



COMMUNITY WILDFIRE PROTECTION IMPLEMENTATION PLAN (CWPIP)



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FORWARD

The experience of the last several fire seasons, sustained drought conditions, disease, and the ever-increasing number of homes constructed in the Wildland-Urban Interface (WUI) make future wildfires in the City a near certainty. All residents and property owners of the City have a personal responsibility to understand the linkage between forest stewardship, their personal safety, that of their neighbors, and our firefighters.

With future fires a certainty, it is vitally important that each individual home and property owner understand and apply principles and guidelines in the Colorado State Forest Service Publication, (Updated 2021): *The Home Ignition Zone: A Guide to Preparing Your Home for Wildfire and Creating Defensible-Space*, and other Firewise recommendations found at www.firewise.org. However, principles, standards and techniques in various wildfire publications are useless without a key factor: The human will to make a change in the WUI environment.

To make this change, three key principles can be examined: Community, Consensus, and Collaboration.

Community:

- Responsibility- individual and collective.
- Entire areas mitigated and forests restored to healthy conditions.
- Overall reduction in fuel volumes.
- Risk management as opposed to an unrealistic expectation of risk elimination.

Consensus:

- Standards for fuel reduction are intended to protect life, property and natural resources.
- Adoption of an overall Plan (CWPP) to address/manage wildfire risks.
- Breaking through deeply held cultural values and beliefs that prevent residents from becoming more adapted to fire as a natural part of the ecosystem.
- Definition of a healthy forest, using the best science available, and development of an acceptable “aesthetic” based on this science.
- Wildfires will happen. It is not a matter of “if”, but “when”.
- There are no guarantees with wildfire due to many variables; both human and natural.

Collaboration:

- Partnering with organizations that can have an impact on the life, property and natural resources of the County.
- Working together to take advantage of any outside financial assistance or programs to meet stated fuels modification.
- Empathy with different standards.
- Getting past “no” and/or willful ignorance.

The Three C’s are vital to building common interest, understanding and action; and necessary to protect the values that make the study area unique.



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INTRODUCTION

As the threat of catastrophic wildfires continues to escalate across the region, the City of Castle Pines recognizes the urgent need to enhance its wildfire resilience and protect the community. This Community Wildfire Protection Implementation Plan (CWPIP) serves as a comprehensive guiding document for the City to address the long-overdue wildfire mitigation efforts within its boundaries, specifically focusing on the western side of I-25.

Historically, the open spaces within the City have been neglected and allowed to become overgrown, posing a significant fire hazard. However, with the transfer of these open space properties from the Castle Pines North Metro District to the City's ownership and maintenance, a window of opportunity has opened to address these critical fire mitigation needs.

The primary objective of this CWPIP is to identify and prioritize the high-risk open spaces that require immediate mitigation efforts, with the goal of phasing the work over the next three years. Furthermore, the plan establishes guidelines and best practices for conducting effective wildfire mitigation work on these properties, ensuring long-term fire resilience.

While the CWPIP's scope is centered within the City of Castle Pines, in an effort to be proactive, collaboration with local agency partners and adjacent jurisdictions responsible for surrounding areas will be necessary to achieve a landscape-level approach to wildfire risk reduction.

With the amount of land burned by wildfires increasing annually, the City of Castle Pines community must proactively reduce ladder fuels, increase tree crown separation, and harden structures to withstand the potential impact of a high-intensity wildfire that could approach from any direction, as evidenced by recent catastrophic fires in the region.

The key objectives of this CWPIP are:

- Protect the lives, properties, and natural resources within the City from wildfire threats.
- Safeguard the community's lifestyle and shared values.
- Continuously identify and prioritize assets that require protection from wildfire risks.
- Restore and protect the City's forested areas through effective mitigation strategies.

- Ensure homeowners maintain access to affordable insurance by reducing wildfire risks.
- Foster partnerships and collaborative efforts for shared stewardship in mitigating wildfire hazards at a landscape level.
- Enhance the safety and effectiveness of firefighters in protecting the community during wildfire events.
- Collaborate with South Metro Fire Rescue, the Colorado State Forest Service, Douglas County Sheriff's Office, and Douglas County to implement a coordinated approach to wildfire mitigation across the region.

To develop this Community Wildfire Protection Implementation Plan, a thorough evaluation process was undertaken. This process involved analyzing various data sources and conducting on-site assessments. Crucial data inputs included the identification of critical infrastructure locations and escape routes, mapping of the Wildland-Urban Interface (WUI) boundaries, and risk assessment data from the Colorado Wildfire Risk Assessment Portal (CO-WRAP), such as wildfire intensity and rate of spread projections. Additionally, a detailed examination of the diverse fuel types present within the community, including forest stands, grasslands, and riparian zones, was conducted. Topographical factors and their potential influence on fire behavior were also taken into consideration. Furthermore, every open space parcel within the City's jurisdiction was physically evaluated through on-site inspections to assess site-specific conditions and potential hazards. By integrating these various data sources and field assessments, a comprehensive understanding of the wildfire risks and mitigation needs was established, forming the foundation for the strategies outlined in this plan.

This CWPIP represents a crucial step in safeguarding the well-being of Castle Pines residents and their community. By implementing the mitigation practices outlined in this plan, the City aims to create a more fire-resilient environment and foster partnerships for shared stewardship efforts in addressing the growing wildfire threat.



The CWPIP Study Area

The CWPIP study area is the west portion of the City, west of I-25. The area east of I-25 was not included as future private and public open spaces on the east side of the City are still under the control of the developer and are not currently considered a high wildfire risk. However, it is recommended the City partner with developers in the area east of I-25 to implement proactive measures and other ownerships within a one-half mile wide buffer around the City limits.

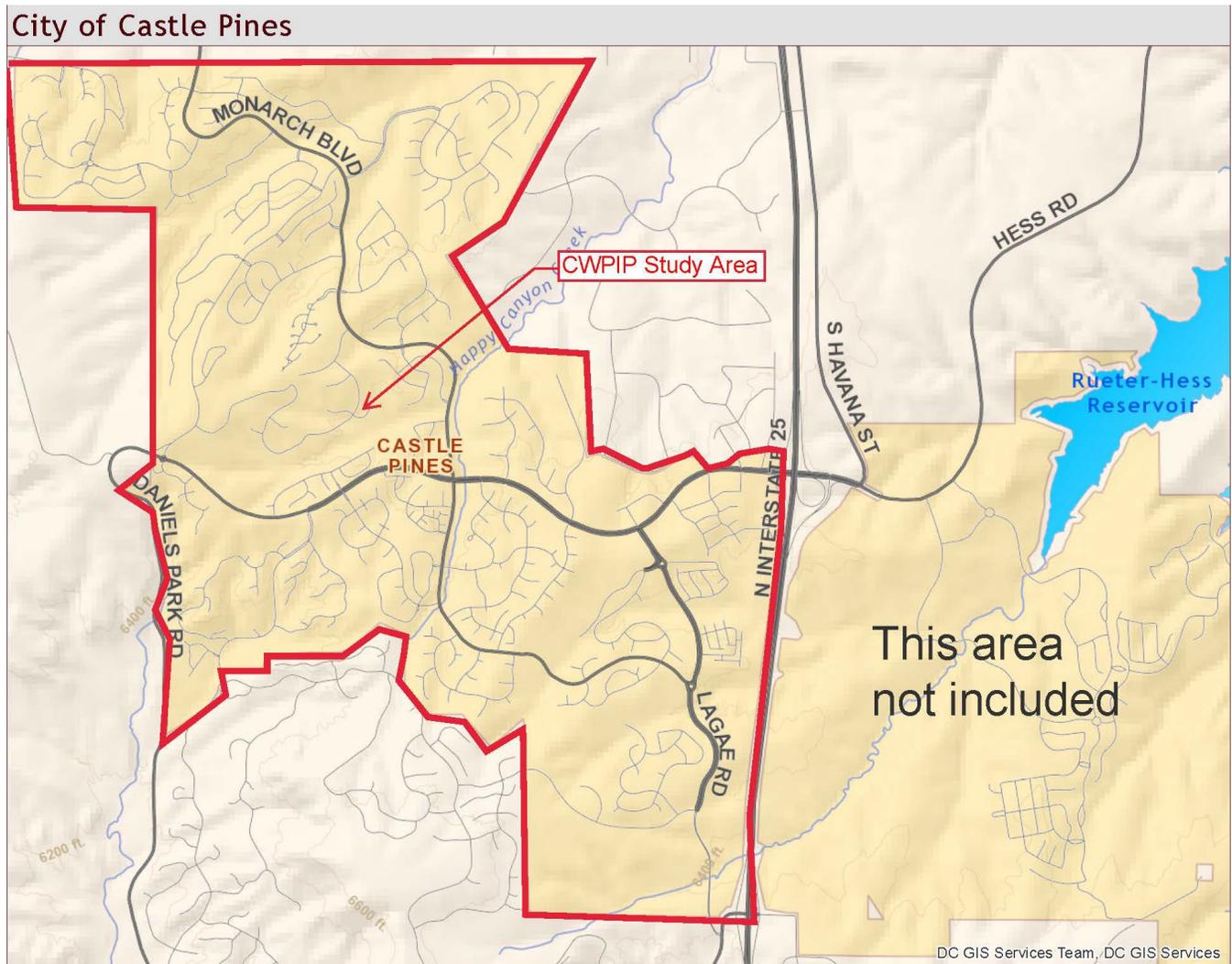


Figure 1. Map of the CWPIP Study Area

CWPIP Compartments and Sub-compartments

To effectively plan and implement wildfire mitigation strategies, the City of Castle Pines has been divided into five distinct compartments for the purposes of evaluation, each requiring varying levels of mitigation efforts. These compartments labeled A through E,

are designed to create strategic zones where fuel treatments can be applied to either contain or exclude the spread of wildfires.

The concept of compartments and sub-compartments utilized in this plan serves as a practical approach to delineate areas that require specific fuel management practices. By segmenting the City into these zones, tailored mitigation measures can be implemented to address the unique characteristics and wildfire risks within each compartment.

Compartment boundaries are determined by considering factors such as topography, fuel types, accessibility, and the presence of natural or man-made barriers that could aid in fire management efforts. Within the broader compartments, sub-compartments were identified to further refine the implementation of targeted fuel treatments.

By segmenting the City into these compartments and sub-compartments, as shown in *Figure 2*, specific mitigation measures can be tailored and prioritized appropriately for each zone, ultimately enhancing the overall wildfire resilience of the community.

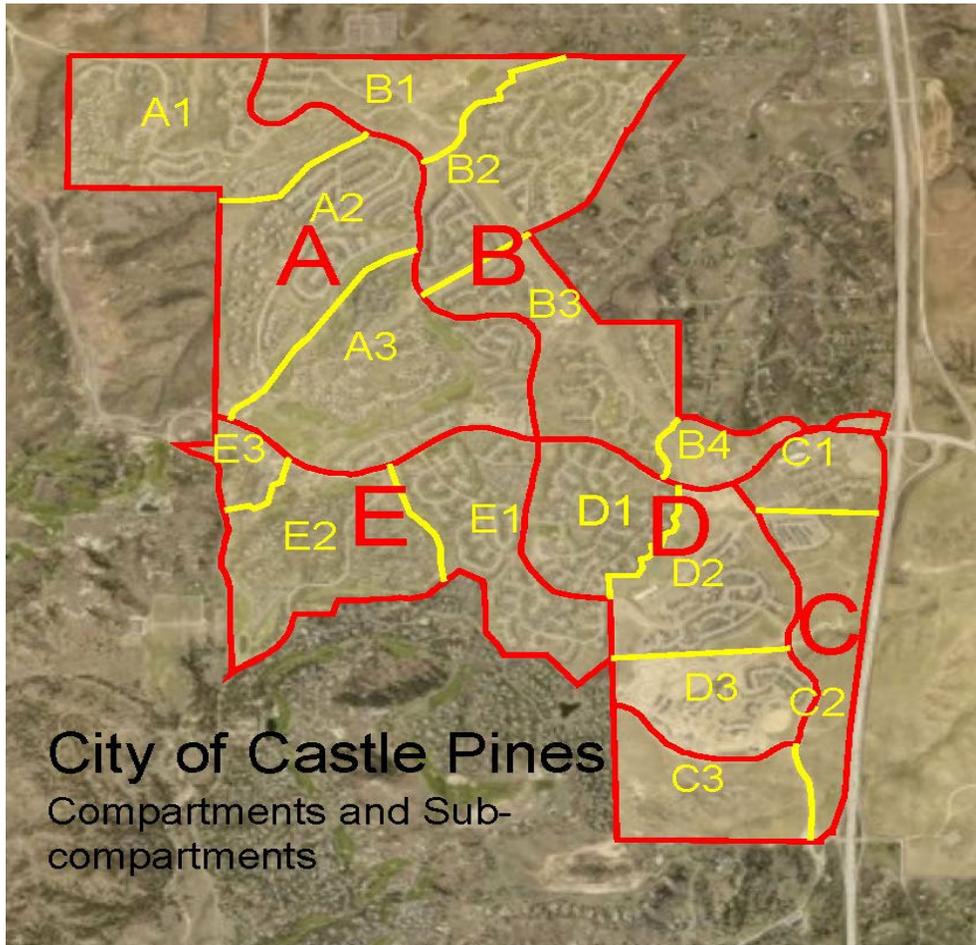


Figure 2. CWPIP Compartments and Sub-compartments

Homeowners Associations

Due to many open spaces in the community being owned by Homeowner Associations (HOAs), land use and control of open space fuels may also be challenging for those properties. The City should work with HOAs in the community to ensure mitigation of open space occurs. Additionally, in some situations, homeowners desiring to mitigate individual properties may believe to be hindered by restrictive covenants of their HOA. Figure 3. shows the HOAs in the study area.

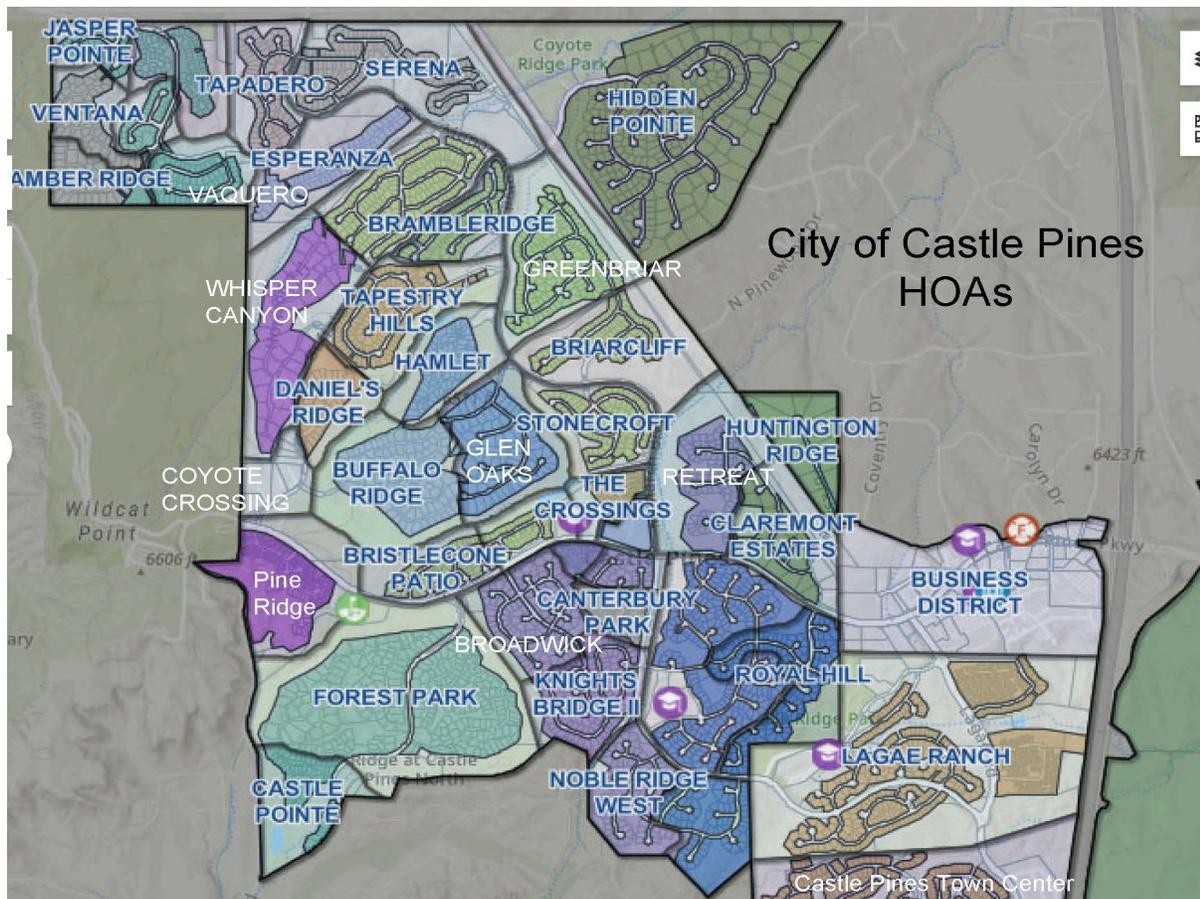


Figure 3. Homeowner Associations East of I-25

Some HOA covenants may restrict vegetation removal or modification. However, individual homeowners do have a right to do wildfire mitigation under **C.R.S 38-33.3-106.5** (a.k.a. SB-100 or Homeowner Bill of Rights), which supersedes said HOA restrictions:

“Notwithstanding any provision in the declaration, bylaws, or rules and regulations of the association to the contrary, an association shall not prohibit any of the following:

Section (e): The removal by a unit owner of trees, shrubs, or other vegetation to create defensible space around a dwelling for fire mitigation purposes, so long as such removal complies with a written defensible space plan created for the property by the

Colorado State Forest Service, an individual or company certified by a local government entity to create such a plan, or the fire chief, fire marshal, or fire protection district within whose jurisdiction the unit is located, and is no more extensive than necessary to comply with the plan. The plan shall be registered with the association before the commencement of work. The association may require changes to the plan if the association obtains the consent of the person, official or agency that originally created the plan. The work shall comply with applicable association standards regarding slash removal, stump height, revegetation, and contractor requirements.”

This means that HOAs can't stop homeowners from removing trees, shrubs, or other plants around their homes if they need to do so to reduce fire risk. However, a written plan for creating a “[defensible space](#)” must be developed by the Colorado State Forest Service, a certified individual or company approved by local authorities, or the fire chief, fire marshal, or fire protection district. Once a homeowner has the written plan, it must be registered with the governing HOA, which can ask for changes from the person or agency that created the original plan.

In essence, this law ensures homeowners can take necessary steps to protect their homes from fire, even if HOA rules usually wouldn't allow it, as long as they follow a proper plan and meet certain standards, as explained above.

COMMUNITY CONDITIONS

Community Values at Risk

To appropriately assess the wildfire mitigation needs of the community, it is important to identify and describe the assets, resources, and values that are considered most important to the community. These values are at potential risk from threats such as wildfires, natural disasters, or other hazards. This may include elements such as residential and commercial properties, natural resources, cultural and historical assets, infrastructure, and intangible values such as scenic views and community character.

The first step in evaluating the City of Castle Pines was to assess the values at risk. The primary asset of values at risk established is the residential and commercial properties.¹ However, the surrounding forest areas also hold significant value for the community. These forested areas provide four main benefits:

1. Aesthetic Value: the natural beauty of the forest attracts locals to the area.
1. Property Value: homes and lots located near or within forested areas tend to have higher property values and resale values

¹ CSFS Forest Atlas and CO-WRAP mapping tools used to generate risk maps.

2. Water Resources: the watershed to the south and west of the city provide valuable renewable water resources for domestic use.
3. Wildlife Habitat: the variety of habitats found in the forested areas provide essential cover and refuge for local wildlife.

In addition to these primary benefits, the forests also contribute to preserving scenic view corridors and providing a sense of privacy for residents. Protecting these valuable community assets is of the utmost importance and was considered throughout determining all recommendations related to tactics for mitigating fire risk.

Critical Infrastructure

Protecting critical infrastructure facilities is of paramount importance when prioritizing wildfire mitigation efforts within the City of Castle Pines. These facilities, such as water and sewer facilities, are essential for maintaining vital services and ensuring the well-being of the community.

In the event of a wildfire, the potential impact on critical infrastructure can be catastrophic, leading to secondary emergencies and disruptions that extend far beyond the immediate fire threat. For example, if a wildfire were to affect an open space containing a lift station or other water/sewer facility, it could result in the loss of water and sewage operations for a significant portion of the community.

Such a scenario would compromise essential services and pose severe health and safety risks to residents. Consequently, parcels housing critical infrastructure facilities were identified for evaluation, and those requiring any level of wildfire mitigation were given the highest priority for wildfire mitigation efforts.

Wildland Urban Interface Boundary

The Wildland Urban Interface (WUI) boundary is defined as the area where a wildfire would be a threat to the community. The study boundary, shown as a black-outlined area on *Figure 4.*, was set as the CWPIP boundary. Additional areas outside the boundaries are also important to note during the evaluation, as they can influence the wildfire risk of certain areas. Important areas to note are:

- Zone 1- City boundary.
- Zone 2- Wildfire impact areas abutting the City, primarily land where wildfire occurrence may have an immediate impact on the City. A minimum ½ mile-wide area would be considered a high priority for treatments due to potential crown fire spread and ember outwash from this zone into the community. It should be noted that embers generated outside of the community can also impact all residents.²

² Framework for Addressing the National Wildland Urban Interface Fire Problem – Determining Fire and Ember Exposure Zones using a WUI Hazard Scale, NIST Technical Note 1748, January 2013, A. Maranghides, W. Mell <http://dx.doi.org/10.6028/NIST.TN.1748>

- Zone 3- Wildfire influence zone beyond 1/2 mile from the City. Wildfires from this zone can exhibit extreme fire behavior that continues into zones 1 and 2, with little or no potential for containment or control.

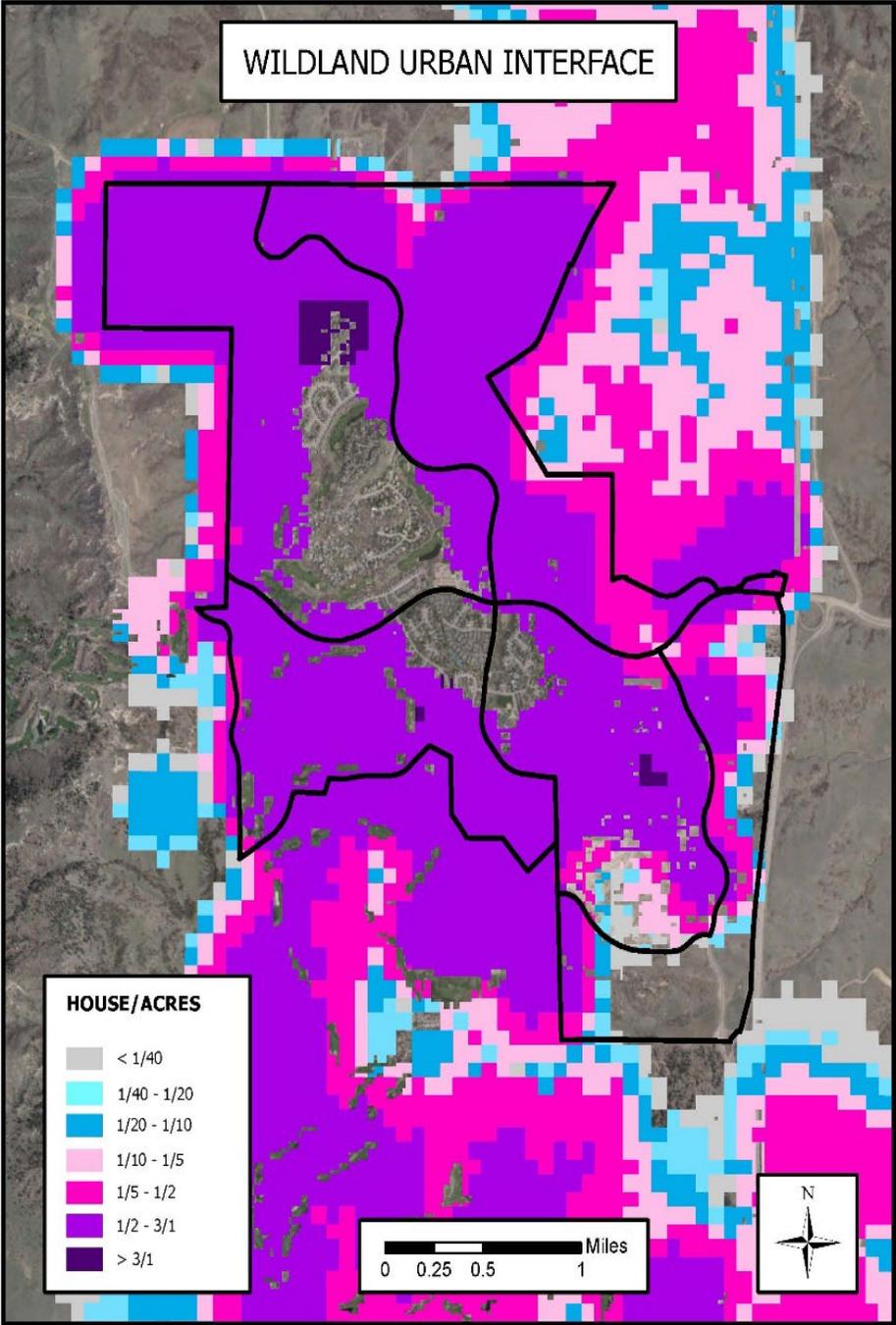


Figure 4. Wildland Urban Interface (“hs/ac” = houses/structures per acres)

Wildfire Intensity Map

The City is surrounded by areas with heavy fuels that can impact the community. The wildfire intensity map in *Figure 5* represents the Colorado Wildfire Risk Assessment Portal (CO-WRAP) analysis of the potential wildfire intensity in and around the study area. This map provides an indication of the expected fire line intensity, which is a measure of the heat output of the fire front. Areas with higher wildfire intensity are at greater risk of experiencing more severe and destructive fire behavior.

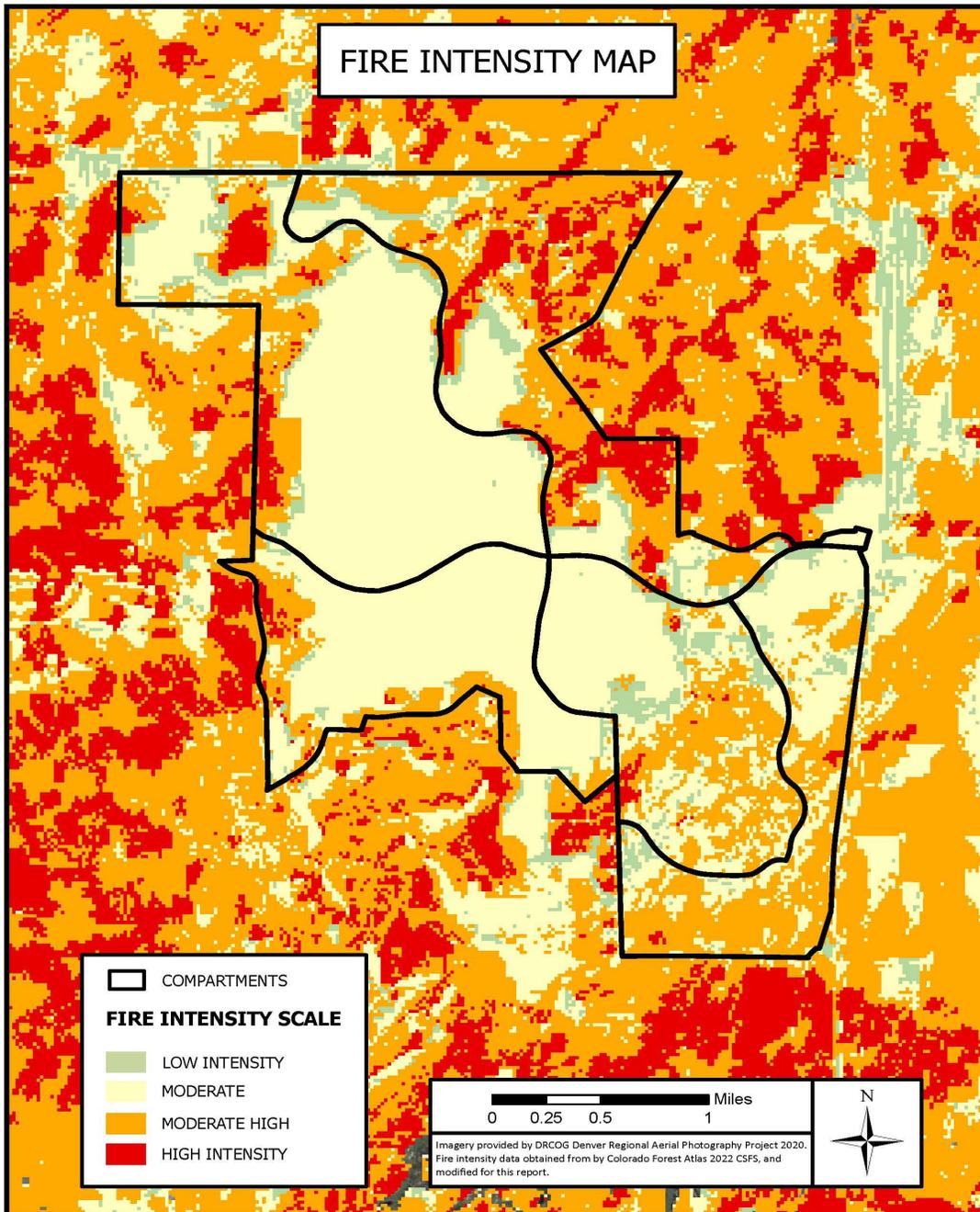


Figure 5. Fire Intensity Map from CO-WRAP

Rate of Spread Map

Figure 6 depicts the anticipated speed at which a wildfire would move through the landscape under normal burning conditions. This metric is critical for understanding how quickly a fire could advance and threaten communities and infrastructure. Faster rates of spread leave less time for evacuation and firefighting efforts.

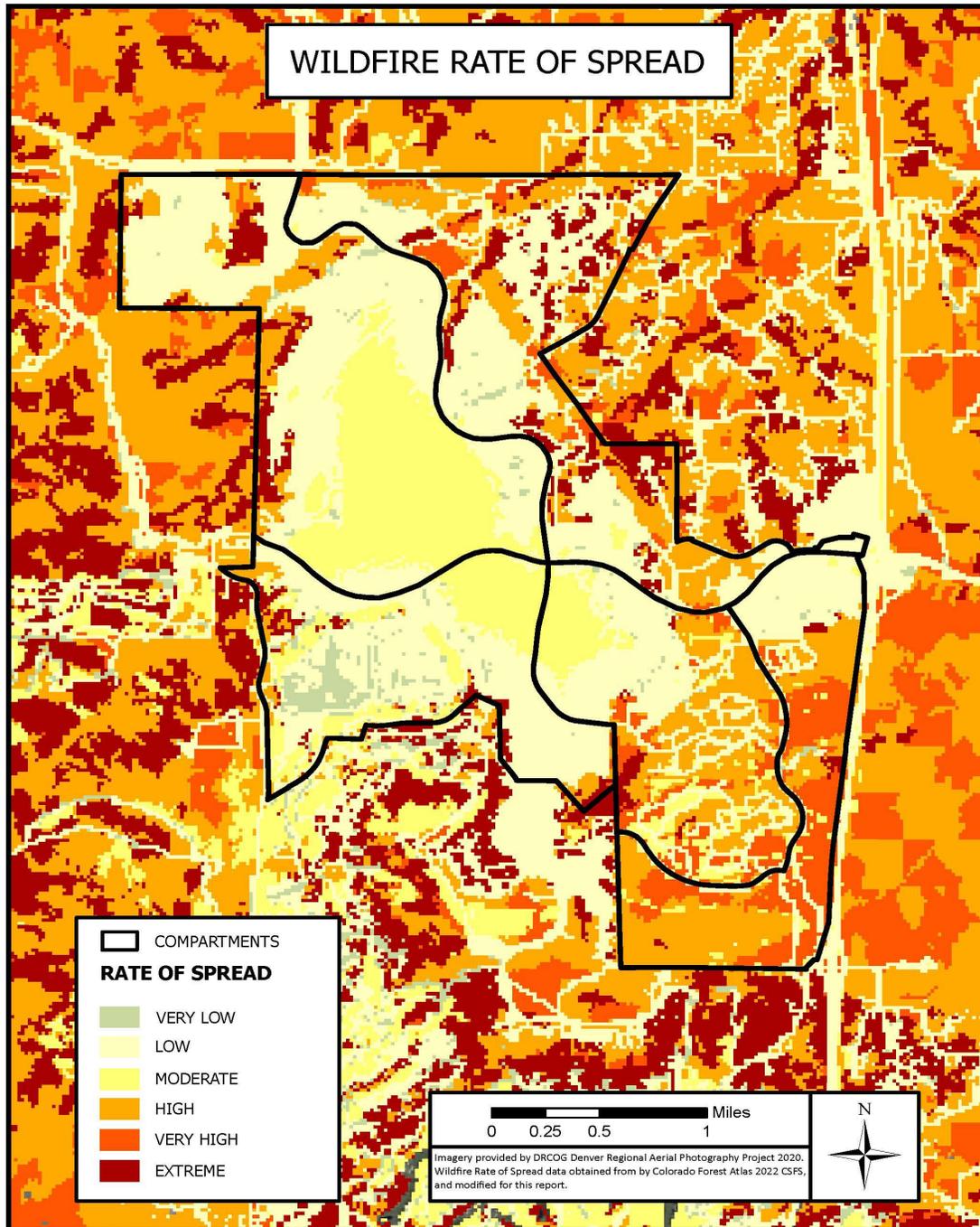


Figure 6. Rate of Spread Map from CO-WRAP

Wildfire Risk Analysis and Implications

Using the data from CO-WRAP, it was determined that most of the community is at a "Moderate" to "High" risk for wildfire occurrence and intensity.

When interpreting CO-WRAP data, it should be noted that predictions are based on the average of historical weather over time. Thus, risk mapping does not predict fire behavior on any given day. Weather conditions at the time of a fire greatly influence actual fire behavior and spread. For example, both the Waldo Canyon and Black Forest Fires burned during the most severe fire weather and not on average days. The effect of weather conditions on fire behavior is further explained in the section on factors that influence fire behavior.

The existing fuels in the community will have high rates of spread under relatively mild weather conditions. The local topography in the area can further aggravate fire behavior and control efforts. The community is situated in a way that funnels prevailing west winds through the region, leading to eddying effects on the leeward side of the high ridge west of the City. Additionally, the area is prone to winds from the east and southeast during upslope weather patterns.

The slopes in the forested areas range from 5 to 30 percent, with most hillsides falling between 10 to 30 percent gradients. This varied and often steep terrain can contribute to unpredictable fire behavior and make it more challenging to manage wildfires in the region.

These local geographic and meteorological factors, combined with the high-risk fuel loads, create an environment that is prone to rapid fire spread and intense wildfire behavior, even under relatively mild weather conditions. Careful planning and mitigation efforts will be critical to enhancing community resilience against the threat of devastating wildfires.

Rate of spread shown on these maps is under normal burning conditions. During the Black Forest Fire, burning conditions were considered extreme, with spread rates over 100 chains per hour or 1.25 miles per hour.

Fuel Types

An essential component of this wildfire risk assessment involved an evaluation of the various fuel types present within the City of Castle Pines. Fuel types are the vegetation and other combustible materials that can contribute to the spread and intensity of a wildfire. There are three main fuel types throughout the City of Castle Pines:

- Prairie fuels consisting of grasses and scattered shrub clumps.
- Gambel oak intermixed with grasses and scattered Ponderosa Pines.
- Ponderosa Pines intermixed with Gambel oak.

The dominant vegetation in the study area is a second-growth forest, a forest that has regrown after a previous disturbance removed the original older trees, made up primarily of ponderosa pine and mixed conifer trees. These forests have a high density of trees, with their branches and leaves forming a closed, overlapping canopy. The under-story is also very dense, with an abundance of smaller pine, Douglas-fir, and oak trees and shrubs. Appendix G references the specific fuel models.

- This type of dense, layered forest vegetation creates a significant fire fuel load.
- In addition to the forested areas, a large portion of the study area is covered in prairie grasses and low-growing shrubs.
- The riparian zones along waterways and storm channels are dominated by shrubs like willows and cottonwoods, mixed with grassy fuels. These areas are of particular concern where they border high-density residential developments, especially during drought conditions.

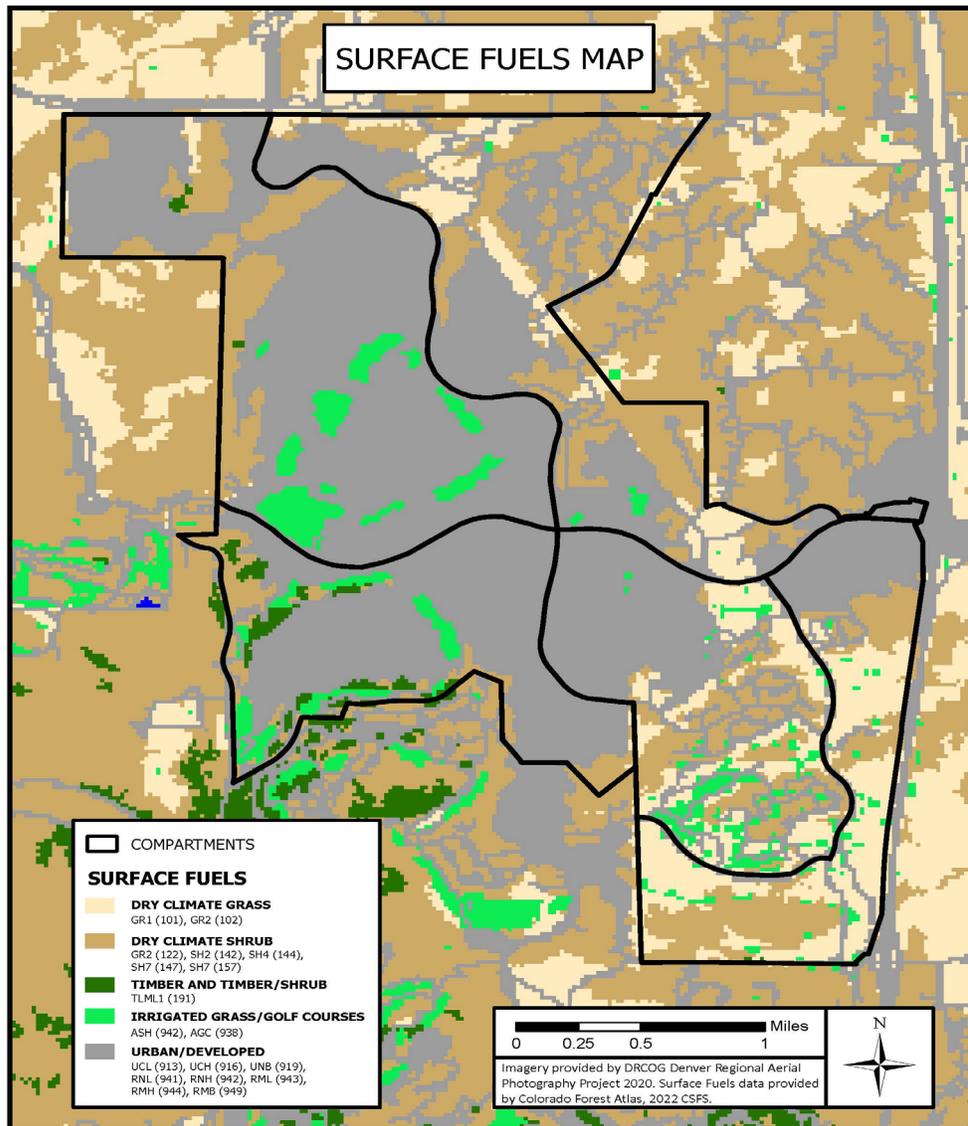


Figure 7. Wildland Urban Interface Fuel Types

Additional observations regarding fuels in and around the CWPIP Study Area are:

- Large, un-thinned, decadent forests will exacerbate fire behavior.
- Limited fuel treatments implemented by homeowners can be easily overwhelmed due to untreated fuels on surrounding properties.
- Unmitigated fuels on surrounding properties may compromise civilian evacuation, and firefighter access and safety.
- Embers blown into suburban areas may cause home ignitions that lead to “urban conflagrations” like those experienced in the Waldo Canyon Fire and Marshal Fire. There will never be enough water and resources to contain this type of event.
- Aerial resources may be unavailable, or of limited value for reducing the rate of fire spread due to extreme fire behavior and high winds.
- Density of the tree and brush canopies provide challenges for the effective placement of retardant by some of the delivery systems in use.

RELEVANT WILDFIRE HISTORY

The 2003 Cherokee Fire threatened the west side of Castle Pine, stopping short of the Daniels Gate community. Both Castle Pines and Castle Pines Village were evacuated during this wildfire. The point of origin was at US Highway 85, which was caused by a downed power line due to high winds.

In past fire seasons, ninety-eight percent (98%) of wildfires were contained or controlled within the first or second burning period.³ The first burning period is the initial, rapid spread phase of the wildfire, driven by factors like wind, slope, and available fuel. Fires can exhibit extreme behavior and spread quickly during this critical first phase, posing the greatest threat to life and property.

The second burning period occurs after the initial rapid spread when the fire begins to slow down and become more manageable. During this period, the fire is influenced more by the available fuel and topography, rather than wind. Firefighting efforts can often be more effective during the second burning period, as the fire behavior becomes less erratic.

The Hayman, Waldo Canyon, and Black Forest Fires fit into the remaining two percent of fires that exceeded the suppression capacity of fire service control due to extreme weather and fuel conditions. Most homes and structures are lost during this “convergence of conditions” of fuel, weather, and topography within the first 24 hours of the fire.

³ *Assessing Wildfire Hazards in the Home Ignition Zone*, NFPA, 2010, Publication FWC93710PKD

The 2020 fire season called into question the 2% to 98% ratio due to decades-long drought. The Cameron Peak Fire, Troublesome Fire, Pine Gulch Fire, Calwood Fire and Grizzly Creek Fire were even more unprecedented in their behavior.

Causes of Wildfire Ignitions

A reconstruction of fire history and forest dynamics in the area, reveals:

1. An average fire interval of about fifty years during the period 1300-1880, but no major fires between 1880 and 2000.
2. The 2002 Hayman Fire consumed 138,000 acres. Since then, numerous larger and more destructive wildfires have occurred in the region. The 2020 fire season resulted in large fires⁴ that exceeded the Hayman Fire in size.
3. A mix of surface fire and stand-replacing⁵ fires in the historic burns (mixed-severity fire regime).
4. A striking increase in forest density from 1900-2021.
5. Extended droughts have persisted in the region.
6. Wildfire seasons may extend from March to December.

The Hayman Fire of 2002 was a high-severity event, unprecedented in the last 700 years. This was due in part to the dense forest conditions that had developed over the course of the 20th century, as well as the extreme drought and fire weather conditions that had existed since the year 2000.

Similar severe drought conditions also contributed to the devastating impacts of other major wildfires over a decade later, including the Waldo Canyon Fire (2 fatalities), the Black Forest Fire (2 fatalities), and the Lower North Fork Fire (3 fatalities).

Historically, wildfires were typically caused by lightning, though the use of fire by aboriginal populations is unknown. Today, human activities remain the highest risk for fire ignitions. Critical evacuation routes can also serve as ignition points due to vehicle accidents, disabled vehicles, discarded cigarettes, and maintenance activities. Residential fire exposures can stem from equipment, BBQ grills, unsupervised youth, and burning structures. Outdoor burning, improper ash disposal, chimney embers, and sparks from recreational gear and chainsaws are other common wildfire start sources.

⁴ (i.e. Cameron Peak, East Troublesome, Pine Gulch, Grizzly and Calwood fires)

⁵ A stand-replacing wildfire is an intense and severe fire that completely consumes or kills nearly all vegetation within a forest stand or ecosystem, leaving behind a landscape dominated by charred remains and bare soil.

RISK OF IGNITION AND WILDFIRE OCCURRENCE

The City has multiple potential ignition sources that can contribute to starting a wildfire in, or abutting, the City. Some of these sources are:

- Proximity to major roadways such as Interstate 25.
- High recreation areas in and abutting the City.
- Residential and commercial areas where sparks can be generated.
- Above-ground electrical distribution systems with vegetation growth underneath.

Aging infrastructure and high winds caused the Cherokee Fire in 2003 that caused the evacuation of Castle Pine North and Castle Pines Village.

The area is prone to low fuel moisture and relative humidity levels, as well as periods of high winds. When these dry and windy conditions coincide, the stage is set for the potential of large, destructive wildfires.

Adding to this fire risk, the human population in the area has been steadily increasing. In fact, all of the recent major fire events were caused by human activities, either accidental or intentional. Additionally, the region experiences numerous lightning-ignited fires each year, as Colorado has some of the highest lightning strike occurrences in the continental United States.

Fires originating within or near the community are the most immediate concern, but wildfires starting beyond the City of Castle Pines boundaries can also have profound effects on the local populations. Rapid rates of fire spread and long-distance spotting, where embers and burning materials are carried far ahead of the main fire front to ignite new spot fires, are common characteristics of the fires in this vicinity.

FACTORS AFFECTING HOMES IN THE WUI

The overall risk to the community from wildland fire is moderate to high. This section will discuss the factors that led to the overall rating. All residences in the city should be considered as being in the Wildland Urban Interface (WUI). The homes in CWPIP Study Area have various risks of being destroyed by a wildfire. The amount of risk depends on the vegetative fuels, topography, weather events, and the construction of the home itself. It is important to understand these conditions and factors to make appropriate decisions about vegetative fuel reductions.

Fire Behavior at any time is dependent on three factors: weather, topography, and fuels.

Weather

Weather influences fire behavior as both a long-term and transient phenomenon. Long-term weather trends such as extended drought increase the possibility of ignition and increase the rate of fire spread. Strong upslope winds are an especially significant weather feature of the Douglas County area. These winds occur year-round, at 30-60 miles per hour, and caused the rapid fire spread in the Waldo Canyon and Black Forest fires. These winds reverse the normal topographic uphill convective spread of wildfire and present the greatest threat of spreading wildfire both upslope and downslope to private lands in the Larkspur area.

Topography

Topography includes the degree of slope and the shape of the terrain. Hot gases rise in front of the fire along the slope face, pre-heating the vegetation above a fire. As slope increases the effect of the preheating and increased spread increases, and fires may move up to four times faster with flames twice as long as a fire on level ground.

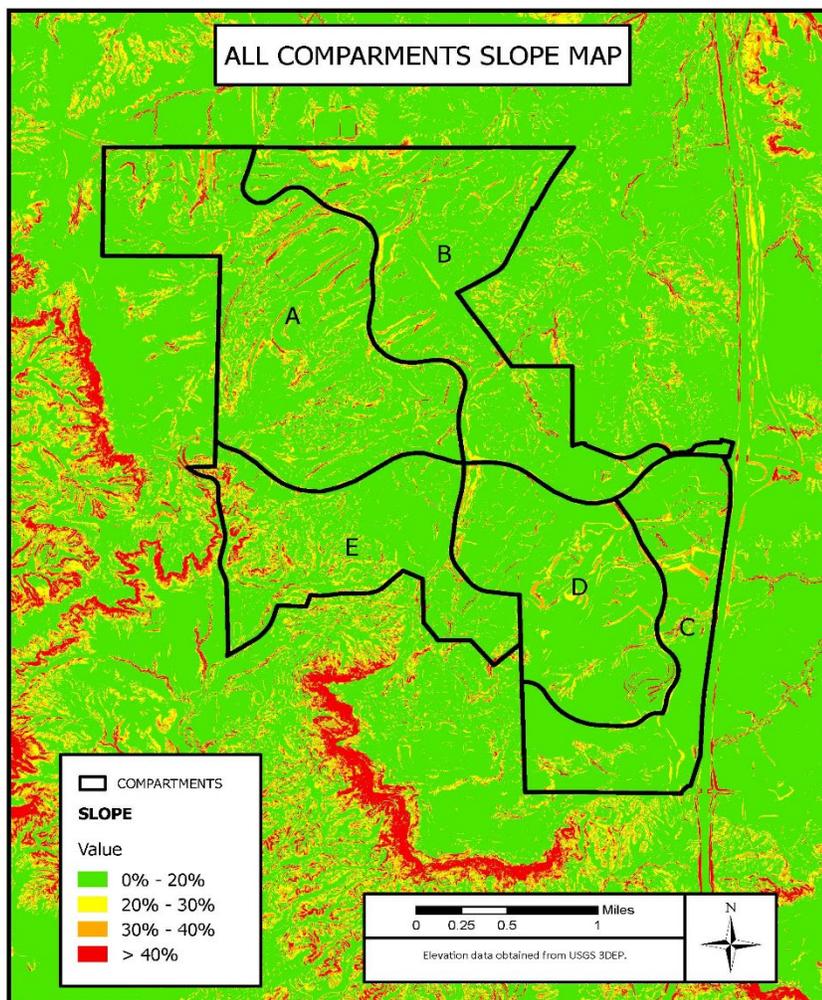


Figure 8. Average Slopes in the Study Area

Areas within the City with significant slopes are concentrated on the west side of the City in Sub-compartments E-2 and E-3. Slope maps for these areas are shown in Figure 9 And Figure 10. Figure 8. shows areas (red) outside of the City that will affect fire behavior from western and southern directions. Also of note are smaller thin bands of red within other compartments throughout the community along ridges, saddles, and chimneys that may increase wind speeds and rate of fire spread.

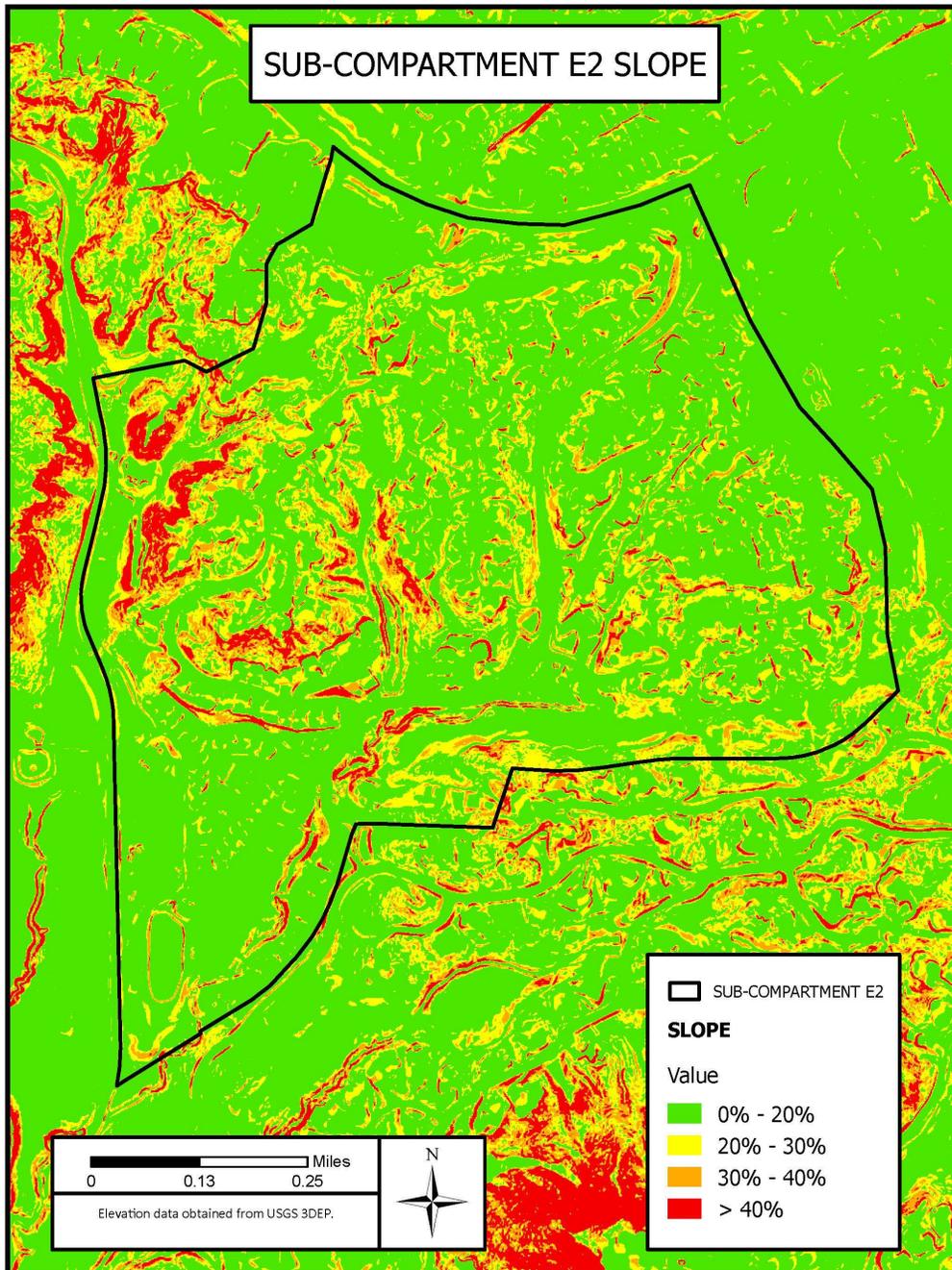


Figure 9. Slopes in Sub-Compartment E-2

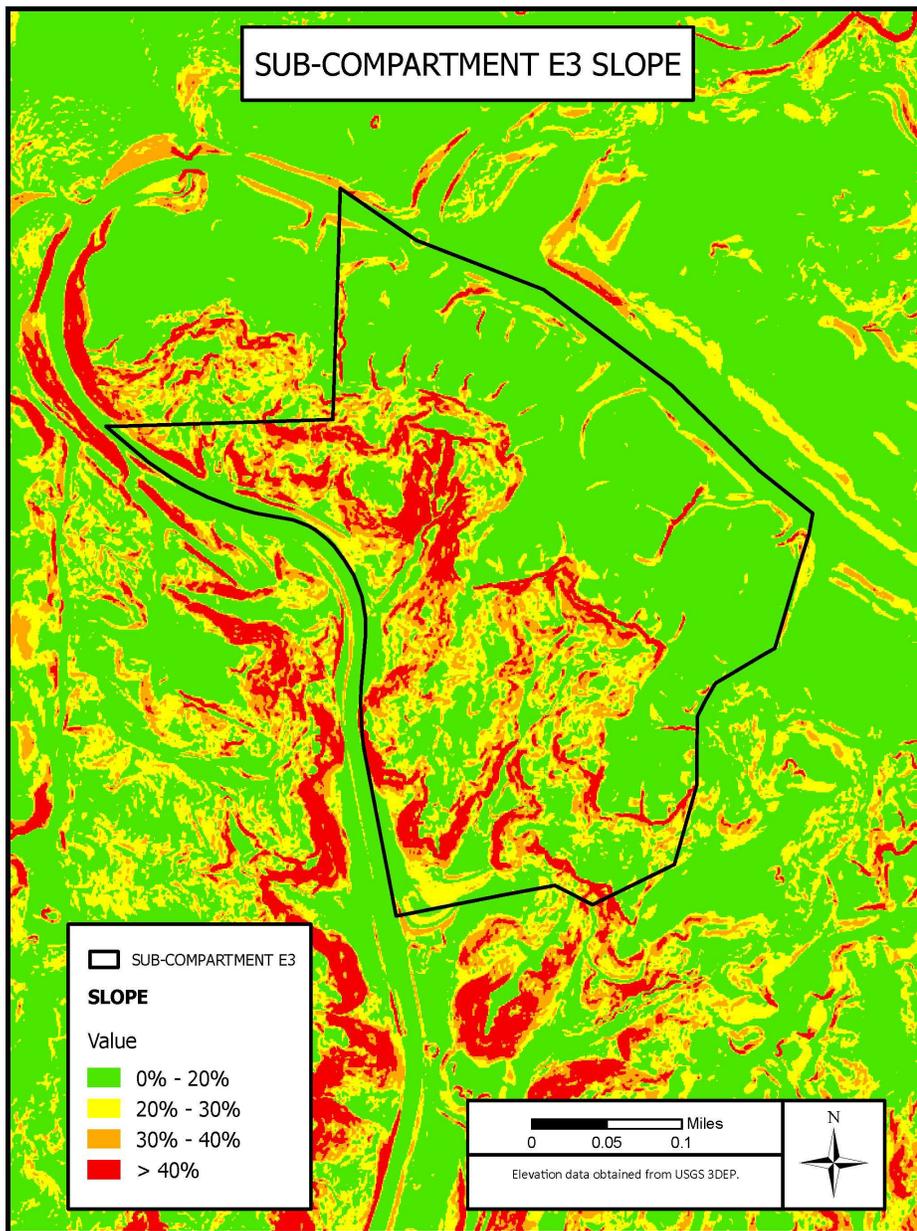


Figure 10. Slopes in Sub-compartment E-3

Fuels

The two fuel types in a WUI are vegetative and structural. Vegetative fuels consist of living and dead trees, bushes, and grasses. Typically, grasses ignite more easily and burn more quickly but with less intensity than trees and brush. Fires can move quickly through grass and herbaceous vegetation, and these smaller fuels are often the kindling that moves fires to larger-size fuels.

The threat of wildfire is exacerbated by deteriorating forest health in the City and along the entire western boundary of the study area. Gambel oak decline over the past 25 years has created heavy fuel loads of both standing dead and down heavy fuels. Concerted efforts are necessary to address this hazard by creating a wide band of fuels management on both public and private lands along this boundary.

Fire intensity and spread rate depend on the fuel type and its condition⁶, the weather and climatic conditions prior to and during ignition, and the topography. Generally, these all affect fire behavior.

- Fine fuels ignite more easily and spread faster with higher intensities than coarser fuels. For a given fuel, the more there is and the more continuous it is, the faster the fire spreads and the higher the intensities. Fine fuels take a shorter time to burn out than coarser fuels.
- The weather conditions affect the moisture content of the dead and live vegetative fuels. Dead fine fuel moisture content is highly dependent on the relative humidity and the degree of sun exposure. The lower the relative humidity and the greater the sun exposure, the lower the fuel moisture content will be. Lower fuel moistures produce higher spread rates and fire intensities.⁷
- Wind speed significantly influences the rate of fire spread and fire intensity. The higher the wind speed, the greater the spread rate and intensity.
- Topography influences fire behavior principally by the steepness of the slope. However, the configuration of the terrain such as narrow draws, saddles and so forth can influence fire spread and intensity. In general, the steeper the slope, the higher the uphill fire spread and intensity.

Structural Vulnerabilities

While not included in the CWPIP specifically, it is important to note that a key aspect of factors influencing homes in the WUI is the resiliency of structures.

There are three ways that a wildfire can transfer itself from natural vegetation, or burning homes, to other homes. These are through radiation, convection, and firebrands⁸.

Radiation: Wildfires can spread to a home by radiating heat in the same way a radiator heats rooms in the wintertime. Radiated heat is capable of igniting combustible materials from a distance of 100 feet.

⁶ Live or dead condition.

⁷ Detailed weather information is available at the National Weather Service website www.weather.gov.

⁸ Also known as embers.

Convection: Direct contact with flames, or the wildfire’s convective heat column—the hot air and gasses rising from the flames--may also ignite a home. This will most likely occur when trees or brush near a structure ignite, and the flames touch a flammable part of the structure.

Firebrands: Firebrands are burning materials that detach from a fire during strong convection drafts in the burning zone. In most cases, the flame front passes quickly, but a shower or “blizzard” of burning embers impinges on the structure for some time before and after the flame front passes. Firebrands are most often the cause of home loss. Firebrands can be carried long distances – more than a mile – by the winds associated with wildfire. All homes in the community are particularly vulnerable to firebrands.

Over 90% of the homes lost in the Waldo Canyon Fire were from embers carried into neighborhoods by winds in excess of 60 mph. These embers were driven horizontally as a “blizzard”

A house burns because of its interrelationship with everything in its surrounding home ignition zone—the house and its immediate surroundings. To avoid a home ignition, a homeowner must eliminate the wildfire’s potential relationship with his/her house. This can be accomplished by interrupting the natural path a fire takes. Changing a fire’s path by clearing a [home ignition zone](#) is an easy-to-accomplish task that can result in avoiding home loss. To accomplish this, combustible items such as dead vegetation and debris must be removed from the area immediately around the structure to prevent flames from contacting it. Also, reducing the volume of live vegetation will affect the intensity of the wildfire as it enters the home ignition zone.

Understanding how home construction affects the vulnerability of the structure to a wildfire helps residents plan defensible space projects to compensate for construction differences. When remodeling or home improvement projects are done, plans can be made to reduce the ignitability of the buildings.

New home construction projects should utilize best practices for home site location and incorporate fire-resistant construction methodologies from the conceptual design phase; regardless of the nonexistence of codes or WUI ordinances requiring such actions.

RESULTING PRIORITIES OF MITIGATION

Utilizing the methods and data established, this plan was developed to aid in planning and budgeting for wildfire mitigation as recommended in the adopted 2022 Douglas County CWPP. The priorities were established based on potential wildfire threats to life, property, and the city's natural resources.

The priorities are listed as the following:

- 1 (red)- Critical Infrastructure
- 2 (orange)- Community Perimeter Fuel Treatments
- 3 (yellow)- Open Space Mixed and Heavy Fuels

The table below (*Figure 11*) shows the evaluation results for open space with a priority of 1-3. Additional open spaces were evaluated and can be seen on the corresponding map in *Figures 12, 13, 14, 15, and 16* as well as Appendix A. These open spaces received a priority rating that corresponded with general maintenance and are not included in the three-year phased mitigation approach.

Map #	ACCOUNT	LEGAL DESCRIPTION	TOTAL ACRES	Priority	Fuel ⁹	Land Use
175	R0349783	TR IN NE1/4NW1/4 9-7-67 1.489 AM/L	1.489	1	S	Water Treatment
21	R0425487	MOST TRACT E CASTLE PINES NORTH #27 13.455 AM/L	13.455	1	G, S	Weils and Electric
152	R0403916	PART TRACT N CASTLE PINES NORTH #21 0.562 AM/L	0.56	1	G	WTP Access
195	R0365597	TR IN NE1/4NE1/4 8-7-67 0.574 AM/L (WELL SITE)	0.574	1	G, S, F	Weils and Electric
153	R0403918	MOST OF TRACT N CASTLE PINES NORTH #21 .853 AM/L	0.85	1	G	WTP Access
162	R0498225	TRACT W-1 LAGAE RANCH 1 1ST AMD 13.088 AM/L	13.088	1	G, S	Sewer Lift Sta.
31	R0436707	TRACT H2 CASTLE PINES NORTH FILING #27 3RD AMD TOTAL ACREAGE .166 AM/L	0.166	1	G,	LIFT STA
1	R0441647	TRACT J1-A ROMAR WEST 2ND AMENDMENT 7.973 AM/L	7.973	2	G, S	Perimeter SFB
15	R0424739	TRACT C ROMAR WEST 2.095 AM/L	2.095	2	G, S	Perimeter SFB
52	R0425559	TRACT AA CASTLE PINES NORTH #27 10.139 AM/L	10.139	2	G, S	Perimeter SFB
58	R0431628	TRACT N1 CASTLE PINES NORTH FILING 27 AMENDMENT 2 TOTAL ACREAGE 6.110 AM/L	6.11	2	S	Roadway, heavy fuels
60	R0425515	TRACT K CASTLE PINES NORTH #27 21.884 AM/L	21.884	2	G, S	Perimeter SFB
95	R0499653	TRACT F LAGAE RANCH 1 2ND AMD 7.932 AM/L	7.932	2	S, G	Perimeter SFB
159	R0478476	TRACT D LAGAE RANCH 1 13.161 AM/L	13.161	2	S, G	Mixed Fuels
163	R0496706	TRACT J CASTLE PINES TOWN CENTER 2 15.978 AM/L	15.978	2	G, S	Facilities
165	R0611823	TRACT A CASTLE PINES TOWN CENTER 1 11.654 AM/L	11.654	2	S, G	Perimeter SFB
179	R0478455	PART TRACT A LAGAE RANCH 1 6.585 AM/L MTD 0478440 (ELK RIDGE PARK)	6.585	2	S, G	Perimeter SFB

⁹ The Fuel types are abbreviated at the following: G-grasses/prairie, S-shrub/gambel oak, R-riparian, F-forest/oak mix.

Map #	ACCOUNT	LEGAL DESCRIPTION	TOTAL ACRES	Priority	Fuel	Land Use
184	R0478444	TRACT S LAGAE RANCH 1 5.294 AM/L	5.294	2	S, G	Perimeter SFB
86	R0335684	TR IN SE1/4 33-6-67. 0.5125 AM/L 621-83	0.513	2	G,	LIFT STA
5	R0441646	TRACT H1-A ROMAR WEST 2ND AMENDMENT 12.10	12.1	3	S	Heavy Fuels
12	R0439335	TRACT M-1 ROMAR WEST 1ST AMENDMENT 19.370 AM/L	19.37	3	S	Heavy Fuels
22	R0425485	PT TRACT E CASTLE PINES NORTH #27 4.603 AM/L MTD #0425487	4.603	3	G, S	Heavy Fuels
25	R0436706	PART OF TRACT F1 CASTLE PINES NORTH FILING #27 3RD AMD TOTAL ACREAGE 2.592 AM/L	2.592	3	G, S	Heavy Fuels
26	R0436705	MOST OF TRACT F1 CASTLE PINES NORTH FILING #27 3RD AMD TOTAL ACREAGE 8.918 AM/L	8.918	3	G, S	Heavy Fuels
27	R0436708	TRACT CC1 CASTLE PINES NORTH FILING #27 3RD AMD TOTAL ACREAGE 2.019 AM/L	2.019	3	G, S	Heavy Fuels
47	R0419194	TRACT A CASTLE PINES NORTH #24 4.980 AM/L	4.98	3	G, S	Heavy Fuels
49	R0419198	TRACT D CASTLE PINES NORTH #24 1.550 AM/L	1.55	3	G, S	Heavy Fuels
50	R0425563	TRACT DD CASTLE PINES NORTH #27 5.222 AM/L	5.222	3	G, S	Heavy Fuels
61	R0455029	TRACT W1 CASTLE PINES NORTH 27 6TH AMD 2.206	2.206	3	S	Heavy Fuels
64	R0419199	TRACT E CASTLE PINES NORTH #24 4.020 AM/L	4.02	3	S	Heavy Fuels
73	R0399924	TRACT A (OPEN SPACE) CASTLE PINES NORTH #17A.	20.8829	3	S, G	Facilities, Wells,
74	R0399925	TRACT B (OPEN SPACE) CASTLE PINES NORTH #17A.	9.232	3	G, S	Mixed Fuels
87	R0372328	TRACT 5 CASTLE PINES NORTH PHASE I 28.83 AM/L	28.83	3	S	Abuts Retreat OS,
16	R0425478	TRACT A CASTLE PINES NORTH #27 9.630 AM/L	9.63	3	S	Heavy Fuels
104	R0349353	PT OF THE E1/2 4-7-67 LYING W OF CASTLE PINES	8.37	3	G, S, R	Mixed Fuels
45	R0421542	TRACT C CASTLE PINES NORTH #16 19.034 AM/L	19.034	3	G, S, R	Mixed Fuels
161	R0498235	TRACT F-1 LAGAE RANCH 1 1ST AMD 14.463 AM/L	14.463	3	G, S	Mixed Fuels
167	R0603573	TRACT B CASTLE PINES TOWN CENTER 1 9.352 AM/L	9.352	3	S, G	Mixed Fuels
51	R0424577	TRACT D CASTLE PINES NORTH #14 3.010 AM/L	3.01	3	G, S	Heavy Fuels
75	R0346487	TRACT E CASTLE PINES NORTH PARCEL R-13 SUB 6.63	6.63	3	G, S	Trail Corridor
3	R0439387	TRACT S1 ROMAR WEST 1ST AMENDMENT 1.183 AM/L	1.183	3	G, S	
11	R0424759	TRACT R ROMAR WEST 3.389 AM/L	3.389	3	S, G	
20	R0425492	PT TRACT E CASTLE PINES NORTH #27 1.359 AM/L MTD	1.359	3	S, G	ROW
57	R0425517	TRACT L CASTLE PINES NORTH #27 1.134 AM/L	1.134	3	S, G	Trail Corridor
59	R0431624	TRACT M1 CASTLE PINES NORTH FILING 27 AMENDMENT 2 TOTAL ACREAGE 0.400 AM/L	0.4	3	S, G	ENTRY
83	R0399977	TRACT C (OPEN SPACE) CASTLE PINES NORTH #18A. 1.478 AM/L	1.478	3	S, G	
85	R0399965	TRACT A (OPEN SPACE) CASTLE PINES NORTH #18A. 1.980 AM/L	1.98	3	S, G	Trail Corridor
142	R0428950	TRACT J CASTLE PINES NORTH FILING 28 TOTAL ACREAGE 1.091 AM/L	1.091	3	S, G	
169	R0496824	TRACT A CASTLE PINES TOWN CENTER 2 4.824 AM/L	4.824	3	S, G	ROW
166	R0603481	TRACT C CASTLE PINES TOWN CENTER 1 2.160 AM/L	2.16	3	S, G	Trail Corridor

Figure 11. Table of Open Space Properties with a Priority Rating of 1-3

The following maps (Figures 12, 13, 14, 15, and 16) show all of the evaluated open space properties and their corresponding priority levels. Each open space property is identified by a number that corresponds to the number listed on the table.

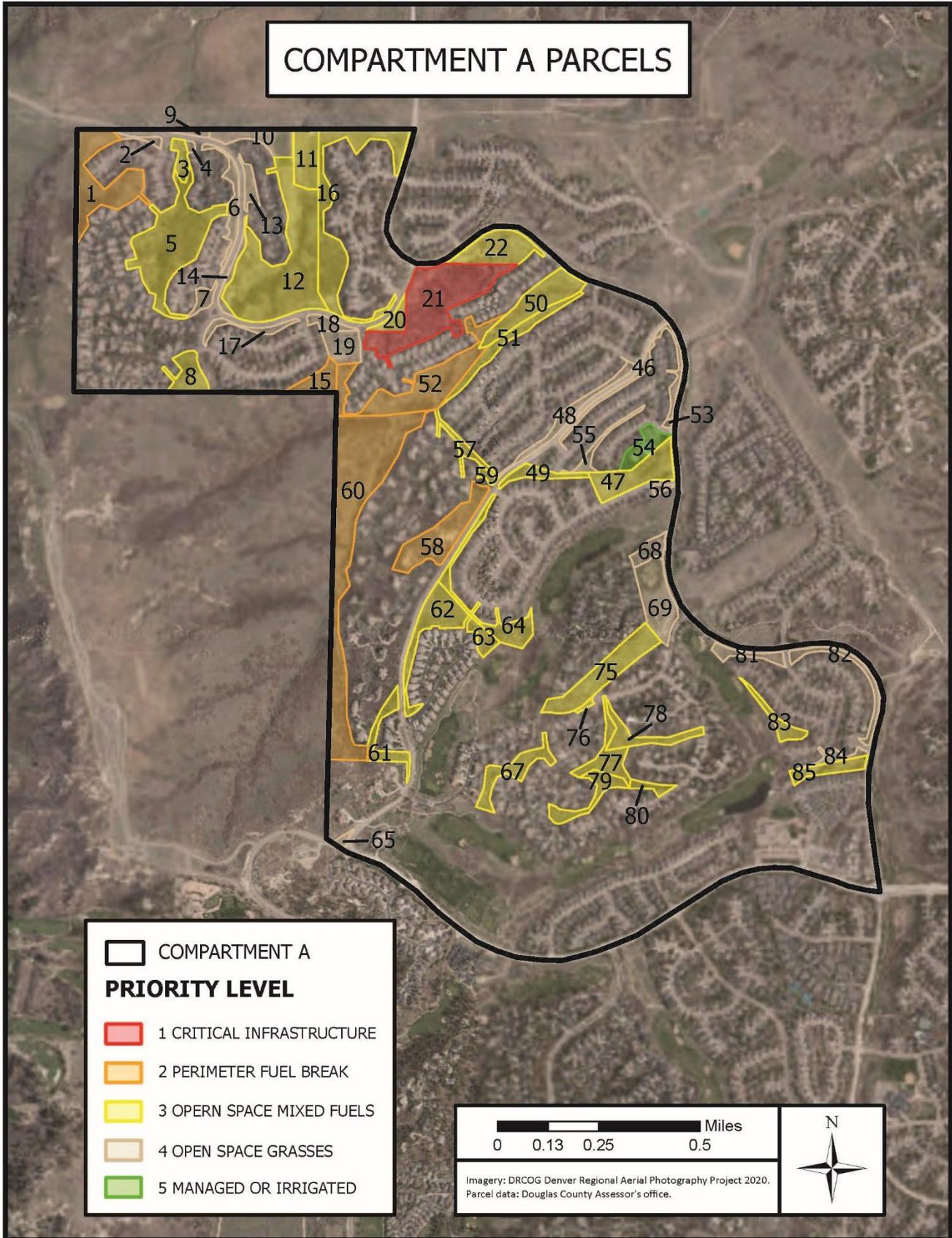


Figure 12. Compartment A Prioritization Map

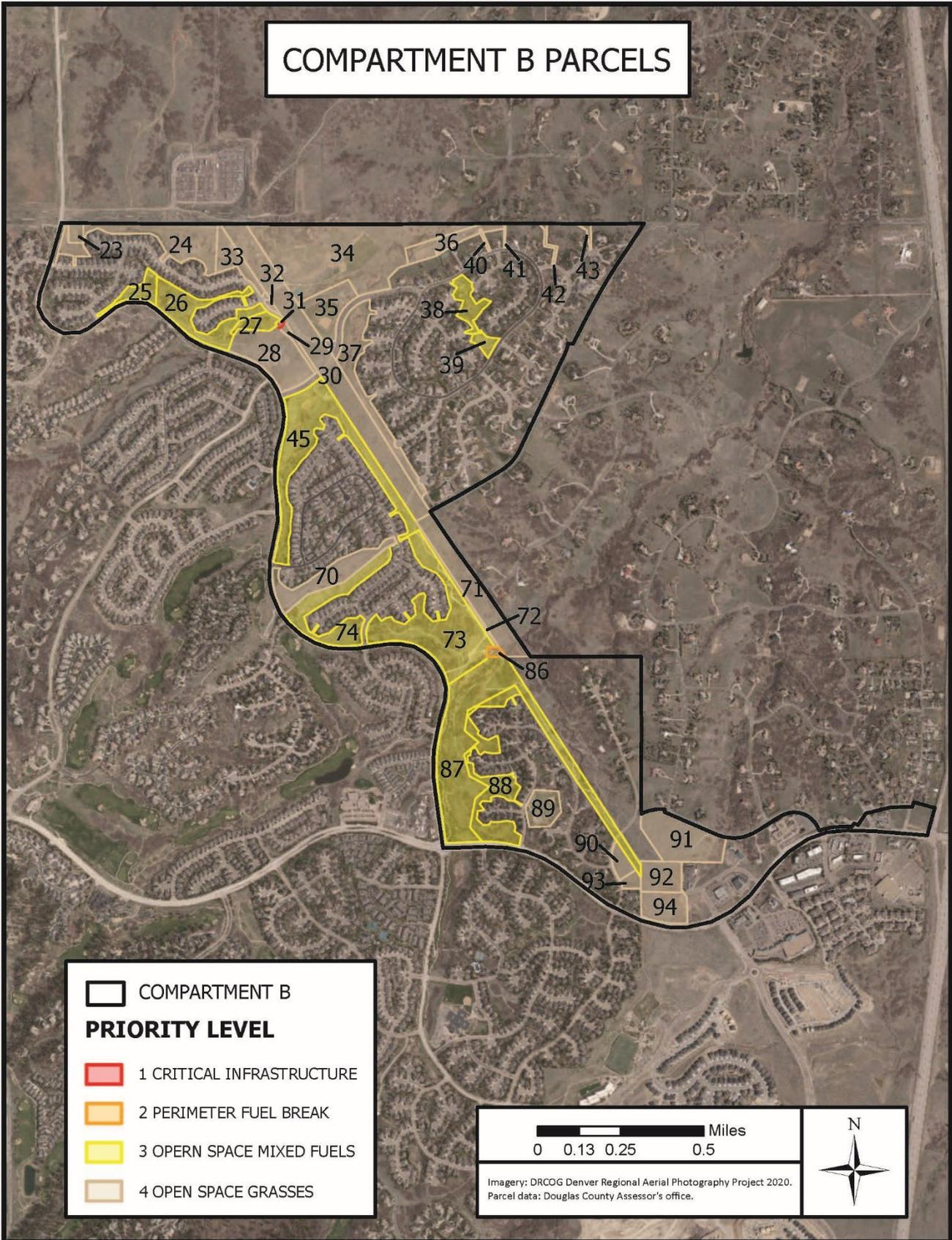


Figure 13. Compartment B Prioritization Map

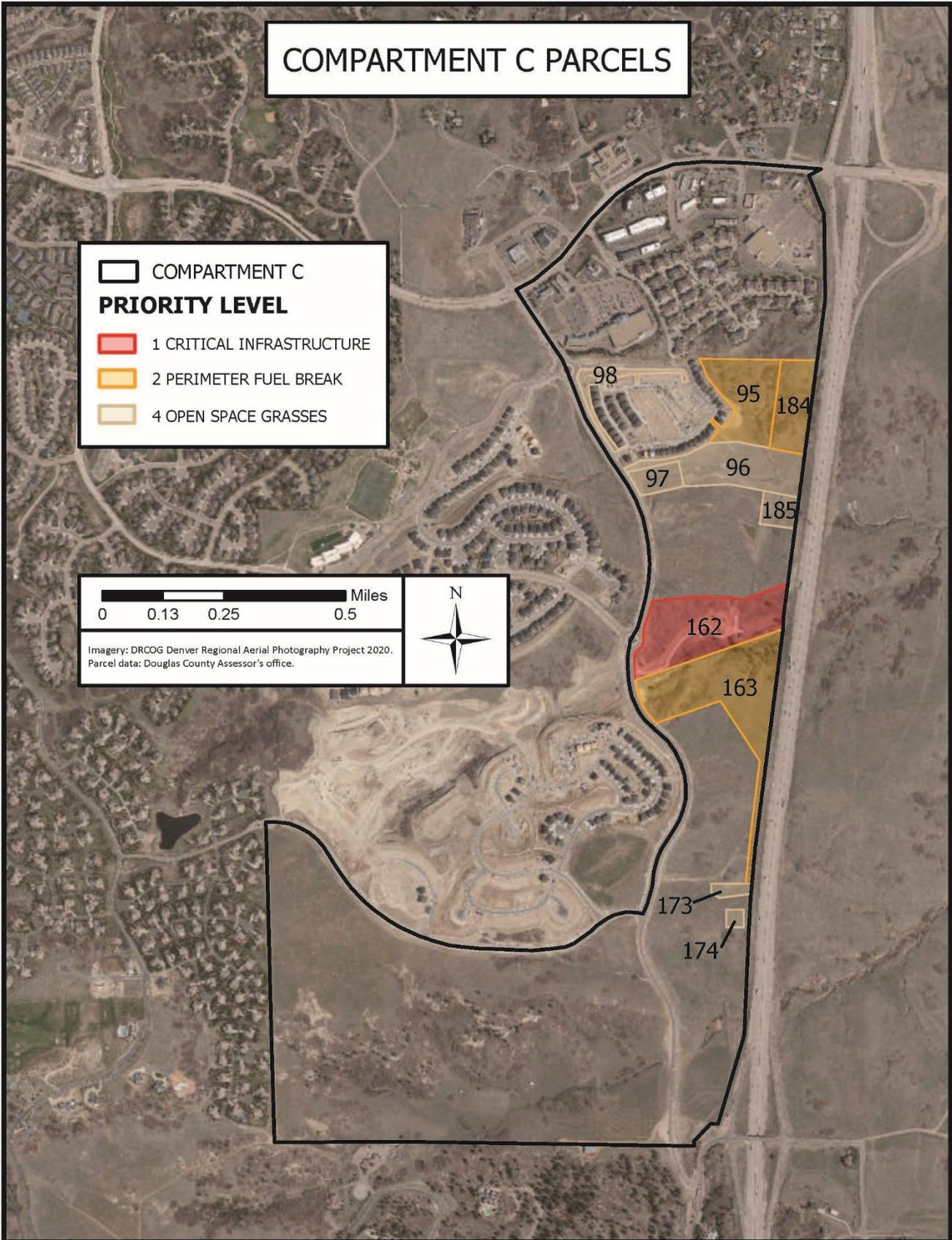


Figure 14. Compartment C Prioritization Map

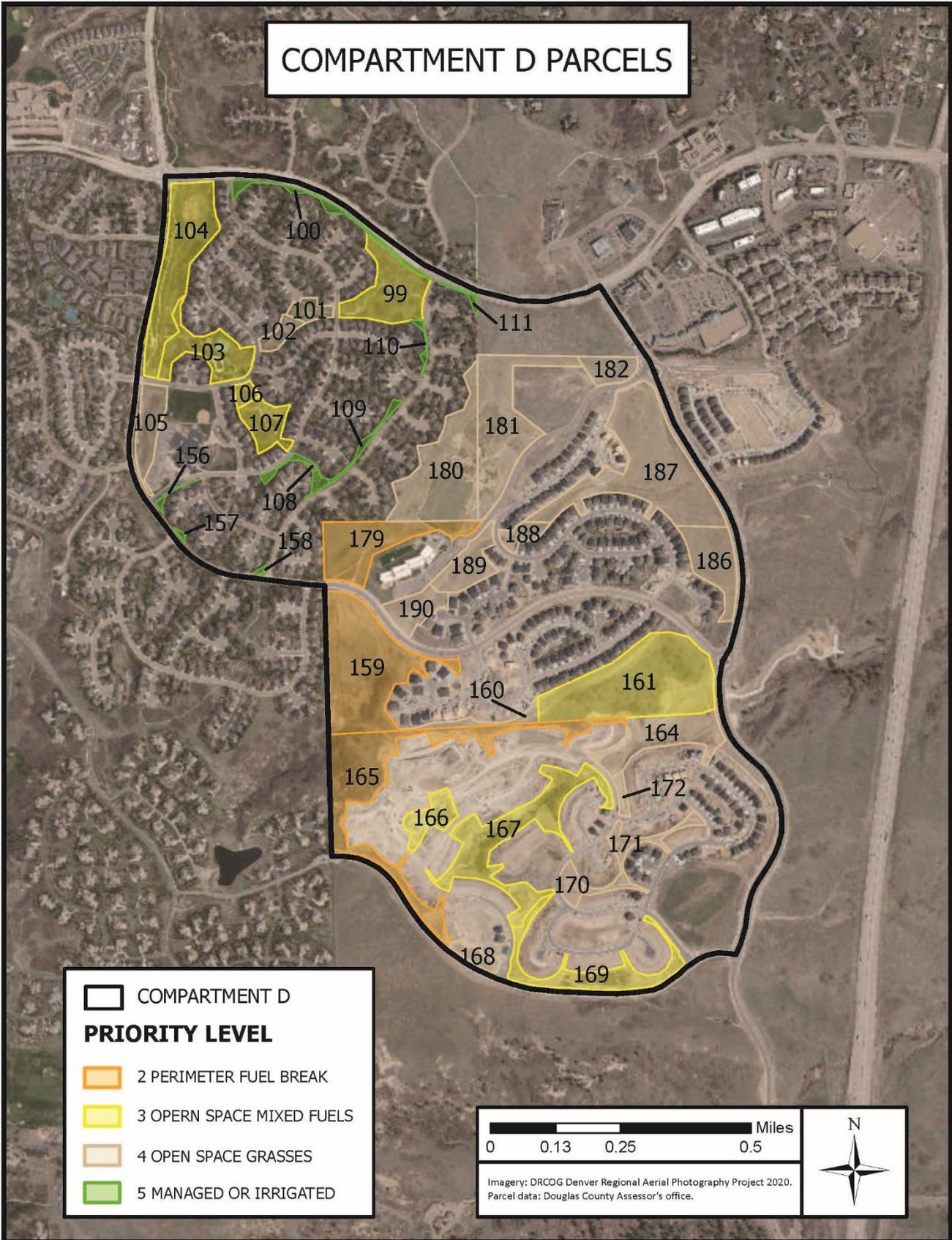


Figure 15. Compartment D Prioritization Map

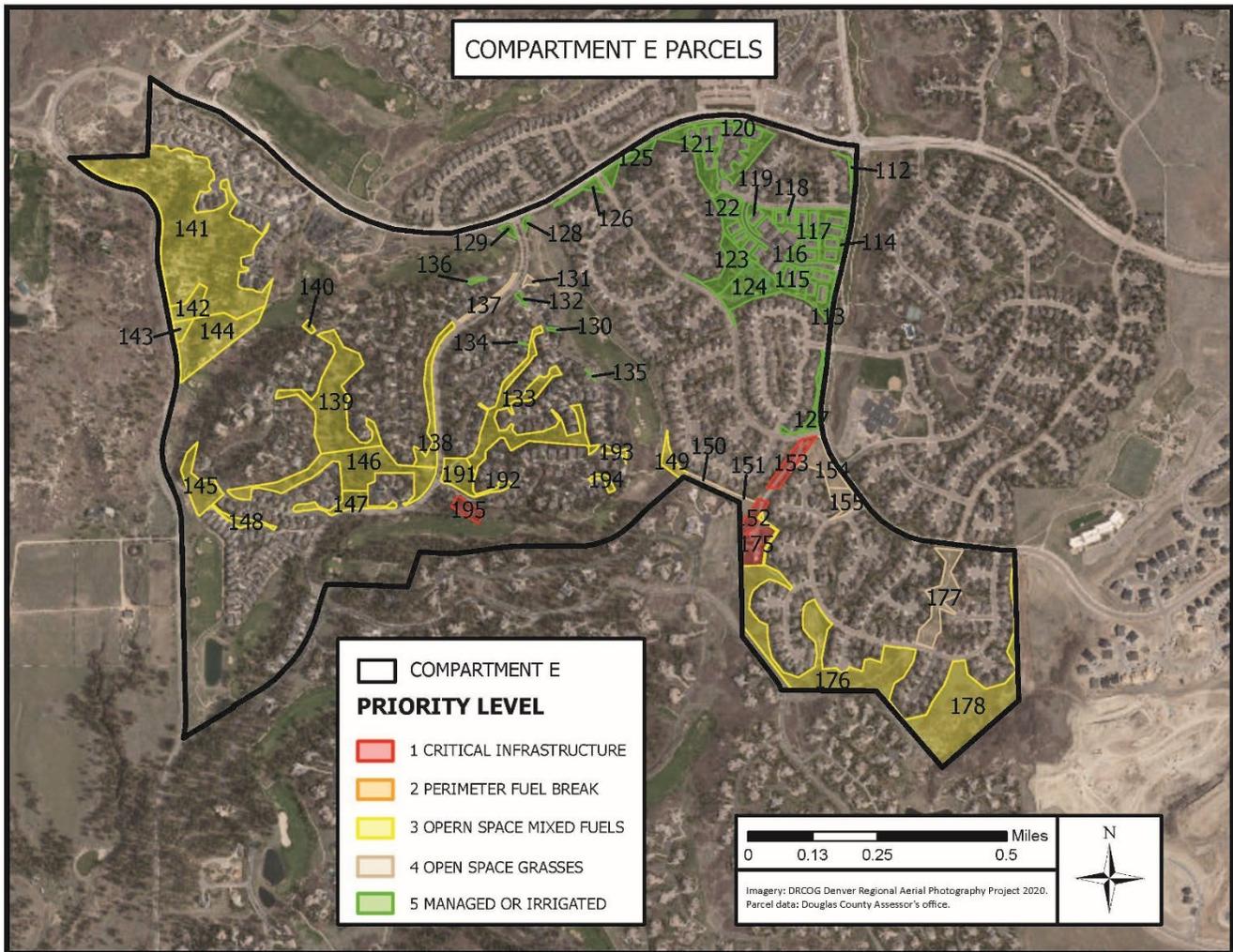


Figure 16. Compartment E Prioritization Map

FINAL CWPIP PHASES

Building upon the comprehensive risk assessments and priority evaluations, city staff developed a three-year phased plan for implementing the Community Wildfire Protection Implementation Plan (CWPIP). This phased approach strategically allocates resources and mitigation efforts across the identified high-risk open spaces, ensuring a cohesive and practical implementation strategy.

The final CWPIP is informed by the three established priorities: (1) protecting critical infrastructure, (2) implementing community perimeter fuel treatments, and (3) addressing open spaces with mixed and heavy fuel loads. Leveraging these priorities, the phased plan aligns the mitigation work with the City's current and projected annual budgets, utilizing the current state-average cost estimate of \$1,700 per acre for mechanical mitigation efforts.

Year 1 of the phased plan focuses on addressing Priority 1, safeguarding parcels housing critical infrastructure from potential wildfire threats. Additionally, select properties initially categorized as Priority 2 (community perimeter fuel treatments) have been strategically incorporated into Year 1's scope, capitalizing on available budgetary resources.

Year 2 concentrates on the remaining Priority 2 open spaces, prioritizing the implementation of perimeter fuel treatments to create defensible buffers around the community. This phase aims to establish a robust line of defense against encroaching wildfires.

Year 3 tackles Priority 3, targeting open spaces with mixed and heavy fuel loads. Implementing fuel reduction measures in these areas will significantly mitigate the risk of high-intensity fires and enhance the overall fire resilience of the community.

The final CWPIP, illustrated in *Figure 17*, represents a comprehensive and fiscally responsible approach to wildfire mitigation in the City of Castle Pines.

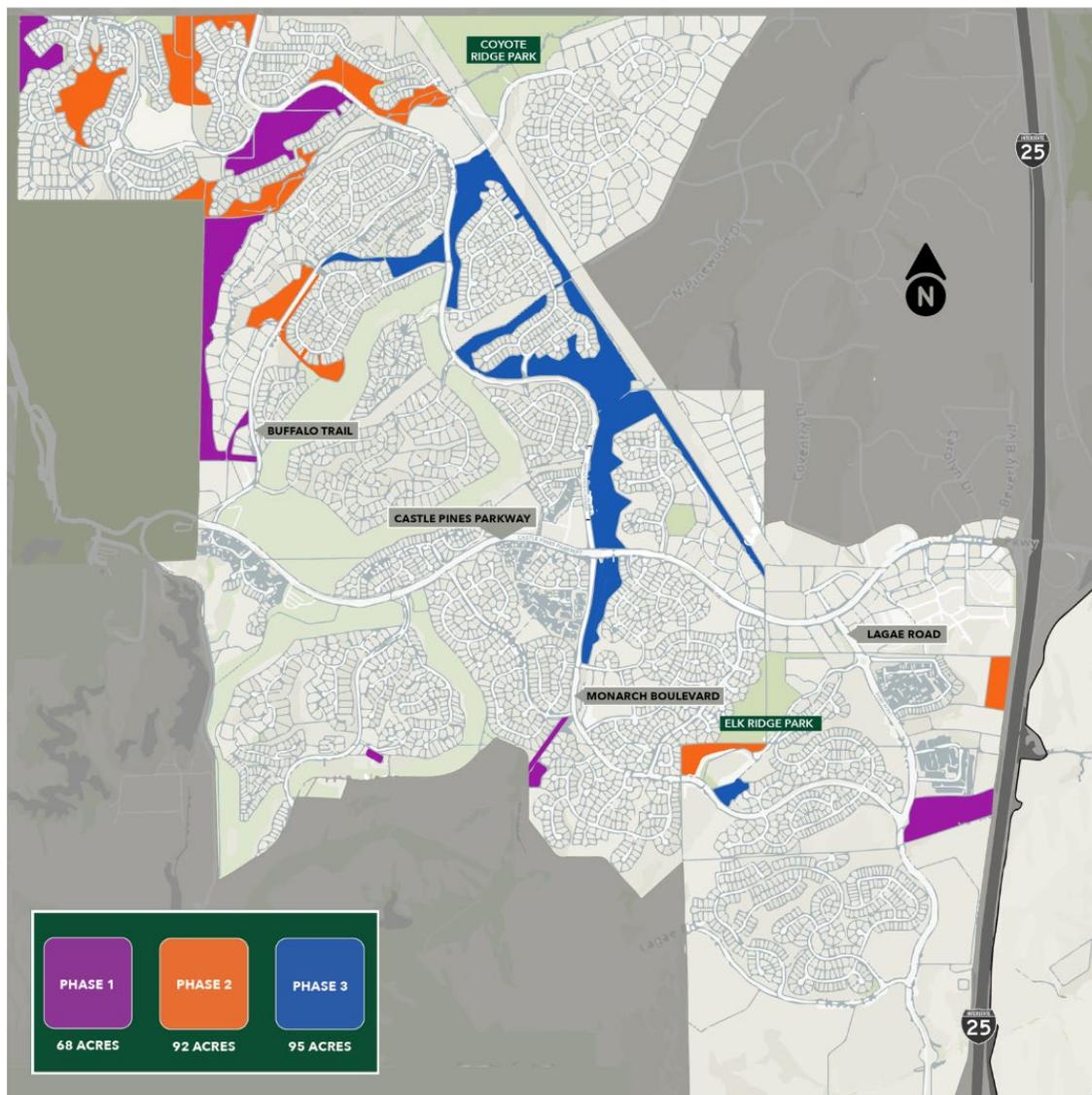


Figure 17. Final Community Wildfire Protection Implementation Plan

PRESCRIPTIONS FOR WILDFIRE HAZARD REDUCTION

The Home Ignition Zone

Modification of vegetation around a structure to reduce fire intensity is called defensible space. The term “[home ignition zone](#)” (HIZ) is defined as a structure and the surrounding vegetation. A structure’s vulnerability to wildfire depends on the surrounding vegetation, including landscaping, and the structure itself.

Thinning around homes is different than thinning for fuel breaks. Thinning in the HIZ is designed to protect structures from the heat of wildfires. Defensible space includes both thinning around structures to reduce the heat from burning vegetation and reducing combustibility of the structures to protect them from wind borne embers, radiation and convective heat.

More information is available at the Colorado State Forest Service (CSFS) website:
www.csfs.colostate.edu

The Colorado State Forest Service Home Ignition Zone guideline is included as Appendix H. It can also be viewed directly on the CSFS website.

https://csfs.colostate.edu/media/sites/22/2021/04/2021_CSFS_HIZGuide_Web.pdf

Gambel Oak Plant Characteristics

The Gambel oak, also known as scrub oak or oak brush, found in the City can best be described as decadent and declining. Extended drought and late spring freezes have caused significant dieback and mortality. In some areas, the oak has begun to take on a negative aesthetic value. When managing Gambel oak wildfire behavior, it is important to know a few facts:

- Shrub clumps are not only oak. These clumps are a plant community that often contains other plant species such as chokecherry, mountain mahogany, three-leaf sumac, hawthorn, snowberry, currant, wild rose, poison ivy, wildflowers, grasses and noxious weeds.
- Gambel oak is a “fire adapted” plant that resprouts quickly after wildfire. In the case of mechanical mitigation, such as mastication, similar 12” to 18” sprouting will appear the next growing season.
- Life expectancy for oak stems is unknown, though it is rare to find them over 100 years of age. Wildfire suppression practices over the past 100+ years have prevented the natural renewal of oak woodlands.

- Currently, the wildlife value of the maturing oak plant community is considered very low. Other than “cover” or “edge”, it has little or no food value for foragers like deer. While some bird species may utilize it, the lack of plant diversity has resulted in a net loss of species diversity.¹⁰
- Mature, large stems of oak are susceptible to storm breakage due to internal rot and decay during wet snow events. Once the integrity of the oak clump is damaged, a rapid acceleration of breakage will occur.
- Gambel oak is a “high hazard” fuel that can move rapidly as a “crown fire” if pushed by high winds. The fuel volume, in its current arrangements, will also produce extreme heat and embers.
- The dead and dying fuel volume in oak clumps is now more than 50% based on wildfire mitigation treatments done by the author in comparable oak clumps across Douglas County.
- Top kill caused by drought and late spring freezes, sometimes referred to as “stag-heading”, is an early indicator of overall clump health showing decline. It is evident throughout the open spaces.

The panoramic photo (*Figure 18*) compilation below shows Gambel oak in 1871 (W. H. Jackson, USGS) and photo point re-creation done in 2010 (R. Johnson). The height of the oak in 1871 can be estimated by using the horse and rider in the middle photo as a comparison. The 2010 comparison shows an unnatural level of fuel volume due to suppression of natural fires that burned in cycles ranging from 8 to 30 years. In many areas, rangelands have been overtaken by Gambel oak and conifers.



Figure 18.
 “Valley of Bagdad” in “Pleasant Park” (Perry Park)
 Top Panorama- 1871, W. H. Jackson. Lower- 2010 by R. Johnson

¹⁰ Source: Keith Worley's personal conversation with Dave Weber, a former avian specialist with CDOW.

The post-fire photos in *Figure 19* and *Figure 20* were taken after the “2003 Cherokee Fire” that burned from US Highway 85, across the Denver Mountain Park property, to the western boundary of Daniels Gate in Castle Pine. The photo points were revisited in 2010 and show how quickly Gambel oak grows back after the above-ground plants are killed by wildfire. All that remains to indicate a wildfire occurred are the dead stems above the oak clump. In this instance, 12 to 15 feet tall oak had been replaced by 5 to 7 feet tall oak in just seven years.



Figure 19. Post-fire photo from the Daniels Park Overlook to the west. (K. Worley)



Figure 20. Photo Point Re-creation in 2010 of view to the west. (K. Worley)

Prescriptions for Gambel Oak

Due to Gambel oak's ability to be renewed by wildfire, mechanical treatment of continuous areas of oak will be the most cost-effective and least intrusive treatment method. In this case, machinery can replicate the post-fire response of rejuvenation without the risk to surrounding structures. This process is called mastication. Objectives are:

- Interrupt the horizontal and vertical arrangement of fuels.
- Eliminate continuous oak canopies in residential areas and open spaces, thereby reducing uncontrollable crown fire potential.
- Clear oak at least 30 feet from rear property lines and structures to reduce flame and heat impingement on private properties and critical infrastructure.
- Restore diversity to an unnatural and decadent ecosystem.
- Allow the healthiest oak clumps to be retained in open spaces.
- Where clumps are retained to maintain privacy or screening, ladder fuels will need to be removed and maintained regularly. This mitigation technique is costly and should be limited to high priority areas.
- In areas abutting critical infrastructure or residences, resprouted oak should be mowed every three to five years to interrupt the fire path leading to the structures.
- Shrub clump spacing should follow guidelines per [CSU Publication 6.311, Managing Gambel Oak](#).

Appendix B lists additional specifications for Gambel Oak treatment.

Figure 21 and *Figure 22* demonstrate before and after treatments following the Colorado State guidelines, in the City of Castle Pines. This project was completed in 2023 at Daniels Gate Road and Griggs Road.



Figure 21. Tract M-1 Romar West 1st Amendment "After" Photo



Figure 22. Tract M-1 Romar West 1st Amendment "Before" Photo

In areas with a ponderosa pine overstory, shrub clump spacing guidelines should be followed. In addition, all oak should be cleared from under pines at least ten feet from the dripline¹¹ to manage wildfire exposure of maturing conifers. *Figure 23* and *Figure 24* show before and after treatments in a mixed oak/conifer forest.



Figure 23. Before Photo of Dense Oak Under and Around Conifers



Figure 24. After Photo of Mastication Done to Prevent Loss of Pines

Appendix F provides additional photo examples of oak treatments following the state guidelines.

¹¹ outermost reach of lower branches away from the tree trunk

Several communities have used goats for fuel treatments. While goats can be effective, re-grazing is required for multiple years and must be repeated at least every three years after initial treatment. Goats are not able to remove the larger fuels and high volumes of dead material. While it may be an organic approach to wildfire mitigation, it is very expensive and not currently included in the recommendations due to the large-scale nature of the work necessary to manage wildfire risks in the City.

Demonstration of Treatment Effectiveness

The following photo (*Figure 25*) was taken after the 2012 Waldo Canyon Fire in the Mountain Shadows neighborhood. Approximately 346 homes were lost in the fire. The home shown completed Gambel oak treatments done by the residents or their contractors prior to the fire. Spot fires started in the prairie fuels below the residences and burned uphill toward the homes.

However, due to the work conducted, the fire stopped at the landscaped area or retaining walls above with no intervention of the fire services. The grass fuels burned under the oak clumps, scorched their leaves, but stayed on the ground until it hit the zone of low combustibility created by the owners. The work completed likely saved the home from fire damage or destruction like many others in the area.



Figure 25. Post-fire Photo, Waldo Canyon Fire. Wildfire Behavior Modification in Heavy Gambel Oak Fuels.

SUMMARY OF FINDINGS

The intent of wildfire mitigation is the protection of life, property, and natural resources. Gambel oak treatments are recommended in this plan in that order of priority. Protection of lives will typically involve escape routes during an evacuation. Properties are considered secondary, with critical infrastructure being of the greatest importance.

Escape Routes

Road intersections will be critical during a wildfire for:

- Safe egress of residents during evacuation.
- Residents may be required to wait at intersections temporarily while evacuation is staged from areas of greatest wildfire threat.
- Safe ingress of emergency services.
- Staging of fire apparatus and other equipment
- Safe staging by law enforcement personnel who may be directing traffic.

Overall, most of the main escape routes in the City have sufficiently maintained road widths that will allow for safe evacuation. In most cases, the community open spaces that may impact evacuation are within private open spaces and are dependent on the actions of the HOAs to manage their fuel loading.

Critical Infrastructure

Water and sewer facilities are at greatest risk of loss due to Gambel oak fuels. Most of the sewer lift stations are in good condition and will require minimal treatment. The water treatment plant is the one exception. It is surrounded by dense oak on its southern and eastern boundaries. If damaged, this facility will be costly to replace and may create secondary health and safety impacts on the community.

Other utilities are typically underground and at low risk of damage or loss. However, many of the water and sewer facilities are dependent on above-ground transformers close to Gambel oak zones. These are high on the list for treatment.

Residential Areas

Open spaces with heavy concentrations of Gambel oak that abut neighborhoods are found throughout the City. As currently proposed, two programs will be implemented. The first is management of grass/prairie fuels within 30 feet of lot lines. The second is management of heavy concentrations of continuous Gambel oak. One of the challenges will be deciding where to start. The following are factors to consider.

1. Is the neighborhood or HOA actively engaged in fuel treatments on its open spaces? If so, these should be the abutting City/CPNMD properties selected to tie into their ongoing efforts.

2. Has the HOA organized to begin treatments but may not have the resources to implement these yet? These areas may rank higher and qualify for grant assistance based on planned City projects.
3. Will treatment of the City open space be effective if the HOA does not concurrently plan to treat its open spaces? In some areas, the City property is only a small portion of the larger “body of fuel” owned by the HOA.
4. In some neighborhoods, individuals have taken significant actions independent of their HOA. Are enough neighbors working together to justify City action?

Wherever possible, the City should utilize its limited resources in areas that have demonstrated both awareness and accountability for fuel management as a shared responsibility.

Trail System Fuel Management

The current trail system should be utilized as a potential fire containment tool. These same paths may provide safer firefighter access. Both natural surface and paved trails should be considered “preconstructed fire lines.” Specific treatments for trails are outlined in Appendix D:

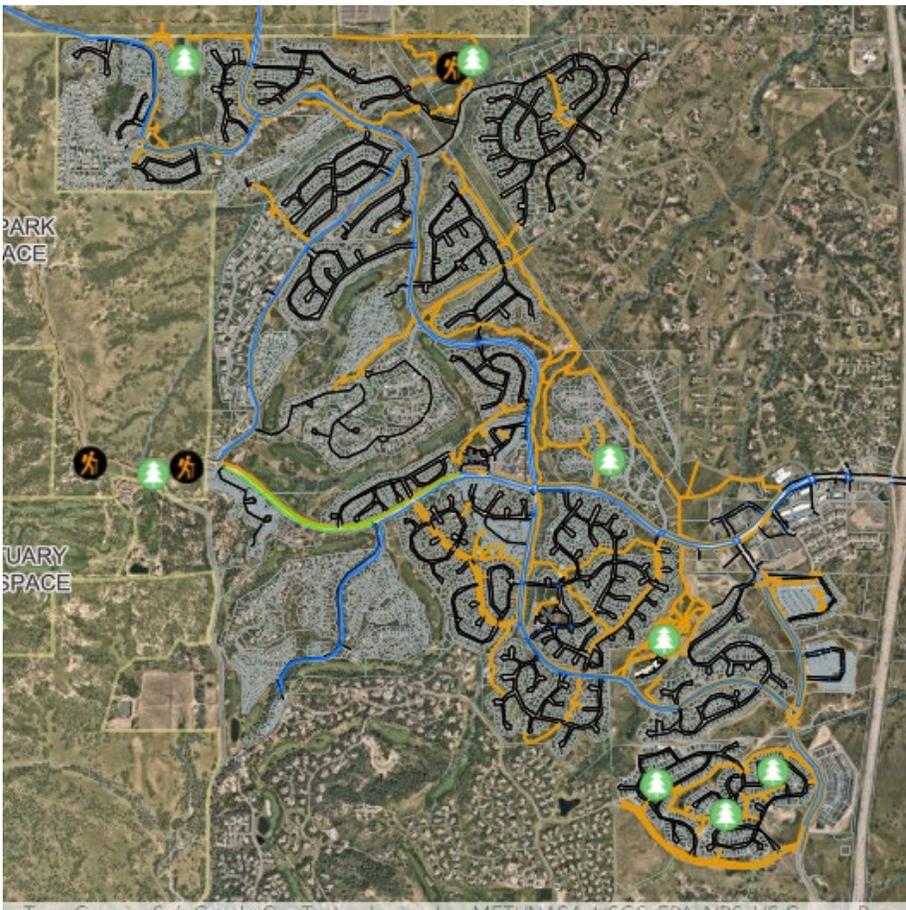


Figure 26. Trails and Pathways in the City

Property Line Fuel Management

To assist homeowners with the creation of their defensible spaces, a fuel management zone, generally 30 feet wide for prairie fuels, should be created in the open spaces abutting residential properties. The fuel management in this zone will also increase firefighter safety and effectiveness. In areas with heavy fuels, such as Gambel oak, this zone should be treated following shaded fuel break guidelines.

RESPONSIBILITY OF THE COMMUNITY

Fostering a fire-adapted community requires a shared commitment from both the City of Castle Pines and its residents. Wildfire mitigation efforts cannot be effective without active participation from all stakeholders. This section outlines the critical roles and responsibilities that the City and individual property owners must embrace to collectively enhance the community's wildfire resilience and preparedness.

City of Castle Pines

The City Council and Staff are responsible for all City lands and infrastructure. They can also set a good example for City residents. The following list summarizes general recommendations to continue to enhance the safety of the community.

- Maintain all City parks and open spaces in a “fire-adapted” condition.
- Implement defensible spaces and structural hardening on all City or CPNMD-owned water and sewer infrastructure.
- Adopt wildfire mitigation regulations for all new development and construction.
- Coordinate with abutting public agencies for implementation of joint fuel treatment projects.
- Coordinate with private landowners, both in and abutting the City, to implement mutually beneficial fuel treatments and forest restoration projects. This may include the following property owners:
 - The Ridge Golf Course
 - Sanctuary Golf Course
 - Castle Pines Village Homeowners Association
- Include wildfire mitigation and maintenance as an annual line item in the City budget.
- Have an annual inspection of all City infrastructure and facilities to identify any mitigation needs.
- Conduct annual “Clean Up Days” to promote wildfire mitigation, noxious weed control, and junk removal.

- Continue to promote **Code Red** and **Access and Functional Needs Registry** with an ultimate goal of 100% participation by City residents.
- Conduct wildfire education opportunities for existing residents and organizations.

Many of the recommendations outlined can be integrated into existing municipal operations and processes. However, some initiatives may necessitate additional financial resources to ensure their effective implementation. To comprehensively address these critical wildfire mitigation measures, the City should establish a goal to fulfill all the identified responsibilities within the next five years. This targeted timeline underscores the urgency and commitment required to enhance the community's overall wildfire resilience and preparedness.

Resident Responsibilities

Residents of Castle Pines also play a pivotal role in collectively safeguarding the community against the threat of wildfires. The occurrence of multiple large-scale fires in the region, such as the 2022 Marshal Fire, serves as a reminder of the devastating impacts these events can have on homes and neighborhoods. It is crucial for residents to recognize that proactive measures are essential to mitigate risks and enhance overall preparedness. The following list summarizes general recommendations residents can follow to enhance the safety of their home and the community.

- Wildfire mitigation of a home is the responsibility of the property owner.
- Secondary responsibility falls on neighbors who must work together to manage their collective wildfire risks. Property owners who do not mitigate their fuels place their neighbors' lives, homes, and forests at risk.
- Thinning and pruning of trees and shrubs to provide good spacing between individual or groups of trees and brush, and pruning dead and lower branches reduces wildfire risk as well as improves forest health, vigor, growth, and aesthetic value.
- All structures constructed in wildfire-prone environments must be hardened against ember ignitions and flames. This will be critical to maintaining access to affordable homeowner insurance.
- Property owners have a responsibility to create a safe working environment for firefighters defending their homes during a wildfire event. While firefighters will make every effort to protect all residences, homeowners should recognize that failing to take proper mitigation measures on their properties may jeopardize the safety of firefighting personnel and the protection of surrounding mitigated homes.
- Structure protection by firefighters during an incident is not guaranteed.
- Property owners must learn that traditional firefighting resources are based on one house on fire at one time. Wildfires, especially with extreme burning conditions, place hundreds of homes at risk at one time.

CRITICAL LESSONS LEARNED

Historically significant fires, such as the Waldo Canyon, Black Forest, and Marshal Fires, have provided critical lessons on how wildfire-prone communities can improve. Some of these lessons include the following:

- Defensible spaces are critical for ensuring firefighter safety and effectiveness.
- Defensible spaces and Home Ignition Zones can be overwhelmed by wildfire from adjoining properties.
- Where wildland fuels have been treated, tree losses and resource damage are significantly reduced.
- Fire is an ecological process. Fire adapted communities are more resilient and result in reduced risks.
- Structural hardening to prevent ember ignitions is just as important, if not more important, as treatment of surrounding native fuels.
- Unregulated construction in areas prone to extreme wildfire behavior will continue to result in similar disasters.

CONCLUSION

This Community Wildfire Protection Implementation Plan serves as a comprehensive guide to help the City of Castle Pines and its residents reduce the risk of catastrophic losses from wildfire events. It is important to recognize that this plan is a living document, designed to allow for flexibility and adaptive management as new scientific insights and technological advancements emerge. Adjustments and updates can be adopted without the need for extensive plan modifications, as long as the core intent and objectives of the Douglas County Community Wildfire Protection Plan and this City CWPIP are met.

Castle Pines is a unique community that offers a distinctive living environment, characterized by a blend of forested areas and open prairies. However, it is crucial to acknowledge that wildfires are an inevitable part of the natural ecosystem dynamics in this region, particularly within the Ponderosa Pine, mixed-conifer, Gambel oak, and prairie landscapes. The question is not if wildfires will occur, but when they will occur. Effective wildfire risk management requires a united and resolute community effort, with responsibility starting at the individual property owner level and supported by comprehensive, community-wide mitigation initiatives.

By embracing the strategies outlined in this plan and fostering a culture of shared stewardship, the City of Castle Pines can enhance its resilience and better safeguard its residents, properties, and natural resources from the ever-present threat of catastrophic wildfires.

APPENDIX A

Full Prioritization of Open Space Parcels

Priorities:	1 = Critical Infrastructure (red). 2 = Community perimeter fuel treatments (orange). 3 = Open space mixed and heavy fuels abutting residences (yellow)
When fuels are not specified, assume grass, prairie, or maintained open space.	
Fuel Types: G = Grasses/Prairie. S = Shrub, Gambel Oak. R = Riparian. F = Forest/oak mix	
Mixed Fuels = mix of grasses and shrubs and Gambel oak. Heavy Fuels = Dense Gambel oak and/or conifer mix.	

Map #	ACCOUNT	LEGAL DESCRIPTION	TOTAL ACRES	Priority	Fuel	Land Use
175	R0349783	TR IN NE1/4NW1/4 9-7-67 1.489 AM/L	1.489	1	S	Water Treatment
21	R0425487	MOST TRACT E CASTLE PINES NORTH #27 13.455 AM/L	13.455	1	G, S	Weils and Electric
152	R0403916	PART TRACT N CASTLE PINES NORTH #21 0.562 AM/L	0.56	1	G	WTP Access
195	R0365597	TR IN NE1/4NE1/4 8-7-67 0.574 AM/L (WELL SITE)	0.574	1	G, S, F	Weils and Electric
153	R0403918	MOST OF TRACT N CASTLE PINES NORTH #21 .853 AM/L	0.85	1	G	WTP Access
162	R0498225	TRACT W-1 LAGAE RANCH 1 1ST AMD 13.088 AM/L	13.088	1	G, S	Sewer Lift Sta.
31	R0436707	TRACT H2 CASTLE PINES NORTH FILING #27 3RD AMD TOTAL ACREAGE .166 AM/L	0.166	1	G,	LIFT STA
1	R0441647	TRACT J1-A ROMAR WEST 2ND AMENDMENT 7.973 AM/L	7.973	2	G, S	Perimeter SFB
15	R0424739	TRACT C ROMAR WEST 2.095 AM/L	2.095	2	G, S	Perimeter SFB
52	R0425559	TRACT AA CASTLE PINES NORTH #27 10.139 AM/L	10.139	2	G, S	Perimeter SFB

Map #	ACCOUNT	LEGAL DESCRIPTION	TOTAL ACRES	Priority	Fuel	Land Use
58	R0431628	TRACT N1 CASTLE PINES NORTH FILING 27 AMENDMENT 2 TOTAL ACREAGE 6.110 AM/L	6.11	2	S	Roadway, heavy fuels
60	R0425515	TRACT K CASTLE PINES NORTH #27 21.884 AM/L	21.884	2	G, S	Perimeter SFB
95	R0499653	TRACT F LAGAE RANCH 1 2ND AMD 7.932 AM/L	7.932	2	S, G	Perimeter SFB
159	R0478476	TRACT D LAGAE RANCH 1 13.161 AM/L	13.161	2	S, G	Mixed Fuels
163	R0496706	TRACT J CASTLE PINES TOWN CENTER 2 15.978 AM/L	15.978	2	G, S	Facilities
165	R0611823	TRACT A CASTLE PINES TOWN CENTER 1 11.654 AM/L	11.654	2	S, G	Perimeter SFB
179	R0478455	PART TRACT A LAGAE RANCH 1 6.585 AM/L MTD 0478440 (ELK RIDGE PARK)	6.585	2	S, G	Perimeter SFB
184	R0478444	TRACT S LAGAE RANCH 1 5.294 AM/L	5.294	2	S, G	Perimeter SFB
86	R0335684	TR IN SE1/4 33-6-67. 0.5125 AM/L 621-83	0.513	2	G,	LIFT STA
5	R0441646	TRACT H1-A ROMAR WEST 2ND AMENDMENT 12.10	12.1	3	S	Heavy Fuels
12	R0439335	TRACT M-1 ROMAR WEST 1ST AMENDMENT 19.370 AM/L	19.37	3	S	Heavy Fuels
22	R0425485	PT TRACT E CASTLE PINES NORTH #27 4.603 AM/L MTD #0425487	4.603	3	G, S	Heavy Fuels
25	R0436706	PART OF TRACT F1 CASTLE PINES NORTH FILING #27 3RD AMD TOTAL ACREAGE 2.592 AM/L	2.592	3	G, S	Heavy Fuels
26	R0436705	MOST OF TRACT F1 CASTLE PINES NORTH FILING #27 3RD AMD TOTAL ACREAGE 8.918 AM/L	8.918	3	G, S	Heavy Fuels
27	R0436708	TRACT CC1 CASTLE PINES NORTH FILING #27 3RD AMD TOTAL ACREAGE 2.019 AM/L	2.019	3	G, S	Heavy Fuels
47	R0419194	TRACT A CASTLE PINES NORTH #24 4.980 AM/L	4.98	3	G, S	Heavy Fuels
49	R0419198	TRACT D CASTLE PINES NORTH #24 1.550 AM/L	1.55	3	G, S	Heavy Fuels
50	R0425563	TRACT DD CASTLE PINES NORTH #27 5.222 AM/L	5.222	3	G, S	Heavy Fuels
61	R0455029	TRACT W1 CASTLE PINES NORTH 27 6TH AMD 2.206	2.206	3	S	Heavy Fuels
64	R0419199	TRACT E CASTLE PINES NORTH #24 4.020 AM/L	4.02	3	S	Heavy Fuels
73	R0399924	TRACT A (OPEN SPACE) CASTLE PINES NORTH #17A.	20.8829	3	S, G	Facilities, Wells,
74	R0399925	TRACT B (OPEN SPACE) CASTLE PINES NORTH #17A.	9.232	3	G, S	Mixed Fuels

Map #	ACCOUNT	LEGAL DESCRIPTION	TOTAL ACRES	Priority	Fuel	Land Use
87	R0372328	TRACT 5 CASTLE PINES NORTH PHASE I 28.83 AM/L	28.83	3	S	Abuts Retreat OS,
16	R0425478	TRACT A CASTLE PINES NORTH #27 9.630 AM/L	9.63	3	S	Heavy Fuels
104	R0349353	PT OF THE E1/2 4-7-67 LYING W OF CASTLE PINES	8.37	3	G, S, R	Mixed Fuels
45	R0421542	TRACT C CASTLE PINES NORTH #16 19.034 AM/L	19.034	3	G, S, R	Mixed Fuels
161	R0498235	TRACT F-1 LAGAE RANCH 1 1ST AMD 14.463 AM/L	14.463	3	G, S	Mixed Fuels
167	R0603573	TRACT B CASTLE PINES TOWN CENTER 1 9.352 AM/L	9.352	3	S, G	Mixed Fuels
51	R0424577	TRACT D CASTLE PINES NORTH #14 3.010 AM/L	3.01	3	G, S	Heavy Fuels
75	R0346487	TRACT E CASTLE PINES NORTH PARCEL R-13 SUB 6.63	6.63	3	G, S	Trail Corridor
3	R0439387	TRACT S1 ROMAR WEST 1ST AMENDMENT 1.183 AM/L	1.183	3	G, S	
11	R0424759	TRACT R ROMAR WEST 3.389 AM/L	3.389	3	S, G	
20	R0425492	PT TRACT E CASTLE PINES NORTH #27 1.359 AM/L MTD	1.359	3	S, G	ROW
57	R0425517	TRACT L CASTLE PINES NORTH #27 1.134 AM/L	1.134	3	S, G	Trail Corridor
59	R0431624	TRACT M1 CASTLE PINES NORTH FILING 27 AMENDMENT 2 TOTAL ACREAGE 0.400 AM/L	0.4	3	S, G	ENTRY
83	R0399977	TRACT C (OPEN SPACE) CASTLE PINES NORTH #18A. 1.478 AM/L	1.478	3	S, G	
85	R0399965	TRACT A (OPEN SPACE) CASTLE PINES NORTH #18A. 1.980 AM/L	1.98	3	S, G	Trail Corridor
142	R0428950	TRACT J CASTLE PINES NORTH FILING 28 TOTAL ACREAGE 1.091 AM/L	1.091	3	S, G	
169	R0496824	TRACT A CASTLE PINES TOWN CENTER 2 4.824 AM/L	4.824	3	S, G	ROW
166	R0603481	TRACT C CASTLE PINES TOWN CENTER 1 2.160 AM/L	2.16	3	S, G	Trail Corridor
9	R0424751	TRACT K ROMAR WEST 0.710 AM/L	0.71	4	G,	ROW
10	R0439336	TRACT L-1 ROMAR WEST 1ST AMENDMENT 3.194 AM/L	3.194	4	G, S	PARK
23	R0425564	TRACT EE CASTLE PINES NORTH #27 1.044 AM/L	1.044	4	G, .	

Map #	ACCOUNT	LEGAL DESCRIPTION	TOTAL ACRES	Priority	Fuel	Land Use
24	R0425479	MOST OF TRACT B CASTLE PINES NORTH #27 12.324 AM/L MTD #0425480	12.325	4	G, .	
32	R0436710	TRACT H1 CASTLE PINES NORTH FILING #27 3RD AMD	0.282	4	G,	ROW
35	R0436985	TRACT G-1 GREEN VALLEY FILING 1B AMENDMENT 1	6.15	4	G, B	PARK
46	R0421122	TRACT B CASTLE PINES NORTH #15B 2.048 AM/L	2.048	4	G, .	ROW
48	R0424575	TRACT B CASTLE PINES NORTH #14 2.490 AM/L	2.49	4	G, .	ROW
53	R0417474	TRACT B CASTLE PINES NORTH #15A 0.130 AM/L	0.13	4	G, .	ROW
56	R0419196	TRACT B CASTLE PINES NORTH #24 0.270 AM/L	0.27	4	S, G	ENTRY
70	R0421539	TRACT A CASTLE PINES NORTH #16 7.357 AM/L	7.357	4	G, .	
72	R0411209	TR IN SE1/4 33-6-67 1.17 AM/L	1.17	4	G,	
81	R0399978	TRACT D (OPEN SPACE) CASTLE PINES NORTH #18A.	1.419	4	G, .	ROW
82	R0399979	TRACT E (OPEN SPACE) CASTLE PINES NORTH #18A. 1.973 AM/L	1.973	4	G, .	ROW
84	R0399970	TRACT B (OPEN SPACE) CASTLE PINES NORTH #18A. 0.917 AM/L 1	0.9169	4	G, .	Trail Corridor
89	R0364664	TRACT 3 CASTLE PINES NORTH PHASE #1 3.82 AM/L	3.82	4	G,	PARK
90	R0417218	LOT 3 CASTLE PINES NORTH PHASE I 2ND REPLAT OF A	1.65	4	G	ROW
91	R0328930	TRACT J CHARTER OAKS AMENDED 10.5312 AM/L	10.531	4	G,	
92	R0455002	TR IN N1/2S1/2 3-7-67 4.304 AM/L	4.304	4	G, S	
93	R0332994	LOT 2 CASTLE PINES NORTH PHASE 1 2ND REPLAT OF A PORTION OF TRACT 2 1.00 AM/L	1	4	G,	ROW
94	R0465016	TR IN NW1/4NW1/4SW1/4 3-7-67 4.697 AM/L AKA PART	4.697	4	G, N	
100	R0336408	TRACT B CASTLE PINES NORTH #6 0.98 AM/L	0.98	4	G, .	ROW
105	R0403914	TRACT L CASTLE PINES NORTH #21 2.669 AM/L	2.67	4	S, G	RIPARIAN
111	R0333043	TRACT L CASTLE PINES NORTH 1 0.280 AM/L	0.28	4	G, .	ROW

Map #	ACCOUNT	LEGAL DESCRIPTION	TOTAL ACRES	Priority	Fuel	Land Use
125	R0333283	TRACT E CASTLE PINES NORTH # 2 0.66 AM/L	0.66	4	G, .	ROW
126	R0333182	TRACT A CASTLE PINES NORTH #3 0.33 AM/L	0.33	4	S, G	ENTRY
190	R0498230	TRACT C-1 LAGAE RANCH 1 1ST AMD 2.361 AM/L	2.361	4	G,	
33	R0425480	PT TRACT B CASTLE PINES NORTH #27 3.513 AM/L MTD #0425479	3.513	4	S, G	
34	R0415879	TRACT A GREEN VALLEY #1B 34.420 AM/L	34.42	4	S, G	PARK
173	R0494886	TRACT IN NW1/4SE1/4 10-7-67 0.763 AM/L (DETENTION POND)	0.763	4	G, S	
28	R0436863	MOST OF TRACT G1 CASTLE PINES NORTH #27	10.44	4	G,	ROW
29	R0436862	PART OF TRACT G1 CASTLE PINES NORTH #27 AMENDMENT 3 33-6-67 TOTAL ACREAGE 0.700 AM/L	0.7	4	G,	
65	R0420558	TR IN NE1/4 5-7-67 0.336 AM/L (AKA BUFFALO TR ROW)	0.336	4	G,	ROW
96	R0607811	MOST TRACT T-2 LAGAE RANCH 1 3RD AMD 8.628 AM/L	8.628	4	G,	
97	R0478436	TRACT U LAGAE RANCH 1 2.015 AM/L	2.015	4	G, .	
160	R0478477	TRACT E LAGAE RANCH 1 1.134 AM/L	1.134	4	G, .	
164	R0496767	TRACT F CASTLE PINES TOWN CENTER 2 5.618 AM/L	5.618	4	G, .	
168	R0603502	TRACT D CASTLE PINES TOWN CENTER 1 1.022 AM/L	1.022	4	G, .	ROW
170	R0496854	TRACT B CASTLE PINES TOWN CENTER 2 1.002 AM/L	1.002	4	G, .	Trail Corridor
171	R0496725	TRACT C CASTLE PINES TOWN CENTER 2 2.105 AM/L	2.105	4	G, .	Trail Corridor
172	R0496766	TRACT E CASTLE PINES TOWN CENTER 2 0.547 AM/L	0.547	4	G, .	ROW
180	R0390094	TRACT F CASTLE PINES NORTH 1 10.556 AM/L (ELK RIDGE PARK)	10.556	4	G, .	

Map #	ACCOUNT	LEGAL DESCRIPTION	TOTAL ACRES	Priority	Fuel	Land Use
181	R0478440	MOST TRACT A LAGAE RANCH 1 9.415 AM/L MTD 0478455 (ELK RIDGE PARK)	9.415	4	G, .	PARK
182	R0498223	TRACT Q-1 LAGAE RANCH 1 1ST AMD 1.83 AM/L	1.83	4	G,	ROW
185	R0607812	PART TRACT T-2 LAGAE RANCH 1 3RD AMD 1.861 AM/L MTD 0607811	1.861	4	S, G	
186	R0498234	PART TRACT H-1 LAGAE RANCH 1 1ST AMD 4.195 AM/L MTD MTD R0498220 & R0498233	4.195	4	G,	
187	R0498220	PART TRACT H-1 LAGAE RANCH 1 1ST AMD 14.922 AM/L MTD R0498233 & R0498234	14.922	4	G,	ROW
188	R0498233	PART TRACT H-1 LAGAE RANCH 1 1ST AMD 1.164 AM/L MTD MTD R0498220 & R0498234	1.164	4	G,	
189	R0498231	PART TRACT B-1 LAGAE RANCH 1 1ST AMD 2.951 AM/L	2.951	4	G,	

APPENDIX B

Gambel Oak Treatment Specifications

The following are additional specifications for Gambel oak treatment:

Zone 1, within 30 feet of property lines:

1. Remove oak clumps wherever possible when oak clumps are present beyond 30 feet.
2. Preferred method of treatment is by use of skid-steer mounted mastication attachments. When properly masticated, no hard oak stubs (stumps) will be present, and the area will be drivable with rubber-tired maintenance equipment.
3. Cut materials should be processed by the masticator into mulch sized pieces no longer than 1 foot in length. All wood and leaf debris should be in contact with the ground surface.
4. If cut using chainsaws, all stumps should be lower than 2 inches high and cut flat to allow for future maintenance equipment access.
5. Any "duff" layer (natural humus layer comprised of decaying leaves) should be left in place. If it is determined by the project supervisor that too much organic matter is present, the top layer of loose leaves can be removed using a leaf blower. This will allow minimal disturbance to the duff layer.
6. If an oak clump is retained in this zone:
 - a. All ladder fuels should be removed from the clump understory. This includes overtopped live stems within the clump.
 - b. The duff layer is to be left in place.
 - c. The canopy of the clump is to be kept intact to retain complete shading of the ground surface.
 - d. Dead stems and dead upper branches or tops should be removed. However, if the remaining live trunk has evidence of significant internal decay that will not support future branch growth, the stem should be removed.
 - e. If more than 50% of the stems in the clump are dead, the clump should be considered for removal.
 - f. Oak stems around the perimeter of the clump that lean less than 60 degrees outward from vertical, should be treated as ladder fuels and removed.
 - g. Other shrub species, like chokecherry, currant, hawthorn, and snowberry, are typically present within oak clumps. These species are less combustible and can be retained within the clumps if all dead stems are removed and lower branches are pruned.
7. Clump management for wildfire hazard reduction can be summarized as removal of the dead, dying, diseased and deranged stems (aka the 4 Ds of Pruning):
 - a. Dead including tops and stems.
 - b. Dying includes overtopped stems that will die due to lack of sunlight.
 - c. Diseased includes areas with oak bullet gall, witches' broom or visible stem decay.
 - d. Deranged are the outer perimeter leaning stems less than 60 degrees vertical.
8. Semi-annual mowing of grasses should be done around any clumps retained in this zone.

Zone 2, within 75 feet of property lines:

1. Shrub clump spacing guidelines should begin in this zone and will apply to Gambel oak and mountain mahogany.
2. The mastication operator should be sufficiently skilled in identification of individual shrub clumps as individual plants.
3. Smaller oak clumps will typically be removed between larger sized clumps.
4. Utilize the naturally rounded clump edges to avoid straight lines when creating openings.

5. Oak clumps, greater than the 30 feet zone, should not typically need ladder fuel treatments. However, if significant dieback has occurred, these stems and tops can be removed from retained clumps and masticated or chipped. It should be noted this is more of an aesthetic issue than a fuel treatment issue.
6. Semi-annual mowing of grasses and other fine fuels should be done in this zone.

Zone 3, greater than 75 feet from property lines:

1. Implement shrub clump spacing guidelines aggressively.
2. Prioritize removal of drought killed clumps where possible.
3. Clump removal should appear as random as possible and avoid straight lines. If enough healthy oak clumps are present, these can be opened in a “layered” manner that limits visibility through the open space.
4. No mowing is required in this zone.

Maintenance of Gambel Oak Fuel Treatments

Gambel oak’s response to mastication is to resprout aggressively, like the oak regrowth that occurred after the Cherokee Fire. In effect, the mastication process can be considered “mechanical fire” that renews the oak plant community. It should be remembered, in addition to managing wildfire behavior, that diversity is being restored to a decadent and unnatural plant community. The follow guidelines are recommended depending on the zone and level of treatment.

All Zones

1. Re-treatment is recommended every three years. Resprouted oak is not as combustible as mature oak and allows for scheduling treatment areas on a three year rotation. If delayed beyond three years, treatment should occur, at a minimum, within five years of initial treatment.
2. Specialized mowing equipment may be required due to irregular and rough terrain. A skid-steer, with a heavy duty mower deck, is often required.
3. Climatic events will continue to have an impact on the health and aesthetics of Gambel oak.
 - a. Drought dieback- Remove dead stems, tops and clumps as part of the three year maintenance program in Zones 1 and 2. It should be remembered this is occurring in within a fuel treatment area that factors in both live and dead fuels. If horizontal and vertical fuel arrangements are maintained, no immediate action is required. If within Zone 3, only remove entire clumps that have died.
 - b. Snowstorm damage- Wet fall and spring snows will continue to damage mature, decaying stems. These can interrupt the horizontal and vertical fuel arrangement and should be cleaned up (removed) if in Zones 1 and 2. Cleanup should be done by mid-summer following the event. If in Zone 3, cleanup can occur as part of the three year retreatment.
 - c. Defoliating insects- Periodic outbreaks of defoliating insects occur given optimal spring conditions for their survival. Typically, defoliation occurs in the spring with minimal impact on the oak. Leaves resprout quickly and no action is required. While alarming, no pesticide controls are recommended. If within Zones 1 or 2, the abutting owner can provide supplemental watering to hasten leaf regrowth. NOTE: These outbreaks are a boon to bluebirds and robins during nesting season.
4. Noxious weed control- Treated areas will be prone to noxious weed invasion due to soil disturbance. Spot treatments may be required to keep these in check. Broadcast application of herbicides will not be possible due to their impacts on Gambel oak. If control is desired, the City and CPNMD qualify for biological control agents through the Colorado Department of Agriculture’s Palisade Insectary program.

Timing for Maintenance

Fall is usually the best time to re-mow Gambel oak for several reasons.

1. Sprouts (suckers) have completed their full seasonal growth and minimizes any late summer regrowth.
2. Fall mowing removes both leaves and stems that might carry fire given that "fire season" is now year round.
3. Gambel oak sprouts later in the spring after cool season grasses and wildflowers have already begun to grow. These plants can, over time, help suppress Gambel oak resprouting resulting in restoration of meadows and plant diversity. NOTE: This restoration process can be accelerated by two to three years of annual oak mowing.

APPENDIX C

Fine Fuels Management Plan

Grasses, Prairies, and Noxious Weeds

The City of Castle Pines (City) and Castle Pines North Metropolitan District (CPNMD) are situated in an ecological zone dominated by prairies with an intermix of brush and ponderosa pines. The dominant non-prairie fuel is Gambel oak. Grass areas tend to be locations where site disturbance occurred in the land development process and were re-seeded to stabilize soils. Unfortunately, many of these areas contain noxious weeds that can contribute to wildfire spread.

Typically, fine fuels will burn and move rapidly, especially if windy conditions exist. Flame impingement is very brief and can be measured in seconds before fuels are consumed. Flame lengths are usually 2 to 3 times the height of the fuels. Most structures are ignited by embers blown ahead of the fire front. In the case of fine fuels, ember life span will be brief. These are often referred to as “1-hour Fuels” that dry out by 10:00 to 12:00am the next day following rainstorms the day before. However, other plants within this fuel mix can generate embers capable of igniting landscape and structural fuels. Examples are yucca, noxious weeds, shrubs, and animal dung may generate embers with greater risk of ignition. These fuels are often referred to as “10-hour Fuels”.

NOTE: Annual mowing of open space prairie ecosystems beyond the fuel treatment zones described below is not normally necessary. However, extreme drought periods exacerbated by prior season fuel growth may affect this recommendation. An alternative is to widen the zones. Examples of prior season plant growth affecting the following fire season occurred in the Chadron, Nebraska and Bastrop County, Texas areas. The 2010 heavy precipitation caused lush and abundant fine fuel growth. In 2011, drought occurred resulting in extreme fire behavior due to the 2010 plant growth.

The following are recommendations to aid abutting owners manage their defensible spaces (D-space) and home ignition zones (HIZ).

Fine Fuel Management Zone 1

Thirty Feet (30') Mowed Buffer at Rear Lot Lines and Fence lines.

Where City and CPNMD open spaces abut private lots, a 30' wide fuel treatment zone is recommended to manage fine fuels that typically connect to residential lots. The intent is to allow safer and more effective structural protection by responding fire services. The rear lots of most residential properties may contain unmitigated landscape fuels, combustible fences, and sheds.

The 30' width is recommended to allow sufficient safe working space and access for firefighters wearing full wildland fire fighting personal protective equipment (PPE). Flame lengths and radiant heat levels will be lessened. It may also allow for other defensive measures to be implemented depending on the size and severity of the wildland fire event. Most importantly, it may buy the time necessary to have resources in place.

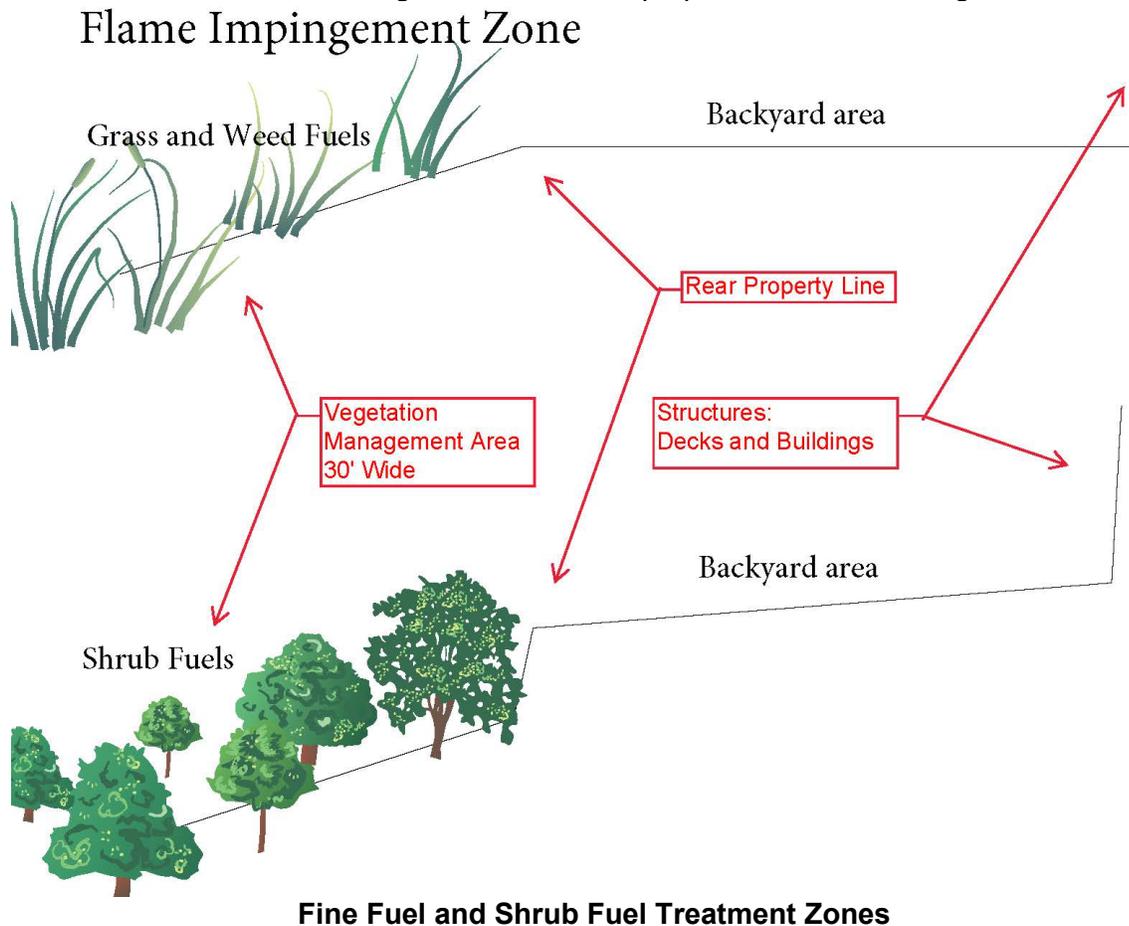
Treatment Frequency

Two annual treatments are recommended to manage the fuel load. Timing will depend on the climatic conditions that occurred in the preceding winter and spring. Heavy winter snows and

spring rains will affect fine fuel growth. Consult with South Metro Fire (SMF) on the combustibility of fuels.

1. First treatment, approximately early to mid-summer (summer fire season). If sufficient winter and spring precipitation has occurred, most of the vegetation growing in this zone will retain some level of fire resistance when lush and green. Both wildflowers and native grasses produce their flowers and seeds in the first half of the growing season. Ideally, the first mowing treatment is timed to occur before grasses go into their summer dormancy and become highly combustible.
2. Second treatment, approximately after fall grass dormancy in late September to mid-October (fall, winter, and spring fire seasons). The need for this treatment may depend on late summer monsoonal rains that spur on a second growth of grass sufficient to carry fire in the fall, winter, and spring drought periods. Ideally, if treated, wildfire risk can be managed until the following spring when grasses begin growing in the spring.
3. If well timed, wildflowers and grasses can be retained and even perpetuated by using the mowing to spread their seeds.
4. Both fuel management mowings allow for noxious weed control treatments. If possible, spot treatments are encouraged instead any broadcast herbicide applications.
5. Recommended mowing height is 4 to 6 inches.
6. Specialized mowing equipment may be required due to side slopes exceeding 4:1 (25%). Roughness of the terrain will be a factor depending on how much erosion occurred prior to post-development revegetation. In some cases, poor grass establishment occurred, and noxious weeds may be the main fuels treated. These areas may also contain small rills and gullies where erosion has occurred.
7. In areas where brush fuels are present, the 30' zone should occur around retained oak or brush clumps. This assumes that shrub clumps have been adequately spaced or treated per CSFS recommendation.

The illustration below shows the general location of proposed fine fuel management.



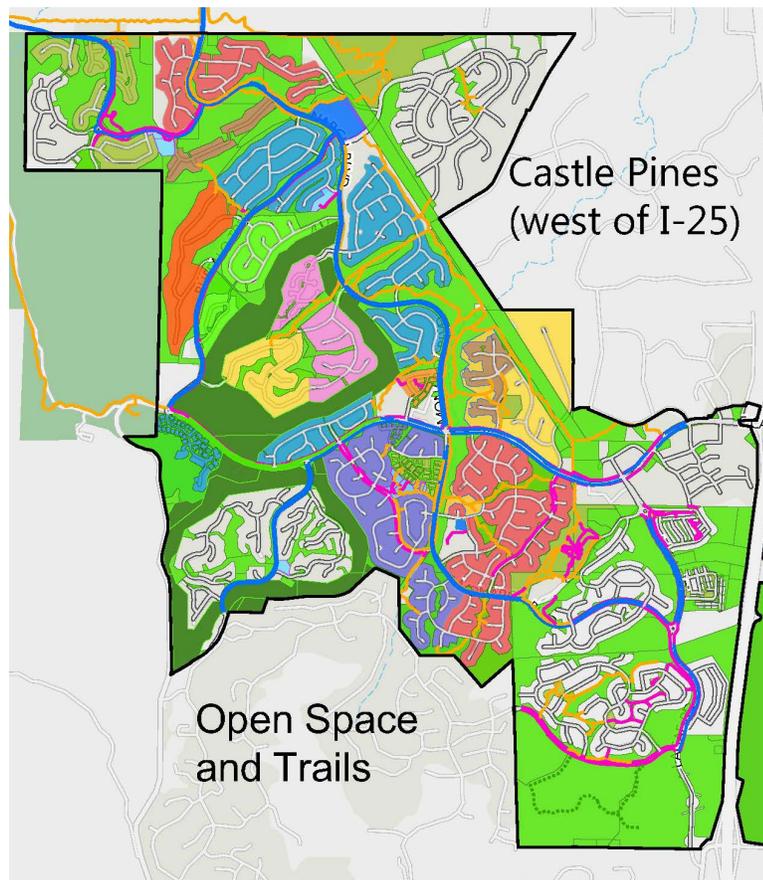
Fine Fuel Management Zone 2

Open Space Trail System

The City is fortunate to have a well developed trail system as an amenity for its residents. This same trail system can be utilized as a wildfire containment opportunity. Many of these trail networks are concrete surfaces drivable by smaller fire suppression vehicles. And can provide access to residential areas threatened by wildfire if conditions allow. The primary recommended practice is to widen the mowed area along the paths. This zone can also be described as the “rattlesnake zone” where residents may encounter them unexpectedly.

To consider it a wildfire containment or control tool, current mowing along concrete paths should be widened. A width of 12’ to 15’, on each side, is recommended. A total area 30’ to 35’ wide will be created that can improve firefighter safety under most burning conditions. The following practices should be considered “guidelines” unless otherwise noted. Item 1 prescriptions differ from Item 2 prescriptions, with Item 2 being the wildfire prescription.

1. Mow grass and fine fuels along the path 5’ to 6’ wide on both sides to keep growth at a maximum 6 inch height throughout the growing season. This is the primary rattlesnake zone. Mow monthly.
2. At a minimum, follow the same mowing schedule for rear lot fuel treatments, by mowing fine fuels along the path 12’ to 15’ on each side. Maximum height is 6 inches.
3. An exception to mowing frequency after the initial treatment and need for more frequent mowing will be:
 - a. Declared Stage 1 or 2 Fire Restrictions.
 - b. “Red Flag Days” occurring regularly.
 - c. Recommendations by SMF based on local conditions.



City Trail System and Open Spaces

Natural surface trails, where present, can be considered “preconstructed fire lines”. These vary from 18 to 36 inches wide. Their use for containment or control may be limited unless adjacent heavy fuels have been treated. In many cases, these occur in the “mountain lion zone” where chance encounters should be expected. Rough terrain will limit any widening by mowing.

Fine Fuel Management Zone 3

Critical Infrastructure and Utilities

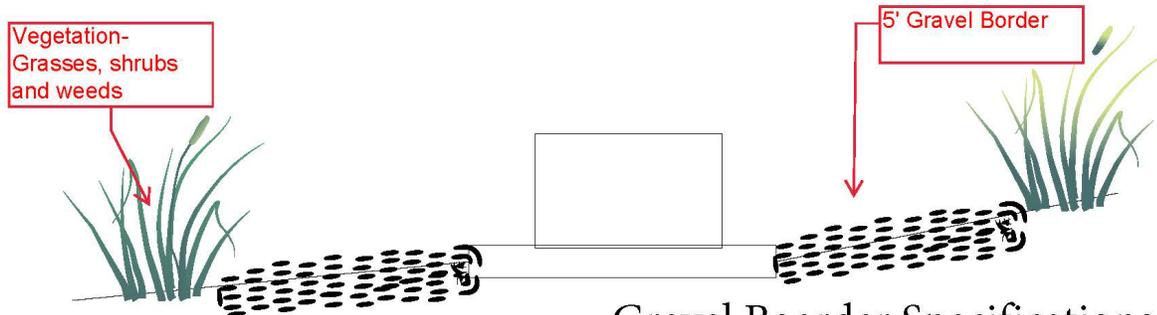
Any improvements that have the potential to be damaged by wildfire should have a mowed area around them. Utility pedestals and transformers are two examples. Critical infrastructure, such as sewer lift stations, well sites, booster pumps and treatment facilities, should be maintained at a high level to manage fine fuels. Many of the actual facilities were found to be wildfire resistant. But the utilities necessary to operate them are at risk. All access driveways should also be kept mowed following the recommendations for Zone 2.



Prairie Fuels shown with a low level of maintenance around structures.

Additional protection, beyond mowing or brush management, is required. And if implemented, should reduce mowing, and weed eating costs. The illustration below shows installation of a 5 feet non-combustible area that should be done on all electrical services. Fine fuels should be kept mown 15 feet beyond the non-combustible surface.

Utility Pedestal and Enclosure Area Wildfire Mitigation



Vegetation Management Specifications:

Maintain at 6" height within 15' of utility or fence. Mow a minimum of twice per year.

Gravel Border Specifications:

Install 5' gravel boarder with 3/4" to 1" gravel over geo-textile fabric. Keep free of all grass, weeds, and leaves. Provide positive drainage away from pedestal base at minimum 3% slope.

Protection for Electrical Facilities and Enclosures

Fine Fuel Management Zone 4

Roadways

Where roads abut unirrigated native grasses, these should be mowed on the same schedule as Zone 1. Flame heights and/or lengths can be 2 to 4 times the fuel height. For example, 3' tall grasses can have flame lengths of 6 to 12 feet. During high winds, the flames will be horizontal and impinge into the roadway. Even on wide collector roads such as Monarch where the flames may not actually threaten evacuees, flame presence may cause motorists to stop. Therefore, keeping flames out of all roadways will be critical for a safe evacuation.

Priority for fine fuel management can be based on the hierarchy of streets ranging from collectors down to local streets. In some areas with detached paths, the strip between the path and the road should be treated. If no path or sidewalk is present, fine fuels should be mowed 15 feet from the back of curb.

Summary of Specifications

1. Mow grass to a maximum height of 6 inches.
2. Complete noxious weed control prior to mowing.
3. Treatment zone widths:
 - a. Rear lot open space- 30 feet
 - b. Concrete paths- 12-15 feet each side
 - c. Utility clearances- 15 feet from utility
 - d. Roadsides- 15 feet from back of curb or sidewalk
 - e. Structures- 30 feet from closest combustible materials
4. Timing of treatments:
 - a. Twice annually if timed properly.
 - b. Additional mowings based on weather patterns or SMF recommendations.

Riparian Zones

Flood plain areas, riparian zones, can have high wildfire potential during the fall and winter. Extended droughts can also allow normally wet areas to burn with high intensity. Ember potential can also be high under windy conditions.



Riparian Zone with willow fuels and noxious weeds.

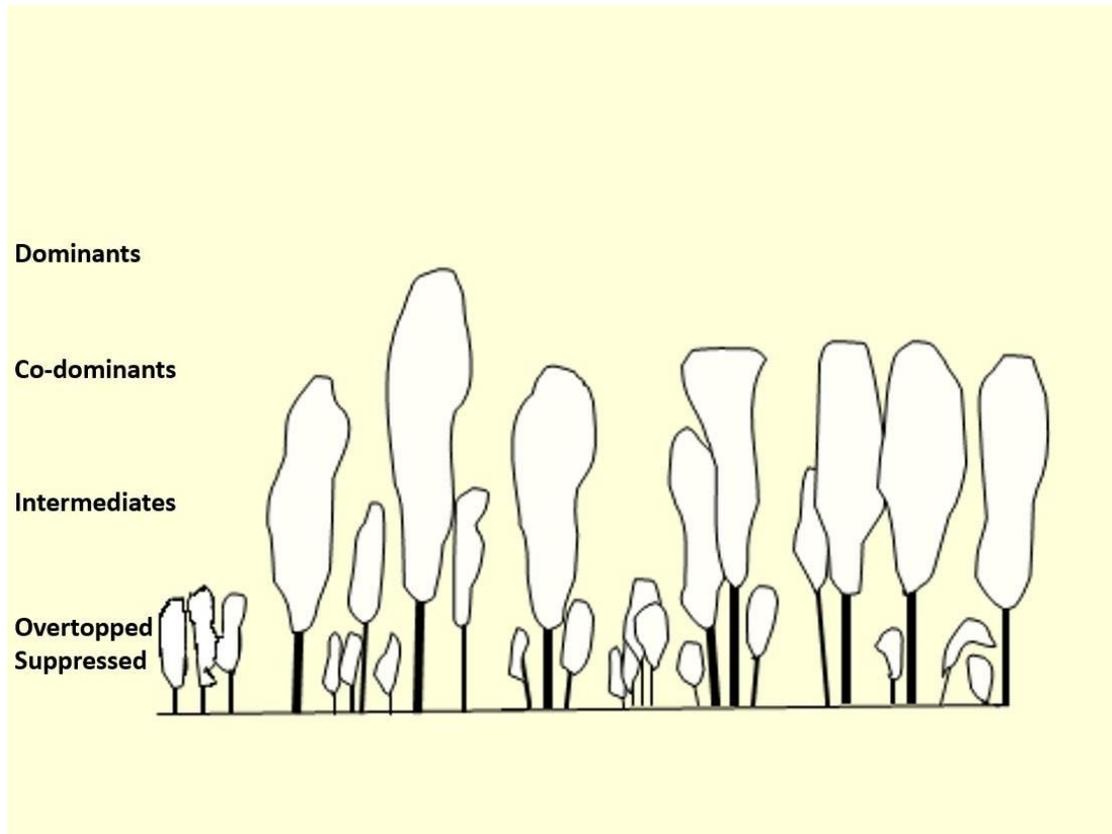
Riparian areas should be managed carefully. Any thinning of shrubs or trees should be done by hand and use of heavy equipment should be avoided. Riparian areas may be regulated by the Army Corp of Engineers or Environmental Protection Agency under the Clean Water Act. Before any work is done in riparian areas, a site-specific consultation with a qualified professional is recommended.

These areas should be monitored for wildfire risk on a regular basis. Fire starts can move quickly to fences, and then to structures.

Thinning and Fuel Reduction

Two communities, Forest Park and Pine Ridge, contain ponderosa pine forests. Foresters use many methods of thinning depending on the specific objectives of the landowner. Fuel break thinning is most often accomplished by a process called thinning from below. Trees are usually removed or remain based on their height in the canopy.

For simplicity, trees can be divided in four levels in the forest canopy. The largest trees at the highest level of the canopy are called dominants. These are usually the most vigorous since they have the largest root systems, most leaf area and receive the most sunlight. Next are the co-dominant trees generally the same height and diameter, but not overtopped by other trees, including dominants. Intermediate trees occupy the middle level of the canopy but tend to be crowded and of smaller diameter. They are less vigorous with smaller root systems and fewer leaves as the result of crowding by the dominant and co-dominant trees. At the lowest level of the forest canopy are the overtopped trees. These are completely shaded by the dominant and co-dominant trees.

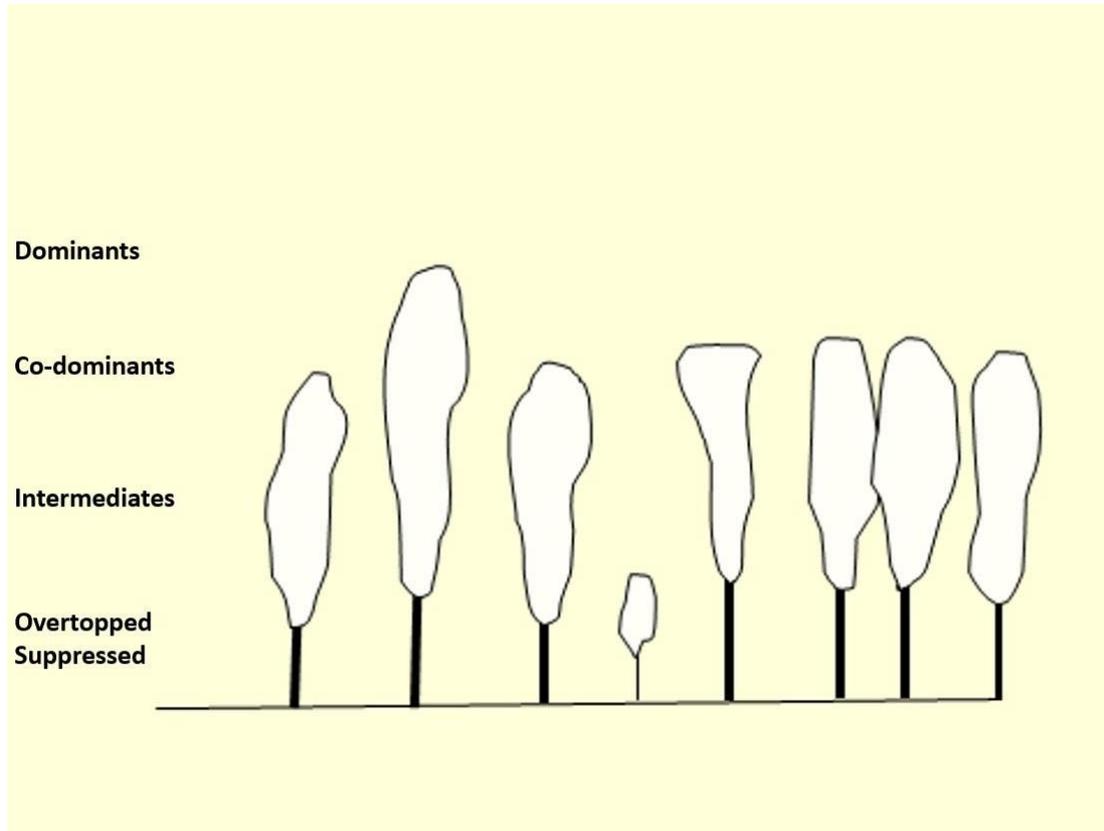


Crown Fire Prone Stand Structure

Thinning from below removes all the overtopped and most of the intermediate trees. It is essential when thinning for fuel breaks to remove ladder fuels and create enough openings in the forest canopy to reduce the crown fire risk. Thinning from below is desirable in fuel reduction projects

because it: 1) leaves the most vigorous trees on the site; 2) creates openings in the forest canopy by removing the less vigorous co-dominants and intermediate trees; and 3) eliminates ladder fuels by removing the overtopped trees, shrubs, and pruning lower limbs of remaining trees.

Gambel oak fuels will generally follow similar guidelines for separation of oak clumps to reduce crown fire potential. Shrub clump spacing guidelines can be found in [CSU Publication 6.311, Managing Gambel Oak](#).



Stand Structure for Reduced Crown Fire Potential

Maintenance

Defensible space, fuel break thinning or any type of forest management, does not end when the initial project is finished. Continual maintenance is an essential part of any forest management program. Even in well managed forests trees will die, storms and wind will damage trees, and new trees will germinate.

Trees should be inspected every spring for any sign of damage from winter or spring snow and wind. Prune any broken branches if they are not too high in the tree, and trees bent by heavy winter snows should be removed. Check for any signs of insect activity or disease.

Late summer and fall are the best times to inspect trees for attack by mountain pine beetles. Beetles have finished attacking trees at this time, and there is adequate time to cut and treat the tree before the adult beetles fly the next July.

At five years, check the canopy closure, especially in zones one and two. Remove any trees necessary to maintain openings in the canopy. Do any additional pruning or removal of trees and shrubs to eliminate ladder fuels.

After ten years, dense thickets of young trees (regeneration) may have become established, and these will need to be thinned. Not all regeneration should be cut since trees of various ages are important for forest diversity. Young trees in openings with adequate room to grow should remain.

These should be at least ten feet from the dripline of overstory trees. Regeneration that is likely to become ladder fuel or crowded by other trees should be cut. Depending on their objectives, landowners may want to consider removing some of the larger trees to make room for the younger ones.

****NOTE**** Wildfire mitigation publications may recommend different spacing recommendations from those listed in the previous sections. Every situation is different. The City should encourage private landowners and HOAs to contact SMFPD to receive mitigation recommendations specific to their properties.

APPENDIX D

Trail Systems & Property Lines Management Specifications

Trail System Fuel Management

The current trail system should be utilized as a potential fire containment tool. These same paths may provide safer firefighter access. Both natural surface and paved trails should be considered “preconstructed fire lines”. Three types of fuel management are suggested:

1. Regular mowing to a maximum height of six inches, 12 to 15 feet wide on each side. NOTE: Rattlesnakes are an ever present danger and regular mowing will help pedestrians avoid them.
2. Seasonal mowing when fine fuels become readily combustible. Where trails are in natural areas with prairie fuels, two annual mowings are recommended:
 - a. First mowing when grass seed heads have formed and just before the leaves begin to “cure” (turn brown and become combustible). If timed properly, both grass and wildflower seed heads will have matured. This mowing will aid in seed dispersal.
 - b. Second mowing in mid to late September before curing begins. This second mowing will be important to manage fall, winter and early spring wildfires during seasonal drought periods.
 - c. Noxious weed control is recommended in this zone.
 - d. NOTE: Mowing of native zones outside of these areas is not necessary.
3. Other fuels, such as Gambel oak and pine/oak mix, should be removed or managed aggressively with ladder fuel removal. If in zones of continuous oak, more than 30 feet wide, shrub clumps should be removed following clump spacing guidelines per *CSU Publication 6.311 Managing Gambel Oak*. Appendix F shows photos of oak management projects done in the Castle Rock area. Other options are:
 - a. If shrub clumps are to be retained along the trail, aggressive ladder fuel removal is recommended within 30 feet of the trail, and
 - b. The horizontal continuity of the forest or shrubs beyond the treated clump is disrupted to reduce crown fire potential. Both Gambel oak and pine forests have the potential to become a running crown fire that cannot be stopped by firefighting resources.
 - c. In addition to wildfire, predator safety should be a concern given the presence of mountain lions. Human predators will also be a public safety concern.

Property Line Fuel Management

To assist homeowners with creation of their defensible spaces, a fuel management zone, generally 30 feet wide for prairie fuels, should be created in the open spaces abutting residential properties. Fuel management in this zone will also increase firefighter safety and effectiveness. In areas with heavy fuels, such as Gambel oak, this zone should be treated following shaded fuel break guidelines. The following strategies are recommended:

- In prairie fuels, the 30 feet wide zone should be mown following the “seasonal mowing” practices described in the previous section.

- Gambel oak fuels in the abutting open space should follow shrub clump spacing guidelines described in the previous section. The minimum width of this zone is 150 feet wide. Where possible, the entire open space parcel should be treated to manage crown fire behavior.
- Gambel oak clumps retained within 75 feet of rear lot lines should be treated to a higher level by removal of all ladder fuels within these clumps.
- Forested areas with a Gambel oak understory will require both tree crown separation and shrub clump separation. Wherever possible, this fuel treatment zone should be a minimum of 300 feet wide to effectively manage crown fire behavior. Additional criteria are:
 - a. Remove all ladder fuels from under conifers and within 10 feet of tree driplines (outer extent of lower branches from the tree trunk).
 - b. Pines can be retained within this zone, including within the 30 feet wide zone, if ladder fuels are managed.
 - c. Shrub clumps retained within 75 feet of rear lot lines should have all ladder fuels removed.
 - d. NOTE: Ponderosa pines, when properly spaced and with ladder fuels managed, can survive wildfire.

APPENDIX E

Recommendations Based on Timeframe

Seasonal

- Mowing:
 - Roadsides and roadside ditches- Monthly or as warranted by fire danger.
 - Re-inspect all intersection sight distances for cleared sight triangles.
 - Clear all grasses and fine fuels 3-5 feet from around street signs, light poles and mailbox kiosks using weed eaters or non-selective herbicides.
 - Open Spaces – Twice per year
 - First mowing mid-summer after wildflower bloom and before grass curing (browning).
 - Second mowing in the fall after grass curing (to reduce wildfire rate of spread during fall/winter fire season, and allow new, green re-growth in the spring).
- Common Area and Entry Landscaping:
 - Landscape entrance areas with Firewise plants to illustrate Firewise landscaping principles.
 - Spring cleanup to remove all dead materials (twigs, leaves, needles, etc.).
 - Remove storm damaged trees and branches.
 - Mid-summer re-inspection to again remove fine fuels within 10-15 feet of all combustible materials.
- Education/Awareness:
 - Spring alerts/mailings for:
 - Emergency notification system signups and updates.
 - Family evacuation plans.
 - Home inventories.
 - Home assessments by local fire agencies.
 - Early to mid-Summer:
 - Firewise classes with emphasis on structural ignitability and forest health.
- Implementation
 - Annual slash disposal program.
 - Consider developing a seasonal slash disposal effort.
 - Coordinate/facilitate property-to-property (neighborhood) fuel treatment projects.
 - Each neighborhood or community should consider becoming a recognized Firewise Community.

Annual

- Renew Firewise Community status:
 - Firewise Day, meeting or special event.
- Coordinate cross-training between all committees (Forestry, Architectural Control, and Fire Mitigation, etc.)
- Update annual operating agreements with local fire agencies for emergency use of common areas and water supplies.

- Continue to encourage neighboring property owners to implement lot-to-lot mitigation projects that enhance all home ignition zones (HIZ).
- Review operating plans to determine annual project needs:
 - Apply for grant funding as available.
- Contact all partners to update any wildfire mitigation needs related to critical infrastructure.
 - Core REA- Power line clearance needs along all utility easements.
 - Utility Pole Inspection and Replacement.
 - Right-of-way mowing along public roads.
- Inspect all fuel treatment areas to identify any maintenance needs, such as dead tree removal, storm damage cleanup, or insect/disease control.
- Meet with abutting ownerships to coordinate fuel treatment projects.
- Continue community wide educational programs through classes, meetings, and annual events. Topics may include:
 - Evacuation Planning.
 - **Code Red** Alert and Notification System program signup (target of 100% participation).
 - Forest Health and related topics.
 - Noxious Weed prevention and control.
 - Wildlife habitat restoration.
 - Insurance coverage for “being made whole again” in the event of home loss.
 - Neighborhood Watch, and “phone trees” (cascading phone call plan to ensure all residents are notified).
 - Special Needs Populations should be registered on the DCSO “Access and Functional Needs Registry”.
 - Evacuation Planning for Pets and Livestock.

Every Three/Five/Ten Years

- Inspect all fuel treatments for:
 - Tree crown and oak clump closure in all areas
 - Shaded Fuel Breaks and D-Space Zone 2: 10 feet between crowns (20 feet between crowns of tree clumps).
 - Forest Health Thinning D-Space Zone 3: 3-5 feet between crowns and/or to allow full sun to tree crowns for optimum tree growth/health.
 - Seedling tree invasion/encroachment
 - Mow or cut seedling and sapling size trees when located within the drip line of mature trees, or not in full sun locations.
 - Where trees establish in open areas, thin out trees to promote full crown development, and reduce crowning potential. Consider removing most encroaching trees from meadows to maintain biological diversity.
 - Prune as necessary to reduce torching potential.

APPENDIX F

Photo Examples of Oak Treatments

The two photos below show before and after treatments following the guidelines noted above. These were done in the Woodlands “Bowl” east of the Castle Rock Recreation Center in the Woodlands and Escavera communities.



Woodlands “Bowl” Before Treatment



Woodlands “Bowl” After Treatment

The following photos show small mastication equipment used in the fuel treatment project noted above. Note that all “slash” is ground up and recycled on the woodland surface with minimal site disturbance.



Skid Steer With Masticator Cutting Head



Before Treatment of Oak Within the Home Ignition Zone of the Abutting Residence.



After Treatment of Area

The photos below show examples of larger scale fuel treatments like those done above the Cedar Heights neighborhood prior to and threatened by the 2012 Waldo Canyon Fire. This level of treatment, done by the Colorado Springs Fire Department three years before the fire, kept the fire from boiling out of Queens Canyon and heading directly at Cedar Heights.



Before Photo of Large-scale Project in Roxborough State Park



After Photo of Large-scale Project in Roxborough State Park.

All mitigation was done with large mastication machines.

APPENDIX G

Specific Fuel Models

Vegetation in the study area is dominated by a second-growth ponderosa pine, mixed-conifer forests with a high percentage of closed crowns, and dense pine, Douglas-fir or Gambel oak understory. Fuel models for this timber type are:

- FBO Fuel Models **1** and **9**¹
- NFDRS Models **U** and **L**²

A high percentage of the area is covered by prairie fuels intermixed with low shrub species. Fuel models for these areas are:

- FBO Fuel Models **1** and **2**
- NFDRS Models **A**, **C**, **L** and **T**

Riparian zones along waterways and seasonal storm channels are made up of shrub species such as willows and cottonwoods, intermixed with grass fuels. These areas are of concern where they abut high density subdivisions, especially under drought conditions. Fuel models for these areas are:

- FBO Model **5**
- NFDRS Models **F** and **T**

¹ *Aids to Determining Fuel Models For Estimating Fire Behavior*, Hal E. Anderson, USDA Forest Service General Technical Report INT-122, April 1982.

² *Gaining an Understanding of the National Fire Danger Rating System (NFDRS)*, PMS 932/NFES 2665, National Wildfire Coordinating Group (NWCG), 2002.



APPENDIX H

THE HOME IGNITION ZONE



A guide to preparing your home
for wildfire and creating defensible space

Formerly Quick Guide FIRE 2012-1: Protecting Your Home From Wildfire



Reducing Your Home's Wildfire Risk Begins With You

WHY?

Homeowners have the ultimate responsibility to proactively prepare their property for wildfire. By creating and maintaining the home ignition zone, residents can improve the likelihood of their home surviving a wildfire and reduce the negative impacts wildfires can have on their property.

In Colorado, if you live in the wildland-urban interface, it is not a matter of *if* a wildfire will impact your home and property, but *when*.

If your home is located in or near the natural vegetation of Colorado's grasslands, shrublands, foothills or mountains, you live in the wildland-urban interface — also known as the WUI — and are inherently at risk from a wildfire. This includes any areas where structures and other human developments meet or intermingle with wildland vegetative fuels.

Wildfires are a natural part of Colorado's varied ecosystems. Planning ahead and taking actions to reduce the risk of wildfires can increase the likelihood your home survives when wildfires occur.

As more people choose to live in

wildfire-prone areas, additional homes and lives are potentially threatened every year. Firefighters always do their best to protect residents, but **ultimately, it is your responsibility to protect your property and investments from wildfire.**

This guide focuses on actions that are effective in reducing wildfire hazards on your property. It is important to recognize that these efforts should always begin with the home or structure itself and progress outwards.

Also, remember that taking wildfire risk reduction steps is not a one-time effort — it requires ongoing maintenance. It may be necessary to perform some actions, such as removing pine needles from gutters and mowing grasses and weeds, several times a year. Other actions may just need to be

addressed annually or only once.

While you may not be able to accomplish all of these actions at once to prepare your home and property for wildfire, each completed activity will improve the safety of your home during a wildfire. However, it is important to remember there are no guarantees when it comes to wildfire. Implementing risk reduction actions does not guarantee your home will survive a wildfire, but it does improve the odds.

Knowing that wildfire impacts are inevitable, it is not only important for individuals to work on their own homes, but also for residents to work together to increase their community's resilience to wildfire. To become fire adapted, actions must not only be taken before a wildfire



As the 416 Fire burned near Durango in 2018, firefighters conducted burnouts near homes in the fire's path to eliminate fuel for the main fire and provide a secure control line. The work done by homeowners to create the defensible space buffer visible here gave firefighters the option to safely conduct the operation. Photo: Jerry McBride, Durango Herald

arrives but during and after a fire.

The National Cohesive Wildland Fire Management Strategy defines a fire-adapted community as “a human community consisting of informed and prepared citizens collaboratively planning and taking action to safely coexist with wildland fire.”

In order to increase the likelihood homes and infrastructure survive a wildfire, all landowners must work together to reduce fire hazards within and adjacent to communities. This includes work on individual home sites and common areas within communities. Every community member has a role in fire adaptation, from civic leaders, to developers, to first responders, to homeowners and land management agencies.

WHAT'S YOUR



WUI RISK?

MORE THAN
HALF

of Colorado residents live in the wildland-urban interface and are at some risk of being affected by wildfire.

Source: CSFS WUI Risk Assessment 2017

Access WUI risk information coloradoforestatlas.org

Reduce your wildfire risk csfs.colostate.edu

Protect your community fireadaptednetwork.org

What Is the Home Ignition Zone?

HOME IGNITION ZONE (HIZ)

is the home and the area around the home (or structure). The HIZ takes into account both the potential of the structure to ignite and the quality of defensible space surrounding it.

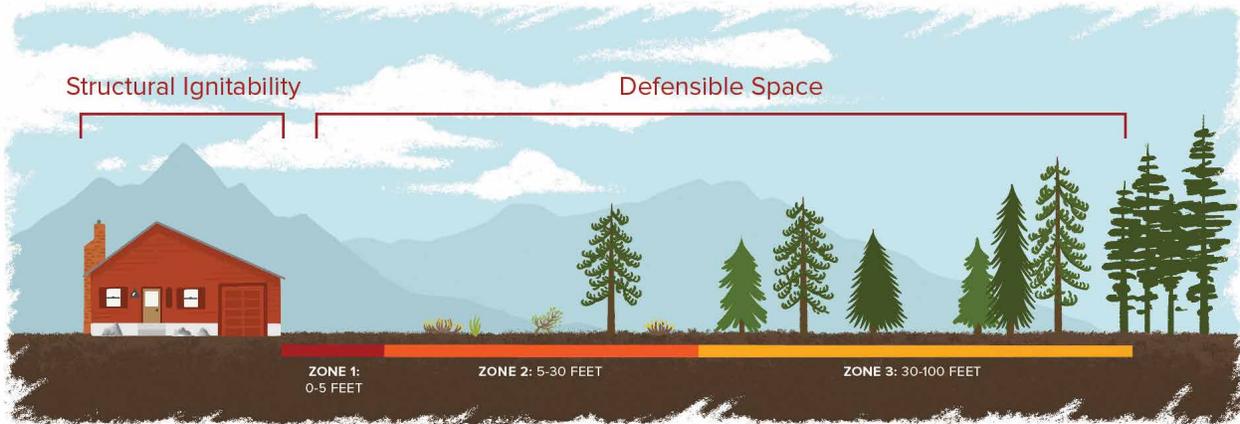


Illustration: Bonnie Palmatory, Colorado State University

The two primary determinants of a home's ability to survive a wildfire include the structure's ignitability and the quality of the surrounding defensible space. Together, these two factors create a concept called the home ignition zone, or

HIZ. It includes the structure and the space immediately surrounding it.

The space around the home is divided into three distinct spaces of management, zones 1, 2 and 3. Pages 8-9 outline specific goals and critical steps to manage your

property within each of these zones.

To reduce wildfire hazards to your home and property, the most effective proactive steps to take are to minimize the ability of the home to ignite and to reduce or eliminate nearby fuel.

METHODS OF HOME IGNITION

1. EMBER IGNITION

Embers (firebrands) are small pieces of burning material that can be transported by wind more than a mile ahead of a wildfire's flaming front. Embers can vary greatly in size, but even the smallest can start new fires (known as spot fires) on any ignitable surface they encounter, inside or outside a home. This is the most common source of home ignition during wildfires.

Flammable horizontal or nearly horizontal surfaces, such as wooden decks or shake-shingle roofs, are at greater risk for ignition from burning embers.

Many homes in the wildland-urban interface have burned because of airborne embers, so addressing structural ignitability is critical even if it appears difficult for fire to spread in the area surrounding a home.

2. SURFACE FIRE/ DIRECT FLAME CONTACT

If fuels are adjacent to a home, direct flame contact can ignite the house. Ensuring no such fuels exist within 5 feet of a home, particularly near windows or under decks, greatly minimizes this possibility.

3. RADIANT HEAT

Radiant heat is what you feel on your hands while warming them next to a campfire. This same type of heat transfer can ignite a home, whether the source of the heat is a crown fire in treetops or an adjacent home that has caught fire.



Flying embers are the most common source of home ignition during wildfires. Preparing homes for their impact is critical. Embers can ignite leaf litter in gutters and on roofs, as well as shrubs and mulch at the base of the house, as seen in this controlled ember shower experiment. Photo: Insurance Institute for Business & Home Safety

What Is Defensible Space?

DEFENSIBLE SPACE

is the area around a home (or structure) that has been modified to reduce fire hazard by creating space between potential fuel sources.

Firefighters may not be present at your home during a wildfire — they are trained to protect structures only when the situation is safe for them. You should prepare your home and property to withstand wildfire without firefighter intervention. Having an effective defensible space combined with reducing structural ignitability is the best way to improve your home's chance of survival.

Defensible space is the area around a home or other structure that has been modified

to reduce fire hazard by creating a disconnected fuel load both vertically and horizontally. In this area, natural and manmade fuels are treated, removed or reduced to slow the spread of wildfire and alter fire behavior.

Establishing defensible space reduces the likelihood of a home igniting by direct flame contact or by radiant heat exposure. It also helps limit local production of embers and reduces the chance a structure fire will spread to neighboring homes or surrounding vegetation.

CREATING AN EFFECTIVE DEFENSIBLE SPACE involves establishing a series of management zones. Develop these zones around each building on your property, including detached garages, storage buildings, barns and other structures.



BEFORE



AFTER

A Colorado State Forest Service forest management project near Evergreen cleared dense trees in a residential area to reduce wildfire risk. The same tree with a crooked trunk in the center of these photos shows how tree thinning can be a useful tool to protect property, decrease fire intensity and boost forest health. Photo: Emma Brokl, CSFS

Recognize that fuel continuity and density play a critical role in wildfire behavior.

As you plan defensible space for your property, you can contact your nearest Colorado State Forest Service field office for guidance, or consult a forester, fire department staff or community organization appropriately trained in wildfire mitigation practices.

3

Factors Determine Wildfire Behavior

1. FUELS
2. WEATHER
3. TOPOGRAPHY

Of the three things wildfires need to start and spread, humans cannot change weather or topography, so we must concentrate on altering fuels in order to have any control over a disturbance as dynamic as wildfire.

Fuels can include vegetation like trees, brush and grass; but when near homes, fuels also include propane tanks, woodpiles, sheds and even homes themselves.



East Troublesome Fire. Photo: Zach Wehr, CSFS



Top left: Hardening your home can include choosing noncombustible building materials like stucco paired with a stone facade. This house near Salida shows you don't have to sacrifice curb appeal to reduce the ignitability of your house. Photo: CSFS

Top right: Preparing your home for wildfire can be accomplished as weekend projects, such as clearing vegetation from around your home's perimeter and adding noncombustible material near the foundation that won't ignite if embers land there. Photo: Wildfire Partners

Bottom: A metal roof and noncombustible exterior window coverings add layers of protection against wildfire, in addition to the well-maintained defensible space that surrounds this home. Photo: Wildfire Partners



MORE ONLINE

This guide provides only basic information about structural ignitability.

The National Fire Protection Association (NFPA) and the Insurance Institute for Business & Home Safety (IBHS) together produce Wildfire Research Fact Sheets that provide additional valuable information.

Visit the "Protect Your Home" section at the CSFS website, csfs.colostate.edu/wildfire-mitigation, for links to these and other structural ignitability resources.



Harden Your Home Against the Threat of Wildfire

STRUCTURAL IGNITABILITY

is the likelihood the materials in and on your home will ignite during a wildfire.

The practice of reducing structural ignitability is commonly called “home hardening.”

The ideal time to address home ignition risk is when the structure is in the design phase.

For existing homes, steps must be taken to reduce the structural ignitability in order to improve the likelihood of the home surviving a wildfire. The practice of reducing structural ignitability is commonly called home hardening.

BEST PRACTICES TO REDUCE STRUCTURAL IGNITABILITY

- Ensure the roof has a Class A fire rating
- Remove all leaves, needles and other debris from all decks, roofs and gutters
- Screen attic, roof, eaves and foundation vents with 1/8-inch metal mesh
- Screen or wall-in stilt foundations and decks with 1/8-inch metal mesh
- Use tempered glass for windows; two or more panes are recommended
- Create 6 inches of vertical clearance between the ground and home siding
- Replace combustible fencing or gates, at least within 5 feet of the home

STRUCTURAL COMPONENTS TO CONSIDER

WINDOWS

Windows can fail either from glass breaking or frames melting before a building ignites, providing a direct path for airborne embers to reach the building’s interior. Metal screens should be installed. Windows with multiple panes provide greater protection than single-paned windows.

VENTS

Vents that are not screened or are screened with a gap that exceeds 1/8 of an inch can be a direct entry point for embers to infiltrate a home and ignite it from the inside. Metal mesh screen that is 1/8-inch is small enough that most embers will be extinguished before making it inside.

SOURCE *NFPA/IBHS Wildfire Research Fact Sheet — Attic and Crawl Space Vents*

EXTERIOR WALLS

The exterior walls of a home or other structure are affected most by radiant heat from a fire and, if defensible space is not adequate, by direct contact with flames. Fiber cement board, brick, stucco or other fire resistant materials are recommended.

ROOF

The roof has a significant impact on a structure’s ignitability because of its extensive surface area. When your roof needs significant repairs or replacement, choose only fire-resistant roofing materials. Wood and shake-shingle roofs are strongly discouraged because they are highly flammable and are prohibited in some areas of the state. Metal sheets, concrete or shingles made from asphalt, tile, clay, stone or metal are all recommended roofing materials. It is critical to keep the roof and gutters clear of flammable debris.

SOURCE *NFPA/IBHS Wildfire Research Fact Sheet — Roofing Materials*

ROOF EXTENSION

The extension of the roof beyond the exterior structure wall is called the eave. This architectural feature is particularly prone to ignition. As fire approaches a building, the exterior wall deflects hot air and gases up into the eave. If the exterior wall isn’t ignition-resistant, the effect of the excess heat is amplified.

SOURCE *NFPA/IBHS Wildfire Research Fact Sheet — Under-Eave Construction*

DECKS/FENCES

Some decks and fences are readily combustible, whether made of synthetic (plastic/composite) or natural materials (wood). Many deck designs allow embers to accumulate between board gaps and at joists below deck boards. Embers can also fall through decks and may easily ignite flammable materials beneath, making it critical to remove all materials from underneath the deck. Regardless of how fuels below decks may ignite, these burning materials can readily ignite the deck and threaten the home.

Fencing material that attaches to the home must be considered a direct extension of the structure and should be made of a noncombustible material, at least where it is immediately adjacent to a home.

SOURCE *NFPA/IBHS Wildfire Research Fact Sheets — Fencing | Decks*

TO MANAGE YOUR HOME, LEARN THE THREE ZONES

ZONE 1

0-5 FEET FROM THE HOME

The area nearest the home. This zone requires the most vigilant work in order to reduce or eliminate ember ignition and direct flame contact with your home.

ZONE 2

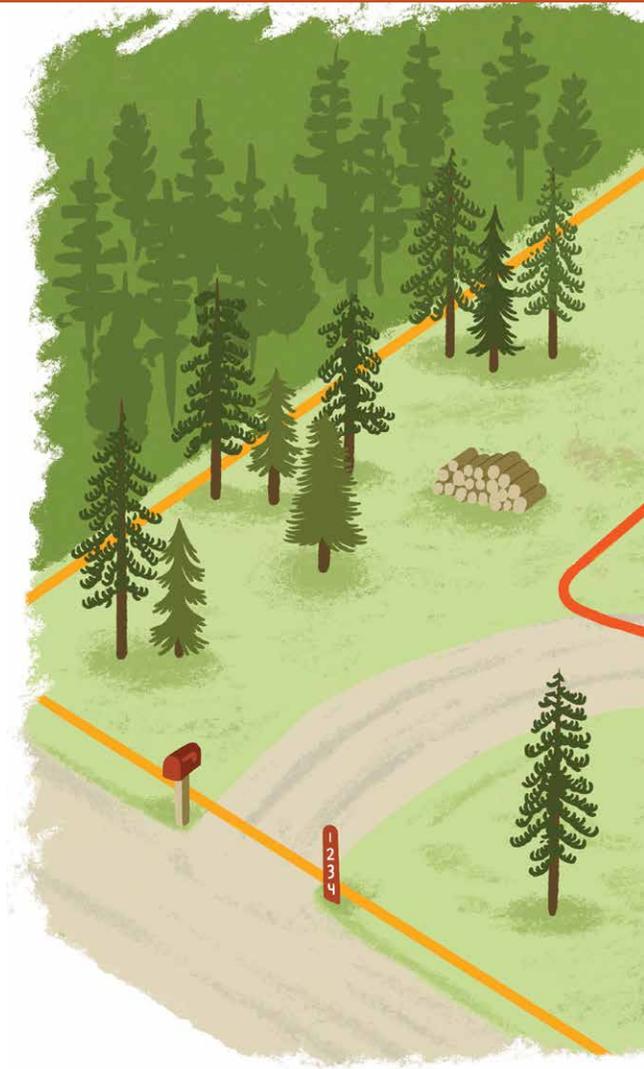
5-30 FEET FROM THE HOME

The area transitioning away from the home where fuels should be reduced. This zone is designed to minimize a fire's intensity and its ability to spread while significantly reducing the likelihood a structure ignites because of radiant heat.

ZONE 3

30-100 FEET FROM THE HOME

The area farthest from the home. It extends 100 feet from the home on relatively flat ground. Efforts in this zone are focused on ways to keep fire on the ground and to get fire that may be active in tree crowns (crown fire) to move to the ground (surface fire), where it will be less intense.



ZONE 1

GOAL: This zone 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.

CRITICAL STEPS

- 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 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

GOAL: This zone 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.

CRITICAL STEPS

- 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 6-10 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.

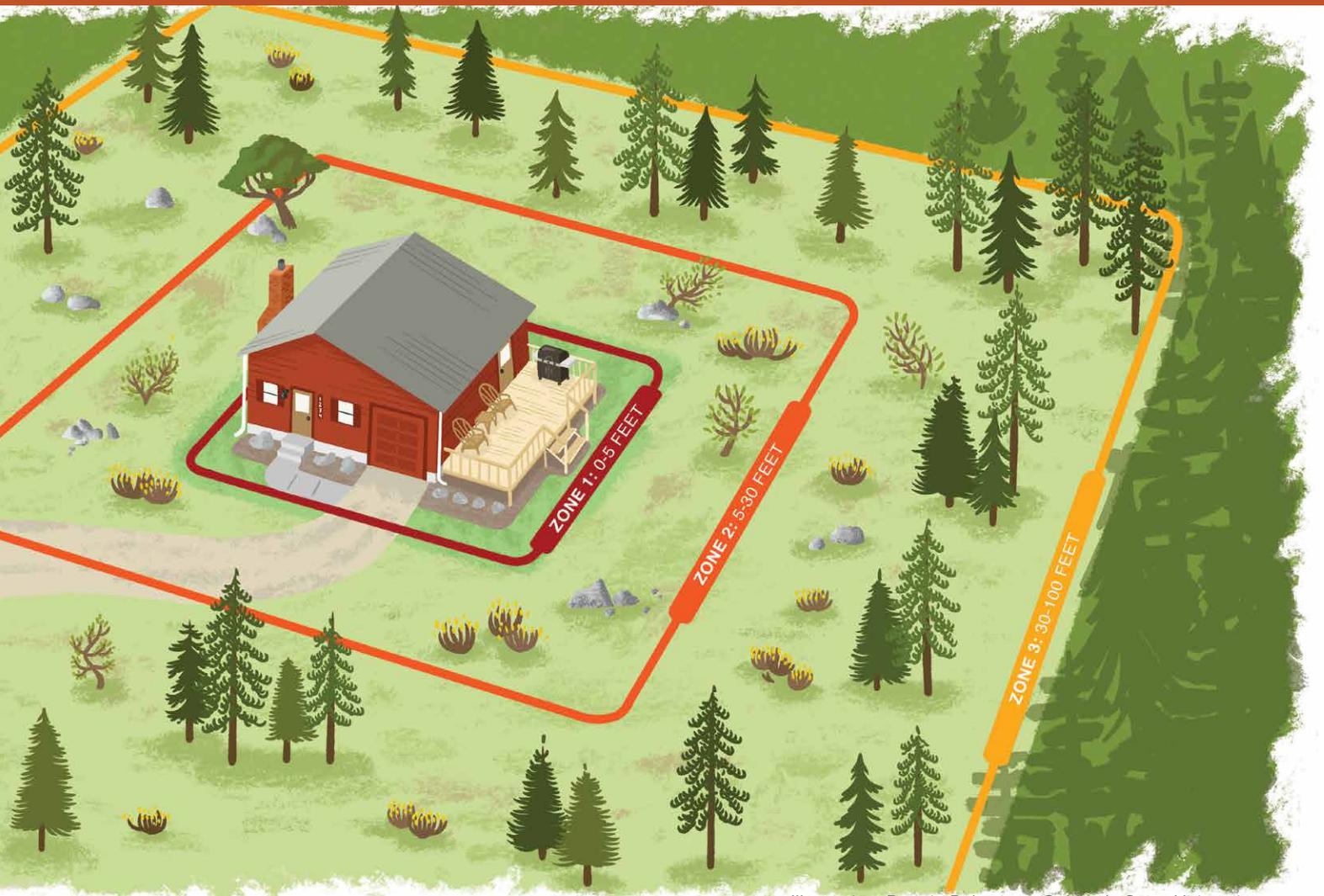


Illustration: Bonnie Palmatory, Colorado State University

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 ½ 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

GOAL: This zone focuses on mitigation that keeps fire on the ground, but it's 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's 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.

STEPS TO CONSIDER

- ❑ 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 6-10 feet is suggested. Consider creating openings or meadows between small clumps of trees so fire must transition to the ground to keep moving.
- ❑ 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.

Make Home Ignition Zone Maintenance a Priority

WHY?

The home ignition zone requires regular, ongoing maintenance to be effective. Your home is located in a dynamic environment — trees, grasses and shrubs continue to grow, die and drop leaves each season, and there are ongoing maintenance needs on any structures on your property.

HOME IGNITION ZONE CHECKLIST

PREPARE YOUR HOME FOR WILDFIRE WITH THESE STEPS

TOP PRIORITIES

- CLEAR** roof, deck and gutters of pine needles and other debris.*
- MOW** grass and weeds to a height of 4 inches or less.*
- RAKE AND REMOVE** all pine needles and other flammable debris from 5 feet around the foundation of your home and deck.*
- TREAT** or mow shrubs that re-sprout aggressively (such as Gambel oak) every 3-5 years or more depending on growth rates.
- REMOVE** branches that hang over the roof and chimney.
- DISPOSE** of slash from thinning trees and shrubs by chipping, hauling to a disposal site or piling in open areas for burning later. *Any accumulation of slash that's chipped or otherwise should be 30 feet or more from the home.**
- AVOID** creating continuous areas of wood chips on the ground when chipping logs and/or slash. Break up the layer of wood chips by adding nonflammable material, or allow for wide gaps of at least 3 feet between chip accumulations.

* Address as needed, more than once a year.

FIREWOOD

- Keep firewood stacked uphill from (or at the same elevation as) any structures, and keep the woodpile at least 30 feet away from the home.
- Do not stack firewood between remaining trees, underneath the deck or on the deck.
- Remove flammable vegetation within 10 feet of woodpiles.

PROPANE TANKS

- Keep aboveground tanks at least 30 feet from the home, preferably on the same elevation as the house.
- Remove flammable vegetation within 10 feet of all propane tanks and gas meters.

DRIVEWAYS

- Maintain at least 10 feet between tree crowns, thinning them a minimum of 30 feet back from each side of the driveway from the house to the main access road.
- Remove ladder fuels beneath trees after thinning.
- Remove any shrubs that are within 10 feet of the outer edge of tree crowns.
- Space shrubs apart at least 2 ½ times their mature height, as measured from the edge of the shrubs.
- Post signs at the end of the driveway with your house number that are noncombustible, reflective and easily visible to emergency responders.

SOLUTIONS FOR MANAGING SLASH

- 1** Spread slash and wood chips over a large area to avoid heavy accumulations and large piles. Being close to the ground will help speed decomposition.
- 2** Burn slash piles, but before doing so, always contact your county sheriff's office or local fire department for current information or possible restrictions.
- 3** Lop and scatter slash by cutting it into small pieces (less than 24 inches long) and spreading it over a wide area, to a depth not exceeding 18 inches. Don't scatter material over 4 inches in diameter.



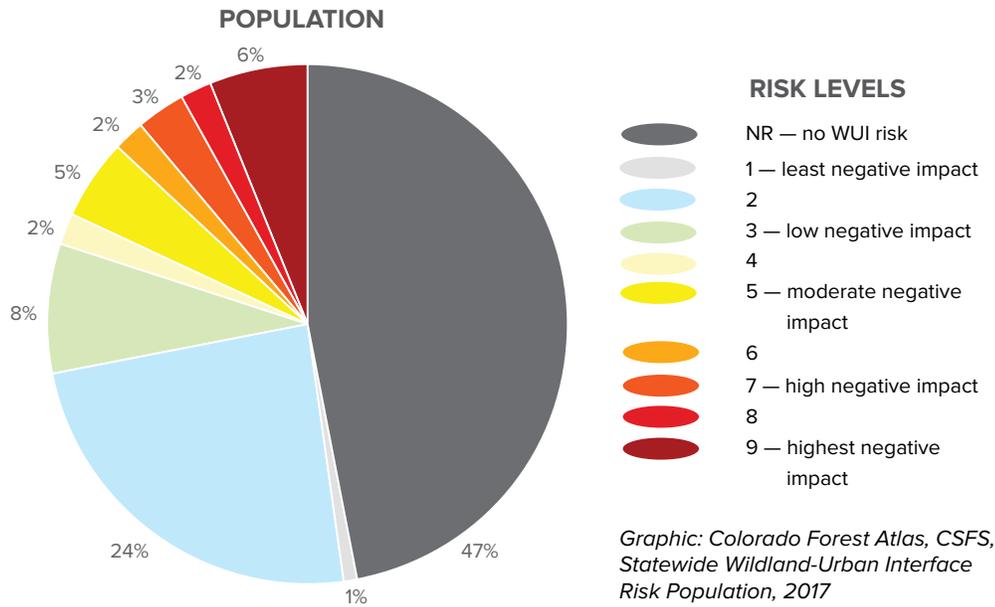
The Colorado State Forest Service works with communities to reduce wildfire risk and become recognized Firewise USA® sites, an accomplishment Piñon Ridge Estates in Chaffee County earned in 2021. CSFS forester Josh Kuehn, right, presents Craig Sommers of Piñon Ridge, with a sign for the community after residents completed the steps required for program recognition. In 2019, the Decker Fire came within a mile and a half of the neighborhood. Photo: Chaffee Chips

More Than Half of Colorado Residents Live With Some Wildfire Risk

The wildland-urban interface (WUI) includes the portions of Colorado where human development meets wildland vegetation.

The majority of Coloradans live in the WUI, in places with at least some risk of wildfire. And that number continues to increase as more residents build homes in the WUI.

As of 2017, the WUI covered about 3.2 million acres in Colorado. By 2040, the WUI area could encompass over 9 million acres in the state, according to projections from Colorado government models.



Additional Wildfire Mitigation Resources Online

» Colorado State Forest Service wildfire mitigation information and publications
csfs.colostate.edu/wildfire-mitigation

» Colorado Wildfire Risk Viewer and Risk Reduction Planner
coloradoforestatlas.org

» Community Wildfire Protection Planning
csfs.colostate.edu/wildfire-mitigation/community-wildfire-protection-plans

» National Fire Protection Association: Firewise USA®
nfpa.org/Public-Education/Fire-causes-and-risks/Wildfire/Firewise-USA

» Insurance Institute for Business & Home Safety
ibhs.org/risk-research/wildfire

» Fire Adapted Communities Learning Network
fireadaptednetwork.org

Fuel Types and Arrangements

FUEL

is any material that will burn.

Whether in a wildland or urban location, when fuels are abundant and there's no space between them, a fire can quickly become uncontrollable and destructive. But when fuels are scarce and separated, a fire cannot build momentum and intensity, which makes it more manageable.

The closer together the fuels are near

your home, the bigger the threat they pose.

Fuel hazard measures look at both horizontal and vertical fuels, factoring in the type, amount and arrangement of fuels (called continuity and uniformity). Horizontal continuity is how the fuels are arranged laterally across the ground or among plant canopies. Vertical continuity refers to fuels extending from the ground into the crowns

of trees and shrubs.

Fuels with a high degree of both vertical and horizontal continuity are the most hazardous, particularly when they occur on slopes.

Mitigating wildfire hazards in the home ignition zone disrupts this fuel continuity, which helps reduce a fire's intensity and potential sources of home ignition.

SURFACE FUELS



Colorado State Forest Service

GRASSES

Grasses are perhaps the most pervasive and abundant surface fuel in Colorado. When available to burn, grasses can catch fire easily, and grass fires often spread rapidly. They also burn out quickly and do not release as much energy as fires in larger fuel types, like trees. Nonetheless, grass fuels can readily ignite structures that are directly adjacent to them.



Colorado State Forest Service

NEEDLES/LEAVES

Needles and leaf litter accumulate naturally in forests across the state. Long needles from pines like ponderosa and broadleaf litter from trees like aspen, cottonwood and maple do not compact as readily as other leaf types. Fire in these fuels can spread rapidly, particularly during windy conditions.

Shorter needle litter from spruce, fir and lodgepole pines compacts more readily and does not generally spread as fast.

Needles and leaves that ignite anywhere on or adjacent to a structure can cause damage and loss.



Colorado State Forest Service

LOGS/BRANCHES/SLASH/ WOOD CHIPS (MULCH)

Naturally occurring woody material on the ground and debris left from cutting down trees and shrubs (slash) are an important part of the fuel complex near structures.

This larger and denser material generates more heat than smaller fuels do, and it can be problematic when it is burning near structures.

Ultimately, the farther away from a structure that large amounts of these materials can be moved, the better.

MORE: A guide to mulched materials is available on the Colorado Forest Restoration Institute website, cfri.colostate.edu.



A firefighter monitors a burnout on the 416 Fire in southwest Colorado in 2018. This effort to manage the wildfire by eliminating fuels left of the train tracks illustrates how fire can transition through different fuel types and arrangements. Photo: Kyle Miller, Wyoming Interagency Hotshot Crew

VERTICAL/LADDER FUELS



Kari Greer

LADDER FUELS

Ladder fuels are burnable materials such as smaller trees and brush that provide a means for fire to climb vertically and continue into aerial fuel sources. Ladder fuels allow a fire to leave the ground level and burn up into the branches and crowns of larger vegetation. Lower branches on large trees also can act as ladder fuels.

These fuels are potentially very hazardous but are generally easy to mitigate. Pay close attention to ladder fuels near homes, as they are extremely hazardous and especially important to address.



InciWeb

BRUSH/SHRUBS

Examples of common brush fuels in Colorado are sagebrush, bitterbrush and mountain mahogany.

As with any type of fuel, brush that is close together and adjacent to homes is hazardous.

In dry climates like Colorado, brush fuels are generally dense and contain more material in a given space than grasses. Brush also usually grows larger and burns longer and more intensely than grass when it ignites.

This makes brush fires more complex, particularly when the brush grows under trees or in large, uniform stands.

CROWN (AERIAL) FUELS



Kari Greer

CROWN FUELS

An intense fire burning in surface fuels can transition into the upper portion of the tree canopies and become a crown fire. Crown fires are dangerous because they are intense, often move rapidly, can burn large areas, and produce embers that can travel great distances and start spot fires well ahead of the main fire.

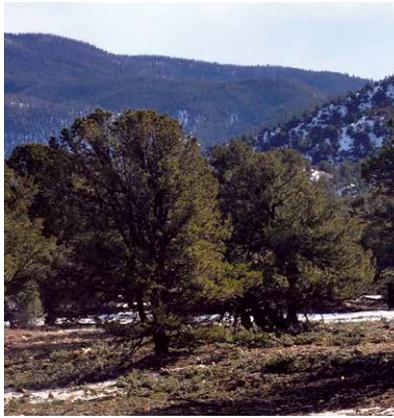
Crown fire hazard can be reduced by thinning trees to decrease crown fuels, reducing surface fuels under the remaining trees and eliminating vertical fuel continuity from the ground into the crowns.

See recommendations on pages 8-9 of this guide.

Forest Types

Recommendations in this guide refer primarily to ponderosa pine, Douglas fir and mixed-conifer ecosystems below 9,500 feet in elevation.

Those who live in or near other forest types can follow these additional recommendations.



PIÑON-JUNIPER

Fires in piñon-juniper forests tend to burn intensely in the crowns of trees under windy conditions.

When thinning these trees on a property, create a mosaic pattern that is a mixture of individuals and clumps of three to five trees. The size of each clump will depend on the size, health and location of the trees. The minimum spacing between the crowns of individual trees is 10 feet, increasing for larger trees, clumps and stands on steeper slopes.

Pruning trees for defensible space is not as critical in piñon-juniper forests as it is in pine or fir forests. Instead, it is more important to space the trees so it is difficult for a fire to move from one tree clump to the next. These trees should only be pruned to remove branches that are dead or are touching the ground. Live branches can be pruned up to 3 feet above the ground, or a third the height of the tree, whichever is less. Removing shrubs growing beneath piñon and juniper canopies is recommended.

Pruning live branches or removing and processing these trees is not recommended between April and October, when the piñon Ips beetle is active in Colorado. Thinning activity that stimulates sap flow in summer months can attract these beetles to healthy trees. It is acceptable to remove dead trees and dead branches during the summer.



LODGEPOLE PINE

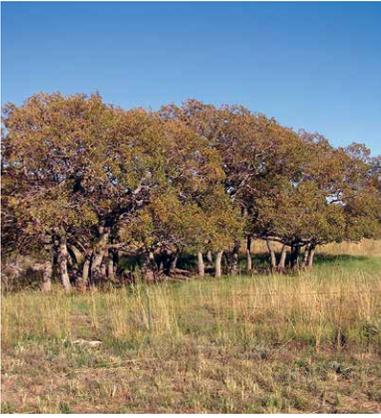
Older lodgepole pine stands generally do not respond well to selective thinning, but instead respond better to removing all trees over a defined area to allow healthy forest regeneration.

Selectively thinning lodgepole can open the stand to severe windthrow and stem breakage. However, if your home is located within a lodgepole pine forest, you may prefer selective thinning instead of removing all the standing trees.

Thinning older stands of lodgepole pine to the extent recommended for defensible space may require several attempts spaced over a decade or more. No more than 30 percent of the trees in a mature stand should be removed in each thinning operation. Focus on removing trees that are obviously lower in height or suppressed in the forest canopy. Leaving the tallest trees will make the remaining trees less susceptible to windthrow.

Another option is leaving clumps of 30-50 trees. Clumps are less susceptible to windthrow than solitary trees. Allow a minimum of 30-50 feet between tree crowns on the clump's perimeter and any adjacent trees or clumps of trees.

To ensure a positive response to thinning throughout the life of a lodgepole pine stand, trees must be thinned early. Begin when trees are small saplings and maintain low densities within the stand as the trees mature.



GAMBEL OAK

Maintaining Gambel oak forests that remain resistant to the spread of wildfire can be a challenge because of their vigorous growing habits. Gambel oak trees grow in clumps or groves, and the stems in each clump originate from the same root system. Most reproduction occurs through sprouts from this deep, extensive root system.

Treat Gambel oak near your home every three to five years, or more often depending on growing conditions. Sprouts should be mowed at least once a year. Herbicides can be used to supplement mowing and control regrowth when treating whole clumps.

This species can be “trained” to grow more like a tree than a shrub in some locations. Remove small diameter oak within clumps and any sprouts growing parallel to the ground.



SPRUCE-FIR

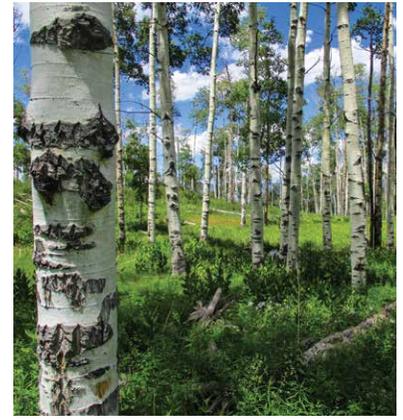
Spruce and fir trees tend to grow in association with each other.

Mature spruce and fir are prone to windthrow when heavily thinned. Light thinnings or leaving groups of trees will help mitigate this problem.

Their hardiness against the wind may not be a problem if a tree has grown to maturity in the open and isn't surrounded by other trees.

Spruce and fir tend to have crowns that extend to the ground. Eliminating lower branches that act as ladder fuels is recommended.

The spruce and Ips bark beetles are native to Colorado and infest Engelmann spruce and Colorado blue spruce. They are particularly attracted to recently fallen green trees and limbs, so it is important to remove any cut branches in a timely manner so surrounding healthy trees are not infested.



ASPEN

Tree spacing and ladder fuel guidelines do not apply to mature stands of aspen trees.

Generally, no thinning is recommended in aspen forests, regardless of tree size, because the thin bark is easily damaged, which can make the tree highly susceptible to fungal infections.

However, in older stands, numerous dead trees on the ground do require removal. Conifer trees often start growing in older aspen stands and can grow up through these old, downed aspens. A buildup of these trees eventually will increase the fire hazard of the stand, so young conifers should be removed from these areas.

Brush also can increase fire hazard in aspen stands and should be thinned to reduce flammability.

Photos: Colorado State Forest Service

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- CSFS program division staff and associate directors
- CSFS field office personnel

Cover Photography

FRONT

Top left: Cleaning debris from gutters is a critical step to prevent home ignition. Photo: Wildfire Partners. **Top right:** Firefighters from Colorado's Platte Canyon Fire Protection District defend a home during a wildfire. As the population expands into the WUI, homeowners must take responsibility to prepare their homes for wildfire. Photo: Kari Greer. **Bottom:** Of 1,000 homes threatened in the 2016 Cold Springs Fire near Nederland, only 8 burned, due in part to homeowners who readied their properties and followed home ignition zone recommendations. Photo: Wildfire Partners

BACK Mitigation work helped spare this Boulder County home near Nederland during the Cold Springs Fire of 2016. Photo: Wildfire Partners



ADAPT TO WILDFIRE

It's never too early to start protecting your home.
The Colorado State Forest Service can help.



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*To achieve stewardship of Colorado's diverse forest environments
for the benefit of present and future generations*

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