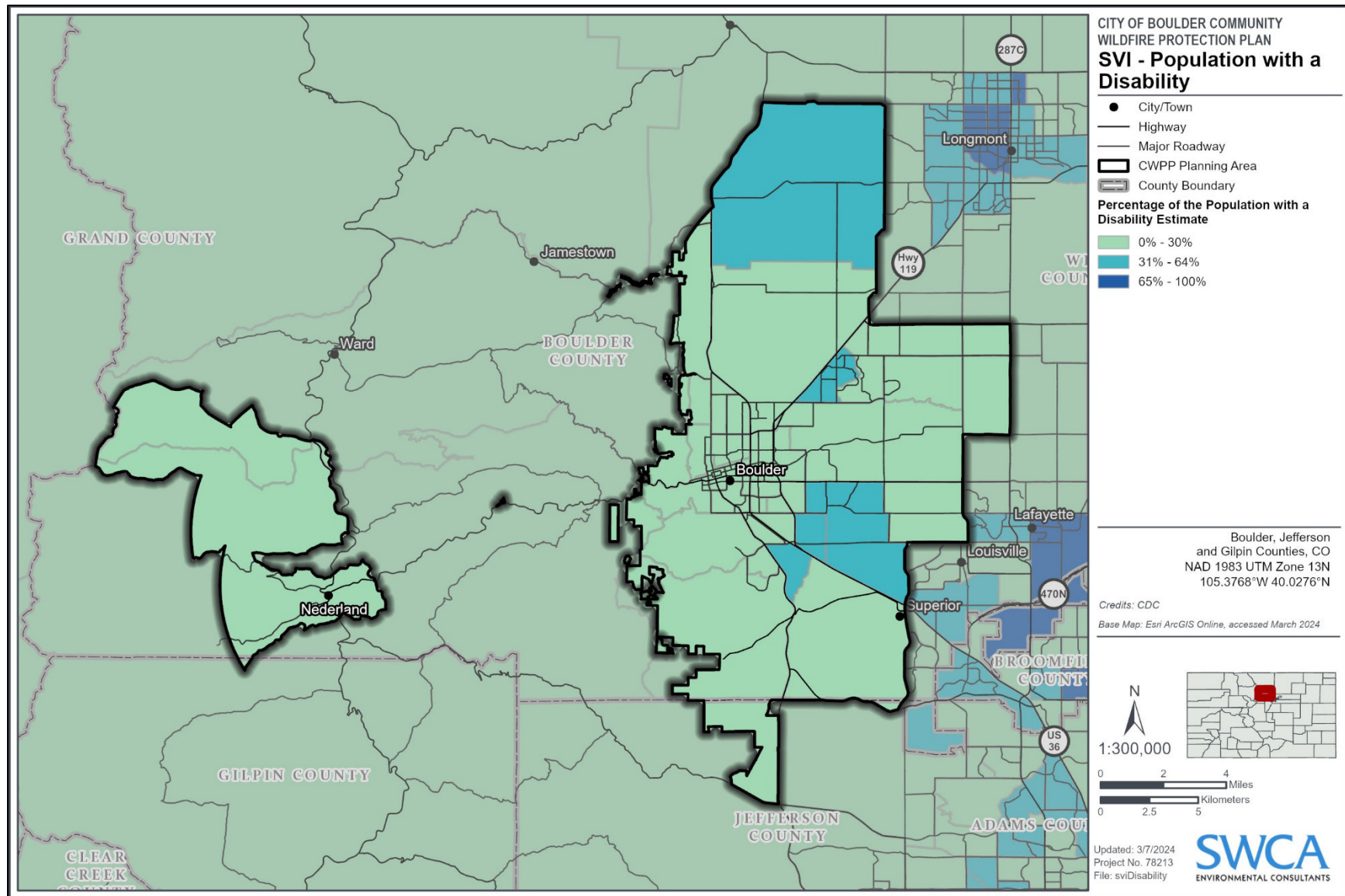


Figure 3.13. Estimated percentage of the population with a disability SVI for the planning area. Source: CDC (2023).

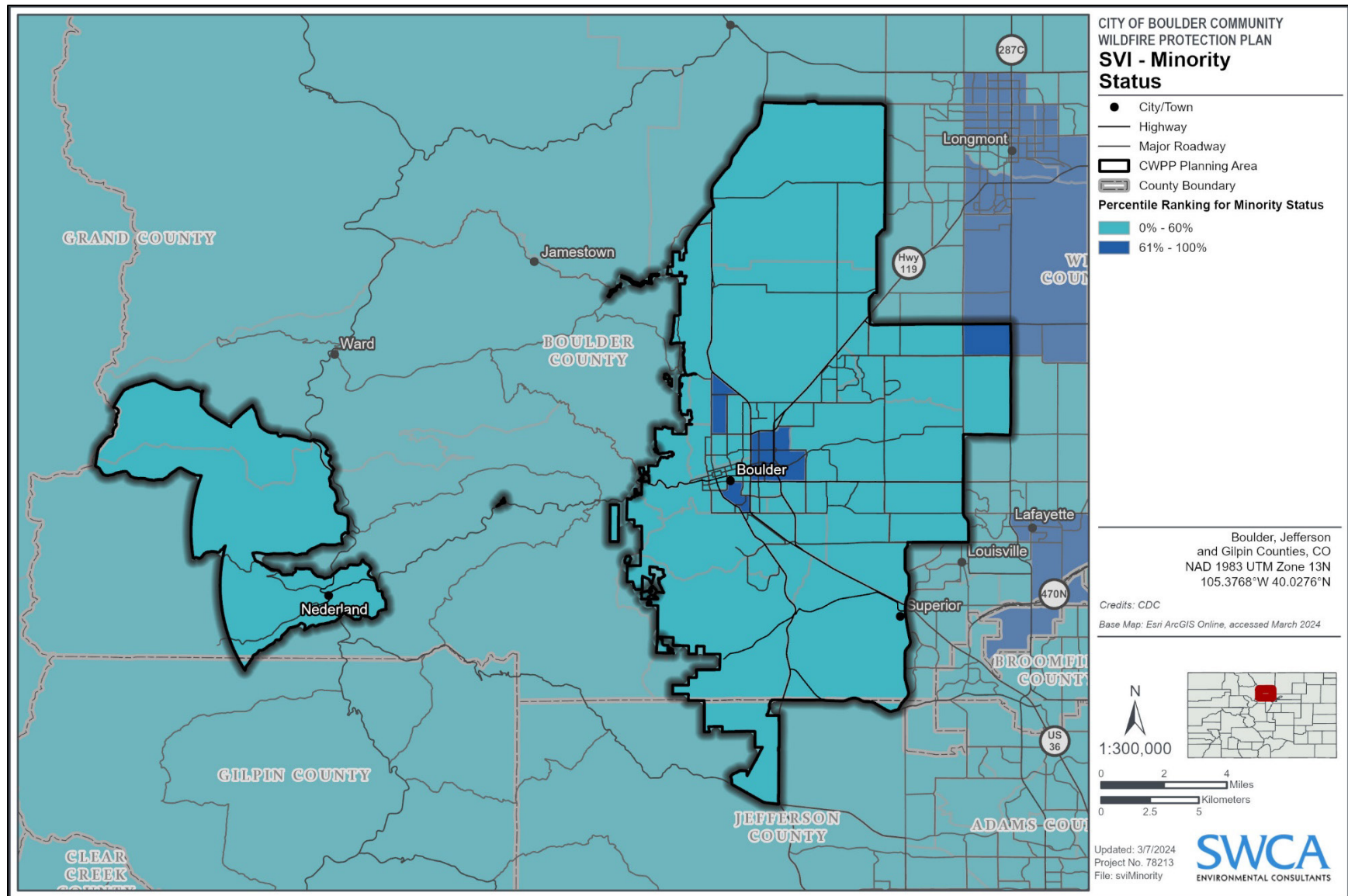


Figure 3.14. Minority status (non-white) SVI for the planning area. Source: CDC (2023).

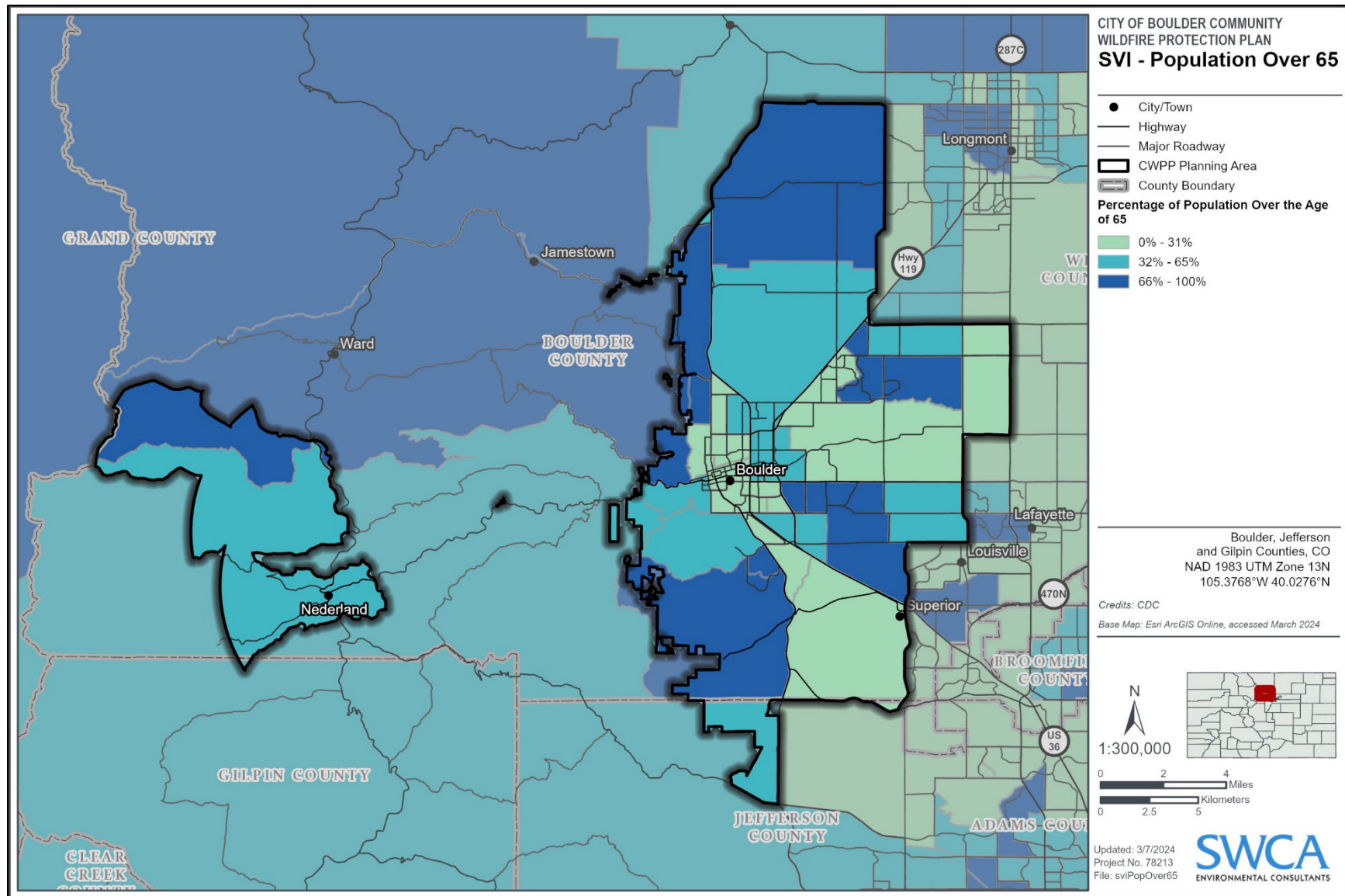


Figure 3.15. Percentage of the population over the age of 65 SVI for the planning area. Source: CDC (2023).

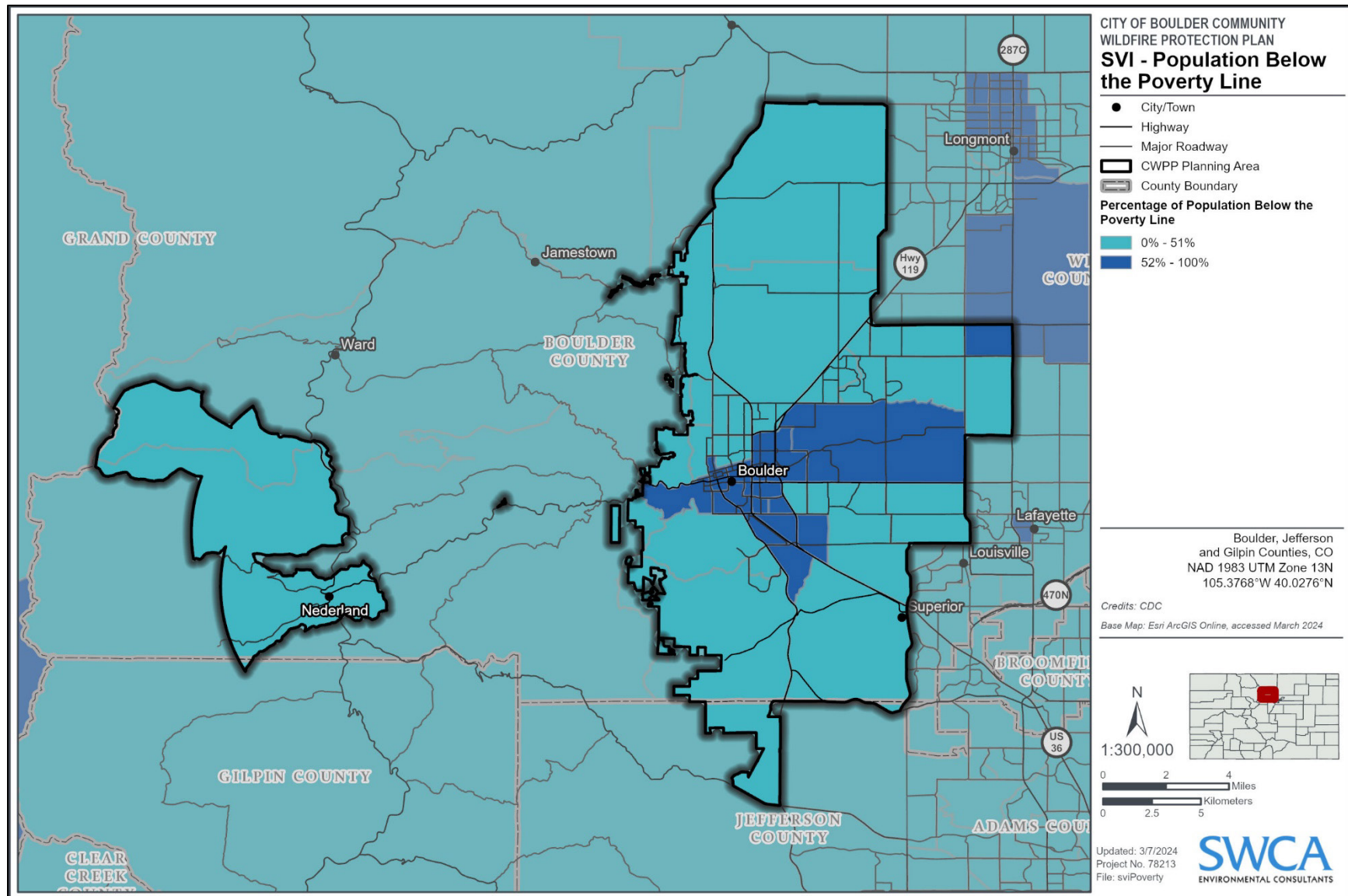


Figure 3.16. Percentage of population below the national poverty line SVI for the planning area. Source: CDC (2023).

FIELD-BASED COMMUNITY RISK-HAZARD ASSESSMENTS

Community Risk-Hazard Assessments were conducted using the NFPA Wildland Fire Risk and Hazard Severity Form 1144 (see Appendix C). This form is based on the NFPA Standard for Reducing Structure Ignition Hazards from the Wildland Fire 2013 Edition and was adapted by SWCA for use in assessing communities for CWPPs (NFPA 2013). The NFPA standard focuses on community structural hazards and requires a spatial approach to assessing and mitigating wildfire hazards around existing structures. It is also used by planners and developers in areas that are threatened by wildfire and is commonly applied in the development of Firewise Communities (for more information, see www.firewise.org).

The purpose of the City of Boulder CWPP Community Risk-Hazard Assessment and subsequent ratings (Table 3.2) is to identify fire hazards and risk and prioritize areas in the city requiring mitigation and more detailed planning. These assessments should not be seen as tactical pre-suppression or triage plans. The Community Hazard Assessment helps to drive the recommendations for mitigation of structural ignitability, community preparedness, and public education (see the project recommendations in Chapter 4). The assessments also help to prioritize areas for fuels treatment based on the hazard rating.

Community areas were collaboratively delineated by the CWPP Core Team in 2023. See Figure 3.17 for a map of the City of Boulder CWPP communities. Community Hazard Assessments for the planning area were conducted in the fall of 2023 and the results are provided in Table 3.2. Full details on these assessments are located in Appendix C. It is recommended additional neighborhood/subdivision- and parcel-level assessments be completed to develop localized action plans.

Each community was rated based on conditions such as access, adjacent vegetation (fuels), defensible space, adjacent topography, roof and building characteristics, available fire protection, and placement of utilities. Where a single score could not be assigned due to a range of conditions, a range of values was assigned. Each score was given a corresponding adjective rating of low, moderate, high, or extreme.

Table 3.2. Community at Risk Ratings with Community Hazard Assessment Summaries

Community	Score	Rating	Fire Station	Positives	Negatives
City of Boulder Source Water Protection Zone (Figure C.3, Appendix C)	94	High	Indian Peaks FPD, Four Mile FPD, and Nederland Fire Department	• Non-combustible roofing materials • Good water source (hydrant) • Fire station near community	• Limited ingress and egress • Limited defensible space • Complex topographic features • Electric and gas utilities above ground • Combustible (wood or vinyl) siding materials • Combustible deck and fencing
Foothills (Figure C.11, Appendix C)	84	High	Mountain View Fire Rescue Station No. 10	• Good ingress and egress • Reflective street signs • Good separation of adjacent structures • Non-combustible roofing materials • Good building setback • Fire station near community	• Limited fire truck access • Limited defensible space • High potential for severe fire weather • Combustible siding, deck and fencing materials • No water source
West Boulder (Figure C.10, Appendix C)	74	High	Boulder Fire-Rescue Station Nos. 1, 2, and 4	• Good ingress and egress • Relatively flat surfaced roads • Reflective street signs • Non-combustible roofing materials • Good building setback • Good water source (hydrant) • Fire station near community	• Limited defensible space • Limited separation of adjacent structures • Combustible siding, deck and fencing materials
36 Corridor (Figure C.4, Appendix C)	73	High	Boulder Fire-Rescue Station Nos. 1 and 5, Lefthand FPD, Boulder Rural FPD, and Hygiene FPD	• Good ingress and egress • Reflective street signs • Good separation of adjacent structures • Non-combustible roofing materials • Good water source (hydrant) • Fire station near community	• Limited defensible space • Combustible siding, deck and fencing materials

Community	Score	Rating	Fire Station	Positives	Negatives
South Open Space (Figure C.2, Appendix C)	66	Moderate	Boulder Fire-Rescue Station No. 4 and Mountain View Fire Rescue Station No. 9	• Good ingress and egress • Relatively flat surfaced roads • Reflective street signs • Low angle slopes around structures • Fire station near community	• Limited defensible space • History of fire occurrence • Combustible siding, deck, and fencing materials • No water source
East Open Space (Figure C.8, Appendix C)	66	Moderate	Boulder Fire-Rescue Station No. 7 and Mountain View Fire Rescue Station No. 2	• Good ingress and egress • Relatively flat surfaced roads • Reflective street signs • Low angle slopes around structures • Relatively flat topography • Non-combustible roofing materials • Good building setback • Good water source (hydrant) • Fire station near community	• Limited defensible space • Combustible siding, deck and fencing materials
Boulder Reservoir and East (Figure C.9, Appendix C)	66	Moderate	Boulder Fire-Rescue Station No. 6, Boulder Rural FPD, Mountain View FPD, and Rocky Mountain FPD	• Good ingress and egress • Relatively wide and flat surfaced roads • Reflective street signs • Predominantly non-burnable fuel types present • Low angle slopes around structures • Relatively flat topography • Non-combustible roofing materials • Good building setback • Good water source (hydrant) • Fire station near community	• Limited defensible space • Combustible siding, deck and fencing materials

Community	Score	Rating	Fire Station	Positives	Negatives
North Open Space (Figure C.5, Appendix C)	62	Moderate	Boulder Fire-Rescue Station No. 5, Mountain View FPD, Boulder Rural FPD, and Hygiene FPD	• Good ingress and egress • Reflective street signs • Low angle slopes around structures • Relatively flat topography • Non-combustible roofing materials • Good building setback • Fire station near community	• Limited fire truck access • Limited defensible space • Combustible siding, deck and fencing materials • No water source
Central/Downtown to Table Mesa (Figure C.6, Appendix C)	56	Moderate	Boulder Fire-Rescue Station Nos. 1, 2, 3, and 4	• Good ingress and egress • Relatively flat surfaced roads • Reflective street signs • Predominantly non-burnable fuel types present • Low angle slopes around structures • Relatively flat topography • Low history of fire occurrence • Low potential for severe fire weather • Non-combustible roofing materials • Good building setback • Good water source (hydrant) • Fire station near community	• Limited defensible space • Limited separation of adjacent structures • Combustible siding, deck and fencing materials

Community	Score	Rating	Fire Station	Positives	Negatives
East Boulder (Figure C.7, Appendix C)	52	Moderate	Boulder Fire-Rescue Station Nos. 3 and 7	• Good ingress and egress • Relatively flat, wide, and surfaced roads • Predominantly non-burnable fuel types present • Reflective street signs • Low angle slopes around structures • Low history of fire occurrence • Low potential for severe fire weather • Relatively flat topography • Good building setback • Good water source (hydrant) • Fire station near community	• Limited defensible space • Combustible deck, fencing, and siding materials

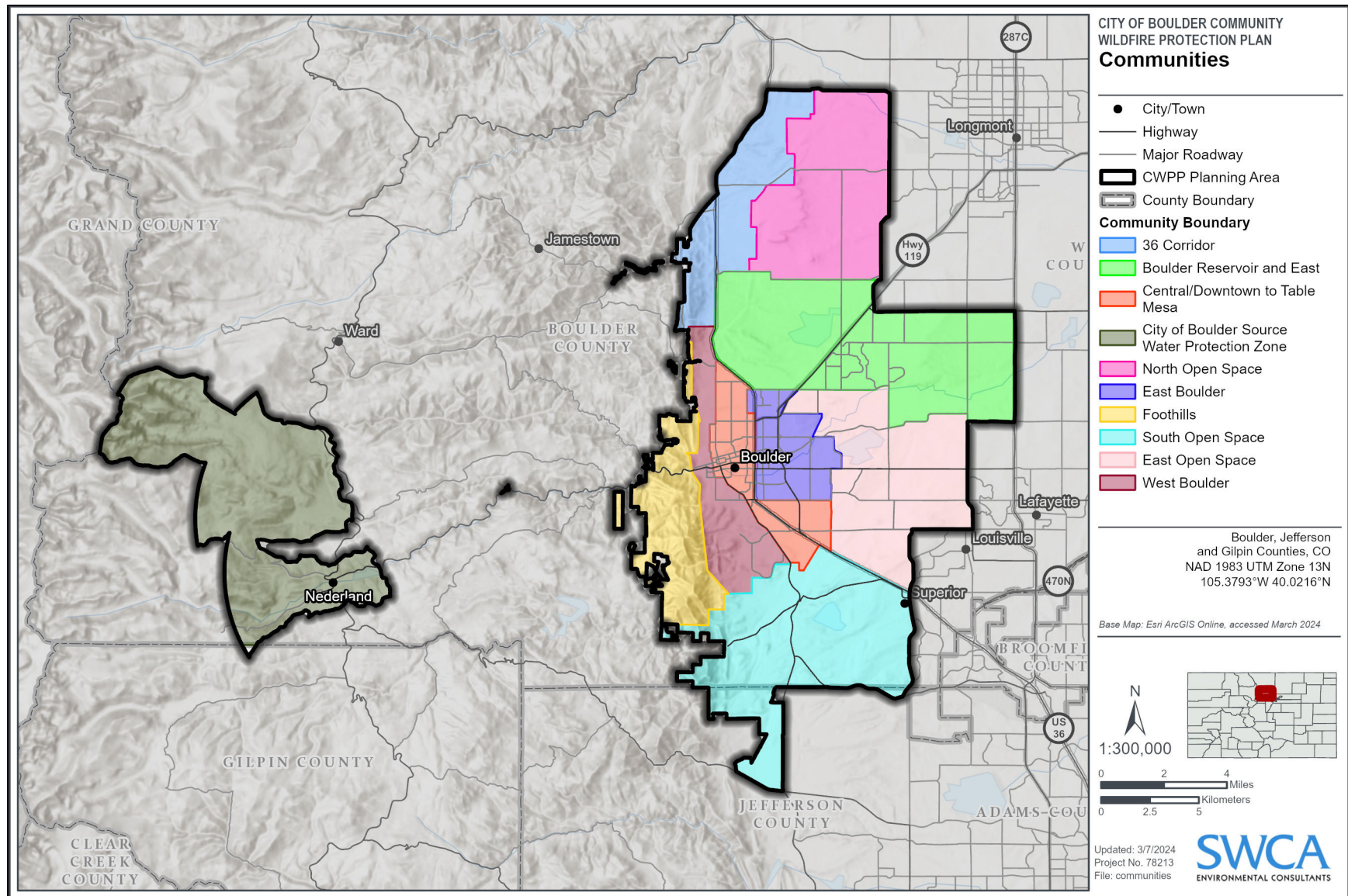


Figure 3.17. City of Boulder CWPP communities.



CHAPTER 4 – MITIGATION STRATEGIES

This chapter provides project recommendations, implementation guidance, and conceptual fuel treatment recommendations. A comprehensive mitigation strategy not only includes recommendations to mitigate wildfire hazards but also actions to improve preparedness and resiliency. This well-rounded approach involves being prepared both pre- and post-fire. Past planning efforts can be found in Appendix B, and post-fire response and rehabilitation information can be found at the end of this chapter and in Appendix G.

CWPP recommendations have been structured around the three main goals of the Cohesive Strategy:

- Resilient landscapes
- Fire-adapted communities
- Safe, effective, risk-based wildfire response

Many of the recommendations listed can be implemented by a homeowner or at a community level (homeowner resources can be found in Appendix F). Projects requiring large-scale support can be prioritized based on the COAL Quantitative Risk Assessment (detailed in Appendix D). Funding resources are summarized in Appendix J.

This chapter includes recommendation matrixes that serve as an action plan for implementation. Recommendations adhere to the minimum requirements for CWPPs established by the CSFS (2022) and are aligned with the strategies in the 2020 Colorado Forest Action Plan (CSFS 2020), wherever possible.



COHESIVE STRATEGY GOAL 1: RESILIENT LANDSCAPES

Recommendations to maintain landscapes are focused on vegetation management and hazardous fuel reduction.

The following information and guidance is provided at a broad scale since this is a citywide CWPP. For more details beyond the recommendations below, please look to local-level plans such as HOA-specific CWPPs or to local experts such as fire chiefs for support. In addition, some recommendations are written for members of the public and some are written for land managers. In terms of resilient landscapes, the information that is most pertinent to the public is in Table 4.1.

A primary element of the CWPP process is to collaborate with Core Team members to compile information on past and planned fuel treatments and prioritize areas for future treatment projects. Detailed recommendations for creating and supporting resilient landscapes are provided in Table 4.1, while recommendations for treating dominant fuel types are in the Dominant Fuel Types and Recommended Treatments section below. The CWPP Core Team identified general, landscape-scale areas of concern, discussed in the Areas of Concern section. Completed fuel treatment projects as well as currently planned fuel treatments are depicted in the figures in the Past Fuel Treatment Accomplishments section. The City of Boulder CWPP also provides more specific recommended fuel treatment projects in the Fuel Treatment Recommendations section. These delineations are based on the Quantitative Risk Assessment (Chapter 3), local knowledge, and Core Team input.

Project prioritization was completed based on multiple risk assessment factors and input from the Core Team. During collaborative planning meetings, the Core Team prioritized projects and set timelines based on wildfire hazard in the planning area, effective mechanisms to mitigate hazards and increase preparedness, and how realistic potential actions were to implement. Other factors that influenced the time frame include availability or need for additional funding, leadership needs, and capacity needs.

To best utilize this information, land managers should prioritize employing mitigation measures to protect life, property, and other values within identified areas of concern and foster wildfire resilience across the local landscape. Both Table 4.1 and Table 4.3 provide actionable recommendations depending on desired outcomes. Treatment types will be site-specific and should address a need to slow fire spread or mitigate potential extreme fire behavior parameters, such as high flame lengths or fireline intensity.

As a non-regulatory document, project and action recommendations in the CWPP are not required to be implemented. Recommendations are put forward to provide guidance and suggestions on actions that will mitigate wildland fire risk. It is at the discretion of City of Boulder representatives and land managers to determine when or if a recommendation will be implemented. Appropriate subject matter experts should be included in decision making regarding project planning, implementation, and maintenance. Including a variety of stakeholders and subject matter experts in the project planning and development phase will ensure that ecological impacts are considered along with risk reduction objectives. A suite of co-benefits are available when developing mitigation projects, and proper discussion should be had to ensure projects can positively impact the community and local ecosystem to the furthest extent possible.

For further planning, land managers, stakeholders, and decision-makers in Colorado have access to valuable information and decision support tools through the Colorado Forest Atlas. The Forest Atlas serves as a one-stop-shop for developing projects, writing forestry plans, and assessing wildfire risk to communities. The applications available through this tool allow users to generate detailed reports to

understand risk and tailor wildfire risk reduction actions both to their specific needs and to the objectives outlined in the Colorado Forest action plan.

To learn more about the Colorado Forest atlas, please visit the following website:

<https://csfs.colostate.edu/wildfire-mitigation/colorado-forest-atlas/>

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RECOMMENDATIONS FOR RESILIENT LANDSCAPES

Table 4.1 Recommendations to Create Resilient Landscapes (Vegetation Management)

Project ID	Status	Priority (H, M, L)	Timeline for Action	Project Description	Location	Land Ownership/ Lead Agency	Methodology/Approach	Serves To:	Monitoring/Maintenance Requirements	Funding Sources
		H	2–5 years	Incorporate and meet the ecological and wildfire mitigation objectives outlined in the following existing plans: - Source Water Protection Plan (2023) - Grassland Ecosystem Management Plan (2010) - Agricultural Resources Management Plan (2017) - Previous City of Boulder CWPP (2007) - Forest Ecosystem Management Plan (1999)	City-managed grassland and forests Planning Area (Shanahan Ridge, Flagstaff, Sanitas, Chautauqua, Enchanted Mesa, Bison Drive) Grassland plan “Best Opportunity areas,” existing agricultural leases and hayed fields, irrigated fields	City of Boulder, USFS, private landowners	Create a cohesive and intersecting fuel treatment and ecosystem management strategy by merging key components of existing plans with the approach set forth within this CWPP. - Integrate the goals of fuel reduction and wildfire mitigation with those of the existing local plans. - Identify and conduct projects outlined within the previous CWPP. - Emphasize treatments in areas where planning objectives overlap with land and ecosystem management plans and where treatments will enhance strategic suppression. - Prioritize projects that accomplish multiple objectives or contribute to multiple planned management goals. - Prioritize the protection of water infrastructure, water resources and their associated watersheds as a fundamental aspect of fuel treatment. - Ensure the protection of ecological values through planning objectives and adaptive management strategies that jointly work to reduce wildfire risk. - Actively involve stakeholders in the planning and implementation of these combined goals. - Identify necessary subject matter experts and land managers to facilitate project implementation.	Align with the City’s vision of sustainable land and resource management. Reduce hazardous fuel loads adjacent to and within communities. create resilient landscapes. Preserve the ecological values of native landscapes.	Establish a robust 10-year monitoring cycle and adaptive management framework. Evaluate the impact of fuel treatments to both wildfire risk reduction and ecosystem health, including water resources. Maintain comprehensive records of fuel treatment activities as part of the CWPP reporting process. Maintain detailed records of all activities, project outcomes, and lessons learned. Communicate these with community members and other stakeholders.	- Wildfire Mitigation Incentives for Local Government (CSFS) - Wildfire Mitigation Resources & Best Practices (CSFS) - Wildfire resilience and mitigation grants (various agencies) - Building Resilient Infrastructure and Communities (BRIC) grants (FEMA) - Regional Catastrophic Preparedness (RCP) grants (FEMA) - Community Wildfire Defense Grants (CWDG) (USFS) - Fire Prevention and Safety (FP&S) grants (FEMA) - Colorado Strategic Wildfire Action Program (COSWAP) (Colorado Department of Natural Resources [DNR])
		H	0–3 years	Mitigate hazardous fuels on private lands.	Private lands within the planning area, prioritizing areas of concern and highest-risk communities as identified in the quantitative risk assessment and where feasible based on City of Boulder and landowner capacity.	Private, City of Boulder, CSFS, federal agencies, CSU Extension	Strategic placement and implementation of fuel treatments and fuel breaks on private lands will help to limit the spread of wildland fire and increase forest health and resiliency. Fuel treatment prescriptions should be site specific depending on the vegetation type, topography, fire regime, adjacent land management practices, and environmental regulations. When possible agencies should work with private landowners to provide technical guidance in the implementation of projects. - Create an educational tool/handout for land/property owners focused on various methods, techniques, and cost for various fuel treatments. - Boulder Fire-Rescue personnel conduct detailed home assessments to provide specific recommendations for actions homeowners can take to reduce their risk. - Provide examples of fuel treatments and properties that have implemented defensible space practices on the City of Boulder website. Create broad fuel breaks adjacent to neighborhoods to prevent direct flame impingement, structure ignitions, and evacuation disruptions. - Utilize NFPA 1144 assessment or similar methods to assess wildfire risk of neighborhoods, identifying areas where fuel breaks are needed to protect lives and property. - Design fuel break locations considering factors such as prevailing winds, terrain, and proximity to structures. - Work collaboratively across private land boundaries and with public land managers to foster landscape-scale resilience and strategic fuel breaks. - Consider important ecological values in designing fuel breaks to ensure protection of sensitive habitats and species	Protect life and property by mitigating fuels and providing defensible space for structure protection. Aid firefighters in structure triage and protection Create a fuel arrangement unlikely to support high-intensity wildfire. Reduce the risk of fire transferring from wildlands into the built environment and causing an urban conflagration. Improve community forest health and resiliency. Water supply protection. Protect infrastructure and other values at risk	Follow up with post-treatment stabilization practices. Engage in frequent communication, collaboration, and cooperation with landowners. Conduct regular maintenance to reduce regrowth and ensure treatment effectiveness. Monitor and treat invasive species. Perform defensible space inspections. Record number of acres treated (by fuel type, treatment method). Maintain detailed records of all activities, project outcomes, and lessons learned. Communicate these with community members and other stakeholders.	- U.S. Endowment for Forestry and Communities - CWDG (USFS) - Forest Restoration & Wildfire Risk Mitigation (CSFS) - Wildfire Mitigation Incentives for Local Government (CSFS) - Wildfire Mitigation Resources & Best Practices (CSFS) - National Fire Plan (NFP) grants (DOI) - BRIC grants (FEMA) - COSWAP (DNR)

Project ID	Status	Priority (H, M, L)	Timeline for Action	Project Description	Location	Land Ownership/ Lead Agency	Methodology/Approach	Serves To:	Monitoring/Maintenance Requirements	Funding Sources
		H	0–5+ years	Collaborate between private, local, state, and federal partners to plan and conduct cross-boundary fuel treatments.	Planning area (including City of Boulder property near Nederland), private, adjacent state- and federally managed lands prioritizing areas of concern and highest risk communities as identified in the CWPP risk-hazard assessment.	City of Boulder, CSFS, USFS, federal agencies, non-profits, Boulder Watershed Collective (BWC), Town of Nederland	Collaboratively identify vegetation and fuels management needs based on the quantitative risk assessment and input from local officials and land managers. - Fuel treatment prescriptions should be site-specific depending on the vegetation type, topography, fire regime, soils, adjacent land management practices, and environmental regulations. - Integrate treatments with POD boundaries as appropriate. - Consider important ecological values in designing treatments to ensure protection of sensitive habitats and species. - Implement treatment prescriptions during times of the year when conditions are most favorable to meet prescription goals. - Smoke management plans should be created and implemented for pile and/or broadcast burning. - Develop equipment needs to accomplish work (including maintenance) and seek funding for purchases. - Ensure fuels reduction in the interface between public and private lands. - Consider implementing and maintaining fuel breaks around the boundaries of federally owned land and critical infrastructure. - Utilize existing fuel treatments (e.g., include patch cuts, shaded fuel breaks, etc.) or fire scars to identify areas where additional treatments may link together to create a larger fuel break. - Assess forest stands for opportunities to reduce fuel loading through the harvest and sale of merchantable timber. Timber sales can be used to fund additional forest restoration and treatment projects. - Collaborate with the Northern Colorado Fireshed Collaborative and others to identify opportunities for funding and hiring.	Create resilient landscapes and reduce the potential for extreme wildfire behavior in and around the WUI. Foster a network of accountability between local landowners and forest managers. Support natural forest successional pathways. Improve forest health and resiliency. Protect water supply resources.	Arrange a standing multi-agency meeting each year to review accomplishments and address future needs. Continue maintenance of fuel treatment projects through the implementation of grazing, brush removal, and prescribed fire. Monitor and treat invasive species annually. Utilize the CWPP project tracker to document updates for stakeholders and other entities throughout the project's lifetime. Maintain detailed records of all activities, project outcomes, and lessons learned. Communicate these with community members and other stakeholders.	- Wildfire Mitigation Incentives for Local Government (CSFS) - Wildfire Mitigation Resources & Best Practices (CSFS) - General Services Administration Federal Excess Personal Property - Firewise grants (various agencies) - BRIC grants (FEMA) - RCP grants (FEMA) - FP&S grants (FEMA) - CWDG - COSWAP (DNR) - HMGP (FEMA)
		H	0–5+ years	Reduce heavy fuels in proximity to utility lines.	Planning area, private land, federal land	City of Boulder, USFS, private landowners, Xcel Energy	Identify, designate, and conduct treatments within strategic fuel reduction zones along utility corridors where heavy fuels are prevalent. - Collaborate with utility companies to treat heavy fuel loads along utility infrastructure. - Establish a routine monitoring schedule to assess the effectiveness of fuel reduction efforts. - Re-enter treated areas as needed to address vegetation regrowth, especially focusing on areas that may serve as ladder fuels, facilitating the upward spread of wildfires. - Collaborate closely with utility companies (e.g., Xcel and Century Link) to share information on fuel reduction efforts and ensure alignment with their operational requirements. - Explore options for undergrounding transmission lines. - Coordinate with utility companies to identify and remove potential hazard trees in proximity to power infrastructure.	Enhance the safety of utility corridors by implementing measures to limit the presence of hazardous heavy fuels. Reduce risk of wildfire and damage to critical infrastructure.	Follow up with post-treatment stabilization practices. Engage in frequent communication, collaboration, and cooperation with landowners. Conduct regular maintenance to ensure the treatment area is clear of hazardous fuels. Employ adaptive management.	- Wildfire Mitigation Incentives for Local Government (CSFS) - Wildfire Mitigation Resources & Best Practices (CSFS) - General Services Administration Federal Excess Personal Property - Firewise grants - BRIC grants - RCP grants - FP&S grants (FEMA) - CWDG (USFS) - HMGP (FEMA)

Project ID	Status	Priority (H, M, L)	Timeline for Action	Project Description	Location	Land Ownership/ Lead Agency	Methodology/Approach	Serves To:	Monitoring/Maintenance Requirements	Funding Sources
		H	0–5+ years	Conduct fuel reduction projects in open space, targeting grass and shrub fuels.	Open space and grasslands within the planning area following the assessment of feasibility. Prioritize treatment in areas of concern and specifically adjacent to areas classified as high and extreme risk in the risk-hazard assessment.	City of Boulder, state, and regional land managers OSMP, water utilities, City properties, ranching and agricultural community, private landowners	Collaboratively identify vegetation and fuels management needs based on the quantitative risk assessment and input from local officials and land managers. - Consider mechanical and chemical treatment (ex. mowing and herbicide). - Consider the use of prescribed fire. - Consider the use of biological treatments (e.g., grazing). - Develop equipment needs to accomplish work (including maintenance) and seek funding for purchase. - Account for ecological values including timing considerations, habitat use, vegetation type, etc. Assess open space risk areas and develop a coordinated approach for delineating project areas and conducting fuel reduction projects in these areas. Employ appropriate treatment methods, targeting and preventing the spread of invasive/noxious species. - Utilize both mechanical and manual methods to target grass and shrub fuels, ensuring effective removal and reduction. - Implement prescribed burning techniques where appropriate. - Monitor and maintain fuel reduction areas regularly to prevent fuel accumulation and promote long-term effectiveness. - Establish main roads and highways as potential fuel breaks through regular mowing of shoulders and medians. - Design fuel reduction projects to protect sensitive or important ecological communities and species (e.g., no shrub removal in Preble’s meadow jumping mouse habitat). Utilize prescribed herbivory as a fuel reduction and maintenance technique in grasslands. - Implement grazing plans to eliminate dry grass and remove weeds and/or establish irrigation to regreen the parcel. - Employ grazing as a solution for treating areas of high concern where topography would be unsafe for hand treatment or where existing agricultural leases/uses exist. Collaborate with the Northern Colorado Fireshed Collaborative to identify opportunities for funding and hiring. Collaborate with Boulder County Fireshed Grasslands working group regarding use of best practices. Support and collaborate with the University of Colorado Boulder and other researchers to gain a deeper understanding of the effectiveness and impacts of various treatment approaches for fine fuels.	Protect life and property by mitigating wildfire hazard through hazardous fuels reduction. Reduce fuel loading and continuity within and around communities. Enhance regional landscape resiliency.	Conduct yearly maintenance and monitoring. Follow up with post-treatment stabilization practices. Engage in frequent communication, collaboration, and cooperation with landowners. Conduct regular monitoring to ensure against environmental damage and invasive species., Record the number of acres treated (by fuel type, treatment method). Communicate lessons learned with the greater open space community across Colorado and the United States.	- Wildfire Mitigation Incentives for Local Government (CSFS) - Wildfire Mitigation Resources & Best Practices (CSFS) - General Services Administration Federal Excess Personal Property - Firewise grants (various agencies) - BRIC grants (FEMA) - RCP grants (FEMA) - FP&S grants (FEMA) - CWDG (USFS)
		H	0–2 years	Conduct fuel treatments along ingress/egress routes.	Communities along the western City of Boulder boundary (e.g., Boulder Canyon, Flagstaff Road), canyon mouths, main drainages.	City of Boulder, USFS, private landowners, Boulder ODM	Effective management of vegetative fuels along ingress and egress routes is vital to ensure safe evacuations and unimpeded access for emergency responders during a wildfire incident. - Collaborate with local law enforcement, fire departments, Boulder ODM , and relevant stakeholders to identify and prioritize key ingress and egress routes. - Develop and implement a comprehensive vegetation management plan for identified routes. Incorporate a combination of methods to clear and maintain vegetation along the roadsides (e.g., mechanical, chemical, biological, and manual methods) - Collaborate with adjacent landowners, homeowners' associations, and local communities where egress overlaps occur. - Establish compliance mechanisms and work with local jurisdictions to enforce regulations related to vegetation management along these routes.	Enhance public and firefighter safety within the City of Boulder. Protect life by reducing high-intensity fire behavior along important roads. Improve community safety by reducing evacuation time.	Conduct regular maintenance to prevent fuel accumulation and allocate resources for ongoing upkeep. Implement a monitoring and evaluation system to assess the effectiveness of fuel treatments along these routes. Align with ongoing evacuation planning and modeling efforts. Maintain detailed records of all activities, project outcomes, and lessons learned. Communicate these with community members and other stakeholders.	- BRIC grants (FEMA) - NFP grants (DOI) - RCP grants (FEMA) - Wildfire resilience and mitigation grants (various agencies) - Forest Restoration & Wildfire Risk Mitigation (CSFS) - Wildfire Mitigation Resources & Best Practices (CSFS) - Wildfire Mitigation Incentives for Local Government (CSFS) - HMGP (FEMA)

Project ID	Status	Priority (H, M, L)	Timeline for Action	Project Description	Location	Land Ownership/ Lead Agency	Methodology/Approach	Serves To:	Monitoring/Maintenance Requirements	Funding Sources
		H	0–2 years	Implement community-level forest thinning and community-wide fuels mitigation projects.	Planning area, residential communities interfacing with forest, woodland, and grassland areas	City of Boulder, USFS, homeowners, private landowners	Leverage shared resources and expertise to effectively implement community fuel mitigation to link defensible space and extend beyond the home ignition zone (HIZ). - Enhance continuity of fuel reduction efforts between public and privately owned land by increasing homeowner and private landowner action. - Conduct a comprehensive assessment of the community of interest to identify high-priority areas for forest thinning and fuels mitigation. - Develop and implement a strategic forest thinning plan, outlining specific areas for thinning, and provide detailed methodology such as selective tree removal, spacing adjustments, and ladder fuel reduction. - Educate residents on the importance of reducing hazardous fuels in their community, and provide methodology related to maintaining defensible space. Prioritize the establishment of fuel breaks, considering shaded fuel breaks to maintain ecosystem health while reducing the risk of uncontrollable fires. - Consider leveraging current/ongoing landscape-scale treatments and burn scars in strategically implementing fire breaks. - Identify and prioritize landscape-scale restoration projects within the community and in collaboration with bordering public lands. - Select the most appropriate treatment methods for each area based on its unique characteristics (e.g., vegetation, prescribed fire, chipping and hauling, and herbivory control). - Consider important ecological values in designing treatments to ensure protection of sensitive habitats and species. Identify and target species contributing to hazardous wildfire conditions (e.g., junipers in the HIZ). Collaborate with the Northern Colorado Fireshed Collaborative and other land management organizations to identify opportunities for funding and hiring.	Reduce fuel continuity within communities to reduce fire behavior and the chance of fire transferring directly into the community. Create resilient landscapes. Reduce ember load impacting communities downwind.	Implement long-term plan for regular monitoring and maintenance of the treated areas to ensure their continued effectiveness in reducing wildfire risk. Engage in frequent communication, collaboration, and cooperation with homeowners. Maintain detailed records of all activities, project outcomes, and lessons learned. Communicate these with community members and other stakeholders.	- BRIC grants (FEMA) - NFP grants (DOI) - RCP grants (FEMA) - Wildfire resilience and mitigation grants (various agencies) - Forest Restoration & Wildfire Risk Mitigation (CSFS) - Wildfire Mitigation Resources & Best Practices (CSFS) - Wildfire Mitigation Incentives for Local Government (CSFS)
		H	0–2 years	Safeguard critical drinking water and wastewater infrastructure.	Planning area	City of Boulder, water providers	Protect critical drinking water and wastewater infrastructure from the impacts of wildfire and post-fire water and debris flows. - Foster collaboration with local water and wastewater agencies, emergency responders, and the surrounding community. - Assess potential risks to water sources and water infrastructure associated with wildfire impacts (e.g., sedimentation, contamination, structural damage, etc.) - Utilize the Source Water Protection Plan to inform management and mitigation strategies. - Design and create fuel breaks and defensible space zones around critical drinking water and wastewater infrastructure facilities using site-specific conditions as a guide (e.g., grazing, mowing, thinning, prescribed burning). - Consider important ecological values in designing treatments to ensure protection of sensitive habitats and species.	Proactively protect critical drinking water and wastewater infrastructure. Reduce hazardous fuel loads within communities and create resilient landscapes.	Conduct regular maintenance to prevent fuel accumulation and allocate resources for ongoing upkeep. Follow up with post-treatment stabilization practices.	- BRIC grants (FEMA) - NFP grants (DOI) - RCP grants (FEMA) - Firewise grants (various agencies) - Forest Restoration & Wildfire Risk Mitigation (CSFS) - Wildfire Mitigation Resources & Best Practices (CSFS) - Wildfire Mitigation Incentives for Local Government (CSFS)
		H	2–5 years	Establish biomass utilization/sort yard facilities to support wildfire prevention and environmental sustainability.	Planning area	City of Boulder, Boulder County	Create formal agreements and utilize resource sharing to establish effective biomass utilization and sort yard operations. - Finalize assessment to identify potential biomass resources within the city and surrounding areas. - Initiate discussions with Boulder County to explore collaboration opportunities and resource sharing for joint efforts. - Analyze the existing Urban Forest Strategic Plan goals to identify opportunities for integrating biomass management and sort yard activities. - Evaluate the feasibility of establishing an eastern sort yard or biomass utilization/chipping area.	Reduce hazardous fuel loads within communities and create resilient landscapes. Contribute to climate initiatives and urban forestry goals.	Periodically review progress with Boulder County and other involved stakeholders (e.g., climate incentive groups). Assess the impact to reducing wildfire risks and achieving goals for sustainability and urban forestry.	- BRIC grants (FEMA) - NFP grants (DOI) - Wood Innovations Grants Program (USFS) - Firewise grants (various agencies) - Wildfire Mitigation Resources & Best Practices (CSFS) - Wildfire Mitigation Incentives for Local Government (CSFS) - Boulder Climate Tax

Project ID	Status	Priority (H, M, L)	Timeline for Action	Project Description	Location	Land Ownership/ Lead Agency	Methodology/Approach	Serves To:	Monitoring/Maintenance Requirements	Funding Sources
		H	2–5 years	Enhance comprehensive noxious weed and high hazard vegetation mitigation strategies throughout open space areas and within communities.	Planning area private land, federal land	City of Boulder, USFS, private landowners	Develop and implement integrated weed mitigation strategies that adhere to local management strategies and encompass a combination of mechanical, chemical, and biological control methods. Align actions with Integrated Pest Management Plan and other weed and invasive species management plans, where feasible. - Establish a proactive program for early detection of invasive and noxious weeds (e.g., an online reporting system). - Collaborate with local agricultural agencies, environmental organizations, and landowners. - Provide resources and training to landowners, residents, and community groups. - Forge partnerships with neighboring jurisdictions, conservation organizations, and governmental agencies to coordinate efforts in invasive weed management. Prioritize and implement targeted programs for high-hazard vegetation species to reduce the accumulation of flammable materials and improve ecosystem health. - Identify key juniper, and other hazardous woody species, removal areas in which effective treatments would reduce wildfire risk, enhance habitat restoration, and optimize response capabilities during wildfire events. - Collaborate with local landowners, conservation organizations, and governmental agencies to identify priority zones for targeted noxious weed management. - Explore and advocate for incentives to encourage private landowners to actively participate (e.g., tax credit). Collaborate with the Northern Colorado Fireshed Collaborative to identify opportunities for funding and hiring.	Proactively address invasive and noxious weed challenges. Promote a healthier landscape and reduce the potential for high-intensity wildfire behavior within communities. Reduce the chance of structures igniting due to high-intensity fire in communities.	Conduct regular maintenance to prevent noxious weed/high-hazard vegetation accumulation, allocating resources for ongoing upkeep. Follow up with post-treatment stabilization practices.	- BRIC grants (FEMA) - NFP grants (DOI) - RCP grants (FEAM) - Firewise grants (various agencies) - Forest Restoration & Wildfire Risk Mitigation (CSFS) - Wildfire Mitigation Resources & Best Practices (CSFS) - Wildfire Mitigation Incentives for Local Government (CSFS)
		H	2–5 years	Utilize controlled, prescribed burning techniques strategically across the landscape to reduce accumulated flammable vegetation.	Planning area; City of Boulder open space; state, and federally managed lands	Boulder OSMP, USFS, Boulder Fire-Rescue, DFPC, private landowners	Implement carefully executed prescribed fires under prescribed conditions to reduce excessive fuel loads. - Follow NWCG standards, CDPHE air regulations, prescribed fire burn plan, etc. - Examine Geospatial Measurements of Air Pollution (GMAP) targets. - Align burning strategies with historical fire return intervals adjusted for current ecological and climatic conditions. - Develop a rotational burning schedule for key areas based on historical fire return intervals for each ecosystem type; burn areas are defined in the Forest Ecosystem Management Plan and the Grassland Ecosystem Management Plan. - Identify operational burn units across OSMP lands. - Identify personnel to become certified burners . - Explore the possibility of assembling experienced and certified burn crews to execute controlled burns safely and effectively. - Develop and execute well-defined prescribed burn plans that align with community and ecological objectives. Continuously monitor weather conditions and air quality to identify suitable windows for prescribed burns, prioritizing days with favorable conditions to minimize smoke impacts. Collaborate with the Northern Colorado Fireshed Collaborative to identify opportunities for funding and hiring.	Improve ecological condition and function. Reduce hazardous fuel loads within communities and create resilient landscapes.	Conduct post-burn monitoring to assess the effectiveness of fuel reduction efforts, evaluate ecological impacts, and make necessary adjustments for future prescribed fires. Maintain detailed records of all activities, project outcomes, and lessons learned. Communicate these with community members and other stakeholders.	- Wildfire Mitigation Incentives for Local Government (CSFS) - Wildfire Mitigation Resources & Best Practices (CSFS) - Firewise grants (various agencies) - BRIC grants (FEMA) - RCP grants (FEMA) - CWDG (USFS) - FP&S grants (FEMA)

Project ID	Status	Priority (H, M, L)	Timeline for Action	Project Description	Location	Land Ownership/ Lead Agency	Methodology/Approach	Serves To:	Monitoring/Maintenance Requirements	Funding Sources
		M	1–5 years	Address hazardous fuels along ditches, irrigation channels, and riparian corridors in coordination with ditch companies.	Planning area, prioritizing ditches, irrigation channels, and riparian areas that have experienced fuel buildup	Ditch companies and their contractors, City of Boulder, private landowners, public landowners	City of Boulder to collaborate with ditch companies, landowners, corporations, and jurisdictions to delineate areas along ditches, irrigation channels, and riparian corridors for potential treatment based on compliance requirements and suitability. - Conduct a thorough assessment of hazardous fuel conditions, and vegetation condition class. - Develop an understanding of resource needs and build capacity to carry out projects as necessary, considering modeling of potential fire characteristics. - Implement a combination of mechanical, chemical, biological, and manual methods consistent with local integrated pest management policies to clear and maintain vegetation along ditches, irrigation channels, and riparian corridors. - Prioritize the establishment and maintenance of shaded fuel breaks and reduction of ladder fuels in ecologically sensitive areas, referencing the risk-hazard assessment. - Identify and manage vegetation and hazardous rubbish in areas of regular transient use. - Provide education and outreach programs to promote awareness and involvement of local communities in fuel reduction efforts along ditches, irrigation channels, and riparian corridors, addressing human ignitions from trail users and unhoused encampments. - Develop a rotational ditch burning schedule for ditch areas of the OSMP system. Create a full- or part-time position funded by the City of Boulder and tasked with coordinating wildfire mitigation activities and maintenance for ditches, irrigation channels, and riparian corridors across jurisdictions. Collaborate with the Northern Colorado Fireshed Collaborative to identify opportunities for funding and hiring.	Reduce fuel continuity within communities and create resilient landscapes. Restore and maintain riparian ecosystem health. Increase safe and effective wildfire response Reduce the probability of ignitions and wildfire spread on ditch company lands.	Maintain vegetation as needed (frequent maintenance may be required as vegetation in riparian areas grows quickly). Record number of acres or linear feet treated (by fuel type, treatment method). Record volumetric data for fuels and debris removed (by weight, number of truck loads, or other methods).	- BRIC grants (FEMA) - NFP grants (DOI) - RCP grants (FEMA) - Firewise grants (various agencies) - Wildfire Mitigation Incentives for Local Government (CSFS) - Wildfire Mitigation Resources & Best Practices (CSFS)
		M	2–5 years	Implement a comprehensive vegetation overgrowth, rubbish, and debris removal program.	Planning area	City of Boulder	Create a structured vegetation overgrowth removal program aligned with local regulations and guidelines. - Conduct thorough assessments of at-risk areas and prioritize removal efforts based on wildfire risk. - Identify managers or owners that are responsible for maintaining vegetation. - Develop or build upon existing vegetation removal assistance programs. - Utilize a range of vegetation management practices tailored to local conditions. - Implement and enforce vegetation clearance standards that specify the distance of removal from structures, roadways, and property lines. - Work with Western Disposal to aid in information and possibly implement a cost-savings program for Boulder residents. Conduct public education campaigns to inform residents about the importance of vegetation overgrowth removal.	Reduce hazardous fuel loads within communities and create resilient landscapes. Enhance public awareness of hazards associated with heavy fuels surrounding their household.	Regularly assess the progress of vegetation overgrowth removal and its impact on reducing wildfire risks within the community. Periodically review the program's efficiency and adapt it based on lessons learned and evolving wildfire threats.	- Firewise grants (various agencies) - FP&S grants (FEMA) - EPA Environmental Education Grants Program - CWDG (USFS) - BRIC grants (FEMA) - Wildfire Mitigation Incentives for Local Government (CSFS) - Wildfire Mitigation Resources & Best Practices (CSFS)

DOMINANT FUEL TYPES AND RECOMMENDED TREATMENTS

The top 5 fuel types in the City of Boulder planning area are displayed in Figure 4.1, with total acreages identified in Figure 4.2. Broad recommendations for these dominant fuel types, which can be implemented in various communities and spatial contexts depending on available funding and capacity, are presented in Table 4.2. A list and detailed descriptions and definitions of different fuel treatment types and methods, including defensible space practices and larger-scale projects, is housed in Appendix E.

Fuels modeling and vegetation coverage was assessed at a large scale to cover the entire planning area. As a result, some nuances in vegetation are not illustrated. This includes variance between grassland and agricultural land, irrigated vs. non-irrigated fields, and native vs. nonnative vegetation. When planning specific projects, fuel and land cover intricacies should be discussed and mapped with appropriate land managers and other subject matter experts to ensure projects align with local land management and ecosystem function objectives.

This CWPP has utilized Potential Operational Delineations (PODs) for informing areas of concern and fuel treatment recommendations. The USFS in partnership with the Rocky Mountain Research Station Wildfire Risk Management Science (WRMS) Team developed PODs for the purposes of creating wildfire preplanning management strategies for land managers and landscape-scale wildfire response teams. PODs utilize existing potential control features such as ridges, rivers, roads, and fuel type transitions. PODs combine local fire knowledge with advanced spatial analytics to help managers develop a common understanding of risks and management opportunities (USFS 2024). Recommended fuel treatment projects in this CWPP may partially follow POD boundaries in areas where fuel management objectives coincide with landscape characteristics and potential control features.

When applying fuel treatments, every effort should be made to align treatments with the Colorado State Forest Action Plan (CSFS 2020) with consideration of all appropriate best management practices and sound science. Treatments should be strategically located to maximize effectiveness of other existing and ongoing projects. Additionally, treatment should occur where these fuels overlap areas of high wildfire risk (see Figure 3.8) and areas of concern (see Figure 4.3).

In addition, when planning and implementing recommended projects, proper consideration should be given to the ecological impacts, both short and long term, that stem from mitigation actions. All projects should adhere to National Environmental Policy Act (NEPA), Endangered Species Act, National Historic Preservation Act, Clean Water Act, and other regulatory compliance mechanisms when conducted on lands requiring compliance considerations. Additionally, broader ecosystem function and health should be considered to ensure projects do not negatively impact habitat. Opportunities for multi-benefit projects should be identified; many mitigation actions overlap actions that restore or improve wildlife habitat, ecosystem function, and overall landscape resilience. Actions that meet or contribute to a variety of goals and objectives and align with multiple planning documents can be a more effective use of limited funding or lead to funding applications that are more competitive.

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

The treatment lists in Tables 4.2 and 4.3 are by no means exhaustive and should be considered as recommendations and examples of pertinent projects for the reduction of wildfire risk on the landscape.

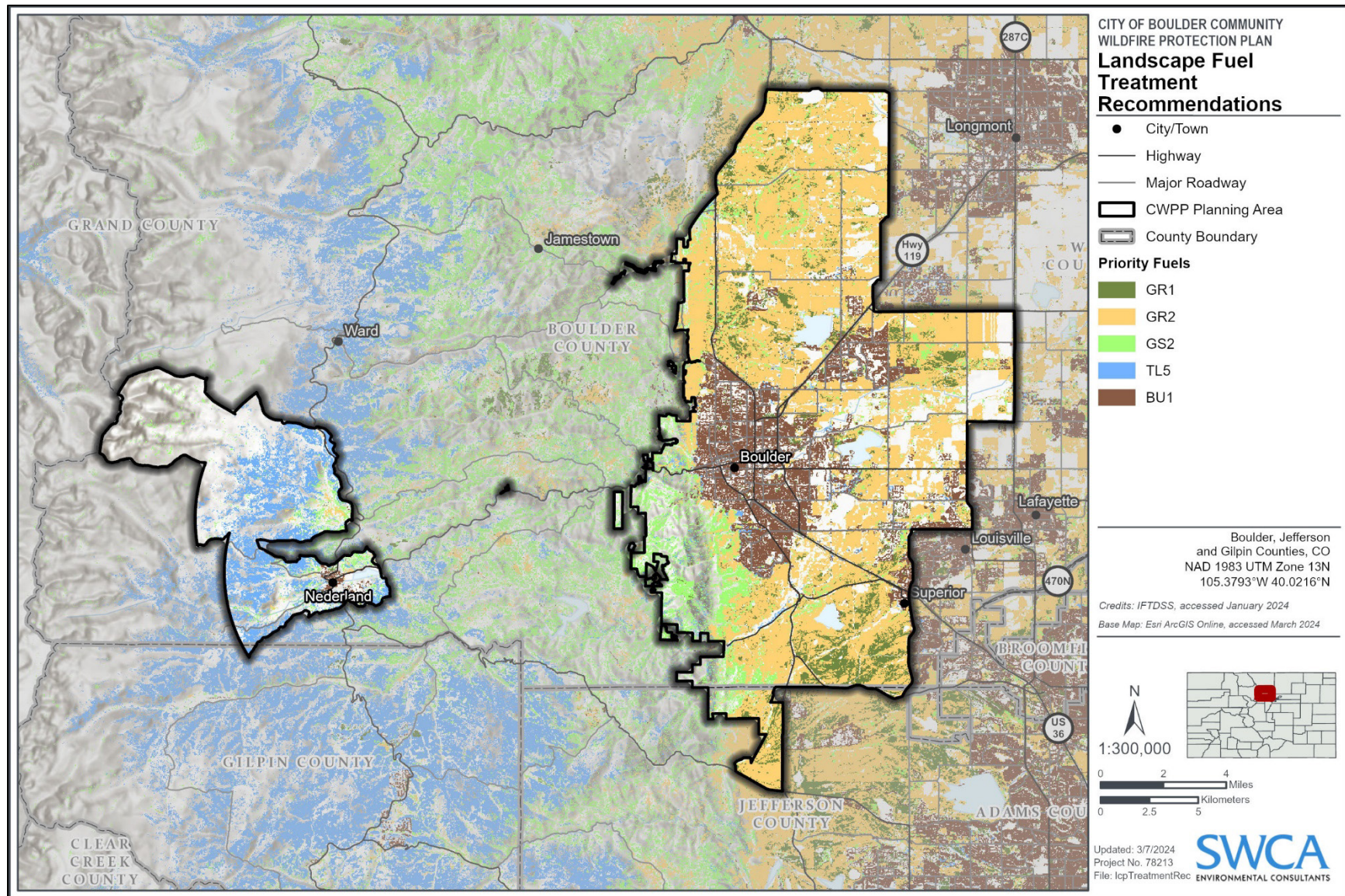


Figure 4.1. Top 5 fuel types in the City of Boulder planning area.

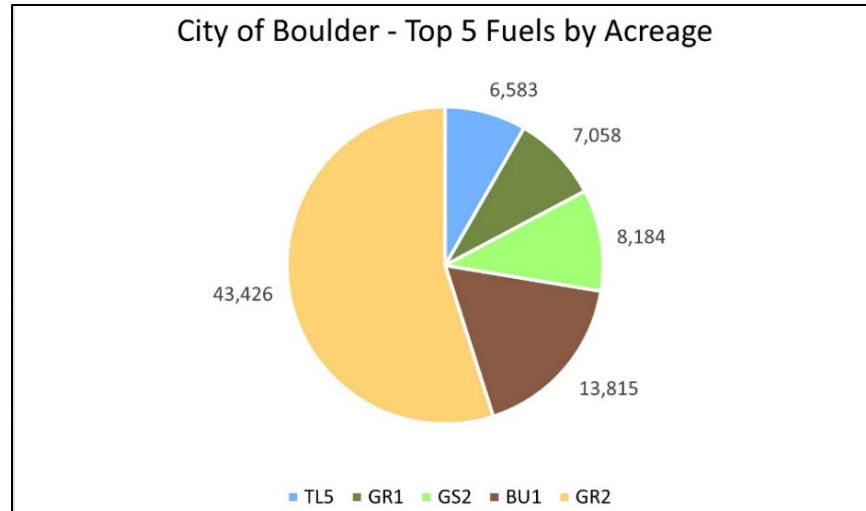


Figure 4.2. Top 5 fuel types in the planning area by acreage.

Table 4.2. Dominant Fuel Types and Recommended Treatments

Fuel Model	Definition*	Recommendation†
GR2	Grass, moderately coarse continuous grass, average depth about 1 foot.	The GR2 fuel type is an excellent candidate for prescribed herbivory techniques for controlling fuel loading in the late summer and fall. Mowing along existing control features such as roads and select trails can be effective in limiting wildfire spread in this fuel type by targeting strategic containment points and breaks. Continuity of grass fuels should be broken up using fuel breaks and other control features to limit the momentum of fast-moving grass fires.
BU1	Burnable developed areas.	Burnable developed areas encompass structures, outbuildings, and HIZs within 50 feet of buildings. Defensible space treatments are effective in reducing wildfire intensity near structures. Home hardening upgrades should be paired with defensible space measures to reduce the risk of structural ignition. Treatment of BU1 fuels should be prioritized in the WUI and where wildland fuels meet the built environment.
GS2	Grass-shrub, shrubs are 1 to 3 feet high, moderate grass load.	The GS2 fuel type can support extreme wildfire behavior, especially during red flag and high-wind conditions. Shrubs such as juniper should be chipped or masticated in strategic locations to decrease fuel loading and continuity. Mowing along existing control features such as roads and select trails can be effective in reducing wildfire spread if done in strategic locations that coincide with existing breaks or clear opportunities to expand control features. Areas with dense shrubs within the WUI and near homes should be assessed and prioritized for thinning and shrub removal.
GR1	Grass, short, patchy, and possibly heavily grazed.	The GR1 fuel type responds well to prescribed herbivory and prescribed fire. Annual burning when paired with livestock grazing can increase economic value of land while simultaneously reducing wildfire risk. Mowing is also an effective strategy for reducing wildfire spread in the GR1 fuel type.
TL5	Timber litter, high load conifer litter; light slash or mortality fuel.	The TL5 fuel type has the potential to support the most extreme wildfire behavior such as active crown fires during red flag conditions. Ladder fuels, dead and down fuels, and young regenerative trees should be prioritized for thinning and removal. Burn piles, mastication, and lop and scatter techniques are all effective means of fuel management. TL5 treatments are often landscape scale but these fuels should always be prioritized for treatment if near structures.

*Detailed definitions of fuel models can be found in Chapter 2.

†Recommendations are broad and do not account for site-specific characteristics and issues. See Appendix E for fuel treatment methods.

AREAS OF CONCERN

To better prioritize resilient landscape recommendations, the CWPP Core Team delineated areas of concern (Figure 4.3) using a variety of mapping products including risk to assets, expected risk to structures, WUI, wildfire hazards, fuel models, probability of control, PODs, and aerial imagery. Areas of concern are places with high fuel loading, expansive WUI, high wildfire risk, and valuable assets such as energy infrastructure. Lower priority areas are often areas where the probability of control is high and where the risk to assets is moderate or below.

PAST FUEL TREATMENT ACCOMPLISHMENTS

The City of Boulder has actively planned and executed fuel treatment projects in coordination with land managers and neighboring jurisdictions for many years. This includes various fuel treatment projects on tall shrub and forested fuels and the implementation of prescribed herbivory grazing in grassland open spaces. Figure 4.4 shows completed and planned fuel treatments by the City of Boulder, CSFS, and other partners. Refer to agency websites and the [Federal Register](#) for the latest information regarding planned or ongoing actions on adjacent public land.

Recommended fuel treatments as shown in Figure 4.6 were created with these past and planned projects in mind. Fuels management of both public and private land in the WUI and beyond is essential to reducing risk to homes during a wildfire event, as well as meeting the criteria of the National Cohesive Strategy Goal 1. Research has shown how fuel treatments in the WUI can change fire behavior to support suppression activities and protect homes (Evans et al. 2015).

FUEL TREATMENT RECOMMENDATIONS

Past and planned fuel treatments were analyzed and compared to areas of concern and PODs, as well as collaboratively delineated by the Core Team in multiple meetings to identify opportunities for additional recommended fuel treatment projects for this CWPP effort. Figure 4.5 shows recommended fuel treatment projects in purple along with existing past (green) and planned (orange) fuel treatments to highlight how these recommendations build on previous work. Information on specific treatment types and methodologies can be found in Appendix E. Figure 4.6 shows only the CWPP-specific recommended fuel treatments with associated treatment type and project IDs included for clarity.

Recommended fuel treatment projects aim to reduce wildfire risk to communities by utilizing an array of mitigation tools that can be implemented by homeowners, landowners, and agencies depending on underlying land ownership. Community-scale treatments are often most effective at reducing wildfire hazards and risk when planned and paired with adjacent landscape-level fuel treatment efforts.

Prescribed Fire Program

The City of Boulder and other area land managers conduct prescribed burns to reduce fire danger for the community, improve the health of open space ecosystems, and maintain agricultural water infrastructure. The City of Boulder conducts agricultural prescribed fire to help maintain open space agricultural properties, including ditches that provide water for open space farming and ranching operations. Prescribed fire in agricultural ditches removes vegetation from important irrigation infrastructure and helps control plant growth and invasive weed species.

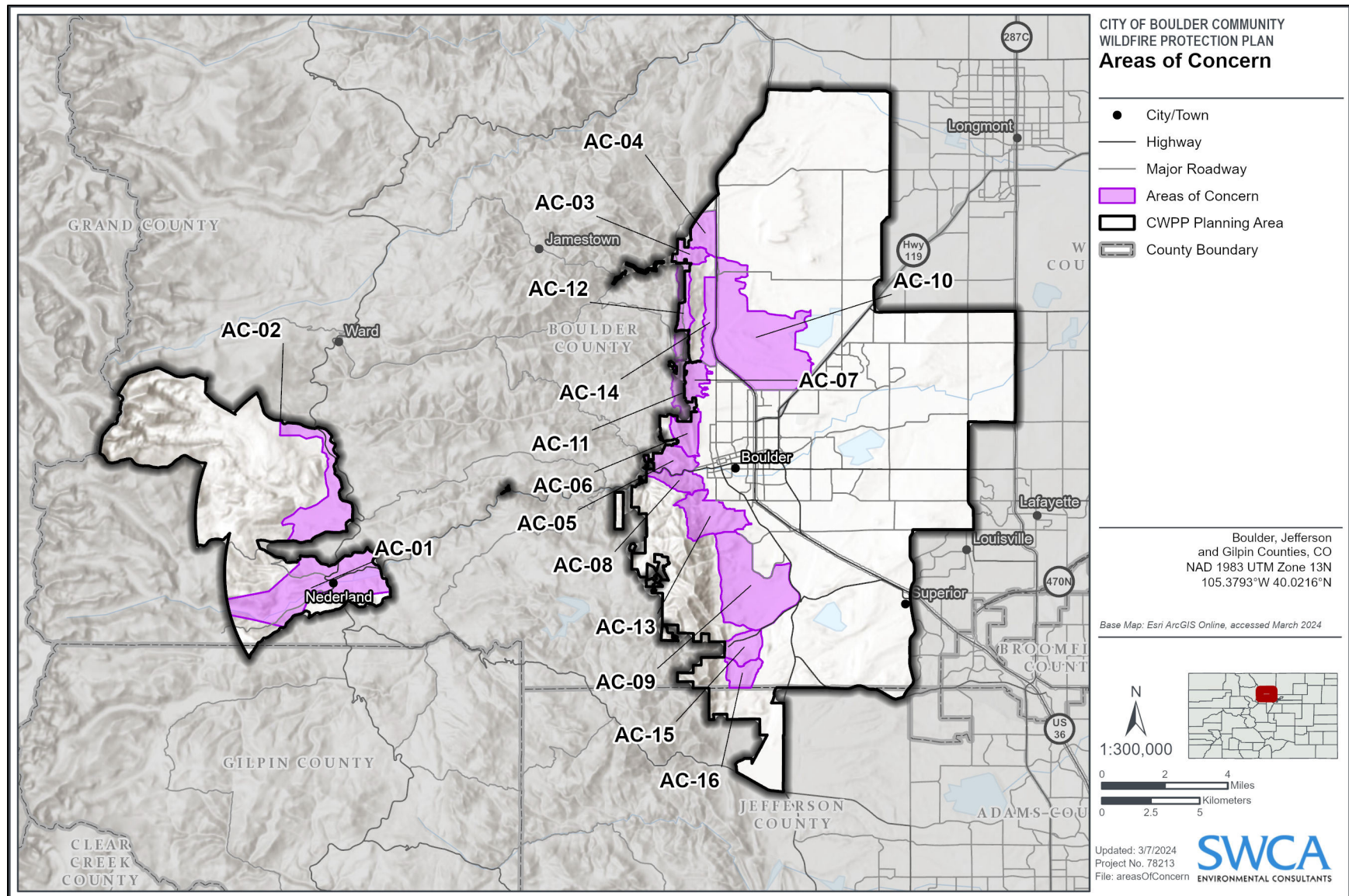


Figure 4.3. 2024 CWPP areas of concern in the planning area.

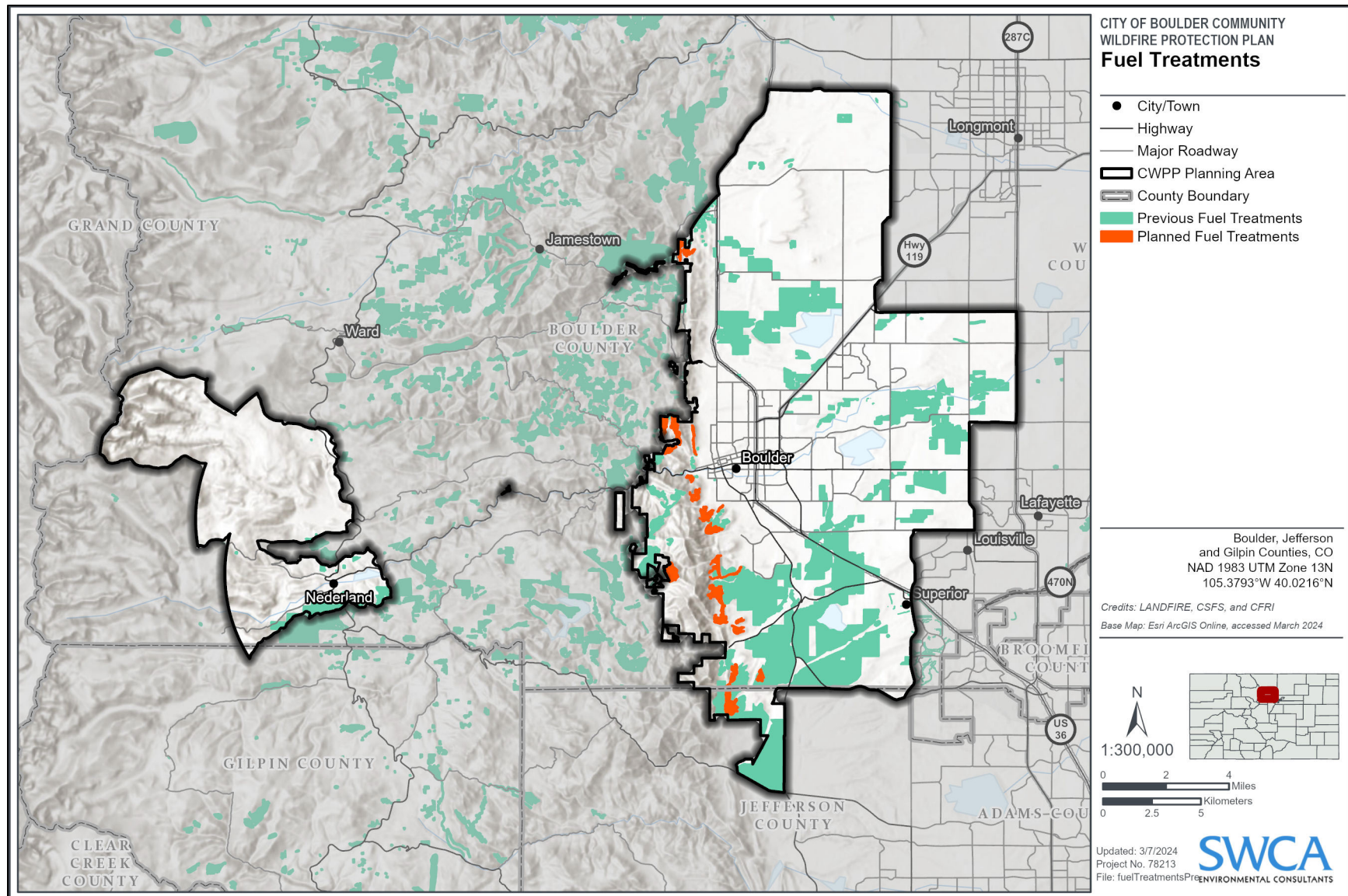


Figure 4.4. Fuel treatments that have been completed or are currently planned by the City of Boulder and partners.

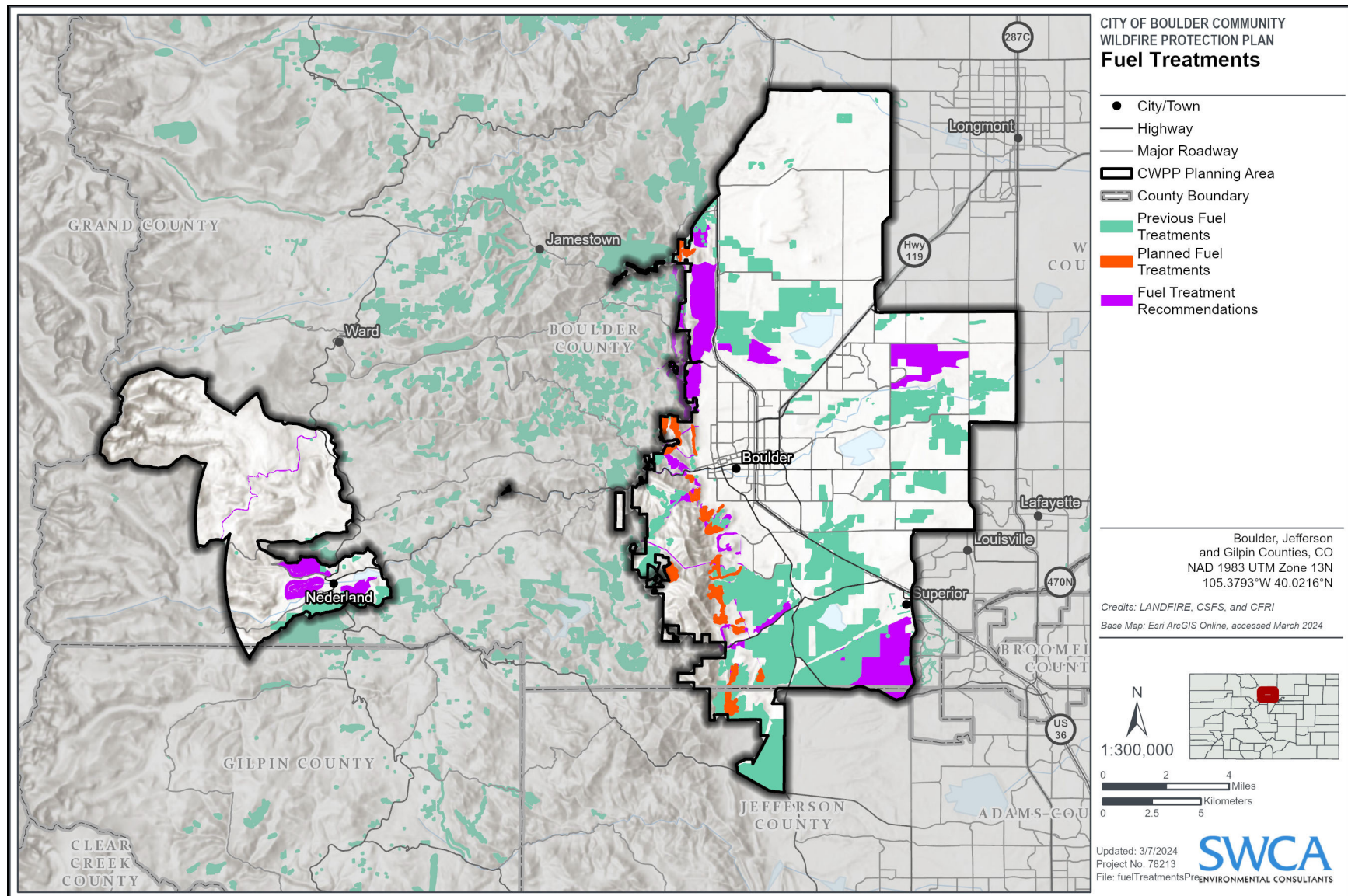


Figure 4.5. CWPP-recommended fuel treatments and City of Boulder past and planned fuel treatments.

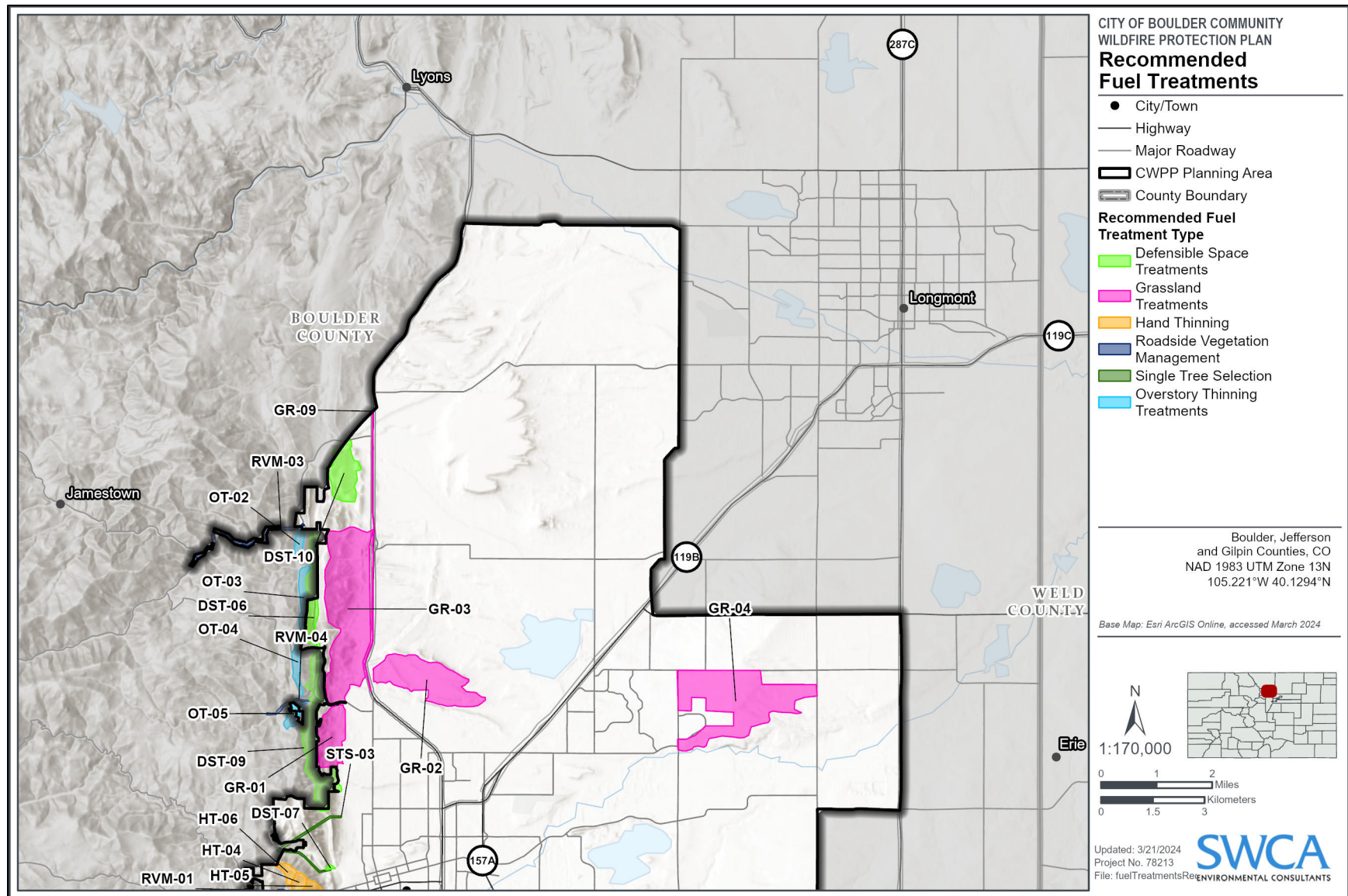


Figure 4.6. Recommended fuel treatment projects with associated treatment types and project IDs for the northern portion of the planning area.



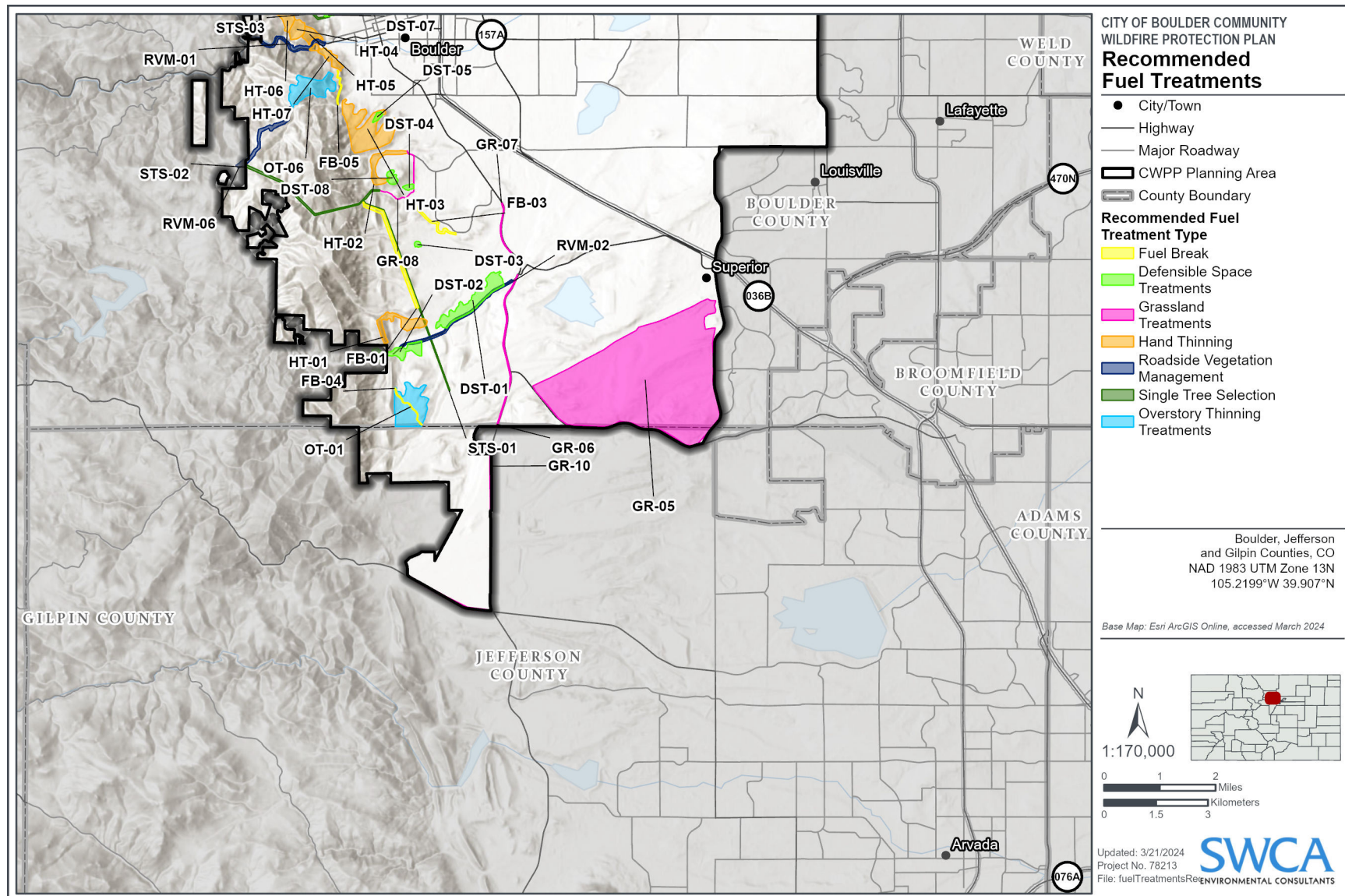


Figure 4.8. Recommended fuel treatment projects with associated treatment types and project IDs for the southern portion of the planning area.

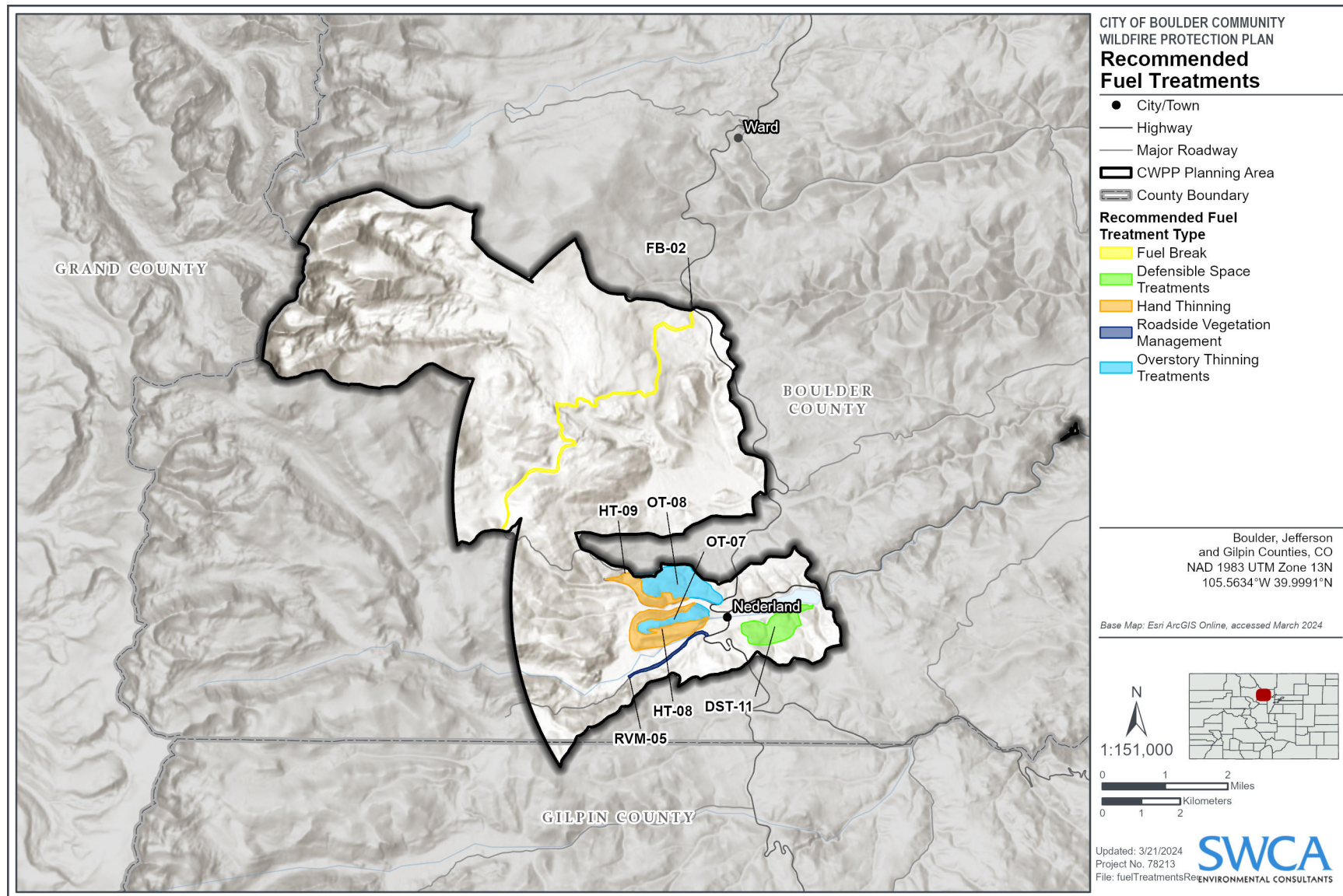


Figure 4.9. Recommended fuel treatment projects with associated treatment types and project IDs for the source water protection zone within the planning area.

Boulder and partner agencies (e.g., OSMP) schedule prescribed burns with significant consideration of multiple requirements. When the City implements a prescribed burn, firefighters trained in preparing, lighting, and supervising prescribed fires will manage a team of certified wildland firefighting staff to confine and contain the burn. Prescribed burning efforts are most often a joint effort with other land management agencies such as Boulder County and USFS personnel.

The completed and planned fuel treatments were delineated by the City of Boulder OSMP (see Figure 4.4). Treatment areas were collaboratively developed with subject matter experts and landowners to strategically identify areas that could reduce wildfire risk, improve public outdoor experience, and improve habitat and ecosystem function. Proposed projects will not be completed without proper inclusion and consultation with appropriate subject matter experts.

The fuel treatment project recommendations in Figure 4.6 encompass 52 project areas and nine different treatment methods for reducing hazardous fuels and improving the wildfire resiliency of communities. For more information regarding each recommended fuel treatment project, see Table 4.3. **In addition, all fuel treatment projects should be aligned with recommendations for resilient landscapes as shown in Table 4.1.**

Treatment types shown in Figure 4.6 and Table 4.3 will be site-specific but are generally aimed at slowing fire spread or mitigating extreme fire behavior parameters. Wildfire does not stop at jurisdictional boundaries; therefore, it is crucial that projects are implemented collaboratively across borders. Fuel treatments also provide a valuable opportunity to discuss co-benefits of enhancing landscape resilience and ecosystem health.

It is important to highlight the availability of government assistance for forest health projects and other activities (e.g., USFS Forest Stewardship Program). Equally significant is the improvement of communication between property owners and local land management agencies. This becomes crucial, especially given the need for effective implementation of fuel treatments and better maintenance within the interface of public and private land.

When considering these recommended fuel treatments, it is important to consider the differences between public and private land. For example, prescribed fire techniques are commonly designed for application on landscape-level, publicly owned land. Recommendations for private land include individual safeguarding measures such as mowing around parcel boundaries and creating defensible space. Consultation with experts and compliance with local regulations are essential for the safe and effective implementation of these treatments.

Additional information on fuel treatment types and methods is in Appendix E.

Table 4.3. Recommended Fuel Treatment Projects

Project ID	
Defensible Space Treatments	
DST-01	Complete defensible space fuel treatments in the HIZ of structures. Consider this community as a priority for Fire Aside curbside wildfire risk assessments. Consider focusing fuel reduction on the interface between public and private land.
DST-02	Complete defensible space fuel treatments in the HIZ of structures. Consider this community as a priority for Fire Aside curbside wildfire risk assessments. Align defensible space treatments with cross-boundary mitigation projects in and around the community of Eldorado Springs.

Project ID

DST-03	Manage vegetation surrounding critical water and communication infrastructure. Implement defensible space of at least 30 feet. Incorporate this site into a utility management plan or protocol for increasing wildfire protection of HVRAs.
DST-04	Treat vegetation surrounding key energy infrastructure. Ensure defensible space is clear of fuel. Consider increasing treatment distances on the western flank to account for prevailing winds contributing to high flame lengths. Utilize existing trails as small fuel breaks and consider mowing.
DST-05	Treat vegetation surrounding key energy infrastructure. Ensure defensible space is clear of fuels. Consider increasing treatment distances on the western flank to account for prevailing winds contributing to high flame lengths. Utilize existing roads and trails as treatment unit boundaries.
DST-06	Complete defensible space treatments for homes along the Olde Stage Road; this is of critical importance due to nearby wildland fuels, dangerous topography (box canyon), number of homes, and WUI intermix. Treatments may encompass the entire HIZ. Work with homeowners and FPDs to create achievable action plans for reducing hazardous fuels in this community. This area can be a focus of Fire Aside curbside wildfire risk assessments.
DST-07	Treat vegetation surrounding key energy infrastructure. Ensure defensible space is clear of fuel. Consider increasing treatment distances on the western flank to account for prevailing winds contributing to high flame lengths.
DST-08	Complete defensible space treatments within the HIZ of the NCAR structure. The NCAR structure may be assessed for wildfire risk and structural ignitability. Consider removal or management of conifers and ornamentals near the structure
DST-09	Defensible space treatments for homes along the Olde Stage Road are of critical importance due to nearby wildland fuels, dangerous topography (box canyon), number of homes, and WUI intermix. Treatments can encompass all three HIZs comprehensively. Work with homeowners and FPDs to create achievable action plans for reducing hazardous fuels in this community. This area can be a focus of Fire Aside curbside wildfire risk assessments.
DST-10	Complete defensible space treatments within the HIZ of the NCAR structure. The NCAR structure may be assessed for wildfire risk and structural ignitability risk. Consider removal or management of conifers and ornamentals near the structure.
DST-11	Work with homeowners surrounding the community of Nederland on implementing defensible space treatments. Align landscape treatments with defensible space treatments to establish congruency between objectives for reducing wildfire risk.

Hand Thinning Treatments

HT-01	Consider treating timber fuels and increase tree spacing. Consider various strategies for fuel removal that align with ecological benefits. Align fuel treatments with cross-boundary projects such as defensible space treatments in and around the community of Eldorado Springs. Under the right conditions this south facing hillslope is a good area to implement prescribed fire.
HT-02	Complete hand thinning of conifer fuels surrounding NCAR. Consider various strategies for fuel removal. Treatment of ladder fuels and increasing canopy spacing can be effective in reducing potential fire behavior
HT-03	Consider treating ladder fuels, increasing tree spacing, removing unhealthy trees, reducing fuel continuity and loading. Consider various strategies for fuel removal. Consider implementing low-severity broadcast burning under appropriate prescribed conditions. Fuels can be more aggressively thinned closer to the HIZ of structures.
HT-04	Consider treating hazardous fuels north of Boulder Canyon Drive. Reduce fuel loading and continuity for the purpose of lowering wildfire intensity and rates of spread to allow suppression resources opportunities to control wildfire as it reaches the Boulder Canyon Drive control feature.
HT-05	Consider treating hazardous fuels north of Boulder Canyon Drive. Reduce fuel loading and continuity for the purpose of lowering wildfire intensity and rates of spread to allow suppression resources opportunities to control wildfire as it reaches the Boulder Canyon Drive control feature.

Project ID

HT-06	Consider treating hazardous fuels north of Boulder Canyon Drive. Reduce fuel loading and continuity for the purpose of lowering wildfire intensity and rates of spread to allow suppression resources opportunities to control wildfire. South facing slopes may present good opportunities for low-severity prescribed fires during appropriate prescription conditions.
HT-07	Consider thinning fuels in the woodland–grassland interface. Prioritize fuels near the HIZ. Consider removing tree regeneration and ladder fuels and increasing crown spacing. Consider limbing trees near structures. Prioritize leaving large trees and ponderosa pine. Consider various strategies for fuel removal that align with ecological benefits.
HT-08	Consider utilizing hand thinning treatment methods in the forested stands located on steep slopes. Consider various strategies for fuel removal. Work with homeowners in the area to implement defensible space treatments to ensure connectivity of hazardous fuel management goals.
HT-09	Consider thinning fuels in the woodland/grassland interface. Prioritize fuels near and within HIZs. Remove tree regeneration and ladder fuels and increase crown spacing. Consider limbing trees near structures. Prioritize leaving ponderosa pine. Consider various strategies for fuel removal that align with ecological benefits.

Overstory Thinning Treatments

OT-01	Utilize overstory thinning methods on flat ground and outside riparian management and channel migration zones. Consider strategies such as mastication, chipping, and tree removal. Consider various strategies for fuel removal that align with ecological benefits. Align treatments with cross-boundary efforts near the community of Eldorado Springs.
OT-02	Consider thinning overstory fuels on densely forested slopes immediately west of primary residences. Utilize hand thinning in steep areas and HIZs. Coordinate with FPDs, Boulder County, and USFS personnel. Increase tree spacing, remove ladder fuels, reduce fuel continuity, and improve forest health and resiliency to wildfire and insects and diseases.
OT-03	Consider thinning overstory fuels on densely forested slopes immediately west of primary residences. Utilize hand thinning in steep areas and HIZs. Coordinate with FPDs, Boulder County, and USFS personnel. Utilize Valley Lane as an existing control feature. Increase tree spacing, remove ladder fuels, reduce fuel continuity, and improve forest health and resiliency to wildfire and insects and diseases.
OT-04	Consider thinning overstory fuels on densely forested slopes immediately west of primary residences. Utilize hand thinning in steep areas and HIZs. Coordinate with FPDs, Boulder County, and USFS personnel. Utilize Lee Hill Drive as an existing control feature. Increase tree spacing, remove ladder fuels, reduce fuel continuity, and improve forest health and resiliency to wildfire and insects and diseases.
OT-05	Consider thinning overstory fuels on densely forested slopes immediately west of primary residences. Utilize hand thinning in steep areas and HIZs. Coordinate with FPDs, Boulder County, and USFS personnel. Increase tree spacing, remove ladder fuels, reduce fuel continuity, and improve forest health and resiliency to wildfire and insects and diseases.
OT-06	Utilize existing roads and lack of riparian areas to conduct timber thinning on dry upland sites to open the overstory conifer fuels. Decrease fuel continuity and loading through removal of tree regeneration and ladder fuels. Prioritize leaving mature trees and ponderosa pine. Make use of existing roads as potential control features and landing sites for thinning operations.
OT-07	Consider thinning overstory fuels in the forested stand immediately west of Nederland. Heavy machinery should not be used on slopes greater than 20 degrees and/or within riparian management and channel migration zones. Complete timber treatments with hand thinning strategies where possible. On-the-ground analysis will be necessary for determining appropriate methods.
OT-08	Consider thinning overstory fuels in the forested stand immediately north of Nederland. Heavy machinery should not be used on slopes greater than 20 degrees and outside of riparian management and channel migration zones. Complete timber treatments with hand thinning strategies where possible. On-the-ground analysis will be necessary for determining appropriate methods.

Project ID**Roadside Vegetation Management**

- RVM-01 Complete an assessment of roadside vegetation along Boulder Canyon Drive and complete necessary mitigation actions for maintaining clearances of trees from the road corridor. Roadside vegetation management is important for maintaining critical egress routes in the event of a fire and taking advantage of existing control features such as roads.
- RVM-02 Complete an assessment of roadside vegetation along Eldorado Springs Drive and complete necessary mitigation actions for maintaining clearances of trees from the road corridor. Roadside vegetation management is important for maintaining critical egress routes in the event of a fire and taking advantage of existing control features such as roads.
- RVM-03 Complete an assessment of roadside vegetation along Lefthand Canyon Drive and complete necessary mitigation actions for maintaining clearances of trees from the road corridor. Roadside vegetation management is important for maintaining critical egress routes in the event of a fire and taking advantage of existing control features such as roads.
- RVM-04 Complete an assessment of roadside vegetation along Wagon wheel Gap Road and complete necessary mitigation actions for maintaining clearances of trees from the road corridor. Roadside vegetation management is important for maintaining critical egress routes in the event of a fire and taking advantage of existing control features such as roads.
- RVM-05 Complete an assessment of roadside vegetation along Eldora Road and complete necessary mitigation actions for maintaining clearances of trees from the road corridor. Roadside vegetation management is important for maintaining critical egress routes in the event of a fire and taking advantage of existing control features such as roads.

Grassland Treatments

- GR-01 Consider implementing a grazing schedule for reducing grass fuel loading during the growing season. Consider creating grazing rotation units prioritizing areas close to structures. Livestock suitable for prescribed herbivory include goats, sheep, and cattle.
- GR-02 Parcel the proposed area into prescribed burning management blocks. Pair prescribed burning strategies with mowing and grazing methods near roads and structures.
- GR-03 Consider prescribed burning in conifer-to-grassland transitional areas. Consider the impacts of conifer encroachment and prescribed burning on native grassland ecosystems. Implement prescribed burning during favorable burning weather conditions and times of year.
- GR-04 Consider implementing a grazing schedule for reducing grass fuel loading during the growing season. Boulder County and City of Boulder lands can be good jurisdictions to complete prescribed burning during favorable burning weather conditions and times of year.
- GR-05 Mowing along existing control features such as roads can effectively increase the size of fuel breaks. Consider implementing grazing practices throughout the growing season.
- GR-06 Utilize the South Foothills Highway as a control feature for reducing the spread of grass fire from the west. Implement a grass fuel break through mowing. The mowing width should account for extreme flame lengths and rates of spread. Mowing intervals should be annual or biannual during high-growth years.
- GR-07 Utilize the South Foothills Highway as a control feature for reducing the spread of grass fire from the west. Implement a grass fuel break through mowing. The mowing width should account for extreme flame lengths and rates of spread. Mowing intervals should be annual or biannual during high-growth years.
- GR-08 Utilize Table Mesa Drive, Bear Canyon Trail, and the connecting two track service road as control features. Implement an annual or biannual mowing regime depending on vegetation growth. The mowing width should account for extreme flame lengths and rates of spread. The two track road oriented north to south should be a priority for mowing.
- GR-09 Utilize the North Foothills Highway as an existing control feature. Implement a biannual mowing regime along the western flank of the highway. The mowing width should account for extreme flame lengths and rates of spread.

Project ID

GR-10 Utilize Highway 93 and Coal Creek Canyon Drive as existing control features. Implement a biannual mowing regime along the western flank of the highway and northern and southern flanks of Coal Creek Canyon Drive. The mowing width should account for extreme flame lengths and rates of spread.

Single Tree Selection

STS-01 Maintain clearances of above ground power lines. Utilize transmission line rights-of-way (ROWs) as potential control features. Look for opportunities to harden transmission line ROWs to be used as strategic fuel breaks. Conduct regular assessments of hazard trees along transmission lines and branching power lines. Remove dead and diseased trees within double the length of striking distance to power lines.

STS-02

STS-03 Coordinate with utility companies regarding ROW assessments, vegetation removal, and hazard tree removal.

Fuel Break Continuation with Rights-of-Way and PODs

FB-01 Consider using the transmission line ROW as an existing control feature to anchor a wide fuel break leading to the west. The fuel break should be devoid of all fuels save short forbs and grasses. This fuel break will serve to limit the spread of low to moderate intensity wildfire traveling west to east from the higher elevation forested woodlands to lower elevation urban grasslands.

FB-02 Create a fuel break along the western flank of County Road 116 utilizing the existing USFS POD boundary and control features. The fuel break should be devoid of most fuels save short forbs and grasses. Any trees may impact the defensibility of the fuel break if they were to fall should be removed.

FB-03 Consider implementing a fuel break west of the Shanahan Hill community. The fuel break should be devoid of most trees and shrubs. Consider implementing a mowing regime along existing trails in the area to limit the rate of spread of wildfire. Anticipate wildfire being fueled by downslope high winds coming from the west. Pair the fuel break with defensible space treatments in the WUI.

FB-04 Utilize the Boulder Diversion Canal as a wildfire suppression control feature and improve effectiveness by implementing a fuel break on the western edge of the canal. This fuel break will serve to slow fire spread from wildland fuels into low country woodlands and grasslands west of communities. Anchor the fuel break into cliff bands, roads, and meadows.

FB-05 Consider implementing a fuel break west of Flagstaff Road and use the road as a control feature for limiting fire spread for wildfire traveling west to east out of the Gregory Creek drainage. Ensure no significant fuels are within the fuel break and that the fuel break is flush with the road where delineated and implemented.



COHESIVE STRATEGY GOAL 2: FIRE ADAPTED COMMUNITIES

In this CWPP, recommendations for fire-adapted communities include public education, outreach actions, and recommended methods to reduce structural ignitability.

RECOMMENDATIONS FOR PUBLIC EDUCATION AND OUTREACH

Table 4.4 provides a list of recommendations to increase public education and outreach and reduce structural ignitability that should be implemented throughout the City of Boulder CWPP planning area.

Actions on the landscape are only a partial solution to reducing wildfire hazard; public education is also critical for reducing human-caused ignitions and ensuring community members are aware of their role in

reducing structural ignitability and community wildfire resilience. Lack of knowledge, lack of positive actions (e.g., failing to create adequate defensible space), and negative actions (e.g., keeping leaf litter and exposed propane tanks close to structures) all contribute to increased risk of loss in the WUI.

There are a variety of strategies to effectively engage community members and move them to action. These include conducting wildfire home assessments, coordinating workshops and trainings to teach home hardening methods, implementing beneficial building and landscaping techniques, and hosting community cleanups. Individual and family preparedness is also a crucial aspect of planning. Properly educating the community on preparing for an event can reduce strain on response resources and help families efficiently and safely evacuate and respond during a wildfire.

The City of Boulder recognizes the need for well-informed fire-adapted communities and has therefore prioritized public engagement during the CWPP development process through public events, advertisements, and an online survey (Figure 4.7). See Appendix H for examples of public outreach efforts during the CWPP planning process. The City of Boulder has also hosted vital information found in this CWPP in an interactive online story map, which can be found here:

<https://bouldercolorado.gov/guide/community-wildfire-protection-plan-cwpp>.

RECOMMENDATIONS FOR FIRE-ADAPTED COMMUNITIES

Table 4.4 provides a list of community-based recommendations to reduce structural ignitability that should be implemented throughout the City of Boulder CWPP planning area. Reduction of structural ignitability depends largely on public education that provides homeowners the information they need to take responsibility for protecting their own properties. Recommendations for public education programs are also included in Table 4.4.

Carrying out fuels reduction treatments on public land may only be effective in reducing fire risk to some communities. If owners have not carried out mitigation on their own properties, the risk of home ignition and home-to-home spread remains high. A lack of attention on defensible space and home ignition places firefighter lives at risk when carrying out structural defense.

Studies have shown that burning vegetation at least 120 feet from a structure is unlikely to ignite the structure through radiant heat (Butler and Cohen 1996). However, embers that travel independently of the flaming front can ignite homes even if they were not impacted by direct flame impingement, see the Ember Ignition Hazards section in Chapter 3. Hardening the home to ignition from embers, including maintaining vent coverings and other openings, is also strongly advised to protect a home from igniting during a wildfire. Additionally, measures proven to protect against ember ignition include removing weeds and debris within a 30-foot radius of the structure and maintaining a clean roof and gutters.

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Table 4.4. Recommendations for Creating Fire-Adapted Communities (Public Education and Reducing Structural Ignitability)

Project ID	Status	Priority (H,M,L)	Timeline for Action	Project Description	Location	Land Ownership/ Lead Agency	Methodology/Approach	Serves To:	Monitoring/Maintenance Requirements	Funding Sources
		H	0–2 years	Build on existing public education efforts and programs to raise awareness of the mitigation actions being taken by the city. Develop outreach materials and programs where lacking.	Planning area	City of Boulder	Develop and implement a comprehensive public education campaign to inform residents about wildfire mitigation measures. - Utilize various communication channels including social media, community workshops, and informational materials, to reach a broad audience. - Clearly communicate the specific wildfire mitigation measures being implemented on both public and privately owned lands. - Highlight the benefits of various treatment methodologies, such as prescribed fire. Include discussions on the risks and drawbacks of treatments (e.g., smoke, ecological damage). - Emphasize the importance of creating defensible space, reducing fuel loads, and other best practices in the HIZ. Organize collaborative workshops and hands-on training sessions that bring together public and private landowners, Boulder Fire-Rescue, and relevant agencies to foster knowledge and experience sharing. - Balance technology-focused engagement options with low-tech options to involve citizens with varying levels of technology proficiency. Establish a citywide wildfire resilience collaborative group to ensure consistency in messaging, methodology, and programs. - Facilitate regular meetings involving key stakeholders, agencies, and community groups. - Integrate broader land management representatives to ensure cross-boundary consistency in messaging. - Develop and maintain consistent messaging and establish standardized methodologies. - Utilize existing resources when possible to ensure consistent messaging with state and national practices. - Encourage information sharing. Implement targeted public awareness initiatives near trailheads and recreation sites. - Install clear and informative signage at trailheads and recreation sites, detailing wildfire risk, prevention measures, and emergency procedures. - Distribute educational materials through various mediums, such as brochures, pamphlets, and websites.	Engage and inform the public on wildfire mitigation approaches and ongoing and planned efforts. Encourage community collaboration on wildfire mitigation efforts.	Conduct an annual review of outreach materials and methods. Schedule frequent check-ins amongst engagement specialists and community leaders to monitor progress and effectiveness. Conduct public surveys and analyze feedback.	- EPA Environmental Education Grants Program - CWDG (USFS) - Building Resilient Infrastructure and Communities (BRIC) grants - Wildfire Mitigation Incentives for Local Government (CSFS) - Wildfire Mitigation Resources & Best Practices (CSFS) - Boulder Climate Tax - Wildfire Mitigation Public Outreach grant (CSFS)

Project ID	Status	Priority (H,M,L)	Timeline for Action	Project Description	Location	Land Ownership/ Lead Agency	Methodology/Approach	Serves To:	Monitoring/Maintenance Requirements	Funding Sources
		H	0–2 years	Educate homeowners on home hardening and defensible space best practices	Planning area, high hazard residential areas	Boulder Fire-Rescue, Parks and Recreation, OSMP, private landowners	Strongly promote defensible space and utilize CSFS and national best practices as primary guidance for homeowners. - Consider and promote fuels pickup and disposal options to reduce fire hazards. - Provide examples for reducing structural ignitability using the HIZs and enacted WUI codes for homeowner education. - Educate homeowners on methods and resources available in the city to reduce their home's risk through defensible space improvements and structure hardening. Conduct detailed home and HIZ assessments. - Continue Boulder Fire-Rescue's detailed home assessment program, prioritizing highest risk areas in the planning area. - Consider neighborhood-level assessments to identify vulnerabilities. - Explore incentives for resident HIZ home hardening actions. - Consider incorporating HIZ components for existing home assessment programs within the region (e.g., Boulder Fire-Rescue's Curbside and Wildfire Home Assessment Project, Boulder Wildfire Partners) - Continue to partner with and explore other collaborative efforts to improve home assessment program (e.g. CSFS, CSU, other agencies).	Reduce structural ignitability. Provide residents with specific vulnerabilities and specific mitigation measures on their homes and properties. Reduce loss of life and structures through increased resident understanding and participation in defensible space and home hardening practices.	Evaluate the program annually and update as necessary. Track and record community participation, and identify effective outreach strategies. Track data from home assessments, including resident self-reporting, to monitor mitigation actions taken.	- Firewise grants (various agencies) - FP&S grants (FEMA) - EPA Environmental Education Grants Program - CWDG (USFS) - BRIC grants (FEMA) - Wildfire Mitigation Incentives for Local Government (CSFS) - Wildfire Mitigation Resources & Best Practices (CSFS)
		H	0–2 years	Enhance emergency notification capabilities.	Planning area	City of Boulder, Boulder ODM	Establish a multi-faceted communication approach that includes traditional methods (e.g., sirens and public announcements) and modern technology (e.g., text messages and mobile apps). Prioritize redundancy in communication channels to ensure messages reach residents through various means. - Conduct regular public awareness campaigns to educate homeowners on emergency notification while conducting wildfire home assessments and at other opportunities. - Provide resources and training to enhance community members' familiarity with emergency response protocols. - Recognize the limitations of technology in mountainous or rural areas and explore alternative communication methods. - Coordinate with Boulder ODM and the sheriff's office to ensure effective notifications. - Increase use of the ReachWell app for community members whose primary language is not English.	Create a robust and inclusive emergency notification system that caters to the specific needs of all residents. Increase participation in the opt-in notification system. Ensure notifications can be effective for Spanish and other non-English speakers.	Evaluate and refine emergency notification plans based on feedback from residents and lessons learned during exercises. Conduct annual assessment and review.	- Firewise grants (various agencies) - FP&S grants (FEMA) - EPA Environmental Education Grants Program - CWDG (USFS) - BRIC grants (FEMA) - Wildfire Mitigation Incentives for Local Government (CSFS) - Wildfire Mitigation Resources & Best Practices (CSFS)

Project ID	Status	Priority (H,M,L)	Timeline for Action	Project Description	Location	Land Ownership/ Lead Agency	Methodology/Approach	Serves To:	Monitoring/Maintenance Requirements	Funding Sources
		M	2+ years	Improve evacuation protocol education and outreach to the public.	Planning area	Boulder ODM; federal, state, and local agencies; Boulder Police Department	Set up meetings and events at the community level tailored to the evacuation and emergency service protocols for each community throughout the city. - Develop engaging and interactive training modules. - Collaborate with local authorities, emergency management agencies, and educational institutions. - Utilize a variety of instructional methods (e.g., video tutorials, in-person activities). - Implement a comprehensive evaluation system to assess the effectiveness of training materials (e.g., volunteer quizzes and surveys). - Regularly update the educational materials as protocols change. Enhance public awareness of evacuation protocols across jurisdictions. - Develop and distribute public education and outreach materials concerning evacuation zones, routes, and best practices. - Make available checklists and preparation guides for evacuation. - Encourage the storage and development of grab lists/go-bags in easily accessible locations, such as near exit points, to ensure a quick evacuation. - Utilize common information resources to spread information on evacuation best practices and routes such as the City of Boulder website, social media, news (local newspaper, TV and radio), Nextdoor, X (formerly Twitter), and others. - Consider measures that need to be taken for socially vulnerable populations. Make specific evacuation recommendations for various population groups (earlier departure time, earlier notification, etc.) and develop reference materials for socially vulnerable groups to utilize when planning. - Engage HOAs and neighborhoods in community-specific education. - Familiarize the public with FEMA's Integrated Public Alert and Warning System (IPAWS). - Explore opportunities to enhance the reverse 911 system.	Ensure public and first responder safety in the event of a wildfire or other emergency.	Develop and distribute a survey to understand and adapt best practices for communication and teaching. Assess and adapt methodologies and current information annually to ensure information is up to date. Review lessons learned on an annual basis.	- BRIC grants (FEMA) - Community Wildfire Defense Grant (USFS) - FP&S grants (FEMA) - Wildfire Mitigation Incentive for Local Government (CSFS) - Firewise grants (various agencies)
		M	2–5 years	Conduct detailed HIZ assessments to advise on methods to reduce structural ignitability.	Planning area	City of Boulder	Encourage detailed HIZ assessments for every property within the community, with an emphasis on areas identified as high wildfire hazard risk. - Use NFPA 1144 protocol or other industry standard for assessment criteria, focusing on providing specific recommendations to reduce structural ignitability. - Collaborate with other practitioners and experts to continuously improve assessment effectiveness. - When possible, utilize existing programs to reach a wider range or residents by removing barriers to participation and expanding access (e.g., Boulder Fire-Rescue's Curbside and Wildfire Home Assessment Project, Boulder Wildfire Partners). - Explore incentives for resident HIZ action/home hardening actions. - Explore additional staff capacity to coordinate and conduct home assessments.	Provide homeowners with specific recommendations to reduce structural ignitability. Reduce loss of life and structures through increased resident understanding and participation in defensible space and home hardening. Empower individual homeowners to take action to reduce wildfire risk by providing specific recommendations.	Tracking the number of assessments conducted and the adoption of mitigation measures by homeowners. Perform regular surveys to evaluate continued participation in mitigation practices.	- BRIC grants (FEMA) - Community Wildfire Defense Grant (USFS) - FP&S grants (FEMA) - Wildfire Mitigation Incentive for Local Government (CSFS) - Firewise grants (various agencies)

Project ID	Status	Priority (H,M,L)	Timeline for Action	Project Description	Location	Land Ownership/ Lead Agency	Methodology/Approach	Serves To:	Monitoring/Maintenance Requirements	Funding Sources
		M	2–5 years	Establish a community-based leadership program such as the FAC Neighborhood Ambassador Program.	Planning area	City of Boulder, BWC, Boulder County Wildfire Partners, Boulder ODM	Develop a structured community-based leadership program, such as the FAC Neighborhood Ambassador Program, - Encourage active participation of residents, homeowners, agencies, and other stakeholders. - Provide neighborhood leaders with comprehensive training and resources for mobilizing their communities. - Organize regular meetings, workshops, drills, and neighborhood-wide projects, Increase staff capacity to manage a community leadership program, Collaborate with Boulder County Wildfire Partners, Boulder ODM, and nonprofit partners such as BWC on leadership and implementation. Build on or use the ODM Train-the-Trainer program as a springboard for continued community-based programs	Reduce risk on a neighborhood or community scale by empowering residents to organize and collaborate. Build relationships between community members and between communities and the City of Boulder. Reduce structural ignitability.	Conduct regular assessments to evaluate effectiveness. Establish metrics for measuring the program's impact (e.g., number of neighborhoods involved, level of community engagement, documented reductions in wildfire risk). Participate in statewide ambassador community of practice to stay aligned with best practices.	- EPA Environmental Education Grants Program - CWDG (USFS) - BRIC grants (FEMA) - Action, Implementation, & Mitigation Grant (COCO) - Wildfire Mitigation Incentives for Local Government (CSFS) - Wildfire Mitigation Resources & Best Practices (CSFS) - Boulder Climate Tax
		M	2–5 years	Create additional City of Boulder positions to assist with wildfire grant program creation, project evaluation, and CWPP project completion.	Planning area	City of Boulder	Allocate resources to establish staffed positions focused on researching, identifying, and applying for relevant grants to secure financial and further staffing support for wildfire prevention and mitigation initiatives. - Create a position responsible for evaluating the impact and efficacy of ongoing CWPP projects. - Facilitate collaboration between relevant stakeholders, including community members, governmental agencies, and non-profit organizations. - Implement campaigns to raise awareness about CWPP projects implementation. Provide training for individuals in the newly created positions to enhance their expertise in grant writing, project evaluation, and community engagement. Collaborate with the Northern Colorado Fireshed Collaborative, Boulder County Fireshed Group, and other relevant groups to identify opportunities for funding and hiring.	Strengthen the City of Boulder's capacity to secure funding, assess project effectiveness, and ensure the successful completion of CWPP projects.	Implement a standardized evaluation framework to assess the effectiveness of projects and identify areas for improvement. Identify and communicate lessons learned from projects. Conduct frequent assessments of future needs. Continually monitor grant status.	- EPA Environmental Education Grants Program - CWDG (USFS) - BRIC grants (FEMA) - Wildfire Mitigation Incentives for Local Government (CSFS) - Wildfire Mitigation Resources & Best Practices (CSFS) - Boulder Climate Tax
		M	2–5 years	Explore the adoption and enforcement of defensible space and building codes.	Planning area	City of Boulder	Collaborate with local building departments and fire agencies to review and, if necessary, update building codes to incorporate effective wildfire-resistant construction standards and best defensible space practices. - Integrate clear and enforceable defensible space requirements. - Utilize the international WUI code. - Conduct public outreach campaigns and provide educational materials on code requirements. - Strengthen code enforcement mechanisms to ensure adherence. - Increase staff capacity to perform inspections, provide education and enforce code. - Offer technical assistance and support to builders, architects, and property owners.	Increase community resilience to wildfires, reduce structure ignitability, and enhance overall safety in the WUI. Reduce suppression costs and risk to residents and first responders. Reduce risk of urban conflagration and damage or destruction of infrastructure and other values at risk.	Establish a process for regular reviews and updates of local building codes to reflect advancements in fire science, construction technology, and best practices. Involve relevant stakeholders, including fire professionals, in the code revision process to ensure comprehensive and up-to-date standards.	- EPA Environmental Education Grants Program - CWDG (USFS) - BRIC grants (FEMA) - Wildfire Mitigation Incentives for Local Government (CSFS) - Wildfire Mitigation Resources & Best Practices (CSFS) - Boulder Climate Tax

Project ID	Status	Priority (H,M,L)	Timeline for Action	Project Description	Location	Land Ownership/ Lead Agency	Methodology/Approach	Serves To:	Monitoring/Maintenance Requirements	Funding Sources
		M	1–3 years	Create smoke-ready communities through facilitating smoke education and providing educational resources.	Planning area	City of Boulder, ODM	Identify smoke-prone regions and socioeconomically disadvantaged communities that are most vulnerable to impacts of smoke. Provide resources (e.g., air cleaners, filtration systems) to vulnerable and at-risk communities. Disseminate educational information through various channels, including: • Social media • Public events • In-person training and workshops • School curriculum integration Utilize existing resources, such as the Smoke Ready Colorado program created by Fire Adapted Colorado and BLM Colorado. Consider additional staff capacity to perform these tasks.	Provide the community with knowledge and strategies to reduce health impacts associated with smoke from wildfires and prescribed fire.	Conduct annual program evaluation and updates as necessary. Conduct an annual lessons learned review.	• Firewise grants (various agencies) • FP&S grants (FEMA) • EPA Environmental Education Grants Program • CWDG (USFS) • BRIC grants (FEMA) • Wildfire Mitigation Incentives for Local Government (CSFS) • Wildfire Mitigation Resources & Best Practices (CSFS)
		M	0–5 years	Partner with volunteer groups and establish a city volunteer program to assist with home hardening and defensible space efforts.	Planning area	City of Boulder	Solicit participation from resident volunteers and volunteer groups to conduct wildfire mitigation efforts (e.g., cleaning gutters, removing dead leaves and needles, limbing trees, screening vents). • Identify and obtain needed equipment and support for mitigation efforts. • Coordinate with local volunteer groups and non-profits for labor assistance and methodology. Assist elderly, disabled, and low-income residents in improving defensible space and home susceptibility. • Identify priority populations and areas for volunteer efforts.	Improve defensible space and home ignition susceptibility. Provide support to vulnerable communities.	Conduct an annual program evaluation and update as necessary.	• Firewise grants (various agencies) • FP&S grants (FEMA) • EPA Environmental Education Grants Program • CWDG (USFS) • BRIC grants (FEMA) • Wildfire Mitigation Incentives for Local Government (CSFS) • Wildfire Mitigation Resources & Best Practices (CSFS) • Action, Implementation, & Mitigation Grant (COCO)
		M	0–5 years	Coordinate with HOAs to facilitate education and outreach events at the neighborhood or community level.	Planning area	City of Boulder, ODM, City HOAs	Identify HOAs located in high-risk areas of the city. Coordinate engagement and home assessment efforts with HOA managers. • Facilitate community education days and home assessments with participation and support from HOAs. Provide existing defensible space and home hardening checklists and resources to HOA managers and other community leaders for broader dissemination.	Increase emergency preparedness. Increase participation in emergency notification system. Facilitate defensible space and home hardening improvements.	Conduct an annual evaluation of HOAs engaged/events held.	• Action, Implementation, & Mitigation Grant (COCO) • EPA Environmental Education Grants Program • CWDG (USFS) • BRIC grants (FEMA) • Wildfire Mitigation Incentives for Local Government (CSFS)

Project ID	Status	Priority (H,M,L)	Timeline for Action	Project Description	Location	Land Ownership/ Lead Agency	Methodology/Approach	Serves To:	Monitoring/Maintenance Requirements	Funding Sources
		M	0-5 years	Implement home hardening, defensible space, and fire resilient landscaping skills training. Facilitate workshops and trainings focused on defensible space, home hardening, and resilient landscaping methods. House videos, guides, and other resources on the City of Boulder website or similar source.	Planning area	City of Boulder, ODM, CSFS	Provide training, knowledge and skills workshops to teach residents about proper defensible space improvements and home hardening actions. - Utilize how-to videos with instructions on home hardening practices and implementation methods. - Provide hands-on training and demonstration to homeowners and contractors. - Create a City-"approved" list of contractors to complete home hardening and HIZ projects. - Create a City-"approved" list of home hardening materials based on NFPA and IBHS. Provide trainings and resources for homeowners and residents regarding wildfire-resilient landscaping practices. - Utilize existing guides and training videos for in-person training. - Develop an area-specific planting guide. - Disseminate resources through the City of Boulder website and other trusted outlets. - Partner with local landscapers and fire resilience experts for demonstrations and material development. - Create demonstrations garden on City of Boulder-owned property.	Reduce structural ignitability. Provide instruction and skills to complete home hardening.	Conduct annual evaluations of trainings completed.	- Action, Implementation, & Mitigation Grant (COCO) - EPA Environmental Education Grants Program - CWDG (USFS) - BRIC grants (FEMA) - Wildfire Mitigation Incentives for Local Government (CSFS)

Table 4.5 is a list of practical options that homeowners can take to reduce the structural ignitability of their homes and properties and contribute toward their community's wildfire resilience. The price of these actions may vary, and homeowners should take action to implement recommendations at a level consistent with their abilities.

Table 4.5. Homeowner Actions for Reducing Structural Ignitability

Limited Investment*
Regularly check fire extinguishers and have a 100-foot hose available to wet perimeter of home.
Maintain defensible space around home. Collaborate with neighbors to provide adequate fuels mitigation in the event of overlapping property boundaries.
Ensure that house numbers are easily readable from the street.
Keep wooden perimeter fences free of combustible materials. If possible, non-combustible material should link the house and fence.
Store combustible materials (propane, grills, firewood) away from the house.
Remove flammable material from around propane tanks.
Maintain a 5-foot perimeter around homes clear of any combustible materials.
Clear out materials from under decks and near structures. Enclose area underneath deck when feasible.
Stack firewood at least 30 feet from homes.
Prioritize your workload by considering local weather conditions. First, consider mitigating hazards on the side of your property that faces the prevailing wind direction. Then work around to cover the whole property.
Keep gutters free of combustible material. Gutters can act as collection points for embers.
Maintain roofs by installing flashing, fixing holes, replacing shingles, and closing gaps.
Purchase or use a NOAA weather alert radio to hear fire weather announcements.
Moderate Investment*
When landscaping in the HIZ (approximately 30 feet around the property), select non-combustible plants, lawn furniture, and landscaping material. Combustible plant material like junipers and ornamental conifers should be pruned and kept away from siding with regular maintenance. If possible, trees should be planted in groups and no closer than 10 feet to the house. Tree crowns should have a spacing of at least 18 feet when within the HIZ. Vegetation at the greatest distance from the structure and closest to wildland fuels should be carefully trimmed and pruned to reduce ladder fuels, and density should be reduced with approximately 6-foot spacing between trees and crowns. For additional defensible space and landscaping guidance, see Appendix E.
Work on mitigating hazards on adjoining structures like sheds, garages, barns, etc. These can act as ignition points to your home.
Clear and thin vegetation along driveways and access roads so they can act as safe evacuation routes and allow emergency responders access to the home.
Construct a gravel turnaround in your driveway to improve access and mobilization of fire responders.
Install a roof irrigation system.

High Investment*

Install an environmentally friendly and fire-resistant xeriscape yard.

Install screen vents with non-combustible meshing. Mesh openings should not exceed nominal 1/8 - 1/16 inch size.

Enclose open space underneath permanently located manufactured homes using non-combustible skirting

Construct a non-combustible wall or barrier between your property and wildland fuels. This could be particularly effective at mitigating the effect of radiant heat and fire spread where 30 feet of defensible space is not available around the structure.

Install fire-resistant soffits and under eave vents to protect your home from heat and embers that can be trapped beneath roof overhangs.

Replace exterior windows and skylights with tempered glass or multilayered glazed panels.

Update your roof to a non-combustible construction. Look for materials that have been treated and given a fire-resistant roof classification of Class A.

Upgrade exterior walls with fire-resistant materials.

Relocate propane tanks underground.

Sources: Headwaters Economics, HomeAdvisor, HomeServe, HomeGuide, bobvila.

*Disclaimer: Level of investment and average costs will vary by action item based on a multitude of factors including location, structure complexity, quality of materials, local building codes and regulations, as well as preferences and scope of work.



COHESIVE STRATEGY GOAL 3: SAFE, EFFECTIVE, RISK-BASED, WILDFIRE RESPONSE

Goal 3 of the Cohesive Strategy/Western Regional Action Plan is Wildfire Response: All jurisdictions participate in making and implementing safe, effective, efficient risk-based wildfire management decisions:

A balanced wildfire response requires integrated pre-fire planning with effective, efficient, and coordinated emergency response. Pre-fire planning helps tailor responses to wildfires across jurisdictions and landscape units that have different uses and management objectives. Improved prediction and understanding of weather, burning conditions, and various contingencies during wildfire events can improve firefighting effectiveness, thereby reducing losses and minimizing risks to firefighter and public health and safety. Wildfire response capability will consider the responsibilities identified in the Federal Response Framework. Local fire districts and municipalities with statutory responsibility for wildland fire response are not fully represented throughout the existing wildland fire governance structure, particularly at the NWCG, NMAC, and GACC levels (WRSC 2013:15).

This section provides recommended actions that various agencies as well as the public could implement to support safe, effective wildfire response (Table 4.6). Recent wildfires in and around the city, such as the Marshall Fire, underscore the importance of safe and effective wildfire response, and highlight the multifaceted challenges in responding to wildfire in WUI and urban areas. This intricate issue requires cooperation and collaborative efforts between various levels of government, response agencies, and the public.

Often during wildfire incidents, resources are stretched thin due to limited personnel. Increased community preparedness through education is a key factor in supporting local fire departments, in particular education regarding emergency notifications and evacuation protocols.

Please visit the City's [wildfire preparedness guide](https://boulderodm.gov/preparedness/reachwell/) for more information. You can sign up for emergency alerts at <https://www.bocoalert.org>, or access alerts without signing up by using the ReachWell app, which provides alert information in more than 100 languages. To learn more, visit <https://boulderodm.gov/preparedness/reachwell/>

For more information on Boulder Fire-Rescue, visit their website here: <https://bouldercolorado.gov/government/departments/fire-rescue>.

RECOMMENDATIONS FOR SAFE AND EFFECTIVE FIRE RESPONSE

Table 4.6. Recommendations for Safe and Effective Wildfire Response

Project ID	Status	Priority (H, M, L)	Timeline for Action	Project Description	Location	Land Ownership/ Lead Agency	Methodology/Approach	Serves To:	Monitoring/Maintenance Requirements	Funding Sources
		H	0–2 years	Enhance emergency response and coordination during wildfire events through the integration of dispatch centers.	Planning area	City of Boulder, Boulder Regional Emergency Telephone Service Authority (BRETSA)	Implement and upgrade communication systems that facilitate seamless information exchange and ensure compatibility of communication technologies to critical information sharing. • Create seamless updates and information sharing between City of Boulder and Boulder County dispatch systems. • Establish clear and standardized protocols. • Conduct regular joint training exercises for dispatch personnel. • Implement a unified incident tracking system to monitor resource allocation and staffing availability. • Integrate up-to-date geospatial technology to make informed decisions. • Ensure solid understanding among response coordinators of local resources and capabilities. • Conduct public education campaigns to raise awareness about the role of dispatch centers in wildfire response. Develop interoperability between Boulder County and City of Boulder Dispatch centers. Utilize 800 and VHF radios. Explore and establish agreements with neighboring jurisdictions, private entities, or specialized firefighting agencies to supplement staffing and resources during constraint periods.	Strengthen the City of Boulder’s dispatch center integration, resulting in a more coordinated, efficient, and effective response to wildfire incidents. Improve communication between Boulder County and City of Boulder dispatch during wildland fire incidents. Enhance emergency response and coordination during wildfire (and other emergency) events.	Conduct a routine evaluation process to assess the effectiveness of dispatch center integration measures. Use feedback from wildfire incidents to continuously improve coordination.	• Emergency Management Performance Grant (EMPG) (FEMA) • Regional Catastrophic Preparedness (RCP) grants (FEMA) • Building Resilient Infrastructure and Communities (BRIC) grants (FEMA) • Firewise grants (various agencies) • Forest Restoration & Wildfire Risk Mitigation (CSFS) • Wildfire Mitigation Incentives for Local Government (CSFS) • Wildfire Mitigation Resources & Best Practices (CSFS)

Project ID	Status	Priority (H, M, L)	Timeline for Action	Project Description	Location	Land Ownership/ Lead Agency	Methodology/Approach	Serves To:	Monitoring/Maintenance Requirements	Funding Sources
		H	0–2 years	Create a tactical and operational fire response and suppression plan, with a focus on wildland fire escalations into urban conflagration.	Planning area	City of Boulder, Front Range FPDs, Boulder ODM, BCSO	Establish a formalized interagency coordination framework involving local fire departments, emergency services, and relevant governmental bodies, with a focus on the City of Boulder and Front Range FPDs. - Develop comprehensive tactical and operational interagency standard operating procedures. - Facilitate regular joint training exercises to ensure seamless integration of resources and personnel. - Identify weaknesses and strengthen mutual aid agreements with neighboring jurisdictions and FPDs to ensure a rapid and coordinated response. - Evaluate and establish shared response goals and responsibilities between entities (e.g., BCSO and City of Boulder Wildland Division). Design a suppression and control protocol that utilizes predetermined control features (e.g., grasslands firebreaks and fuel breaks) to strategically manage and contain wildfires. Provide land managers with a formal process for developing landscape-scale wildfire response options in wildland areas before fires start (similar to PODs). - Define spatial units and summarize relevant information and local knowledge on fuel conditions, ecology, and fire behavior potential. - Facilitate collaborative pre-planning and address potential cross-boundary issues. Coordinate with Boulder County and local response partners to create consistent map products to be made available to local response agencies and to be shared with non-local resources.	Improve preparedness and capacity for local FPDs to respond to and slow the spread of WUI fires.	Conduct a routine evaluation process to assess the effectiveness of the response and suppression integration measures. Use feedback from wildfire incidents to continuously improve coordination.	- EMPG (FEMA) - RCP grants (FEMA) - BRIC grants (FEMA) - Assistance to Firefighters Grant (FEMA) - Northern Colorado Fireshed Fund (NFF) - Council of Western State Foresters WUI Program (USFS) - Forest Restoration & Wildfire Risk Mitigation (CSFS) - Wildfire Mitigation Incentives for Local Government (CSFS) - Wildfire Mitigation Resources & Best Practices (CSFS)
		H	1–3 years	Address staffing limitations within the City of Boulder's wildfire division	Planning area	City of Boulder	Conduct a comprehensive assessment of the current staffing levels and allocate resources strategically, ensuring that staffing levels are a proper reflection of the scale of wildfire risk and current wildfire season. - Explore and establish collaborative partnerships with neighboring jurisdictions, firefighting agencies, and relevant private entities. - Invest in ongoing training programs for wildfire division staff, focusing on building specialized skills in regional risk factors. - Provide training, equipment, and resources to community volunteers.	Improve local ability and self-reliance of the City of Boulder to address its wildfire concerns, effectively leaning on partnerships where necessary. Reduce risk of loss of life and property from wildfire Provide career growth opportunities for personnel and support succession planning.	Establish a regular review process to assess the effectiveness of staffing solutions and wildfire management strategies. Adapt staffing levels and approaches based on evolving wildfire risk assessments, community changes, and changing risk conditions.	- EMPG (FEMA) - RCP grants (FEMA) - BRIC grants (FEMA) - Firewise grants (various agencies) - Forest Restoration & Wildfire Risk Mitigation (CSFS) - Wildfire Mitigation Incentives for Local Government (CSFS) - Wildfire Mitigation Resources & Best Practices (CSFS)

Project ID	Status	Priority (H, M, L)	Timeline for Action	Project Description	Location	Land Ownership/ Lead Agency	Methodology/Approach	Serves To:	Monitoring/Maintenance Requirements	Funding Sources
		M	0-2 years	Encourage relevant City of Boulder Departments to develop plans and procedures for activating Departmental Operations Centers.	Planning area	City of Boulder, Boulder ODM	Partner with the Boulder ODM to ensure that City of Boulder departments that have an important role related to wildfire response develop plans that describe priorities and procedures when a wildfire occurs. - Allow City departments to activate Departmental Operations Centers to lead and coordinate essential tasks to support incident management objectives. - Interface successfully with the Emergency Operations Center and local policy groups.	Improve communication and coordination across a variety of City departments and local stakeholders when these organizations are supporting incident objectives, providing strategic direction to incident managers, or dealing with wildfire impacts or consequences.	Conduct routine interdepartmental or interorganizational trainings and scenarios to ensure that plans for Departmental Operations Centers interface effectively with Incident Command and the Emergency Operations Center.	Departmental budget
		H	0–2 years	Secure annual funding for the Boulder Wildland Fire Incident Management Type 3 Team.	Planning area	City of Boulder, Boulder County	Prepare a grant proposal and establish a dedicated annual funding allocation for the Boulder Wildland Fire Incident Management Type 3 Team. - Ensure that this funding encompasses all operational needs. - Clearly articulate how the team's activities contribute to climate resilience, community safety, and overall wildfire risk reduction. - Align the budget for the Type 3 Team with the specific criteria and objectives outlined by the Climate Tax and 1B funding initiatives.	Ensure sustained financial support for the Boulder Wildland Fire Incident Management. Contribute to the overall wildfire resilience of the community.	Establish a mechanism for regular review and adjustment of the Type 3 Team's budget based on evolving needs, technological advancements, and changes in training requirements	Boulder County Wildfire Mitigation Tax
		M	1–5 years	Address the impacts of extreme wind on wildfire behavior and emergency response capabilities.	Planning area	City of Boulder, Boulder ODM, academic institutions	Implement a multi-pronged approach to mitigate the effect of extreme wind on wildfire response and improve containment efforts during wind events. - Continue to integrate weather data and wind forecasting into the response plan. - Work closely with National Weather Service Boulder office for wind and weather forecasts. - Utilize wind modeling programs, i.e., Wind Ninja. - Utilize satellite imaging, drones, and remote sensors for early detection and monitoring. - Research wildfire early-detection sensor technologies and potential for integration. - Implement fuel treatments and fuel breaks aimed at reducing spread under high wind conditions. - Train and equip firefighting personnel to respond to wind-driven wildfire incidents rapidly. - Establish efficient communication channels between fire response entities.	Enhance wildfire response capabilities and reduce extreme wind impacts. Enhance life safety and emergency notification protocols.	Train and educate all staff. Assess annual effectiveness.	- Firewise grants (various agencies) - National Urban and Community Forest Program (USFS) - Forest Restoration & Wildfire Risk Mitigation (CSFS) - Wildfire Mitigation Incentives for Local Government (CSFS) - Wildfire Mitigation Resources & Best Practices (CSFS)

Project ID	Status	Priority (H, M, L)	Timeline for Action	Project Description	Location	Land Ownership/ Lead Agency	Methodology/Approach	Serves To:	Monitoring/Maintenance Requirements	Funding Sources
		M	0–5 years	Implement and continue to update the Structure Protection Plan.	Planning area	City of Boulder, , Boulder County Community Planning & Permitting Department	Conduct a thorough assessment to identify areas with higher wildfire risk (e.g., wildland areas, complex topography, historical fire behavior) and prioritize structures within those zones for targeted protection efforts. - Outline strategic approach and provide residents, architects, and planners with the resources necessary to support preparedness and construction efforts. - Carry out community-wide initiatives to ensure consistent application of protection efforts. - Foster collaboration with local experts to coordinate best practices and protocols to inform the plan. - Consider use of “Expected Risk to Structures” dataset that was employed in the development of this CWPP. - Ensure local mutual aid resources have access to the structure protection plan.	Enhance ease of response associated with structural fire hazards. Protect life and property.	Establish a schedule for regular updates and reviews of the Structure Protection Plan.	- EMPG (FEMA) - RCP grants (FEMA) - BRIC grants (FEMA) - Firewise grants (various agencies) - Forest Restoration & Wildfire Risk Mitigation (CSFS) - Wildfire Mitigation Incentives for Local Government (CSFS) - Wildfire Mitigation Resources & Best Practices (CSFS)
		M	1–3 years	Conduct a comprehensive review of trails, roads, and undesignated routes within the planning area with the goal of improving response access, evacuation, and effective management.	Planning area	City of Boulder and OSMP	Assess existing trails, roads, and undesignated routes to identify opportunities for improvements or infrastructure enhancements that can aid in navigation, evacuation, and wildfire response. - Define clear maintenance and management objectives. - Engage with the local community to gather input. - Collaborate with local emergency services to ensure that identified evacuation routes align with their operational needs. - Utilize GIS mapping technology to create detailed maps of evacuation routes and emergency access points. - Assess the environmental impact of any proposed enhancements and explore mitigative options.	Proactively enhance evacuation routes and emergency access, contributing to overall community safety and resilience in the face of wildfire threats.	Establish a regular maintenance schedule to address issues related to trail erosion, vegetation encroachment, and other factors.	- EMPG (FEMA) - RCP grants (FEMA) - BRIC grants (FEMA) - Firewise grants (various agencies) - Forest Restoration & Wildfire Risk Mitigation (CSFS) - Wildfire Mitigation Incentives for Local Government (CSFS) - Great Outdoors Colorado Planning and Capacity Grants - Colorado Parks & Wildlife Non-motorized Trails Grant - Wildfire Mitigation Resources & Best Practices (CSFS)

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DRAFT



Developing an action plan and an assessment strategy that identifies roles and responsibilities, funding needs, and timetables for completing highest-priority projects is an important step in organizing the implementation of the City of Boulder CWPP. The previous chapter identifies tentative timelines and monitoring protocols for project recommendations, the details of which are outlined below. Included below is the description of the 2024 City of Boulder CWPP project tracking system. This system serves as a unified, multi-agency tool for local land managers, facilitating the tracking of project progress for planned and executed initiatives. It offers quick stats on metrics like acres treated or expenditures, and a summary dashboard accessible to community members showcases wildfire mitigation efforts in the city.

City of Boulder representatives and land managers should use the project tracker to enter all relevant metrics related to completed actions, as well to monitor progress on recommendations. Individual project metrics will vary based on the Cohesive Strategy goal. This will allow the City of Boulder to view accomplishments as they relate to the timelines suggested in the recommendations. The City of Boulder is not required to implement any recommended project; recommendations were collaboratively developed to meet the current needs and risk in the planning area.

All stakeholders and signatories to this CWPP desire worthwhile outcomes. It is also known that risk reduction work on the ground, for the most part, is often not attainable in a few months—or even years. The amount of money and effort invested in implementing a plan such as this requires that there be a means to describe, quantitatively and/or qualitatively, if the goals and objectives expressed in this plan are being accomplished according to expectations.

Monitoring and reporting contribute to the long-term evaluation of changes in ecosystems, as well as the knowledge base about how natural resource management decisions affect both the environment and the people who live in it. Although the HFRA does not include specified requirements for CWPP project tracking, it is important that project outcomes are monitored and evaluated as a regular practice. Furthermore, as the CWPP evolves over time, there may be a need to track changes in policy, requirements, stakeholder changes, and levels of preparedness. These can be significant for any future revisions and/or addendums to the CWPP.

It is recommended that project monitoring be a collaborative effort. There are many resources for designing and implementing community-based, multi-party monitoring that could support and further inform a basic monitoring program for the CWPP (Egan 2013). Multi-party monitoring involves a diverse group consisting of community members, community-based groups, regional and national interest groups, and public agencies. Using this multi-party approach increases community understanding of the effects of restoration efforts and trust among restoration partners. Multi-party monitoring may be more time consuming due to the collaborative nature of the work; therefore, a clear and concise monitoring plan must be developed. Table 5.1 Identifies monitoring strategies for various aspects of all categories of CWPP recommendations and the effects of their implementation, both quantifiable and non-quantifiable, for assessing the progress of the CWPP and increase sustainability of projects. It must be emphasized that these strategies are 1) not exhaustive and 2) dependent on available funds and personnel to implement them.

Table 5.1. Recommended Monitoring Strategies

Strategy	Task/Tool	Lead	Remarks
Project tracking system	Online web app (LINK COMING JUNE 2024) to track hazardous fuels projects spatially, integrating wildfire risk layer to show progress toward wildfire hazard and risk reduction. Web app includes attribute tables that outline project details. Tracker will be developed in coordination with Boulder County.	City	Interactive tool is easily updated and identifies areas that require additional efforts, update monthly if possible
Photographic record (documents pre- and post-fuels reduction work, evacuation routes, workshops, classes, field trips, changes in open space, treatment type, etc.)	Establish field GPS location; photo points of cardinal directions; keep photos protected in archival location.	Core Team member	Moderate cost, repeatable over time; used for programs and tracking objectives
Number and acres of home ignition zones/defensible space treated to reduce fuels Number and cost of home treatments to reduce ignitability	GPS – This can be monitored within the project tracking system	Homeowner	Fuels reduction Structure protection
Number of residents/citizens participating in any CWPP projects and events	Meetings, media interviews, articles	Core Team member	Evaluate culture change objective Annual lessons learned review encouraged among stakeholders
Number of homeowner contacts (brochures, flyers, posters, etc.)	Visits, phone	Core Team member	Evaluate objective Annual lessons learned review encouraged among stakeholders
Number of jobs created, contracts, grants Project tracking system	Core Team member	Evaluate local job growth	

Strategy	Task/Tool	Lead	Remarks
Education outreach: number, kinds of involvement	Workshops, classes, field trips, signage; project tracking system, number of property assessments complete	Core Team member, Boulder Community Connectors Program	Evaluate objectives Annual lessons learned review encouraged among stakeholders
Fire Response: changes in agency response capacity	Collaboration, grants to fund fire department needs such as new personnel and equipment	Agency representative	Evaluate mutual aid Annual review
Codes and policy changes affecting CWPP	Qualitative	Core Team	CWPP changes
Number of stakeholders Number of Firewise communities and % of all City neighbors	Added or dropped	Core Team	CWPP changes
Wildfire acres burned, human injuries/fatalities, infrastructure loss, environmental damage, suppression, and rehabilitation costs	Wildfire records	FPDs	Compare with 5- or 10-year average

FUELS TREATMENT MONITORING

It is important to evaluate whether fuel treatments have accomplished their defined objectives and whether any unexpected outcomes have occurred.

The strategies outlined in this section consider several variables:

- Do the priorities identified for treatment reflect the goals stated in the plan? Monitoring protocols can help address this question.
- Can there be ecological consequences associated with fuels work? Items to consider include soil movement and/or invasive species encroachment post-treatment. Relatively cost-effective monitoring may help reduce long-term costs and consequences.
- Vegetation will grow back. Thus, fuel break maintenance and fuels modification both in the HIZ and at the landscape scale require periodic assessment. Monitoring these changes can help decision-makers identify appropriate treatment intervals.
- Monitoring for all types of fuels treatment is recommended. For example, in addition to monitoring mechanical treatments, it is important to carry out comprehensive monitoring of burned areas to establish the success of pre-fire fuels reduction treatments on fire behavior, as well as monitoring for ecological impacts, repercussions of burning on wildlife, and effects on soil chemistry and physics. Adaptive management is a term that refers to adjusting future management based on the effects of past management. Monitoring is required to gather the information necessary to inform future management decisions. Economic and legal questions may also be addressed through monitoring. In addition, monitoring activities can provide valuable educational opportunities for students.

- When possible, other relevant plans should be used as guidance for monitoring protocols, especially when projects overlap other planning objectives. Plans relevant to monitoring protocols include the Forest Ecosystem Management Plan, Grassland Ecosystem Management Plan, Source Water Protection Plan, and area management plans.
- Local and regional partner agencies and organizations should be teamed with and relied on to support monitoring efforts.

The monitoring of each fuel reduction project would be site-specific, and decisions regarding the timeline for monitoring and the type of monitoring to be used would be determined by project. Monitoring schedules will be developed utilizing knowledge of past projects that employed best practices to achieve similar goals. These schedules may also be adjusted to accommodate special requirements for the targeted landscape as well as the responsible party. The most important part of choosing a fuels project monitoring program is selecting a method appropriate to the people, place, and type of project. Several levels of monitoring activities meet different objectives, have different levels of time intensity, and are appropriate for different groups of people. They include the following:

Minimum – Level 1: Pre- and Post-project Photographs

Appropriate for many individual homeowners who conduct fuels reduction projects on their properties.

Moderate – Level 2: Multiple Permanent Photo Points

Permanent photo locations are established using rebar or wood posts, GPS-recorded locations, and photographs taken on a regular basis. Ideally, this process would continue over several years. This approach might be appropriate for more enthusiastic homeowners or for agencies conducting small-scale, general treatments.

High – Level 3: Basic Vegetation Plots

A series of plots can allow monitors to evaluate vegetation characteristics such as species composition, percentage of cover, and frequency. Monitors then can record site characteristics such as slope, aspect, and elevation. Parameters would be assessed pre- and post-treatment. The monitoring agency should establish plot protocols based on the types of vegetation present and the level of detail needed to analyze the management objectives. This method is appropriate for foresters or other personnel monitoring fuel treatments on forested land.

Intense – Level 4: Basic Vegetation Plus Dead and Downed Fuels Inventory

The protocol for this level would include the vegetation plots described above but would add more details regarding fuel loading. Crown height or canopy closure might be included for live fuels. Dead and downed fuels could be assessed using other methods, such as Brown's transects (Brown 1974), an appropriate photo series (Ottmar et al. 2000), or fire monitoring (Fire Effects Monitoring and Inventory System [FIREMON]) plots. This method is ideal for foresters or university researchers tracking vegetation changes in forested lands.

IMPLEMENTATION

The 2024 City of Boulder CWPP makes recommendations for prioritized fuels reduction projects, measures to reduce structural ignitability, methods to carry out public education and outreach, and recommendations to increase safe, effective wildfire response. Implementation projects need to be tailored to the specific project and will be unique to the location depending on available resources and regulations. For project descriptions, timelines, and other important details regarding these recommended mitigation strategies, please see Chapter 4. As aforementioned, on-the-ground implementation of the

recommendations in the City of Boulder CWPP planning area will require development of an action plan and assessment strategy for completing each project. This step will identify the roles and responsibilities of the people and agencies involved, as well as funding needs and timetables for completing the highest-priority projects (SAF 2004). Information pertaining to funding is provided in Appendix J.

PROJECT TRACKER

Within the project's home page, an interactive web-based tool designed to communicate CWPP components, is a project tracking system (<https://bouldercolorado.gov/guide/community-wildfire-protection-plan-cwpp>) designed to provide real-time updates and the ability for multi-agency coordination and collaboration. The tracking system is available for internal use and comes with the following features:

- Project database
- Project entries and sub-entries into the database
- Funding tracking
- Milestone and goal tracking
- Project constraint/opportunity tracking
- Project progress tracking
- Agency delegation
- Attach images or other files to project records
- Spatially delineated project locations/working areas

Externally, the project tracker holds the ability to display statistics to the public, such as acres treated, dollars spent, or number of meetings held.

CWPP EVALUATION

CWPPs are intended to reduce the risk from wildfire for a community and surrounding environment. However, over time, communities change and expand, vegetation grows back, and forests and wildlands evolve. As such, the risk of wildfire to communities is constantly changing. The plans and methods to reduce risk must be dynamic to keep pace with the changing environment. An evaluation of the CWPP will gather information and identify whether the plans and strategies are on course to meet the desired outcomes or if modifications are needed to meet expectations.

Four general steps can be used to evaluate the CWPP:

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

	d.	Structural ignitability
	i.	Have there been updates to fire codes and ordinances?
	ii.	How many structures have been lost to wildfire?
	iii.	Has the CWPP increased public implementation of structural ignitability and hazard reduction strategies?
	e.	Public education and outreach
	i.	Has public awareness of wildfire and mitigation strategies increased?
	ii.	Have residents, visitors, and second homeowners been involved in wildfire mitigation activities?
	iii.	Has there been public involvement?
	iv.	Have vulnerable populations been involved?
	f.	Emergency response
	i.	Has the CWPP been integrated into relevant plans (e.g., hazard mitigation or emergency operations)?
	ii.	Is the CWPP congruent with other hazard mitigation planning efforts?

TIMELINE FOR UPDATING THE CWPP

The HFRA allows for maximum flexibility in the CWPP planning process, permitting the Core Team to determine the time frame for updating the CWPP. However, it is suggested that a formal revision be made on the fifth anniversary of signing and every 5 years following. Furthermore, due to the dynamic nature of wildfire mitigation and the natural landscape, there are several triggers that may warrant a CWPP update before the 5-year mark. Among these triggers are an extensive wildfire or another disaster event, changes to the local planning outlook (e.g., significant update to Hazard Mitigation Plan), and local adoption of the international WUI code. The Core Team members are encouraged to meet on an annual basis to review the project list, discuss project successes, strategize regarding project implementation funding, and determine whether a plan revision is needed.

ABBREVIATIONS AND ACRONYMS

°F	degrees Fahrenheit
AMMs	avoidance and minimization measures
ATV	all-terrain vehicle
BAER	Burned Area Emergency Rehabilitation
BLM	Bureau of Land Management
BMP	best management practice
Boulder ODM	Boulder Office of Disaster Management
BRIC	Building Resilient Infrastructure and Communities
BWC	Boulder Watershed Collective
CA GOPR	California Governor's Office of Planning and Research
CAR	community at risk
CDC	Centers for Disease Control and Prevention
CDHSEM	Colorado Division of Homeland Security and Emergency Management
CE	categorical exemption
CERT	Community Emergency Response Team
ch/hr	chains per hour
CIG	Conservation Innovation Grants
COAL	Colorado All Lands
Cohesive Strategy	National Cohesive Wildland Fire Management Strategy
COSWAP	Colorado Strategic Wildfire Action Program
CRS	Congressional Research Service
CSFS	Colorado State Forest Service
CWA	Clean Water Act
CWPP	community wildfire protection plan
DEM	digital elevation model
DFPC	Division of Fire Prevention and Control
DHS	Department of Homeland Security
DNR	Colorado Department of Natural Resources
EAS	Emergency Alert System
EIR	Environmental Impact Report
EMS	Emergency Management System
EOC	Emergency Operations Center
EPA	U.S. Environmental Protection Agency

EQIP	Environmental Quality Incentives Program
ESRI	Environmental Systems Research Institute
FAC	fire-adapted community
FCIDC	Fort Collins Interagency Dispatch Center
FEMA	Federal Emergency Management Agency
FIREMON	Fire Effects Monitoring and Inventory System
FLAME	Federal Land Assistance, Management and Enhancement Act
FP&S	Fire Prevention and Safety
FPD	Fire Protection District
FRI	fire return interval
GACC	Geographic Area Coordination Centers
GAID	Geographic Area Interagency Division
GIS	geographic information system
GPS	global positioning system
HFRA	Healthy Forests Restoration Act of 2003
HIZ	home ignition zone
HMP	hazard mitigation plan
HOA	homeowners association
HVRA	highly valued resource or asset
IBHS	Institute for Business & Home Safety
ICC	International Code Council
ICS	Incident Command System
IMT	Incident Management Team
ISO	Insurance Services Office
JPA	Joint Powers Agreement
MFI	mean fire interval
MND	mitigated negative declaration
NCFC	Northern Colorado Fireshed Collaborative
NEPA	National Environmental Policy Act
ND	negative declaration
NFP	National Fire Plan
NFPA	National Fire Protection Association
NIFC	National Interagency Fire Center
NIMS	National Incident Management System
NOAA	National Oceanic and Atmospheric Administration

NPS	National Park Service
NRCS	Natural Resources Conservation Service
NWCG	National Wildfire Coordinating Group
OEM	Office of Emergency Management
OES	Office of Emergency Services
OSMP	Open Space and Mountain Parks
PERI	Public Entity Risk Institute
POD	Potential Operational Delineation
PPE	personal protective equipment
PRISM	PRISM Climate Group
RAWS	remote automated weather station
RCP	Regional Catastrophic Preparedness
RFA	Rural Fire Assistance
ROW	right-of-way
SAF	Society of American Foresters
SAFER	Staffing for Adequate Fire and Emergency Response
SHPO	State Historic Preservation Office
SVI	social vulnerability index
SWCA	SWCA Environmental Consultants
USDA	U.S. Department of Agriculture
USDOI	U.S. Department of the Interior
USFA	U.S. Fire Administration
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VAR	value at risk
VCC	Vegetation Condition Class
VDEP	Vegetation Departure
WRSC	Western Regional Strategy Committee
WUI	wildland-urban interface

GLOSSARY

Aspect: Cardinal direction toward which a slope faces in relation to the sun (NWCG 2021b).

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Crown Fire: A fire that advances at great speed from crown to crown in tree canopies, often well in advance of the fire on the ground (NWCG 1988).

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

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

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

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

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

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

Fire-Adapted Community: A fire-adapted community collaborates to identify its wildfire risk and works collectively on actionable steps to reduce its risk of loss. This work protects property and increases the safety of firefighters and residents (USFA 2021b).

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

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

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

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

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

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

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

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

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

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

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

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

Fire Severity: A qualitative measure of the immediate effects of fire on the fire severity ecosystem. It relates to the extent of mortality and survival of plant and animal life both aboveground and belowground and to loss of organic matter. It is determined by heat released aboveground and belowground. Fire severity is dependent on intensity and residence dependent of the burn. For trees,

severity is often measured as percentage of basal area removed. An intense fire may not necessarily be severe (Wooten 2021).

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

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

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

Forest Fire: Uncontrolled burning of a woodland area (NWCG 1988).

Fuel Break: A natural or human-made change in fuel characteristics that affects fire behavior so that fires burning into them can be more readily controlled (NWCG 2021c).

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

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

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

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

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

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

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

Fuel Moisture Content: This is expressed as a percent or fraction of oven dry fuel moisture content weight of a live or dead fuel. It is the most important fuel property controlling flammability. When herbaceous plants cure, their moisture content responds as dead fuel moisture content, which fluctuates according to changes in temperature, humidity, and precipitation (Wooten 2021).

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

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

Ground Fire: Fire that burns organic matter in the soil, or humus; usually does not appear at the surface (NWCG 1988).

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

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

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

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

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

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

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

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

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

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

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

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

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

Line Officer: An agency administrator and the official responsible, as defined by the NWCG, for the management of a geographic unit or functional area (NWCG 2021f).

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

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

Mechanized Treatments: Mechanical treatments masticate large continuous patches of fuel to reduce the volume and continuity of material. Mechanical treatments can be applied through a multitude of methods (e.g., masticating, chipping, chain sawing, lopping and scattering, piling, hauling debris). These treatments allow land manager to control woody material, either leaving residue or collecting the biomass. Mechanical treatments can target specific areas and vegetation while excluding areas of concern. In addition, mechanical treatment is easily scalable to large areas (>30 acres) with little added cos. (UCANR 2021b).

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

Mutual Aid: Assistance in firefighting or investigation by fire agencies, irrespective of jurisdictional boundaries (NWCG 2021g).

Native Revegetation: The process of replanting and rebuilding the soil of disturbed land (e.g., burned) with native plant species (USDA 2005b).

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

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

1. Resilient Landscapes
2. Fire-Adapted Communities
3. Safe and Effective Wildfire Response

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

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

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

Prescribed Fire: Any fire ignited by management actions under specific, predetermined conditions to meet specific objectives related to hazardous fuels or habitat improvement. Usually, a written, approved prescribed fire plan must exist, and NEPA requirements must be met, prior to ignition.

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

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

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

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

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

Slope Percent: The ratio between the amount of vertical rise of a slope and horizontal distance as expressed in a percent. One hundred feet of rise to 100 feet of horizontal distance equals 100 percent (NWCG 2021i).

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

Surface Fire: fire that typically burns only surface litter and undergrowth (NWCG 1988).

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

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

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

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

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

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

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

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

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

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

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

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

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

Wildland Fire: Fire that occurs in the wildland as the result of an unplanned ignition (CA GOPR 2020).

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

1. Grass
2. Shrub
3. Grass-Shrub
4. Timber Litter
5. Timber-Understory
6. Slash-Blowdown

Wildland-Urban Interface (WUI): The WUI is the zone of transition between unoccupied land and human development. It is the line, area, or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels (USFA 2021a). In the absence of a CWPP, Section 101 (16) of the Healthy Forests Restoration Act defines the WUI as “ (I) an area extending ½ mile from the boundary of an at-risk community; (II) an area within 1 ½ miles of the boundary of an at-risk community, including any land that (1) has a sustained steep slope that creates the potential for wildfire behavior endangering the at-risk community; (2) has a geographic feature that aids in creating an effective fire break, such as a road or ridge top; or (3) is in condition class 3, as documented by the Secretary in the project-specific environmental analysis; (III) an area that is adjacent to an evacuation route for an at-risk community that the Secretary determines, in cooperation with the at-risk community, requires hazardous fuels reduction to provide safer evacuation from the at-risk community.” A CWPP offers the opportunity to establish a localized definition and boundary for the WUI (USFA 2020).

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WASH STATE

APPENDIX A:

Community Background and Resources

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LOCATION AND GEOGRAPHY

Boulder is 25.8 square miles, located 35 miles northwest of Denver at 5,430 feet above sea level (City of Boulder 2021). The city is roughly 18.5 miles east of the Continental Divide and the landscape roughly transitions from the foothills to the plains on the city's western edge (City of Boulder 2021). Due to its geographical location, it exhibits diverse topography. South-facing slopes support dryland vegetation, while the north-facing slopes support boreal vegetation (City of Boulder 2021). These terrain variations result in many saddles, chimneys, and canyons, which contain varied wildland fire fuel types as well as human development (City of Boulder 2021).

Land ownership in the planning area is split between private land and several local, state, and federal agencies. The majority of the planning area is under private and City of Boulder ownership, followed by Boulder County and federal ownership. A summarized breakdown of land ownership in the planning area is provided in Table A.1.

Table A.1. Breakdown of Land Ownership in the Planning Area

Land Ownership	Acres	Percentage of City
Private	49,692	40.9
City of Boulder	37,797	31.2
Boulder County	18,882	15.6
Federal	10,558	8.7
Conservation Easements	2,439	2.0
City of Boulder Parks & Recreation	1,858	1.5
State	81	0.1
Total	121,307	100



Figure A.1. Typical landscape immediately west of Boulder.



Figure A.2. Typical landscape in Boulder.

TOPOGRAPHY

Boulder's topography is complex and characterized by a mixture of higher-elevation foothills and relatively flat, low-elevation plains. Situated at the base of the Colorado Front Range, Boulder is surrounded by forested hills to the west and rangelands and grasslands to the north, east, and south.

Of particular significance is the mountain-grassland interface west of Boulder, a critical area concerning wildfire risk. Here, strong westerly winds, influenced by orographic and diurnal effects due to mountainous topography, pose a direct threat. Cold mountain air descending the east slope of the Rocky Mountain front can potentially propel wildfires into the grasslands surrounding Boulder. Canyons, cliffs, and valleys further enhance the risk by funneling and intensifying westerly winds, creating hazardous fire weather conditions. Conversely, the flatter grasslands to the east support wildfires primarily influenced by weather and fuel characteristics rather than topography.

POPULATION

In 2020, the population estimate of Boulder was 105,482 persons, an increase of 7.7% over the 2010 census numbers of 97,385 (U.S. Census Bureau 2020). The city also experiences an estimated 3.3 million visitors annually, with extreme seasonal influxes of visitors in the summer (Boulder Economic Council 2020).

The city of Boulder lies within Boulder County in north-central Colorado, approximately 30 miles from Denver. It is home to a mix of urban and suburban communities within WUI, providing a varied residential landscape that has experienced notable growth in recent years. The distribution of Boulder's population varies throughout the city, with the most densely populated areas being downtown Boulder situated toward central Boulder, and University Hill adjacent to the University of Colorado Boulder located southwest of the downtown area. Residential neighborhoods can be found throughout Boulder but often surround the central and eastern portions of the downtown area such as Table Mesa to the south and North Boulder to the north.

RECREATION

Outdoor recreation is extremely popular in Boulder, with numerous attractions drawing millions of visitors each year. The city is surrounded by the Flatirons, Green Mountain, Flagstaff Mountain, Royal Arch, Mount Sanitas, Eldorado Canyon, Boulder Reservoir, wilderness areas, scenic trails, and outdoor cultural attractions. Hiking, biking, camping, hunting, fishing, skiing, snowmobiling, boating, and other activities are all popular throughout the county with 155 miles of trails over 60 parks, and outdoor recreation programs (City of Boulder).

In 2023, at least 1.15 million people visited parks in the City of Boulder, based on the city's OSMP trail counter installed at 11 of the city's 14 most visited parks, including Chautauqua Trail, Flatirons Vista, Sanitas Valley Trail, South Boulder Creek (Bobolink), and South Mesa Trail (City of Boulder OSMP 2024). Chautauqua Trail had the most annual visitors on average with over 388,505 visitors recorded in 2023 (City of Boulder OSMP 2024). Based on the visitation data captured by Boulder OSMP, park visitation is highest during the months of July, June, and August, followed by September and October (City of Boulder OSMP 2024). It is estimated that 51% of the visitors arrived during the summer and fall to experience Boulder's public lands and numerous outdoor attractions. Approximately 37% of recorded visits arrived for ski season during the winter and spring months (Boulder Census 2020 | City of Boulder 2020).

The high volume of visitors to Boulder's natural areas elevates the risk of wildfires due to increased human activities. There is a greater potential for accidental ignition sources and an increase in the likelihood of fire incidents. During peak visitation times, especially during wildfire seasons, a significant number of people can congregate in relatively small areas, which results in large populations potentially needing to evacuate should an emergency occur.



Figure A.3. Several vehicles parked at the Foothills Trailhead just north of Boulder off Highway 36.

Source: City of Boulder (2024)

ENVIRONMENTAL CHALLENGES

DROUGHT AND CLIMATE

Frequent drought, tree mortality, and climate change have all worked together to increase wildfire likelihood and community vulnerability to wildfire (CSFS 2020). These factors have interacted to increase the risk of uncharacteristically large and high-severity fires (CSFS 2020). In the past few years, fires have grown to record sizes in Colorado and are burning longer, hotter, and more intensely than they have in the past (CSFS 2021). According to the National Interagency Fire Center (NIFC), the occurrence of catastrophic wildfires in the western United States has greatly increased over the last 20 years. Westerling et al. (2016) found that the frequency of large wildfires has been increasing with each decade since 1970.

Elevated seasonal temperatures, as shown in Figure A.4, contribute to drier conditions, reducing soil moisture and increasing the likelihood of vegetation drying out. This prolonged dryness, combined with hot temperatures, creates a conducive environment for the ignition and rapid spread of wildfires.

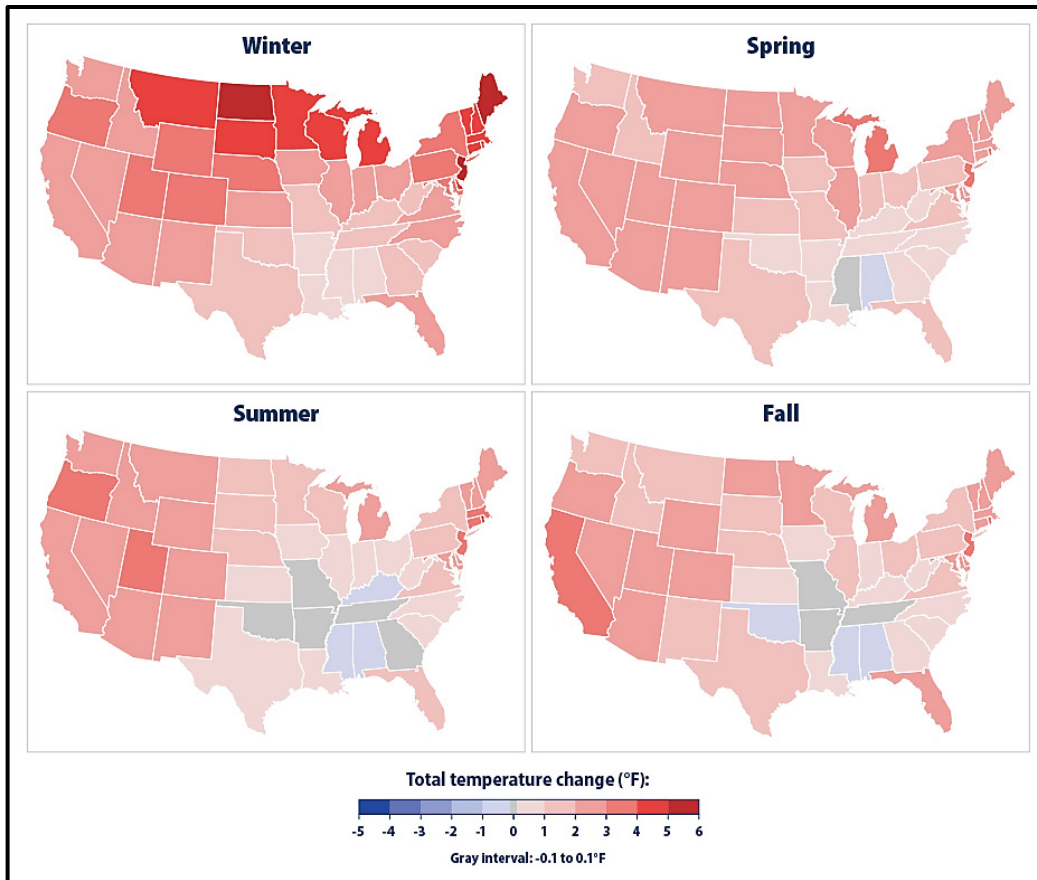


Figure A.4. Graphs showing the change in seasonal temperatures by state from 1896 to 2021.

Source: NOAA (2022b)

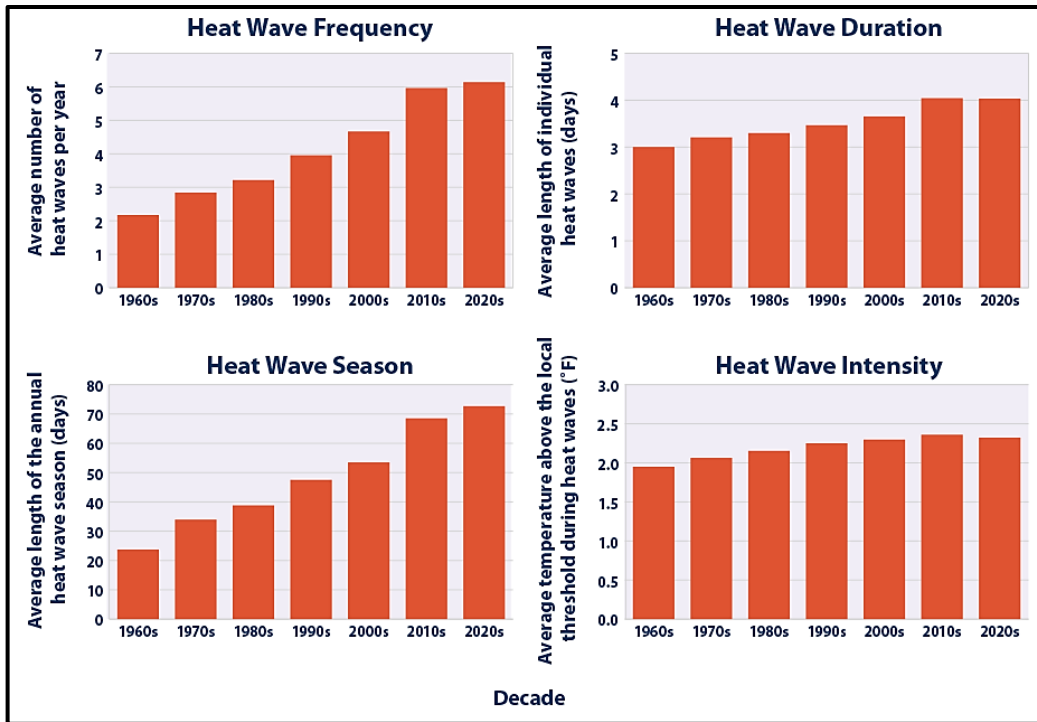


Figure A.5. Graphs showing the change in heat wave characteristics by decade from 1960 to 2020.

Source: NOAA (2022b)

The shifting climate, particularly rising temperatures, changing wind patterns, and increasing temporal and spatial variability of water availability, is considerably escalating wildfire risk across the state. Since 1990, mean annual temperatures in Colorado have increased by 2°F. Climate change projections predict that these trends will continue and possibly accelerate, depending on CO₂ emission scenarios. By the mid-twenty-first century, Colorado is expected to have 40 fewer days when the temperature in the high-elevation areas drops below 32°F (CSFS 2020).

It is important to note that fire is a natural part of Colorado's diverse landscapes and is essential to many ecosystems across the state. Almost all of Colorado's diverse ecosystems are fire-dependent or fire-adapted (CSFS 2020). Wildfire, when not directly or indirectly intensified by human actions, works to balance ecosystems, and restore their natural functions. Rises in unnatural and unintentional ignitions coupled with disruptions to the regions established vegetative and ecological relationship with fire can lead to frequent, uncharacteristically large, high-severity wildfires (CSFS 2020).

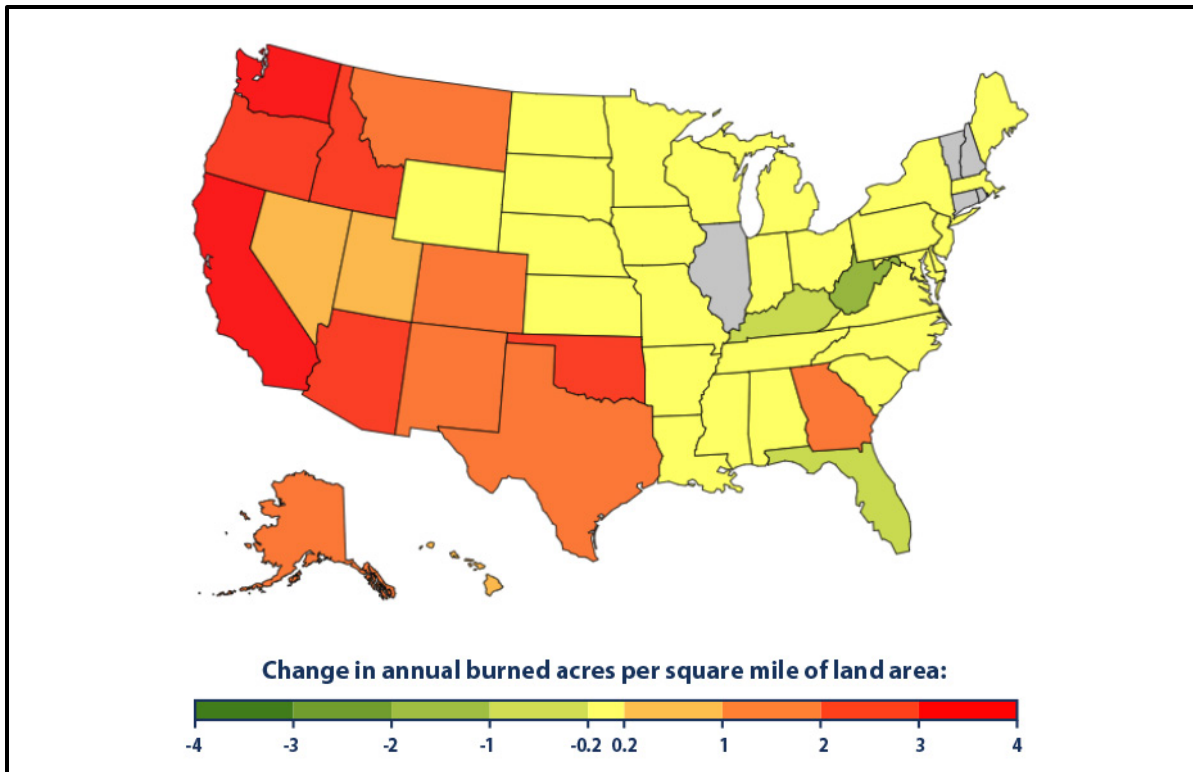


Figure A.6. A map showing the change in annual acres burned per square mile due to wildfire from 1984 to 2020.

Source: NOAA (2022b)

WIND

The extended wildfire season, influenced by warmer temperatures associated with climate change, also contributes to the heightened risk posed by wind. Altered atmospheric circulation patterns, driven by climate change, affect wind directions and speeds resulting in shifts in the distribution and behavior of wildfires (Abell et al. 2021). Prolonged periods of conditions favorable for wildfires, including dry vegetation and strong winds, increase the window of vulnerability.

Strong winds, carrying embers over long distances, can ignite new fires ahead of the primary fire front, making containment efforts more challenging (NWCG n.d.). Boulder experiences a complex interplay of meteorological factors impacting the severity of wildfires. The west side of Boulder bears the brunt of wildfire's rapid spread, primarily influenced by the occurrence of strong downslope winds, also called foehn winds, descending from the eastern slope of the Front Range (U.S. Department of Commerce n.d.).

Foehn winds, a warm and dry downslope wind on the leeward side of a mountain range, play a crucial role in the fire's behavior and have contributed to several high-intensity wildfires in the Boulder area (Dougherty and Johnson 2023). As foehn winds descend from the eastern slope of the Front Range, they gain momentum as they reach the grassland-mountain transition zone and become increasingly dry, creating conditions conducive to the rapid spread of wildfires (Fovell et al. 2022). The warming effect of foehn winds further dry vegetation, increasing their susceptibility to ignition.

The wind dynamics, characterized by cross-barrier flow, with winds hitting the Continental Divide directly from the west, can set the stage for a mountain wave (Stein 2021). Mountain waves occur when air

encounters a barrier, such as a mountain range. The Front Range can act as a barrier, causing air to be forced upward. However, the presence of a stable layer of air near the mountaintops, known as an inversion, can impede the upward movement of the air, resulting in a wave-like motion (Durrán 1990). This phenomenon, illustrated in Figure A.7, contributed to the formation and intensification of the mountain wave, leading to unprecedented wind speeds exceeding 100 mph during the Marshall Fire in 2021 (Stein 2021).

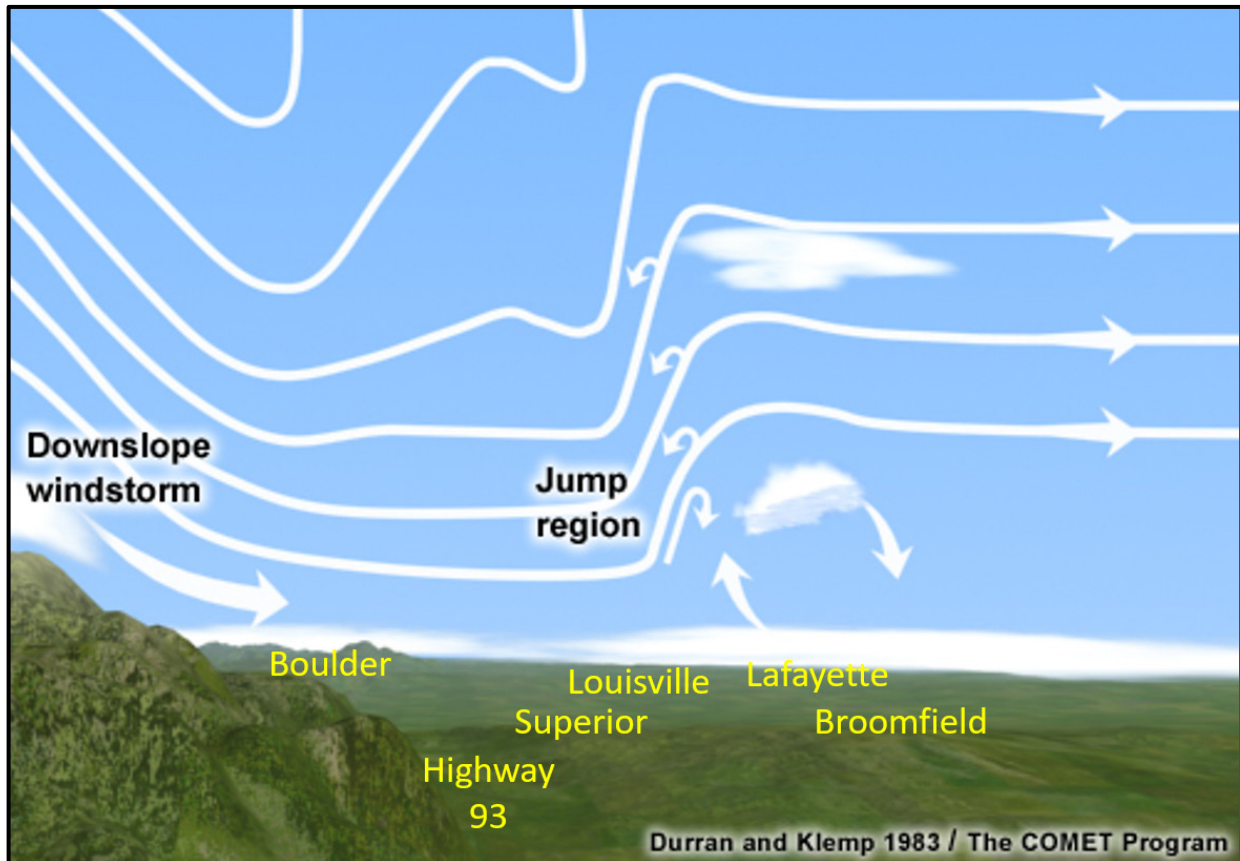


Figure A.7. Illustration of the extreme wind caused by mountain waves that develop as very strong westerly winds accelerate down the Front Range and foothills to the flatter low county. Wind disperses east into the Superior and Louisville area before quickly weakening (jump region) in the east.

Source: U.S. Department of Commerce (n.d.)

FOREST HEALTH

Boulder is home to many species of deciduous and coniferous trees spread throughout an urban environment. Both native and non-native species can be found throughout the planning area. This presents unique challenges for urban foresters who must contend with a multitude of native and introduced insects and diseases.

Not only are typical western insects and diseases such as mountain pine beetle (*Dendroctonus ponderosae*), western balsam bark beetle (*Dryocoetes confusus*), and western spruce budworm (*Choristoneura freemani*) present in the planning area, but so are invasive insects and diseases affecting hardwoods such as emerald ash borer (*Agilus planipennis*) and cottonwood canker (*Cytospora chrysosperma*). Proper planning and treatment are often more involved for urban forests due to the

increased risk that weakened and damaged trees pose to people and infrastructure. Woody debris must be managed closely and collaboratively within Boulder, especially in riparian areas where a buildup of dead and downed material can increase the risk of wildfire.

SOURCE WATER PROTECTION AREAS

The City of Boulder Source Water Protection Areas consist of two zones and an area of interest. Zone 1, the primary zone of protection, encompasses the direct watershed area used by the city's drinking water utility. Zone 1 is afforded the highest level of protection due to having the greatest potential impact to water resources if impaired. Zone 2 consists of auxiliary watershed areas for Boulder's water supply diversions, and the area of interest includes large drainages upstream from Carter Lake and west of the Continental Divide (City of Boulder 2023). The City of Boulder completed updates to the Source Water Protection Plan in 2023, which notably summarized protection projects implemented since 2017 and outlined updated 2023 protection project objectives.

Several projects implemented in 2017 and proposed in the 2023 update center around the issue of post-wildfire impacts to watershed systems (see Table ES.1). Effort has been taken to plan for and mitigate sediment and debris runoff (Figure A.8) into the municipal watershed following wildfire events. Additional concerns for watershed resources post-wildfire include the eutrophication of reservoirs, temporary water treatment plant shutdowns, and drinking water taste issues (City of Boulder 2023). To address these concerns, the Boulder Watershed Collective (BWC), in partnership with state, county, and local agencies, will be implementing forest health projects to minimize post-fire impacts to water supply. To help accomplish this, the BWC uses the Wildfire Erosion and Sediment Transportation Tool (WESTT) to identify areas that are susceptible to mass wasting and erosion into water systems following a severe wildfire.

Explore the story map to learn more about "proactive planning for wildfire and flood sediment in the North, Middle, and South Boulder Creek Watersheds" (Jagt 2020):

<https://storymaps.arcgis.com/stories/a76eaa904aaa4c0f87feee151d36794c>



Figure A.8. Surface erosion and rilling after the 2018 Buffalo Creek Fire.

Source: Jagt (2020)

THREATENED AND ENDANGERED SPECIES

Several federally and state threatened and endangered species reside in and around Boulder in the various open spaces, forests, and wilderness areas. These include Preble's meadow jumping mouse (*Zapus hudsonius preblei*), tricolor bat (*Perimyotis subflavus*), Mexican spotted owl (*Strix occidentalis lucida*), piping plover (*Charadrius melodus*), whooping crane (*Grus americana*), burrowing owl (*Athene cunicularia*), greenback cutthroat trout (*Oncorhynchus clarkii stomias*), pallid sturgeon (*Scaphirhynchus albus*), and the monarch butterfly (*Danaus plexippus*). In addition to mammals, birds, fishes, and insects, there are also listed flowering plants in the regions such as Ute ladies'-tresses (*Spiranthes diluvialis*) and western prairie fringed orchid (*Platanthera praecleara*) (USFWS 2023).

Recommendations for fuel treatments should be developed in alignment with all required compliance, and when possible, treatment approaches should be aligned with actions that provide for habitat enhancement for threatened and endangered species as well as rare plant and animal communities that may be impacted. Refer to guidance from local, regional, or state natural resource agencies before conducting fuel treatments, during active fire response, and during post-fire recovery efforts.

FIRE RESPONSE CAPABILITIES

The wildland fire community is well known for its development of mutual aid agreements at the federal, state, and local levels. Such automatic aid agreements allow for the closest forces to respond to an incident as quickly as possible regardless of jurisdiction.

Fire management in Colorado relies on a cooperative, interagency partnership among federal, state, and local entities. Wildland fire response for large fires is typically supported and coordinated by regional interagency dispatch centers in Colorado. These dispatch centers are part of the larger Rocky Mountain Area Coordination Center.

Incident management within Boulder is first coordinated by the Boulder Police and Fire Communications Center (BPFCC). The BPFCC answers non-emergency and emergency calls 24 hours per day, seven days per week. The BPFCC operates within Boulder city limits and is staffed by a variety of dispatchers, supervisors, and support staff (City of Boulder n.d.). For wildland fire incidents in and around the city of Boulder and within the source water protection zone, incident management is coordinated through the Fort Collins Interagency Dispatch Center.

When a fire occurs within the jurisdictional boundaries of the City of Boulder, the responsibility of incident commander falls upon the Boulder Fire Rescue (BFR) Fire Chief, who may assume command of the fire or assign a qualified incident commander to lead wildfire operations. However, if an incident exceeds the capacity of the City of Boulder or occurs in an unincorporated area outside of the city, such as the source water protection zone, incident command defaults to the associated county sheriff, who will identify a local incident commander whose qualifications are adequate for managing the wildfire complexity type. The Sheriff's Office will often assume evacuation management roles during wildfire incidents. The authority of fire chiefs and the sheriff is derived from the Colorado Revised Statutes (Colorado General Assembly 2022b). If an incident occurs on land managed by the USFS, BLM or NPS, the respective managing agency is responsible for the response and establishment of an incident commander who bears the power of declaring evacuations.

BFR has automatic aid/or mutual aid agreements with Boulder Rural Fire Rescue, Hygiene Fire Protection District, Lafayette Fire Department, Longmont Fire Department, Louisville Fire Protection District, and Mountain View Fire Rescue.

LOCAL RESPONSE

In the event of an emergency, always call 911. The 911 dispatcher will send the appropriate response resource to the incident. 911 calls reporting suspicious smoke or clouds are highly valued as they can help locate wildfire ignitions.

When a fire occurs within the jurisdictional boundaries of the City of Boulder, the responsibility of incident commander falls upon the BFR Fire Chief, who may assume command of the fire or assign a qualified incident commander to lead wildfire operations.

The City of Boulder's fire response capabilities are spread across the Boulder Fire Rescue Department (BFRD) and five FPDs: Four Mile FPD, Sunshine FPD, Boulder Rural FPD, Coal Creek Canyon FPD, and Open Space Mountain Parks (OSMP), which collectively contribute to the city's wildfire preparedness. Representatives from each of these entities were surveyed to compile the fire department concerns, needs, and resources. See results from these surveys below. BFRD is the primary wildfire response agency within the City of Boulder city limits and will coordinate with neighboring fire resources when establishing an incident command system.

Each FPD focuses its risk reduction efforts based on the challenges faced individually. Boulder Rural FPD, Coal Creek FPD, and OSMP all actively conduct public engagement through a variety of channels and activities. The Four Mile FPD, with diverse topography and roads, emphasizes fuel reduction, defensible space, improved water supplies, and ingress/egress challenges throughout the district.

The Sunshine FPD faces water source challenges, is actively seeking fuel thinning treatments in high-risk areas, and requires essential equipment and improved cooperation. The Boulder Rural FPD also faces ingress and egress challenges and requires additional funding for personnel and enhanced training opportunities. The Coal Creek Canyon FPD identifies high-risk areas like Coal Creek Heights, emphasizing large-scale mitigation efforts on large private parcels, mitigation for roadway survivability on the four main ingress/egress routes, and collaboration on federal projects.

All five FPDs have reported that additional training could benefit their jurisdictions, including live fire or field-based training exercises and participation on prescribed fires with cooperators. Sunshine FPD, Boulder Rural FPD, and Coal Creek FPD are in agreement that access to more classroom-based NWCG wildland fire courses would be beneficial to their districts. Both Four Mile and Sunshine FPDs identify the need for improved equipment integration to enhance firefighting capabilities. Financial support is a consistent theme among the identified needs, ranging from funding for training and personnel to acquiring essential resources like new radios.

Boulder Fire Rescue Department

The Boulder Fire-Rescue Department (BFRD) is dispatched by the Boulder Police & Fire Communication and is a part of the Boulder County Hazmat Authority. The BFRD serves out of five stations throughout the City of Boulder, a station in Gunbarrel, Arapahoe Ridge, a Wildland Station, as well as a training center. The BFRD covers 25 square miles throughout Boulder County (Table A.2) and has mutual aid agreements with Boulder Rural Fire Rescue, Hygiene Fire Protection District, Lafayette Fire Department, Longmont Fire Department, Louisville Fire Protection District and Mountain View Fire Rescue.

Table A.2. Fire Resources for the Boulder Fire Rescue Department

Fire Department Statistics:			
<u>Fire Protection District:</u> Boulder Fire Rescue			
<u>Communities Served:</u> Boulder and associated lands (OSMP, Utilities, & Parks and Recreation)			
<u>Full-time Firefighters:</u> 127	<u>Red-Carded Firefighters:</u> 95		<u>Volunteer Firefighters:</u> 0
<u>Water Tender:</u>	<u>Wildland Engines</u>		
Type 1: 0	<u>Total Number:</u>	<u>4WD/AWD:</u>	<u>Brush Breaker:</u>
Type 2: 0	Type 3: 3	3	0
Type 3: 0	Type 4: 0	0	0
<u>Structure Engines:</u>	Type 5: 0	0	0
Type 1: 10	Type 6: 3	3	0
Type 2: 0	Type 7: 0	0	0
<u>Port-A-Tanks:</u> 4	<u>Fire Shelters:</u> 130		
<u>Portable Pumps:</u> 2			

Four Mile FPD

The Four Mile FPD is a combination agency consisting of 25 volunteers and a paid fire crew comprising full-time and seasonal firefighters (Table A.3). Situated in the foothills of the Rocky Mountains, just west of Boulder, this organization provides professional fire and medical response to the local community.

Covering approximately 15 square miles of high-risk WUI, the district serves a diverse area with a mix of public lands, mining claims, and residential properties along mountain creeks. With four stations, the Four Mile FPD responds to approximately 100 to 150 emergencies annually, handling a wide range of incidents, including structure fires, wildland fires, medical calls, and rescues.

Table A.3. Fire Resources for the Four Mile FPD

Fire Department Statistics:			
<u>Fire Protection District:</u> Four Mile			
<u>Communities Served:</u> Boulder Canyon, Fourmile Canyon, Salina, Summerville, Wallstreet, Crisman, Logan Mill, Poorman, Sunset			
<u>Full-time Firefighters:</u> 5–20	<u>Red-Carded Firefighters:</u> 25	<u>Volunteer Firefighters:</u>	25
<u>Water Tender:</u>	<u>Wildland Engines</u>		
Type 1: 2	<u>Total Number:</u>	<u>4WD/AWD:</u>	<u>Brush Breaker:</u>
Type 2: 0	Type 3: 2	2	0
Type 3: 0	Type 4: 0	0	0
<u>Structure Engines:</u>	Type 5: 0	0	0
Type 1: 0	Type 6: 2	2	0
Type 2: 2	Type 7: 0	0	0
<u>Port-A-Tanks:</u> 5	<u>Fire Shelters:</u> 30		
<u>Portable Pumps:</u> 4			

Sunshine FPD

The Sunshine FPD is a fire department located in Boulder County. It covers an area of 4 square miles, which includes Bald Mountain, Lee Hill, Misty Vale, Sunshine Canyon, and Whispering Pines (Table A.4). The department operates primarily out of two fire stations and consists of 30 active firefighters and emergency medical technicians (EMTs)/emergency medical responders (EMRs). Staff are trained to handle both wildland and structure firefighting. In addition to responding to emergencies within its own district, the Sunshine FPD also helps five surrounding districts through mutual/automatic aid agreements.

Table A.4. Fire Resources for the Sunshine FPD

Fire Department Statistics:			
<u>Fire Protection District:</u> Sunshine			
<u>Communities Served:</u> Sunshine Canyon, Town of Sunshine, County Road 83 as well as automatic and mutual aid partners.			
<u>Full-time Firefighters:</u> 0	<u>Red-Carded Firefighters:</u> 26	<u>Volunteer Firefighters:</u>	30
<u>Water Tender:</u>	<u>Wildland Engines</u>		
Type 1: 0	<u>Total Number:</u>	<u>4WD/AWD:</u>	<u>Brush Breaker:</u>
Type 2: 0	Type 3: 1	1	0

Fire Department Statistics:			
Type 3: 0	Type 4: 1	1	0
<u>Structure Engines:</u>	Type 5: 0	0	0
Type 1: 1	Type 6: 2	2	0
Type 2: 0	Type 7: 0	0	0
<u>Port-A-Tanks:</u> 2	<u>Fire Shelters:</u> 0		
<u>Portable Pumps:</u> 2			

Boulder Rural FPD

The Boulder Rural FPD serves approximately 25 square miles of unincorporated areas north, west, and east of the city of Boulder (Table A.5). The Boulder Rural FPD has two stations and has automatic and/or mutual aid agreements with six other surrounding districts and departments. Responsible for approximately 17,000 residents in its district, the Boulder Rural FPD receives over 800 calls each year, with nearly 60% of calls being medical.

Table A.5. Fire Resources for the Boulder Rural FPD

Fire Department Statistics:			
<u>Fire Protection District:</u> Boulder Rural			
<u>Communities Served:</u> Unincorporated Boulder County (areas north, west, and east of Boulder)			
<u>Full-time Firefighters:</u> 23	<u>Red-Carded Firefighters:</u> 24	<u>Volunteer Firefighters:</u>	1
<u>Water Tender:</u>	<u>Wildland Engines</u>		
Type 1: 1	<u>Total Number:</u>	<u>4WD/AWD:</u>	<u>Brush Breaker:</u>
Type 2: 0	Type 3: 1	1	0
Type 3: 0	Type 4: 0	0	0
<u>Structure Engines:</u>	Type 5: 0	0	0
Type 1: 2	Type 6: 1	1	0
Type 2: 0	Type 7: 0	0	0
<u>Port-A-Tanks:</u> 2	<u>Fire Shelters:</u> 27		
<u>Portable Pumps:</u> 1			

Coal Creek Canyon FPD

The Coal Creek Canyon FPD operates as a volunteer fire department in WUI areas, serving Boulder, Gilpin, and Jefferson Counties (Table A.6). The challenging terrain, limited access, and high-hazard conditions pose significant wildland fire potential. The district's roadways, especially in the upper canyon, present navigational difficulties, while a major railway passing through the heavily forested hillsides increases rail traffic, including trains carrying hazardous materials. The Coal Creek Canyon FPD addresses these challenges from its four strategically located fire stations, equipped with multiple vehicles, and specialized equipment.

Table A.6. Fire Resources for the Coal Creek Canyon FPD

Fire Department Statistics:			
<u>Fire Protection District:</u> Coal Creek			
<u>Communities Served:</u> Coal Creek Canyon, Blue Mountain Subdivision, and Canyon Pines Subdivision. Portions of Boulder, Gilpin, and Jefferson Counties, as well as portions of the city of Arvada			
<u>Full-time Firefighters:</u> 1	<u>Red-Carded Firefighters:</u> 54	<u>Volunteer Firefighters:</u>	5,854
<u>Water Tender:</u>		<u>Wildland Engines</u>	
Type 1: 4	<u>Total Number:</u>	<u>4WD/AWD:</u>	<u>Brush Breaker:</u>
Type 2: 1	Type 3: 0	0	0
Type 3: 0	Type 4: 1	1	0
<u>Structure Engines:</u>	Type 5: 0	0	0
Type 1: 0	Type 6: 4	4	0
Type 2: 0	Type 7: 0	0	0
<u>Port-A-Tanks:</u> 5	<u>Fire Shelters:</u> 60		
<u>Portable Pumps:</u> 1			

Open Space and Mountain Parks (OSMP)

The City of Boulder Open Space Mountain Parks (OSMP) is not primarily a fire response organization; however, it does respond to ignitions in the Planning Area (Table A.7). OSMP conducts public outreach and wildland fire training with a focus on hazardous fuels management along with experience and coordination for red-carded OSMP staff to enhance an effective response to wildland fires.

Table A.7. Fire Resources for the OSMP

Agency Statistics:			
<u>Agency:</u> OSMP			
<u>Communities Served:</u> Dispersed communities throughout Boulder County			
<u>Full-time Firefighters:</u> 0	<u>Red-Carded Firefighters:</u> ~40	<u>Volunteer Firefighters:</u>	0
<u>Water Tender:</u>		<u>Wildland Engines</u>	
Type 1: 0	<u>Total Number:</u>	<u>4WD/AWD:</u>	<u>Brush Breaker:</u>
Type 2: 0	Type 3: 0	0	0
Type 3: 0	Type 4: 0	0	0
<u>Structure Engines:</u>	Type 5: 0	0	0
Type 1: 0	Type 6: 1	1	0
Type 2: 0	Type 7: 0	0	0
<u>Port-A-Tanks:</u> 0	<u>Fire Shelters:</u> ~40		
<u>Portable Pumps:</u> 0			

STATE RESPONSE

Colorado Division of Fire Prevention and Control

The DFPC is the lead state agency for fire. DFPC's Wildland Fire Management Section (WFMS) is responsible for wildland fire management on local and state lands and aids in the coordination of wildfire management across local, state, and federal agencies. DFPC states that its priority wildland fire mission is "to assist and support local agencies and counties with a range of wildfire management programs including administrative, technical, preparedness and planning, funding, response, and prescribed fire functions" (DFPC 2022b).

On non-federal lands, wildfire management follows a hierarchy of local jurisdiction, to county sheriff, and, finally, to the State of Colorado. The chief of a local FPD is responsible for fires that occur within the boundaries of their district. If a fire is outside of the chief's ability to manage, it is the duty of the county sheriff to assume the responsibility for coordinating fire suppression efforts and requesting assistance from the DFPC. The county sheriff is also responsible for coordinating fire suppression efforts in unincorporated areas of the county. In the event that the county sheriff and DFPC have determined that the County's capacity has been exceeded, the DFPC director will approve state assistance based on the assessment of capacity and availability of funds. If state assistance is approved, the fire becomes a state responsibility area and DFPC assumes cost and management responsibility, along with ongoing involvement from local and County partners (DFPC 2022b).

Boulder falls in the Coal Creek Region of the Northeast District of DFPC. The Fort Collins Interagency Dispatch Center is responsible for dispatching the initial attack resources of state responsibility areas in the DFPC Northeast District (BLM Colorado State Office n.d.).

In Colorado, the state can either provide assistance for fighting fires or be responsible for fighting fires.

State assistance for fires includes the following management strategies and resources (DFPC 2022a):

- Seeks to encourage rapid initial attack actions where fire is unwanted to reduce the size, duration, costs, and impacts of wildfires.
- Can provide personnel, enabling local agencies to respond to their next incident and volunteer firefighters to return to their regular jobs.
- Provides funding and resources for local and County responsibility fires. The fire does not have to exceed the capacity of the fire department or the county for a county to receive funding.
 - This can include funding and reimbursement for aviation and hand crew resources during the initial attack phase of fires on non-federal lands. Ordered resources are based on the closest forces concept, whether they are state or federal agency resources, to reduce response times.
- Resource support can include DFPC engines, module, and overhead resources, as well as technical assistance from DFPC fire management staff.

State responsibility for wildfire covers the following conditions and scenarios (DFPC 2022a):

- The state is responsible if the county requests assistance from DFPC.

- DFPC and Sheriff have conducted an assessment and have determined that the county capacity has been exceeded.
- DFPC Director approves the State's responsibility based on assessment of capacity and availability of funds.
- If approved for state responsibility, DFPC assumes cost and management responsibility, along with ongoing involvement from local and county partners.

FEDERAL RESPONSE

Arapaho & Roosevelt National Forests Pawnee National Grassland

Fire response for the national forest is a multiagency effort with primary response being the responsibility of local ranger districts and the Roosevelt Interagency Hotshot Crew (USDA n.d.[a]). The crew is stationed in Fort Collins but provides response capacity nationwide. Response for the national forest and national grassland is dispatched through the Fort Collins Interagency Dispatch Center (GACC 2023). Additional fires response resources include the Northern Colorado Interagency Helitack and Jeffco Airtanker base, which are headquartered in Broomfield, Colorado. Both organizations are able to provide regional air support for large and small wildfire incidents (USDA n.d.[b], n.d.[c]).

WATER AVAILABILITY AND SUPPLY

The available water resources for fire suppression operations within the city include a combination of municipal hydrants, cisterns, water shuttling, and persistent ponds. Fire suppression operations in areas beyond hydrant service zones rely on cisterns and water shuttling via tenders and engines. As part of the 2024 CWPP Update, City of Boulder fire response organizations rated available water resources for fire suppression efforts within their jurisdictions. Most jurisdictions reported acceptable availability of water resources, but certain areas lack hydrants or contain few water cisterns which will require water shuttling operations increasing suppression costs and fire control times. Water resources for fire suppression throughout the service area and surrounding region are displayed in Figure A.9.



EVACUATION RESOURCES

Evacuation relies on both cooperative planning and the capability of residents to effectively comprehend and execute planned evacuation procedures. Boulder County's Office of Emergency Management developed a Multi-Hazard Mitigation Plan that highlights the need for evacuation planning for disaster events that pose a threat to human life, including wildfire.

The City of Boulder has developed an Emergency Preparedness Guide as a comprehensive educative resource for planning family evacuation plans for wildfire and other emergency events. The guide includes an emergency alert program, a Genasys Protect map with zones corresponding to evacuation status, evacuation points, and areas of refuge (City of Boulder 2018).

The City of Boulder encourages citizens to understand how to properly prepare for wildfire impacts by exploring the following resources:

Emergency Preparedness Guides for the Boulder Area:

- <https://assets.boulderodm.gov/wp-content/uploads/2023/05/Handout-Preparedness-Quick-Guide.pdf>
 - Genasys Protect Map
 - <https://protect.genasys.com/search?z=14&latlon=44.977753%2C-93.265011>

Boulder ODM Evacuation Information & Tips:

- <https://boulderodm.gov/preparedness/planning/evacuation/>
- <https://assets.boulderodm.gov/wp-content/uploads/2023/07/creating-a-plan-worksheet.pdf>

Please note that the public should follow the latest guidance from trusted sources, such as official government agencies, with regard to evacuation orders, especially as emergency response plans change rapidly. Current evacuation orders should always be adhered to and supersede all information presented in the CWPP.

Road Systems

The majority of communities in the planning area consist of urban and rural roadways with few hazardous features or obstructions for emergency response vehicles and personnel. The primary concern arises in the mountainous canyons of western Boulder, posing challenges for wildfire evacuations due to steep slopes that limit access for emergency responders and egress routes. Certain trailheads in the planning area's foothills, accessible only via unsurfaced roads through variably forested areas, are often narrow, lengthy, and winding, with many dead-ends and blind corners. These access roads present heightened hazards during emergency evacuations, especially in areas where thick, dense vegetation lines the roads and dense wildfire smoke can obstruct visibility. Fuel treatments may be needed along some roads where vegetation is overhanging and could prevent safe evacuation of residents or safe access by emergency responders.

People

The safe and efficient evacuation of people from wildfire requires emergency notification systems, preplanning of evacuation routes, and effective public education and outreach on emergency preparedness. The following sections detail these elements within the city.

Emergency Notification Methods

Boulder County utilizes Everbridge for emergency notification and communication, which functions by sending text and voice messages from local emergency response agencies to the phone numbers and email addresses of those who have signed up and “opted in” for emergency alerts. To reach members of the community who use a primary language other than English, Boulder County also utilizes the ReachWell App, which allows users to receive emergency alert content in over 100 languages. The City of Boulder is also offering a Prepared911 program, where dispatchers in the Boulder Police Department and Fire Communication Center can accept live streamed videos from callers, allowing first responders to respond quickly and appropriately to emergency situations.

In 2022 the City launched a new emergency alert capability allowing police and fire departments to send Integrated Public Alert Warnings (IPAWS) including Wireless Emergency Alerts (WEA). It is important to note that temporary residents or tourists may not be signed up for emergency alert notifications. The use of IPAWS, including WEA will allow City of Boulder officials to reach out-of-town visitors, unhoused individuals, along with people outside of their opt-in address during life-threatening emergencies. These alerts will reach all enabled cell phones in a specific geographic region without requiring users to opt in or subscribe to the service.

See the following resources to sign up for emergency alerts and Prepared911 for Boulder County and the city of Boulder:

- <https://member.everbridge.net/453003085612231/login>
- <https://www.prepared911.com/>

In addition to the alert systems utilized in and adjacent to the planning area, word of mouth also plays a role in emergency notification, especially in more rural areas where residents may not be subscribers to opt-in alerting systems. When safe to do so, residents should call or text friends, neighbors, and contacts to ensure that they are aware of active alerts.

Community Emergency Response Team

Developed by the Federal Emergency Management Agency (FEMA), the Community Emergency Response Team (CERT) training is a program that educates community members about disaster preparedness for hazards that may impact their area and trains them in basic disaster response skills, such as fire safety, light search and rescue, team organization, and disaster medical.

For more information, visit FEMA’s CERT webpage: <https://www.fema.gov/emergency-managers/individuals-communities/preparedness-activities-webinars/community-emergency-response-team>

Animals and Livestock

In the event of a wildfire, it is important that residents and fire responders within Boulder have a plan for evacuation of pets and livestock. Evacuation planning often neglects to describe how animals will be evacuated and where they will be taken. The loading of horses, for example, during a fire and smoke situation, and transport of stock vehicles down narrow roads under stressful situations, can be very difficult.

The Colorado State University has additional resources for livestock and animals, you can view those resources here: <https://extension.colostate.edu/disaster-web-sites/fire-resources/fire-livestock-resources/>

However, additional public education could emphasize the need for individuals to have a plan for the evacuation of pets and horses in addition to their family, ensuring a lack of planning doesn't slow or prevent evacuation.

VALUES AT RISK

Earlier compilation of the critical infrastructure in the planning area, coupled with public outreach and Core Team input, has helped in the development of a list of values at risk (VARs) from wildland fire. These data are also supplemented with the COAL HVRA data explained in Chapter 3. The public was encouraged to provide additional VARs during public meetings and within the public survey for the project.

In addition to critical infrastructure (Maps I.4–I.6 in Appendix I), VARs can also include natural, cultural, and socioeconomic resources (see Figures A.10–A.12). It is important to note that although an identification of VARs can inform treatment recommendations, a number of factors must be considered in order to fully prioritize areas for treatment; these factors include treatment type, land ownership constraints, locations of ongoing projects, available resources, and other physical, social, or ecological barriers to treatment.

The scope of this CWPP does not allow determination of the absolute natural, socioeconomic, and cultural values that could be impacted by wildfire in the planning area. In terms of socioeconomic values, the impact due to wildfire would cross many time scales and sectors of the economy and call upon resources locally, regionally, and nationally.

NATURAL VALUES AT RISK

The CWPP planning area has a variety of natural resources of particular concern to land managers, such as endangered species habitats, surface water and aquatic resources, hiking trails, and listed plant and wildlife species. The City of Boulder tracks ongoing data of sensitive and ecologically important natural areas through the City's 2023 Safe and Managed Public Space. For more information on the City of Boulder's Safe Management of Public Spaces Tracking Data, please visit: <https://bouldercolorado.gov/safe-management-public-spaces-data-dashboard>.

Examples of natural values identified by the public and the Core Team include the following:

- Local parks, open spaces, natural areas
- Arapaho National Forest
- Trail systems
- Agricultural land and preserves
- Wildlife species of conservation concern or special concern (Preble's meadow jumping mouse [*Zapus hudsonius preblei*])
- USFS buildings
- Trail heads and campgrounds
- Scenic viewsheds
- Critical habitat for wildlife and wildlife movement corridors
- Reservoirs (Boulder Reservoir), creeks, lakes, wetlands, riparian areas and other water bodies (see Figure A.10)
- Rare and sensitive plant communities



Figure A.10. Example of a natural VAR in the planning area, a waterbody.

SOCIOECONOMIC VALUES AT RISK

Social values include population, recreation, infrastructure, and the built environment. Examples include the following:

- Communications infrastructure (e.g., cell phone and radio towers)
- Tourism values (e.g., restaurants, recreational facilities, rental houses/cabins)
- Schools
- Public safety infrastructure
- Public works
- Highways
- Grocery and hardware stores
- Churches
- Care homes, senior housing, day care, and other group homes
- Water storage (see Figure A.11)
- Recreation sites (e.g., trails, parks)
- NCAR Mesa Laboratory



Figure A.11. Example of a socioeconomic VAR, water infrastructure site.

CULTURAL VALUES AT RISK

Many historical landmarks are scattered throughout the planning area. The City of Boulder is currently undergoing the planning phase for ongoing tracking and mapping of culturally sensitive areas through a Cultural Asset Mapping tool to fully understand the cultural value of specific community resources in the planning area. For more information on the City of Boulder's project overview, please visit:

<https://bouldercolorado.gov/projects/cultural-mapping-project>.

Particular cultural VARs that have been identified by the Core Team and the public in the CWPP planning area are the following:

- Chautauqua Park (see Figure A.12)
- Arnett-Fullen House
- Walker Ranch Historic District
- Boulder Creek Bridge
- Hannah Barker House
- Boulder County Poor Farm
- Theaters and music venues
- Museums (Boulder History Museum), galleries, public art, and murals
- Significant Indigenous heritage sites
- Carnegie Library
- Hotel Boulderado
- Norlin Quadrangle Historic District
- Places of worship
- McKenzie Well
- University of Colorado
- Colorado Chautauqua



Figure A.12. Example of a cultural VAR, the Chautauqua Dining Hall in Chautauqua Park.

Source: City of Boulder (2024)

PUBLIC EDUCATION AND OUTREACH PROGRAMS

Public education and outreach programs are a common factor in virtually every jurisdiction involved with wildfire response. The City of Boulder emphasizes that the region is “highly prone to potentially catastrophic events such as wildfires”, underscoring the importance of preparation for a swift and effective response. Education plays a pivotal role in the City of Boulder’s approach to facilitating greater community safety and resilience to disasters and other emergencies.

BOULDER EMERGENCY PREPAREDNESS GUIDE

The City of Boulder “Guides to Boulder” webpage provides information from on emergency preparedness, particularly in dealing with extreme weather events such as wildfires, blizzards, and flash flooding. The page offers resources on receiving emergency alerts, knowing evacuation zones, creating emergency plans, and preparing a “go bag” for quick evacuation. It also discusses the City of Boulder’s response to emergencies, the risk factors associated with Boulder’s location, and the impact of climate change to natural hazards. The City’s aim with this page is to empower the community to be resilient in the face of potential disasters and encourage residents to stay informed and prepared. The City has also completed a specific structure protection plan regarding wildfire risks.

For more information on preparation for emergencies and extreme weather events, visit the following webpage: <https://bouldercolorado.gov/guide/emergency-preparedness>.

BOULDER FIRE-RESCUE COMMUNITY RISK REDUCTION

Boulder Fire-Rescue's Community Risk Reduction Division offers a range of programs aimed at enhancing wildfire resilience within our community. Among these initiatives is the Detailed Home Assessment (DHA) program, which provides a complimentary, thorough evaluation of a home's vulnerability to wildfire. Conducted by experienced risk reduction specialists, the assessment offers tailored recommendations to homeowners, equipping them with actionable strategies to mitigate wildfire risks. In addition to the DHA program, Boulder Fire-Rescue offers various other valuable services to promote fire safety and emergency preparedness in our community. These include community events, fire emergency preparedness, permitting, home safety visits, school visits, and station visits.

Did you know?

Boulder Fire-Rescue also offers free on-site assessments of your home and property to help protect it and your family from wildfire.

To learn more, please visit: <https://bouldercolorado.gov/guide/fire-department-community-outreach-education-and-permits>

Boulder Fire-Rescue is available to attend community events upon request. Have a Boulder fire engine come by for a visit to your community event. This is a great opportunity to ask the firefighters questions and see the fire engine up close. See the general Community Event Request Form.

Detailed Home Assessments

The City of Boulder Fire-Rescue can conduct a free on-site assessment of your home and property to help protect it and your family from a wildfire. The program is available only to residents within the city of Boulder. These are conducted by trained and qualified community risk reduction specialists. See the Home Assessment Request Form here:

<https://www.defensiblespacereport.org/cityofboulder/address/requestCode>

Curbside Assessments

Boulder Fire-Rescue is continuing to conduct curbside assessments of homes and structures along the western edge of the city. These provide valuable data to residents, homeowners, and emergency responders regarding the preparedness level of each home in the WUI. Check your address for its curbside assessment.

Public Education and Engagement

In addition to conducting home assessments, Boulder Fire-Rescue Community Risk Reduction staff are available to attend HOA meetings, help conduct community preparedness events, and assist with projects that are intended to increase wildfire resilience and reduce risk.

BOULDER OFFICE OF DISASTER MANAGEMENT (ODM)

Boulder ODM provides a webpage offering extensive educational resources on disaster preparedness, covering topics such as alerts and warnings, hazard awareness and risk assessment, creating a plan, and emergency guidance such as evacuation information.

Disaster Strong Preparedness Series

In an effort to increase community preparedness, Boulder ODM has created the Disaster Strong Preparedness Series, which consists of workshops and resources to increase the public's knowledge and skills related to disaster preparedness. The Disaster Strong Series Workshops cover a variety of topics, including disaster preparedness basics, pet and large animal preparedness, and train-the-trainer education. New topics are continually added to meet the needs of the community.

Resource documents can also be found at <https://boulderodm.gov/preparedness/resource-library/>.

A list of upcoming workshops and events from ODM can be found at:

<https://boulderodm.gov/preparedness/events-workshops/>

BOULDER COUNTY WILDFIRE PARTNERS

The Boulder County Wildfire Partners is a wildfire mitigation and preparedness program funded by Boulder County, CSFS, and FEMA. City of Boulder residents are eligible for their Community Chipping Program and the Strategic Fuels Mitigation Grant Program, for which HOAs are eligible for funding.

To learn more about the Boulder County Wildfire Partners Program, please visit:

<https://wildfirepartners.org/about/>

BOULDER WATERSHED COLLECTIVE

BWC has been an important non-profit partner in the city, providing community engagement, organization, and project management in a variety of projects. These include fuels reduction projects in Devil's Thumb and Wonderland, in collaboration with Climate Initiatives, BFR, and HOAs. The organization collaborates with communities, fire districts, and agency partners within the Boulder Creek Watershed to identify gaps and reduce wildfire risk at both community and landscape scales. Additionally, the Collective facilitates on-the-ground forest watershed mitigation and restoration projects, empowering individuals and communities to play an active role in enhancing forest health and resilience.

For additional information regarding ongoing projects and future events please visit:

<https://www.boulderwatershedcollective.com/events-1>

OPEN SPACE AND MOUNTAIN PARKS

OSMP preserves and protects the natural environment and land resources that characterize Boulder. OSMP conducts research and implements various projects with community volunteers for preserving and protecting more than 46,640 acres of land.

Firewood Program

Wood generated by the City of Boulder forest management operations is made available to contract-holding members of the public. The firewood program incentivizes the reduction of hazardous wildland fuels on OSMP lands while providing firewood to local contract holders. To participate in the firewood program, users must:

- Review and acknowledge the terms of the 2024 contract online PDF, by clicking the 'Purchase Your Woodlot Permit' link.
- Pay the \$15 administrative fee by credit card online (a \$1.00 surcharge will be added). As of March 2024, the OSMP administrative office remains closed to the public.

Community Connectors

The City of Boulder sponsors the Community Connectors Program, which helps connect underrepresented voices with City of Boulder government agencies. Community Connectors are members of the community who partner with the City to co-design engagement opportunities and participate in City decision making. Community Connectors are involved in a variety of different capacities and programs, a few of which are described below. See <https://bouldercolorado.gov/services/community-connectors-program> for more information.

Community Connectors-in-Residence

Community Connectors-in Residence support the voices and build the power of underrepresented community members by reducing barriers to community engagement, advancing racial equity, and surfacing the ideas, concerns, and dreams of community members.

Recovery Equity Connectors

Recovery equity Connectors ensure the perspectives of community members of color and ensure review of Rapid Response Racial Equity Assessments are included in the City's decision making throughout the recovery process.

Emergency Response Connectors

Emergency Response Connectors build trust between community members and local government, share COVID updates and public health guidelines, provide outreach and navigate for basic needs services, and surface the issues and ideas of community members.

See the State Programs and National Programs sections below for a comprehensive list of state and national educational resources.

See Appendix F for homeowner resources and Appendix J for funding sources.

STATE PROGRAMS

Colorado Division of Homeland Security and Emergency Management

The Colorado Division of Homeland Security and Emergency Management offers numerous services, including those geared towards prevention, protection, mitigation, response, and recovery. They also help facilitate pre- and post-disaster funding to local governments. Their emergency management website can be accessed here: <https://dhsem.colorado.gov/emergency-management-office>.

Colorado Division of Fire Prevention and Control

The DFPC offers various resources for topics such as building safety, fire prevention, community risk reduction, firework safety, vehicle safety, and the fire safety evaluation system (FSES) (DFPC 2022c). The DFPC has its own wildland fire management communications and outreach specialist. Contact information is available here: <https://dfpc.colorado.gov/home/public-information>.

Live Wildfire Ready is a program funded by the DFPC aimed at promoting wildfire preparedness among residents. Through the Live Wildfire Ready program, residents can access a range of resources and support, including grants and funding opportunities to aid in mitigation efforts. Action checklists are provided to guide homeowners in implementing effective wildfire mitigation measures as well as resources to connect with local contractors trained in wildfire mitigation practices.

For more information of the DFPC's Live Wildfire Ready, please visit: <https://csfs.colostate.edu/live-wildfire-ready/>

In addition, the DFPC hosts several campaigns throughout the year including building safety month, fire prevention week, community risk reduction week, and more. You can find more information on the DFPC campaigns and public education webpage located here:

<https://dfpc.colorado.gov/FLScampaigns?web=1&wdLOR=c61B38F2B-6998-4994-BC02-E114F1CDA5E3>

NATIONAL PROGRAMS

Ready, Set, Go!

The Ready, Set, Go! program, managed by the International Association of Fire Chiefs, was launched in 2011 at the WUI conference. The program seeks to develop and improve the dialogue between fire departments and residents, educating residents who live in high-risk wildfire areas on how to best prepare themselves and their properties for wildfire.

The tenets of Ready, Set, Go! as included on their website (<http://www.wildlandfirersg.org>) are:

Ready – Take personal responsibility and prepare long before the threat of a wildland fire so your home is ready in case of a fire. Create defensible space by clearing brush away from your home. Use fire-resistant landscaping and harden your home with fire-safe construction measures. Assemble emergency supplies and belongings in a safe place. Plan escape routes and ensure all those residing within the home know the plan of action.

Set – Pack your emergency items. Stay aware of the latest news and information on the fire from local media, your local fire department, and public safety.

Go – Follow your personal wildland fire action plan. Doing so will not only support your safety but will allow firefighters to best maneuver resources to combat the fire.

National Fire Protection Association (NFPA) Firewise USA

The NFPA is a global non-profit organization devoted to eliminating death, injury, and economic loss due to fire. Its 300 codes and standards are designed to minimize the risk and effects of fire by establishing criteria for building, processing, design, service, and installation around the world (NFPA 2013).

The NFPA develops easy-to-use educational programs, tools, and resources for all ages and audiences, including Fire Prevention Week, an annual campaign that addresses a specific fire safety theme.

The NFPA's Firewise USA program (www.firewise.org) encourages local solutions for wildfire safety by involving homeowners, community leaders, planners, developers, firefighters, and others in the effort to protect people and property from wildfire risks.

The NFPA is a premier resource for fire data analysis, research, and analysis. The Fire Analysis and Research division conducts investigations of fire incidents and produces a wide range of annual reports and special studies pertaining to fire hazards.

National Interagency Fire Center

The NIFC provides a wide array of fire resources and services and can provide communication assistance to over 32,000 firefighters and 50 major events at any given time (NIFC 2022). The program also offers wildfire forecasts and predictions using fuel and weather data collected from their remote automated weather base with over 2,000 weather stations. Additionally, the NIFC has a training branch where national curriculums are developed, including FireWorks, an educational program designed for kids K-12. The program teaches children about wildland fire science, ecosystem fluctuations, human interaction on the environment, and other environmental science topics.

NIFC public education resources can be found here: <https://disastersafety.org/wildfire/wildfire-ready/>

U.S. Fire Administration's WUI Toolkit

The U.S. Fire Administration (USFA) is an entity of the U.S. Department of Homeland Security's Federal Emergency Management Agency (FEMA) that aids in the preparation for and response to fire. Their WUI toolkit consists of websites and other information regarding risk assessments, public outreach, and community training. Find the toolkit here: <https://www.usfa.fema.gov/wui/>.

Wildfire Research Center (WiRē)

Wildfire Research Center (WiRē) is a non-profit organization that works with local wildfire services to highlight community-tailored pathways to reduce risk to wildfire while simultaneously promoting pathways to fire adaptation. WiRē's mission states that fire adaptation is "about living with fire", while "creating safe and resilient communities that reduce wildfire risk on their properties before a fire, and supporting effective response when fires threaten a community." WiRē states that wildfire is an integral component of many ecosystems, and that safe fire must be allowed to ensure healthy forests.

To achieve its goals and serve communities, WiRē typically assesses factors contributing to wildfire risks; factors include building materials, vegetation near homes, background fuels, local topography, and access to emergency fire services. Additionally, they conduct social surveys to gauge residents' perceptions about wildfire, wildfire risk, risk mitigation behavior, and assess their willingness to take action in reducing wildfire risks.

For more information, please visit <https://wildfireresearchcenter.org/>.

Community Navigators

The Community Navigators Program (CNP) supports historically underserved communities in collaboration with the USFS. The CNP connects communities to appropriate resources for building climate resilience such as access funding and partnership support. The program aims to create mutually beneficial relationships between local communities, the USFS, and other federal agencies that contribute to community and ecosystem resilience. Through their website, community leaders can request a navigator; resources are available in Spanish and English and accessibility accommodations are available.

For more information, please visit <https://communitynavigators.net/>



APPENDIX B:

Planning and Policy Background

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PLANNING PROCESS

The SAF, in collaboration with the National Association of Counties and the National Association of State Foresters, developed a guide entitled *Preparing a Community Wildfire Protection Plan: A Handbook for Wildland-Urban Interface Communities* (SAF 2004) to provide communities with a clear process in developing a CWPP. While this guide is now dated, the eight steps for developing a CWPP are still relevant and have been followed in preparing the City of Boulder CWPP:

Step One: Convene Decision-makers. Form a Core Team made up of representatives from the appropriate local governments, local fire authorities, and state agencies responsible for forest management.

Step Two: Involve Federal Agencies. Identify and engage local federal representatives and contact and involve other land management agencies as appropriate.

Step Three: Engage Interested Parties. Contact and encourage active involvement in plan development from a broad range of interested organizations and stakeholders.

Step Four: Establish a Community Base Map. Work with partners to establish a base map(s) defining the community's WUI and showing inhabited areas at risk, wildland areas that contain critical human infrastructure, and wildland areas at risk for large-scale fire disturbance.

Step Five: Develop a Community Risk-Hazard Assessment. Work with partners to develop a community Risk-Hazard Assessment that considers fuel hazards; risk of wildfire occurrence; homes, businesses, and essential infrastructure at risk; other values at risk (VARs); and local preparedness capability. Rate the level of risk for each factor and incorporate this information into the base map as appropriate.

Step Six: Establish Community Priorities and Recommendations. Use the base map and Community Risk-Hazard Assessment to facilitate a collaborative community discussion that leads to the identification of local priorities for treating fuels, reducing structural ignitability and other issues of interest, such as improving fire response capability. Clearly indicate whether priority projects are directly related to the protection of communities and essential infrastructure or to reducing wildfire risks to other community values.

Step Seven: Develop an Action Plan and Assessment Strategy. Consider developing a detailed implementation strategy to accompany the CWPP as well as a monitoring plan that will ensure its long-term success.

Step Eight: Finalize Community Wildfire Protection Plan. Finalize the CWPP and communicate the results to community and key partners.

FIRE MANAGEMENT POLICY

The responsibility for WUI fire prevention and protection lies with property owners and state, county, and municipal governments. Property owners must comply with existing state statutes and local regulations. These responsibilities should be carried out in partnership with the federal government and the private sector. The current federal fire policy states that protection priorities are 1) life, 2) property, and 3) natural resources. These priorities often limit flexibility in the decision-making process, especially when a wildland fire occurs within the WUI.

LEGISLATIVE DIRECTION

City Direction and Codes

Housed in Chapter 8 -Title 10 of the City of Boulder Municipal Code, the City of Boulder's Fire Code enforces regulations that are designed to prevent and mitigate the impact of fires on life, the environment, and valued resources. Incorporated into the code are the regulations outlined in the 2018 International Fire Code as specified by the International Code Council. However, certain amendments outlined in the City's specific provisions will also apply, ensuring local compliance. Some key changes include establishing a Community Risk Reduction division within the fire department, clarifying liability issues, identifying necessary permits, and introducing new definitions as well as several other systems and procedural requirements.

State Direction

Colorado Minimum CWPP Standards

The 2022 Colorado State Forest Service (CSFS) Minimum Standards for Developing CWPPs provide basic guidelines that have been updated according to Colorado Senate Bill 09-001. The purpose of the described standards is to provide a foundation for supporting healthy, resilient, and fire-adapted communities. The plan has been developed into three overarching goals, which are broken into sub-goals as well as related action items (CSFS 2022a). These goals include but are not limited to:

1. Promote Community Fire Adaptation: Through a deeper understanding of living with wildfire, facilitate social community adjustments, wildfire risk reduction through community enhancement, and an increase of pace and scale of wildfire risk reduction efforts.
2. Reduce the Risk of Uncharacteristic Wildfire: Reduction of wildfire severity through forest alteration, maintenance and enhancement of species and structural diversity, and revegetation of sites through species transitions before and after disturbances.
3. Promote the Role of Fire in Ecological Processes: Fundamental sustainability through ecological functions, improving the understanding of the role of fire in Colorado's ecosystems, and increasing the use of managed and prescribed wildfire.

The standards specify that the planning process should be as inclusive as possible to address the needs of socially vulnerable populations and ensure all residents' concerns are represented in the plan. CSFS also requires mapping of the WUI, completion of a Risk-Hazard Assessment, and identification of priority projects including fuel treatment recommendations. These requirements aim to provide the community with actionable recommendations on risk reduction and resilience. The USFS recommends updating CWPPs at 5-year intervals to ensure project objectives, demographics, and Risk-Hazard assessments are relevant (CSFS 2022a).

Colorado Strategic Wildfire Action Program

In 2021, Colorado Senate Bill 21-258 was signed by Governor Polis. This bill designates \$17.5 million to immediately address the wildfire crisis in Colorado through mitigation and community resilience work. This objective will be realized by increasing funding to the Forest Restoration and Wildfire Risk Mitigation Grant Program and other fire-related funding mechanisms, providing funds to hire additional mitigation and firefighting personnel, and establishing a hazard mitigation and capacity development fund. This bill

marks a statewide recognition of the extreme hazards wildfires create and an investment in creating more fire-resilient landscapes (Colorado Department of Natural Resources 2022).

Colorado Forest Action Plan

In 2020, the CSFS developed Colorado's Forest Action Plan (CSFS 2020). The purpose of the plan was to provide a framework for addressing the "current conditions and trends in Colorado's forests, as well as the current threats and challenges the state's forests face across political, jurisdictional and ecological boundaries." Priorities of the Forest Action Plan include the following: "Conserve and manage working forest landscapes", "protect forests from threats", and "enhance public benefits from trees and forests". This plan is centered around six themes, but the four themes most important this CWPP are:

1. **Forest Conditions** focuses on the current conditions of Colorado's forests, present and future pressures, and the challenges forests are facing from climate change (e.g., longer fire seasons and more uncharacteristic wildfires).
2. **Living with Wildfire** focuses on the natural role wildfire plays in Colorado's forests and rangelands. It emphasizes that fire exclusion and suppression efforts of the past are no longer appropriate and, when combined with the impacts of climate change, have put communities at heightened risk from wildfire. It also states that communities must practice wildfire risk reduction strategies as WUIs expand across the state.
3. **Watershed Protection** focuses on the risks that uncharacteristic droughts and wildfires pose to Colorado's watersheds. This theme emphasizes the link between forest health and watershed health.
4. **Forest Products** focuses on the importance of the logging industry in Colorado and describes the economic impact that declines in forest health (e.g., wildfire, overgrowth, and disease and insect associated mortality) have had on the industry.

This plan estimates that 10% of Colorado's 24 million acres of forest are in "urgent need of treatment to address forest health, wildfire risk and watershed protection threats, at a cost of approximately \$4.2 billion." This plan provides detailed direction for Colorado to meet its forest treatment goals.

HB22-1111 (Insurance Coverage for Loss Declared Fire Disaster)

In 2022, Colorado passed HB-1111, which increases the amount of lost property insurers must cover upfront and extends the time frame that victims of wildfire have to rebuild their homes. This bill was signed by Governor Polis in 2022 and outlines standards and restrictions for home insurers when covering instances of total loss from wildfire events. This bill includes, but is not limited to, the following requirements:

- There will be a minimum of 24 months to collect additional living expense coverage with two extensions of 6 months.
- Homeowners cannot be denied insurance payment if they decide to rebuild in a different location than their previous home or if building code updates will make rebuilding costs higher than the home value.
- If a policy requires repair or rebuild in order for the owner to collect payments, the owner shall be allowed 36 months to submit invoices.
- Homeowners have the right to use all available rebuild benefits to buy a replacement home.

- Homeowners can collect 65% of contents benefits without having to inventory a lifetime of possession.
- Homeowners have the right to know how an insurer calculated depreciation.

Additional measures of this bill ensure homeowners can recoup money from furniture and other items lost in a fire and establishes a mandatory time that insurers must cover living expenses. This bill applies only to future declared fire disasters (Colorado General Assembly 2022a).

Federal Direction

Federal wildfire planning has historically been guided by the U.S. Department of the Interior, who stated in its 1998 Wildland Fire Management Department Manual (U.S. Department of the Interior [DOI] 1998) that all public lands with burnable vegetation must have a fire management plan. Subsequent efforts, including the National Fire Plan (NFP) in 2000 and the HFRA in 2003 (revised in 2009), which further incentivized the development and highlighted the importance of CWPPs, emphasized collaboration, and expedited hazardous fuels reduction projects (Public Law 108–148, 2003; H.R. 4233 - Healthy Forest Restoration Amendments Act of 2009). CWPPs are an effort to enhance collaborative wildfire management approaches between federal agencies and communities, prioritize treatment areas, and secure grant funding priority to communities with an established CWPP.

In 2023, the Wildfire Leadership Council sought to update and enhance the strategic direction of the 2014 National Cohesive Wildland Fire Management Strategy framework. This was done through the 2023 National Cohesive Wildland Fire Management Strategy Addendum Update (Wildland Fire Leadership Council 2023). The updated strategy highlights critical emphasis areas that were not identified in the previous framework.

Included among these emphasis areas are:

1. Climate change
2. Workforce capacity, health, and well-being
3. Community resilience (preparation, response, and recovery)
4. Diversity, equity, inclusion, and environmental justice

Thorough analysis of these emphasis areas is provided for within the addendum update report, along with new management options to address them.

PAST PLANNING EFFORTS

Local, City, and County

1999 Forest Ecosystem Management Plan: The City of Boulder's Open Space and Mountain Parks (OSMP) developed the 1999 Forest Ecosystem Management Plan (City of Boulder 1999). The plan is divided into three sections that establish a framework for forest ecosystem management in Boulder and describe management prescriptions for low- and high-elevation forest stands within Boulder. Low-elevation stand prescriptions focus on WUI areas, whereas the high-elevation stand prescriptions are aimed at mountain parks.

2007 City of Boulder CWPP: This document, created for citizens, policymakers, and public agencies in Boulder, Colorado, compiled new and existing wildfire information. It utilized data from wildfire hazard

ratings and fire behavior potential analyses, with detailed findings and methodologies in appendices for reference. The City of Boulder CWPP was the result of a comprehensive community-wide effort, involving data gathering, analysis of fire behavior, and collaboration with stakeholders, including homeowners and the CSFS. The project aligned with federal requirements under the Healthy Forests Restoration Act of 2003 for community fire planning and aimed to enhance life safety, protect property and infrastructure, and safeguard the environment and quality of life. To achieve these goals, the plan established objectives such as risk assessment, scientific analysis of fire potential, grouping VARs, identifying mitigation factors, and recommending actions to reduce hazards (City of Boulder 2007a).

2007 Boulder Rural Fire Protection District CWPP: The Boulder Rural FPD's CWPP was developed in 2007 to enhance safety, protect property and infrastructure, and safeguard the environment and quality of life in the planning area. To achieve these goals, the plan aimed to analyze fire behavior potential, group VARs into communities based on hazard factors, and recommend actions to reduce risks to those values. The plan assessed wildfire hazards and risks within the Boulder Rural FPD, prioritized mitigation efforts, and provided recommendations for short-term and long-term fuels and fire management plans (City of Boulder 2007b).

2010 Boulder Grassland Ecosystem Management Plan: The City of Boulder's OSMP developed the 2010 Grassland Ecosystem Management Plan (Grassland Plan) to protect the rapidly developing region where the Central High Plains meet the Southern Rocky Mountains. The Grassland Plan outlines strategies and measures of success to conserve the 24,000 acres of grasslands. It serves as a framework for on-the-ground management actions, public policies, and land and water acquisition priorities (City of Boulder 2010).

2012 Boulder Reservoir Master Plan: The 2012 Boulder Reservoir Master Plan is a comprehensive document that outlines how to manage and balance recreational activities, protect wildlife habitats, and maintain water quality at the Reservoir. The plan aligns with City-wide goals of energy conservation and waste reduction by incorporating these principles into future facility development and enhancements (City of Boulder 2012a).

2012 City of Boulder Structure Protection Plan: In 2012, the City of Boulder adopted the Structure Protection Plan, aimed at safeguarding structures within and near the municipal boundary of Boulder. The plan offers guidance on protecting structures and efficiently deploying structure-defending resources. To quickly convey essential information with minimal reading, the plan contents of the plan are presented graphically and organized in sections of various levels of resolution (City of Boulder 2012b).

2017 Agricultural Management Plan: The 2017 Agricultural Resources Management Plan aims to ensure the long-term sustainability of agricultural operations on the City of Boulder's OSMP lands while supporting the ecological health of the area and fostering connections between the community and agricultural lands (City of Boulder 2017). The plan focuses on maintaining and enhancing agricultural operations and relationships with lessees, integrating agriculture with scenic, cultural, and ecological stewardship, and creating opportunities for people to connect with agriculture. The ultimate goal is to promote the thriving and sustainable development of agriculture in the Boulder Valley amid social and environmental changes.

2018 City of Boulder Multi-Hazard Mitigation Plan: In 2018, the City of Boulder prepared a hazard mitigation plan to reduce or eliminate the long-term risks posed by natural hazards and their effects on people and property. This plan is necessary to maintain the city's eligibility for FEMA Pre-Disaster Mitigation and Hazard Mitigation Grant Programs and to make the city less vulnerable to future disasters. The plan, updated periodically, serves as a tool for decision-makers to direct mitigation activities and resources and enables the city to access federal disaster assistance and lower flood insurance

premiums. A wildfire hazard-profile is included within the plan, providing a thorough description of past wildfire occurrences, the current wildfire threat, and impacts that climate changes will have on wildfire preparedness (City of Boulder 2018a).

2018 City of Boulder Urban Forest Strategic Plan: In 2018, Boulder developed the Urban Forest Strategic Plan (UFSP) in partnership with the Davey Resource Group to address challenges and opportunities facing its urban forest over the next two decades. Boulder's urban forest comprises around 650,000 trees, with 50,800 being publicly owned and managed by the Boulder Forestry Division. These public trees have an appraised replacement value of over \$110 million. The UFSP aims to preserve the health, sustainability, and services of trees and canopy cover through proactive management and long-term planning. Partnering with Two Forks Collective for community engagement, the UFSP seeks to foster cohesion between city staff and the public to ensure effective urban forest management (City of Boulder 2018b).

2019 Boulder Open Space and Mountain Park Master Plan: The Open Space and Mountain Park Master Plan describes a comprehensive management approach for building ecosystem resilience, maintaining agricultural systems, conducting stewardship and responsible recreation, engaging with the community, and prioritizing financial stability. The Plan aims to ensure conservation and maintenance of the existing natural areas and assets while balancing the need for restoration, management projects, and providing the public with opportunities for the enjoyment of open space. Wildfire is identified as a key area of focus for maintaining forest health, with the plan recommending continued implementation of wildfire management forest health projects such as thinning and maintaining open canopy stands (City of Boulder 2019).

2022 Boulder Parks and Recreation Master Plan: The 2022 Boulder Parks and Recreation (BPR) Master Plan strategically guides Boulder County's investments and development, addressing three key questions about BPR's identity, current status, future plans, and the path forward. It highlights community demographics, recreation trends, the current system, and service overview, offering recommendations for improvements. The plan includes a 5-year roadmap outlining strategic direction and vision achievement. Notably, it identifies wildfire as a key environmental trend impacting the County (City of Boulder 2022a).

2023 Boulder Source Water Protection Plan: The Boulder Source Water Protection Plan is crucial for ensuring safe and high-quality drinking water for the community and visitors. Boulder's water originates from alpine lakes, reservoirs, and headwater streams near Nederland and the Continental Divide, with most of the watershed managed by various entities. The 2017 plan identifies voluntary strategies and projects to protect the water supply, and since then, many of these have been implemented. The updated 2023 plan continues this effort with new strategies, considering changes in the water supply and land use. Wildfire and post-wildfire impacts are described as a potential threat to water infrastructure and sources contamination for drinking water (City of Boulder 2023).

State

2018–2023 Colorado Hazard Mitigation Plan: The 2018–2023 Colorado Hazard Mitigation Plan was developed by the Colorado Department of Public Safety in 2023. The Plan is designed to maintain a framework for implementing hazard mitigation actions and minimizing the impacts of hazards across the State. The Plan breaks down planning into categories regarding identifying hazards, implementation and response capabilities, planning at local levels, and maintaining plans. Wildfire is identified as a high annual hazard with large associated economic losses. Recommended mitigation actions include developing and maintaining CWPPs (Colorado Department of Public Safety 2018).

2019 State Emergency Operations Plan: The State Emergency Operations Plan was implemented in 2019 by the Colorado Division of Homeland Security and Emergency Management. The purpose of the Plan is to establish guidelines on how Colorado provides response and recovery actions for emergencies and disasters. The Plan provides a single framework for response, with specific details of response varying based on the type and severity of incident. For wildfire, the plan emphasizes the importance of preparedness, coordinated interagency response, and clear assignment of responsibilities (Colorado Division of Homeland Security and Emergency Management 2019).

2020 Colorado State Forest Action Plan: The Colorado State Forest Action Plan was developed by the CSFS in 2020. The Plan provides a framework for identifying forest stewardship priorities within the state by accounting for forest constraints, threats, trends, and jurisdictional boundaries. The plan breaks forest management into six categories: conditions, living with wildfire, watershed protection, wildlife, urban and community forestry, and forest products. Strategies for cooperatively addressing these categories while achieving healthy forest goals are also discussed. Key wildfire priorities outlined in the Plan include promoting community wildfire adaptation, reducing risks of severe wildfires, and promoting the ecological role of wildfires (CSFS 2020).

2023 Wildfire Preparedness Plan: The 2023 Wildfire Preparedness Plan was prepared by the Colorado Division of Fire Prevention and Control and provides an overview of the Division's wildfire response capabilities. Specific numbers and types of ground, aviation, and other support resources are outlined, along with additional needs and considerations (DFPC 2023).

Federal

National Fire Plan: The National Fire Plan (Managing the Impact of Wildfires on Communities and the Environment) was implemented by the U.S. Department of the Interior and the USFS in 2000. The Plan was established to develop a collaborative approach among various governmental agencies to actively respond to severe wildland fires and ensure sufficient firefighting capacity for the future. Focuses of the Plan are on firefighting preparedness and accountability, forest restoration, hazardous fuels reduction, community assistance, and research (Forests and Rangelands 2000).

A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment:

A 10-year Implementation Strategy: This Plan was most recently updated in 2006 and focuses on using a collaborative framework for restoring fire-adapted ecosystems, reducing hazardous fuels, mitigating risks to communities, providing economic benefits, and improving fire prevention and suppression strategies. The Plan also emphasizes information sharing and monitoring of accomplishments and forest conditions, a long-term commitment to maintaining the essential resources for implementation, a landscape-level vision for restoration of fire-adapted ecosystems, the importance of using fire as a management tool, and continued improvements to collaboration efforts (Forests and Rangelands 2006).

Arapahoe and Roosevelt National Forests and Pawnee National Grassland Land and Resource

Management Plan: The Plan was revised in 1997, last updated in 2019, and is the guiding land management document for the Arapahoe National Forest. The Plan recognizes the natural role and importance of wildfire in mountain ecosystems and outlines that significant efforts should be made to reduce wildfire hazards. These efforts include fuel management such as targeted timber harvest, wildfire-habitat improvement, and invasive species control to reduce risk to lives and property while improving forest health. Public education around wildfire protection is also emphasized in the Plan (USFS 2019).

The National Cohesive Wildland Fire Management Strategy: The Strategy outlines a holistic approach to the future of wildfire management, with the goal of managing forests to coexist with wildland fire but containing incidents when necessary. The Strategy maintains that this goal will be achieved by restoring

and maintaining landscapes, developing fire-adapted communities, and maintaining sufficient wildfire response capabilities (Forests and Rangelands 2021).

PUBLIC LAND MANAGEMENT

LAND MANAGEMENT STRATEGIES

Local and State Land

Land management practices pertaining to wildfire mitigation are conducted with regard to guidance provided in both the 2007 City of Boulder CWPP and the 2007 Boulder Rural FPD CWPP.

The documents share the same objective of enhancing life safety, protecting property and infrastructure, and preserving the environment and quality of life, and recommend strategies for actions for risk and hazard reduction (City of Boulder 2007a, 2007b).

Boulder Open Space and Mountain Parks lands, characterized by expansive open spaces and diverse terrain, require a tailored land management framework. The OSMP Master Plan outlines focus areas, including ecosystem health, agricultural sustainability, recreation, community involvement, and financial sustainability, to guide land use (City of Boulder 2019). Public land in the planning area aligns with state guidance, as reflected in the 2020 Forest Action Plan by the CSFS, emphasizing management goals, fuel reduction treatments in priority regions and providing guidance on fund allocation for maximum impact.

Moreover, the 2023 Wildfire Preparedness Plan plays a pivotal role in shaping wildfire mitigation as it pertains to planning and land management strategies in Colorado. It covers aerial firefighting, equipment availability, personnel staffing, aligning with statewide mobilization planning and providing a breakdown of the hierarchy of local, County, and State jurisdictions when dealing with fires (DFPC 2023). See Appendix B, "Fire Response Capabilities," for more information regarding incident management.

The State of Colorado has joined forces with major federal agencies, namely the Bureau of Land Management (BLM), U.S. Fish and Wildlife Service (USFWS), U.S. Department of Agriculture, Bureau of Indian Affairs, and National Park Service, to form the Colorado Cooperative Wildland Fire Management and Stafford Act Response Agreement. The agreement focuses on interagency cooperation, the use of interagency fire resources, operations, and preparedness (DFPC 2021).

Federal Land

Arapahoe and Roosevelt National Forests (USFS)

The Arapaho and Roosevelt National Forests are managed by the USFS. Situated along the Continental Divide, these forests showcase Colorado's diverse mountain ecosystems with glacial peaks, snowfields, lakes, alpine tundra, and varied vegetation (USFS 2022a). These forests are intersected by the boundaries of the Boulder Source Water Protection Zone, specifically the Barker Reservoir Watershed (Middle Boulder Creek watershed) and North Boulder Creek watersheds, which are densely forested. These areas, known for high recreational use, feature popular destinations like Rainbow Lakes, the Fourth of July Trail, and West Magnolia. However, due to concerns such as damaged vegetation, compromised water quality, and the wildfire risk associated with illegal campfires, the USFS has implemented restrictions on backcountry dispersed camping in recent years (City of Boulder 2023).

The 1997 revision of the Land and Resource Management Plan guides the Arapahoe and Roosevelt National Forests' land management. Strategies to reduce wildfire hazards include fuel management (prescribed fire, mechanical thinning), targeted timber harvest, wildfire-habitat improvement, and invasive species control. Emphasizing human-caused fire prevention, community protection, collaborative efforts, and public education, the plan recognizes the natural role of wildfire in mountain ecosystems (USFS 2022b).

Table Mountain Field Site and Radio Quiet Zone (U.S. Department of Commerce)

The U.S. Department of Commerce Table Mountain Field Site and Radio Quiet Zone is located among the open space north of Boulder just east of U.S. Route 36. The site serves as a hub for the research activities of several entities, including the Institute of Telecommunications Sciences, the National Ocean, and Atmospheric Administration (NOAA), the National Institutes of Standards and Technologies (NIST), the National Telecommunications and Information Administration (NTIA), and the U.S. Geological Survey (USGS). The site's management responsibilities reside with the Director of the ITS (NTIA 2023).

NIST Boulder Laboratories (U.S. Department of Commerce)

Managed under the U.S. Department of Commerce, the NIST Boulder Laboratories support manufacturing and innovation by providing research, measurements, technology, tools, data, and services for various industries. The laboratories employ over 350 scientific, technical, and support staff, hosting hundreds of visiting researchers, students and contractors (NIST 2022, 2023).

National Center for Atmospheric Research (National Science Foundation)

Established by the National Science Foundation, the National Center for Atmospheric Research's (NCAR's) mission is to provide the global atmospheric and earth system science community with cutting-edge resources and facilities. Among a wide range of other focuses, the center's scientists are actively engaged in projects such as improving wildfire behavior models, studying the air quality impacts of smoke plumes, and exploring the influence of climate change on wildfires (NCAR 2023a, 2023b).

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APPENDIX C:

Community Risk-Hazard Assessments for WUI Communities

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FIELD-BASED COMMUNITY RISK-ASSESSMENT SUMMARIES

This appendix provides a summary of the data gathered in each community (Figure C.1) during on-the-ground assessments. The creation of these community polygons was based on the CWPP planning area as well as the zones delineated during the City's adoption of Genasys a web-based emergency mapping tool. The intent of these community polygons is to break the larger CWPP planning area into smaller regions to provide more focused information.

The community assessment summaries below capture average conditions within each community boundary; therefore, the provided ratings (e.g., moderate, extreme, etc.) may not universally apply to every parcel within the community. It's important to note that these ratings reflect the collective evaluation of the community as an entity and may be used to guide strategies for informed mitigation actions.

Community assessments were completed using methodology described by the National Fire Protection Association (NFPA) Code 1144: *Standard for Reducing Structure Ignition Hazard for Wildland Fire* (<https://www.nfpa.org/codes-and-standards/nfpa-1144-standard-development/1144>). The assessment rates categories numerically to determine a composite risk rating ranging from low to extreme. Assessed categories include means of access, topography, fuels, roof and construction materials, response resources, and utility locations. Assessors examine these conditions across the entire community and score the community based on the most common conditions. Individual properties may have components that rate above or below these generalized assessment scores. The score is calculated by trained SWCA staff using a field assessment form hosted on ArcGIS Survey123; the form is available at the end of this appendix.

The NFPA 1144 field assessments were completed in November 2023 by trained SWCA staff.

Each line of the form is filled with a number evaluation with lower numbers indicating a lower risk factor for that category. To make these assessments more approachable and easier to comprehend, each risk level score was assigned a color to demonstrate risk ranging from low to high as described below:

- a **green score** corresponds with **low risk**,
- a **yellow score** corresponds to a **moderate risk**,
- an **orange score** corresponds to a **high risk**, and
- a **red score** indicates **extreme risk** for that category

Using this method, residents and preparedness planners can quickly identify each community's main risk factors and opportunities for resilience improvements. Below are the simplified risk assessments for the communities of the City of Boulder (Figure C.1). At the end of each assessment is the total score given to the community and the risk level that it correlates with.

Maps accompanying the community risk assessments **are not** based on the field data collected during the NFPA 1144 field assessments. The Expected Risk to Structure maps are sourced from the COAL Quantitative Risk Assessment, which is discussed in further detail in Chapter 3. Risk to Potential Structure maps are developed based on topography, fuels, and other fire spread factors. For any point on the map, the modeling assesses relative wildfire risk to a house or other structure if it were present there. This allows for the analysis of wildfire risk in places where homes already exist and places where new construction may be proposed.

COMMUNITY ASSESSMENT SUMMARIES

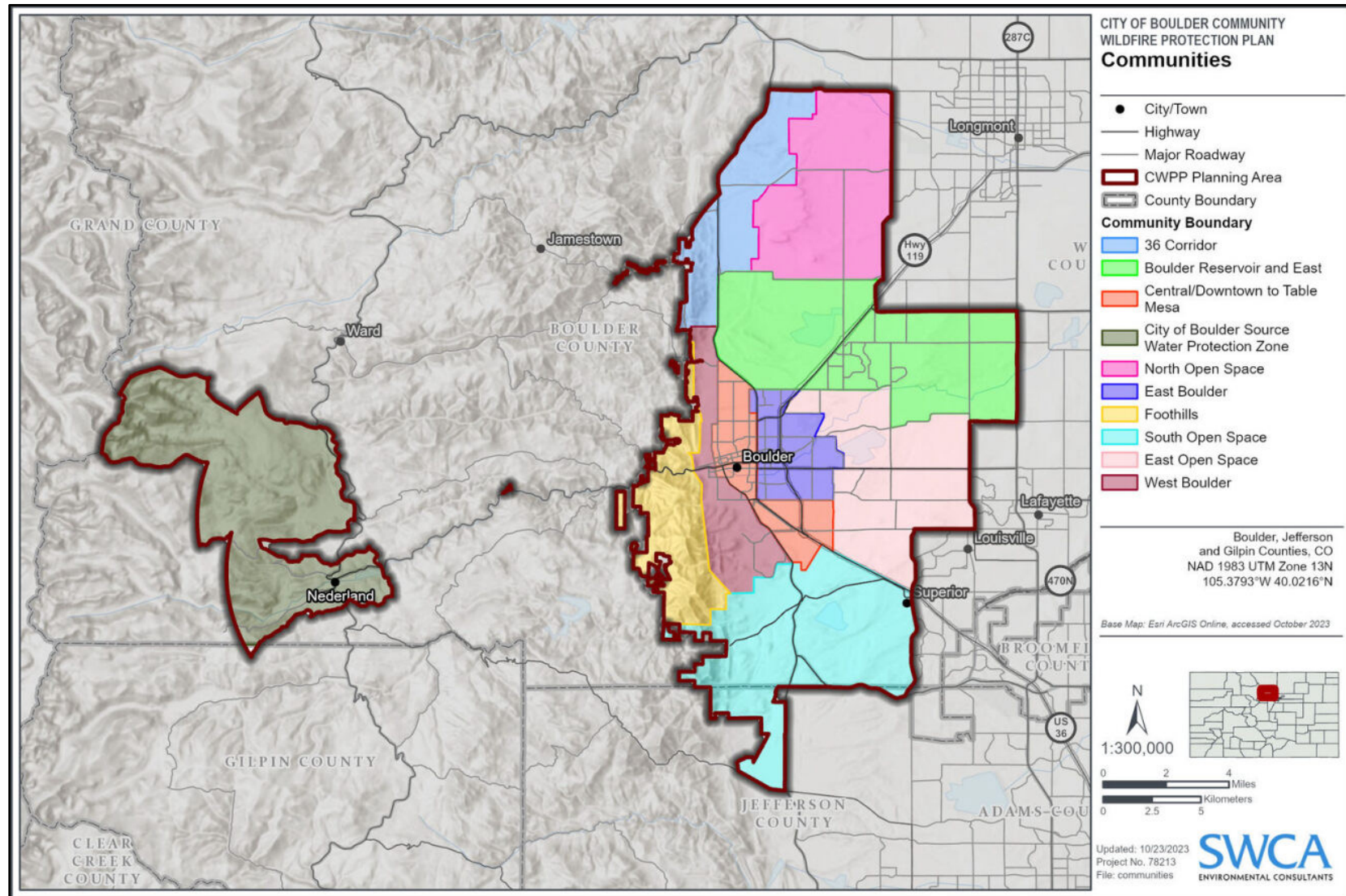


Figure C.1. City of Boulder CWPP community polygon delineations.

SOUTH OPEN SPACE WILDLAND-URBAN INTERFACE COMMUNITY

Community Polygon Background		
Community Polygon Name: South Open Space	Total NFPA 1144 Score + Rating:	66, Moderate
Area (Square Miles): 28.17		
Building Count: 1020		
Building Density (Building Units per square mile): 36.21		

Percent of Community by Modeled Desktop Risk Assessment (Figure C.2)			
<u>N/A:</u>	<u>Low:</u>	<u>Moderate:</u>	<u>High:</u>
2.0%	2.0%	96.0%	0%

1144 Risk Variable	Assessed Condition	Risk Rating
Means of Access		
<i>Entrance/Exit</i>	2 or more roads in and out	Low
<i>Road Width</i>	< 20 ft	High
<i>Road Conditions</i>	Surfaced road, grade < 5%	Low
<i>Fire Truck Access</i>	< 300 ft with no turnaround	High
<i>Street Signs</i>	Present – reflective	Low
Vegetation (Fuel Model)		
<i>Predominate Vegetation</i>	Grass Shrub (GS)	Moderate
<i>Defensible Space</i>	< 30 ft around structure	Extreme
Topography Within 300 ft of Structures		
<i>Slope</i>	< 9%	Low
<i>Topographic Features</i>	2	Moderate
<i>History of High Fire Occurrence</i>	5	Extreme
<i>Severe Fire Weather Potential</i>	3	Moderate
<i>Separation of Adjacent Structures</i>	4	High
Roofing Assembly		
<i>Roofing</i>	Class A - metal roof, clay/concrete tiles, slate, asphalt shingles	Low
Building Construction		
<i>Siding Materials</i>	Combustible (wood or vinyl)	Extreme
<i>Deck and Fencing</i>	Combustible deck and fence	Extreme
<i>Building Setback</i>	> 30 ft to slope	Low

1144 Risk Variable	Assessed Condition	Risk Rating
Available Fire Protection		
Water Sources	No	Extreme
Water Source Type	None	Extreme
Water Source Score	10	Extreme
Organized Response	Station < 5 mi from community	Low
Placement of Gas and Electric Utilities		
Utilities Placement	One above, one below	Moderate
1144 Survey Summary Highlights		
<u>Positive Attributes (Low Scores)</u> • Good ingress and egress • Relatively flat surfaced roads • Reflective street signs • Low angle slopes around structures • Fire station near community		<u>Negative Attributes (High Scores)</u> • Limited defensible space • History of fire occurrence • Combustible siding, deck, and fencing materials • No water source

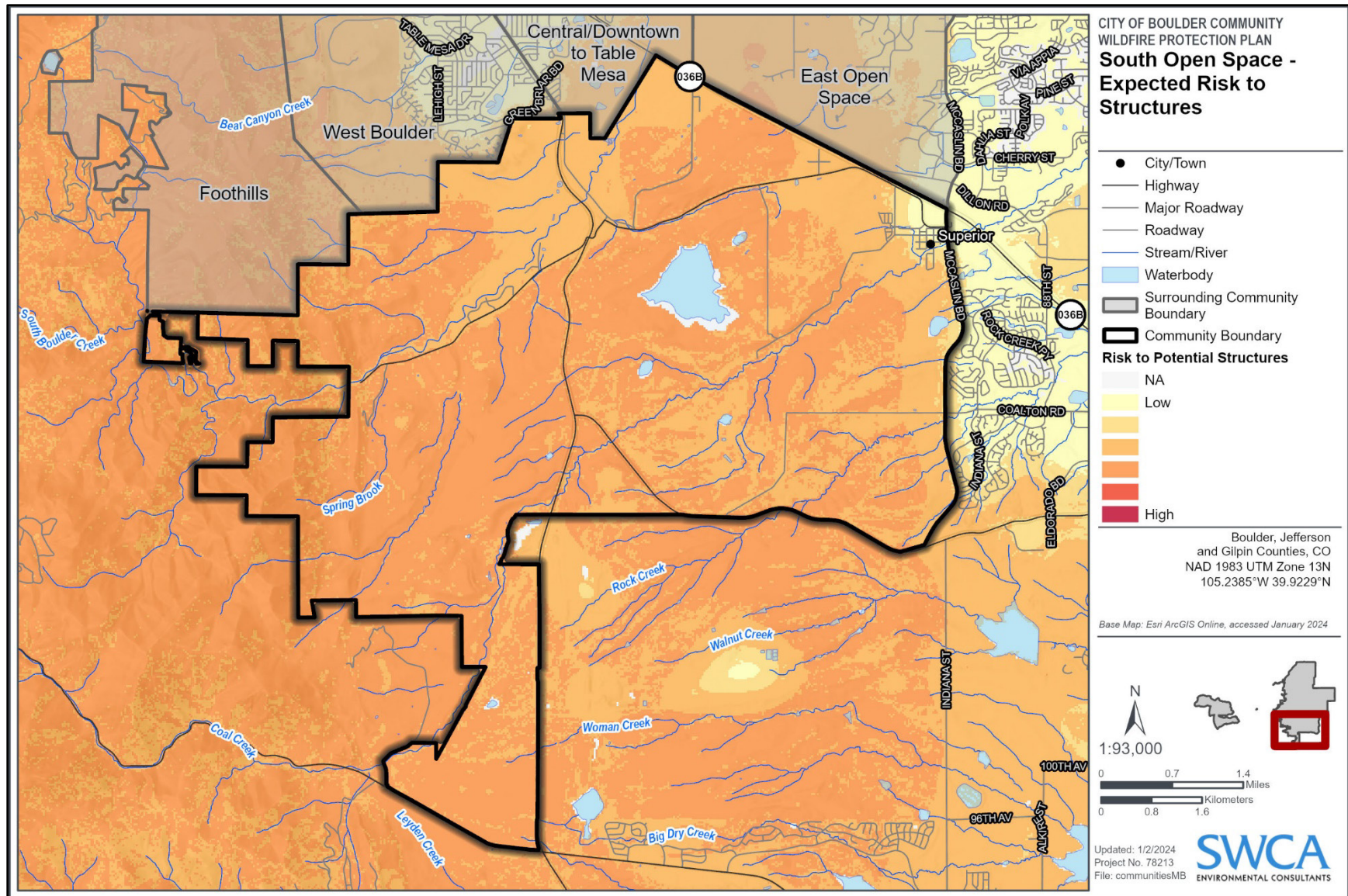


Figure C.2. South Open Space Expected Risk to Potential Structures.

CITY OF BOULDER SOURCE WATER PROTECTION ZONE WILDLAND-URBAN INTERFACE COMMUNITY

Community Polygon Background		
Community Polygon Name: City of Boulder Source Water Protection Zone	Total NFPA 1144 Score + Rating:	94, High
Area (Square Miles): 36.00		
Building Count: 976		
Building Density (Building Units per square mile): 27.1		

Percent of Community by Modeled Desktop Risk Assessment (Figure C.3)			
<u>N/A:</u> 10.1%	<u>Low:</u> 12.9%	<u>Moderate:</u> 77.0%	<u>High:</u> 0%

1144 Risk Variable	Assessed Condition	Risk Rating
Means of Access		
Entrance/Exit	1 road in and out	Extreme
Road Width	> 20 ft < 24 ft	Moderate
Road Conditions	Non-surfaced road, grade < 5%	Moderate
Fire Truck Access	< 300 ft with no turnaround	High
Street Signs	Present – non-reflective	Moderate
Vegetation (Fuel Model)		
Predominate Vegetation	Timber with grass or shrub understory (TU)	High
Defensible Space	< 30 ft around structure	Extreme
Topography Within 300 ft of Structures		
Slope	10% to 20%	Moderate
Topographic Features	5	Extreme
History of High Fire Occurrence	2	Moderate
Severe Fire Weather Potential	4	High
Separation of Adjacent Structures	3	Moderate
Roofing Assembly		
Roofing	Class A - metal roof, clay/concrete tiles, slate, asphalt shingles	Low
Building Construction		
Siding Materials	Combustible (wood or vinyl)	Extreme
Deck and Fencing	Combustible deck and fence	Extreme
Building Setback	< 30 ft to slope	Extreme

1144 Risk Variable	Assessed Condition	Risk Rating
Available Fire Protection		
Water Sources	Yes	Low
Water Source Type	Hydrant	Low
Water Source Score	1	Low
Organized Response	Station < 5 mi from community	Low
Placement of Gas and Electric Utilities		
Utilities Placement	Both above ground	Extreme
1144 Survey Summary Highlights		
<u>Positive Attributes (Low Scores)</u> • Non-combustible roofing materials • Good water source (hydrant) • Fire station near community		<u>Negative Attributes (High Scores)</u> • Limited ingress and egress • Limited defensible space • Complex topographic features • Electric and gas utilities above ground

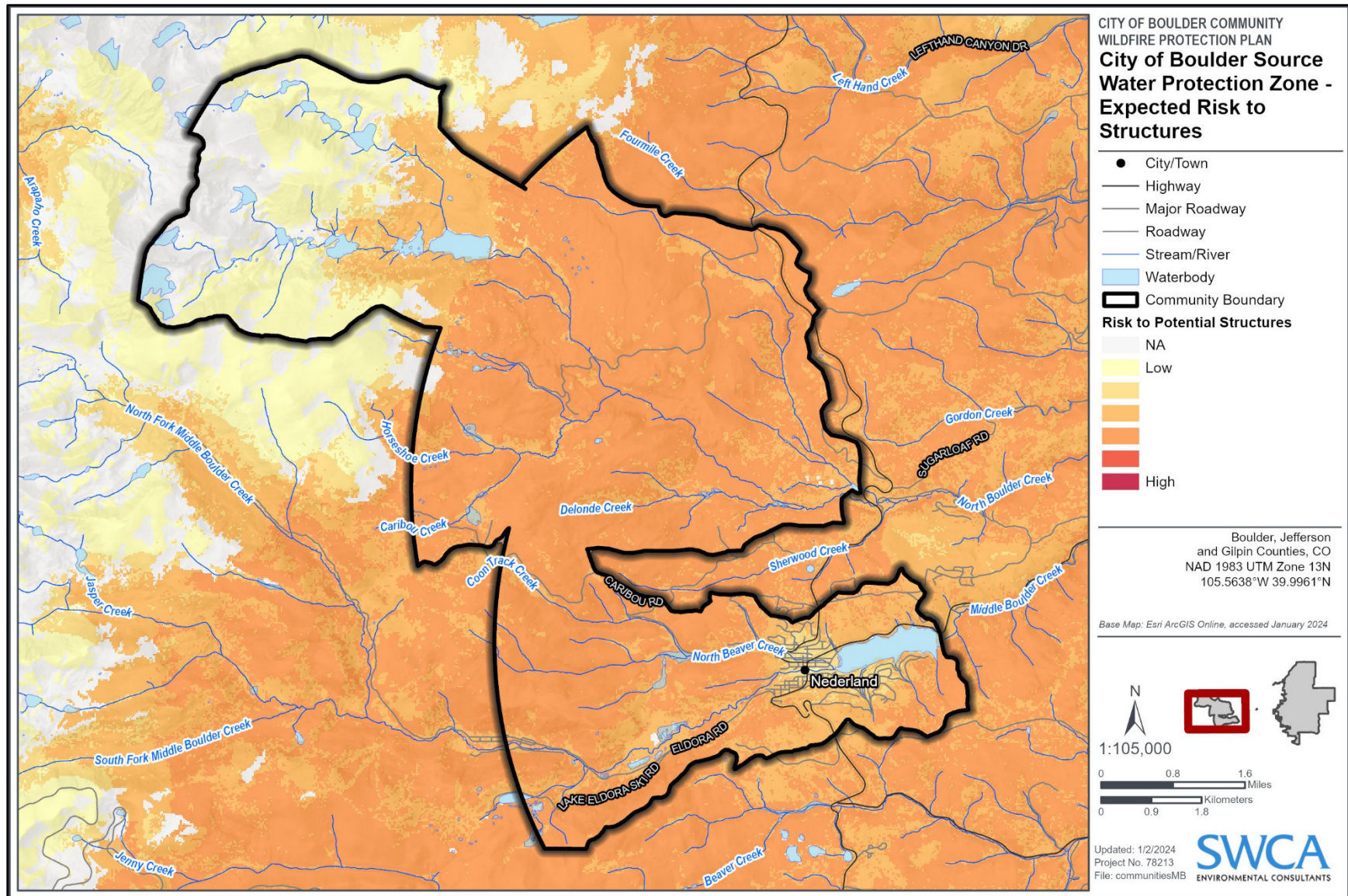


Figure C.3. City of Boulder Source Water Protection Zone Expected Risk to Potential Structures.

36 CORRIDOR WILDLAND-URBAN INTERFACE COMMUNITY

Community Polygon Background		
Community Polygon Name: 36 Corridor	Total NFPA 1144 Score + Rating:	73, High
Area (Square Miles): 12.70		
Building Count: 708		
Building Density (Building Units per square mile): 55.76		

Percent of Community by Modeled Desktop Risk Assessment (Figure C.4)			
<u>N/A:</u>	<u>Low:</u>	<u>Moderate:</u>	<u>High:</u>
1.7%	0%	98.3%	0%

1144 Risk Variable	Assessed Condition	Risk Rating
Means of Access		
Entrance/Exit	2 or more roads in and out	Low
Road Width	> 20 ft < 24 ft	Moderate
Road Conditions	Non-surfaced road, grade < 5%	Moderate
Fire Truck Access	< 300 ft with no turnaround	High
Street Signs	Present – reflective	Low
Vegetation (Fuel Model)		
Predominate Vegetation	Grass Shrub (GS)	Moderate
Defensible Space	< 30 ft around structure	Extreme
Topography Within 300 ft of Structures		
Slope	10% to 20%	Moderate
Topographic Features	4	High
History of High Fire Occurrence	2	Moderate
Severe Fire Weather Potential	4	High
Separation of Adjacent Structures	1	Low
Roofing Assembly		
Roofing	Class A - metal roof, clay/concrete tiles, slate, asphalt shingles	Low
Building Construction		
Siding Materials	Combustible (wood or vinyl)	Extreme
Deck and Fencing	Combustible deck and fence	Extreme
Building Setback	< 30 ft to slope	Extreme
Available Fire Protection		
Water Sources	Yes	Low
Water Source Type	Hydrant	Low
Water Source Score	1	Low

1144 Risk Variable	Assessed Condition	Risk Rating
<i>Organized Response</i>	Station < 5 mi from community	Low
<i>Placement of Gas and Electric Utilities</i>		
<i>Utilities Placement</i>	One above, one below	Moderate
1144 Survey Summary Highlights		
<u>Positive Attributes (Low Scores)</u> • Good ingress and egress • Reflective street signs • Good separation of adjacent structures • Non-combustible roofing materials • Good water source (hydrant) • Fire station near community		<u>Negative Attributes (High Scores)</u> • Limited defensible space • Combustible siding, deck, and fencing materials

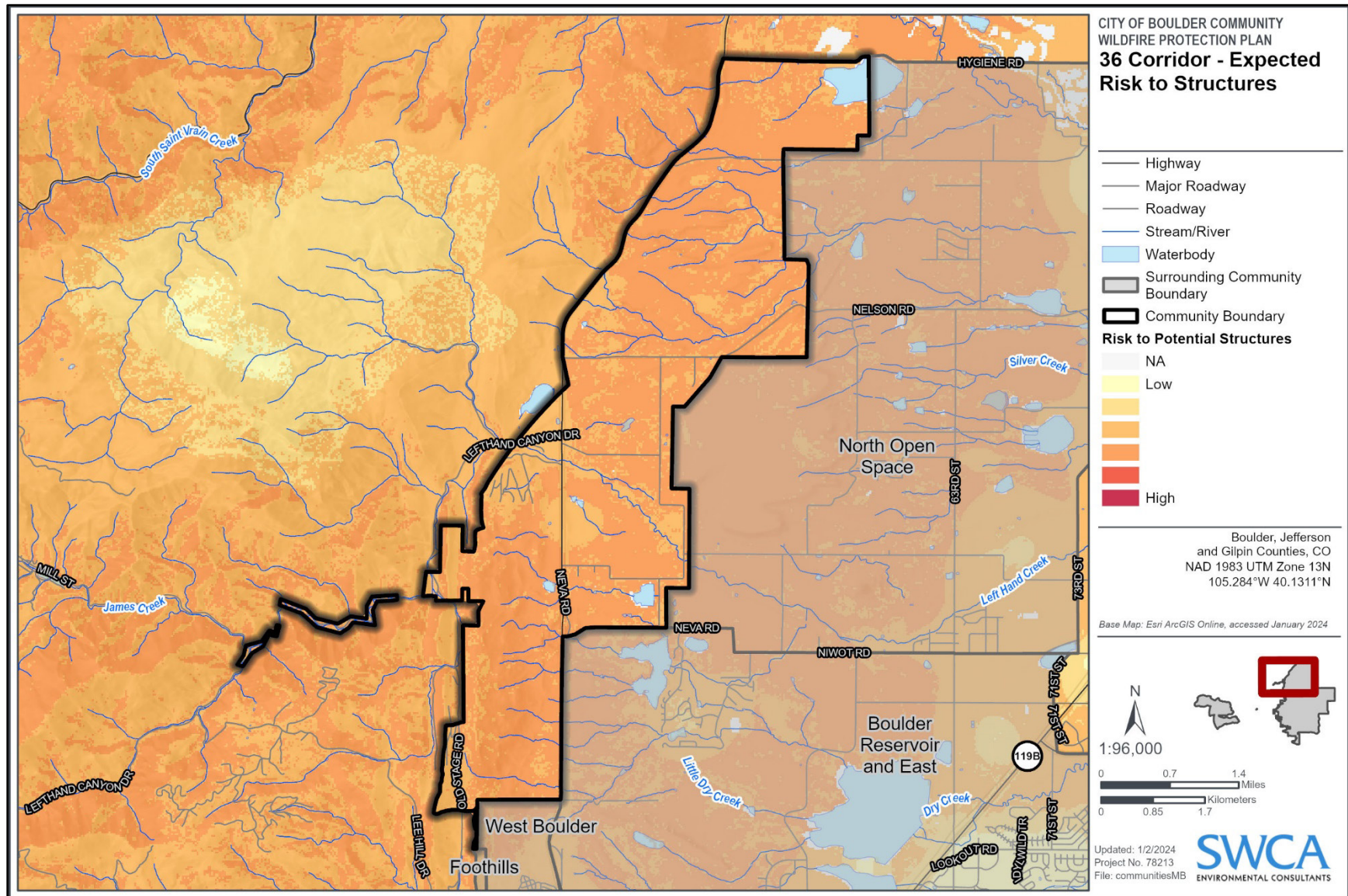


Figure C.4. 36 Corridor Expected Risk to Potential Structures.

NORTH OPEN SPACE WILDLAND-URBAN INTERFACE COMMUNITY

Community Polygon Background		
Community Polygon Name: North Open Space	Total NFPA 1144 Score + Rating:	62, Moderate
Area (Square Miles): 20.98		
Building Count: 1486		
Building Density (Building Units per square mile): 70.81		

Percent of Community by Modeled Desktop Risk Assessment (Figure C.5)			
<u>N/A:</u>	<u>Low:</u>	<u>Moderate:</u>	<u>High:</u>
3.5%	1.6%	94.9%	0%

1144 Risk Variable	Assessed Condition	Risk Rating
Means of Access		
Entrance/Exit	2 or more roads in and out	Low
Road Width	> 20 ft < 24 ft	Moderate
Road Conditions	Non-surfaced road, grade < 5%	Moderate
Fire Truck Access	> 300 ft with no turnaround	Extreme
Street Signs	Present – reflective	Low
Vegetation (Fuel Model)		
Predominate Vegetation	Grass Shrub (GS)	Moderate
Defensible Space	< 30 ft around structure	Extreme
Topography Within 300 ft of Structures		
Slope	< 9%	Low
Topographic Features	1	Low
History of High Fire Occurrence	2	Moderate
Severe Fire Weather Potential	3	Moderate
Separation of Adjacent Structures	2	Moderate
Roofing Assembly		
Roofing	Class A - metal roof, clay/concrete tiles, slate, asphalt shingles	Low
Building Construction		
Siding Materials	Combustible (wood or vinyl)	Extreme
Deck and Fencing	Combustible deck and fence	Extreme
Building Setback	> 30 ft to slope	Low
Available Fire Protection		
Water Sources	No	Extreme
Water Source Type	None	Extreme

1144 Risk Variable	Assessed Condition	Risk Rating
Water Source Score	10	Extreme
Organized Response	Station < 5 mi from community	Low
Placement of Gas and Electric Utilities		
Utilities Placement	One above, one below	Moderate
1144 Survey Summary Highlights		
<u>Positive Attributes (Low Scores)</u> • Good ingress and egress • Reflective street signs • Low angle slopes around structures • Relatively flat topography • Non-combustible roofing materials • Good building setback • Fire station near community		<u>Negative Attributes (High Scores)</u> • Limited fire truck access • Limited defensible space • Combustible siding, deck, and fencing materials • No water source

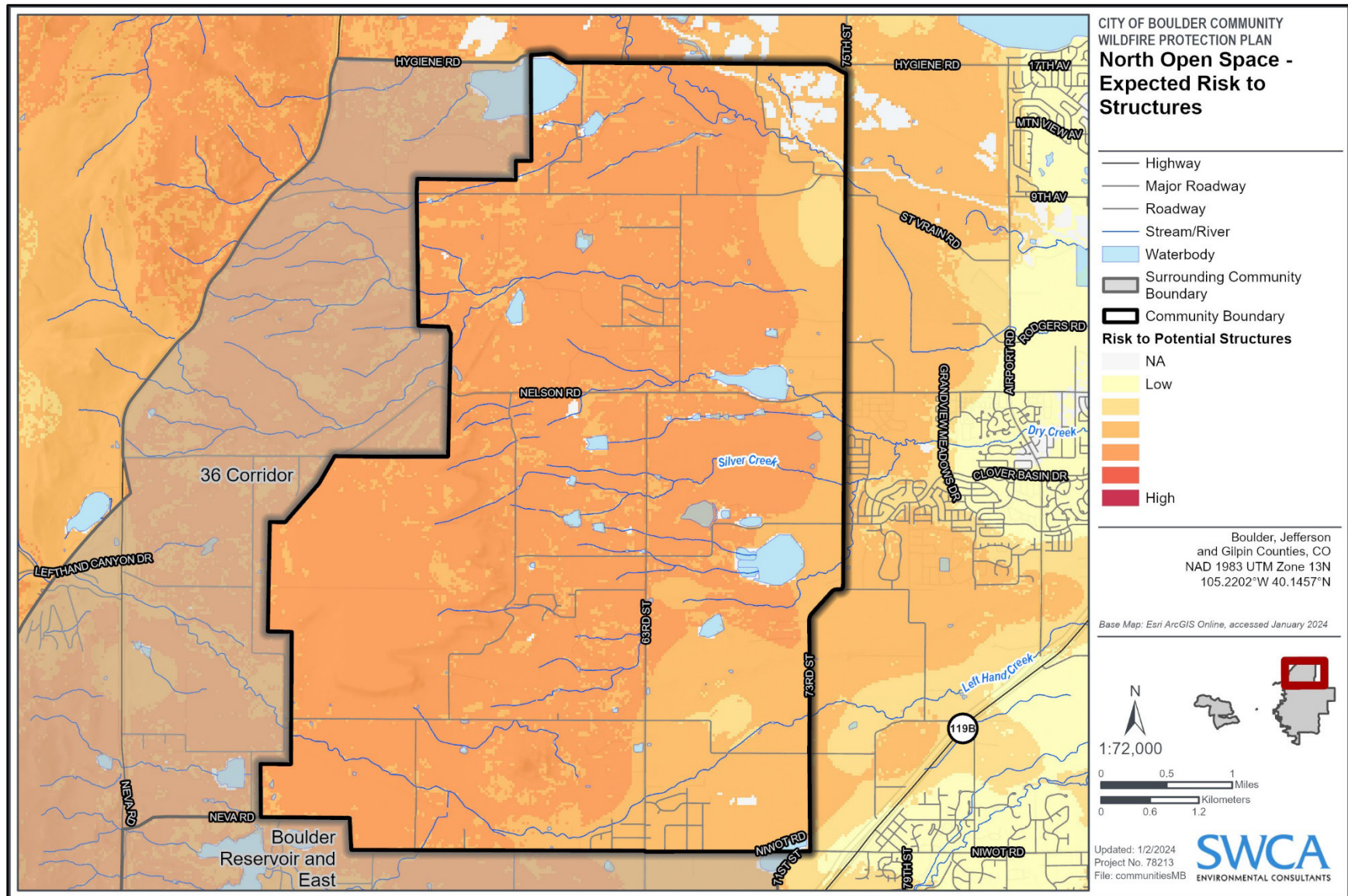


Figure C.5. North Open Space Expected Risk to Potential Structures.

CENTRAL/DOWNTOWN TO TABLE MESA WILDLAND-URBAN INTERFACE COMMUNITY

Community Polygon Background		
Community Polygon Name: Central/Downtown to Table Mesa	Total NFPA 1144 Score + Rating:	56, Moderate
Area (Square Miles): 8.39		
Building Count: 10841		
Building Density (Building Units per square mile): 1292.81		

Percent of Community by Modeled Desktop Risk Assessment (Figure C.6)			
<u>N/A:</u> 29.6%	<u>Low:</u> 59.2%	<u>Moderate:</u> 11.2%	<u>High:</u> 0%

1144 Risk Variable	Assessed Condition	Risk Rating
Means of Access		
Entrance/Exit	2 or more roads in and out	Low
Road Width	> 20 ft < 24 ft	High
Road Conditions	Surfaced road, grade < 5%	Low
Fire Truck Access	< 300 ft with no turnaround	High
Street Signs	Present – reflective	Low
Vegetation (Fuel Model)		
Predominate Vegetation	Non-burnable (NB)	Low
Defensible Space	< 30 ft around structure	Extreme
Topography Within 300 ft of Structures		
Slope	< 9%	Low
Topographic Features	1	Low
History of High Fire Occurrence	1	Low
Severe Fire Weather Potential	1	Low
Separation of Adjacent Structures	5	Extreme
Roofing Assembly		
Roofing	Class A - metal roof, clay/concrete tiles, slate, asphalt shingles	Low
Building Construction		
Siding Materials	Combustible (wood or vinyl)	Extreme
Deck and Fencing	Combustible deck and fence	Extreme
Building Setback	> 30 ft to slope	Low
Available Fire Protection		
Water Sources	Yes	Low

1144 Risk Variable	Assessed Condition	Risk Rating
Water Source Type	Hydrant	Low
Water Source Score	1	Low
Organized Response	Station < 5 mi from community	Low
Placement of Gas and Electric Utilities		
Utilities Placement	One above, one below	Moderate
1144 Survey Summary Highlights		
<u>Positive Attributes (Low Scores)</u> • Good ingress and egress • Relatively flat surfaced roads • Reflective street signs • Predominantly non-burnable fuel types present • Low angle slopes around structures • Relatively flat topography • Low history of fire occurrence • Low potential for severe fire weather • Non-combustible roofing materials • Good building setback • Good water source (hydrant) • Fire station near community		<u>Negative Attributes (High Scores)</u> • Limited defensible space • Limited separation of adjacent structures • Combustible siding, deck, and fencing materials

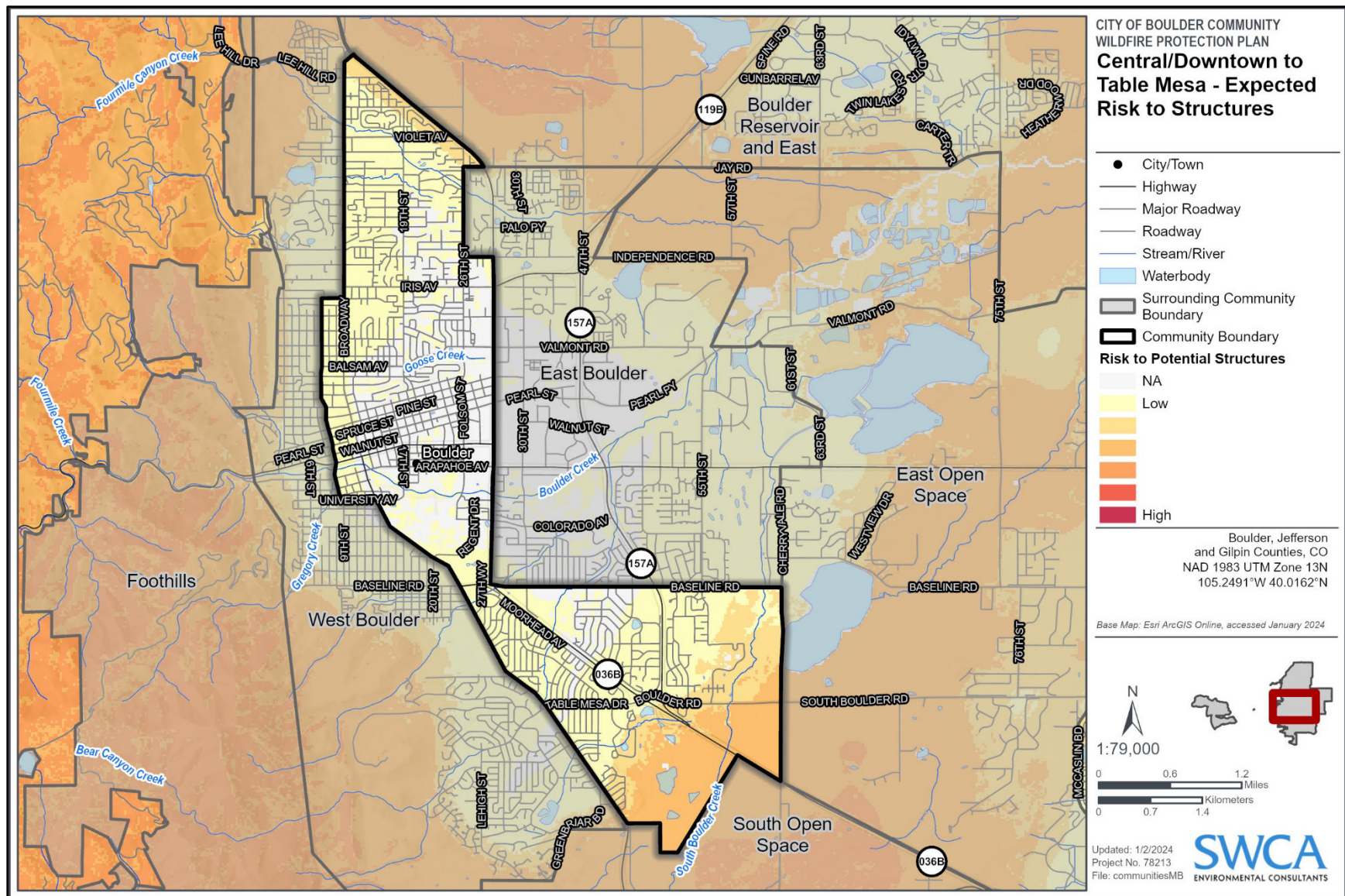


Figure C.6. Central/Downtown to Table Mesa Expected Risk to Potential Structures.

EAST BOULDER WILDLAND-URBAN INTERFACE COMMUNITY

Community Polygon Background	
Community Polygon Name: East Boulder	Total NFPA 1144 Score + Rating: 52, Moderate
Area (Square Miles): 7.57	
Building Count: 5971	
Building Density (Building Units per square mile): 788.31	

Percent of Community by Modeled Desktop Risk Assessment (Figure C.7)			
<u>N/A:</u> 31.2%	<u>Low:</u> 65.8%	<u>Moderate:</u> 3.0%	<u>High:</u> 0%

1144 Risk Variable	Assessed Condition	Risk Rating
Means of Access		
Entrance/Exit	2 or more roads in and out	Low
Road Width	> 24 ft	Low
Road Conditions	Surfaced road, grade < 5%	Low
Fire Truck Access	< 300 ft with no turnaround	High
Street Signs	Present – reflective	Low
Vegetation (Fuel Model)		
Predominate Vegetation	Non-burnable (NB)	Low
Defensible Space	< 30 ft around structure	Extreme
Topography Within 300 ft of Structures		
Slope	< 9%	Low
Topographic Features	1	Low
History of High Fire Occurrence	1	Low
Severe Fire Weather Potential	1	Low
Separation of Adjacent Structures	4	High
Roofing Assembly		
Roofing	Class A - metal roof, clay/concrete tiles, slate, asphalt shingles	Low
Building Construction		
Siding Materials	Fire Resistive (stucco/adobe)	High
Deck and Fencing	Combustible deck and fence	Extreme
Building Setback	> 30 ft to slope	Low
Available Fire Protection		
Water Sources	Yes	Low
Water Source Type	Hydrant	Low

1144 Risk Variable	Assessed Condition	Risk Rating
Water Source Score	1	Low
Organized Response	Station < 5 mi from community	Low
Placement of Gas and Electric Utilities		
Utilities Placement	One above, one below	Moderate
1144 Survey Summary Highlights		
<u>Positive Attributes (Low Scores)</u> • Good ingress and egress • Relatively flat, wide, and surfaced roads • Predominantly non-burnable fuel types present • Reflective street signs • Low angle slopes around structures • Low history of fire occurrence • Low potential for severe fire weather • Relatively flat topography • Good building setback • Good water source (hydrant) • Fire station near community		<u>Negative Attributes (High Scores)</u> • Limited defensible space • Combustible deck and fencing materials

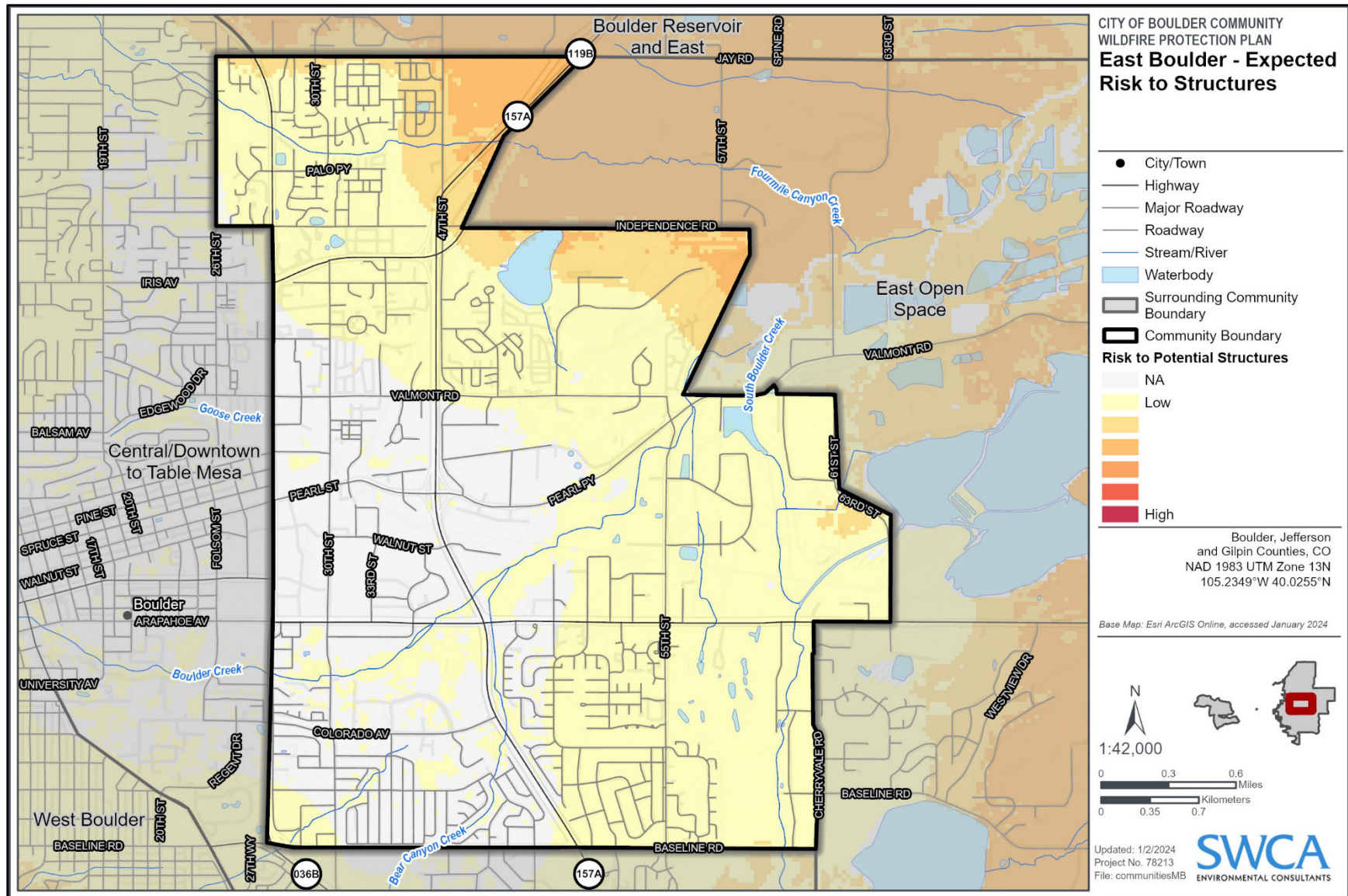


Figure C.7. East Boulder Expected Risk to Potential Structures.

EAST OPEN SPACE WILDLAND-URBAN INTERFACE COMMUNITY

Community Polygon Background		
Community Polygon Name: East Open Space	Total NFPA 1144 Score + Rating:	66, Moderate
Area (Square Miles): 21.67		
Building Count: 5156		
Building Density (Building Units per square mile): 237.98		

Percent of Community by Modeled Desktop Risk Assessment (Figure C.8)			
<u>N/A:</u>	<u>Low:</u>	<u>Moderate:</u>	<u>High:</u>
1.1%	44.3%	46.6%	0%

1144 Risk Variable	Assessed Condition	Risk Rating
Means of Access		
Entrance/Exit	2 or more roads in and out	Low
Road Width	> 20 ft < 24 ft	Moderate
Road Conditions	Surfaced road, grade < 5%	Low
Fire Truck Access	< 300 ft with no turnaround	High
Street Signs	Present – reflective	Low
Vegetation (Fuel Model)		
Predominate Vegetation	Non-burnable (NB), Grass Shrub (GS)	Moderate
Defensible Space	< 30 ft around structure	Extreme
Topography Within 300 ft of Structures		
Slope	< 9%	Low
Topographic Features	1	Low
History of High Fire Occurrence	2	Moderate
Severe Fire Weather Potential	2	Moderate
Separation of Adjacent Structures	3	Moderate
Roofing Assembly		
Roofing	Class A - metal roof, clay/concrete tiles, slate, asphalt shingles	Low
Building Construction		
Siding Materials	Combustible (wood or vinyl)	Extreme
Deck and Fencing	Combustible deck and fence	Extreme
Building Setback	> 30 ft to slope	Low
Available Fire Protection		
Water Sources	Yes	Low

1144 Risk Variable	Assessed Condition	Risk Rating
Water Source Type	Hydrant	Low
Water Source Score	1	Low
Organized Response	Station < 5 mi from community	Low
Placement of Gas and Electric Utilities		
Utilities Placement	One above, one below	Moderate
1144 Survey Summary Highlights		
<u>Positive Attributes (Low Scores)</u> • Good ingress and egress • Relatively flat surfaced roads • Reflective street signs • Low angle slopes around structures • Relatively flat topography • Non-combustible roofing materials • Good building setback • Good water source (hydrant) • Fire station near community		<u>Negative Attributes (High Scores)</u> • Limited defensible space • Combustible siding, deck, and fencing materials

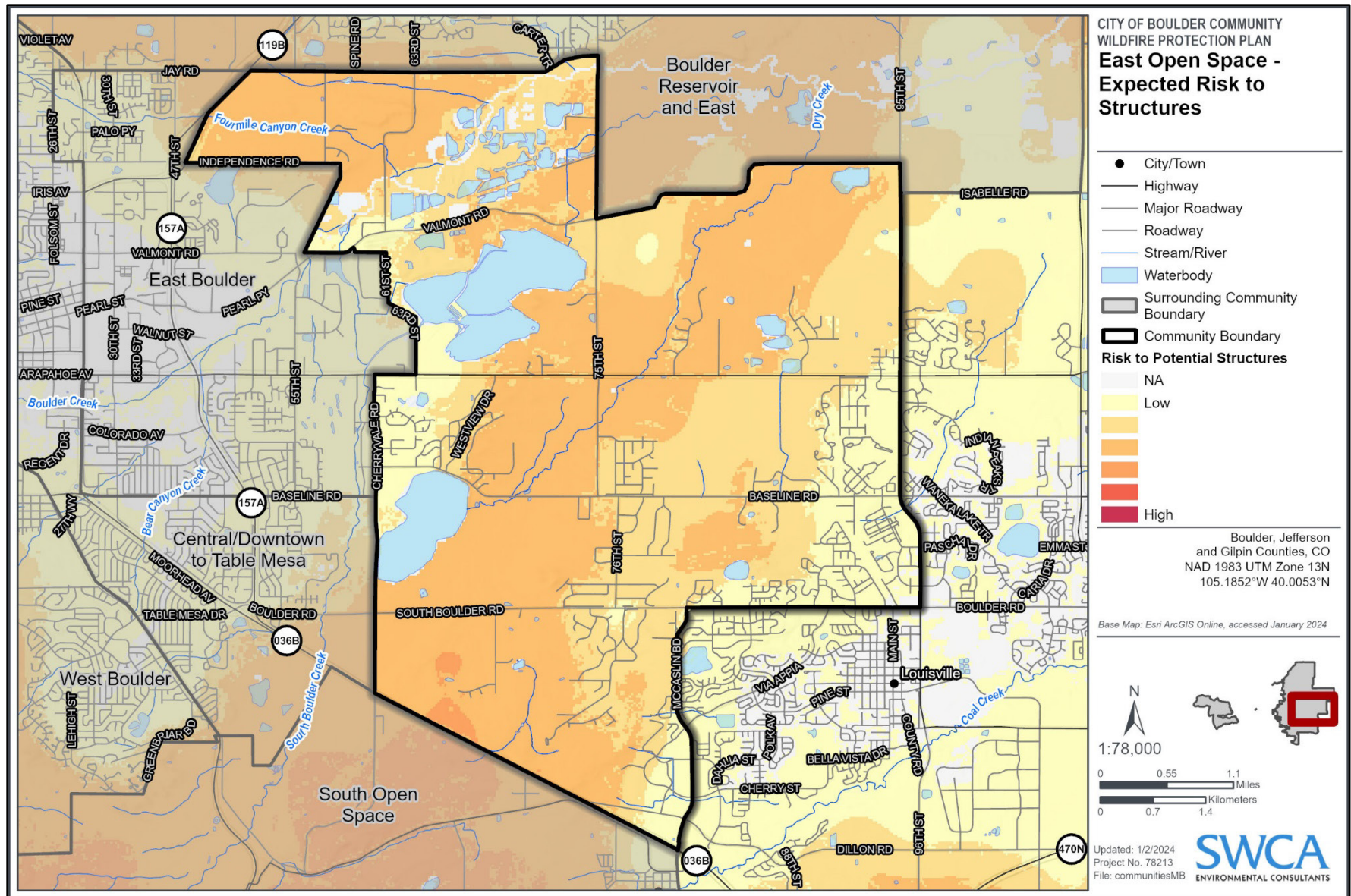


Figure C.8. East Open Space Expected Risk to Potential Structures.

BOULDER RESERVOIR AND EAST WILDLAND-URBAN INTERFACE COMMUNITY

Community Polygon Background		
Community Polygon Name: Boulder Reservoir and East	Total NFPA 1144 Score + Rating:	66, Moderate
Area (Square Miles): 32.41		
Building Count: 5118		
Building Density (Building Units per square mile): 157.9		

Percent of Community by Modeled Desktop Risk Assessment (Figure C.9)			
<u>N/A:</u> 6.2%	<u>Low:</u> 22.9%	<u>Moderate:</u> 68.9%	<u>High:</u> 0%

1144 Risk Variable	Assessed Condition	Risk Rating
Means of Access		
Entrance/Exit	2 or more roads in and out	Low
Road Width	> 24 ft	Low
Road Conditions	Non-surfaced road, grade < 5%	Moderate
Fire Truck Access	< 300 ft with no turnaround	High
Street Signs	Present – reflective	Low
Vegetation (Fuel Model)		
Predominate Vegetation	Non-burnable (NB), Grass Shrub (GS)	Low
Defensible Space	< 30 ft around structure	Extreme
Topography Within 300 ft of Structures		
Slope	< 9%	Low
Topographic Features	1	Low
History of High Fire Occurrence	2	Moderate
Severe Fire Weather Potential	2	Moderate
Separation of Adjacent Structures	2	Moderate
Roofing Assembly		
Roofing	Class A - metal roof, clay/concrete tiles, slate, asphalt shingles	Low
Building Construction		
Siding Materials	Combustible (wood or vinyl)	Extreme
Deck and Fencing	Combustible deck and fence	Extreme
Building Setback	> 30 ft to slope	Low

1144 Risk Variable	Assessed Condition	Risk Rating
Available Fire Protection		
Water Sources	Yes	Low
Water Source Type	Hydrant	Low
Water Source Score	1	Low
Organized Response	Station < 5 mi from community	Low
Placement of Gas and Electric Utilities		
Utilities Placement	One above, one below	Moderate
1144 Survey Summary Highlights		
<u>Positive Attributes (Low Scores)</u> • Good ingress and egress • Relatively wide and flat surfaced roads • Reflective street signs • Predominantly non-burnable fuel types present • Low angle slopes around structures • Relatively flat topography • Non-combustible roofing materials • Good building setback • Good water source (hydrant) • Fire station near community		<u>Negative Attributes (High Scores)</u> • Limited defensible space • Combustible siding, deck, and fencing materials

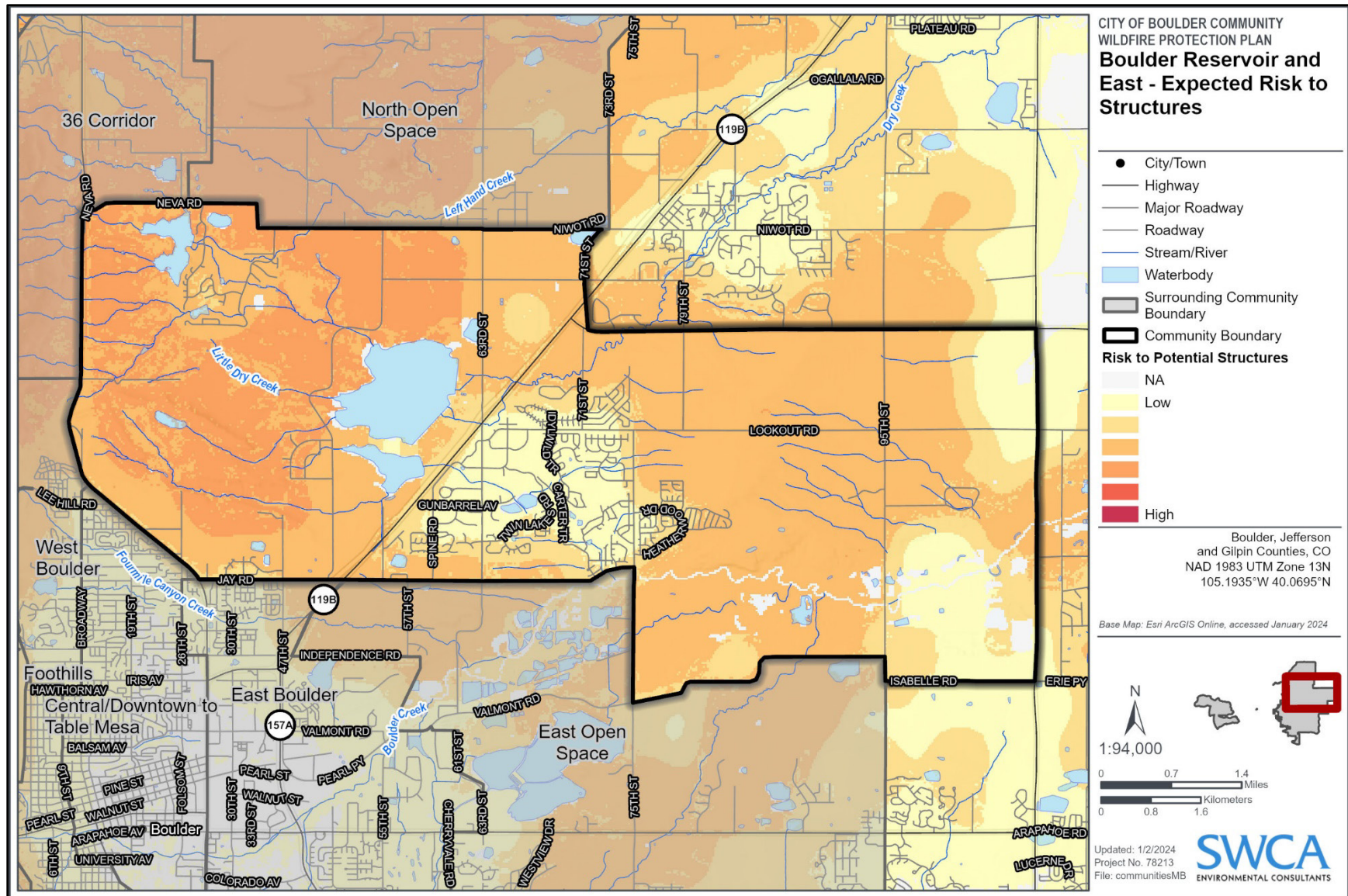


Figure C.9. Boulder Reservoir and East Expected Risk to Potential Structures.

WEST BOULDER WILDLAND-URBAN INTERFACE COMMUNITY

Community Polygon Background		
Community Polygon Name: West Boulder	Total NFPA 1144 Score + Rating:	74, High
Area (Square Miles): 9.48		
Building Count: 8996		
Building Density (Building Units per square mile): 948.71		

Percent of Community by Modeled Desktop Risk Assessment (Figure C.10)			
<u>N/A:</u>	<u>Low:</u>	<u>Moderate:</u>	<u>High:</u>
1.8%	52.2%	46.0%	0%

1144 Risk Variable	Assessed Condition	Risk Rating
Means of Access		
Entrance/Exit	2 or more roads in and out	Low
Road Width	> 20 ft < 24 ft	High
Road Conditions	Surfaced road, grade < 5%	Low
Fire Truck Access	< 300 ft with no turnaround	High
Street Signs	Present – reflective	Low
Vegetation (Fuel Model)		
Predominate Vegetation	Non-burnable (NB), Shrub (SH)	Moderate
Defensible Space	< 30 ft around structure	Extreme
Topography Within 300 ft of Structures		
Slope	10% to 20%	Moderate
Topographic Features	2	Moderate
History of High Fire Occurrence	3	Moderate
Severe Fire Weather Potential	3	Moderate
Separation of Adjacent Structures	4	Extreme
Roofing Assembly		
Roofing	Class A - metal roof, clay/concrete tiles, slate, asphalt shingles	Low
Building Construction		
Siding Materials	Combustible (wood or vinyl)	Extreme
Deck and Fencing	Combustible deck and fence	Extreme
Building Setback	> 30 ft to slope	Low
Available Fire Protection		
Water Sources	Yes	Low
Water Source Type	Hydrant	Low

1144 Risk Variable	Assessed Condition	Risk Rating
Water Source Score	1	Low
Organized Response	Station < 5 mi from community	Low
Placement of Gas and Electric Utilities		
Utilities Placement	One above, one below	Moderate
1144 Survey Summary Highlights		
<u>Positive Attributes (Low Scores)</u> • Good ingress and egress • Relatively flat surfaced roads • Reflective street signs • Non-combustible roofing materials • Good building setback • Good water source (hydrant) • Fire station near community		<u>Negative Attributes (High Scores)</u> • Limited defensible space • Limited separation of adjacent structures • Combustible siding, deck, and fencing materials

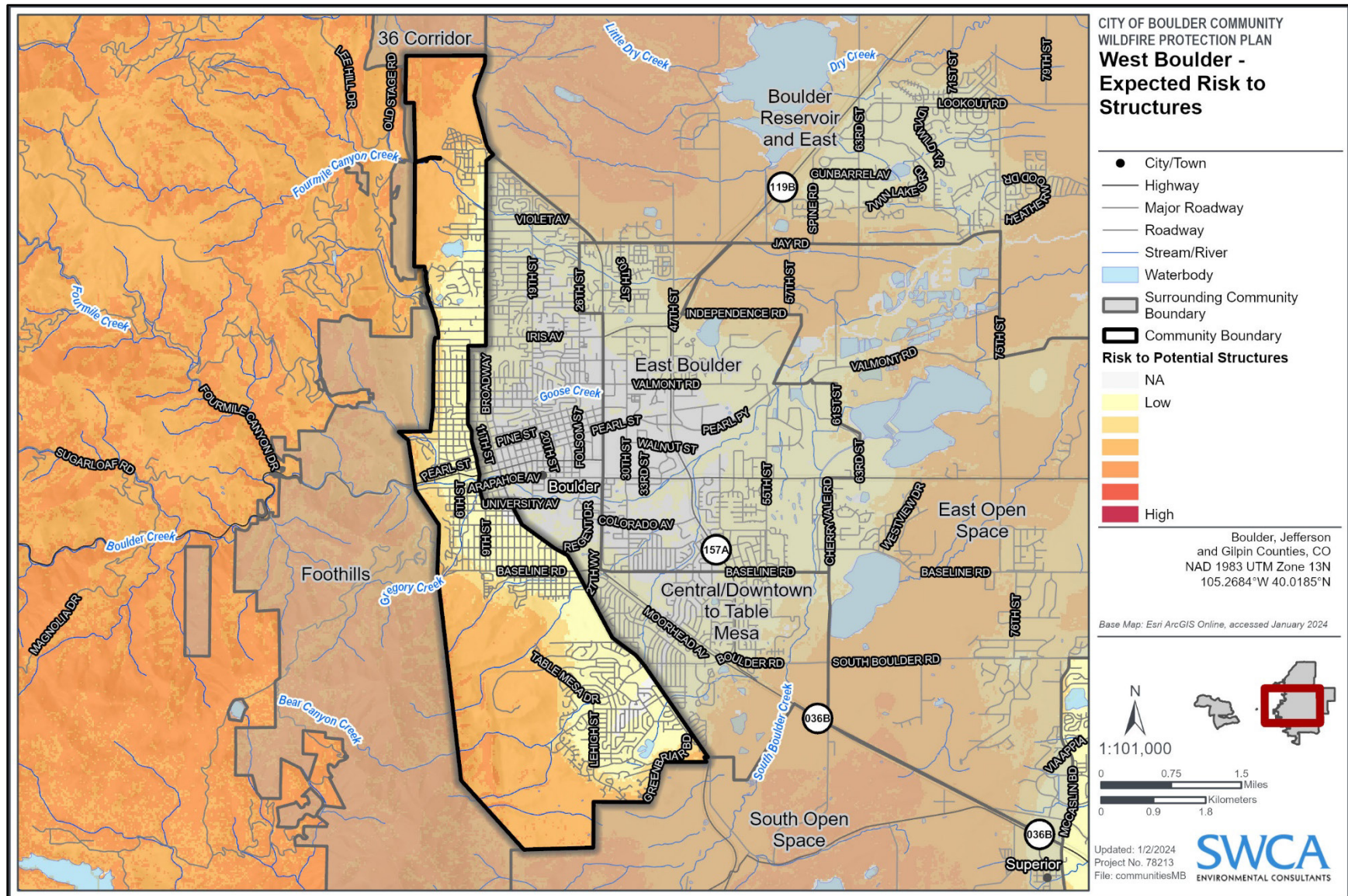


Figure C.10. West Boulder Expected Risk to Potential Structures.

FOOTHILLS WILDLAND-URBAN INTERFACE COMMUNITY

Community Polygon Background		
Community Polygon Name: Foothills	Total NFPA 1144 Score + Rating:	84, High
Area (Square Miles): 12.01		
Building Count: 187		
Building Density (Building Units per square mile): 15.48		

Percent of Community by Modeled Desktop Risk Assessment (Figure C.11)			
<u>N/A:</u>	<u>Low:</u>	<u>Moderate:</u>	<u>Extreme:</u>
0.2%	2.1%	97.7%	0%

1144 Risk Variable	Assessed Condition	Risk Rating
Means of Access		
Entrance/Exit	2 or more roads in and out	Low
Road Width	> 20 ft < 24 ft	Moderate
Road Conditions	Surfaced road, grade > 5%	Moderate
Fire Truck Access	> 300 ft with no turnaround	High
Street Signs	Present – reflective	Low
Vegetation (Fuel Model)		
Predominate Vegetation	Timber with grass or shrub understory (TU)	High
Defensible Space	< 30 ft around structure	Extreme
Topography Within 300 ft of Structures		
Slope	31% to 40%	High
Topographic Features	4	High
History of High Fire Occurrence	4	High
Severe Fire Weather Potential	5	Extreme
Separation of Adjacent Structures	1	Low
Roofing Assembly		
Roofing	Class A - metal roof, clay/concrete tiles, slate, asphalt shingles	Low
Building Construction		
Siding Materials	Combustible (wood or vinyl)	Extreme
Deck and Fencing	Combustible deck and fence	Extreme
Building Setback	> 30 ft to slope	Low
Available Fire Protection		
Water Sources	No	Extreme
Water Source Type	None	Extreme

1144 Risk Variable	Assessed Condition	Risk Rating
<i>Water Source Score</i>	10	Extreme
<i>Organized Response</i>	Station < 5 mi from community	Low
Placement of Gas and Electric Utilities		
<i>Utilities Placement</i>	One above, one below	Moderate
1144 Survey Summary Highlights		
<u>Positive Attributes (Low Scores)</u>		<u>Negative Attributes (High Scores)</u>
• Good ingress and egress • Reflective street signs • Good separation of adjacent structures • Non-combustible roofing materials • Good building setback • Fire station near community		• Limited fire truck access • Limited defensible space • High potential for severe fire weather • Combustible siding, deck, and fencing materials • No water source

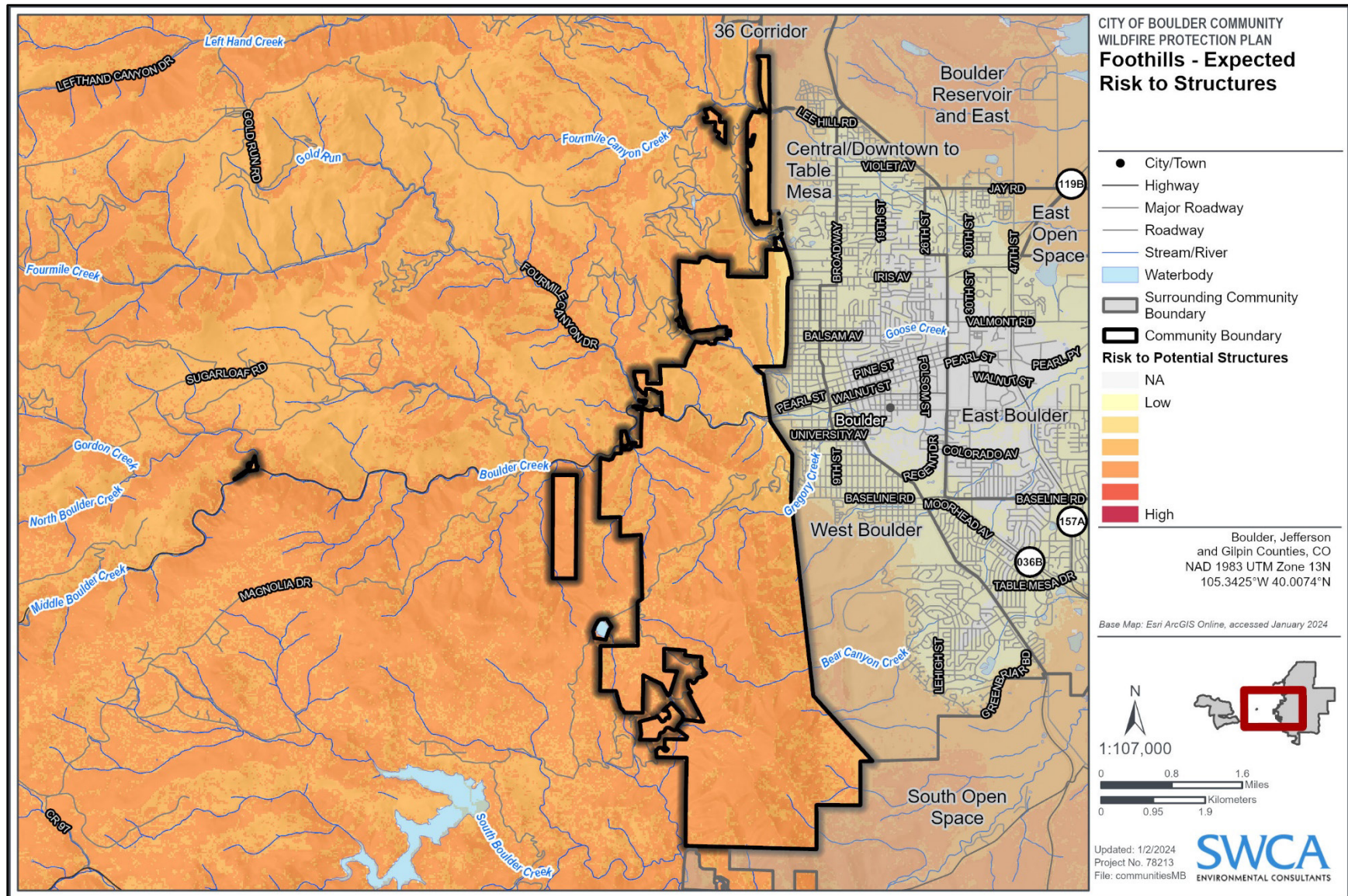


Figure C.11. Foothills Expected Risk to Potential Structures.

To replicate these community assessments in the future, please see Table C.2 below.

Table C.2. National Fire Protection Association Assessment Form as adapted by SWCA

SWCA – 1144 Assessment		
Community		Notes:
Surveyor		
Survey Date/Time		
Means of Access		
Ingress and Egress		
2 or more roads in and out score 0		
1 road in and out 7		
Road Width		
> 24 ft 0		
> 20 ft < 24 ft 2		
< 20 ft 4		
Road Conditions		
Surfaced road, grade < 5% 0		
Surfaced road, grade > 5% 2		
Non-surfaced road, grade < 5% 2		
Non-surfaced road, grade > 5% 5		
Other than all season 7		
Fire Access		
< 300 ft with turnaround 0		
> 300 ft with turnaround 2		
< 300 ft with no turnaround 4		
> 300 ft with no turnaround 5		
Street Signs		
Present – reflective 0		
Present – non-reflective 2		
Not present 5		
Notes:		
Vegetation (Fuel Models)		
Predominant Vegetation		
Primary Predominant Vegetation		
Non-Burnable (NB) Score 2		
Grass (GR) Score 5		
Grass-Shrub (GS) Score 10		

Shrub (SH) Score 15	
Timber-Understory (TU) Score 20	
Timber-Litter (TL) Score 25	
Slash-Blow (TU) Score 30	
Notes:	
Defensible Space	
> 100 ft around structure 1	
> 70 ft < 100 ft around structure 3	
> 30 ft < 70 ft around structure 10	
< 30 ft around structure 25	
Topography Within 300 ft of Structures	
Slope	
< 9% 1	
10% to 20% 4	
21% to 30% 7	
31% to 40% 8	
>41% 10	
Additional Rating Factors (rate all that apply)	
Topographic features 1-5	
History of high fire occurrence 1-5	
Severe fire weather potential 1-5	
Separation of adjacent structures 1-5	
Notes:	
Roofing Assembly	
Roofing	
Class A - metal roof, clay/concrete tiles, slate, asphalt shingles 0	
Class B - pressure treated composite shakes and shingles 3	
Class C - untreated wood shingle, plywood, particle board 15	
Unrated - Extremely poor roofing conditions 25	
Notes:	
Building Construction	
Siding Materials (predominant)	
Non-combustible (brick/concrete) 5	
Fire Resistive (stucco/adobe) 10	
Combustible (wood or vinyl) 12	

Deck and fencing (predominant)				
No deck or fence/noncombustible 0				
Combustible deck and fence 5				
Building Set-Back				
> 30 ft to slope 1				
< 30 ft to slope 5				
Notes:				
Available Fire Protection				
Water Sources				
Water Source? yes/no				
Water Source Type hydrant, water tank, other				
Other Water Source				
Water Source Score Hydrant = 1 Water Tank = 3				
Organized Response				
Station < 5 mi from community 1				
Station > 5 mi from community 3				
Notes:				
Placement of Gas and Electric Utilities				
Both underground 0				
One above, one below 3				
Both above ground 5				
Values at Risk Observations				
Forest Health Observations				
Land Use Observations				
Misc Observations				
Total				
Hazard Rating Scale	<40 Low	>40 Moderate	>70 High	>112 Extreme

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APPENDIX D:

Fire Behavior Modeling/GIS Background and Methodology

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FIRE BEHAVIOR MODELING AND METHODOLOGY

COLORADO ALL LANDS QUANTITATIVE RISK ASSESSMENT

Fire behavior models were sourced from the Colorado All Lands (COAL) quantitative risk assessment developed by Pyrologix LLC in partnership with several federal and state land management agencies across Colorado. Efforts to create the quantitative wildfire risk assessment began in 2019 and concluded in 2021 (Pyrologix 2022a). The assessment utilizes a collaboratively calibrated fuelscape, state-of-the-art modeling methodologies, and a set of collaboratively defined HVRAs standardized across Colorado.

This risk assessment improves upon previous risk assessment efforts by improving the burnable calibrations for various fuel types like urban and agricultural fuels in addition to removing data seam lines. The assessment incorporates both stochastic and deterministic models to accurately model wildfire behavior (deterministic) and then predict burn probabilities and integrated hazards (stochastic). Deterministic models utilize known inputs to calculate a single deterministic answer. In contrast, stochastic models utilize known inputs in thousands of simulated scenarios, also known as a Monte Carlo simulation, to calculate the probability of different answers occurring. Additionally, the quantitative risk assessment makes use of conditional outputs and probabilistic outputs to inform users of objective hazards (conditional) and calculated risk (probabilistic). More on these statistical theories as well as modeling methodology is explained below.

CONDITIONAL VS. PROBABILISTIC OUTPUTS

The COAL quantitative risk assessment makes use of conditional model outputs multiplied by probabilistic model outputs to produce spatial risk metrics for the operational, fire effects and integrated hazard products listed below. Conditional outputs show results for the entire landscape as if everything had the same chance of burning and show modeled wildfire behavior as a result of existing conditions. The probabilistic outputs are a product of conditional metrics multiplied by burn probability which is predicted by simulating thousands of fires based on historic weather and wind conditions for the area. This is done for each grid square (30 m) on the landscape to create a gradient (raster) of probability for metrics such as burning, operational control, and risk to structures. Conditional outputs are typically best utilized by land managers, developers, and fuel treatment planners who want to see what the fire behavior would be like, regardless of probability. Alternatively, probabilistic outputs give a more comprehensive representation of wildfire risk on the landscape and are best for prioritization and community planning efforts, as they incorporate the odds of any future fire impact.

FIRE BEHAVIOR MODELS

LANDFIRE

LANDFIRE is a national remote sensing project that provides land managers with a data source for all inputs needed for fire behavior models (fuels, topography and canopy characteristics). The database is managed by the USFS and the USDOJ and is widely used throughout the United States for land management planning. More information can be obtained from <http://www.landfire.gov>. The COAL

quantitative risk assessment utilized many of the fuel models housed within LANDFIRE but made significant adjustments to create a better match for Colorado's fire environment (Pyrologix 2022b). Specifically, Pyrologix has recalibrated previously non-burnable fuels to account for burnable agricultural and urban lands such as parks. Additionally, the updated fuelscape removes raster tile seamlines in raster datasets which have occurred throughout the district in base LANDFIRE remaps. To produce locally accurate fire behavior results, a 2-day fuel calibration workshop was held in Lakewood, Colorado with a group of interagency fire and fuels experts from across Colorado (Pyrologix 2022b).

FSIM

FSim (Large Fire Simulator) is a wildfire simulation program developed by the USFS fire sciences laboratory in Missoula, Montana. The program utilizes a stochastic Monte Carlo method to simulate hundreds of thousands of fire events across large land areas using a variety of input parameters such as fire occurrence, terrain, weather, and fuel conditions (USFS 2023). This analysis method allows for the quantification of wildfire risk as it relates to fire impact probabilities and sizes. Pyrologix has used FSim for the COAL quantitative risk assessment to calculate outputs associated with wildfire likelihood and burn probability for the integrated hazard products (Pyrologix 2022c).

WILDEST

Pyrologix recognized the challenges of estimating wildfire intensity with a stochastic simulator such as FSim. Stochastic models rely on a robust sample size, so, in low fire occurrence areas stochastic simulators will be less reliable due to the small sample size. Therefore, Pyrologix developed a custom utility called WildEST (Wildfire Exposure Simulation Tool). WildEST is a deterministic model that calculates intensity values from weighing spatially continuous weather input variables based on how likely they will occur on the landscape (Pyrologix 2022c). Deterministic values are more robust than FSim's stochastic values, especially in areas with relatively low wildfire occurrences such as the City of Boulder. Pyrologix has used WildEST to calculate wildfire intensity outputs (flame front characteristics) such as flame lengths and rate of spread for the COAL quantitative risk assessment (Pyrologix 2022c). The deterministic fire behavior outputs were derived from WildEST simulations using 216 real world weather scenarios. See the Historical Weather section below.

FIRE BEHAVIOR MODEL INPUTS

The assessment utilizes LANDFIRE's 2016 fuel model remap for producing a current conditions fuelscape for the COAL statewide assessment. Significant updates to the fuelscape were conducted after the release of LANDFIRE's 2019 remap. Additionally, Pyrologix made use of 2021 satellite imagery to calculate continuous vegetation cover and height classifications to predict wildfire behavior more accurately. Furthermore, the 2020 fire season had a significant impact on fuels and in order to represent current conditions Pyrologix updated the fuelscape to incorporate changes in fuels resulting from the 2020 fire season (Pyrologix 2022a). Current conditions are constantly changing, and it is imperative to constantly update the source fuel model data for maintaining reliable fire behavior and wildfire risk results.

An in-depth overview of Pyrologix's fuelscape inputs are available here:

http://pyrologix.com/reports/COAL_FuelscapeReport.pdf

The following is a list of fuel characteristic inputs used in the creation of the COAL fuelscape:

- Surface Fuels
- Canopy Fuels
 - Canopy Cover
 - Canopy Height
 - Canopy Bulk Density
 - Canopy Base Height
 - Canopy Overrides
- Recent Disturbances
- Developed Ruderal Vegetation Types
- Canopy Bulk Density Adjustments for Insects and Disease
- Custom Fuel Model Assignments
 - High Elevation-Subalpine Vegetation
 - Burnable Agriculture and Urban Fuel Models

TOPOGRAPHY

Topography is important in determining fire behavior and is a required input for FSim and WildEST models. Steepness of slope, aspect (direction the slope faces), elevation, and landscape features can all affect fuels, local weather (by channeling winds and affecting local temperatures), which in turn influence the behavior of wildfire (Figure D.1). Boulder contains complex topography in the western portion of the city, and Nederland is surrounded by highly contoured terrain.

More detailed information regarding topography in the planning area can be found in Appendix A.

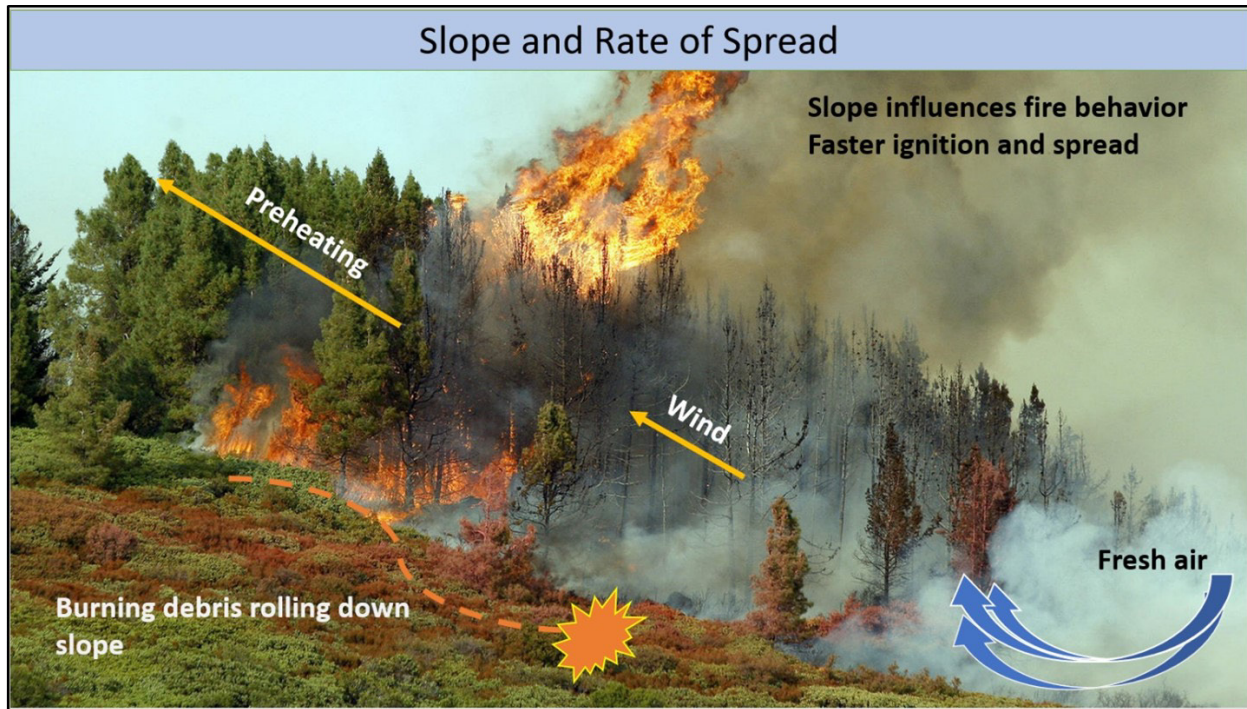


Figure D.1. Effect of topography on fire behavior.

HISTORICAL WILDFIRE OCCURRENCE

Fire occurrence data spanning 26 years from 1992-2017 was used to develop model inputs, an ignition density grid, and model calibration targets (Figure D.2) (Pyrologix 2022c). For detailed information on historical wildfire occurrence methodology go to: http://pyrologix.com/reports/COAL_HazardReport.pdf. See the Fire History section in Chapter 2 for detailed information on wildfire history in and around the Boulder.

Fire Occurrence Density

Pyrologix utilized the program FSim to create an ignition density grid to represent the relatively large fires that may occur across Colorado. The ignition density grid within FSim produced a spatial pattern of large fire occurrences which were calibrated with historical wildfire occurrences across five different calibration regions within Colorado to produce a viable prediction of large fires throughout Colorado. Within the planning area, fires ignition densities are greatest around the community of Nederland and decrease along broad isolines going from west to east (Figure D.3).

HISTORICAL WEATHER

Of the three fire behavior components, weather is the most likely to fluctuate. Accurately predicting fire weather remains a challenge for forecasters. As rising temperatures dry fuels in the late spring, summer and early fall, dry conditions can be exacerbated, creating an environment that is susceptible to wildland fire. Fine fuels (grass and leaf litter) can cure rapidly, making them highly flammable in as little as 1 hour following light precipitation. Low live fuel moistures of grass, shrubs, and trees can significantly contribute to fire behavior in the form of fast rates of spread, crowning and torching.

A selected list of ten Remote Automatic Weather Stations (RAWS) was used to produce FSim results. Selected RAWS were distributed across Colorado with relatively long and consistent records. RAWS were also selected using suggestions from local fire personnel with knowledge of RAWS with the most representative data. FireFamilyPlus version 4.1 was used to generate fire risk files for each RAWS (Pyrologix 2022c). The weather inputs used within FSim were:

- Monthly distribution of wind speed and direction
- Live and dead fuel moisture content
- Seasonal trends in the mean and standard deviation of the Energy Release Component (ERC)
 - ERC values were sourced from Dr. Matt Jolly's publicly available ERC raster for the period 1992-2017.
 - ERC sample sites were distributed throughout Colorado similar to RAWS.

Additionally, Pyrologix utilized FSim to generate stochastic fire ignitions based on historical relationships between large fires and ERC. This was then used to determine burn probabilities.

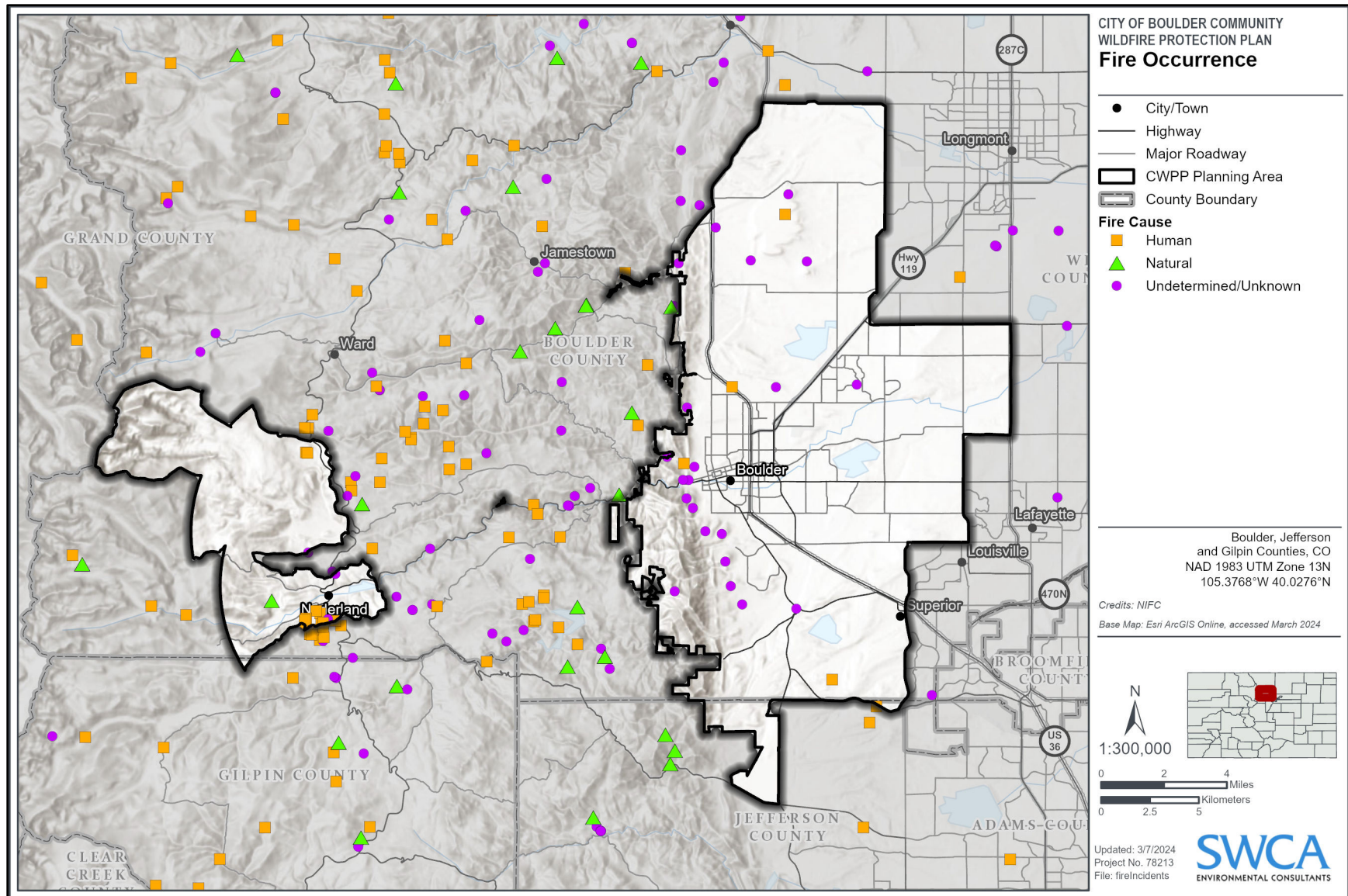


Figure D.2. Historical occurrence of wildfire by ignition cause type in the planning area.

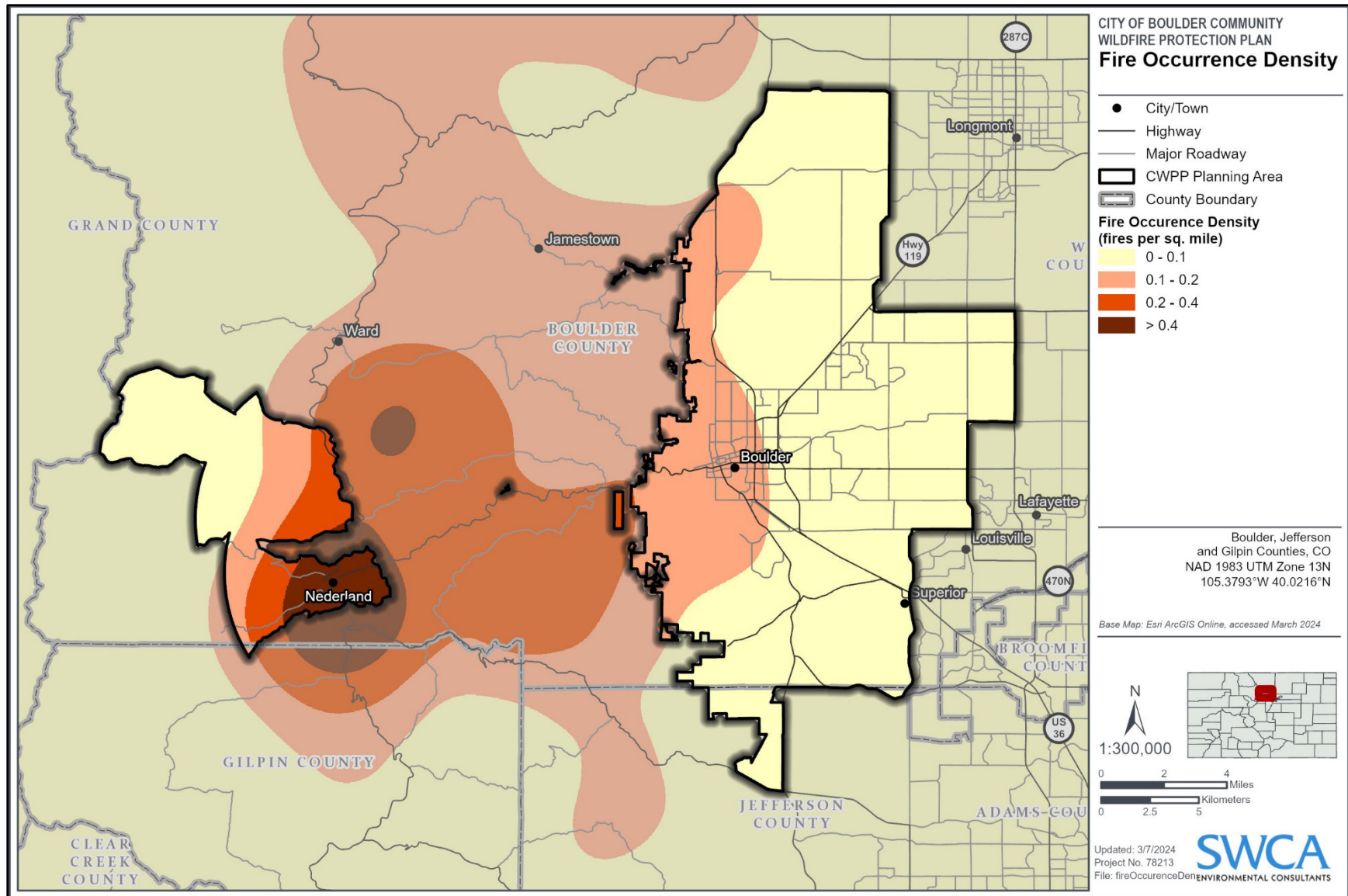


Figure D.3. Fire occurrence density for the planning area.

FIRE BEHAVIOR MODEL OUTPUTS

RATE OF SPREAD

Rate of spread (Figure D.4) is calculated in WildEST and is a weighted average rate quantified in meters per minute for each pixel in the fuelscape. Rate of Spread includes contributions from crown fire under given weather scenarios. Within city limits of Boulder, rates of spread are low and range from 0 to 4 meters per minute. In the southern open spaces and grasslands west of Superior rates of spread are higher and range from 16 to 32 meters per minute. Rates of spread along the Front Range vary greatly, 2 to 64 meters per minute, due to topographic and vegetation influence. Rate of spread in the grasslands and open spaces north of the city are more consistent at 4 to 8 meters per second. In the source water protection zone rates of spread are 32 to 64 meters per second in the north and 2 to 16 meters per second in the south.

FLAME LENGTH

Flame length (Figure D.5) is calculated by WildEST and is a weighted-average flame length quantified in feet for each pixel in the fuelscape. Flame length includes contributions from crown fire under severe weather scenarios. For example, high winds may cause fire to spread in the crown of trees. This crown fire flame length is then incorporated into the flame length output where topography, weather, and fuels are conducive to crown fire occurring. Flame lengths are highest (11–25+ feet) in the source water protection zone and in forested regions along the Front Range. Much of the open space and grasslands surrounding Boulder are modeled to experience potential flame lengths of 0 to 8 feet with higher flame lengths expected in the grasslands west of Superior and south of Boulder.

PROBABILITY OF OPERATIONAL CONTROL

The probability of exceeding flame length thresholds for manual control of wildfire is 4 feet (Figure D.6), and for the mechanical control of wildfire, it is 8 feet (Figure D.7). Within Boulder, the area with the greatest probability of exceeding both manual and mechanical control is in the forested alpine areas within the source water protection zone and the Flatirons area along the Front Range. Operational control is modeled to be more difficult in the open space west of Superior and in the foothills immediately east of the Front Range across the planning area. Operational control is most attainable within the city limits and in the rural developments in the east half of the planning area.

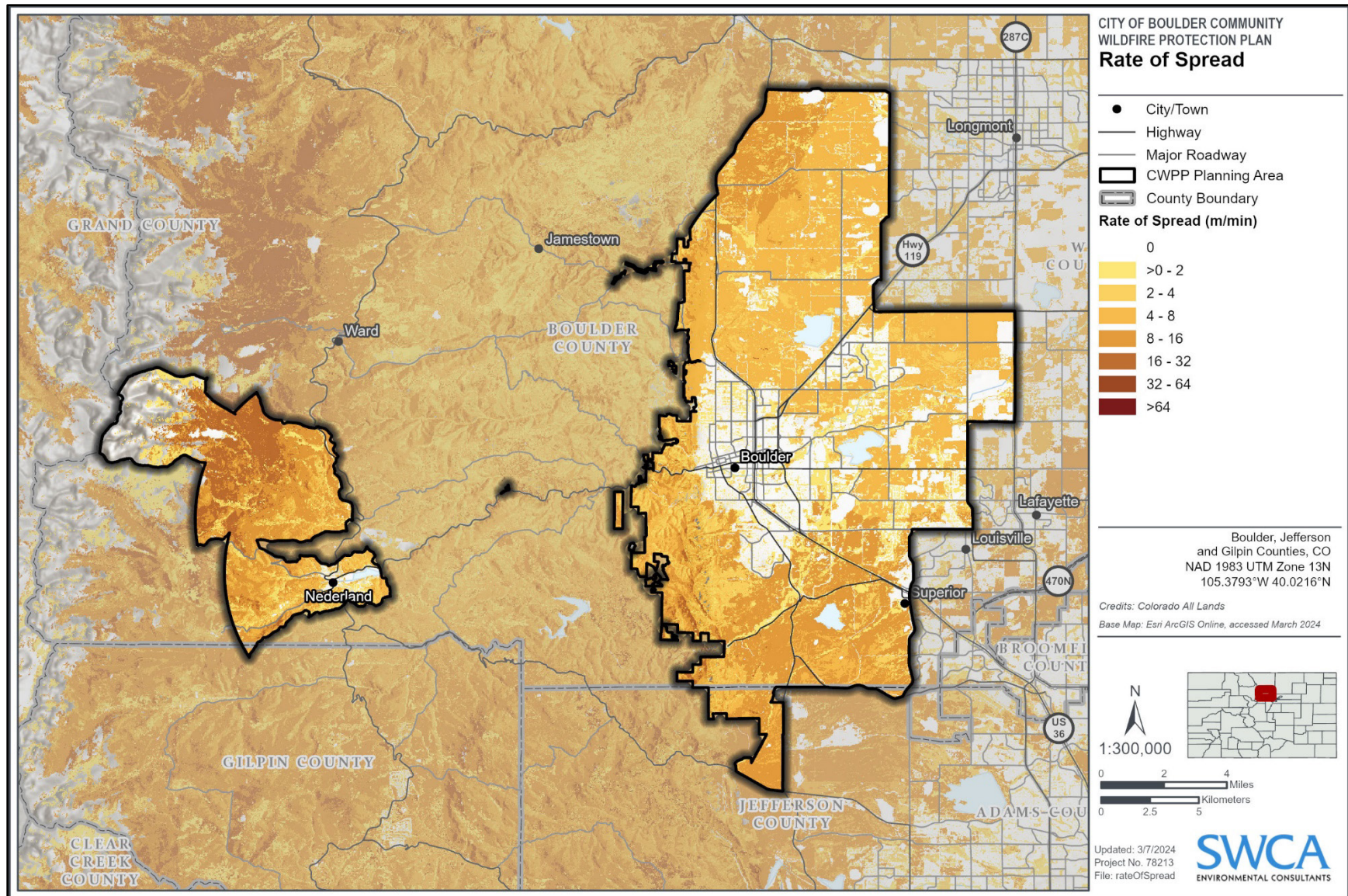


Figure D.4. Modeled rate of spread of wildfire for the planning area.

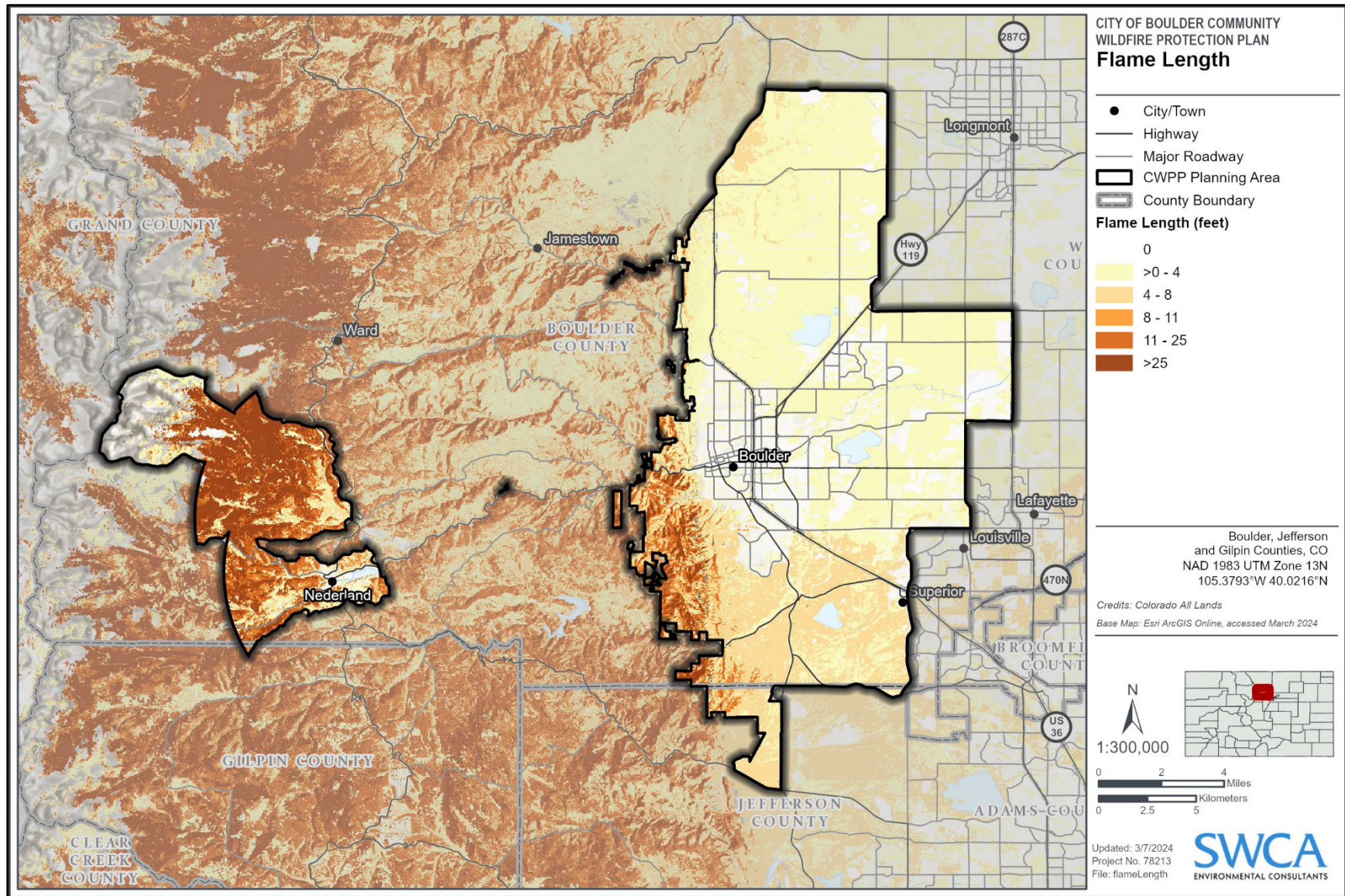


Figure D.5. Modeled flame length of wildfire for the planning area.

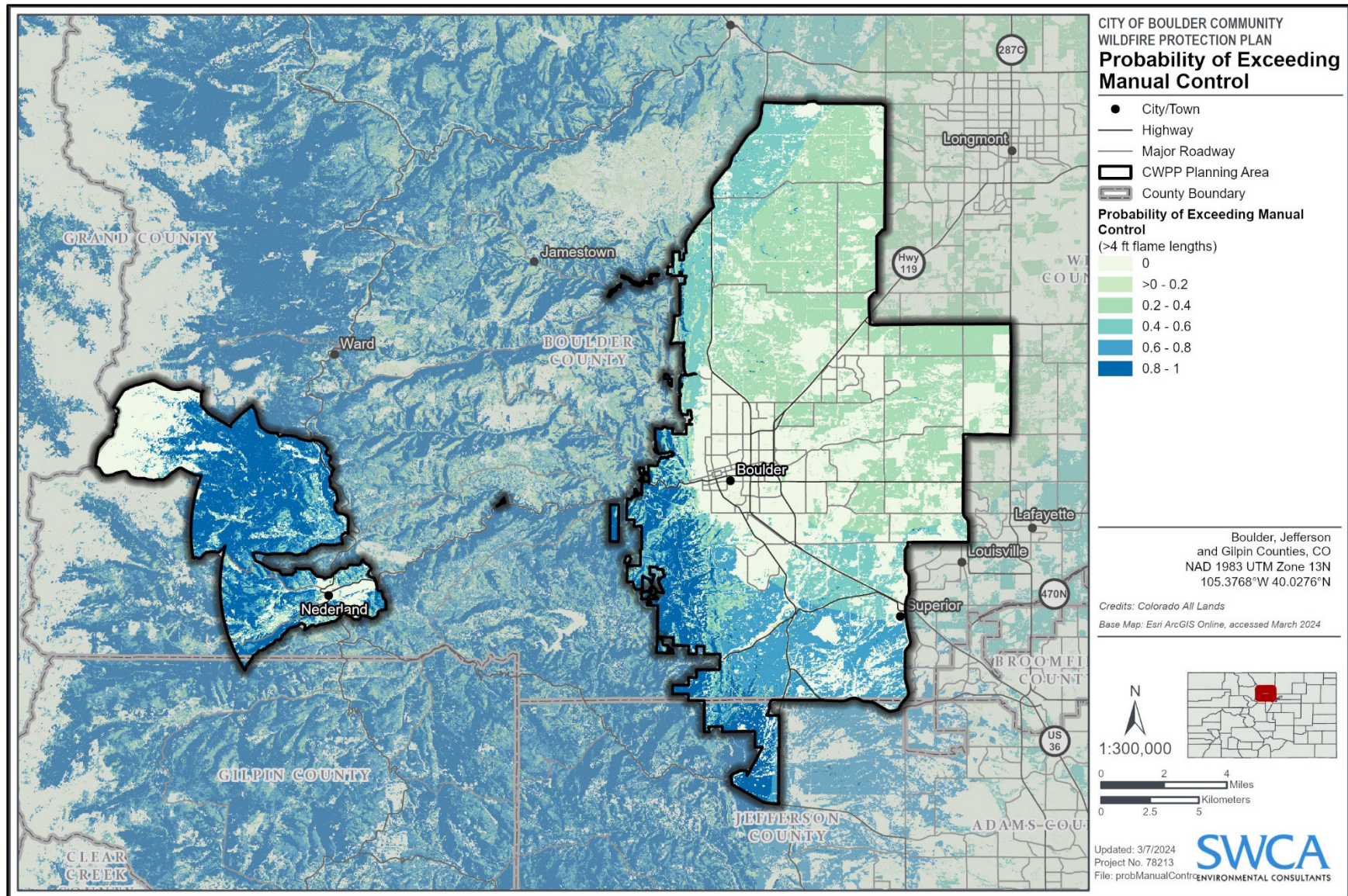


Figure D.6. Modeled probability of exceeding manual control (>4 feet) for the planning area.

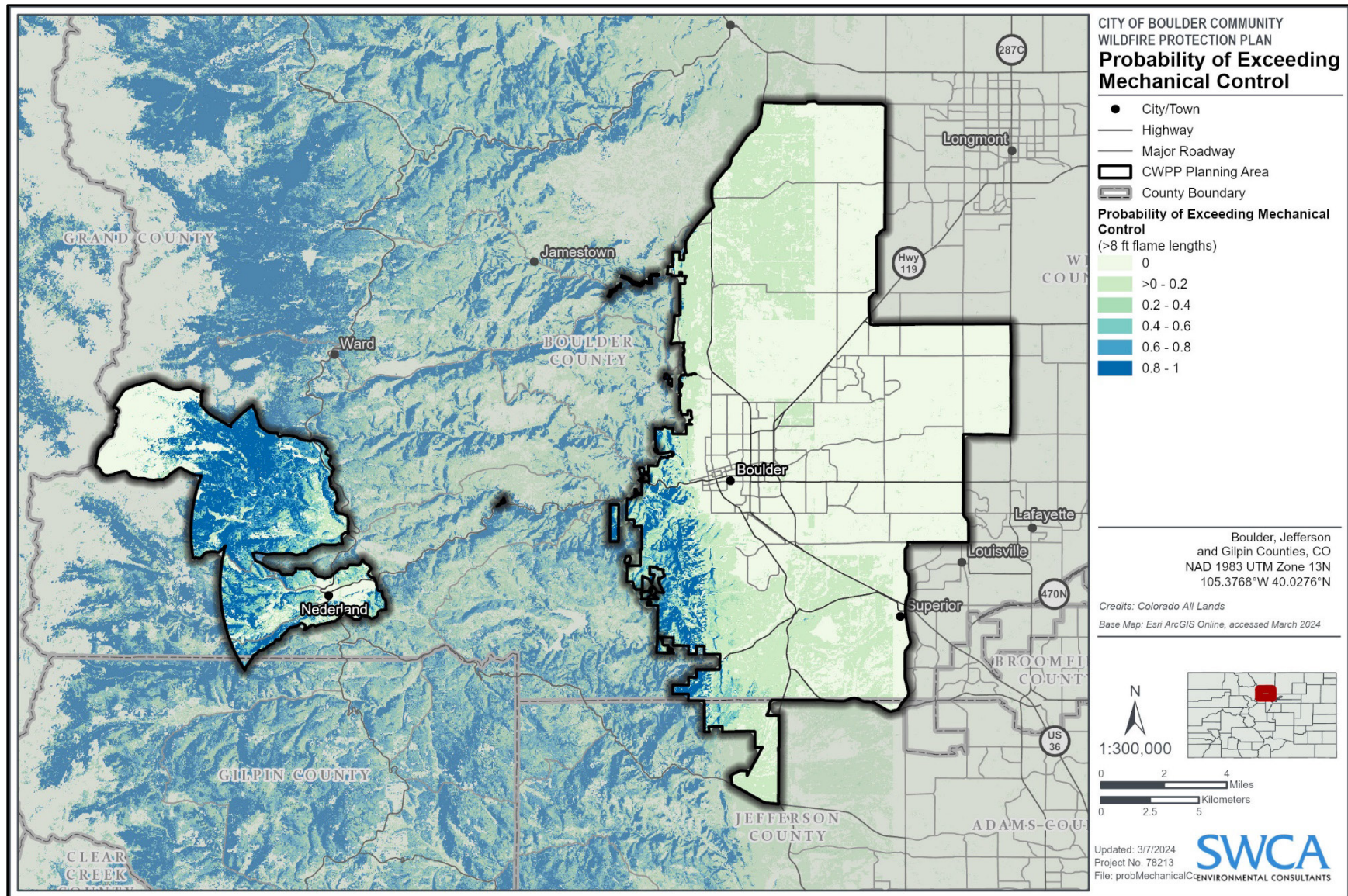


Figure D.7. Modeled probability of exceeding mechanical control (>8 feet) for the planning area.

EMBER LOAD INDEX

Ember load Index (ELI) is derived from modeled fire behavior at the head of the fire and represents the relative ember load being received at any given pixel (30 m). To calculate this, simulated embers are produced and launched based on fire behavior, topography, wind, fuel, and canopy characteristics at the source. Burn probability is incorporated before the embers are distributed downwind where the model tracks the number of hot embers reaching the source to derive the ember load index.

The COAL modeling process allows ember production from grass and brush, in addition to timber. The ember load index map (Figure D.8) identifies areas where buildings will need to resist ignition from embers, as well as the priority for doing so based on burn probability. Ember production is highly variable and difficult to model. This product should be used as a relative potential ember production, from few to many, rather than an actual real-world count of anticipated embers. Ember loads are moderate in grasslands and open spaces and highest in the forested areas in the western parts of the planning area.

RISK TO ASSETS (TOTAL EXPECTED NET VALUE CHANGE)

For the purposes of this CWPP and for describing risk more clearly to the public, Pyrologix's Total Expected Net Value Change (TeNVC) product has been renamed "risk to assets" in this plan.

To begin, response functions (RF) and relative importance per pixel (RIPP) were calculated for each of the four HVRA datasets. RF and RIPP were combined with estimates of flame-length probability to estimate conditional net value change (cNVC). Outputs were adjusted using the RIPP of each HVRA. Total conditional net value change (TcNVC) was calculated by summing the total of cNVC for each HVRA at every pixel on the landscape. The TeNVC (AKA "risk to assets") was calculated from TcNVC by multiplying TcNVC with burn probability. The resulting risk to assets map (Figure D.9) is a comprehensive risk product that incorporates modeled fire behavior, burn probability, and weighted assets.

Each HVRA was evaluated for impacts from flame length probabilities independently of each other to avoid skewing of risk outputs when conditional values were multiplied with burn probability to attain expected risk values.

COAL HIGHLY VALUED RESOURCES AND ASSETS (HVRAS)

The following four HVRA datasets (Figures D.9–D.13) were used to calculate the risk to assets dataset (see Figure D.8). See the Wildfire Risk in the City of Boulder subsection in Chapter 3 for in-depth descriptions of each HVRA and how they were weighted in the quantitative risk assessment.

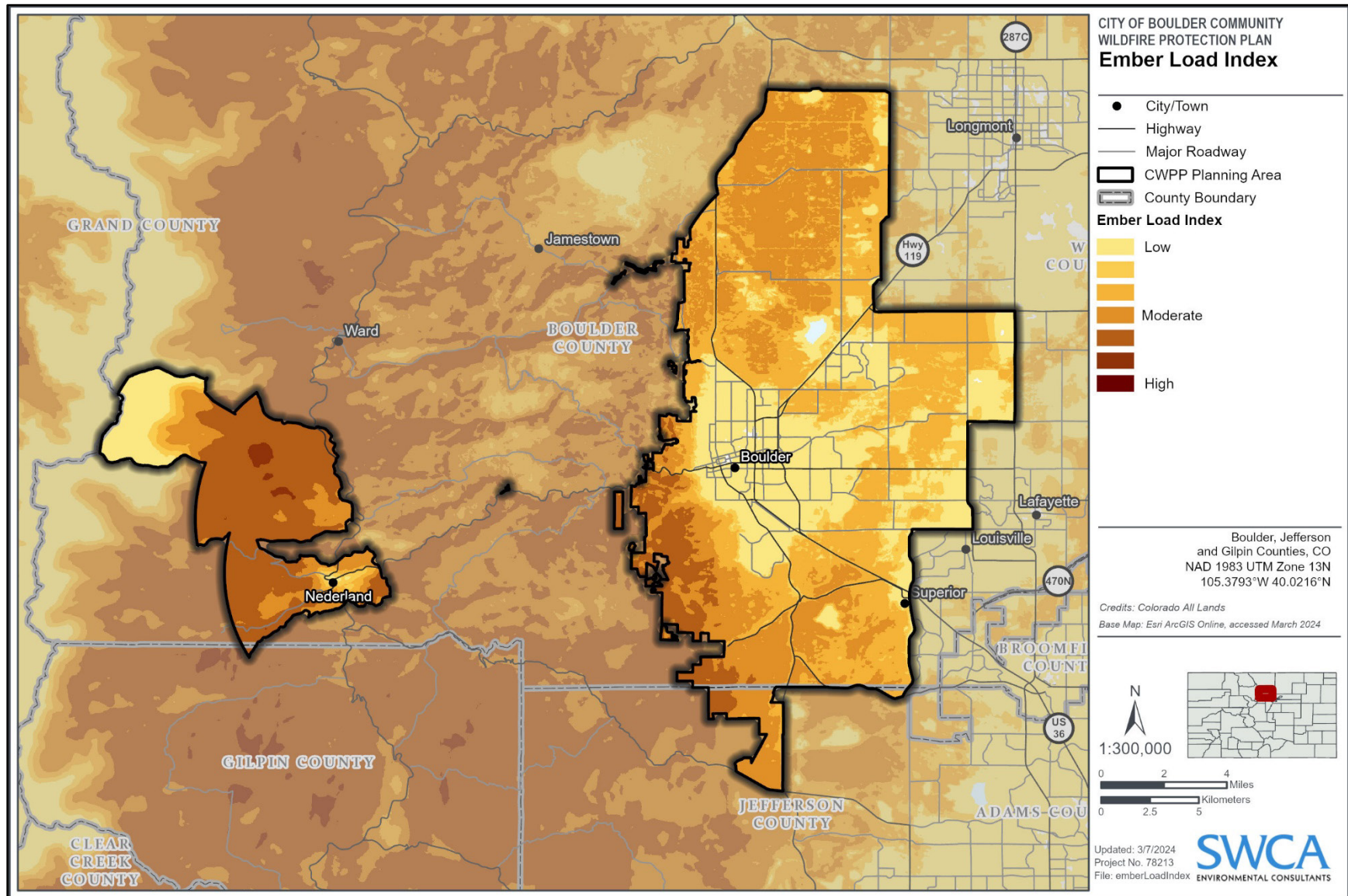


Figure D.8. Modeled ember load index on the landscape for the planning area. A higher ember load index number represents the probability of that area experiencing more embers during a wildfire.

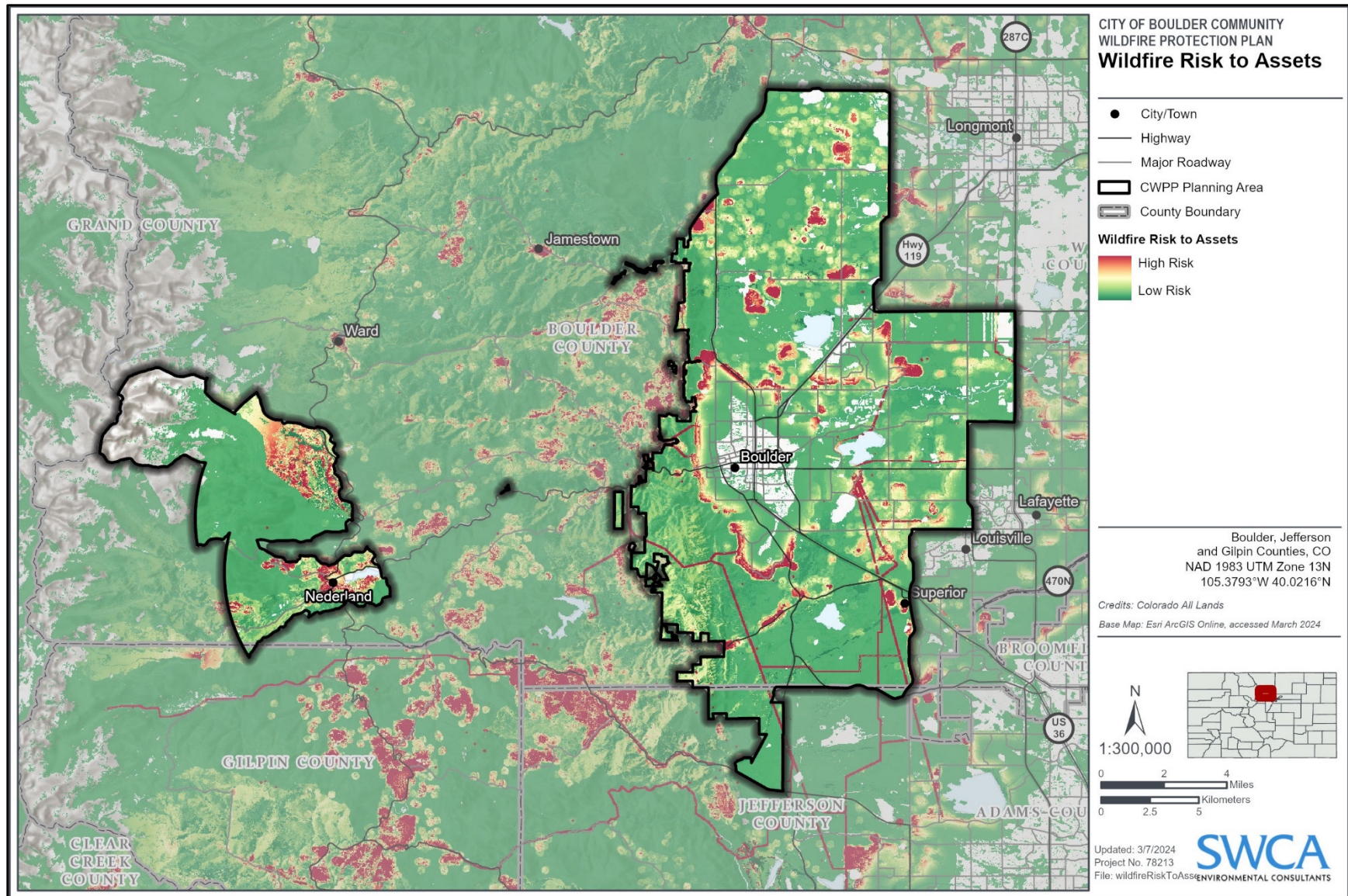


Figure D.9. Wildfire risk to assets sourced from the COAL quantitative risk assessment.

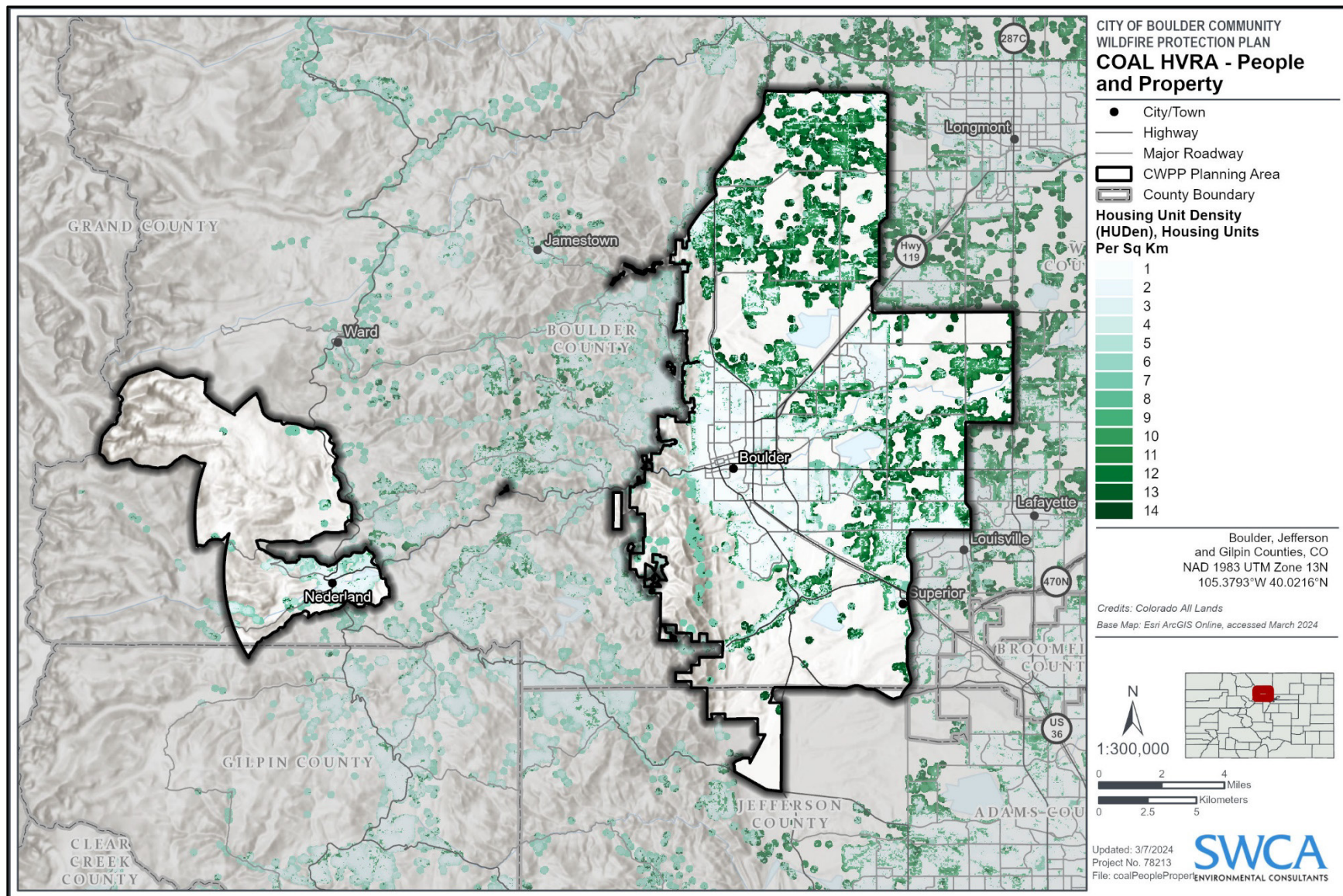


Figure D.10. COAL HVRA people and property based on housing unit density classifications. The relative importance weighting of people and property in quantitative risk assessment is 53%.

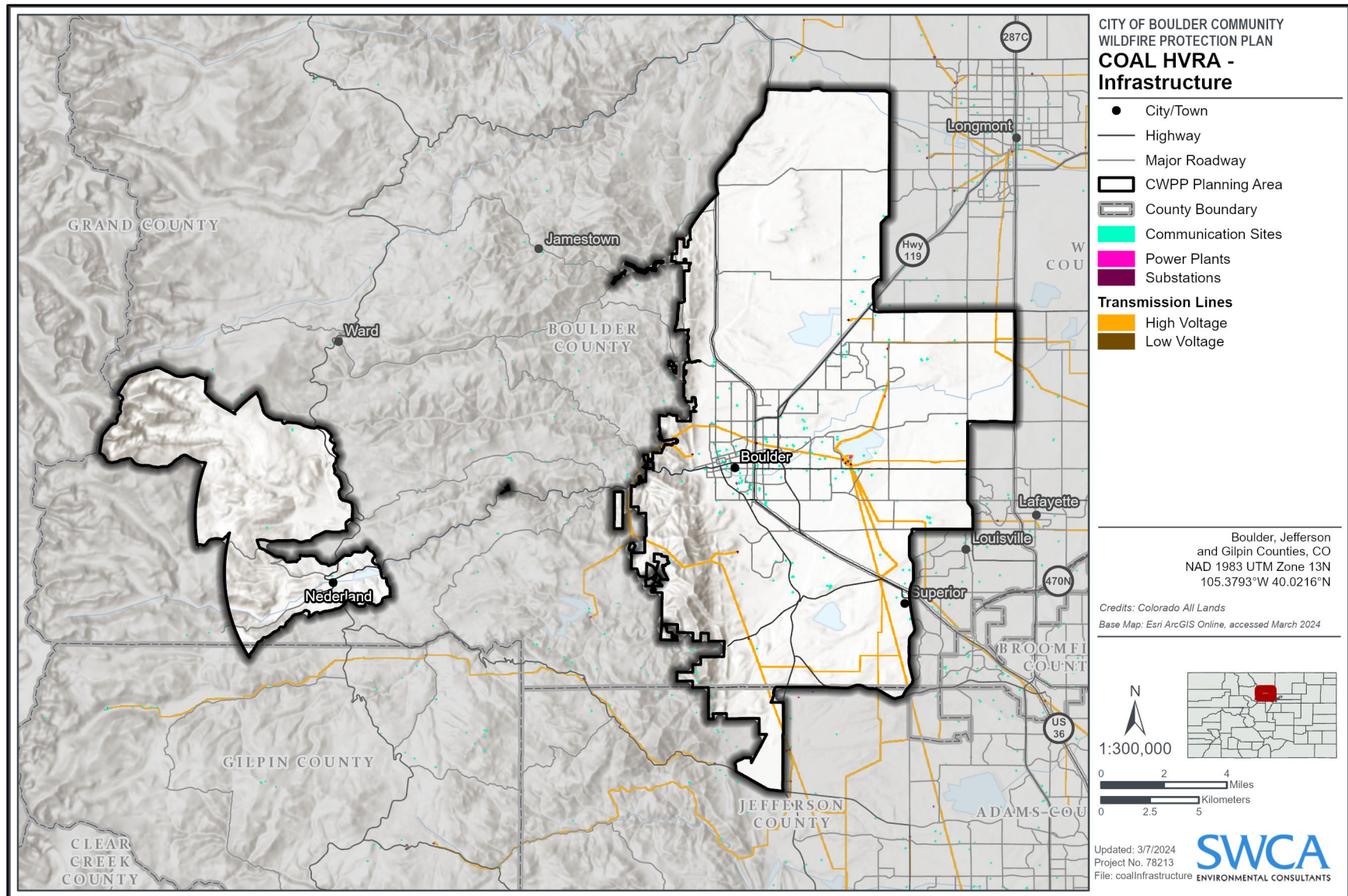


Figure D.11. COAL HVRA infrastructure based on energy and communication infrastructure. The relative importance weighting of infrastructure in quantitative risk assessment is 32%.

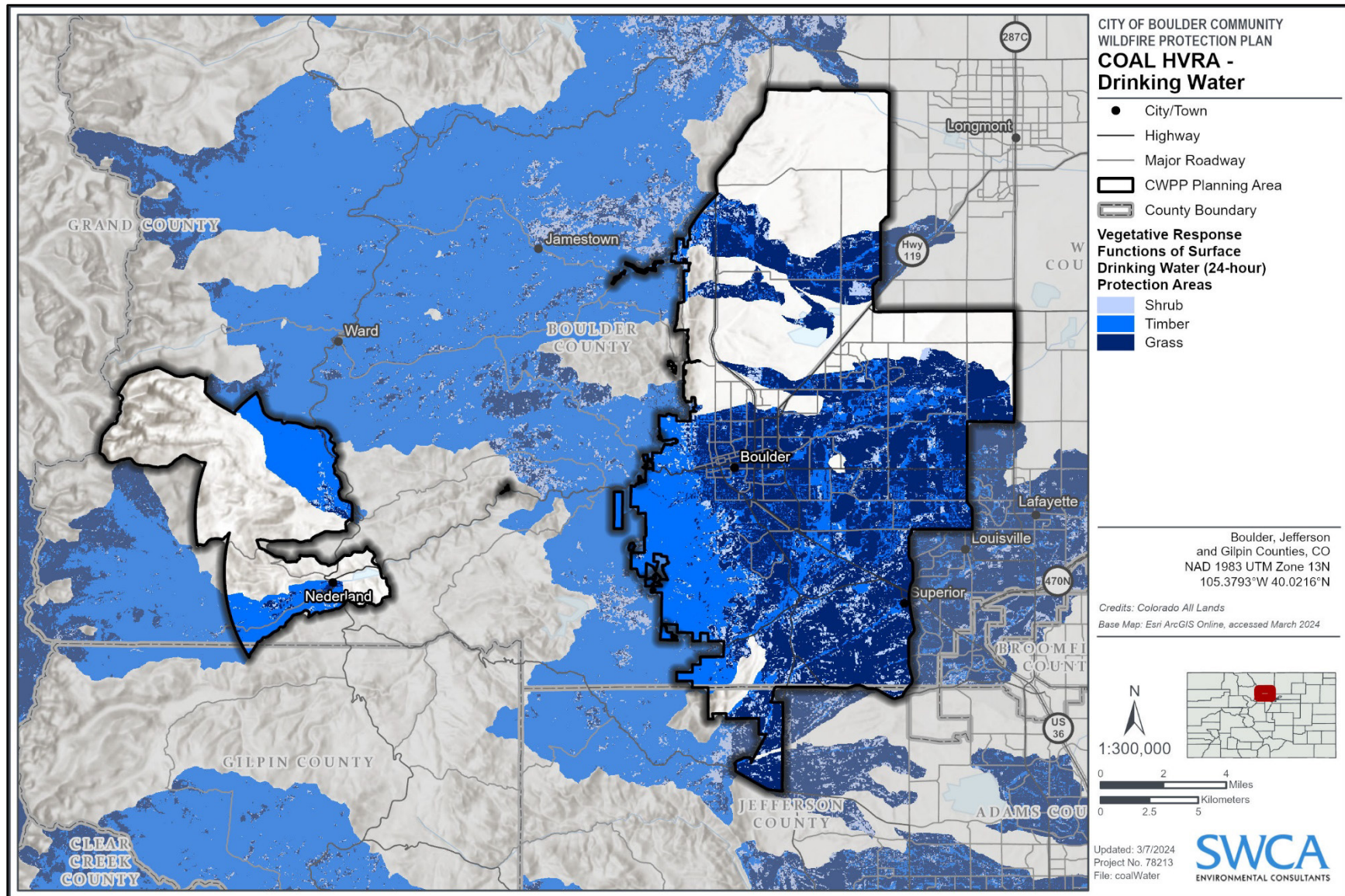


Figure D.12. HVRA drinking water based on surface drinking water protection areas. The relative importance weighting of drinking water in quantitative risk assessment is 10%.

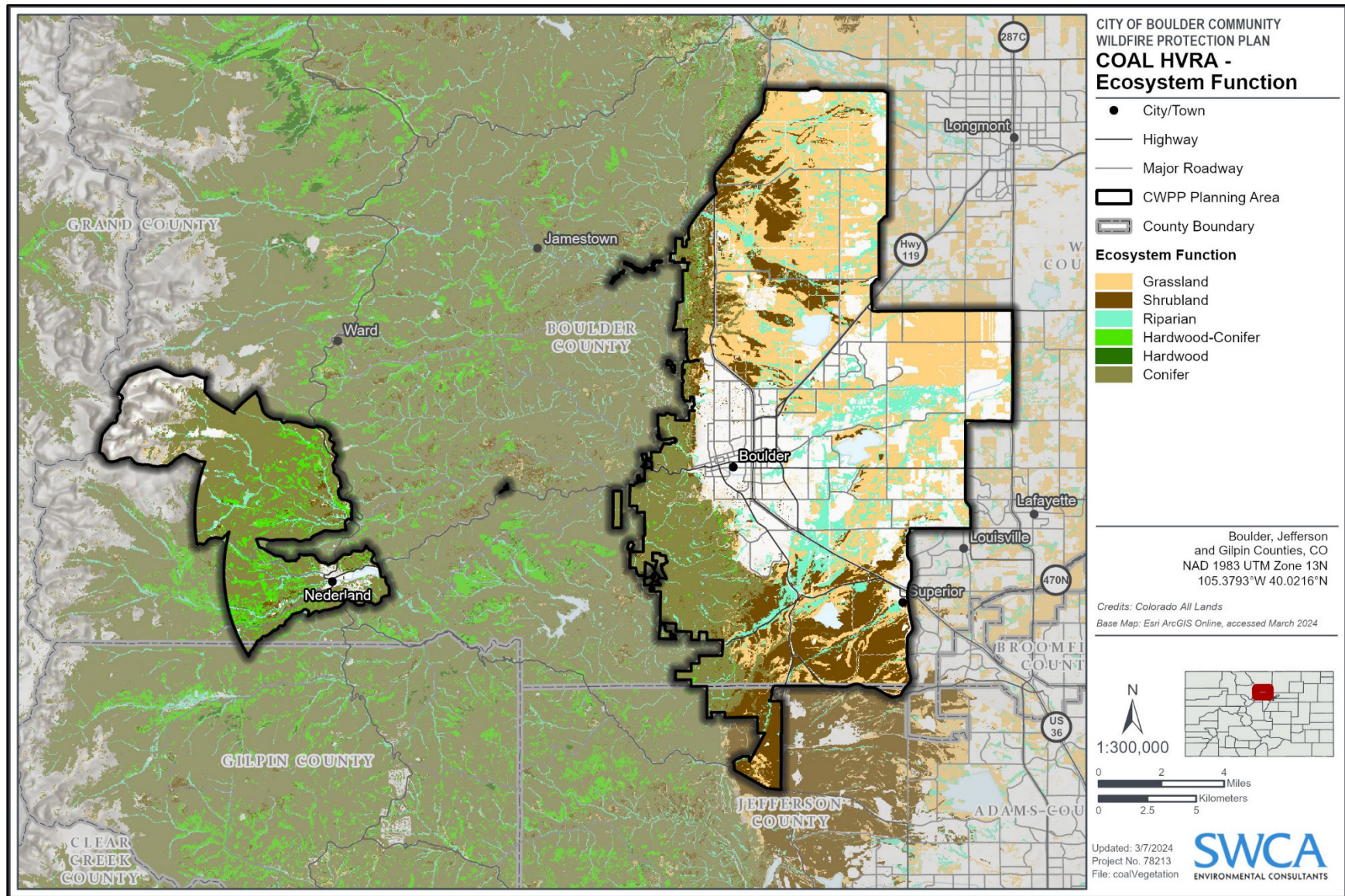


Figure D.13. COAL HVRA vegetation based on ecosystem function classification. The relative importance weighting of vegetation in quantitative risk assessment is 5%.

INTEGRATED HAZARDS

RISK TO POTENTIAL STRUCTURES

The risk to potential structures (RPS) dataset (Figure D.14) gauges the combined risk of wildfires based on their likelihood, intensity, and potential impact on potential structures. RPS was calculated using flame-length probabilities generated from WildEST. RPS helps answer the question, "How vulnerable would a house or building be if located here?" This helps compare wildfire risks in existing residential areas versus potential construction sites. RPS is determined by multiplying the conditional risk to structures (cRPS) with burn probability.

WILDFIRE HAZARD POTENTIAL

Wildfire hazard potential (WHP) is calculated from a combination of burn probability and conditional flame length converted into an index (Figure D.15). A weighted resistance to control measure is applied based on the fire line production rates associated with the Scott and Burgan 40 fuel models. Wildfire hazard potential is a good output for determining the likelihood of a fire occurring, the intensity range if it did, and a rough measure of control difficulty. WHP is a useful tool for evaluating fuel treatment priorities based on burn probability.

SUPPRESSION DIFFICULTY INDEX

Suppression difficulty index (SDI) (Figure D.16) does not incorporate burn probability in the source data and is based on a severe fire weather scenario. SDI is a function of flame length outputs, topography, fire line production rates, and the distance of evaluated cells (30 meter) from trails and roads. SDI is a good output for determining how difficult it would be for resources to park, hike to, and suppress a wildfire. This output should not be used to evaluate the risk to structures and instead shows areas where fires would be difficult to suppress under severe fire weather conditions.

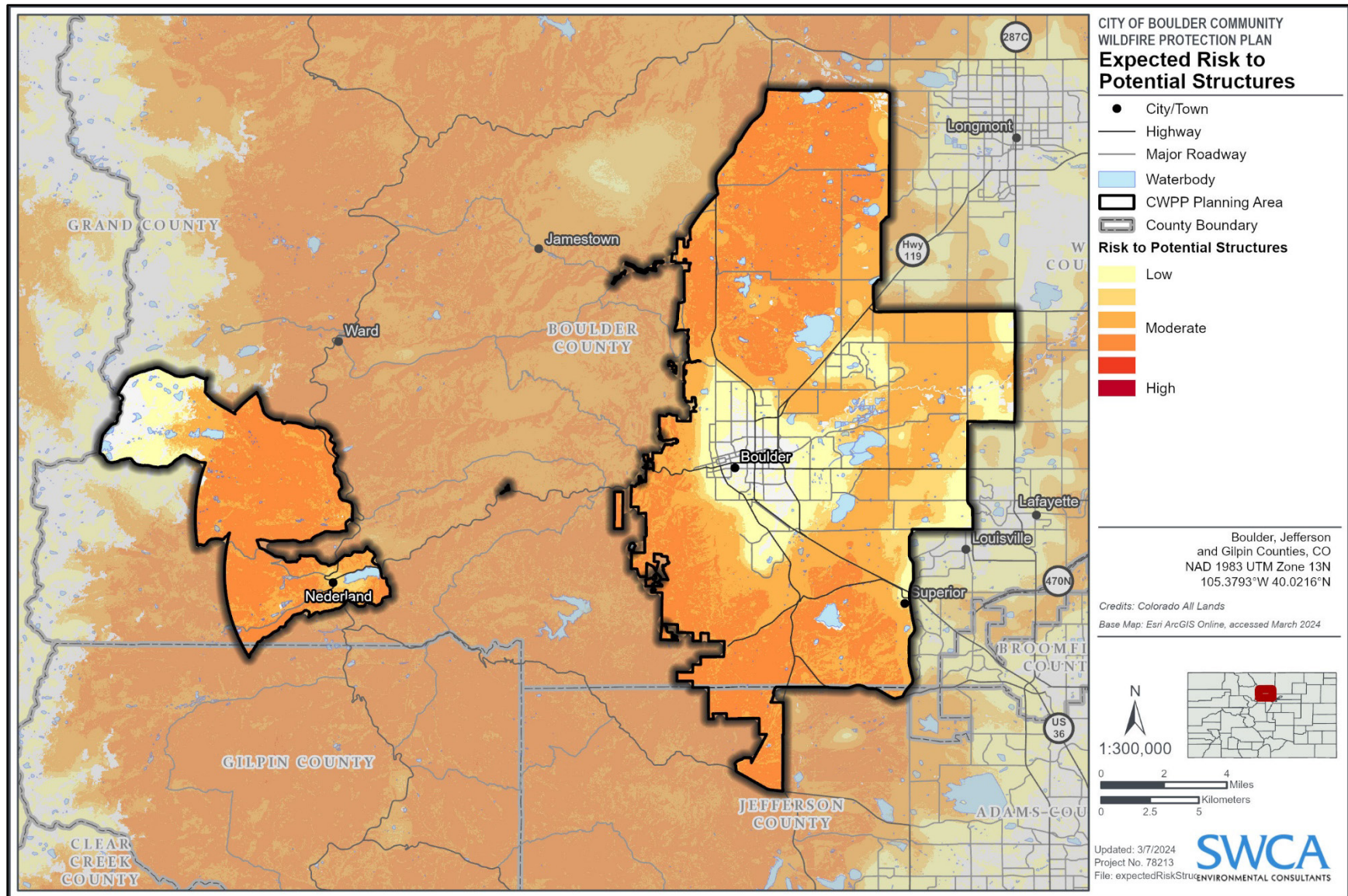


Figure D.14. Modeled flame expected risk to potential structures on a 6-point low-to-high scale for the planning area.

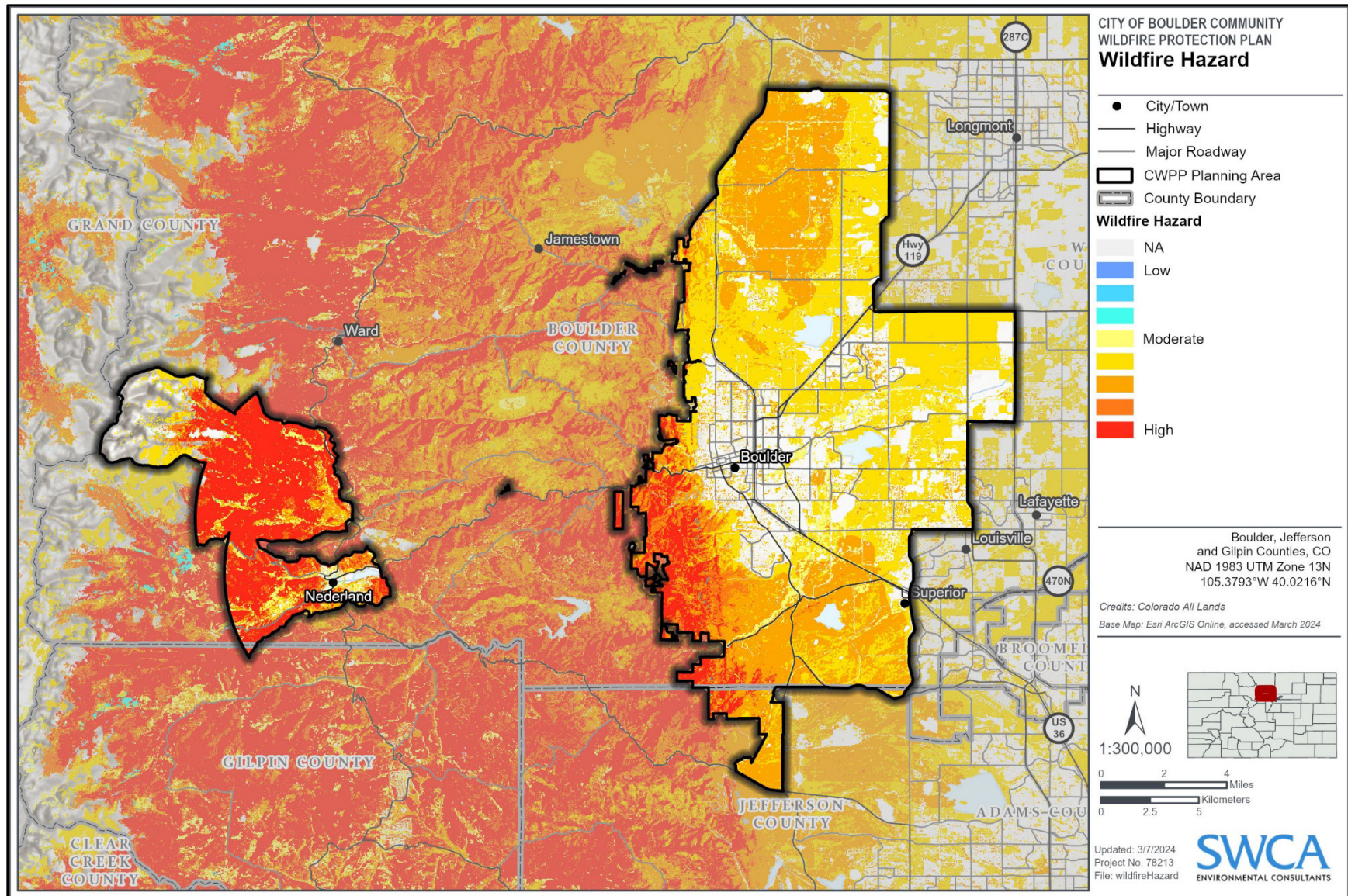


Figure D.15. A map showing the modeled wildfire hazard on an 8-point, low-to-high scale for the planning area. NA represents non-burnable or highly urban areas within the wildfire behavior model.

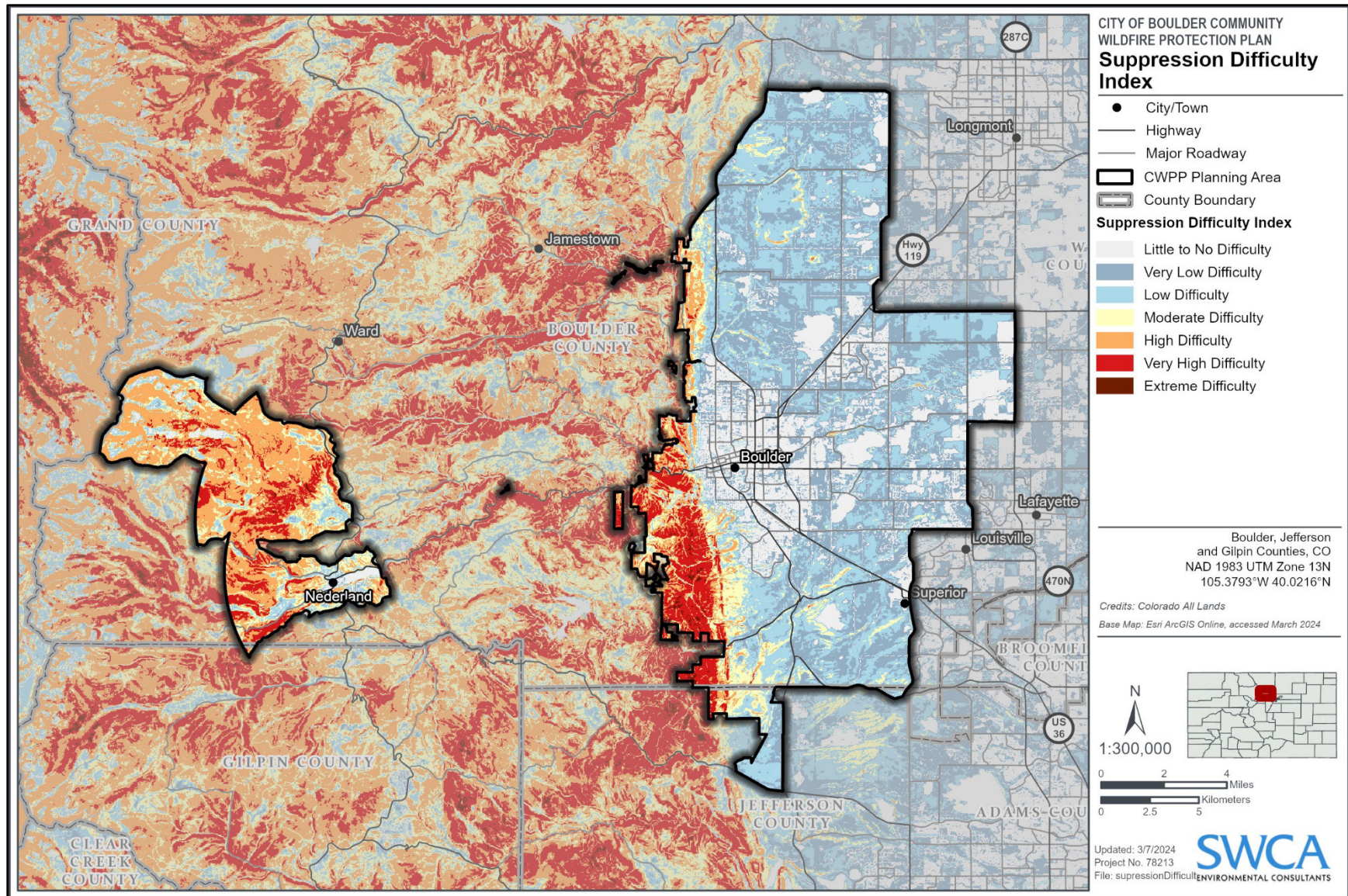


Figure D.16. Modeled SDI on a 7-point scale from little to extreme difficulty for the planning area.

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APPENDIX E:

Fuel Treatment Types and Methods

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FUELS TREATMENT SCALES

DEFENSIBLE SPACE

Defensible space is perhaps the fastest, most cost-effective, and most efficacious means of reducing the risk of loss of life and property. The City of Boulder emphasizes the importance of creating and maintaining defensible space to enhance a home's chance of surviving a wildfire. Ten steps for defensible space, including creating a fire-free area, removing dead vegetation, regular lawn maintenance, and using Firewise plants, are provided. The focus is on protecting homes from embers, a common cause of wildfire damage. Although fire agencies can be valuable in providing guidance and assistance, creating defensible space is the responsibility of the individual homeowner (Figure E.1). Residents are encouraged to refer to the Wildland Fire Preparedness Guide (<https://bouldercolorado.gov/media/3298/download?inline>) for more detailed information.

For additional details from the City of Boulder on fortifying your home from the impacts of wildfire please visit: <https://bouldercolorado.gov/media/3298/download?inline>

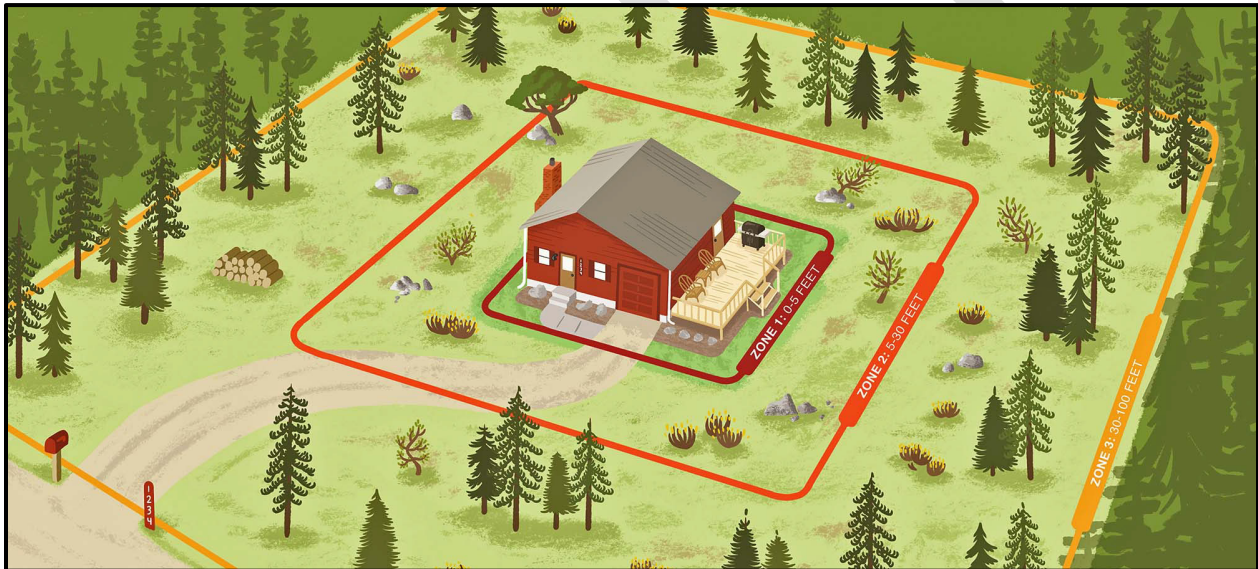


Figure E.1. Defensible space zones providing clearance between a structure and adjacent woodland or forest fuels.

Source: NFPA (2022)

Effective defensible space consists of creating an essentially fire-free zone adjacent to the home, a treated secondary zone that is thinned and cleaned of surface fuels, and (if the parcel is large enough) a transitional third zone that is basically a managed forest area (Figure E.1). These components work together in a proven and predictable manner. Zone 1 keeps fire from burning directly to the home; Zone 2 reduces the adjacent fire intensity and the likelihood of torching, crown fire, and ember production; and Zone 3 does the same at a broader scale, keeping the fire intensity lower by maintaining a more natural, historic condition (Figure E.1).

Three zones for defensible space actions are described. These include:

Zone 1 This zone, which consists of an area of 0 to 5 feet around the structure, is designed to prevent flames from coming in direct contact with the structure. Use nonflammable, hard surface materials in this zone, such as rock, gravel, sand, cement, bare earth, or stone/concrete pavers.

Recommendations for treating Zone 1 include (NFPA 2022):

- Remove all flammable vegetation, including shrubs, slash, mulch, and other woody debris.
- Do not store firewood or other combustible materials inside this zone.
- Prune tree branches hanging over the roof or decks and remove all fuels within 10 feet of the chimney.
- Regularly remove all pine needles and other debris from the roof, deck, and gutters.
- Rake and dispose of pine needles, dead leaves, mulch, and other organic debris within 5 feet of all decks and structures. Farther than 5 feet from structures, raking material will not significantly reduce the likelihood of ignition and can negatively affect other trees.
- Do not use space under decks for storage.

Zone 2 This zone, which consists of an area of 5-30 feet around the structure, is designed to give an approaching fire less fuel, which will help reduce its intensity as it gets nearer to your home or any structures.

Recommendations for treating Zone 2 include (NFPA 2022):

- Mow grasses to 4 inches tall or less.
- Avoid large accumulations of surface fuels such as logs, branches, slash, and mulch.
- Remove enough trees to create at least 10 feet* of space between crowns. Measure from the outermost branch of one tree to the nearest branch on the next tree.
- Small groups of two or three trees may be left in some areas of Zone 2. Spacing of 30 feet* should be maintained between remaining tree groups to ensure fire doesn't jump from one group to another.
- Remove ladder fuels under remaining trees. This is any vegetation that can bring fire from the ground up into taller fuels.
- Prune tree branches to a height of 6 to 10 feet from the ground or a third of the total height of the tree, whichever is less.
- Remove stressed, diseased, dead, or dying trees and shrubs. This reduces the amount of vegetation available to burn and improves forest health.
- Common ground junipers should be removed whenever possible because they are highly flammable and tend to hold a layer of flammable material beneath them.
- You can keep isolated shrubs in Zone 2, as long as they are not growing under trees. Keep shrubs at least 10 feet* away from the edge of tree branches.
- Periodically prune and maintain shrubs to prevent excessive growth. Remove dead stems annually.

- Spacing between clumps of shrubs should be at least 2.5 times* their mature height. Each clump should have a diameter no more than twice the mature height of the vegetation.
Example: For shrubs that grow 6 feet tall, space clumps 15 feet apart or more (measured from the edge of the crowns of vegetation clumps). Each clump of these shrubs should not exceed 12 feet in diameter.

* Horizontal spacing recommendations are minimums and can be increased to reduce potential fire behavior, particularly on slopes. Consult a forestry, fire, or natural resource professional for guidance with spacing on slopes.

Zone 3 This zone, which consists of an area of 30 to 100 feet around the structure, focuses on mitigation that keeps fire on the ground, but it is also a space to make choices that can improve forest health. Healthy forests include trees of multiple ages, sizes, and species, where adequate growing room is maintained over time. If the distance of 100 feet to the edge of Zone 3 stretches beyond your property lines, it is encouraged to work with adjoining property owners to complete an appropriate defensible space. If your house is on steep slopes or has certain topographic considerations, this zone may be larger.

Recommendations for treating Zone 3 include (NFPA 2022):

- Mowing grasses is not necessary in Zone 3.
- Watch for hazards associated with ladder fuels. The chance of a surface fire climbing into the trees is reduced in a forest where surface fuels are widely separated, and low tree branches are removed.
- Tree crown spacing of 6 to 10 feet is suggested. Consider creating openings or meadows between small clumps of trees so fire must transition to the ground to keep moving.
- Where practical, prune tree branches to a height of 6 to 10 feet from the ground or a third of the total height of the tree, whichever is less.
- Any approved method of slash treatment is acceptable in this zone, including removal, piling and burning, lop and scatter, or mulching. Lop-and-scatter or mulching treatments should be minimized in favor of treatments that reduce the amount of woody material in the zone. The farther this material is from the home, the better.

Please see the figures below for a visual representation of minimum vertical and horizontal spacing, as well as spacing on slopes (Figures E.2–E.4).

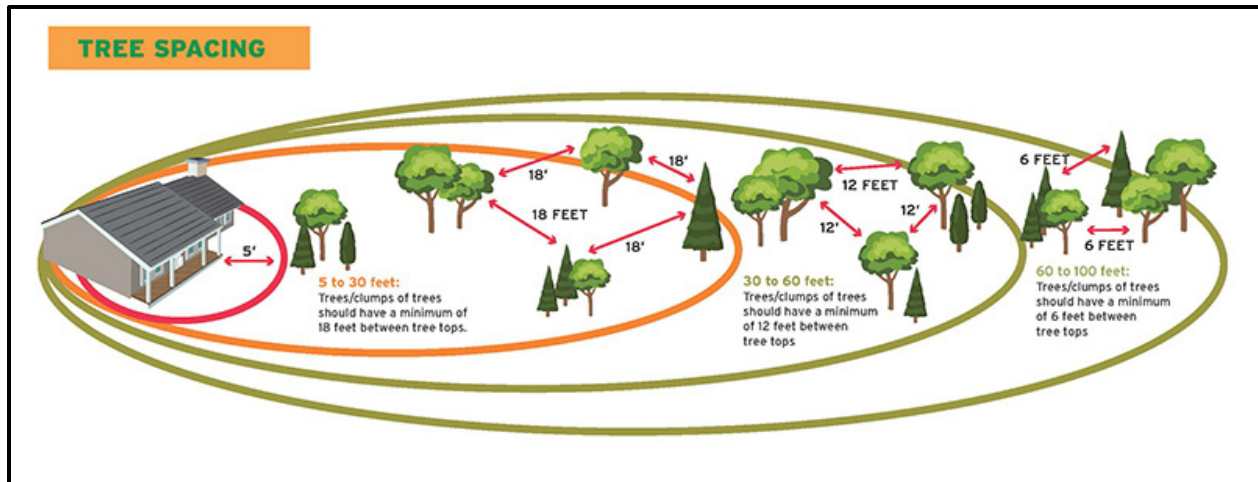


Figure E.2. Recommended tree spacing.

Source: NFPA (2022)



Figure E.3. Recommended minimal vertical clearance.

Source: CAL FIRE (2022)

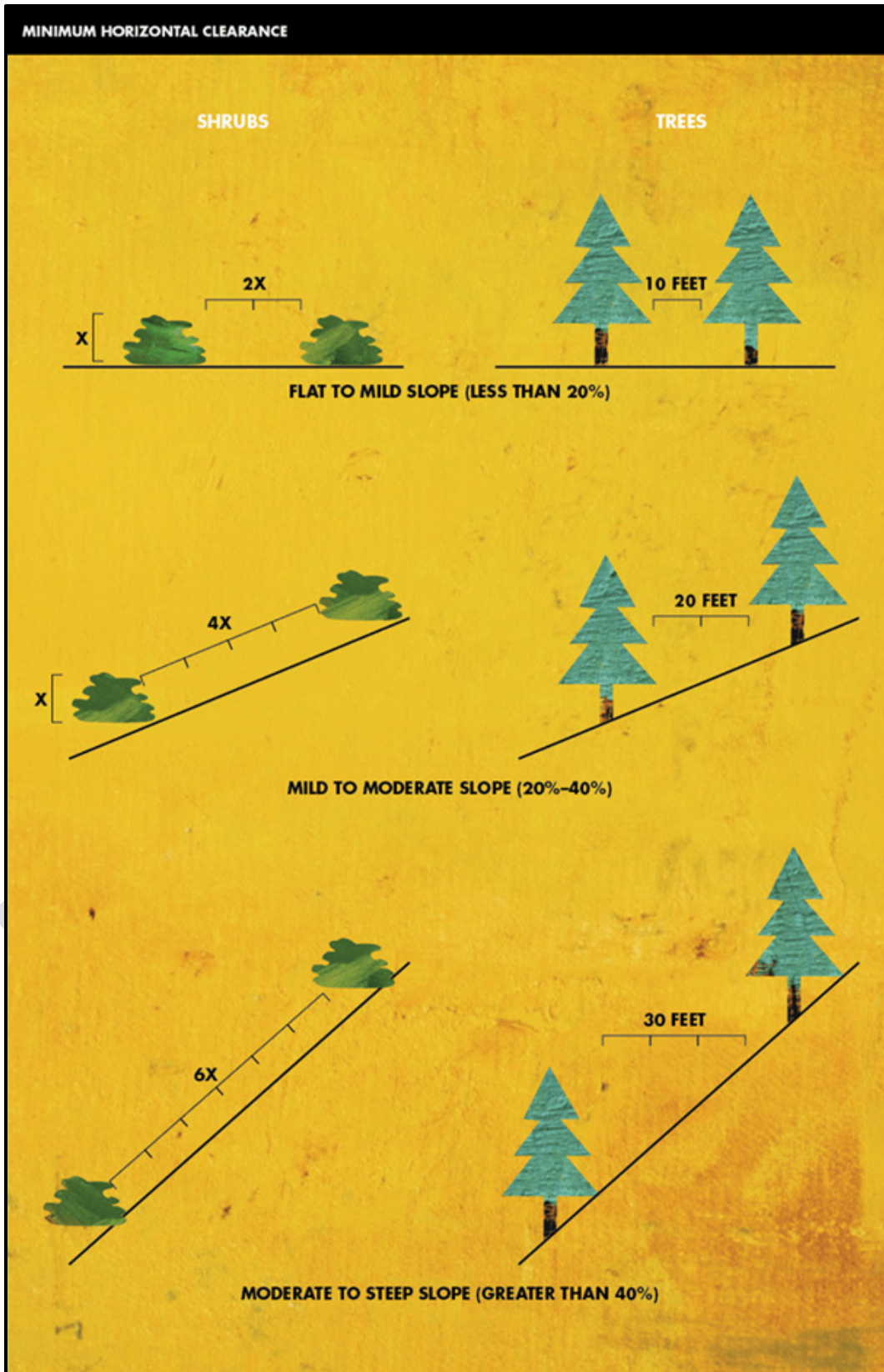


Figure E.4. Recommended minimal horizontal clearance.

Source: CAL FIRE (2022)

Specific recommendations should be based on the hazards adjacent to a structure such as slope steepness and fuel type. Firewise guidelines and the Homeowner's Guide (see Appendix F) are excellent resources but creating defensible space does not have to be an overwhelming process. The NFPA offers a free [Community Wildfire Risk Assessment Tutorial](#) and an online learning module: [Understanding the Wildfire Threat to Homes](#). Both tools are great resources for learning about, and implementing, defensible space.

Assisting neighbors may be essential in many cases. Homeowners should consider assisting the elderly, sharing ladders for gutter cleaning, and assisting neighbors with large fuels thinning needs. Homeowner actions have been found to also motivate neighbors to act, increasing the scope of the wildfire mitigation across a community (Evans et al. 2015). Adopting a phased approach can make the process more manageable and encourage maintenance (Table E.1).

Table E.1. Example of a Phased Approach to Mitigating Home Ignitability

Year	Project	Actions
1	Basic yard cleanup (annual)	Dispose of clutter and dead branches in the yard and under porches. Move firewood to >30 feet from home. Mow and rake grass. Clean off roofs and gutters. Remove combustible vegetation near structures, especially junipers. Coordinate fuels disposal as a neighborhood or community. Post 6-inch reflective address numbers visible from road.
1-2	Understory thinning near structures	Repeat basic yard cleanup. Limb trees up to 6–10 feet. Trim branches back 15 feet from chimneys. Trim or cut down brush. Remove young trees that can carry fire into forest canopy. Coordinate disposal as a neighborhood or community.
1-3	Understory thinning on private property along roads and drainages	Limb trees up to 6–10 feet. Trim or cut down brush. Evaluate the need to thin diseased trees. Remove young trees that can carry fire into forest canopy. Coordinate disposal as a neighborhood or community.
2-4	Overstory treatments on private property	Evaluate the need to thin mature or diseased trees. Prioritize and coordinate tree removal within neighborhoods to increase cost effectiveness.
5	Restart defensible space treatment cycle	Continue the annual basic yard cleanup. Evaluate need to revisit past efforts or catch those that were bypassed.

FUEL BREAKS AND OPEN SPACE CLEANUP

The next location priority for fuels treatments should be where the community meets wildland. This may be the outer margins of the city or an area adjacent to occluded open spaces such as a park. Fuel breaks (also known as shaded fuel breaks) are strips of land where fuel (for example, living trees and brush, dead branches, leaves or downed logs) has been modified or reduced to limit the fire's ability to spread rapidly. Fuel breaks should not be confused with firebreaks, which are areas where vegetation and

organic matter are removed down to mineral soil. Shaded fuel breaks may be created to provide options for suppression resources or to provide opportunities to introduce prescribed fire. In many cases, shaded fuel breaks may be created by thinning along roads. This provides access for mitigation resources and firefighters, as well as enhancing the safety of evacuation routes.

LARGER-SCALE TREATMENTS

Farther away from WUI communities, the emphasis of treatments often becomes broader. While reducing the buildup of hazardous fuels remains important, other objectives are often included, such as forest health and resiliency to catastrophic wildfire and climate change considerations. Wildfires frequently burn across jurisdictional boundaries, sometimes on landscape scales. As such, these larger treatments need to be coordinated on a strategic level. This requires coordination between projects and jurisdictions, as is currently occurring.

Specifically, land managers have carried out numerous pre- and post-fire forest restoration projects across the city and open space areas and have ongoing projects planned that are designed to reduce hazardous fuels to protect communities and resources, while restoring fire-adapted communities.



Figure E.5. Burn pile – active fuels mitigation treatment.

ACTION ITEMS FOR HOMEOWNERS TO REDUCE STRUCTURAL IGNITABILITY

Limited Investment

- Regularly check fire extinguishers and have a 100-foot hose available to wet perimeter of home.
- Maintain defensible space within 30ft around home. Collaborate with neighbors to provide adequate fuels mitigation in the event of overlapping property boundaries.
- Ensure that reflective 4-inch house numbers are easily readable from the street.
- Keep wooden fence perimeters free of combustible materials. If possible, 5 feet of non-combustible material should link the house and fence.
- Store combustible materials (liquid fuels, propane, grills, firewood) away from the house.
- Remove flammable material from around propane tanks.
- Clear out materials from under decks and near structures.
- Stack firewood at least 30ft away from the house.
- Reduce your workload by considering local weather conditions. First, mitigate hazards on the side of your property that faces the prevailing wind direction. Then work around to cover the whole property.
- Keep gutters free of combustible material. Gutters can act as collection points for embers.
- Maintain roofs by flashing, fixing holes, replacing shingles, and closing gaps.
- Purchase or use a National Oceanic and Atmospheric Administration weather alert radio to hear fire weather announcements.

Moderate Investment

- When landscaping in the home ignition zone (HIZ) (approximately 30 feet around the property), select non-combustible plants, decks, lawn furniture, and landscaping material. Combustible plant material like ornamental conifers should be pruned and kept away from siding. If possible, trees should be planted in groups and no closer than 10 feet to the house. Tree crowns should have a spacing of at least 18 feet when within the HIZ. Vegetation at the greatest distance from the structure and closest to wildland fuels should be carefully trimmed and pruned to reduce ladder fuels, and density should be reduced with approximately 6-foot spacing between trees and crowns.
- Work on mitigating hazards on adjoining structures. Sheds, garages, barns, etc. These can act as ignition points to your home.
- Clear and thin vegetation along driveways and access roads so they can act as a safe evacuation route and allow emergency responders access to the home to at least 14 ft clear width and 14 ft height clearance
- Construct a gravel turnaround in your driveway to improve access and mobilization of fire responders. (e.g., 100-foot-diameter cul-de-sac or T-shape with 28-foot radius)
- Install a roof irrigation system.

High Investment

- Install an environmentally friendly and fire-resistant xeriscape yard. \$5 - \$20 sq ft.
- Install screen vents with non-combustible meshing. Mesh openings should not exceed nominal 1/8 - 1/16-inch size. \$2.50 sq ft. Average cost per home approximately \$5,000.
- Enclose open space underneath decks or permanently located manufactured homes using noncombustible skirting and ember resistant skirting vents.
- Install fire resistant Soffits and under eave vents to protect your home from heat and embers that can be trapped beneath roof overhangs.
- Replace exterior windows and skylights with tempered glass or multilayered glazed panels.
- Update your roof to a non-combustible construction. Look for materials that have been treated and given a fire-resistant roof classification of Class A.
- Upgrade exterior walls with fire resistant siding materials.
- Relocate propane tanks underground.

Additional resources regarding home hardening can be found in Appendix F.

FUEL TREATMENT METHODS

Since specifics of the treatments are not provided in detail in Table E.2, different fuels reduction methods are outlined in the following narrative.

Several treatment methods are commonly used for hazardous fuels reduction, including manual treatments, mechanized treatments, prescribed fire, and grazing (Table E.2). This brief synopsis of treatment options is provided for general knowledge; specific projects will require further planning. The appropriate treatment method and cost will vary depending on factors such as the following:

- Diameter of materials
- Proximity to structures
- Acreage of project
- Fuel costs
- Steepness of slope
- Area accessibility
- Density of fuels
- Project objectives

It is imperative that long-term monitoring and maintenance of all treatments is implemented. Post-treatment rehabilitation such as seeding with native plants and erosion control may be necessary. In addition, post-treatment fuel clean-up is a must as neglected piles of vegetation may result in increased fire risk.

Table E.2. Summary of Fuels Treatment Methods

Treatment	Comments
Machine mowing	Appropriate for large, flat, grassy areas on relatively flat terrain.
Manual treatment with chipping or pile burning	Requires chipping, hauling, and pile burning of slash in cases where lop and scatter is inappropriate. Slash tree limbs to 6 feet from ground or max of 1/3 of tree height Remove ladder fuels below / near trees. Pile burning must comply with smoke management policy. Permits administered on behalf of the state by the Grand County Division of Natural Resources.
Brush mastication	Brush species tend to re-sprout vigorously after mechanical treatment. Frequent maintenance of treatments is typically necessary. Mastication tends to be less expensive than manual (chainsaw) treatment and eliminates disposal issues.
Timber mastication	Materials up to 10 inches in diameter and slopes up to 30% can be treated. Eliminates disposal issues. Environmental impact of residue being left on-site is still being studied.
Prescribed fire	Can be very cost effective for public land but not close to the city. Ecologically beneficial. Can be used as training opportunities for firefighters. May require manual or mechanical pretreatment. Carries risk of escape. Unreliable scheduling due to weather and smoke management constraints.
Feller buncher	Mechanical treatment on slopes more than 30% or of materials more than 10 inches in diameter may require a feller buncher rather than a masticator. Costs tend to be considerably higher than masticator.
Grazing (goats)	Can be cost effective. Ecologically beneficial. Can be applied on steep slopes and shrubby and flashy fuels. Requires close management.

MANUAL TREATMENT

Manual treatment refers to crew-implemented cutting with chainsaws. Although it can be more expensive than mechanized treatment, crews can access many areas that are too steep or otherwise inaccessible with machines. Treatments can often be implemented with more precision than prescribed fire or mechanized methods allow. Merchantable materials and firewood can be removed while non-merchantable materials are often lopped and scattered, chipped, or piled and burned on-site. Care should be exercised to not increase the fire hazard by failing to remove or treat discarded material in a site-appropriate manner.

Strategic timing and placement of fuels treatments is critical for effective fuels management practices and should be prescribed based on the conditions of each treatment area. Some examples of this would be to place fuel breaks in areas where the fuels are heavier and in the path of prevailing winds and to mow grasses just before they cure and become flammable. Also, fuel reductions on slopes/ridgelines extending from the WUI to enhance community protection. In areas where the vegetation is sparse and not continuous, fuels treatments may not be necessary to create a defensible area where firefighters can

work. In this situation, where the amount of fuel to carry a fire is minimal, it is best to leave the site in its current condition to avoid the introduction of exotic species.

MECHANIZED TREATMENTS

Mechanized treatments include mowing, mastication (ground-up timber), and whole tree felling. These treatments allow for more precision than prescribed fire and are often more cost-effective than manual treatment.

Mowing, including skid steer, ATV, and tractor-pulled mower decks, can effectively reduce grass and brush fuels adjacent to structures and along highway rights-of-way and fence lines. For heavier fuels, several different masticating machines can be used, including drum- or blade-type masticating heads mounted on machines and ranging in size from a small skid-steer to large front-end loaders. Some masticators can grind standing timber up to 10 inches in diameter. Other masticators are more effective for use in brush or surface fuels. Mowing and mastication do not actually reduce the amount of on-site biomass but alter the fuel arrangement to a less combustible profile.

In existing fuel break areas maintenance is crucial especially in areas of encroaching shrubs or trees. In extreme risk areas more intensive fuels treatments may be necessary to keep the fire on the ground surface and reduce flame lengths. Within the fuel break, shrubs should be removed, and the branches of trees should be pruned from the ground surface to a height of 4 to 8 feet, depending on the height of the fuel below the canopy, and thinned with a spacing of at least two to three times the height of the trees to avoid movement of an active fire into the canopy.

Mechanical shears mounted on feller bunchers are used for whole tree removal. The stems are typically hauled off-site for utilization while the limbs are discarded. The discarded material may be masticated, chipped, or burned in order to reduce the wildfire hazard and to speed the recycling of nutrients.

GRAZING

Fuel modifications targeted toward decreasing both vertical and horizontal continuity in fuels is critical as a prevention method against fire proliferation. The primary objectives for these modifications are treating surface fuels and producing low-density and vertically disconnected stands. Livestock grazing is an effective, nontoxic, nonpolluting, and practically carbon-neutral vegetation treatment method. A Livestock grazing system typically consists of a high density of livestock enclosed by a metallic or electrified fence guided by herders. Livestock feed on a variety of foliage and twigs from herbaceous vegetation and woody plants (Lovreglio et al. 2014).

PRESCRIBED BURNING

Where possible, prescribed fire could occur on public land since fire is ecologically beneficial to this fire-adapted vegetation community and wildlife habitat. All prescribed fire operations will be conducted in accordance with federal and state laws and regulations. Public safety would be the primary consideration in the design of any prescribed burn plan so as to not negatively impact the WUI. Agency use of prescribed fire on public land would be carried out within the confines of the agency's fire management planning documents and would require individual prescribed burn plans that are developed for specific burn units and consider smoke management concerns and sensitive receptors within the WUI. Smoke monitors could be placed in areas where smoke concerns have been raised in the past.

Following any type of fuels reduction treatment, post-treatment monitoring should continue to ensure that management actions continue to be effective throughout the fire season. The vegetation within this ecosystem can change rapidly in response to drought or moisture from year to year and during the course of the season, so fuels treatments should be adjusted accordingly. To learn more about firing techniques, visit the EFIRE Fire Techniques webpage: <https://efire.cnr.ncsu.edu/efire/fire-techniques/>.

The City of Boulder enforces a permanent burn ban within its city limits, prohibiting open burning, including burnable piles, fire pits, and bonfires of any size or flammable material. The ban also extends to portable outdoor fire pits. The only exemption is for burning safety flares, like road flares, to indicate danger to the public. Residents are encouraged to report safety concerns or code violations.

The following page provides additional information on related services and contacts for burn permits outside the city limits in Boulder County: <https://bouldercolorado.gov/services/burning-within-city-limits>

Outside of the city, a permit from must be obtained for a resident or land manager to start a prescribed burn on a designated property. The Boulder County website provides resources with safety tips and instructions for burning. It is also recommended that resident and land managers consider reasonable alternatives to burning if the primary purpose is material disposal. Several burns may be needed to meet full resource management objectives, so a maintenance plan is needed to ensure success.

For more information and to access the burn permit application for, please visit: <https://bouldercounty.gov/safety/fire/burn-permits/>

Agricultural Burning

Agricultural burning of fields and ditches is a common practice among agricultural areas within the Boulder region. The process typically functions to clear land, fertilize soil, or prepare for planting of new crops. Awareness of smoke dispersal, obtainment of proper permits, and alerting proper personnel prior to burn operations are critical components of agricultural burning. Historically, wildfire risks associated with agricultural burning have been low in the region but escape occasionally occurs.

Cultural Burning

Across the American west, fire has historically been a means of forest management and restoration by Indigenous communities for thousands of years (Carter et al. 2021; Roos et al. 2021). Research has demonstrated that use of wildfire by indigenous communities prior to European settlement frequently served to reduce fuel loads, maintain wildlife habitat, and reduce wildfire severity (Carter et al. 2021). Research and ongoing indigenous practices reflect that utilizing these traditional indigenous wildfire management practices can help create and maintain fire resilient WUI communities.

Although cultural burning is included under the umbrella of prescribed burns, it holds a different meaning and has more purposes than a typical prescribed burn (FACNM 2021). Cultural burns are “pertinent and substantial to the cultural livelihood” with over 70 identified purposes (FACNM 2021).

Rather than focusing solely on fuel reduction, or as a means of wildfire mitigation, cultural burning is done with a more holistic view, under the philosophy of “reciprocal restoration,” meaning, as stewardship responsibilities to the land are fulfilled, those actions will in turn benefit the peoples who depend on those ecosystems (Long et al. 2021). Cultural burning is typically performed with a variety of objectives, such as landscape management, ecosystem and species biodiversity and health, transmission of environmental and cultural knowledge, ceremonies and spiritual wellbeing, a sense of place, and material services (i.e., food, medicine, plant materials, etc.). Extensive site preparation is typically done before a burn,

and post-burn monitoring and additional cultural practices are a common factor of the land stewardship tradition (Long et al. 2021).

“Cultural burning by Native Americans interconnected them not only to the land but to their animal, reptile, bird and plant spiritual relatives. Therefore, conducting a cultural burn relates to what they burned, how they burned it, and why they burned it.”

- Ron W. Goode, Tribal Chair, North Fork Mono Tribe

Benefits of Prescribed Fire to Grasslands

The Watershed Center’s story map for [Grassland Management in Boulder County](#) highlights a range of benefits associated with conducting prescribed fire in grassland areas. Among these benefits is the promotion of native vegetation, particularly fire adapted species. Additionally, prescribed fires revitalize grass-dominant habitats by re-establishing keystone ecological processes and returning nutrients to the soil. Prescribed fires also play a crucial role in limiting the establishment and spread of invasive species and preventing the encroachment of trees and shrubs into grasslands. This reduction in woody undergrowth, known as ladder fuels, is particularly vital in foothill areas. Collectively, these benefits create a healthier ecosystem that positively impacts a range of wildlife, including native pollinators, small mammals, and various bird species.

For more information on managing grasslands, please visit the Watershed Center’s ArcGIS Story Map: <https://bouldercounty.gov/news/grassland-management-in-boulder-county-story-map-now-available/>

Impacts of Prescribed Fire to Communities

Prescribed fires can have impacts on air quality that may impact local communities. Impacts on a regional scale are typically only acute when many acres are burned on the same day, which is uncommon in this region. Local problems are occasionally acute due to the large quantities of smoke that can be produced in a given area during a short period of time. Residents with respiratory problems may be impacted during these burning periods since smoke consists of small particles of ash, partly consumed fuel, and liquid droplets that are considered air pollutants. Other combustion products include invisible gases such as carbon monoxide, carbon dioxide, hydrocarbons, and small quantities of nitrogen oxides. Oxides of nitrogen are usually produced at temperatures only reached in piled or windrowed slash or in very intense wildfires that are uncommon in the region. In general, prescribed fires produce inconsequential amounts of these gases. Inappropriate management of prescribed fires can be bothersome to residents, and it can negatively affect community health.

Smoke from burning vegetation produces air pollutants that are regulated by both the U.S. Environmental Protection Agency (EPA) and the state of Colorado (Colorado General Assembly 2020). Additionally, smoke can increase ambient air pollution levels to a point where it exceeds air quality standards (Colorado General Assembly 2020). Therefore, effective smoke management is a vital component of planning and conducting prescribed fires. The Colorado Department of Public Health & Environment has smoke management guidelines that protect the health and welfare of Coloradans from the impacts of smoke.

In addition, the NWCG released the NWCG Smoke Management Guide for Prescribed Fire in 2020 (NWCG 2020). This plan is designed to act as a guide to all those who use prescribed fire. Smoke management techniques, air quality regulations, public perception of prescribed fire, foundational science behind prescribed fire, modeling, smoke tools, air quality impacts, and more are all discussed in this plan. The document is meant to pair with NWCG’s Interagency Prescribed Fire Planning and Implementation

Procedures Guide for planning and addressing smoke when prescribed fire is used (NWCG 2020). To view the plan, please visit: <https://www.nwcg.gov/sites/default/files/publications/pms420-3.pdf>.

Effects of smoke can be managed by burning on days when smoke will blow away from smoke-sensitive areas. Precautions are taken when burning near populated areas, highways, airports, and other smoke sensitive areas. Any smoke impact downwind is considered before lighting a fire. Smoke management is a significant component of all prescribed burn plans. Other mitigating actions include alerting the public of upcoming burning activities, including the purpose, best conditions for ensuring good smoke dispersal, duration, size, and location of projects. Local radio, newspapers, social media, and TV can provide broad coverage for alerts. Land management agencies in the planning area consistently work with concerned citizens regarding smoke management and attempt to provide solutions such as the placement of smoke monitors at sensitive sites.

Thinning and Prescribed Fire Combined

Combining thinning and prescribed fire can be the most effective treatment (Graham et al. 2004). In forests where fire exclusion or disease has created a buildup of hazardous fuels, prescribed fire cannot be safely applied, and pre-burn thinning is required. The subsequent use of fire can further reduce residual fuels and reintroduce this ecologically imperative process.

MANAGEMENT OF NON-NATIVE PLANTS

The USDA maintains a list of introduced, invasive, and noxious plants by state (USDA 2022c). Fuel treatment approaches should always consider the potential for introduction or proliferation of invasive non-native species as a result of management actions.

WASH STATE

APPENDIX F:

Homeowner Resources

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LOCAL RESOURCES

BOULDER OFFICE OF DISASTER MANAGEMENT

- Main page: <https://boulderodm.gov/emergency-home/>
- Fire Restrictions: <https://bouldercounty.gov/safety/fire/fire-restrictions/>
- Sign Up for Emergency Alerts: <https://boulderodm.gov/preparedness/emergency-alerts/#you>
- County-wide evacuation map: <https://bouldercounty.maps.arcgis.com/apps/webappviewer/index.html?id=13ab214fe2bb4da5a850df0ca0f00fc5>
- Natural Hazard Mitigation Plan: <https://boulderodm.gov/recovery/mitigation/mitigation-plan/>

CITY OF BOULDER RESOURCES:

- Wildfire Preparedness Guide: <https://bouldercolorado.gov/media/3298/download?inline=>
- Create a Go-Bag/Grab List: <https://boulderodm.gov/preparedness/planning/grab-list/>; <https://www.ready.gov/kit>
- Wildfire Home & Curbside Assessments: <https://bouldercolorado.gov/services/wildfire-home-assessment>
- Steps to Prepare for Wildfires: <https://bouldercolorado.gov/news/take-these-steps-prepare-wildfires>
- Prevent Wildfires by Recreating Responsibly: <https://bouldercolorado.gov/news/prevent-wildfires-recreating-responsibly>
- Emergency Preparedness: <https://bouldercolorado.gov/guide/emergency-preparedness>
- Evacuation Information: <https://protect.genasys.com/search?z=14&latlon=40.014986%2C-105.270546>

BOULDER COUNTY FINANCIAL RESOURCES:

- Colorado Disaster Rebuild Programs: <https://cedproject.org/rebuild/>
- State Housing Recovery Programs (HRP): <https://dlg.colorado.gov/housing-recovery-program>
- FEMA Assistance for Residents & Businesses: Contact FEMA: 1-800-621-FEMA (3362) or 1-800-462-7585 (TTY) for the hearing and speech impaired.
- Internal Revenue Service (IRS): <https://www.irs.gov/businesses/small-businesses-self-employed/faqs-for-disaster-victims#affectedtaxpayersandrecords>

- Resources for those impacted by the Marshall Fire: <https://bouldercounty.gov/finances-and-rebates-2/>
 - Apply for Grant: <https://docs.google.com/forms/d/e/1FAIpQLSfdsy8uyM9fPqBeyzH79pjZFtWrMSstU8ukB1KEgwvO01aj9A/viewform>

STATE RESOURCES

COLORADO DIVISION OF FIRE PREVENTION AND CONTROL (DFPC)

- Community Preparedness – Living in the WUI and Vehicle Safety Tips: <https://dfpc.colorado.gov/communityfireprep>
- Colorado Wildfire Preparedness Plan: <https://dfpc.colorado.gov/colorado-wildfire-preparedness-plan>
- Wildfire Information Resource Center: <https://dfpc.colorado.gov/sections/wildfire-information-resource-center>

COLORADO STATE FOREST SERVICE

For Homeowners

- Educational Resources and Publications: <https://csfs.colostate.edu/csfspublications/>
 - Includes wildfire mitigation and education for homeowners
- Resources for Homeowners and Landowners: <https://csfs.colostate.edu/homeowners-landowners/>
 - Includes resources to help you manage your property
- Resources for Communities: <https://csfs.colostate.edu/communities/>
- Programs for Homeowners and Landowners: <https://csfs.colostate.edu/forest-management/programs-for-homeowners-landowners/>
 - Grant programs and homesite assessments
- Post-Fire Forest Restoration and Rehabilitation: <https://csfs.colostate.edu/forest-management/restoration-rehabilitation/>
 - Includes rehabilitation practices, restoration publications, and burned tree management for various species
- Home Ignition Zone and Defensible Space Guide
 - https://csfs.colostate.edu/wp-content/uploads/2021/04/2021_CSFS_HIZGuide_Web.pdf
- Home Ignition Zone Checklist
 - <https://csfs.colostate.edu/wildfire-mitigation/home-ignition-zone-checklists/>

Misc.

- Colorado Forest Atlas: <https://coloradoforestatlas.org/>
 - Includes spatial maps for the 2020 Forest Action Plan, Wildfire Risk Reduction Planner, and Wildfire Risk Viewer
- USFS Wildfire Risk to Communities Interactive Tool: [Wildfire Risk to Communities \(wildfirerisk.org\)](https://wildfirerisk.org/)

COLORADO MISC.

- Boulder County Community Chipping Program: <https://bouldercounty.gov/property-and-land/forest-health/community-chipping-reimbursement/>
- Colorado Emergency Alert Notification Sign-up: <https://bouldercolorado.gov/guide/emergency-preparedness>
- Community Preparedness – Living in the WUI and Vehicle Safety Tips: <https://dfpc.colorado.gov/communityfireprep>
- Colorado Wildfire Preparedness Plan: <https://dfpc.colorado.gov/colorado-wildfire-preparedness-plan>
- Colorado Association of Realtors Colorado Project Wildfire: <https://coloradorealtors.com/projectwildfire/>
- Common Colorado Insects and Diseases: <https://csfs.colostate.edu/forest-management/common-forest-insects-diseases/>
- Ignition Resistant Construction Design Manual: https://coloradosprings.gov/sites/default/files/2020_ignition_resistant_design_manual_march_2020.pdf
- Colorado Property and Insurance Wildfire Preparedness Guide: https://93j20c.p3cdn2.secureserver.net/wp-content/uploads/2021/08/Wildfire_22x8.5_2021.pdf
- Fire Adapted Colorado: <https://fireadaptedco.org/>

NATIONAL RESOURCES

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA):

Protecting Your Home

- Preparing Homes for Wildfire: <https://www.nfpa.org/Public-Education/Fire-causes-and-risks/Wildfire/Preparing-homes-for-wildfire>
- Reducing Wildfire Risks to Property: Help Protect Your Home or Business Online Training: <https://www.nfpa.org/for-professionals/training-for-me/wildfire-training/reducing-wildfire-risks-to-property-help-protect-your-home-or-business>
- If your Home Doesn't Ignite, It Can't Burn: <https://www.youtube.com/watch?v=RqKFDDBGd5o>

- How do Homes Burn in a Wildfire? <https://www.youtube.com/watch?v=3QthynXyml>
- Wildfire Community Preparedness Day Toolkit: <https://go.nfpa.org/l/14662/2022-01-11/8j6nqh>
- 5 Key Areas Around the Home You Must Examine When Assessing Wildfire Risk: <https://www.youtube.com/watch?v=MIUQVL3BvVg>
- Your Home and Wildfire, Choices That Make a Difference: <https://www.youtube.com/watch?v=pfbEcMeYFFA>
- Home Hardening Fact Sheets: <https://www.nfpa.org/Public-Education/Fire-causes-and-risks/Wildfire/Firewise-USA/Firewise-USA-Resources/Research-Fact-Sheet-Series>

Preparation and Evacuation

- Wildfire Preparedness Tips: <https://www.nfpa.org/Public-Education/Fire-causes-and-risks/Wildfire/Wildfire-safety-tips>
- Evacuation for Household Pets and Horses: <https://www.nfpa.org/education-and-research/wildfire/household-pets-and-horses>
 - Provides preparation documents for household pets and wildfire preparedness for horses
- Emergency Supplies Kit Checklist: <https://www.nfpa.org/downloadable-resources/checklists/emergency-supplies-kit-checklist>
- Outthink a Wildfire; Wildfire Action Policies: <https://www.nfpa.org/wildfirepolicy>

FEMA

- Protective Actions for Wildfires FEMA: <https://community.fema.gov/ProtectiveActions/s/article/Wildfire>
- Flood Insurance Information: <https://www.fema.gov/flood-insurance>
- Explore FEMA's National Risk Index by County for risk, expected annual loss, social vulnerability, and community resilience: <https://hazards.fema.gov/nri/map>

RED CROSS

- Red Cross – How to Prepare For Emergencies: <https://www.redcross.org/get-help/how-to-prepare-for-emergencies.html>
- Red Cross – Wildfire Safety: <https://www.redcross.org/get-help/how-to-prepare-for-emergencies/types-of-emergencies/wildfire.html>
- Red Cross – How to Prevent Wildfires: <https://www.redcross.org/get-help/how-to-prepare-for-emergencies/types-of-emergencies/wildfire/how-to-prevent-wildfires.html>
- Red Cross – Colorado Wildfires: Red Cross Supporting Victims <https://www.redcross.org/about-us/news-and-events/news/2021/colorado-wildfires-red-cross-responds-as-people-forced-to-evacuate.html>

EPA

- Smoke Ready Toolbox for Wildfires EPA: <https://nepis.epa.gov/Exe/ZyPURL.cgi?Dockkey=P100WRAP.txt>
- AirNow: <https://www.airnow.gov/>
- AirNow Fire and Smoke Map: <https://fire.airnow.gov/>
- Smoke Advisories: <https://www.airnow.gov/air-quality-and-health/fires/smoke-advisories/>
- Fires and Your Health Documents: <https://www.epa.gov/pm-pollution/fires-and-your-health-documents>
- Wildfires and Indoor Air Quality: <https://www.epa.gov/indoor-air-quality-iaq/wildfires-and-indoor-air-quality-iaq>
- Frequent Questions About Wildfire Smoke: https://usepa.servicenowservices.com/airnow?id=kb_search&kb_knowledge_base=798f5d172fa050102be2d2172799b6d8&spa=1&kb_category=23bbbd9f1b681c104614ddb6bc4bcb70
- Smoke Sense App: <https://www.epa.gov/air-research/smoke-sense-study-citizen-science-project-using-mobile-app>
- Prepare For Natural Disasters and Recovery: <https://www.epa.gov/natural-disasters>

READY.GOV

- Wildfires Ready.gov: <https://www.ready.gov/wildfires>
- Family Disaster Readiness: <https://www.ready.gov/kids>
- Kids: <https://www.ready.gov/kids/be-ready-kids>
- Teens: <https://www.ready.gov/kids/teens>
- Families: <https://www.ready.gov/kids/prepare-your-family>
- Educators and Organizations: <https://www.ready.gov/kids/educators-organizations>
- Wildfire Information Sheet: https://www.ready.gov/sites/default/files/2021-12/ready_wildfire_info-sheet.pdf

MISC.

- Climate Mapping for Resilience and Adaptation (CMRA) portal which provides a live dashboard to help communities see extreme weather and other hazards from climate change: <https://resilience.climate.gov/#real-time-data>
- Community Planning for Wildfire Assistance Program (CPAW) – Assists the GCWC with wildfire risk-reduction communications, increasing land use planning capacity, and collaborating with agencies to identify overlaps in scopes of work: <https://cpaw.headwaterseconomics.org/>
- Instructor Guide; The ability to identifying, analyzing, and using relevant situational information about topographic features can help predict wildland fire behavior is the responsibility of everyone on the fireline: <https://www.nwcg.gov/sites/default/files/training/docs/s-190-ig04.pdf>

- WiRē – Wildfire Research, an interdisciplinary collaboration on community adaptability to wildland fire: <https://wildfireresearchcenter.org/>
- Wildfire Ready App:
 - App Store: <https://apps.apple.com/us/app/wildfire-ready-virtual/id1540773278?msclkid=4eac0069a71411ecb26fa03c0b08eba2>

WASH STATE

APPENDIX G:

Post-Fire Recovery and Restoration

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POST-FIRE RESPONSE AND RESTORATION

There are many aspects to post-fire response and restoration, including but not limited to:

- Returning home and checking for hazards.
- Coordinating and mobilizing a group of teams in the community to respond to post-fire related emergencies (not to be confused with initial fire response).
- Rebuilding communities and assessing economic needs—securing the financial resources necessary for communities to rebuild homes, business, and infrastructure.
- Restoring the damaged landscape—restoration of watersheds, soil stabilization, and tree planting.

Prioritizing the needs of socially vulnerable residents/communities who have specific circumstances, such as individuals living in poverty, minorities, people without vehicles, people with disabilities, older adults, and people with limited English proficiency, is imperative in the post-fire recovery process.

BACKGROUND

The recent increase in severe fires has highlighted the numerous complexities of post-fire response. Research indicates that high-severity burn areas may produce erosion and runoff rates 5 to 10 times higher than the rates produced by moderate-severity burn areas (Sierra Nevada Conservancy 2021). Following a fire, heavy rains may result in widespread floods carrying trees, boulders, and soil through canyons, ultimately damaging communities and critical infrastructure. Slope-adjacent roadways are particularly vulnerable to debris flow.

Learn more about debris and mud flow here: <https://coloradogeologicalsurvey.org/hazards/debris-flows/>

The most recent significant fire in the planning area was the Marshall Fire, which resulted in 6,026 acres burned and destroyed or damaged over 1,000 homes and commercial structures (Boulder County 2023). The fire spread quickly due to high winds and dry conditions, and left debris, ash, and partially burnt vegetation in its wake. Additionally, the fire dramatically reduced vegetative cover, resulting in exposed mineral soils prone to water repellency and increasing runoff. This exposed mineral soil is readily transported during rain events and likely resulted in elevated soil erosion and sediment loading in streams, creeks, and rivers (BAER 2021).

A comprehensive dashboard showing progress towards recovering from the Marshall Fire can be found here: <https://bouldercounty.gov/marshall-fire-recovery-dashboard/>

BURNED AREA EMERGENCY RESPONSE PROGRAM

One example of a post-fire response program is the USFS's post-fire emergency stabilization program, called the Burned Area Emergency Response (BAER) program. The goal of the BAER program is to discover post-wildfire threats to human life and safety, property, and critical natural or cultural resources on USFS lands and take appropriate actions to mitigate unacceptable risks (BAER 2021). BAER teams are composed of trained professionals in different fields: soil scientists, engineers, hydrologists, biologists, botanists, archaeologists, and others who quickly assess the burned area and advise emergency stabilization treatments (BAER 2021).

There are many facets to post-fire recovery, including but not limited to:

- Ensuring public health and safety—prompt removal of downed and hazard trees, addressing watershed damage, and mitigating potential flooding.
- Rebuilding communities and assessing economic needs—securing the financial resources necessary for communities to rebuild homes, business, and infrastructure.
- Restoring the damaged landscape—restoration of watersheds, soil stabilization, and tree planting.
- Reducing fire risk in the future—identifying hazard areas and implementing mitigation.
- Prioritizing the needs of vulnerable and disadvantaged communities during response and disaster recovery efforts.
- Reducing post-fire recovery time by replanting native species.
- Ensuring fire protection measures enhance sustainability of restoration projects e.g., introducing prescribed fire to a fire-dependent ecosystem where fire had previously been excluded.
- Retaining downed logs for erosion control and habitat maintenance.
- Evaluating and updating disaster recovery plans every 5 years to respond to changing needs and characteristics of the community.
- Coordinating with planning, housing, health and human services, and other local, regional or state agencies to develop contingency plans for meeting short-term, temporary housing needs of those displaced during a catastrophic wildfire event.
- Incorporating forecasted impacts from climate change into trends and projections of future risk and consideration of policies to address identified risk.
- Updating codes and ordinances to specify procedures and standards for planning and permitting the reconstruction of buildings destroyed by wildfire.

In addition, both the USFS and CSFS provide science-based frameworks to guide post-fire restoration efforts in State Forest lands of Colorado. This guidance outlines methods of ecological management and a step-by-step framework for agencies to follow in post-fire planning (CSFS 2022a). A list of resources to guide post-wildfire rehabilitation is available at: <https://csfs.colostate.edu/forest-management/restoration-rehabilitation/>

EMERGENCY WATERSHED PROTECTION PROGRAM

As another example, the Natural Resource Conservation Service's (NRCS's) Emergency Watershed Protection (EWP) program provides technical and financial services for watershed repair on public (state and local) and private land. The goal is to reduce flood risk through funding and expert advice on land treatments. The EWP program can provide up to 75% of funds and remaining funds are often paid with in-kind volunteer labor (Coalition for the Upper South Platte [CUSP] 2016). This funding is used by the State Emergency Rehabilitation Team (a multi-agency group assembled by the NRCS) to develop specific recovery and treatment plans.

Examples of potential treatments include (USFS 2021b):

- Hillside stabilization (for example, placing bundles of straw parallel to the slope to slow erosion)

- Hazard tree cutting
- Felling trees perpendicular to the slope contour to reduce runoff
- Mulching areas seeded with native vegetation
- Stream enhancements and construction of catchments to control erosion, runoff, and debris flows
- Planting or seeding native species to limit spread of invasive species

The Colorado State Forest Service maintains a webpage with Colorado-specific forest restoration resources. This page includes guides on soil and erosion treatment techniques, rehabilitation and replanting for success guides, and a link to the Colorado Post-Fire Playbook. These resources are available here: <https://csfs.colostate.edu/forest-management/restoration-rehabilitation/>

A comparison of potential hillside, channel, and road treatments is available at: <https://www.afterwildfirenm.org/post-fire-treatments/which-treatment-do-i-use>

The effectiveness of various treatments is described at: https://www.fs.usda.gov/rm/pubs/rmrs_gtr240.pdf

WESTT TOOL

Specific Post-Fire Treatment Details

Hillslope Treatments

Cover Applications:

Dry mulch: provides immediate ground cover with mulch to reduce erosion and downstream flow.

Wet mulch (hydromulch): provides immediate cover to hold moisture and seeds on slopes using a combination of organic fibers, glue, suspension agents, and seeds (most effective on inaccessible slopes).

Slash spreading: provides ground cover to reduce erosion by felling trees in burned areas.

Seeding: reduces soil erosion over time with an application of native seed mixtures (most successful in combination with mulching). Breaking up and loosening topsoil to break down the hydrophobic layer on top of the soil is also effective.

Erosion Barrier Applications:

Erosion control mat: organic mats staked on the soil surface to provide stability for vegetation establishment.

Log erosion barrier: trees felled perpendicular to the hillslope to slow runoff.

Fiber rolls (wattles): rolls placed perpendicular to the hillslope to reduce surface flows and reduce erosion.

Silt fencing: permeable fabric fencing installed parallel to the slope contour to trap sediment as water flows down the hillslope.

Channel Treatments

Check dam: small dams built to trap and store sediment in stream channels.

In-channel tree felling: felling trees in a staggered pattern in a channel to trap debris and sediment.

Grade stabilizer: structures made of natural materials placed in ephemeral channels for stabilization.

Stream bank armoring: reinforcing streambanks with natural materials to reduce bank cutting during stream flow.

Channel deflector: an engineered structure to direct flow away from unstable banks or nearby roads.

Debris basin: constructed to store large amounts of sediment moving in a stream channel.

Road and Trail Treatments

Outsloping and rolling dips (water bars): alter the road shape or template to disperse water and reduce erosion.

Overflow structures: protect the road by controlling runoff and diverting stream flow to constructed channels.

Low water stream crossing: culverts replaced by natural fords to prevent stream diversion and keep water in the natural channel.

Culvert modification: upgrading culvert size to prevent road damage.

Debris rack and deflectors: structure placed in a stream channel to collect debris before reaching a culvert.

Riser pipes: filter out debris and allow the passage of water in stream channels.

Catchment-basin cleanout: using machinery to clean debris and sediment out of stream channels and catchment basins.

Trail stabilization: constructing water bars and spillways to provide drainage away from the trail surface.

These treatments and descriptions are further detailed at: <https://afterwildfirenm.org/post-fire-treatments/treatment-descriptions>

For more information about how to install and build treatments, see the Wildfire Restoration Handbook at: https://www.rmfi.org/sites/default/files/hero-content-files/Fire-Restoration-HandbookDraft_2015_2.compressed_0.pdf

TIMBER SALVAGE

Many private landowners may decide to harvest trees killed in a fire, a decision that can be controversial. Trees remaining post-fire can be instrumental for soil and wildlife habitat recovery, but dead standing trees may also pose safety concerns and fuel loadings may still be conducive to future high intensity wildfires. Burned soils are especially susceptible to soil compaction and erosion so it is recommended to have professionals perform the timber salvage. Several programs assist landowners with timber salvage, including the NRCS Environmental Quality Incentives Program (EQIP) (CUSP 2016).

INVASIVE SPECIES MANAGEMENT

Wildfire provides opportunity for invasive species to dominate because many of these species thrive on recently burned landscapes. It is imperative that landowners prevent invasive establishment by eradicating weeds early, planting native species, and limiting invasive seed dispersal (CUSP 2016).

Planting native seeds is an economical way to restore a disturbed landscape. Vegetation provides protection against erosion and stabilizes exposed soils. To be successful, seeds must be planted during the proper time of year, using correct techniques. Use a native seed mixture with a diversity of species and consider the species' ability to compete with invasive species. If you choose to transplant or plant native species, consider whether the landscape has made a sufficient recovery to ensure the safety of the individuals (CUSP 2016).

COMMUNITY RESPONSE AND RECOVERY

Community Emergency Response Team

Developed by the Federal Emergency Management Agency (FEMA), the Community Emergency Response Team (CERT) training is a program that educates community members about disaster preparedness for hazards that may impact their area and trains them in basic disaster response skills, such as fire safety, light search and rescue, and team organization. Supplemental training modules are available to better assist professional responders in a variety of emergency situations. Advanced training includes topics such as animal response, emergency communications, traffic and crowd management, and flood response.

In addition, each community is encouraged to create its own type of a Post-Fire Coordination Group (PFCG) to direct the response to any ensuing post-wildfire natural hazards and aid in determining post-fire mitigation actions. The PFCG should work directly with local, state, or federal agencies, emergency response officials, and others to aid in a coordinated response. Primary duties of the PFCG include coordinating the exchange of information among agencies, assembling and exchanging geospatial data, assisting public communications, and coordinating with elected officials (Colorado Silver Jackets 2021).

The recovery coordinator should become familiar with representatives from local, state, and government agencies that will be helping with coordination or funding of post-fire recovery. Any large wildfire will also involve an Incident Command System (ICS), an appropriately sized team assigned to aid in post-fire recovery. Learn more are <https://www.nps.gov/articles/wildland-fire-incident-command-system-levels.htm>.

Boulder County After the Disaster Guidebook

Even after the flames are extinguished, several dangers persist after a wildfire. These hazards include potential flash flooding, structural damage, downed powerlines, unstable roads, weakened trees, remaining hot spots, and the presence of wildlife predators in the area. Homeowners that have experience property damage during a wildfire event are advised to make an initial trip to assess the damage, identify post-fire hazards, and plan for necessary restoration tasks before starting cleanup or returning home. The recovery process begins with assessing and documenting losses, taking pictures, and notes. Re-entry safety tips and a post-fire supply list are available within the Guidebook to aid in this process.

Livestock and large pet owners delay bringing their animal back to the property until the extent of damage and existing hazards are well understood. Livestock should be shelter somewhere safe from post-fire impacts until the hazards have subsided.

For more information in post-fire actions and a supply list, please visit:

https://mcusercontent.com/2263fe298f4df255d22b80097/files/9262ab8f-acc3-2b00-5040-3a916c7c342b/Boulder_County_After_the_Disaster_Guidebook_CSU_Extension_V3.pdf

Open Space and Mountain Parks Disaster Recovery

The City of Boulder Office of Open Space and Mountain Parks regularly organizes recovery efforts for major disasters affecting the Boulder and surrounding communities and landscapes. A prime example includes the 2013 floods.

- More than 1,480 volunteers donated 8,000 hours to help rebuild and restore shared open space.
- Volunteers helped OSMP to complete more than 120 projects to repair trails and restore areas affected by the floods.

City of Boulder Office of Disaster Management

The Office of Disaster Management for the City of Boulder and Boulder County manages recovery beginning with mass care services, impact assessment and emergency debris management. Once the response phase is declared over the ODM continues to manage the transition to the longer-term recovery structure.

Following the Marshall Fire, the City of Boulder and Boulder County partnered with communities and agencies to provide comprehensive post-fire and post-wind event recovery resources and information to citizens. Boulder County hosts a recovery web page that provides information and resources regarding:

- Emotional support
- Financial help
- Rebuilding
- Insurance (debris, home, wildfire)
- Property taxes and valuation

Explore the recovery web page to learn more about what Boulder area governments are doing to provide post-disaster recovery resources. <https://bouldercounty.gov/disasters/wildfires/marshall/>

Recovery Navigators

The Recovery Navigator Program began on July 25, 2022. Recovery Navigators provided monthly reports on Marshall Fire recovery progress and convened over 1,150 appointments with citizens to help with personal disaster recovery efforts. Marshall recovery navigation services are scheduled to end March 2024. However, the success of the Recovery Navigators program paves the way for future disaster recovery efforts in and around Boulder.

Recovery Navigators worked one-on-one with individuals and families to provide a broad array of support, including:

- applying to rebuilding grant funds
- applying to unmet needs grant funds
- access to financial planning resources
- advocacy and connections to state and federal programs (DOLA, SBA, FEMA)
- connections with local jurisdiction building departments
- access to additional resources from area nonprofits
- help developing individualized recovery plans
- providing referrals to legal and insurance claims advisors
- comprehensive recovery planning resources
- mental health services

Explore the Recovery Navigators Program here: <https://bouldercountynavigatingdisaster.gov/>

Wildfire Recovery and Returning Home

Recovery from wildfire impacts can vary greatly across income levels and demographics. Rural areas, low-income neighborhoods, and immigrant communities generally do not have the necessary resources to cover insurance and rebuilding expenses that occur after a fire. As a result, many of these areas take more time to recover than those with greater access to resources. In addition, the occurrence of wildfire can worsen existing mental health conditions and lead to post-traumatic stress, low self-esteem, and depression for at-risk populations (CA GOPR 2020).

First and foremost, follow the advice and recommendations of emergency management agencies, fire departments, utility companies, and local aid organizations regarding activities following the wildfire. Do not attempt to return to your home until fire personnel have deemed it safe to do so.

When driving, watch for trees, brush, and rocks which may have been weakened or loosened by the fire. Be aware of any damage or debris on roads and driveways. Traffic may be delayed, or lanes closed due to firefighter operations. Use extreme caution around trees, power poles, and any other tall objects that may have been weakened by the fire (Colorado Silver Jackets 2021).

Even if the fire did not damage your house, do not expect to return to normal routines immediately. Expect that utility infrastructure may have been damaged and repairs may be necessary. When you return to your home, check for hazards, such as gas or water leaks and electrical shorts. Turn off damaged utilities if you did not do so previously. Request that the fire department or utility companies turn the utilities back on once the area is secured. Similarly, water supply systems may have been damaged; do not drink from the tap until you have been advised that it is safe to do so. Finally, keep a “fire watch”; look for smoke or sparks in houses and other buildings (CDHSEM 2022). Once at home, check for the following (CDHSEM 2022):

- Use caution when walking through burned areas. Hazards, such as hot spots and flare ups, may still exist.
- Keep a “fire watch” for several hours after returning to watch for smoke and sparks.

- Leave immediately if there is heat or smoke coming from a damaged structure.
- Avoid damaged or fallen power lines, poles, and downed wires.
- Mark ash pits properly and warn others of them. Stay clear of pits when possible.
- Keep animals close by- do not allow them to wander as hot spots and embers can burn their paws.
- Listen to instructions given by those in charge. Remain calm and deal with the most urgent issues first.
- If there is damage to your property, contact your insurance company.

Insurance Claims

Your insurance agent is the best source of information for submitting a claim. If you do not have insurance, reach out to local disaster recovery groups, such as the Recovery Navigators listed above. It is recommended you take photos of your home, both inside and out, in preparation of an emergency. Keep the photos in a safe place as this will make the insurance claim process easier. Most expenses incurred during the time you are displaced may be reimbursed, so be sure to keep all receipts. Additional items that may be covered are extra transportation costs to and from work or school, telephone installation, furniture rental, extra food costs, and water damage. Do not start any repairs without the approval of your claims adjuster (Colorado Division of Insurance 2020).

Natural disasters aren't always predictable, but there are steps property owners can take to better prepare for an emergency.

- Review your insurance policy annually to see if your home is adequately insured
- Know your "loss of use" section – these cover living expenses should your home become unlivable due to fire, smoke, or otherwise

You can view a guide on creating a home inventory here: <https://www.iii.org/article/how-create-home-inventory>

Learn more about insurance decisions in the Colorado Property and Insurance Wildfire Preparedness Guide: https://93j20c.p3cdn2.secureserver.net/wp-content/uploads/2021/08/Wildfire_22x8.5_2021.pdf

United Policy Holders also provides insurance resources for property damage and loss: www.uphelp.org

Community Safety: Post-Fire Floods and Debris Flows

There are numerous natural hazards after a wildfire. The most dangerous are potential flash floods and landslides that can occur with rainfall in a burned area. Wildfires increase the risk of flooding because burned soil is unable to absorb rainfall and it becomes hydrophobic. Factors that contribute to flooding and debris flows are steep slopes, heavy rainfall, weak or loose rock and soil, and improper construction and grading. Even small rainfall can cause a flash flood, transporting debris and damaging homes and other structures. Following a wildfire, burned areas are susceptible to debris flows for 5-10 years, leaving downhill residents in danger. It is crucial to be aware of your surroundings and take note of steep, unstable slopes that could require hasty evacuation (Colorado Geological Survey 2021). Develop an evacuation plan with your family and stay away from waterways. Be aware of your risk, pay attention to weather forecasts, listen to local authorities, and have a household inventory with copies of critical documents (Colorado Geological Survey 2021).

Mobilizing Your Community

Wildfires that produce extensive damage require a community-scale response. The local Emergency Manager will collaborate with state and federal partners to manage disaster response and urgent needs. Additional mobilization of a response and recovery team or group of teams in a community can function as a vital part of the recovery procedure. Coordinated and informed direction throughout community-level volunteers and all levels of government are necessary for successful recovery (Colorado Silver Jackets 2021).

Communication

After a team is assembled and immediate tasks are identified, find the best way to spread information in your community. You may distribute flyers, set up a voicemail box, work to find pets or livestock that have been displaced, develop a mailing list for property owners, hold regular public meetings, etc. It is important that a long-term communications plan is developed (Natural Hazards Center, 2020). Applying the following steps can aid in successful communication (Colorado Silver Jackets 2021):

- Communicate through familiar and trusted messengers
- Provide clear, actionable information
- Tailor messages and information pathways for target audience
- Communicate hazards that still exist
- Use diverse communication networks
- Ensure cross-organizational communication
- Work with educational institutions
- Encourage alert system participation

Long-Term Community Recovery

On non-federal land, recovery efforts are the responsibility of local governments and private landowners. Challenges associated with long-term recovery arise when homes were saved but are located in high severity burn areas or within other hazard prone areas. Economically, essential businesses that were burned, damaged, or otherwise forced to close pose a challenge to communities of all sizes. Given these complications, rebuilding and recovery efforts can last for years, with invasive species control and ecosystem restoration lasting even longer (CUSP 2016). It is critical that a long-term plan is in place and there is sufficient funding and support to properly restore the ecosystem and community.

To learn about more post-fire recovery resources, visit the After the Flames website here: <https://aftertheflames.com/resources/>.

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APPENDIX H:

Project Outreach

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COMMUNITY OUTREACH

Throughout the project, the Core Team utilized online resources, public engagement events and surveys, and an online Story Map to gather public feedback.

To maximize audience reached, online resources were used to provide information to the public and solicit feedback. Figures H.1 through H.8 show examples of online posts.

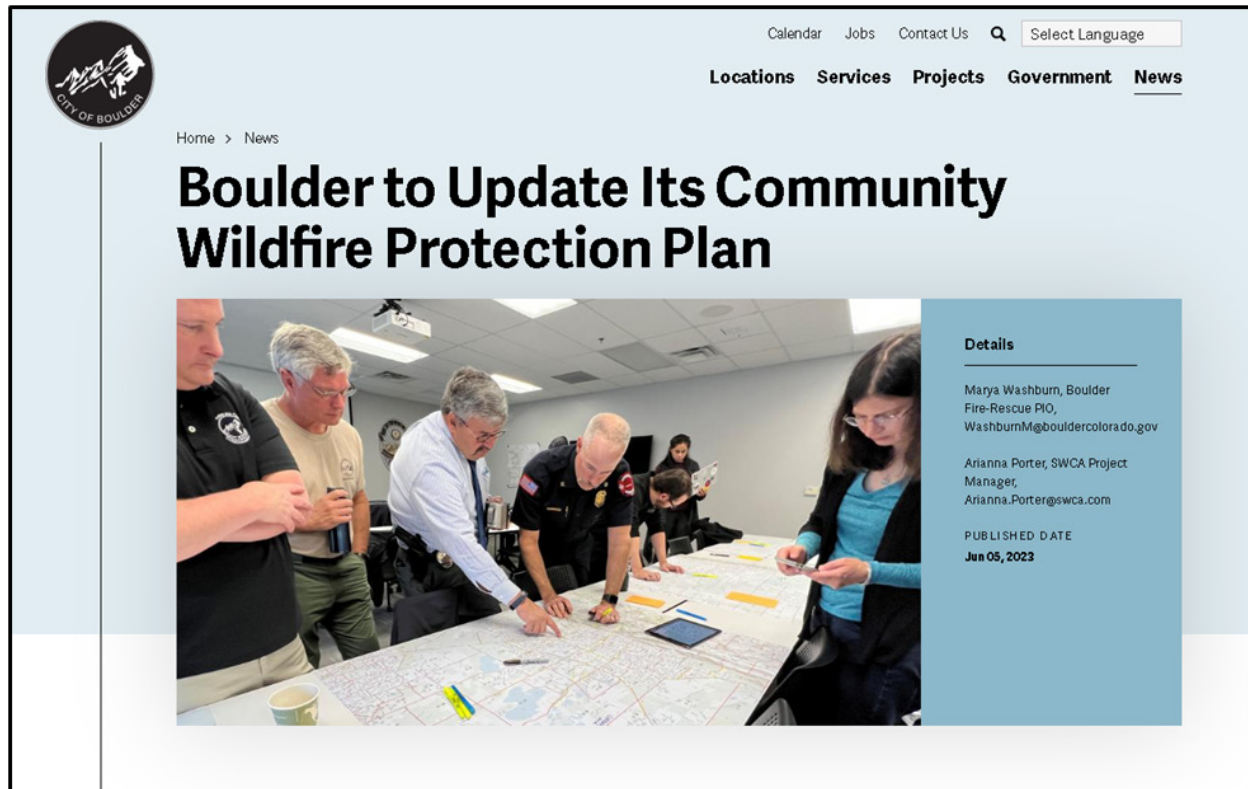


Figure H.1. Article on City of Boulder website announcing CWPP.

City of Boulder Contracts SWCA Environmental Consultants for 2023 Community Wildfire Protection Plan (CWPP) Update

The City of Boulder has taken proactive measures to protect its communities and infrastructure from wildfire hazards by contracting SWCA Environmental Consultants to develop an updated Community Wildfire Protection Plan (CWPP) for 2024. The CWPP identifies wildfire risks in the wildland-urban interface (WUI), which refers to the area between wildland and human development.

A crucial aspect of the CWPP is to recommend strategies for hazardous fuels reduction, public outreach and education, structural ignitability reduction, and improved fire response capabilities. By addressing these areas, the City aims to heighten the safety of its residents and critical infrastructure in the face of potential wildfires. The CWPP will serve as a guiding document that will assist the City and landowners in making informed decisions with respect to wildfire preparation and management.

The City's CWPP project Core Team, composed of dedicated experts and professionals, will recommend projects that significantly reduce wildfire risks for residents, allowing them to live safely in the City of Boulder. SWCA has also partnered with Mountain View Fire Protection District in the development of its CWPP, allowing the City to have greater collaborative opportunities with surrounding entities.

The City has opted to utilize an Esri Story Map and Hub Site, an interactive project website that combines maps and storytelling, as the primary means of two-way communication to disseminate information and gather community input regarding the project. The Story Map and Hub Site will serve as a platform for the ongoing implementation of the CWPP, allowing for seamless updates as conditions in the City change.

Community input is essential, and individuals are encouraged to share their concerns directly with the planning team by taking a short survey accessible at <https://arcg.is/1Gjft8>.

The City of Boulder remains committed to the safety and well-being of its residents, and this CWPP update represents another significant step in mitigating the risks posed by wildfires.

Figure H.2. Press release announcing CWPP and describing the planning process.

boulderganic

Living with fire

Documentary coming to Nederland fuels wildfire discussion as local resilience plans are underway

By Will Matuska - June 8, 2023



Courtesy: Elemental

Figure H.3. Living with fire article.

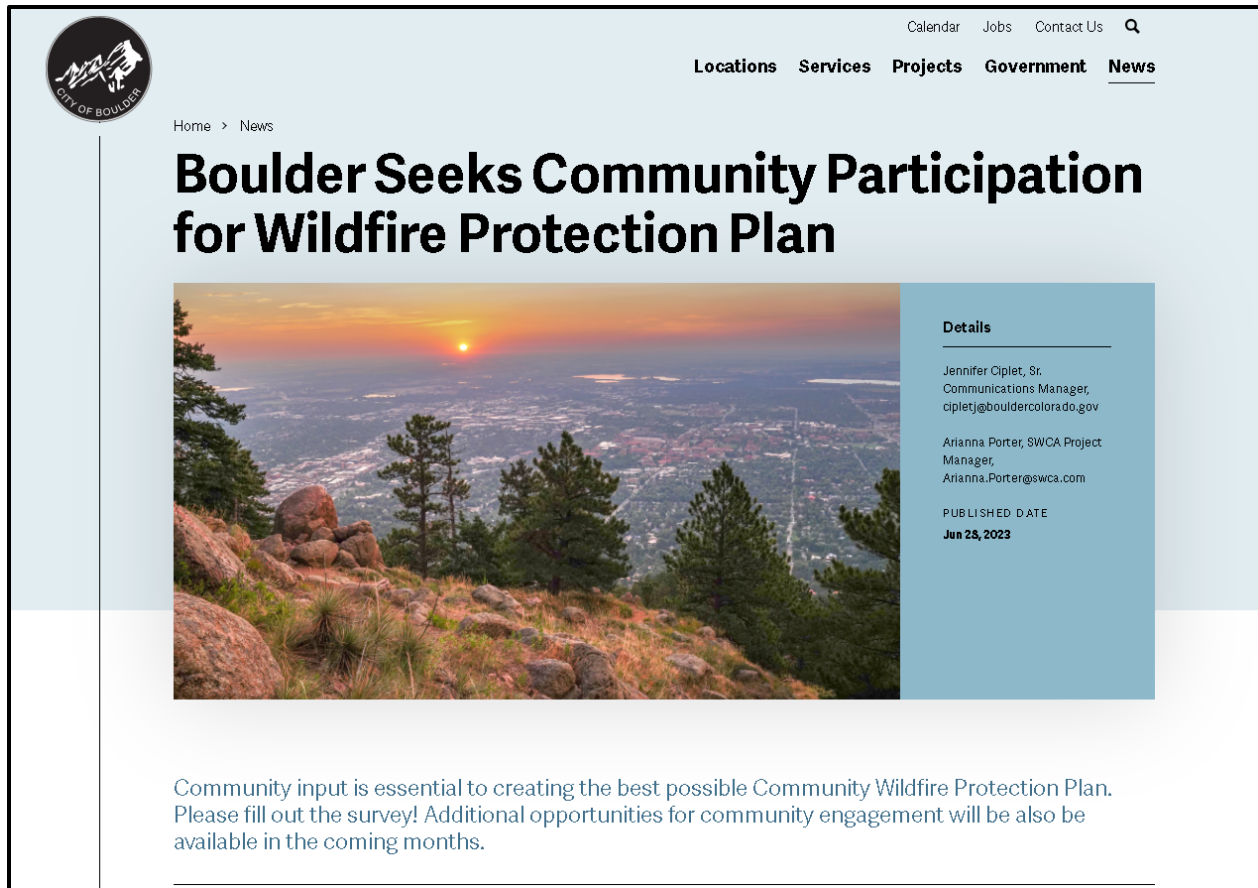


Figure H.4. Article on City of Boulder website soliciting public feedback.

WE WANT YOUR INPUT**City of Boulder to Host Public Open House for
2024 Community Wildfire Protection Plan (CWPP) Update**

On August 5, 2023, the City of Boulder will host a public open house at 2520 55th Street, Boulder, CO 80301 for the 2024 City of Boulder Community Wildfire Protection Plan (CWPP) Update. This will be an opportunity for the community to learn about the CWPP, visit with City of Boulder staff and the fire protection districts, and provide comments to inform CWPP development. Information will be on display and light refreshments will be provided; a short presentation will take place at 9:00 AM. If you are unable to attend in person but would still like to learn about the CWPP and provide comments, information and a digital comment form can be found here:

www.bouldercolorado.gov/guide/community-wildfire-protection-plan-cwpp

The City of Boulder has taken proactive measures to protect its communities and infrastructure from wildfire hazards by contracting SWCA Environmental Consultants to develop an updated CWPP for 2024. The CWPP identifies wildfire risks in the wildland-urban interface (WUI), which refers to the area between wildland and human development.

A crucial aspect of the CWPP is to recommend strategies for hazardous fuels reduction, public outreach and education, structural ignitability reduction, and improved fire response capabilities. By addressing these areas, the City aims to heighten the safety of its residents and critical infrastructure in the face of potential wildfires. The CWPP will serve as a guiding document that will assist the City and landowners in making informed decisions with respect to wildfire preparation and management.

Please take 5 minutes to complete this community survey: <https://arcg.is/1Gjft8>

The survey data is anonymous. All data collected from this survey will be used to inform the CWPP.

Figure H.5. Press release announcing the Public Open House and encouraging public participation.

CITY OF BOULDER

COMMUNITY WILDFIRE PROTECTION PLAN

THE PLAN

The city of Boulder has contracted SWCA Environmental Consultants to work in collaboration with municipal, state, and federal land management agencies to develop the 2024 City of Boulder Community Wildfire Protection Plan Update (CWPP).

A CWPP is designed to assist the city and property owners in mitigating wildfire risk by assessing areas at risk and recommending measures to decrease those risks. You (the public) can play a part in crafting fire mitigation recommendations to reduce risk in your community. Read below to find out more about the collaborative Community Wildfire Protection Plan process and public involvement.



WHAT DOES A COMMUNITY WILDFIRE PROTECTION PLAN DO?

- Identify areas at risk for wildland fire
- Make recommendations for hazardous fuels treatments (vegetation thinning)
- Prioritize areas for wildfire mitigation funding
- Make recommendations for homeowners to reduce fire risk
- Ask the public to share ideas about wildfire prevention and identify community values at risk

WHY YOU SHOULD BE INVOLVED

A CWPP is designed to assist the city of Boulder and landowners in mitigating wildfire risk. It is important that this process is collaborative.

Please scan the QR code to the right to take a brief survey and give us your feedback on wildfire risk reduction in your community.



COMMUNITY FACT

The 2024 City of Boulder CWPP is being developed in conjunction with the 2024 Boulder County and 2023 Mountain View Fire Protection District CWPPs. All three plans will align to identify hazards and reduce wildfire risk in and around the city of Boulder.

PROJECT CONTACT ARIANNA.PORTER@SWCA.COM

Figure H.6. City of Boulder CWPP flyer.

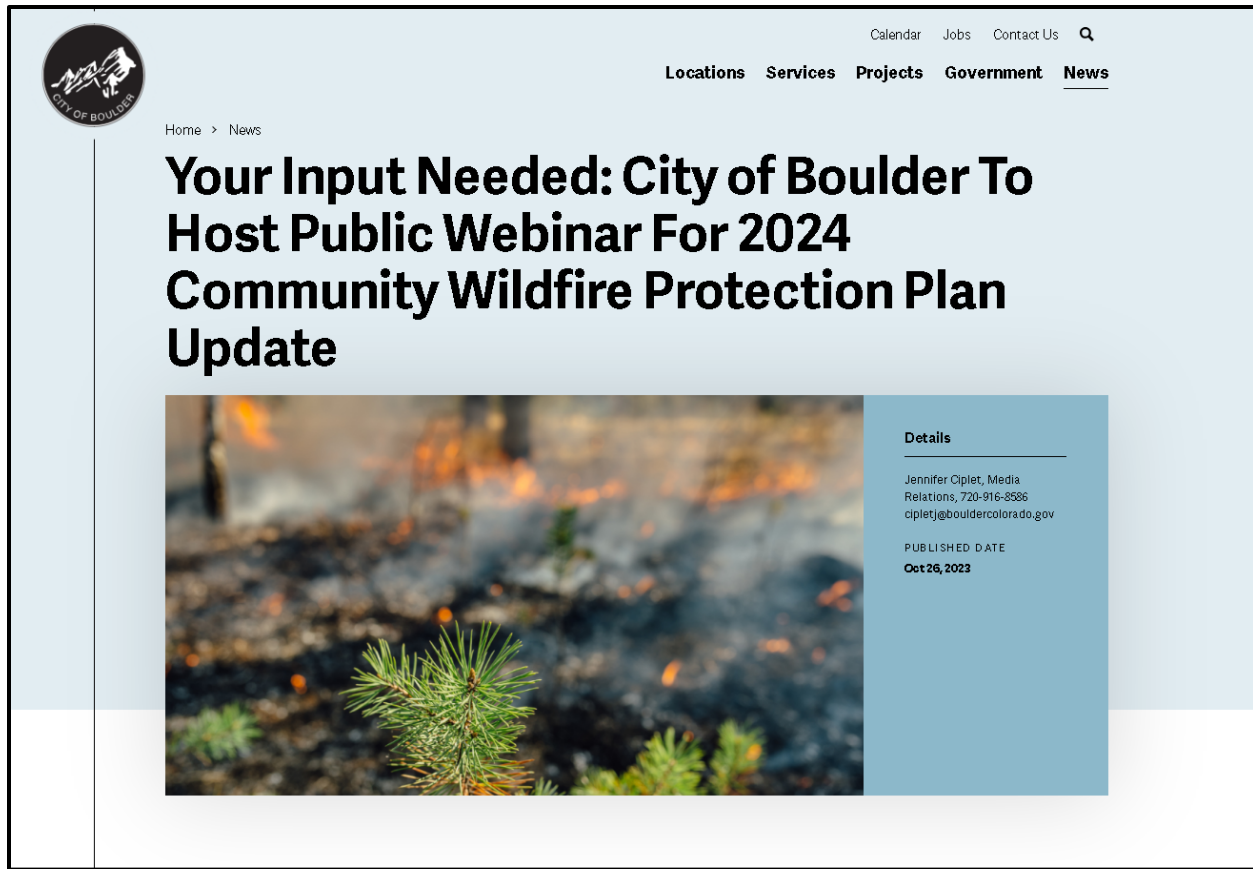


Figure H.7. Article on City of Boulder website announcing CWPP requesting public participation in CWPP development.

Boulder making headway on Community Wildfire Protection Plan as Marshall Fire anniversary nears



Nearing the second anniversary of the Marshall Fire, the City of Boulder is making headway on its Community Wildfire Protection Plan (CWPP).



**Click here to see
amazing photos and
videos from our
archives**

Figure H.8. Article on ABC Denver Channel 7 discussing the progression of City of Boulder CWPP's development.

PUBLIC ENGAGEMENT EVENT FEEDBACK SURVEY

Those that attended public engagement events were able to submit a short survey to provide their feedback on what they learned, as well feedback regarding development of the CWPP. All feedback was reviewed to ensure the CWPP reflects public priorities and concerns. Common feedback provided by community members includes:

- Continuing coordinated fuels management with an emphasis on surface fuel treatment, reforestation in patch cuts, and limiting treatment to specified zones to maintain habitat.
- Advocating for fuel treatment methods that avoid clear cuts and focus on surface fuels.
- Advocating for in-person or virtual participation of wildfire mitigation professionals in neighborhood/HOA wildfire meetings with an emphasis on continued education and outreach efforts.
- Incorporating home hardening guidance into community planning efforts and hosting neighborhood-specific information sessions to identify recommended actions for each area.
- Providing more incentives for xeriscaping, resilient livable spaces, and other home hardening measures.
- Improving evacuation route signage and traffic control, specifically in priority areas and communities within the WUI.
- Protecting forests, wildlife habitats, and water resources with an emphasis on sustainable wildfire management strategies.

COMMUNITY SURVEY

As part of the CWPP public engagement process, SWCA held a public survey period from June 2023 through April 2024. Feedback received during this feedback process was addressed through diligent adaptations and additions to the plan's content and mitigative recommendations. Figures H.9 through H.23 provide visualizations of the data received through the public survey responses.

Note: Variations in the quantity of responses across survey questions are due to respondents abstaining from certain questions. A total of 1,123 community survey responses were collected throughout the project lifespan. The results are summarized below.

1. What is your age?

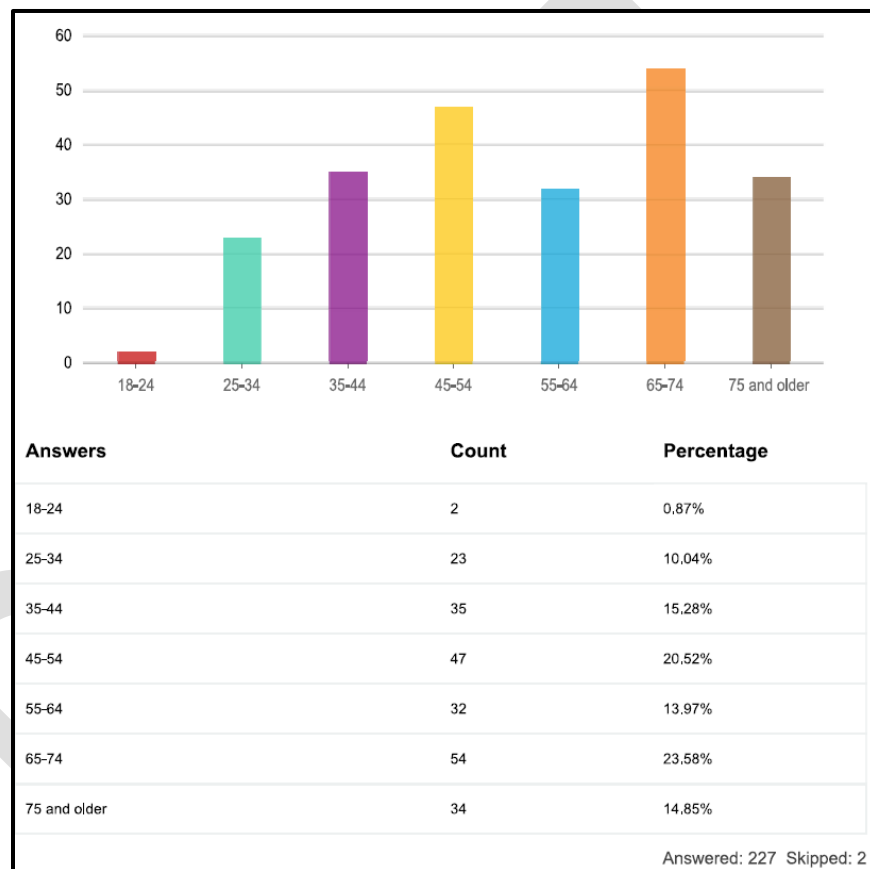


Figure H.9. Community survey response summary.

2. How long have you lived at this residence?

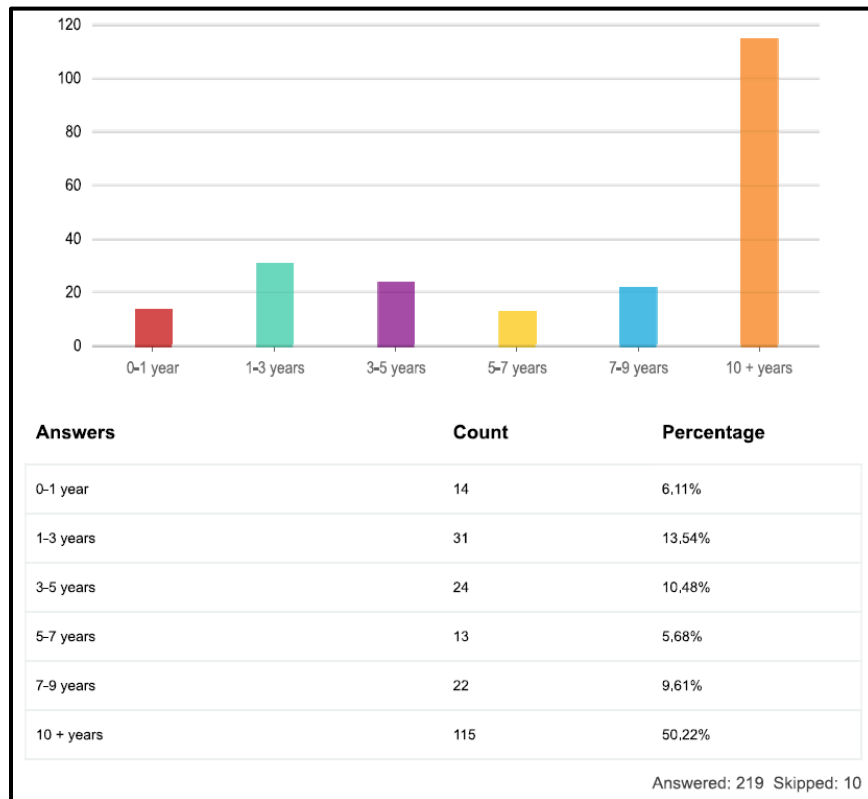


Figure H.10. Community survey response summary.

3. Do you identify as a person with a disability by the Americans with Disabilities Act (ADA)?

Answers	Count	Percentage
No	214	93.45%
Yes	10	4.37%

Answered: 224 Skipped: 5

Figure H.11. Community survey response summary.

4. How many times have you evacuated from your residence because of wildfire or threat of wildfire in the last 10 years (mandatory or voluntary)?

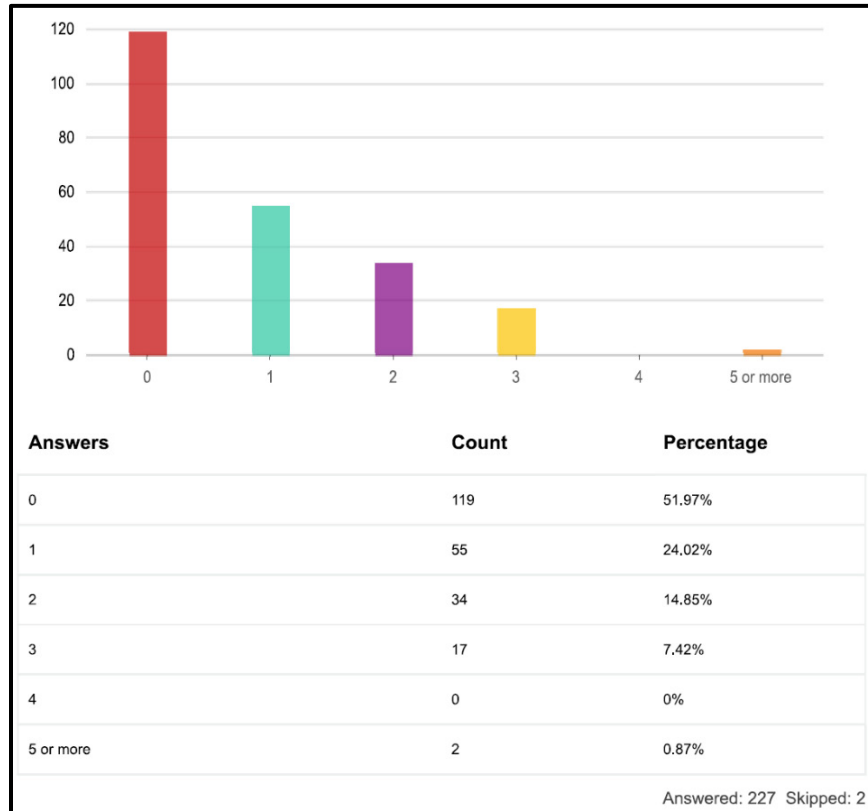
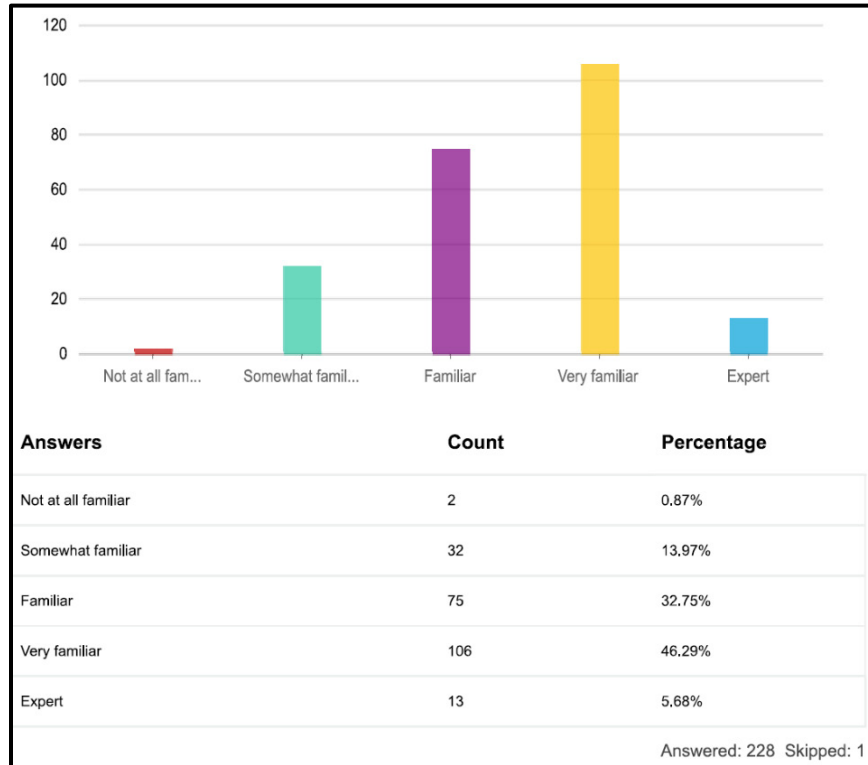


Figure H.12. Community survey response summary.

5. What is your level of familiarity or knowledge about wildfire?**Figure H.13. Community survey response summary.**

6. How concerned/worried are you about the risk of wildfire where you live and the threat wildfire poses to your primary residence?

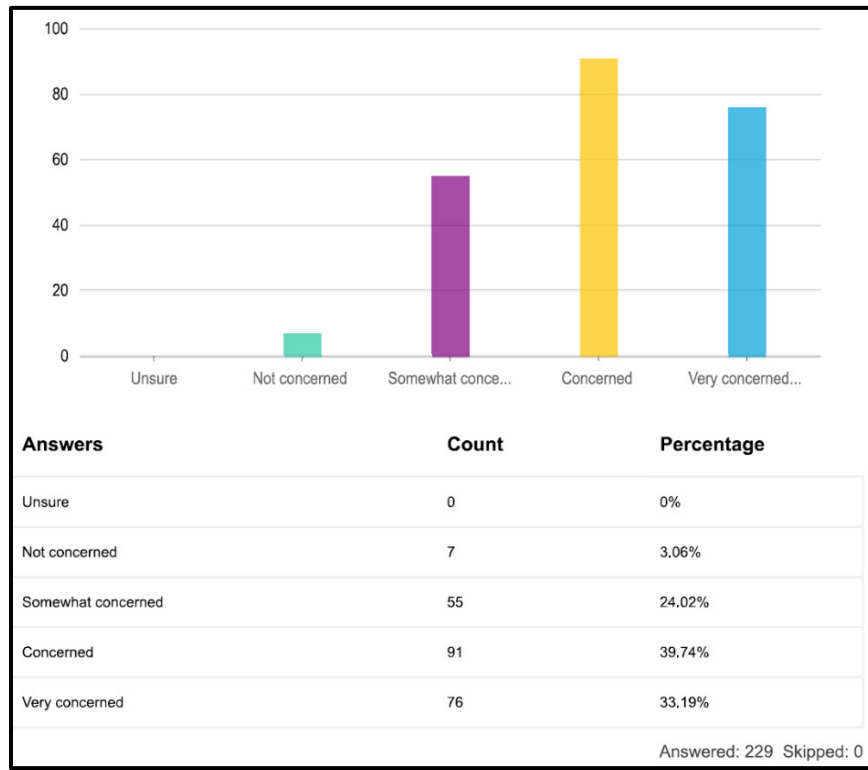


Figure H.14. Community survey response summary.

7. Compared to five years ago, how would you describe your level of concern/worry regarding your safety from wildfires and the safety of your family, home, and assets?

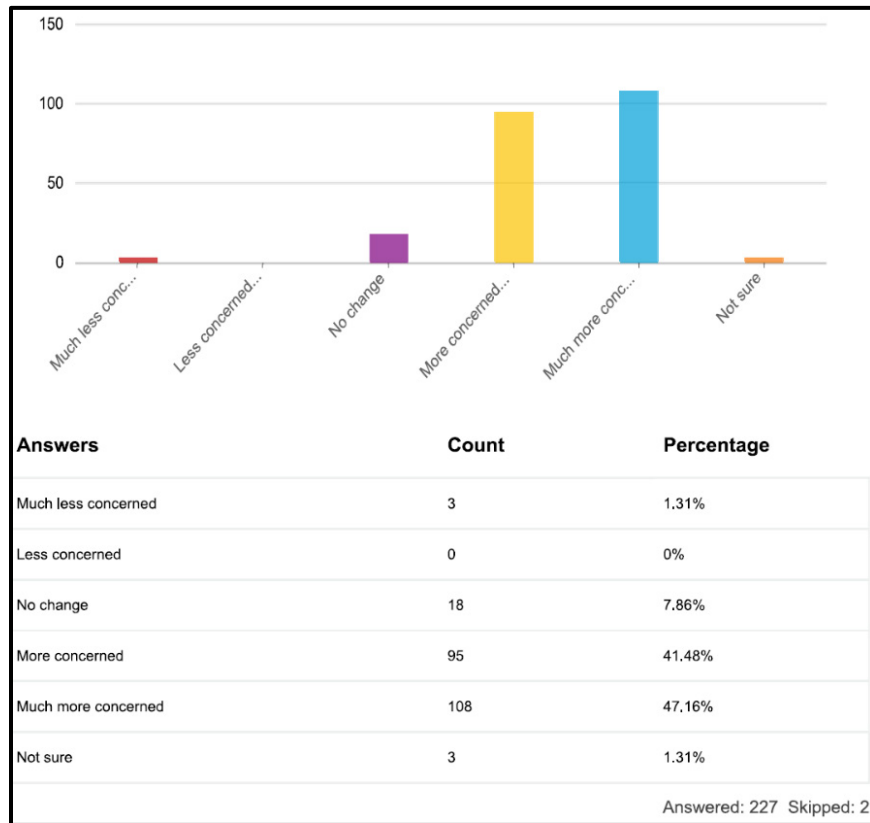


Figure H.15. Community survey response summary.

8. Are you familiar with where to get updates and information regarding evacuation or incidents?

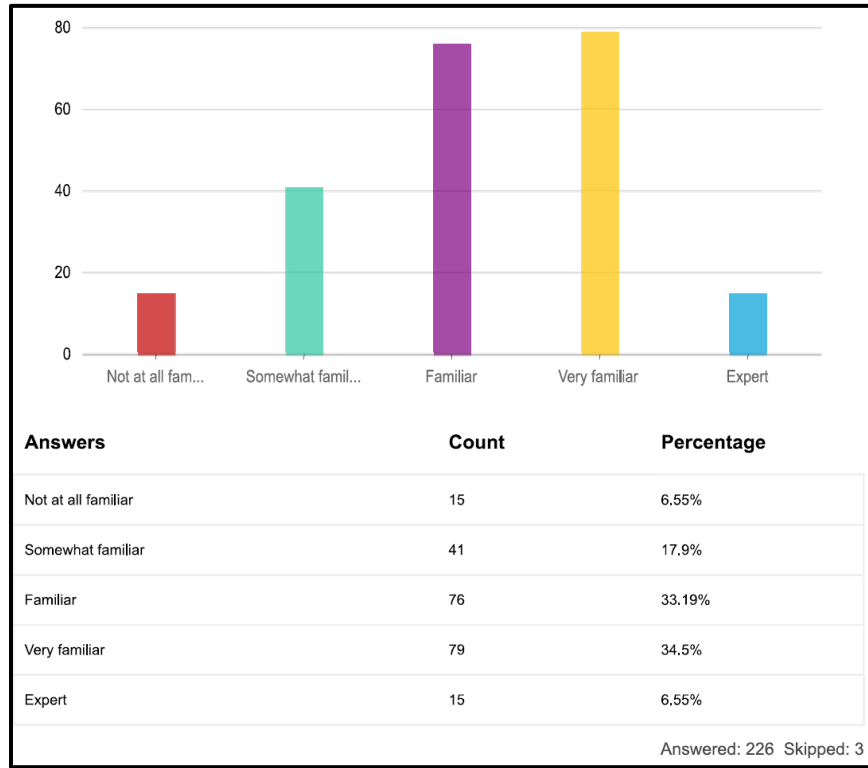


Figure H.16. Community survey response summary.

9. Are you interested in implementing "home hardening" on your own residential property?

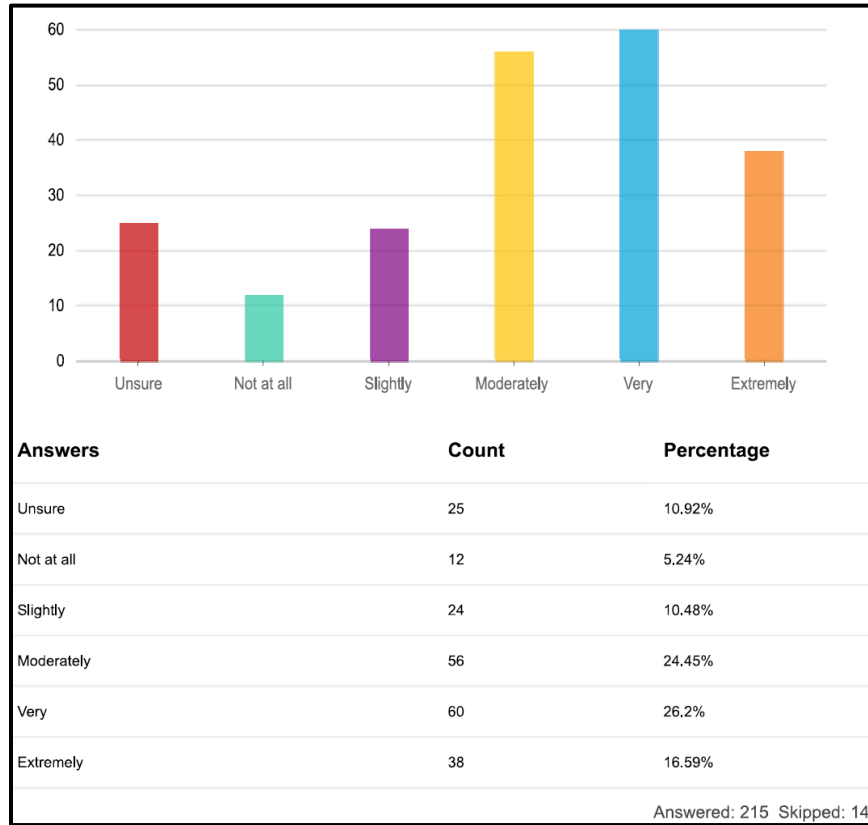


Figure H.17. Community survey response summary.

10. If a cost-share grant or incentive program were available, would you participate in it to better prepare your home and property from wildfire risk?

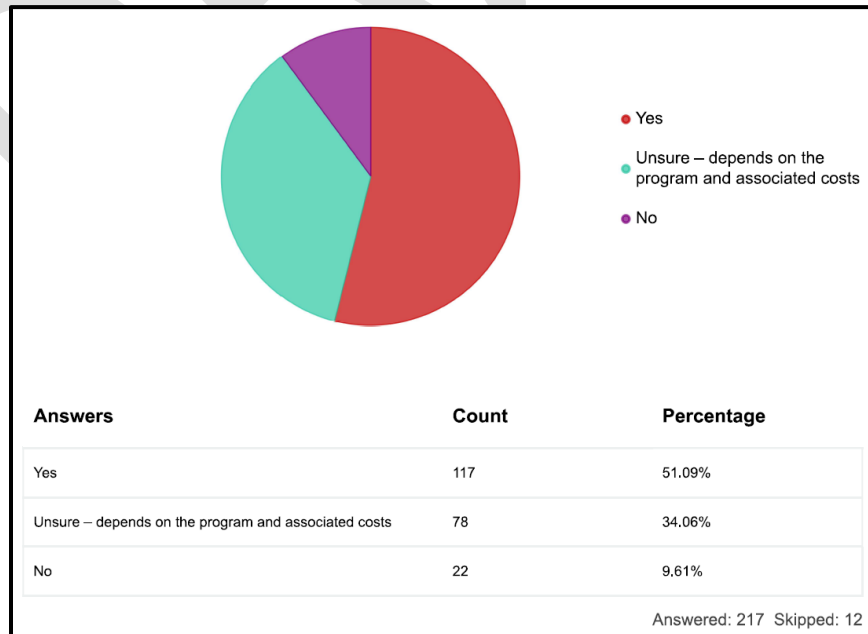


Figure H.18. Community survey response summary.

11. Have you participated in Community Wildfire Protection Plan (CWPP) efforts in the last 10 years?

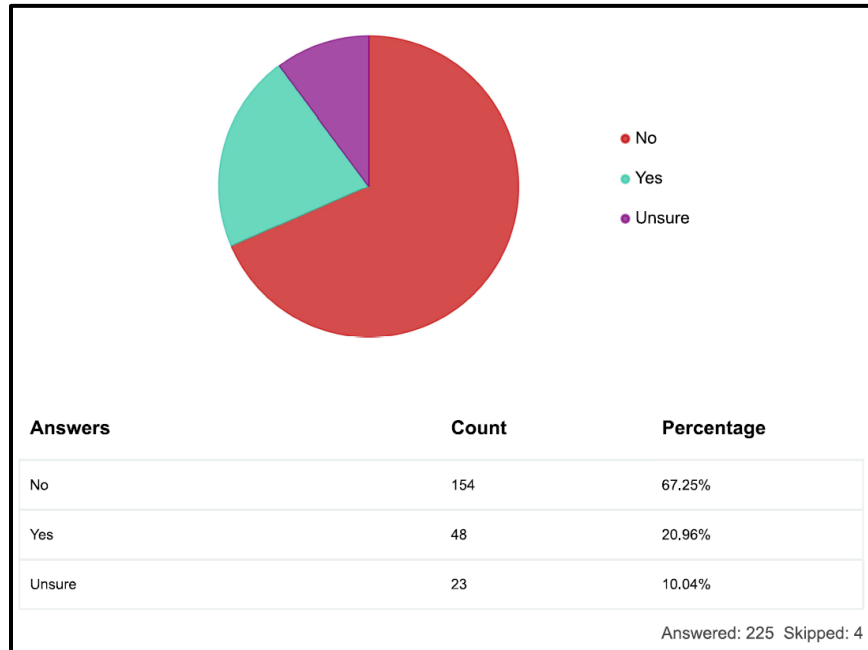


Figure H.19. Community survey response summary.

12. Do you think your community could do better to prepare for and prevent wildfires?

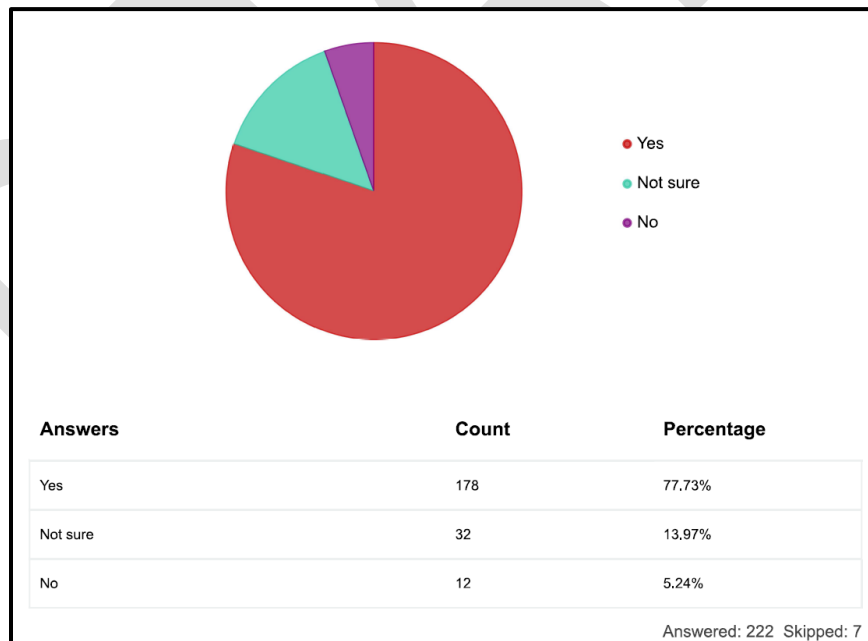


Figure H.20. Community survey response summary.

13. Do you believe you would know how to safely evacuate in the event of a wildfire?

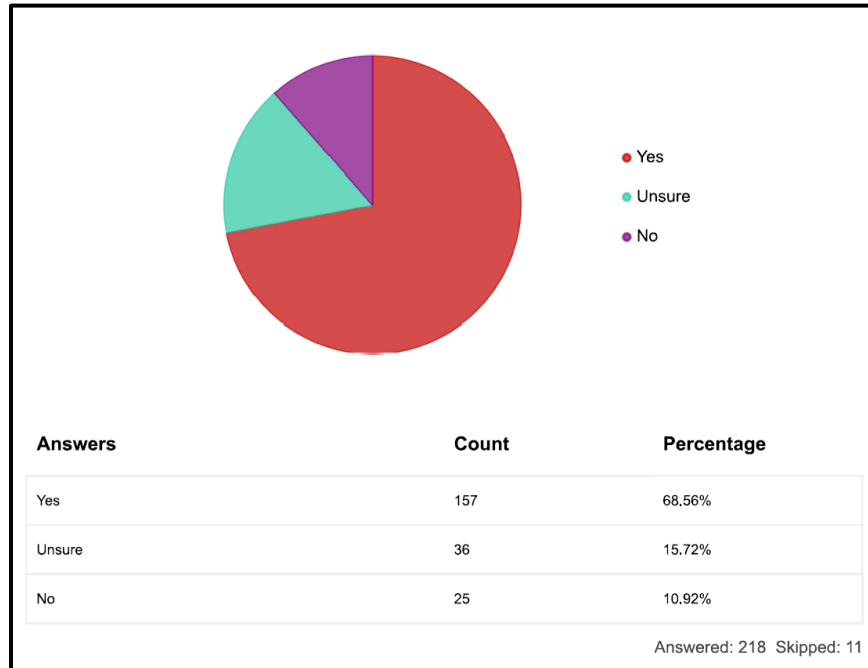


Figure H.21. Community survey response summary.

14. Do you have knowledge about how the natural environment (changes in temperature, relative humidity, wind, drought, etc.) can influence fire behavior?

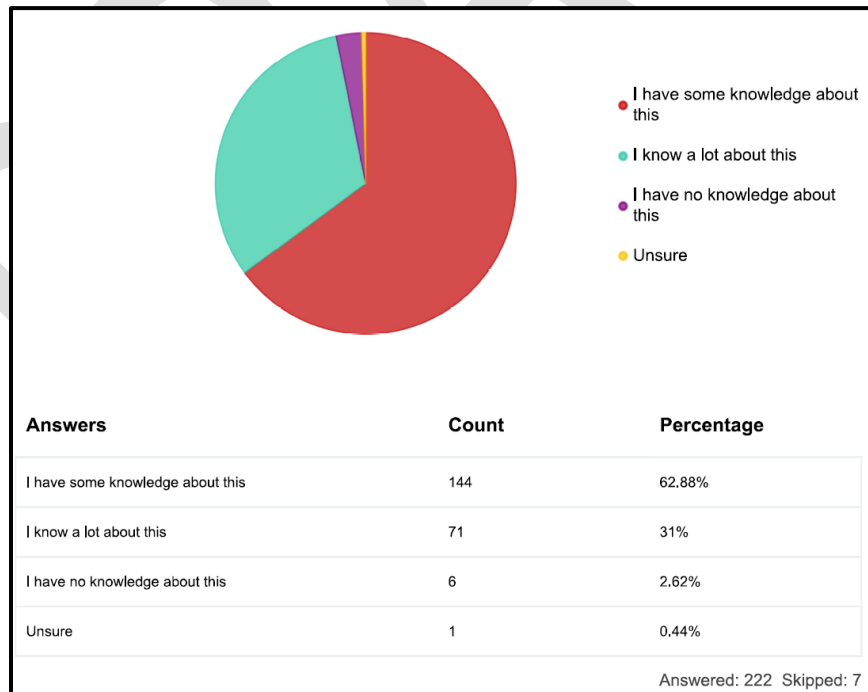


Figure H.22. Community survey response summary.

15. Would you like to see more projects in your community that treat and reduce hazardous vegetation?

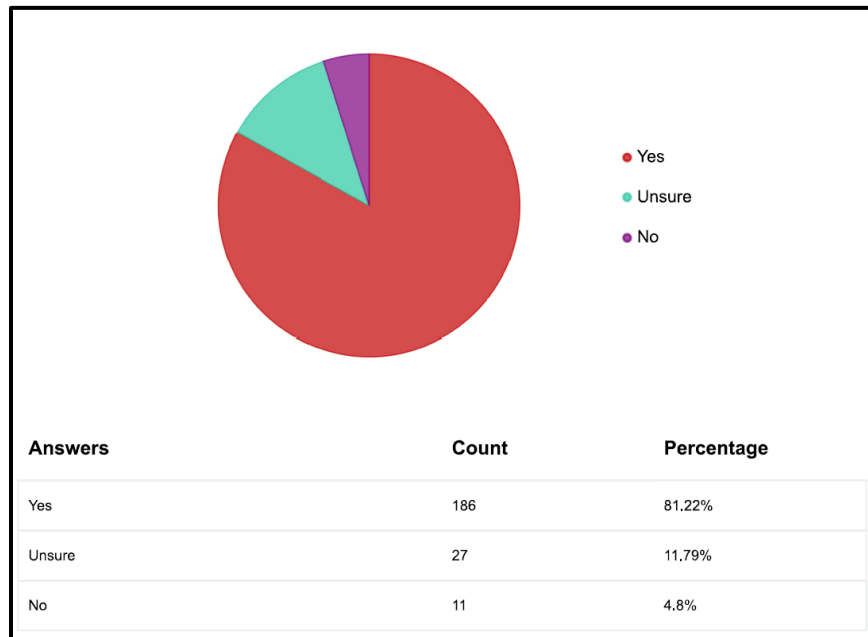


Figure H.23. Community survey response summary.

STORY MAP

The City of Boulder developed the CWPP story map to facilitate further engagement with the public. The story map provides opportunities for both information sharing and gathering between the public and the City. The story map has several tabs, each demonstrating information from various chapters in the CWPP document.

The introductory tab presents the purpose of the story map, project history, instructions for navigating the content, and the National Cohesive Wildland Fire Management Strategy framework. Next, the public involvement tab invites viewers to see a list of scheduled events, participate in the CWPP community survey, and access key resources. The fire environment, risk assessment, wildfire mitigation strategies, and monitoring and evaluation strategies tabs will contain the bulk of the final CWPP content. These tabs will introduce the WUI concept, fire regimes, values at risk and fire history in the city, information regarding Boulder fire planning and response, city values at risk from wildfire, areas with high versus low risk, wildfire mitigation actions, and monitoring strategies for applied treatments.

The story map also links the viewer to the CWPP document and contact information for the City of Boulder CWPP planning team. The figures below (H.24–H.26) demonstrate the general layout of the story map. Maps within the story map will be interactive, with several clickable layers providing information on numerous aspects of wildfire, including but not limited to communities in high-risk areas, vegetation and fuels, current mitigation projects, and fire behavior.

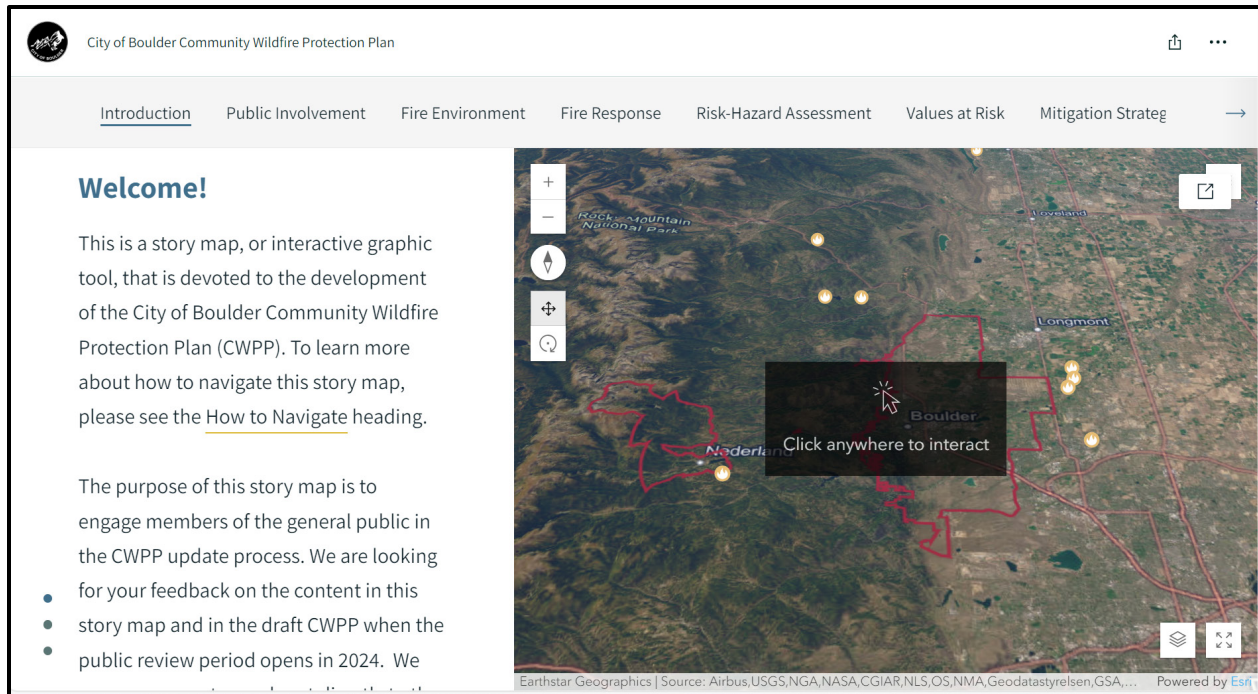


Figure H.24. CWPP story map introduction tab sample.

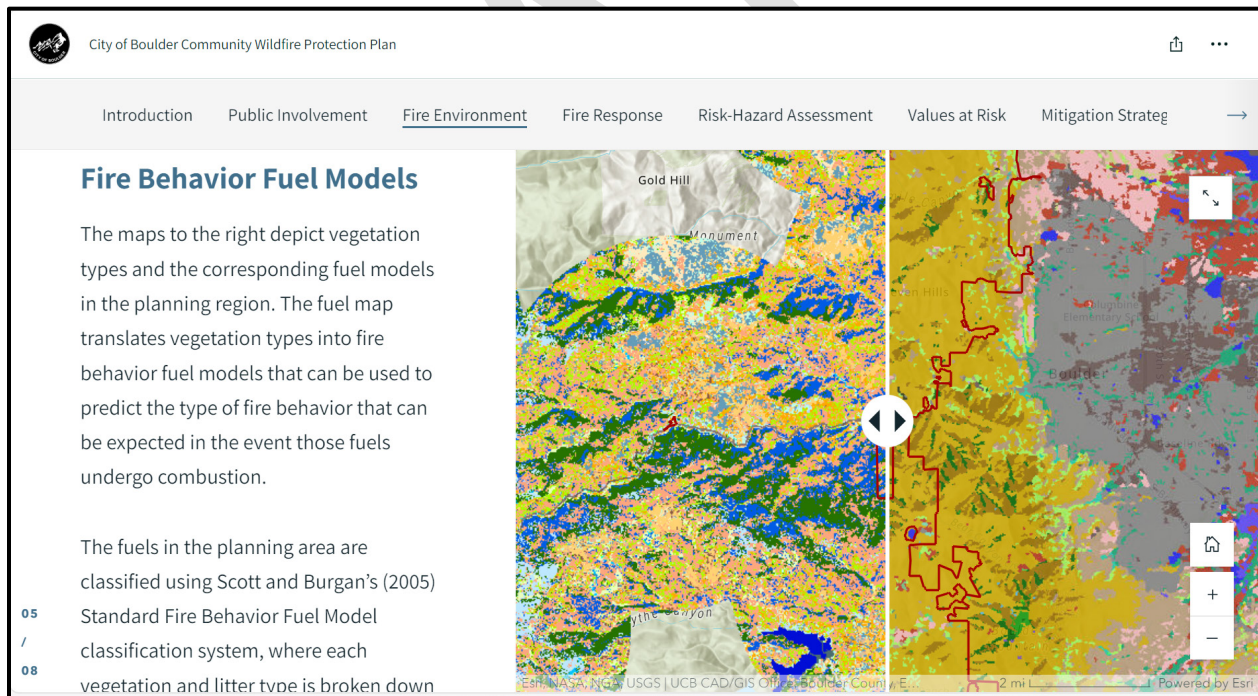


Figure H.25. Story map fire behavior fuel models tab sample.

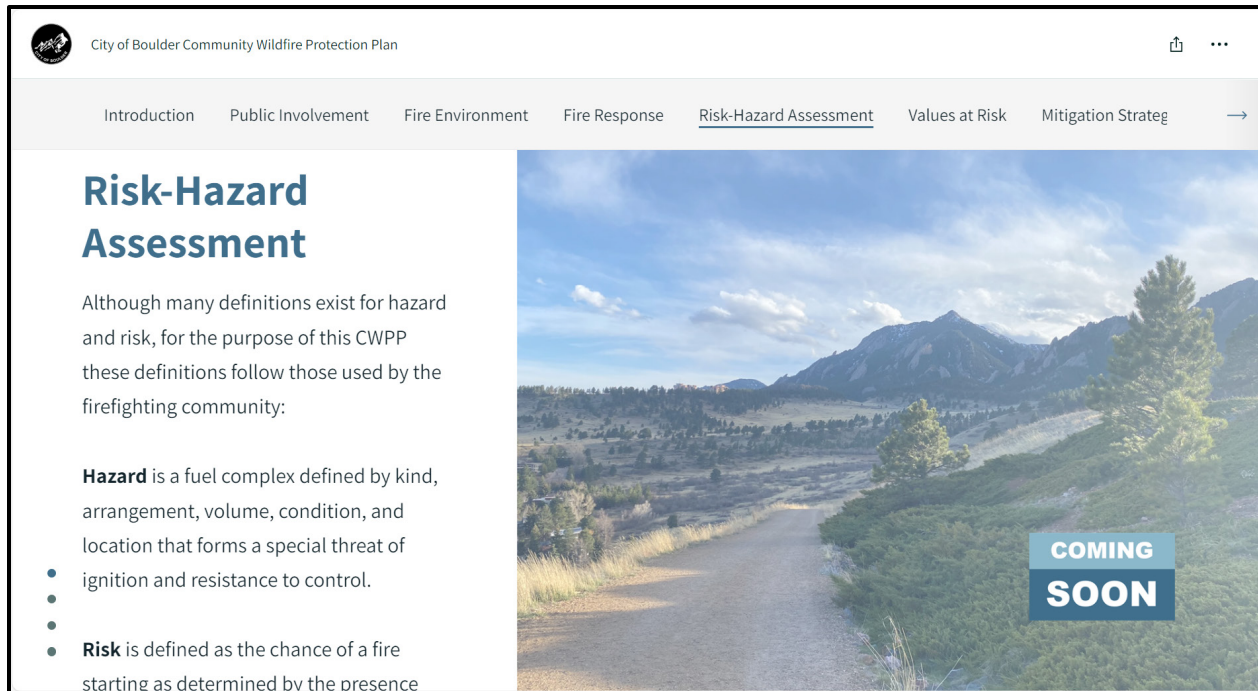


Figure H.26. Story map Risk-Hazard Assessment tab sample.

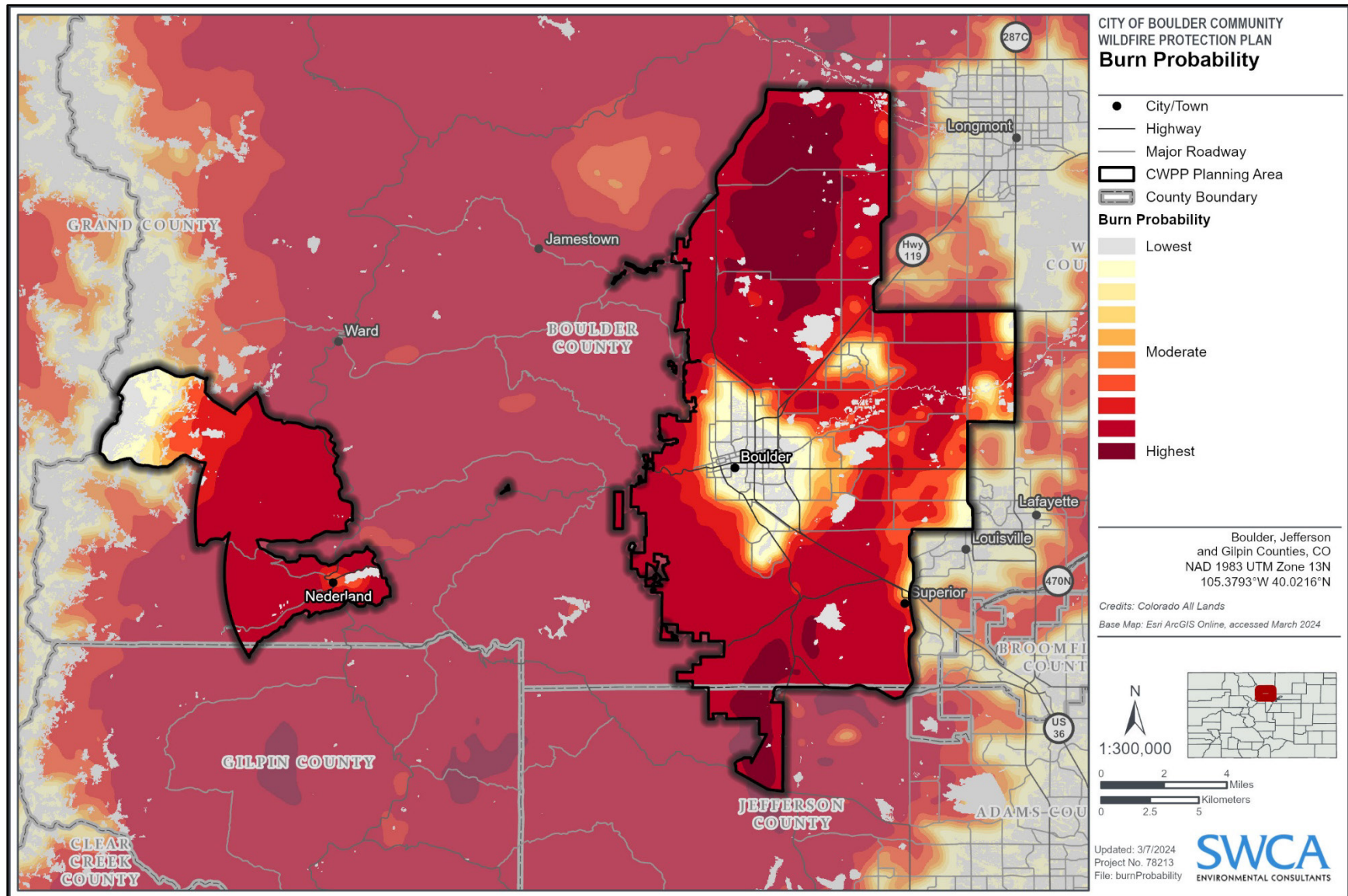
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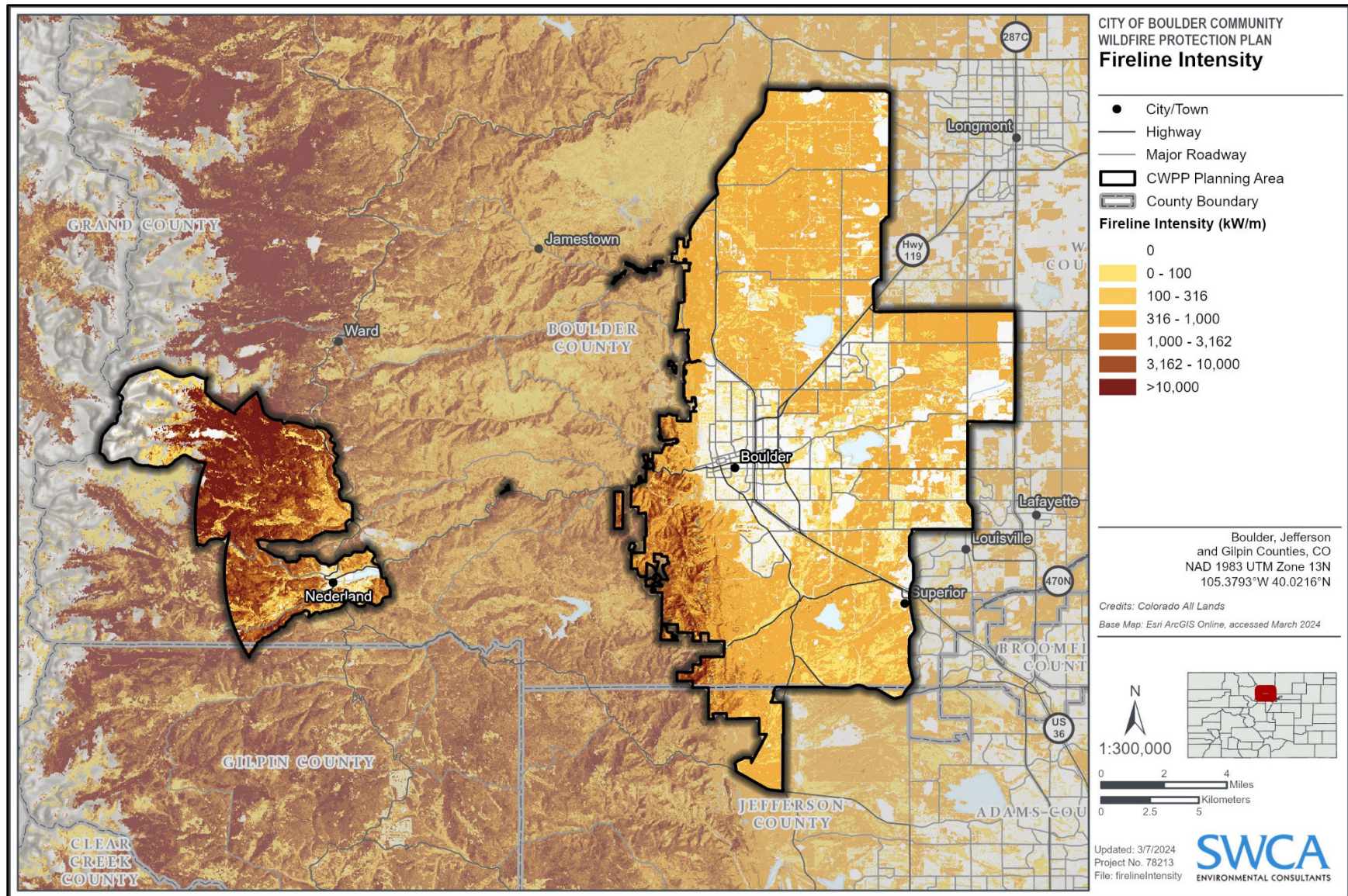
WASH STATE

APPENDIX I: Additional Mapping

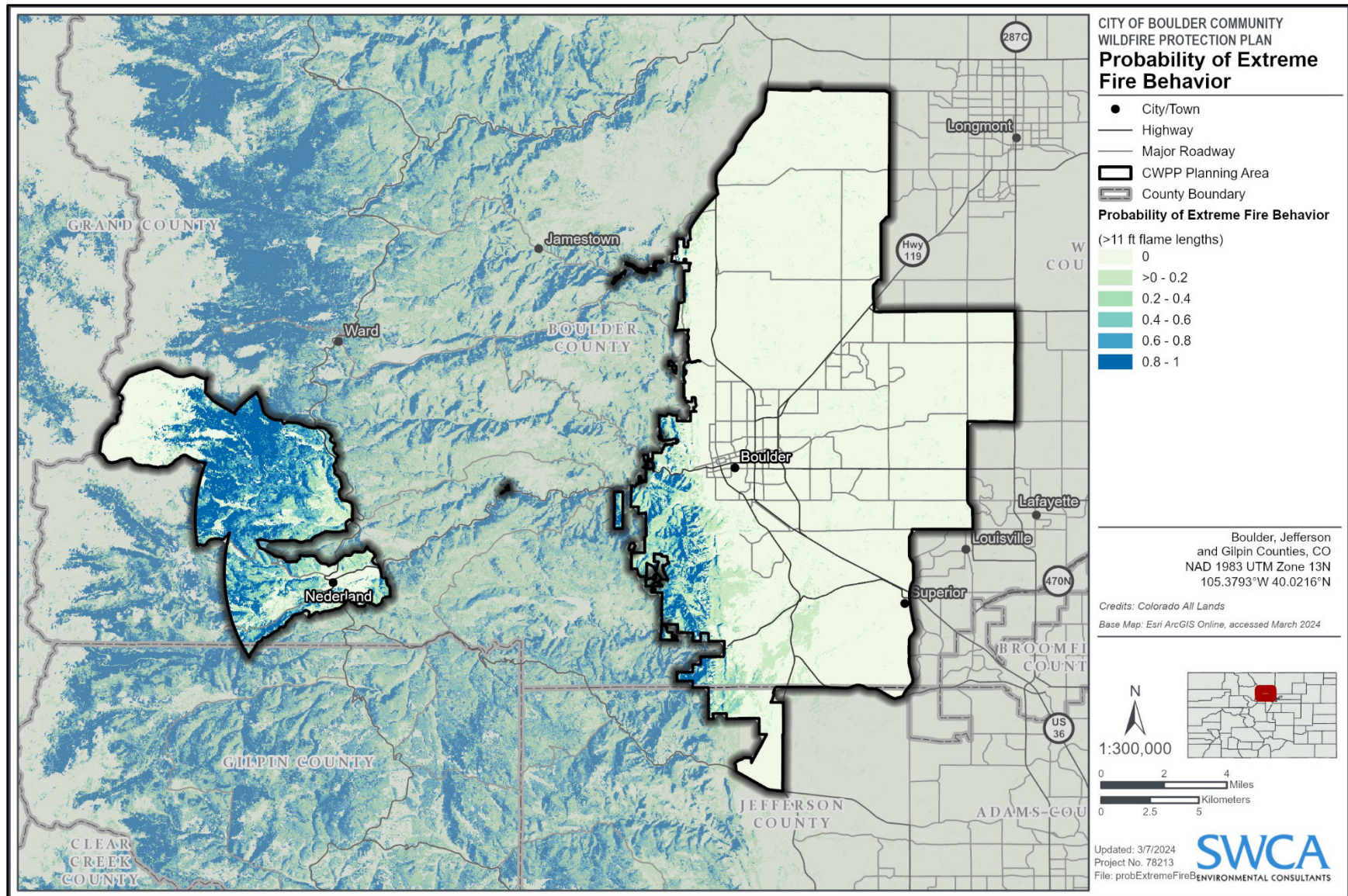
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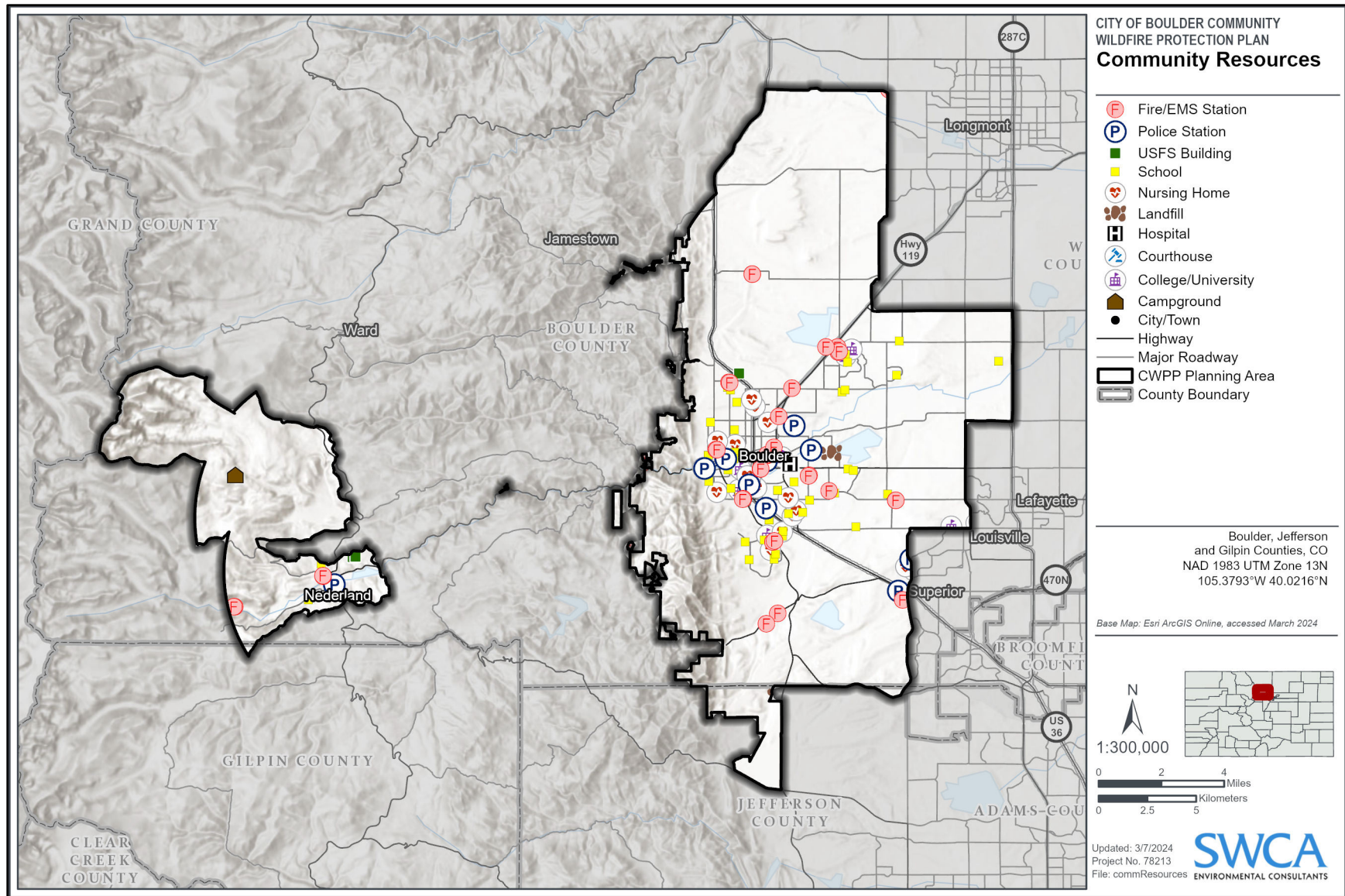
Map I.1. COAL burn probability.



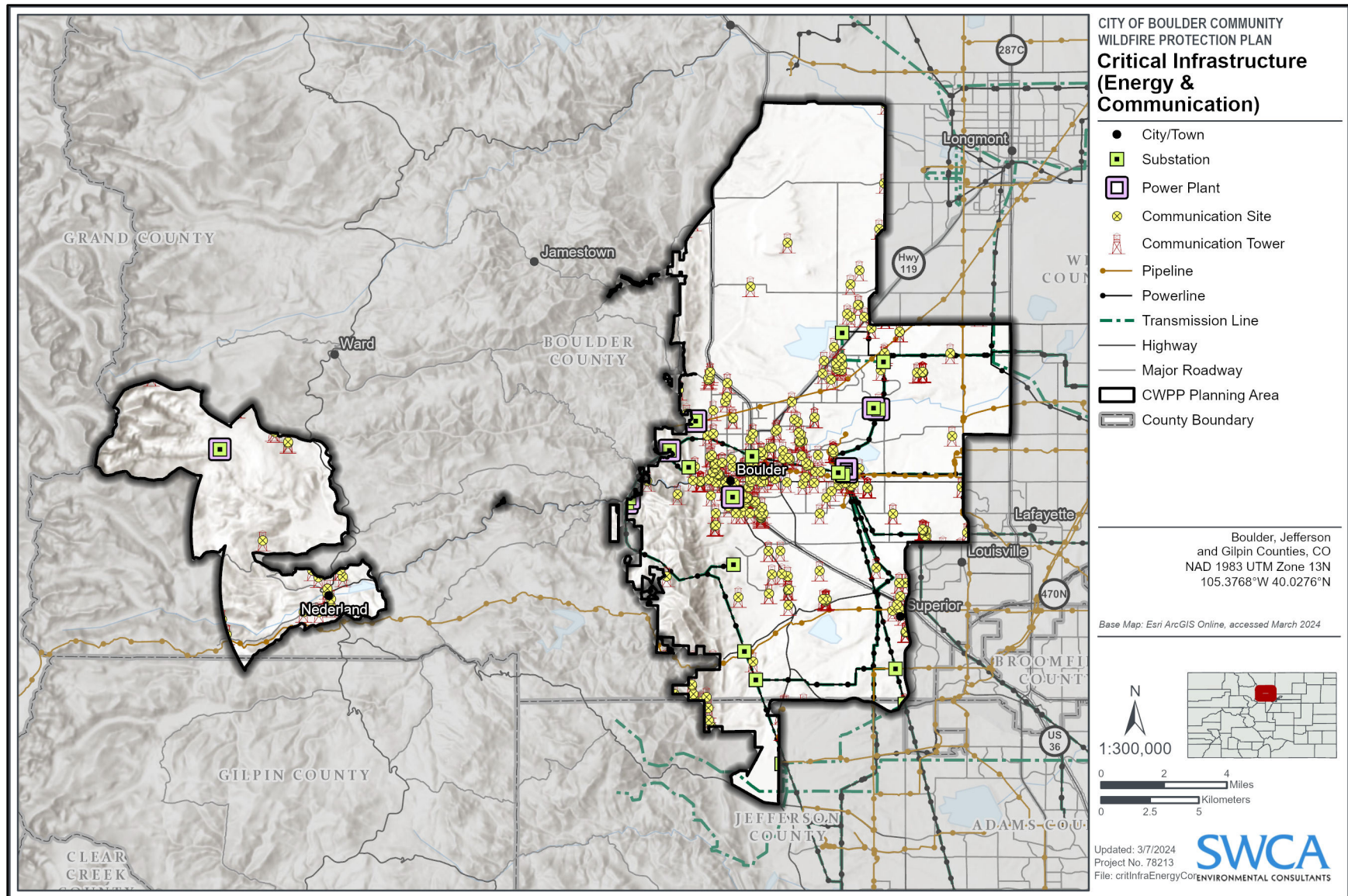
Map I.2. COAL fireline intensity



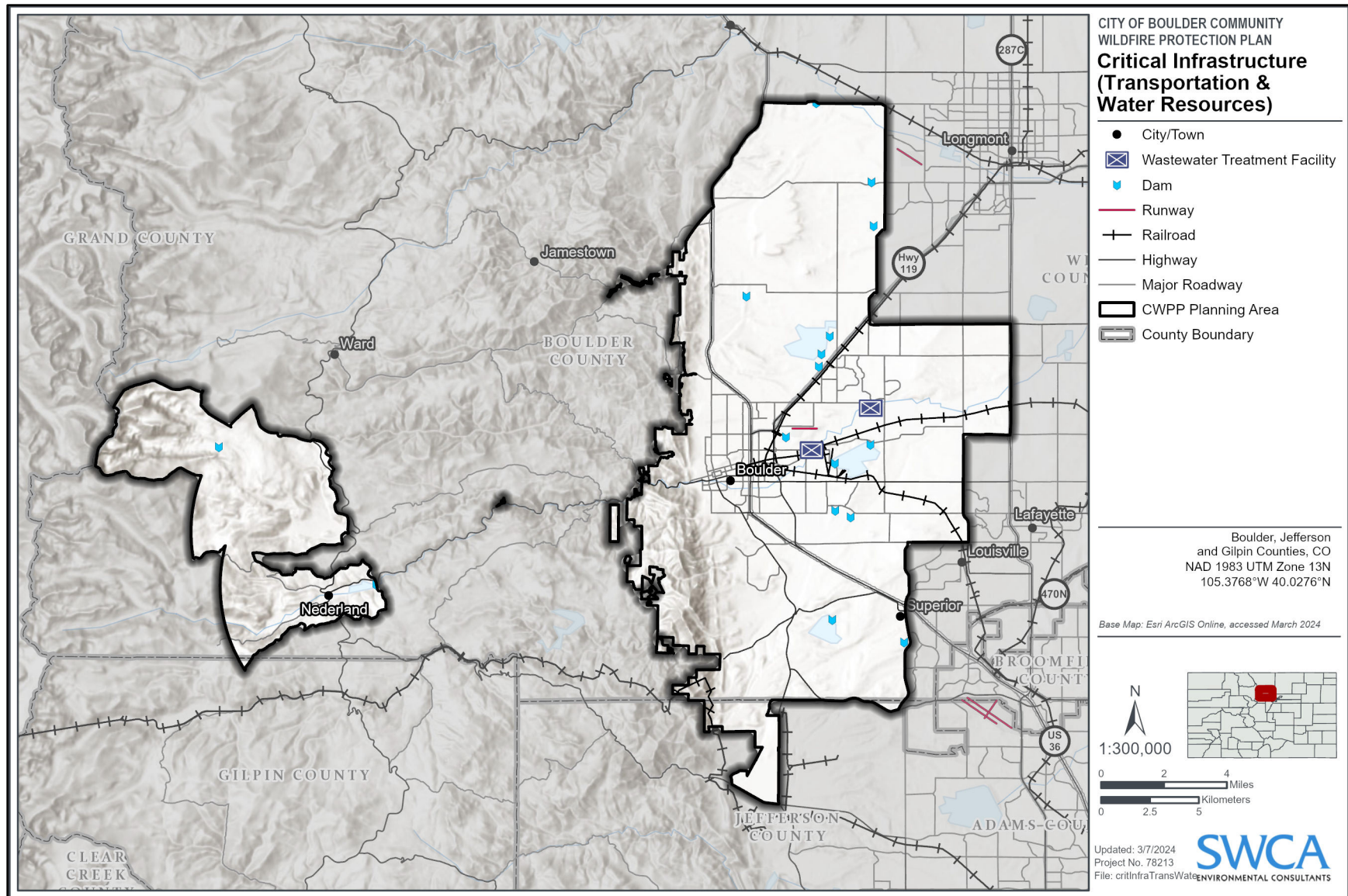
Map I.3. COAL probability of extreme fire behavior



Map I.4. A map of critical infrastructure including community resources.



Map I.5. A map of critical infrastructure including energy and communication facilities and infrastructure.



Map I.6. A map of critical infrastructure including transportation and water resources facilities and infrastructure.

TABLE

APPENDIX J:

Funding Sources

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FUNDING SOURCES

The following section provides information on federal, state, and private funding opportunities for conducting wildfire mitigation projects. It should be noted that matched funding can be an excellent funding strategy, when possible.

FEDERAL FUNDING INFORMATION

Source: 2022 Infrastructure Investments and Jobs Act

Agency: Multiple

Website: <https://www.congress.gov/bill/117th-congress/house-bill/3684>

Description: The Infrastructure Investments and Jobs act allocated funding through various departments for infrastructure projects including, but not limited to roads, bridges, and major projects; passenger and freight rail; highway and pedestrian safety; public transit; broadband; ports and waterways; airports; water infrastructure; power and grid reliability and resiliency; resiliency, including funding for coastal resiliency, ecosystem restoration, and weatherization; clean school buses and ferries; electric vehicle charging; addressing legacy pollution by cleaning up Brownfield and Superfund sites and reclaiming abandoned mines; and Western Water Infrastructure.

Specifically, the Community Wildfire Defense Grant Program is a \$1 billion program where the Department of Agriculture will provide grants to communities at risk from wildfire to develop or revise their community wildfire protection plans and carry out projects described within those plans. It will include a mix of formula and competitive funds. Applications are expected to open early in 2023.

Section 40803 addresses wildfire risk reduction, section 40804 deals with ecosystem restoration, section 40806 handles the establishment of fuel breaks in forests and other wildland vegetation, and section 70302 addresses reforestation. To learn more about the Act, please see guidebook located here <https://www.whitehouse.gov/wp-content/uploads/2022/05/BUILDING-A-BETTER-AMERICA-V2.pdf>

Source: Tribal Lands Landscape Scale Restoration Grants

Agency: First Nations Development Institute

Website: <https://www.firstnations.org/projects/landscape-scale-restoration/>

Description: For more than 41 years, First Nations Development Institute (First Nations), a Native-led 501(c)(3) nonprofit organization, has worked to strengthen American Indian economies to support healthy Native communities by investing in and creating innovative institutions and models that strengthen asset control and support economic development for American Indian people and their communities. First Nations began its national grantmaking program in 1993. Through mid-year 2021, First Nations has successfully managed 2,276 grants totaling more than \$46 million to tribal and community institutions across Indian Country. First Nations supports a series of grants focused on controlling and protecting food systems, water, languages, traditional ecological knowledge, and land. They support landscape restoration grants funded through the USDA Forest Service to support priority forest landscapes at a high wildfire risk.

Source: Building Resilient Infrastructure and Communities (BRIC) Grant Program

Agency: Department of Homeland Security (DHS) Federal Emergency Management Agency (FEMA)

Website: <https://www.fema.gov/grants/mitigation/building-resilient-infrastructure-communities>

Description: BRIC will support states, local communities, tribes, and territories as they undertake hazard mitigation projects, reducing the risks they face from disasters and natural hazards. The BRIC program guiding principles are supporting communities through capability- and capacity-building; encouraging and enabling innovation; promoting partnerships; enabling large projects; maintaining flexibility; and providing consistency. You can find more information on the BRIC program here: <https://www.fema.gov/grants/mitigation/building-resilient-infrastructure-communities>

Source: Hazard Mitigation Grant Program (HMGP)

Agency: FEMA

Website: <https://www.fema.gov/grants/mitigation/hazard-mitigation>

Description: The HMGP provides funding to state, local, tribal, or territorial governments (and individuals or businesses if the community applies on their behalf) to rebuild with the intentions to mitigate future losses due to potential disasters. This grant program is available after a presidentially declared disaster.

Source: Hazard Mitigation Grant Program (HMGP) – Post Fire

Agency: FEMA

Website: <https://www.fema.gov/grants/mitigation/post-fire>

Description: The HMGP Post Fire grant program provides assistance to communities for the purpose of implementing hazard mitigation measures following a wildfire. Mitigation measures may include:

- Soil stabilization
- Flood diversion
- Reforestation

Source: Flood Mitigation Assistance (FMA) Grant

Agency: FEMA

Website: <https://www.fema.gov/grants/mitigation/floods>

Description: The Flood Mitigation Assistance Program is a competitive grant program that provides funding to states, local communities, federally recognized tribes, and territories. Funds can be used for projects that reduce or eliminate the risk of repetitive flood damage to buildings insured by the National Flood Insurance Program. FEMA chooses recipients based on the applicant's ranking of the project and the eligibility and cost-effectiveness of the project.

Source: Emergency Management Performance Grant (EMPG)

Agency: FEMA

Website: <https://www.fema.gov/grants/preparedness/emergency-management-performance>

Description: The EMPG program provides funding to state, local, tribal, and territorial emergency management agencies with the overall goal of creating a safe and resilient nation. The two main objectives of the program are 1) closing capability gaps that are identified in the state or territory's most recent Stakeholder Preparedness Review (SPR); and 2) building or sustaining those capabilities that are identified as high priority through the Threat and Hazard Identification and Risk Assessment (THIRA)/SPR process and other relevant information sources. The grant recipient and Regional Administrator must come to an agreement on program priorities, which are crafted based on National, State, and regional priorities.

Source: Fire Management Assistance Grant (FMAG)

Agency: FEMA

Website: <https://www.fema.gov/assistance/public/fire-management-assistance>

Description: Fire Management Assistance is available to state, local, and tribal governments for the mitigation, management, and control of fires on publicly or privately owned forests or grasslands, which threaten such destruction as would constitute a major disaster. The Fire Management Assistance declaration process is initiated when a state submits a request for assistance to the FEMA Regional Director at the time a "threat of major disaster" exists. The entire process is accomplished on an expedited basis and a FEMA decision is rendered in a matter of hours. Before a grant can be awarded, a state must demonstrate that total eligible costs for the declared fire meet or exceed either the individual fire cost threshold, which applies to single fires, or the cumulative fire cost threshold, which recognizes numerous smaller fires burning throughout a state.

Source: Regional Catastrophic Preparedness (RCP) Grants

Agency: FEMA

Website: <https://www.fema.gov/grants/preparedness/regional-catastrophic>

Description: The Regional Catastrophic Preparedness Grant program provides funding to increase collaboration and capacity in regard to catastrophic incident response and preparation.

Source: Emergency Forest Restoration Program (EFRP)

Agency: USDA Farm Service Agency (FSA)

Website: <https://www.fsa.usda.gov/programs-and-services/disaster-assistance-program/emergency-forest-restoration/indexprogram/emergency-forest-restoration/index>

Description: The Emergency Forest Restoration Program (EFRP) helps the owners of non-industrial private forests restore forest health damaged by natural disasters. The EFRP does this by authorizing payments to owners of private forests to restore disaster damaged forests. The local FSA County Committee implements EFRP for all disasters with the exceptions of drought and insect infestations. Eligible practices may include debris removal, such as down or damaged trees; site preparation, planting materials, and labor to replant forest stand; restoration of forestland roads, fire lanes, fuel breaks, or erosion-control structures; fencing, tree shelters; wildlife enhancement. To be eligible for EFRP, the land must have existing tree cover; and be owned by any nonindustrial private individual, group, association, corporation, or other private legal entity.

Source: Emergency Conservation Program (ECP)**Agency:** USDA Farm Service Agency (FSA)**Website:** <https://www.fsa.usda.gov/programs-and-services/conservation-programs/emergency-conservation/indexconservation/index>

Description: The Emergency Conservation Program (ECP) helps farmers and ranchers to repair damage to farmlands caused by natural disasters and to help put in place methods for water conservation during severe drought. The ECP does this by giving ranchers and farmers funding and assistance to repair the damaged farmland or to install methods for water conservation. The grant could be used for restoring conservation structures (waterways, diversion ditches, buried irrigation mainlines, and permanently installed ditching system).

Source: Environmental Quality Incentives Program (EQIP)**Agency:** National Resource Conservation Service (NRCS)**Website:** <https://www.nrcs.usda.gov/programs-initiatives/eqip-environmental-quality-incentives>

Description: The Environmental Quality Incentives Program (EQIP) is a voluntary program authorized under the Agricultural Act of 2014 (2014 Farm Bill) that helps producers install measures to protect soil, water, plant, wildlife, and other natural resources while ensuring sustainable production on their farms, ranches, and working forest lands.

Source: Emergency Watershed Protection (EWP) Program**Agency:** National Resource Conservation Service (NRCS)**Website:** <https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/landscape/ewpp/>

Description: The program offers technical and financial assistance to help local communities relieve imminent threats to life and property caused by floods, fires, windstorms, and other natural disasters that impair a watershed.

Eligible sponsors include cities, counties, towns, conservation districts, or any federally recognized Native American tribe or tribal organization. Interested public and private landowners can apply for EWP Program recovery assistance through one of those sponsors.

EWP Program covers the following activities.

- Debris removal from stream channels, road culverts, and bridges
- Reshape and protect eroded streambanks
- Correct damaged drainage facilities
- Establish vegetative cover on critically eroded lands
- Repair levees and structures
- Repair conservation practices

Source: Funding for Fire Departments and First Responders**Agency:** DHS, U.S. Fire Administration**Website:** <https://www.fema.gov/grants/preparedness/firefighters/assistance-grants>

Description: Includes grants and general information on financial assistance for fire departments and first responders. Programs include the Assistance to Firefighters Grant Program, Reimbursement for Firefighting on Federal Property, State Fire Training Systems Grants, and National Fire Academy Training Assistance.

Source: Tribal Environmental General Assistance Program (GAP)**Agency:** Environmental Protection Agency (EPA)**Website:** <https://www.epa.gov/tribal-pacific-sw/epa-region-9-tribal-environmental-gap-funding>

Description: Funding under this program is used to aid Native American tribes in establishing and implementing their own reservation-specific environmental protection programs. To find out more about this funding opportunity please contact Tribal Branch Manager, Jeremy Bauer, at bauer.jeremy@epa.gov.

Source: Specific EPA Grant Programs**Agency:** Environmental Protection Agency (EPA)**Website:** <https://www.epa.gov/tribal-pacific-sw/epa-region-9-tribal-environmental-gap-funding>

Description: Various grant programs are listed under this site. Listed below are examples of grants offered:

- Multipurpose Grants to States and Tribes: <https://www.epa.gov/grants/multipurpose-grants-states-and-tribes>
- Environmental Education Grants: <https://www.epa.gov/education/grants>
- Environmental Justice Grants: <https://www.epa.gov/environmentaljustice/environmental-justice-grants-funding-and-technical-assistance>

Source: Conservation Innovation Grants (CIG)**Agency:** National Resource Conservation Service**Website:** <https://www.nrcs.usda.gov/programs-initiatives/cig-conservation-innovation-grants>

Description: CIG State Component. CIG is a voluntary program intended to stimulate the development and adoption of innovative conservation approaches and technologies while leveraging federal investment in environmental enhancement and protection, in conjunction with agricultural production. Under CIG, Environmental Quality Incentives Program (EQIP) funds are used to award competitive grants to non-federal governmental or nongovernmental organizations, tribes, or individuals. CIG enables the Natural Resources Conservation Service (NRCS) to work with other public and private entities to accelerate technology transfer and adoption of promising technologies and approaches to address some of the nation's most pressing natural resource concerns. CIG will benefit agricultural producers by providing more options for environmental enhancement and compliance with federal, state, and local regulations. The NRCS administers the CIG program. The CIG requires a 50/50 match between the agency and the applicant. The CIG has two funding

components: national and state. Funding sources are available for water resources, soil resources, atmospheric resources, and grazing land and forest health.

Source: Urban and Community Forestry Program, National Urban and Community Forestry Challenge Cost Share Grant Program

Agency: U.S. Forest Service

Website: <https://www.fs.usda.gov/managing-land/urban-forests/ucf>

Description: U.S. Forest Service funding will provide for Urban and Community Forestry Programs that work with local communities to establish climate-resilient tree species to promote long-term forest health. The other initiative behind this program is to promote and carry out disaster risk mitigation activities, with priority given to environmental justice communities. For more information, contact a Forest Service Regional Program Manager.

Source: Catalog of Federal Funding Sources; Land Resources

Agency: Multiple

Website: <https://ofmpub.epa.gov/apex/wfc/f?p=165:512:6483383318137:::512::>

Description: The Land Finance Clearing House is a catalogue of Federal funding sources for all things land related.

Examples of the types of grants found at this site are:

- Forest and Woodlands Resource Management Grant: https://sam.gov/fal/a798ad78cac749639b48270db3e86fdc/view?index=cfda&page=2&organization_id=100011100
- Environmental Education Grant: <https://www.epa.gov/education/grants>
- Public Assistance Grant Program: <https://www.fema.gov/assistance/public>
- Hazard Mitigation Grant: <https://www.fema.gov/grants/mitigation/hazard-mitigation>

Source: Catalog of Federal Funding Sources; Water Resources

Agency: Multiple

Website: <https://ofmpub.epa.gov/apex/wfc/f?p=165:12:6483383318137:::12::>

Description: The Water Finance Clearing House is a catalogue of Federal funding sources for all things water related. One example is the WaterSMART Water and Energy Efficiency Grant: <https://www.usbr.gov/watersmart/weeg/>.

Source: Firewise Communities

Agency: Multiple

Website: <http://www.firewise.org>

Description: Many different Firewise Communities activities are available to help homes and whole neighborhoods become safer from wildfire without significant expense. Community cleanup days, awareness events, and other cooperative activities can often be successfully accomplished through partnerships among neighbors, local businesses, and local fire departments at little or no cost. The kind of help you need will depend on who you are, where you are, and what you want to do.

Among the different activities that individuals and neighborhoods can undertake, the following often benefit from seed funding or additional assistance from an outside source:

- Thinning/pruning/tree removal/clearing on private property—particularly on large, densely wooded properties
- Retrofit of home roofing or siding to non-combustible materials
- Managing private forest
- Community slash pickup or chipping
- Creation or improvement of access/egress roads
- Improvement of water supply for firefighting
- Public education activities throughout the community or region

Source: The National Fire Plan (NFP)

Agency: DOI & USDA

Website: <http://www.forestsandrangelands.gov/>

Description: Many states are using funds from the NFP to provide funds through a cost-share with residents to help them reduce the wildfire risk to their private property. These actions are usually in the form of thinning or pruning trees, shrubs, and other vegetation and/or clearing the slash and debris from this kind of work. Opportunities are available for rural, state, and volunteer fire assistance.

Source: Staffing for Adequate Fire and Emergency Response (SAFER)

Agency: FEMA

Website: <https://www.fema.gov/grants/preparedness/firefighters/safer>

Description: The purpose of SAFER grants is to help fire departments increase the number of frontline firefighters. The goal is for fire departments to increase their staffing and deployment capabilities and ultimately attain 24-hour staffing, thus ensuring that their communities have adequate protection from fire and fire-related hazards. The SAFER grants support two specific activities: (1) hiring of firefighters and (2) recruitment and retention of volunteer firefighters. The hiring of firefighters activity provides grants to pay for part of the salaries of newly hired firefighters over the five-year program.

Source: The Fire Prevention and Safety Grants (FP&S)

Agency: FEMA

Website: <https://www.fema.gov/grants/preparedness/firefighters/safety-awards#:~:text=Awards%20%20%20Organization%20%20%20,%20%20%20241%2C499%2C957%20%2016%20more%20rows%20>

Description: FP&S offers support to projects that enhance the safety of the public and firefighters who may be exposed to fire and related hazards. The primary goal is to target high risk populations and mitigate high incidences of death and injury. Examples of the types of projects supported by FP&S include fire-prevention and public-safety education campaigns, juvenile fire-setter interventions, media campaigns, and arson prevention and awareness programs. In fiscal year 2005, Congress reauthorized funding for FP&S and expanded the eligible uses of funds to include firefighter safety research and development.

Source: GSA-Federal Excess Personal Property

Agency: USFS

Website: <https://www.gsa.gov/tools-overview/personal-property-disposal-and-auctions-tools>

Description: The Federal Excess Personal Property (FEPP) program refers to Forest Service-owned property that is on loan to State Foresters for the purpose of wildland and rural firefighting. Most of the property originally belonged to the Department of Defense (DoD). Once acquired by the Forest Service, it is loaned to State Cooperators for firefighting purposes. The property is then loaned to the State Forester, who may then place it with local departments to improve local fire programs. State Foresters and the USDA Forest Service have mutually participated in the FEPP program since 1956.

Source: Assistance to Firefighters Grants (AFG)

Agency: FEMA

Website: <https://www.fema.gov/grants/preparedness/firefighters>.

Description: The AFG program provides resources to assist fire departments in attaining critical resources such as training and equipment.

Source: Inflation Reduction Act (IRA): Landowner Assistance Programs

Agency: USDA

Website: <https://www.fs.usda.gov/sites/default/files/ira-forest-landowner-support-nofo1.pdf#:~:text=Federal%20Awarding%20Agency%20Name%20U.S.%20Department%20of,Agriculture%20%28USDA%29%20Forest%20Service%3A%20IRA%20Forest%20Landowner%20Support>

Description: The Inflation Reduction Act (IRA) Landowner Assistance Programs, operating under the Cooperative Forestry Assistance Act of 1978 and aligning with the Landscape Scale Restoration (LSR) program guidelines, provide crucial financial support to underserved and small-acreage forest landowners. Launched formally on August 22, 2023, this initiative welcomes proposals from diverse entities, including tribes, nonprofits, and governments. It specifically targets non-industrial private land in rural areas, extending support to a range of underserved landowners, including beginners, those in poverty areas, tribes, limited resource producers, and veterans. The identification of geographic locations utilizes tools such as the Climate and Economic Justice Screening Tool and USDA Economic Research Service measures. By fostering climate solutions, the IRA Landowner Assistance Programs play a pivotal role in overcoming historical barriers to the participation of underserved communities in climate mitigation and forest resilience efforts.

Source: Landscape Scale Restoration (LSR)

Agency: USFS

Website: <https://www.fs.usda.gov/managing-land/private-land/landscape-scale-restoration>

Description: The Landscape Scale Restoration (LSR) program is a competitive grant initiative promoting collaborative, science-based restoration of priority forest landscapes. It allocates funds to projects across multiple jurisdictions, addressing issues like wildfire risk, watershed protection, and invasive species. Projects result in on-the-ground impacts through stakeholder collaboration. Eligibility is extended to state forestry agencies, local government units, Indian Tribes, non-profits, universities, and Alaska Native Corporations. They can request funds between \$25,000 and \$300,000 with a three-year project life. Funds are dedicated to rural nonindustrial private forest or state forest

land outside urbanized areas. The program operates with a 1:1 match requirement, awarding funds through competitive grants and cooperative agreements. For non-Tribal applications, states can submit up to five proposals annually through forestrygrants.org. The Western Forestry Leadership Coalition manages the process, with a review team evaluating submissions in western states and Pacific Island territories.

Source: Forest Stewardship Program (FSP)

Agency: USFS

Website: <https://www.fs.usda.gov/managing-land/private-land/forest-stewardship>

Description: The Forest Stewardship Program (FSP) collaborates with state forestry agencies, cooperative extension, and conservation districts to equip private landowners with tools for effective forest management. Actively managed private forests provide timber, fuel wood, wildlife habitat, watershed protection, and recreational opportunities, benefiting both landowners and adjacent National Forest System lands. Through the capacity grants to state forestry agencies, the FSP supports private forest landowners in maintaining the productivity and health of their forests. These grants aim to enhance economic and environmental benefits, ensuring the sustainability of privately owned forests.

Source: Wood Innovations Funding Opportunity Program/Wood Innovations Grant Program

Agency: USDA

Website: <https://www.fs.usda.gov/science-technology/energy-forest-products/wood-innovation>

Description: The Wood Innovations Grant Program, under the Bipartisan Infrastructure Law and Inflation Reduction Act (IRA), allocates \$20 million to support projects expanding traditional wood use. The program aims to reduce hazardous fuels, enhance forest health, lower forest management costs, and foster economically and environmentally healthy communities. Eligible applicants include for-profit and non-profit entities, government bodies, tribes, educational institutions, communities, and special purpose districts. Priority is given to proposals creating or expanding markets for wood from forest health projects, supporting domestic timber development, involving wood industry partnerships, promoting innovative wood products in commercial building markets, addressing wood energy projects, and projects benefiting underserved communities.

Source: America the Beautiful Challenge

Agency: National Fish and Wildlife Foundation

Website: <https://www.nfwf.org/programs/america-beautiful-challenge>

Description: The America the Beautiful Challenge is an annual initiative to streamline funding for conservation and restoration work to build watershed and forest resilience. The program emphasizes restoration of rivers, coasts, wetlands, grasslands, and forests to protect from drought, flooding, and wildfire. ATBC encourages public-private partnerships to benefit landscape scale conservation and resilience efforts.

Source: Community Wildfire Defense Grant**Agency:** USFS**Website:** <https://www.fs.usda.gov/managing-land/fire/grants>

Description: The Community Wildfire Defense Grant is intended to help communities with a high wildfire risk plan and implement the goals of the National Cohesive Wildland Fire Management Strategy. These goals include restoring and maintaining landscapes, creating fire adapted communities, and improving wildfire response. Funds are available to develop or update community wildfire protection plans and to implement projects listed in CWPPs that are less than 10 years old. At risk communities are those positioned in fire prone areas, low-income communities, and those that have been impacted by a severe disaster.

Source: Forest Legacy Program (FLP)**Agency:** USDA Forest Service**Website:** <https://www.fs.usda.gov/managing-land/private-land/forest-legacy>

Description: The Forest Legacy Program (FLP) is a conservation initiative administered by the USDA Forest Service in collaboration with state agencies. Operating since 1990, FLP aims to identify and conserve environmentally and economically significant forested areas facing the threat of conversion to non-forest uses. FLP incentivizes landowners to maintain their forests, securing public benefits such as water quality, fish and wildlife habitat, and supporting forest product industries. Funded by the Land and Water Conservation Fund (LWCF), which receives earnings from offshore oil and gas leasing, FLP plays a crucial role in protecting privately owned managed forest lands. This is achieved through conservation easements (CEs) or land purchases, allowing landowners to either sell their property outright or retain ownership while selling development rights. The perpetual legal agreement of a CE ensures private ownership while preserving environmental values.

Source: Wildland Urban Interface Grant Program**Agency:** Council of Western State Foresters/ USFS**Website:** <https://www.westernforesters.org/wui-grants>

Description: The Wildland Urban Interface Grant Program is intended to address hazardous fuels in the WUI, information and education, assessment and planning, and monitoring activities. With funds from the USFS, the CWSF administers the WUI program to prioritize actions that directly reduce hazardous fuels in the interface, improve community preparedness knowledge, and develop or update a CWPP. Interested applicants must contact their state forester to discuss the project and funding needs. Projects that emphasis cross boundary or landscape scale work will be prioritized. Hazardous fuel reduction projects will receive 70% of funding. Fundable projects include defensible space improvements, thinning and fuel breaks, education material development and events, firewise or other programs, CWPP planning, and other similar projects.

Source: Action, Implementation, & Mitigation Grant**Agency:** Coalitions and Collaboratives/ USFS**Website:** <https://co-co.org/get-involved/grants/aim-grant/>

Description: The program is intended to increase community resilience, restore fire adapted ecosystems, and create safer conditions for residents and fire fighters. A variety of projects are funded that support wildfire risk reduction to communities with an existing or planned CWPP. Projects

can include planning and or implementation in communities with moderate to high wildfire risk. Projects must demonstrate multi agency coordination and efforts toward landscape scale resilience.

STATE FUNDING INFORMATION

Source: Colorado State Forest Service Grants & Funding Assistance

Agency: Colorado State Forest Service

Website: <https://csfs.colostate.edu/grants/>

Description: The Colorado State Forest Service manages multiple funding programs to assist private and public landowners in managing forested lands to mitigate the risk of wildfire and steward forests for ecological, economic, and social value. A list of current programs is provided here with links to respective program sites:

Public Programs

- Forest Restoration & Wildfire Risk Mitigation: <https://csfs.colostate.edu/grants/forest-restoration-wildfire-risk-mitigation/>
- Wildfire Mitigation Incentives for Local Government: <https://csfs.colostate.edu/grants/wildfire-mitigation-incentives-for-local-government/>
- Wildfire Mitigation Resources & Best Practices Grant Program: <https://csfs.colostate.edu/grants/wildfire-mitigation-resources-best-practices-grant-program/>

Private Landowner Programs

- Forest Ag Program: <https://csfs.colostate.edu/forest-ag-program/>
- Forest Legacy Program: <https://csfs.colostate.edu/forest-legacy-program/>
- Forest Stewardship Program: <https://csfs.colostate.edu/forest-stewardship-program/>
- Tree Farm Program: <https://csfs.colostate.edu/tree-farm/>

Source: Various Funding Sources

Agency: Colorado Division of Fire Prevention and Control (DFPC)

Website: <https://dfpc.colorado.gov/sections/grants>

Description: The DFPC manages three funding programs: HB 22-1194 funding, Firefighter Safety Disease Prevention Grant, and the Volunteer Fire Assistance Grant. HB 22-1194 provides funds to structural and wildland crews to purchase personal protective equipment such as breathing apparatuses and line packs. The FFSDP grant similarly provides funding for any firefighter equipment that improves safety and prevents occupation-related diseases. The VFA Program supports rural fire stations with volunteer crews that serve communities with 10,000 people or fewer.

Source: Colorado Strategic Wildfire Action Program

Agency: Colorado Department of Natural Resources

Website: <https://dnr.colorado.gov/divisions/forestry/co-strategic-wildfire-action-program>

Description: In 2021, Senate Bill 21-258 was signed into law and established the Colorado Strategic Wildfire Action Program. This program is intended to bolster wildland firefighter capabilities by expanding workforce development, providing additional funds to hire more crew members, and helping state wildland inmate fire teams (SWIFT), find long term employment post-incarceration. This

funding opportunity is intended to strategically address focal landscapes and concern areas through expanded mitigation and response capacity.

Source: Northern Colorado Fireshed Fund

Agency: Northern Colorado Fireshed Collaborative/ National Forest Foundation

Website: <https://nocofireshed.org/round-2-fireshed-capacity-funding-now-open/>

Description: NCFC developed the Fireshed fund in collaboration with the National Forest Foundation and Arapahoe Roosevelt National Forests with the intention of achieving landscape scale improvements to fuel reduction, prescribed burning, and strategic wildland fire management. Applicants must work with NCFC to ensure their project aligns with the mission and priorities of NCFC and the National Forest Foundation. Funding requests can include collaborative planning, capacity building, education, and treatment implementation.

Source: Non-motorized Trails Grants

Agency: Colorado Parks and Wildlife

Website: <https://cpw.state.co.us/aboutus/Pages/TrailsGrantsNM.aspx>

Description: The non-motorized Trails Grants program is funded by Great Outdoors Colorado and the Federal Recreational Trail Program and administered by CPW. The program is intended to fund outdoor recreation opportunity improvements while protecting wildlife, habitat and cultural resources. Trail-related projects can include construction, maintenance, planning, and support. Planning applications can include design, inventory, use studies, and feasibility studies.

Source: GOCO Planning and Capacity

Agency: Great Outdoors Colorado

Website: <https://goco.org/programs-projects/grant-programs/planning-and-capacity>

Description: The Planning and Capacity grant program will fund projects related to planning, capacity building, research, and opportunity pathway development in the areas of outdoor recreation, access, stewardship, and conservation. Capacity building and education related projects should improve the ability of the applicant to make informed, actionable decisions. Research and information sharing is also fundable through this opportunity. Potential applicants should consult with their region program officer to discuss project relevance and scope.

Source: Wildfire Mitigation Outreach Grant Program

Agency: Colorado State Forest Service

Website: <https://csfs.colostate.edu/grants/wildfire-mitigation-outreach/>

Description: This grant opportunity provides funding for wildfire mitigation outreach efforts for landowners in high wildfire hazard zones. Applicants must consult the Colorado Forest Atlas for hazard designations. Projects may include outreach material development, conducting outreach events, educational programs or campaigns, and other education related activities.

PRIVATE FUNDING INFORMATION

Source: State Farm Good Neighbor Citizenship (GNC) Grants

Agency: State Farm

Website: <https://www.statefarm.com/about-us/corporate-responsibility/community-grants/good-neighbor-citizenship-grants>

Description: State Farm funding is directed at:

- Auto and roadway safety
- Teen Driver Education
- Home safety and fire prevention
- Disaster preparedness
- Disaster recovery

Source: The Urban Land Institute (ULI)

Website: <http://www.uli.org>

Description: ULI is a 501(c)(3) nonprofit research and education organization supported by its members. The institute has more than 22,000 members worldwide, representing the entire spectrum of land use and real estate development disciplines, working in private enterprise and public service. The mission of the ULI is to provide responsible leadership in the use of land to enhance the total environment. ULI and the ULI Foundation have instituted Community Action Grants that could be used for Firewise Communities activities. Applicants must be ULI members or part of a ULI District Council. Contact actiongrants@uli.org or review the web page to find your District Council and the application information.

Source: Environmental Systems Research Institute (ESRI)

Website: <https://www.esri.com/en-us/home>

Description: ESRI is a privately held firm and the world's largest research and development organization dedicated to geographic information systems. ESRI provides free software, hardware, and training bundles under ESRI-sponsored Grants that include such activities as conservation, education, and sustainable development, and posts related non-ESRI grant opportunities under such categories as agriculture, education, environment, fire, public safety, and more. You can register on the website to receive updates on grant opportunities.

Source: National Forest Foundation; Innovative Finance for National Forests Grant Program

Website: <https://www.nationalforests.org/grant-programs/innovative-finance-for-national-forests-grant-program>

Description: The Innovative Finance for National Forests Grant Program aims to bring in non-USFS funds to increase forest resilience. There are three main topics for funding: wildfire resilience and recovery, sustainable recreation access and infrastructure, and watershed health. In addition, three types of projects are funded: pilot programs with on-the-ground implementation, scaling projects to deliver backlogs of unfunded work, and research and development to provide to new forest information.

Source: Matching Awards Program

Agency: National Forest Foundation (NFF)

Website: <https://www.nationalforests.org/grant-programs/map>

Description: The NFF is soliciting proposals for its Matching Awards Program (MAP) to provide funds for direct on-the-ground projects benefitting America's National Forests and Grasslands. By pairing federal funds provided through a cooperative agreement with the U.S. Forest Service with non-federal dollars raised by award recipients, MAP measurably multiplies the resources available to implement stewardship projects that benefit the National Forest System.

Source: Patagonia Environmental Grants and Support

Agency: Patagonia

Website: <https://www.patagonia.com/how-we-fund/>

Description: Patagonia supports innovative work that addresses the root causes of the environmental crisis and seeks to protect both the environment and affected communities. Patagonia focuses on places where they have built connections through outdoor recreation and through their network of retail stores, nationally and internationally.

Source: Leonardo DiCaprio Foundation Grants

Agency: Leonardo DiCaprio Foundation

Website: <https://www.rewild.org/>

Description: The foundation supports projects around the world that build climate resiliency, protect vulnerable wildlife, and restore balance to threatened ecosystems and communities.

Source: U.S. Endowment for Forestry and Communities

Agency: U.S. Environmental Protection Agency, Natural Resources Conservation Service (NRCS), U.S. Forest Service, U.S. Department of Defense, U.S. Economic Development Agency

Website: <https://www.usendowment.org/>

Description: As the nation's largest public charity dedicated to keeping our working forests working and ensuring their bounty for current and future generations, the Endowment deploys the creativity and power of markets to advance their mission: The Endowment works collaboratively with partners in the public and private sectors to advance systemic, transformative and sustainable change for the health and vitality of the nation's working forests and forest-reliant communities.

Source: State and Private Forestry Programs

Agency: National Association of State Foresters

Website: <https://www.stateforesters.org/appropriations/>

Description: The National Association of State Foresters supports both federal (USDA) and State and Private Forestry programs. Funding allocations and points of contact are clearly displayed in the program fact sheets created by the National Association of State Foresters. Programs included cover forest stewardship, fire assistance, restoration and more.

OTHER FUNDING INFORMATION

The following resources may also provide helpful information for funding opportunities:

- Western Forestry Leadership Coalition: <https://www.thewflc.org/>

- USDA Information Center: <https://www.nal.usda.gov/main/information-centers>
- Forest Service Fire Management website: <https://www.fs.usda.gov/science-technology/fire>
- Insurance Services Office Mitigation Online (town fire ratings): <http://www.isomitigation.com/>
- National Fire Protection Association: <http://www.nfpa.org>
- National Interagency Fire Center, Wildland Fire Prevention/Education: <https://www.nifc.gov/fire-information/fire-prevention-education-mitigation>
- Department of Homeland Security U.S. Fire Administration: <https://www.usfa.fema.gov/index.html>

FUNDING SOURCES FOR HOMEOWNERS

Source: Colorado Wildfire Resilient Home Grant

Agency: Colorado Division of Fire Prevention and Control

Website: <https://dfpc.colorado.gov/sections/fire-and-life-safety/crr-education-branch/community-risk-reduction-crr>

The Wildfire Resilient Home Grant was developed in 2023 through House Bill 23-1273 and allocated \$100,000 annually to fund retrofitting of homes to reduce structural ignitability. The grant will fund materials replacement (roofing, fencing, windows, etc.), landscaping improvements, and other defensible space and home ignition retrofits that reduce the likelihood of home ignition and spread. Homeowners must apply individually and submit a home ignition zone survey as part of the application. Funds are issued as reimbursements once work is completed.

Source: Forest Legacy Program

Agency: Colorado State Forest Service

Website: <https://csfs.colostate.edu/forest-legacy-program/>

The Forest Legacy Program is a federally funded initiative to assist in the acquisition or designation of conservation easements on privately owned forest land. The program was established to permanently protect portions of Colorado's forests that contribute to the state's ecological and scenic value while maintaining sustainable uses of forest resources such as recreation. Funds are primarily provided by the federal government with matching funds required by state funders or conservation organizations to purchase or secure forested lands. Conserved lands can be kept under private ownership or opened to public access through this easement program.

Source: Wildfire Mitigation Resources & Best Practices Grant Program

Agency: Colorado State Forest Service

Website: <https://csfs.colostate.edu/grants/wildfire-mitigation-resources-best-practices-grant-program/>

The Colorado Legislature established the Wildfire Mitigation Resources & Best Practices Grant Program in 2022. This program provides state support to conduct outreach among landowners in high wildfire hazard areas. To be eligible, a recipient must be an agency of local government, a county, municipality, special district, a tribal agency or program, or a nonprofit organization. The Colorado State Forest Service has \$300,000 available for grant awards through this program.

Source: Homesite Assessments

Agency: Colorado State Forest Service

Website: <https://csfs.colostate.edu/homeowners-landowners/homesite-assessments/>

CSFS foresters are available to assist homeowners and landowners through homesite assessments. A forester will visit your land and examine your trees for disease, wildland fire defensible space, and overall health. They can make recommendations for disposing of diseased trees, safeguarding your trees, keeping your trees healthy and reducing their risk of disease, and mitigating the risk of catastrophic wildfire. For more information or to schedule a homesite assessment, contact a local CSFS Field Office.

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