



TECHNICAL MEMORANDUM

DATE: February 14, 2022

TO: William Guman and Associates, Ltd

FROM: Ecosystem Services, LLC

RE: Cathedral Pines Wildland Fire & Hazard Mitigation and Forest Management Plan

1.0 Introduction

Ecosystem Services, LLC (ECOS) was retained by William Guman and Associates (Guman), a representative of Gregg Cawfield (Applicant) to prepare a Natural Features Report; Wildland Fire & Hazard Mitigation Plan; and Forest Management Plan for the approximate 35-acre Cathedral Pines site (Site).

1.1 Purpose

According to the El Paso County (EPC) Land Development Code (LDC) 20-001 for Fire Protection and Wildfire Mitigation (Code) (*EPC, 2021*), the stated general purpose and intent of the Code for Fire Protection and Wildfire Mitigation is *to ensure that proposed development is reviewed in consideration of the wildfire risks and need to provide adequate fire protection in order to:*

- a. *Regulate development, buildings and structures so as to minimize the hazard to public health, safety and welfare;*
- b. *Ensure that adequate fire protection is available for new development;*
- c. *Implement wildfire hazard reduction in new development;*
- d. *Encourage voluntary efforts to reduce wildfire hazards; and*
- e. *Reduce the demands from the public for relief and protection of structures and facilities.*

Refer to Appendix A, El Paso County Fire Protection and Wildfire Mitigation Code.

This Wildland Fire and Hazard Mitigation Plan (Plan) plan does not include:

- Reports and Commitments for Subdivisions (Section B of the Code);
- Design Standards related to the regulation of development, buildings and structures, including water supply, roads, non-road access and gates (Section C of the Code); or
- General Construction in Wildland Fire Areas [Section (D)(1) or (D)(2)(b) of the Code].

These items shall be considered and provided by Applicant and their site planners, engineers, architects and/or home builders under separate cover.

This Plan is provided as a general plan, without analysis, to provide data and resources to meet purpose and intent of the Code for the Cathedral Pines residential project (Project) at this preliminary plan stage in the development process, including a:

- Wildland Fire and Hazard Mitigation Plan [Section (D)(2)(a) of the Code];
- Wildland Fire Risk and Hazard Severity Analysis [Section (D)(3) of the Code]; and
- Defensible Space Requirements (Section D5 of the Code)

Higher level plans developed by a fire ecologist or specialist may be required at a later stage in the development process to satisfy all portions of the Code including:

- No Permit or Approval Granted without Compliance (Section D4 of the Code); or
- Fuels Modification During Development and After Construction (Section D6 of the Code); or
- Combustible Materials (Section D7 of the Code).

This Plan relies on publicly available State and County wildfire references to assist the Applicant and future home owners with meeting the EPC requirements. These references include:

- Colorado State Forest Service (CSFS) Wildfire Risk data;
- CSFS Home and Property Protection data;
- El Paso County (EPC) Office of Emergency Management Wildfire Mitigation and Defensible Space data; and
- EPC Sheriff's Office Community Wildfire Protection Plan for Unincorporated El Paso County;

1.2 Project Description and Site Location

The Applicant proposes to develop a 35-acre Site as a low-density residential community in unincorporated El Paso County. Refer to the development plans and application prepared by Guman under separate cover for more detail on the Project.

The Site is located in the Black Forest approximately 1.6 miles east of State Highway 83 and 1.0 mile north of Shoup Road in El Paso County, Colorado. The Site is located south of Saxton Hollow Road, west of Winslow Drive and north of Peregrine Way. Geographically, the Site is located within the southeast $\frac{1}{4}$ of Section 2, Township 12 South, Range 66 West in El Paso County, Colorado. The center of the Site is situated at Latitude 39.029517°, Longitude -104.745761°. Refer to Figure 1, USGS Site Location Map.

2.0 Environmental Setting

The Site is located in the UESPA Level III Ecoregion: 26 Southwestern Tablelands (Chapman et al, 2006). More specifically, the Site is located within the Pine-Oak Woodlands (26i), Level IV Ecoregion. The Pine-Oak Woodlands ecoregion is a dissected plain with dense oakbrush and deciduous oak woodlands combined with ponderosa pine woodlands. The southern portion is known locally as the Black Forest. Although woodlands dominate, the region is a mosaic of woodlands and grasslands. It is somewhat more dissected than the surrounding Foothill Grasslands (26j) ecoregion. The Pine-Oak Woodlands may be an outlier of the ponderosa pine woodlands found in the mid-elevation forests of the Southern Rockies (21) to the west. Soils are formed from weathered sandstone and shale with some outwash on uplands. Land use is woodland, wildlife habitat, and some rangeland. Areas of the region are rapidly urbanizing.

2.1 Topography

The Site is generally characterized as gently sloping from east to west, with west facing slopes/aspect. Site topography ranges from a high elevation of 7,360 feet above mean sea level (AMSL) along the east-central boundary to a low elevation of 7,290 feet AMSL along the west-central boundary. This amounts to approximately 70 feet of vertical fall over 965 horizontal feet, a 7% slope. Refer to Figure 1, USGS Site Location Map. There are no significantly steep slopes, topographic features or rock outcroppings.

2.2 Drainage Basin and Drainages

The Site is located within the Fountain Creek sub-watershed of the Arkansas River Watershed and outside of any FEMA mapped floodplains (FEMA, 2021). Three swales are present in the north-central, central and south-central portions of the Site, they flow from east to west. The upper/east ends of the swales are small, approximately four feet deep and 40 feet wide. On the west side of the Site the two northernmost swales are much larger, approximately fifteen feet deep and 200 feet wide. Overland drainage from precipitation would generally flow westward within the swales toward Black Squirrel Creek, a perennial stream that flows into Monument Creek, then Fountain Creek, and then into the Arkansas River.

2.3 Vegetation

The Site was vegetated with dense ponderosa pine (*Pinus ponderosa*) forest until 2013 when the Black Forest fire killed approximately 75 percent of the trees. The dead standing trees were removed between 2017 and 2019. Currently, vegetation within the Site consists of cleared areas (former forest) and remnant stands of ponderosa pine running north-south through the east-central portion of the Site with smaller patches in the northeast and southeast corners. Herbaceous vegetation is sparse and weedy in most areas. The Site is not currently grazed. Note that the CSFS vegetation mapping from which all CSFS wildfire data is derived shows that ponderosa pine forest covers approximately 75% of the Site. After forest management and tree removal, ponderosa pine coverage is currently at 25%. Refer to Figure 2, Existing Condition Aerial Photo and Figure 3, Vegetation Map.

2.3.1 Cleared Areas (former Ponderosa Pine Forest)

Three-fourths of the Site is comprised of Cleared Areas (former Ponderosa Pine Forest) that is vegetated with exceptionally weedy, disturbed, sparse vegetation. Cover consists of approximately 30% bare ground, 35% native species, and 35% non-native species. The two main sources of disturbance were the 2013 wildfire and subsequent dead tree removal. The tree removal method appear to have been to pile up dead trees with heavy equipment and then mulch the wood onsite. Almost the entire Site has been disturbed by light grading but does not appear to have been re-seeded with native species. The abundant weeds could have been brought in and spread by the clearing equipment. They may also have started growing following the Black Forest fire, especially if the property had sparse herbaceous vegetation prior to the fire and was not reseeded with native species.

The three most common native species are threadleaf sedge (*Carex filifolia*) (an upland species), hairy goldenaster (*Heterotheca villosa*), and broadbeard penstemon (*Penstemon angustifolius*). There are numerous species of native flowering forbs scattered throughout the Site, but Native grass cover is less than five percent. There is one or two percent cover of scattered small ponderosa pines and aspens (*Populus tremuloides*) (one to three feet tall).

Weed cover is extremely high and mostly consists of species on the Colorado Noxious Weed Lists B and C. There are two dominant non-native species throughout the Site, each with approximately 10 to 15 percent cover: 1) diffuse knapweed is spread throughout the Site with 15 percent cover in most areas; and 2) cheatgrass (*Bromus tectorum*) occurs in scattered dense patches and with lower cover in-between the dense patches. Common mullein (*Verbascum thapsus*) is the third most common species with cover ranging from one to ten percent. Cover of Canada thistle (*Cirsium arvense*) and yellow toadflax (*Linaria vulgaris*) is less than five percent overall and tends to be concentrated along swales. Since weeds were spread throughout the Site, a species specific weed map was not

prepared. The State Listed noxious weeds are summarized in the Weed Management Plan (Appendix C) and revegetation recommendations are provided in the Natural Features Report, both under separate cover.

2.3.2 Ponderosa Pine Forest

The ponderosa pines are visually significant, increase vegetative diversity, and provide wildlife habitat. One-fourth of the Site is forested. There are approximately 7.5 acres of mature ponderosa pine running north-south through the east-central portion of the Site with smaller patches in the northeast and southeast corners. Dead trees were removed from approximately 3.5-acres of the forested areas, leaving an open woodland with less than 40 percent tree cover and disturbed herbaceous vegetation similar to that previously described (30% bare ground and 35% weeds).

In the ponderosa pine forest that was not impacted by tree removal (approximately 4.0-acres), tree cover is more than 50 percent and herbaceous cover is dense (90%) with few weeds. Native grasses are the dominant species including junegrass (*Koeleria macrantha*), blue grama (*Bouteloua gracilis*), Arizona fescue (*Festuca arizonica*), and mountain muhly (*Muhlenbergia montana*). Other common species include threadleaf sedge, broadbeard penstemon, small-leaf pussytoes (*Antennaria parviflora*), and the woody ground cover kinnikinnick (*Arctostaphylos uva-ursi*). Shrub cover is extremely low (less than one percent) and consists of mountain mahogany (*Cercocarpus montanus*) and Gambel's oak (*Quercus gambelii*).

2.3.3 Swales

Three natural drainage swales convey surface flows across the Site from east to west, they cross the north-central, central and south-central portions of the Site. The upper/east ends of the swales are small, approximately four feet deep and 40 feet wide. The two northernmost swales increase in size towards the west side of the Site where they are approximately fifteen feet deep and 200 feet wide. During the Site visit, none of the swales have any visible evidence of recent surface flows or field indicators of an ordinary high water mark. Most of the swales are vegetated with upland vegetation similar to the previously described cleared areas. In moister sections, cover of slightly more mesic species increases, including Japanese brome (*Bromus japonicus*), smooth brome (*Bromus inermis*), western wheatgrass (*Pascopyrum smithii*), and Canada thistle (*Cirsium arvense*) (listed from upland species to more mesic species).

In three small areas moisture is sufficient to support vegetation where wetland species (i.e., hydrophytic species) are dominant. Two of the wetland areas are on the east side of the Site and receive runoff via culverts that flow under Winslow Drive. The third wetland is along a flat section of swale where water may occasionally pool. The dominant species are Kentucky bluegrass (*Poa pratensis*), Baltic rush (*Juncus balticus*), Dudley's rush (*J. dudleyi*), and starry false Solomon's seal (*Maianthemum stellatum*). Other common species are Canada thistle, common spikerush (*Eleocharis palustris*) and Emory's sedge (*Carex emoryii*). There were also sparse occurrences (1%) of small narrowleaf willows (*Salix exigua*) in the northernmost wetland. Soil sampling points were completed and field notes were taken to confirm the presence of wetland soils and hydrology.

3.0 Wildland Fire Risk and Hazard Severity

This wildfire hazard assessment is based on Colorado State Forest Service (CSFS) Wildfire Risk data (CSFS, 2022a) that shows the following for the Site:

- **Wildfire Risk** is the overall composite risk occurring from a wildfire derived by combining Burn Probability and Values at Risk Rating. The site is currently rated at Lowest Risk. Refer to Figure 4.
- **Burn Probability** is the annual probability of any location burning due to wildfire. The site is currently rated at Very Low, Very Low Low and Low. Refer to Figure 5.
- **Fire Intensity Scale (FIS)** specifically identifies areas where significant fuel hazards and associated dangerous fire behavior potential exists. FIS provides a standard scale to measure potential fire intensity (i.e., severity) and consists of five classes where Class 1 is the lowest and Class 5 is the highest intensity. The site is currently rated at Moderate (Class 3) and Moderate to High (Class 4) Intensity if it were to burn. Refer to Figure 6.
- **Values at Risk Rating** is a composite rating of values and assets that would be adversely impacted by a wildfire by combining the four main risk outputs which include wildland urban interface, forest assets, riparian assets, and drinking water importance areas. The site is currently rated at -1, -2, -3 and -4. Refer to Figure 7.
- **Wildland Urban Interface Risk** is a measure of the potential impact on people and their homes from wildfire. The site is currently rated at -1, -2, -5 and -6. Refer to Figure 8.
- **Surface Fuels**, or fire behavior fuel models, is a characterization of surface fuel models to compute rate of spread, flame length, fireline intensity and other fire behavior metrics based on primary carrier of surface fires, including 1) grass (GS), 2) shrub/brush, 3) timber litter (TL) and 4) slash. The site is currently rated at Low Load (GS 1), Moderate Load (TL 3) and Moderate Load (TL 6). Refer to Figure 9.
- **Historical Wildfire Occurrence** is a measure of wildfire ignition density based on historical ignition locations (federal & non-federal). The site is currently rated at 8. Refer to Figure 10.

Refer to Appendix B, CSFS Colorado Wildfire Risk Public Viewer Map Theme Descriptions for further detail on the themes discussed above.

According to the Code (EPC, 2021), *additional fire precaution measures may be required because of fire hazard in the following areas:*

- Areas depicted as forested on the Vegetation Map;*
- Areas rated as fire hazards by the CSFS;*
- Where slopes in or adjacent to proposed development are in excess of 20%; or*
- Where the local fire protection agency identifies a specific fire danger. (EPC, 2021).*

Forested areas are depicted on current aerial imagery (dated July 6, 2022) and the CSFS Vegetation Map generally running in a north-south direction through the center of the Site. Refer to Figure 2, Existing Condition Aerial Photo and Figure 4, Vegetation Map. The CSFS does not specifically rate fire hazards. However, they do rate nearly every portion of the landscape throughout the State for the Wildfire Risk data documented above. If Wildfire Risk is an overall composite risk occurring from fire hazards derived by combining Burn Probability and Values at Risk, the wildland fire risk for the Site is currently rated at Lowest Risk (CSFS, 2022a). Refer to Figure 4, Wildfire Risk Map. If Fire Intensity

Scale (FIS) is a measure of potential fire intensity (or a proxy for severity), the hazard severity for the Site is rated between Moderate (Class 3) and Moderate-High (Class 4) (CSFS, 2022a). Refer to Figure 6, Fire Intensity Scale Map. CSFS defines intensity/hazard severity for these classes as follows:

- *Class 3, Moderate: Flames up to 8 feet in length; short-range spotting is possible. Trained firefighters will find these fires difficult to suppress without support from aircraft or engines, but dozer and plows are generally effective. Increasing potential for harm or damage to life and property.*
- *Class 4, Moderate-High: Large Flames, up to 30 feet in length; short-range spotting common; medium range spotting possible. Direct attack by trained firefighters, engines, and dozers is generally ineffective, indirect attack may be effective. Significant potential for harm or damage to life and property.*

The east-west slopes on the Site are approximately 7% and not in excess of 20%. Given that there are forested areas on Site and the CSFS has rated the Site (albeit very low), the Code requires the preparation of a Wildfire Hazard Mitigation Plan as generally described in the following sections.

4.0 Wildfire Hazard Mitigation and Forest Management

As stated by the CSFS, “Wildfires are a natural part of Colorado’s forests. If you live in the wildland-urban interface in Colorado, where homes and other structures intermingle with wildland vegetation, you are at risk of being affected by wildfire. Planning ahead and taking action can increase the likelihood your home survives when a wildfire occurs. Firefighters always do their best to reduce fire damage, but ultimately, it is your (the homeowners) responsibility to protect your property from wildfire” (CSFS, 2022b).

Given that the Wildfire Risk for the Site is rated at Lowest Risk; the Site already burned in 2013; the Applicant took the responsibility to remove over 50% of the downed/burned timber (surface fuels); thin the remaining 25% of forested areas; to remove ladder fuels (shrubs in the understory); and will layout the development according to Design and Construction Standards in the Code, much of the wildfire hazard has been or will be mitigated by the Applicant prior to development.

However, to protect property from wildfire and manage the remaining forested areas, the wildfire hazard protection and mitigation measures included herein (or by reference) should be incorporated into the Project Codes Covenants and Restrictions (CCRs). After that, it is expected that individual lot owners will be responsible for addressing home ignition, defensible space (including tree removal and thinning), fire mitigation, and residential landscaping according to the following resources:

- CSFS Home Ignition Zone Guide (Appendix C);
- EPC Office of Emergency Management Wildfire Mitigation and Defensible Space located on-line at <https://admin.elpasoco.com/pproem/fire-mitigation>;
- El Paso County Sheriff’s Office Community Wildfire Protection Plan for Unincorporated El Paso County (Appendix D); and
- Colorado State University Extension Fire-Resistant Landscaping (Appendix E).

Refer to the attached appendices and on-line links to the above listed resources.

According to the EPC Office of Emergency Management (EPC, 2022), some wildfire mitigation and defensible space measures to help future residents manage forested areas, defend a buffer and save their homes from wildfire include:

- *Rake up dead grass, pine needles, leaves, and pinecones and dispose of them*
- *Remove dead or dying trees and bushes*
- *Keep the grass yard and fields mowed*
- *Trim low hanging tree branches, 6-foot clearance to the ground*
- *Trim any branches that are within 10 feet of your house and building*
- *Trim any branches that hang over your roof or near your chimney*
- *Clean out roof gutters*
- *Clean out under decks and around gardens*
- *Move wood piles at least 50 feet away from your home*
- *Remove old junk piles that contain flammable materials*
- *Select fire-safe landscaping and fire-resistant plants*
- *Use synthetic fire-resistant materials for decks and fencing*
- *Purchase fire-resistant patio furniture*
- *Cut down trees based on spacing and the slope of the property*
- *Make sure driveways and property are accessible for fire trucks to enter, turn around, and exit*

5.0 Fire Protection and Design Standards

5.1 Reports and Commitments for Subdivisions

The Site is located within the jurisdiction and boundaries of the Black Forest Fire Protection District (District) within the EPC Community Wildfire Protection Plan (CWPP) Northeast Highway 24 Subunit (EPC, 2011). The Applicant will provide the following under separate cover:

- **Fire Protection Report** to include the capabilities, including existing and proposed equipment, facilities, services, response time to provide fire protection for the proposed subdivision, an analysis of compliance with the Fire Protection and Wildfire Mitigation Section of the Code, and an analysis of compliance with the applicable fire code;
- **Fire Protection Commitment** from the local fire protection District to include a written commitment that they will provide structural fire protection for the proposed subdivision;
- **Mitigation Costs Included in the Construction Financial Assurances** if the EPC Board of County Commissioners determines that wildfire mitigation issues are significant enough to require mitigation associated with development construction activities; and
- **Annex and Provide Evidence of a Contract for Service from a Fire District or Department** if the proposed subdivision is located outside the boundaries of an existing District or Department.

5.2 General Design Standards

The EPC Code for Fire Protection and Wildfire Mitigation must be followed by the Applicant for the common areas and all newly constructed buildings. Common area standards include water supply, roads, bridges, non-road access and access gates. Lot development standards include those for the location of building and building envelopes; roof design and materials; accessory structures, access to structures, access to structures not protected by automatic sprinklers and separation between

structures that are potentially threatened by wildland fire shall be designed, located and constructed by the Applicant their planners, engineers, architects and future home builders to comply with the Code and National Fire Protection Association (NFPA) codes and standards under the review of El Paso County. The proof or certification (if necessary) for meeting the ECP design standards and fire codes will be provided by the Applicant under separate cover separately from this Plan.

6.0 Summary

The Wildfire Risk for the Site is rated at Lowest Risk (CSFS, 2022a) as illustrated in Figure 4, Wildfire Risk Map. Wildfire hazard surface fuel reduction was recently completed by the Applicant for much of the forested portions of the Site which should further reduce the overall wildfire risk and hazards for future residents. The site development plan will conform to County development, design and construction standards for fire protection. Fire hazard and defensible space mitigation on each lot will be the ultimate responsibility of individual future landowners according to the CCRs prepared by the Applicant, and CSFS and El Paso County fire hazard mitigation resources including, but not limited to those referenced herein.

6.0 References

- CSFS (Colorado State Forest Service), 2022a. Wildfire Risk Public Viewer, available at: <https://co-pub.coloradoforestatlas.org>. Last accessed December 1, 2022.
- CSFS, 2022b. Colorado State Forest Service Home and Property Protection data, available at: <https://csfs.colostate.edu/wildfire-mitigation/protect-your-home-property-from-wildfire>. Last accessed December 1, 2022.
- CSFS, 2021. Colorado State Forest Service Home Ignition Zone guide, available at: <https://csfs.colostate.edu/wildfire-mitigation/protect-your-home-property-from-wildfire>. Last accessed December 1, 2022.
- CSU (Colorado State University Extension), 1999. Fire-Resistant Landscaping Fact Sheet No. 6.303, available at <https://extension.colostate.edu/docs/pubs/natres/06303.pdf>. Last accessed December 1, 2022.
- EPC (El Paso County), 2021. El Paso County Land Development Code 20-001 for Fire Protection and Wildfire Mitigation. January 26, 2021.
- EPC, 2022. Office of Emergency Management Wildfire Mitigation and Defensible Space located online at <https://admin.elpasoco.com/pproem/fire-mitigation>
- EPC, 2011. El Paso County Sheriff's Office Emergency Services Division. 2011. Community Wildfire Protection Plan for Unincorporated El Paso County "A Continuing Process", available at: <https://static.colostate.edu/client-files/csfs/pdfs/El-Paso-County-CWPP.pdf>.

DISCLAIMER

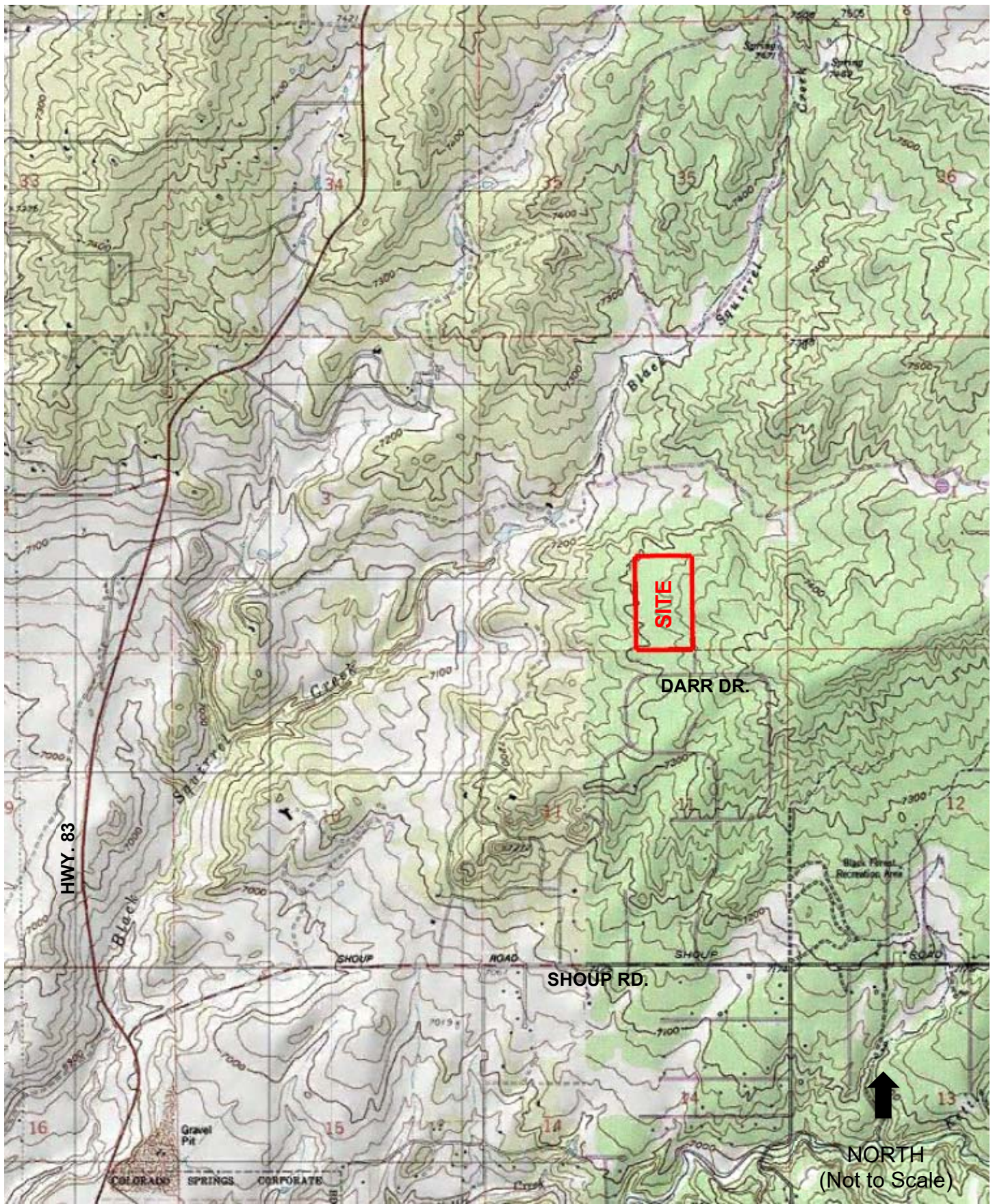
The information contained in this document and by reference is provided as a general assessment and plan utilizing publicly available data and recommendations. ECOS makes no warranties, either expressed or implied, concerning the accuracy, completeness, reliability, or suitability of the information. Nor does ECOS warrant that the use of this information is free of any claims of copyright infringement. The information provided herein is being provided "as is" and without warranty of any kind either express, implied or statutory, including but not limited to the implied warranties of merchantability and fitness for a particular purpose.

Users also should note that property boundaries included herein do not represent an on-the-ground survey suitable for legal, engineering, or surveying purposes. They represent only the approximate locations.

By using the information herein and any references, the Applicant and any future residents of the Project hereby release ECOS, their employees, agents (collectively, ECOS) from any and all responsibility and liability associated with its use. In no event shall ECOS be liable for any damages arising in any way out of the use of the information contained or omitted herein.

The user of this report assumes the entire risk related to their use of this information, references or any products derived herein. In no event will ECOS be liable to Guman, the Applicant or any third party for any direct, indirect, incidental, consequential, special or exemplary damages resulting from any use or misuse of this data, even if the user has been advised of the possibility of such damages.

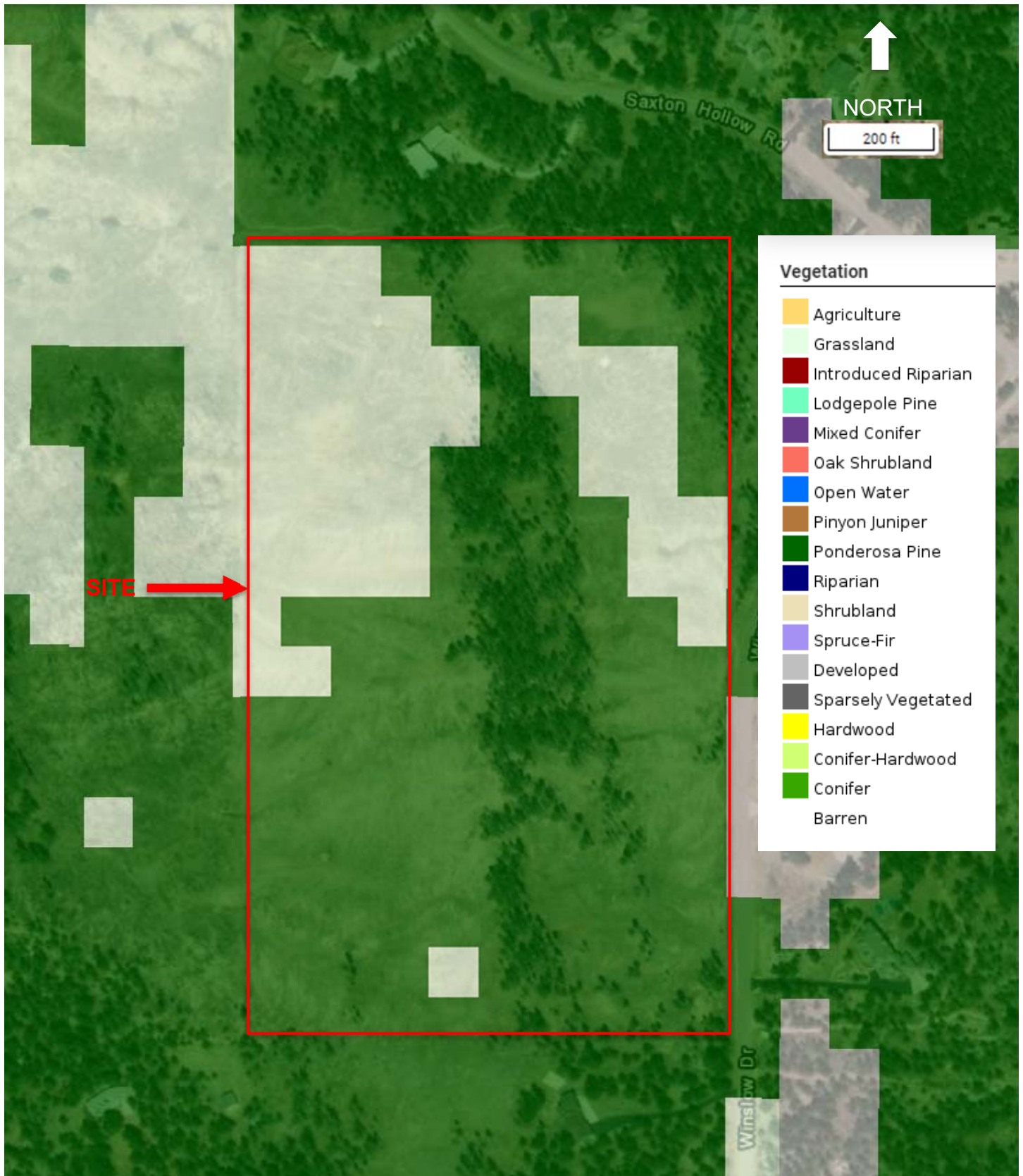
FIGURES



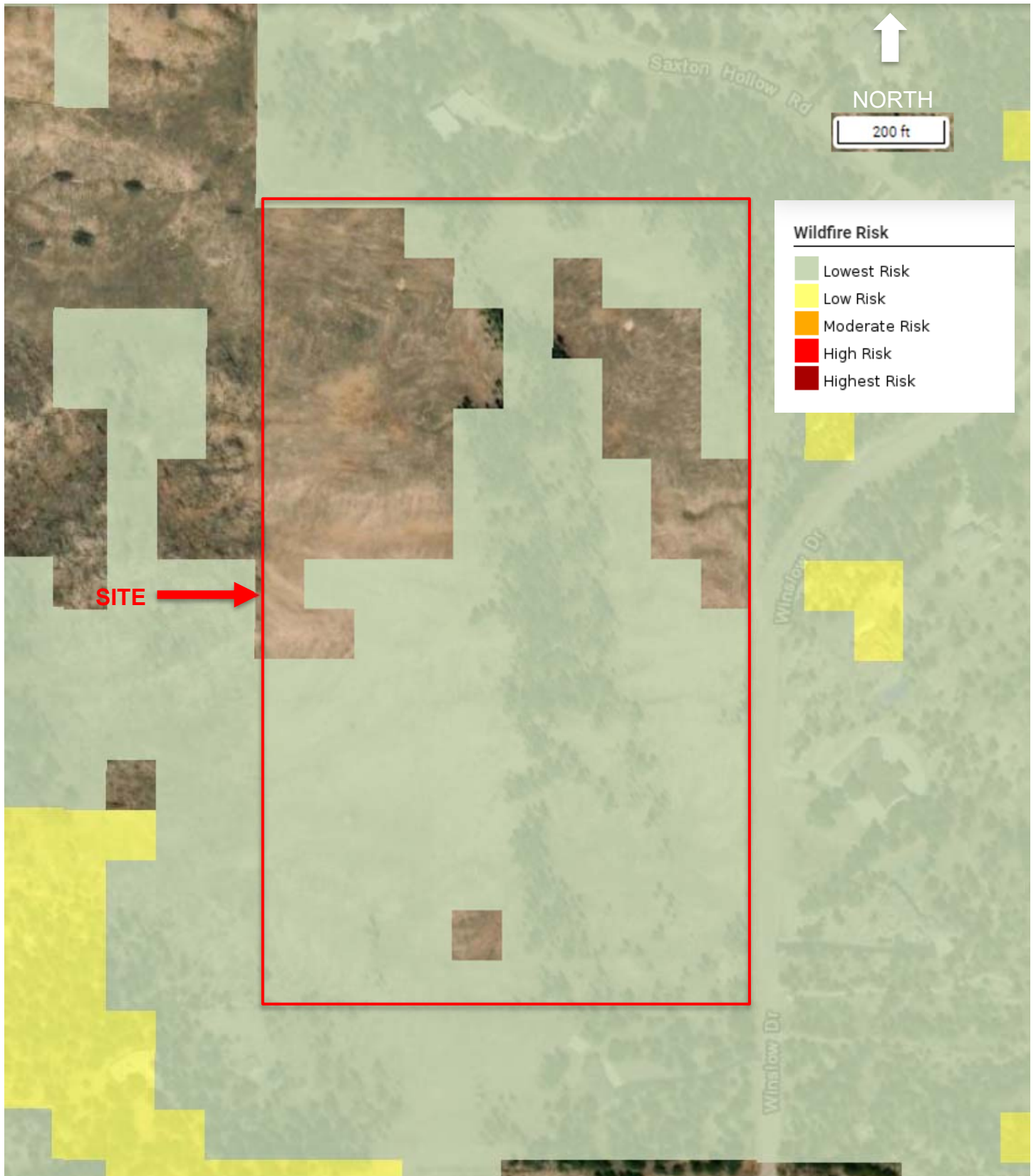
USGS 7.5 min. Quad: Black Forest
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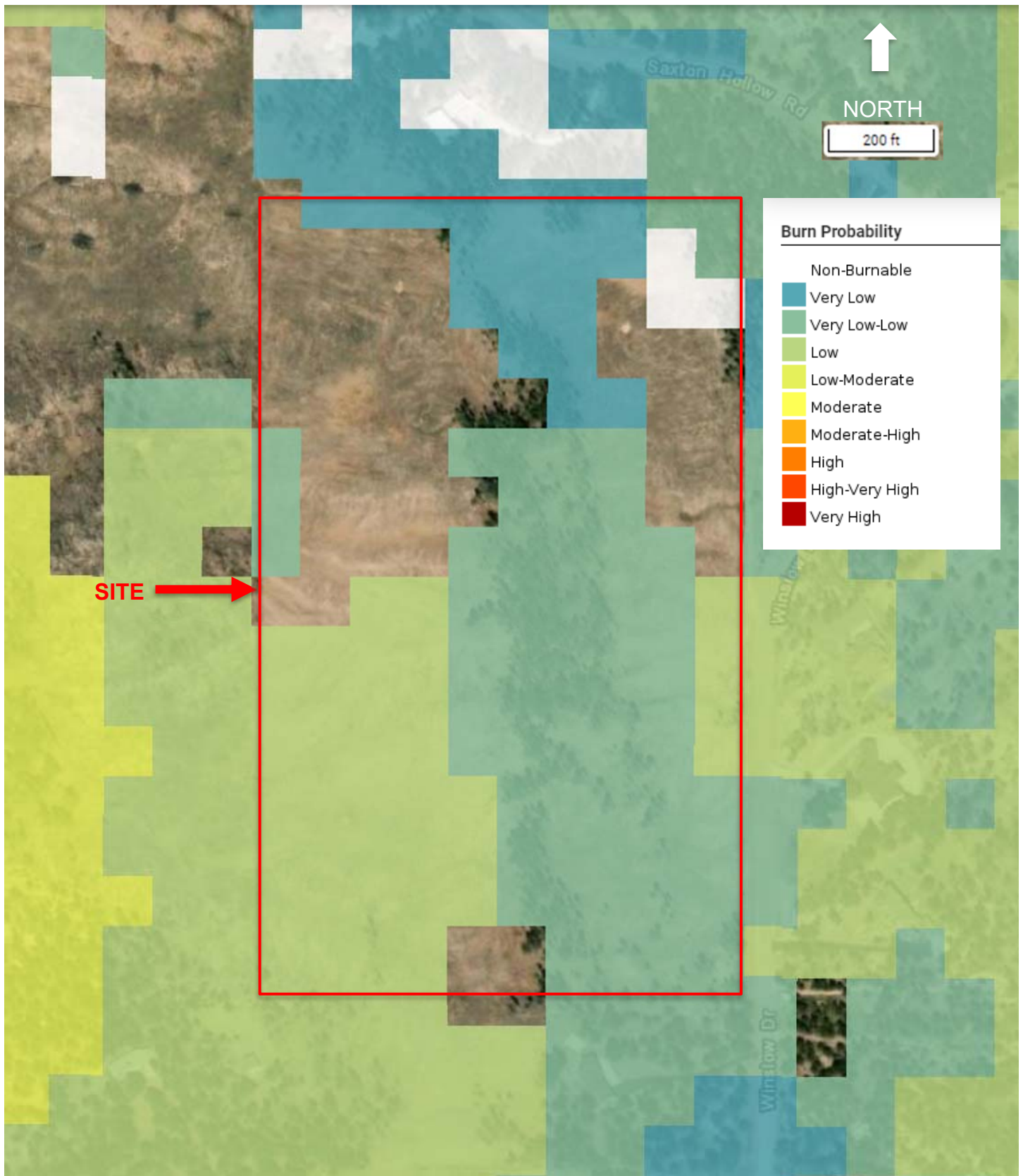
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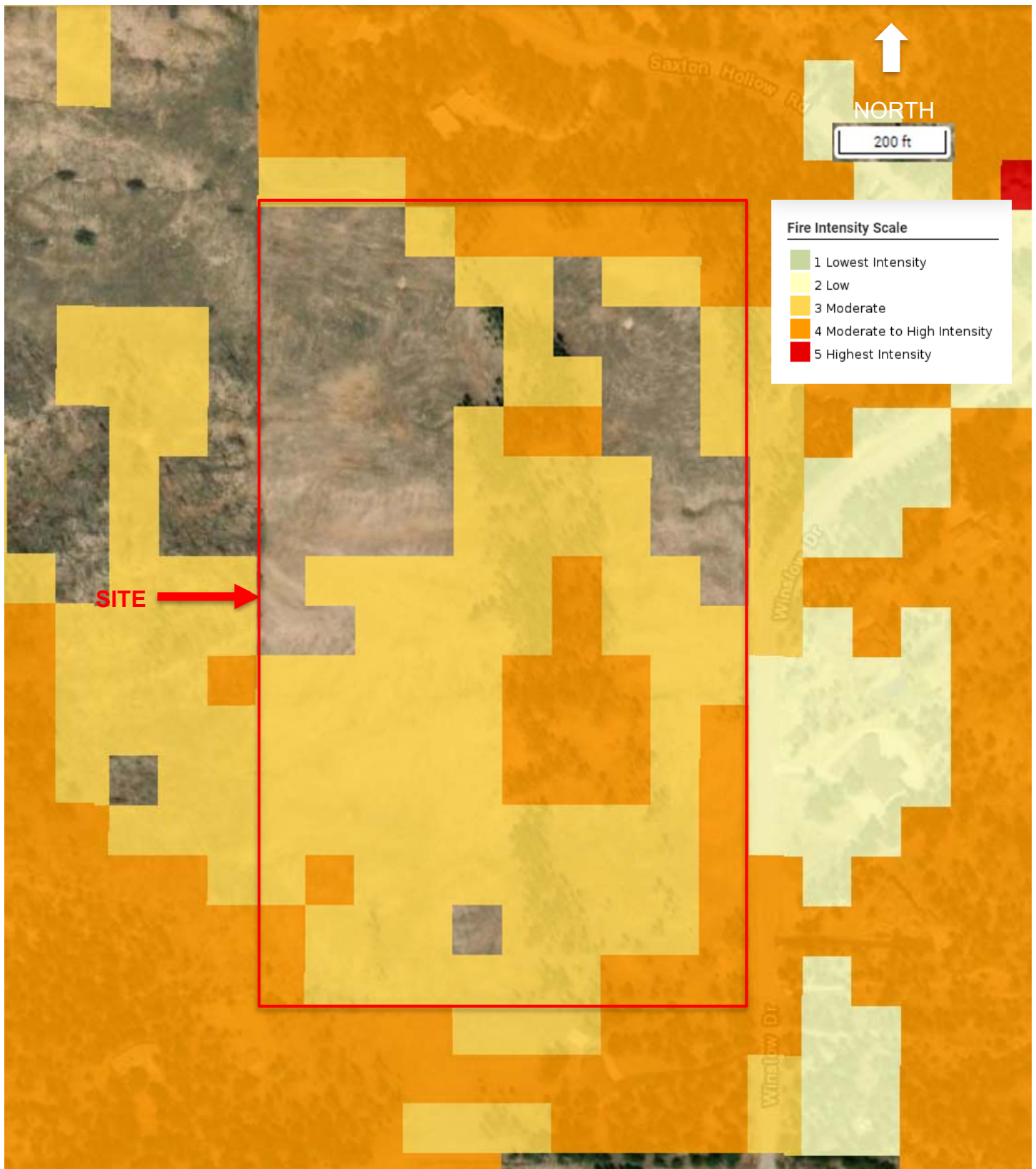
SOURCE: Colorado State Forest Service, Wildfire Risk Public Viewer, accessed on 12/1/2022



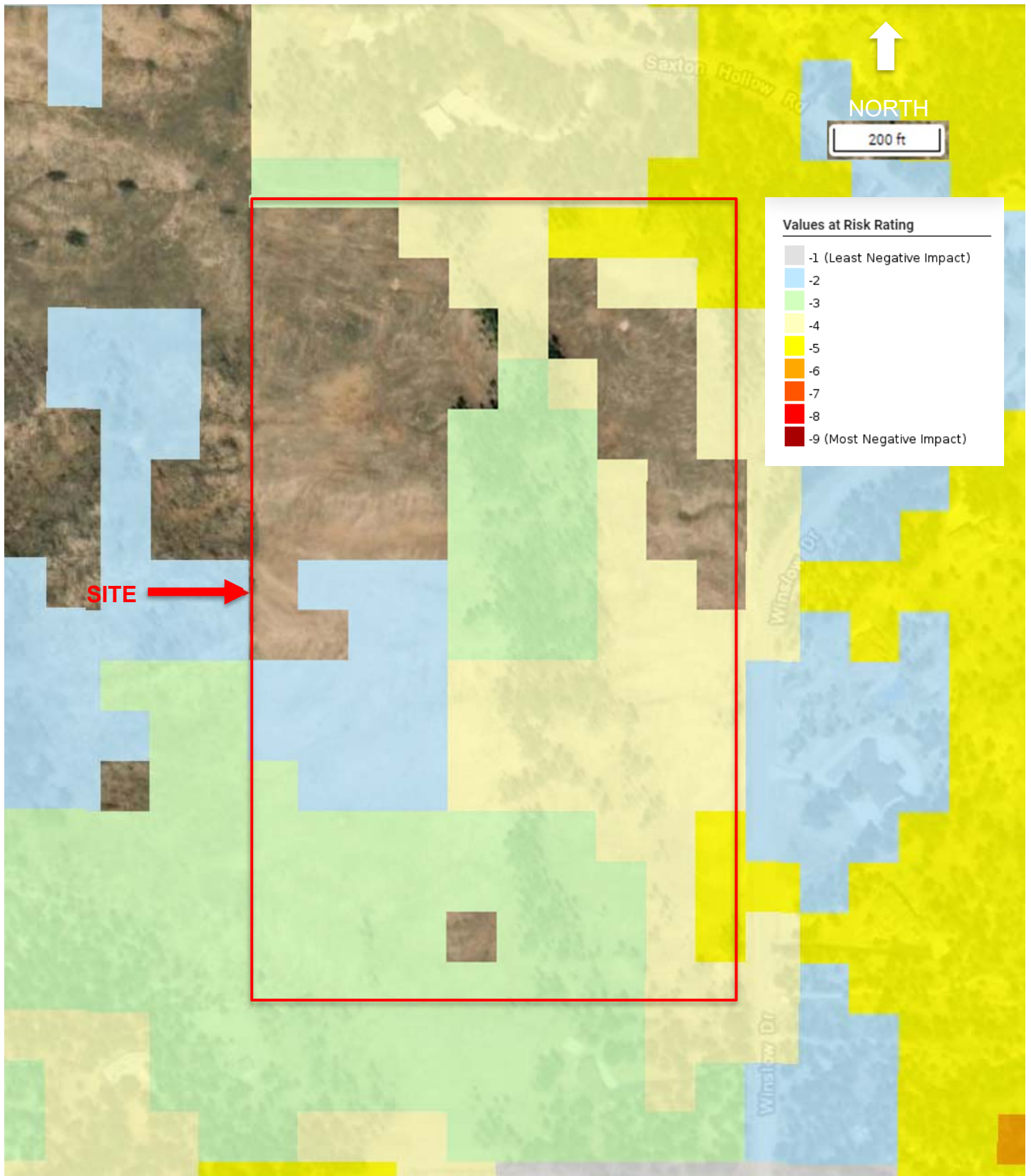
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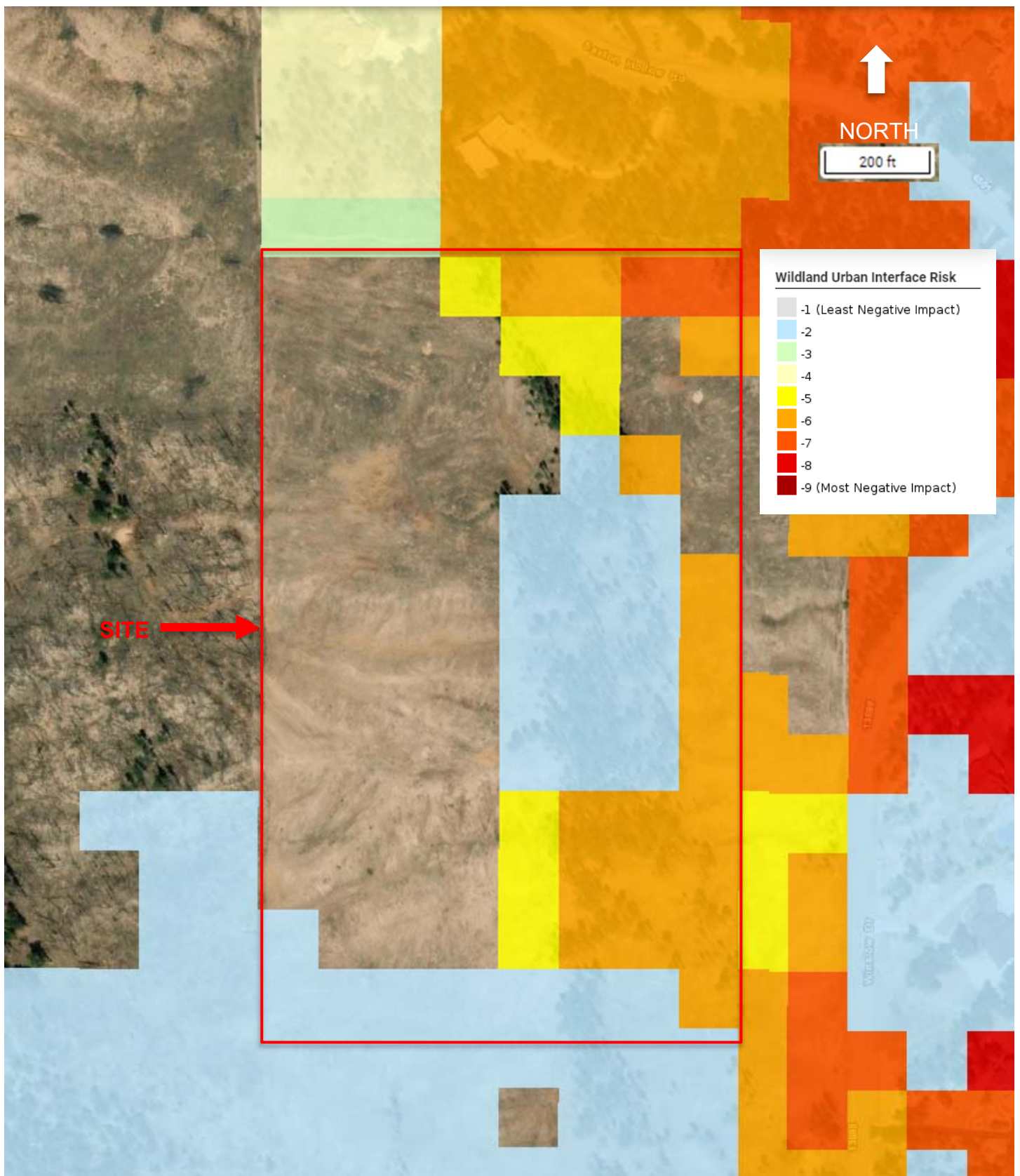
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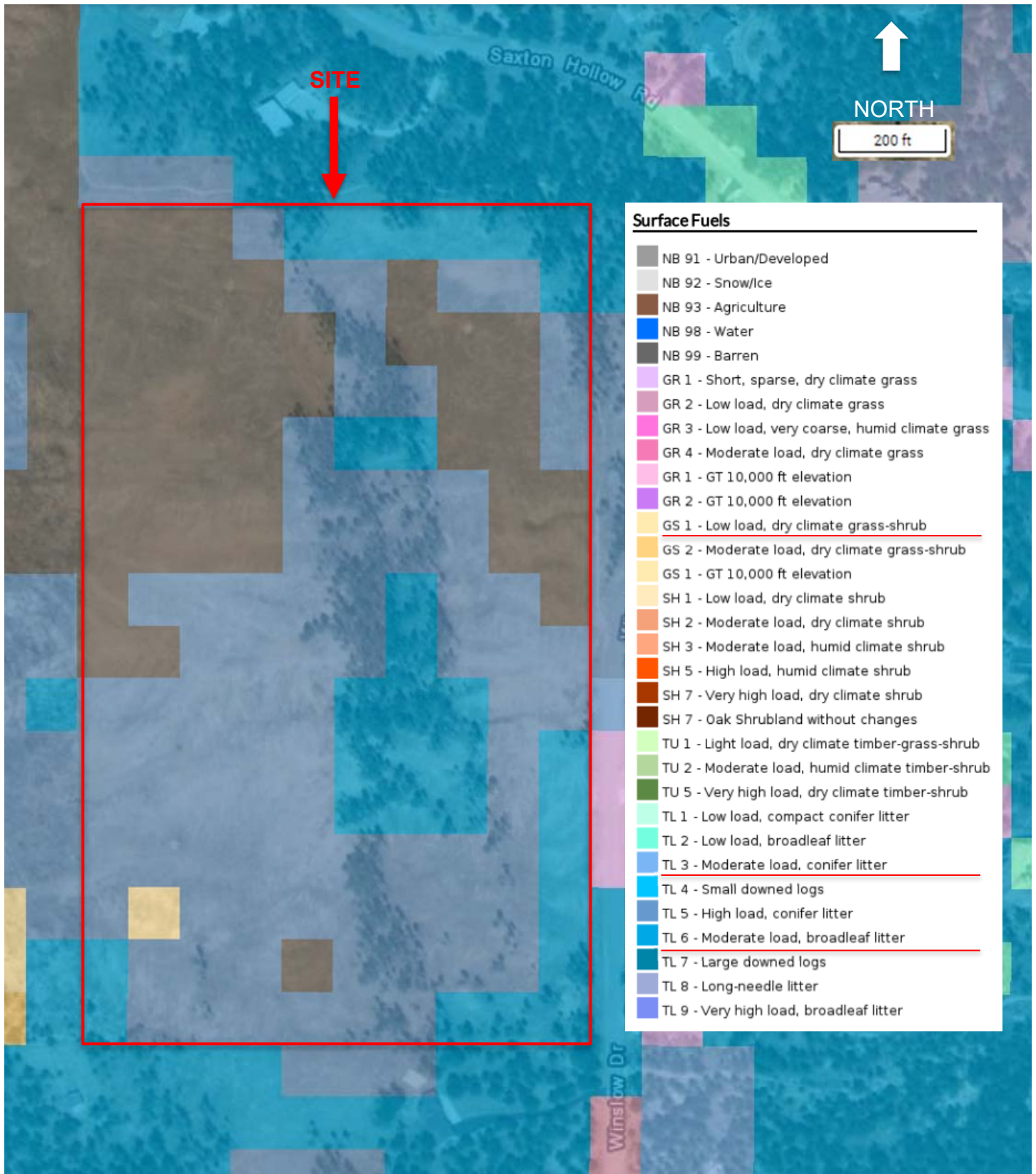
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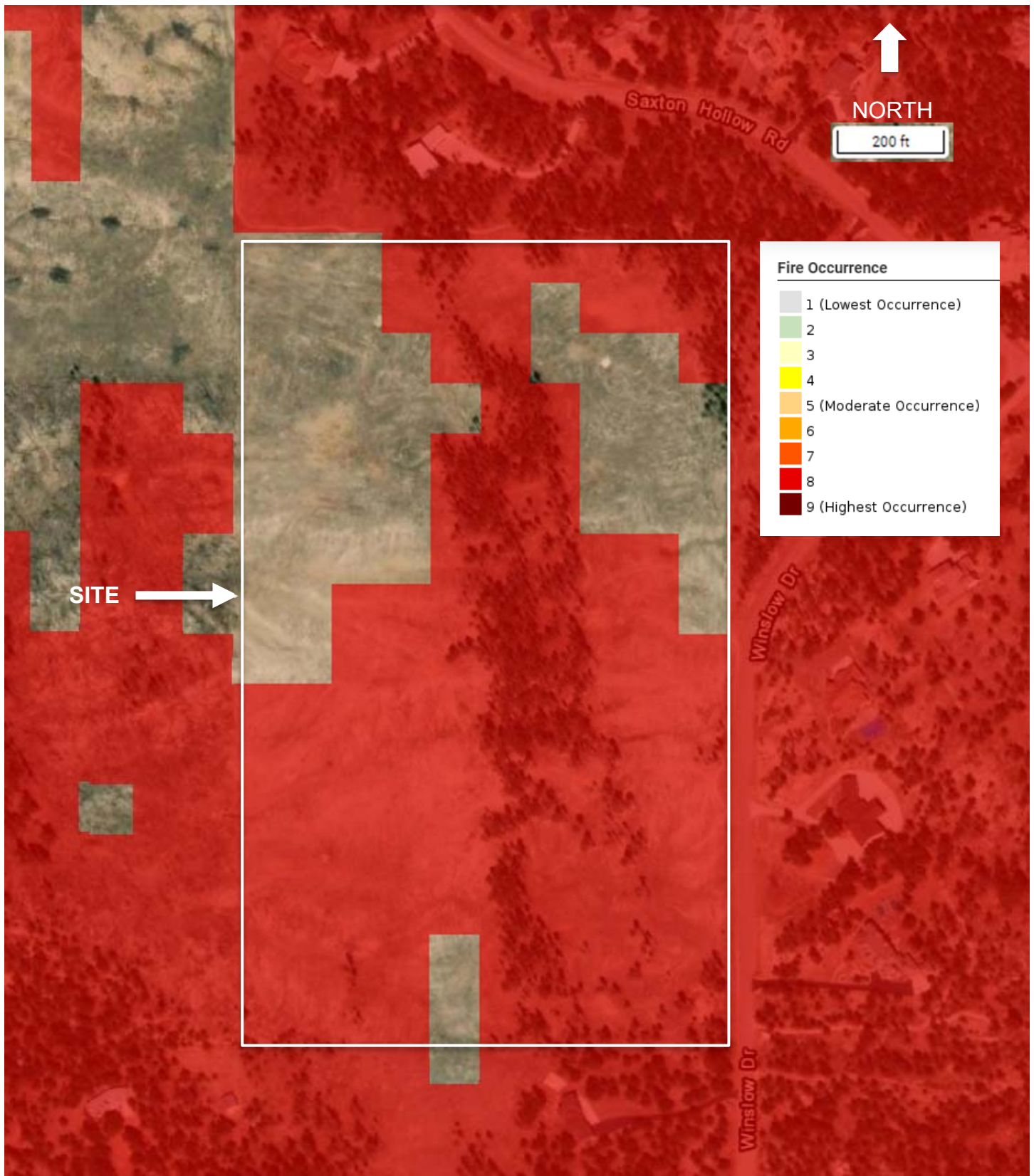
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SOURCE: Colorado State Forest Service, Wildfire Risk Public Viewer, accessed on 12/1/2022



SOURCE: Colorado State Forest Service, Wildfire Risk Public Viewer, accessed on 12/1/2022



SOURCE: Colorado State Forest Service, Wildfire Risk Public Viewer, accessed on 12/1/2022

APPENDIX A

El Paso County Fire Protection and Wildfire Mitigation Code

BACC

Chuck Broerman
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El Paso County, CO



22
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RESOLUTION NO. 21-36

EL PASO COUNTY BOARD OF COUNTY COMMISSIONERS, STATE OF COLORADO

APPROVAL OF AMENDMENT TO THE LAND DEVELOPMENT CODE (LDC-20-001) Fire Protection and Wildfire Mitigation

WHEREAS, the Planning and Community Development Department of El Paso County requests approval of Amendment(s) to Chapter(s) 1, 5, and 6 of the Land Development Code as herein described, including other conforming amendments throughout the Code;

WHEREAS, a public hearing was held by the El Paso County Planning Commission on January 7, 2021, upon which date the Planning Commission did by formal resolution recommend approval of the proposed amendments, and

WHEREAS, a public hearing was held by this Board on January 26, 2021; and

WHEREAS, based on the evidence, testimony, exhibits, consideration of the master plan for the unincorporated area of the County, presentation and comments of the El Paso County Planning and Community Development Department and other County representatives, comments of public officials and agencies, comments from all interested persons, comments by the general public, comments by the El Paso County Planning Commission Members, and comments by the Board of County Commissioners during the hearing, this Board finds as follows:

1. The proposed amendment(s) to the El Paso County Land Development Code Choose an item. properly submitted for consideration by the Planning Commission.
2. Proper publication and public notice were provided as required by law for the hearing before the Planning Commission.
3. The hearing before the Planning Commission was extensive and complete, that all pertinent facts, matters and issues were submitted and that all interested persons were heard at that hearing.
4. All data, surveys, analyses, and studies, as are required by the State of Colorado and El Paso County have been submitted, reviewed, and were received into evidence and found to meet the intent of the Introductory Provisions of the Land Development Code.

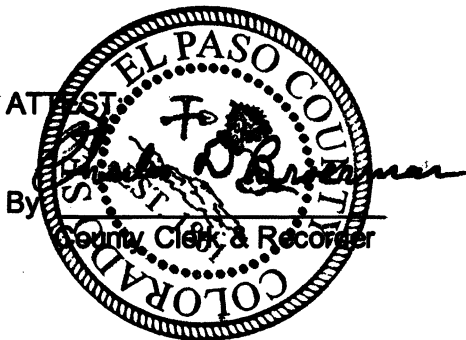
5. For the above-stated and other reasons, the proposed Amendment(s) are in the best interest of the health, safety, morals, convenience, order, prosperity and welfare of the citizens of El Paso County.

NOW, THEREFORE, BE IT RESOLVED the El Paso County Board of County Commissioners hereby approves the amendment(s) to Chapter(s) 1, 5, and 6 of the El Paso County Land Development Code, including other conforming amendments throughout the Code, as represented on the attached Exhibit "A" by underlining (additions) and strike-through (deletions):

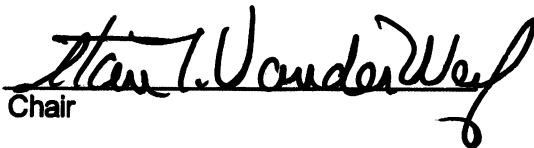
AND BE IT FURTHER RESOLVED that the Executive Director of Planning and Community Development is hereby authorized and directed to develop procedures for the provision of public notice of and opportunity to submit comments on applications for administrative plat approval and for the appeal of administrative plat approval or denial to the Board of County Commissioners.

AND BE IT FURTHER RESOLVED the record and recommendations of the El Paso County Planning Commission be adopted, except as modified herein.

DONE THIS 26th day of January, 2021 at Colorado Springs, Colorado.



BOARD OF COUNTY COMMISSIONERS
OF EL PASO COUNTY, COLORADO

By: 
Chair

Resolution No. 21- 36
Page 3

EXHIBIT A

See attached redline revisions.

EL PASO COUNTY



COMMISSIONERS:
MARK WALLER (CHAIR)
LONGINOS GONZALEZ, JR. (VICE-CHAIR)

COLORADO

HOLLY WILLIAMS
STAN VANDERWERF
CAMI BREMER

PLANNING AND COMMUNITY DEVELOPMENT DEPARTMENT
CRAIG DOSSEY, EXECUTIVE DIRECTOR

TO: El Paso County Board of County Commissioners
Chair

FROM: Nina Ruiz, Planning Manager
Mark Gebhart, Deputy Director
Craig Dossey, Executive Director

RE: LDC-20-001 -- Land Development Code Amendment --
Fire Protection and Wildfire Mitigation Amendment to Chapters 1, 5,
and 6 of the El Paso County Land Development Code (2019) to
remove discrepancies, and add and modify language to eliminate the
term "Fire Marshal"

Commissioner District: All

Planning Commission Hearing Date	1/7/2020
Board of County Commissioners Hearing Date	1/26/2020

EXECUTIVE SUMMARY

A request by the El Paso County Planning and Community Development Department to amend Chapters 1, 5, and 6 of the El Paso County Land Development Code (2019) to remove discrepancies and add and modify language to eliminate the term "Fire Marshal".

The proposed amendments include:

- Amend throughout to replace the term "Fire Marshal" with "Fire Authority"
- Amend Chapter 1 to amend the definition of what will be termed "Fire Authority", to include a Fire District, Fire Department, or Third-Party Fire Reviewer;
- Amend Chapter 1 to add the term "Third Party Fire Reviewer" to apply to those areas of the County outside of a fire district or fire department;
- Amend Chapter 5, Fireworks Sales, to add language specifying that firework sales are not permitted if the Sherriff has implemented a fire ban;
- Amend Chapter 6, Fire Protection and Wildfire Mitigation, throughout to revise all occurrences where authority currently lies with the "Fire Marshal" to instead

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place such authority with the Board of County Commissioners or PCD Director, where applicable.

- Amend Chapter 6, Fire Protection and Wildfire Mitigation, to specifically state that PCD will request a recommendation from the "Fire Authority" in regard to alternatives as well as compliance with the applicable regulations;
- Amend Chapter 6, Fire Protection and Wildfire Mitigation, to amend the required content of the Fire Protection Report to add that the report must include an analysis of how the request complies with the Code and any applicable fire code;
- Amend Chapter 6, Fire Protection and Wildfire Mitigation, to add an additional subsection regarding Development Outside Fire District or Fire Department Boundaries which requires that the property either annex into a fire district or fire department or receive approval of a waiver from the Board of County Commissioner based upon specific criteria;
- Amend Chapter 6, Fire Protection and Wildfire Mitigation, to remove specific requirements regarding automatic fire protection and instead to require development to meet the requirements of the adopted building code;
- Amend Chapter 6, Fire Protection and Wildfire Mitigation, to specify that the Fire Authority may determine the most appropriate location for fire hydrants; and
- Amend Chapter 6, Fire Protection and Wildfire Mitigation, to require that dry hydrants meet the NFPA standards in place of the hydrants being approved by the "Fire Marshall" without specific standards being referenced.

Staff is also requesting authority to make all other conforming amendments necessary to carry out the intent of the BoCC.

A. PLANNING COMMISSION SUMMARY

Request Heard: As a Regular item at the January 7, 2021 hearing.

Recommendation: Approval

Waiver Recommendation: N/A

Vote: 8-0

Vote Rationale: N/A

Summary of Hearing: Ms. Ruiz presented the LDC revisions.

Legal Notice: Advertised in Shopper's Press on January 6, 2021.

B. APPLICABLE RESOLUTIONS:

See attached Resolution.

C. REQUEST

A request by the El Paso County Planning and Community Development Department to amend the El Paso County Land Development Code (2019) to include:

- Amend throughout to replace the term "Fire Marshal" with "Fire Authority"
- Amend Chapter 1 to amend the definition of what will be termed "Fire Authority", to include a Fire District, Fire Department, or Third-Party Fire Reviewer;

- Amend Chapter 1 to add the term “Third Party Fire Reviewer” to apply to those areas of the County outside of a fire district or fire department;
- Amend Chapter 5, Fireworks Sales, to add language specifying that firework sales are not permitted if the Sherriff has implemented a fire ban;
- Amend Chapter 6, Fire Protection and Wildfire Mitigation, throughout to revise all occurrences where authority currently lies with the “Fire Marshall” to instead place such authority with the Board of County Commissioners or PCD Director, where applicable.
- Amend Chapter 6, Fire Protection and Wildfire Mitigation, to specifically state that PCD will request a recommendation from the “Fire Authority” in regard to alternatives as well as compliance with the applicable regulations;
- Amend Chapter 6, Fire Protection and Wildfire Mitigation, to amend the required content of the Fire Protection Report to add that the report must include an analysis of how the request complies with the Code and any applicable fire code;
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- Amend Chapter 6, Fire Protection and Wildfire Mitigation, to require that dry hydrants meet the NFPA standards in place of the hydrants being approved by the “Fire Marshall” without specific standards being referenced.

Staff is also requesting authority to make all other conforming amendments necessary to carry out the intent of the BoCC.

D. BACKGROUND

Staff has worked with stakeholders as well as governmental agencies to draft proposed amendments to the Fire Protection and Wildfire Mitigation section of Code. Those stakeholders that provided input include the Colorado Springs Housing and Building Association, fire districts, Fire Chief, El Paso County Sheriff's Office, the Pikes Peak Regional Office of Emergency Management, as well as homeowners' association groups. All previous comments received have been addressed.

The El Paso County Land Development Code is routinely amended to respond to current land use trends, recurring issues, changes in legislation, and errors/oversights. The Planning and Community Development Department staff maintains a running list of necessary and recommended revisions to the Code as issues arise. Section 6.3.3 of the Land Development Code was written in 2006 when coordination with the Fire Marshal was in place. The amendments proposed with this specific request are in response to El Paso County no longer having a Fire Marshal position. The internal procedures have been amended over time to reflect the loss of the Fire Marshal position, but the regulations have not been updated. The proposed amendments include revisions to Chapters 1, 5, and 6. The topical items included within the proposed revisions include amendments pertaining to the elimination of the term "Fire Marshal" and the addition of the term "Third Party Fire Reviewer". Staff anticipates additional future amendments to the Wildfire Protection section to remove inconsistencies with other rules and regulations but chose to keep the proposed amendments limited to the "Fire Marshal" concern only.

Replace "Fire Marshal" with "Fire Authority"

El Paso County has not recently employed a Fire Marshal but utilizes a Fire Warden who had different powers and authorities than a Fire Marshal. Chapter 6 of the Land Development Code (2019) refers to a Fire Marshal multiple times. Planning and Community Development has relied upon the recommendations of the fire districts and departments, who are the subject matter experts, in place of the Fire Marshal. Each one of the Fire Districts or Fire Departments has their own Fire Marshal. Planning and Community Development is proposing to amend the Code to mirror our current practices to remove the term "Fire Marshal" and replace it with "Fire Authority" in order to avoid confusion.

If approved, the Fire Authority will include fire departments, fire districts, and a third-party fire authority. The current regulations rely heavily on the Fire Marshal approving many fire protection elements. Staff is not proposing to defer all approval authority to the Fire Authority, but instead to rely upon their recommendations. The Fire Authorities are not governed by El Paso County and, therefore, need not report to El Paso County. Staff believes for this reason it is appropriate that the ultimate authority remain with El Paso County.

Third Party Fire Reviewer

The majority of properties in El Paso County are within a Fire District or Fire Department, however, there are still some areas without fire protection. The unserved areas are primarily in the mountainous portions of the County, the numerous enclaves within the City of Colorado Springs, and the land generally between the eastern limits of Colorado Springs and the Ellicott Fire Protection District (see attached map).

Without a Fire Marshal, the proposed Land Development Code amendments rely on the expertise of the fire departments and fire districts to provide comment

when proposed development will not meet the standards. Staff is proposing the addition of the term Third Party Fire Reviewer which will apply to those parcels without fire protection. The proposed definition includes language as to who may be qualified to serve as the Third Party Fire Reviewer.

In addition to the additional definition, staff is proposing to add language to require all parcels undergoing a development application to annex into a fire district or fire department. If they cannot, they must request a waiver from this requirement before the Board of County Commissioners. The Board of County Commissioners then must review the request based upon specific criteria including evidence that it is not feasible to annex into a fire district or fire department and that the request meet all other Sections included in the Fire Protection and Wildfire Mitigation section of the Code.

E. RECOMMENDED AMENDMENTS

A request by the El Paso County Planning and Community Development Department to amend the El Paso County Land Development Code (2019) to include:

- Amend throughout to replace the term “Fire Marshal” with “Fire Authority”
- Amend Chapter 1 to amend the definition of what will be termed “Fire Authority”, to include a Fire District, Fire Department, or Third-Party Fire Reviewer;
- Amend Chapter 1 to add the term “Third Party Fire Reviewer” to apply to those areas of the County outside of a fire district or fire department;
- Amend Chapter 5, Fireworks Sales, to add language specifying that firework sales are not permitted if the Sherriff has implemented a fire ban;
- Amend Chapter 6, Fire Protection and Wildfire Mitigation, throughout to revise all occurrences where authority currently lies with the “Fire Marshall” to instead place such authority with the Board of County Commissioners or PCD Director, where applicable.
- Amend Chapter 6, Fire Protection and Wildfire Mitigation, to specifically state that PCD will request a recommendation from the “Fire Authority” in regard to alternatives as well as compliance with the applicable regulations;
- Amend Chapter 6, Fire Protection and Wildfire Mitigation, to amend the required content of the Fire Protection Report to add that the report must include an analysis of how the request complies with the Code and any applicable fire code;
- Amend Chapter 6, Fire Protection and Wildfire Mitigation, to add an additional subsection regarding Development Outside Fire District or Fire Department Boundaries which requires that the property either annex into a fire district or fire department or receive approval of a waiver from the Board of County Commissioner based upon specific criteria;
- Amend Chapter 6, Fire Protection and Wildfire Mitigation, to remove specific requirements regarding automatic fire protection and instead to

require development to meet the requirements of the adopted building code;

- Amend Chapter 6, Fire Protection and Wildfire Mitigation, to specify that the Fire Authority may determine the most appropriate location for fire hydrants; and
- Amend Chapter 6, Fire Protection and Wildfire Mitigation, to require that dry hydrants meet the NFPA standards in place of the hydrants being approved by the "Fire Marshall" without specific standards being referenced.

Staff is also requesting authority to make all other conforming amendments necessary to carry out the intent of the BoCC.

F. APPROVAL CRITERIA

The statutory role of the Planning Commission and Board of County Commissioners is identified below:

30-28-116. Regulations may be amended.

From time to time the board of county commissioners may amend the number, shape, boundaries, or area of any district, or any regulation of or within such district, or any other provisions of the zoning resolution. Any such amendment shall not be made or become effective unless the same has been proposed by or is first submitted for the approval, disapproval, or suggestions of the county planning commission. If disapproved by such commission within thirty days after such submission, such amendment to become effective, shall receive the favorable vote of not less than a majority of the entire membership of the board of county commissioners. Before finally adopting any such amendment, the board of county commissioners shall hold a public hearing thereon, and at least fourteen days' notice of the time and place of such hearing shall be given by at least one publication in a newspaper of general circulation in the county.

G. PUBLIC COMMENT AND NOTICE

A summary of the proposed Code amendments and the date of the Board of County Commissioner hearing will be published in The Fountain Valley News pursuant to Colorado Revised Statute 30-28-116. A copy of this publication will be included in the backup materials for the Board of County Commissioners hearing. All the stakeholders were noticed by EDARP of the hearing date.

H. ATTACHMENTS

Proposed Amendments to the Land Development Code (2019) (redline version)
Proposed Amendments to the Land Development Code (2019) (clean version)
All Comments Received
Letter of Support from the Housing and Building Association
Planning Commission Resolution
Board of County Commissioners' Resolution

Replace "Fire Marshal" with "Fire Authority" throughout.

Chapter 1 Revisions

~~Fire Marshal Authority — For purposes of this Code, El Paso County Fire Marshal, a person designated by the Fire District or Fire Department within whose their boundaries the property lies. This term shall also include a Third-Party Fire Reviewer for properties not located within the boundaries of a Fire District or Fire Department. "Fire Authority" may include the Sheriff's Office for certain fire events~~

~~**Third Party Fire Reviewer - a person with a minimum of an State of Colorado Inspector II, ICC or NFPA Certification who has provided El Paso County with a copy of such certification and who has self-certified that they are qualified to provide comment and recommendations.**~~

Chapter 5 Revisions

Fireworks Sales

(A) **Sales Period Limited.** Fireworks sales are limited to the period from May 31 to July 6th each year. ~~Firework sales is prohibited if the Sherriff has implemented a fire ban.~~

(B) ~~**Fire Department Authority Approval Required.** The fireworks sales area shall be located within an area provided with fire protection by a fire department.~~ **Fire Authority** approval is required prior to the approval of a temporary use permit.

(C) **Driveway Permit Required.** A driveway permit shall be issued to allow access to the fireworks sales area prior to the approval of a temporary use permit.

(D) **Required Signage.** A fireworks sales area shall post signage noting it is illegal to shoot fireworks within all towns and cities in El Paso County and violators will be prosecuted. Each fireworks sales area shall provide either one sign, with minimum 3 inch letter size, or 4 signs of 8½ by 11 inches, placed in a conspicuous location easily readable by the public, noting the language as stated or similar language approved by the PCD Director.

6.3.3. Fire Protection and Wildfire Mitigation

(A) General.

(1) **Purpose and Intent.** To ensure that proposed development is reviewed in consideration of the wildfire risks and need to provide adequate fire protection in order to:

- Regulate development, buildings, and structures so as to minimize the hazard to public health, safety, and welfare;
- Ensure that adequate fire protection is available for new development;
- Implement wildfire hazard reduction in new development;

- Encourage voluntary efforts to reduce wildfire hazards; and
- Reduce the demands from the public for relief and protection of structures and facilities.

- (2) **Applicability.** This Section shall apply to all development applications and permits within the unincorporated areas of El Paso County. The standards and requirements related to construction in wildland areas are applicable on land that is shown as forested on the Vegetation Map or to areas identified in the a wildland fire risk and hazard mitigation plan, if required by the approval of that plan.
 - (3) **Relationship to Other Standards.** ~~Where a conflict exists between adopted fire district or fire department standards and this Code, the Board of County Commissioners may choose to approve an alternative design which accomplishes the purpose of this section and provides an equivalent benefit to the development. Where a fire department has adopted standards, the more restrictive shall apply. In the case of a conflict between adopted fire district standards and this code, the Fire Marshal~~ Fire Authority should approve provide a recommendation regarding whether the an alternative design which accomplishes the intent of this section and whether it provides an equivalent or similar benefit to the the development property or the community.
 - (4) **Responsibility of Fire Authority.** ~~The Fire Marshal shall have authority to enforce the provisions of this Section. The Fire Marshal shall be authorized to develop and utilize forms and checklists to implement the requirements of this Section. It is the responsibility of the Fire Authority to provide recommendations as to whether a new development meets the applicable fire code standards for the respective area. If a new development does not meet the applicable standards, then the fire authority should provide comments regarding areas of non-compliance and recommendations for achieving compliance.~~
 - (5) **Basis of Standards.** The basis of the standards in this Section is the most current standards adopted by the National Fire Protection Agency (NFPA) and the Colorado State Forest Service (CSFS).
 - (6) **Wildfire Hazard Maps/Vegetation Map.** El Paso County shall maintain a Vegetation Map depicting wildfire hazard areas of the County either based on vegetation type or wildfire hazard analysis, which shall be the official map for the purposes of applying this Section.
- (B) **Reports and Commitments Required for Subdivisions.**
- (1) **Fire Protection Report.** A Fire Protection Report is required for any subdivision application and shall include the fire district's or fire department's Fire Authority's capabilities, including existing and proposed equipment, facilities, services, and response time to provide fire protection for the proposed subdivision, an analysis of compliance with the Fire Protection and Wildfire Mitigation Section of this Code, and an analysis of compliance with the applicable fire code.
 - (2) **Fire Protection Commitment Required.** A written commitment to provide structural fire protection may be required for any proposed subdivision, and the PCD Director may be requested ~~by the Fire Marshal~~ for other development applications.
 - (3) **Mitigation Costs Included in Construction Financial Assurance.** If the Board of County Commissioners determines that wildfire mitigation issues are significant enough in the determination of the Fire Marshal to require mitigation associated with development construction activities, the cost of the mitigation shall be included in the construction financial assurance. The Fire Authority may, at its discretion, choose to provide a recommendation to the Board of County Commissioners regarding whether the cost

associated with performing wildfire mitigation is appropriate and should be secured and accounted for within the financial assurance estimate and associated collateral for the overall development.

(4) Development Outside Fire District or Fire Department Boundaries. Proposed subdivisions outside the boundaries of a fire district or fire department shall annex into a department or provide evidence of a contract for service from a Fire District or Fire Department. Waivers of this requirement may only be approved by the Board of County Commissioners. An applicant's waiver request shall, at a minimum, include the following:

- A letter from the nearest fire district or fire department demonstrating that annexation is not economically feasible.
- A letter or report from a Third Party Fire Reviewer providing a recommendation to the Board of County Commissioners that the proposed development complies with the Fire Protection and Wildfire Mitigation Section of this Code. In the case of a conflict between adopted standards and this Code, the Third Party Fire Reviewer may recommend an alternative design which accomplishes the purposes of this section and provides an equivalent benefit to the development.

(4) Plat Notes Required. Notice of any wildfire mitigation issues or obligations may be required by the County through conditions of approval or notes placed on the face of the plat.

(C) Design Standards.

(1) Water Supply.

(a) General. Water supply systems used for fire protection purposes shall be installed and maintained in accordance with NFPA standards. The required fire flow for one or more buildings of a planned building area (also referred to as the planned building group by the NFPA) shall be determined by the ~~Fire Marshal~~Fire Authority using locally adopted codes, or as specified per the following conditions:

- For areas without municipal-type water systems, NFPA 1142, Standard on Water Supplies for Suburban and Rural Fire Fighting, shall be applied.
- For those areas with municipal-type water systems, nationally recognized criteria shall be applied.

(b) Automatic Fire Protection.

- ~~(i) Commercial and Industrial Structures. All commercial or industrial structures of more than 3 stories or over 40 feet in height above adjacent ground elevation shall be fully protected with an automatic sprinkler system.~~
- ~~(ii) Multifamily Residential Structures. Any multifamily residential building containing more than 2 dwelling units shall have an automatic sprinkler system installed. Automatic fire protection shall be in compliance with the applicable adopted fire code. If a property is not within an area of the County having an adopted fire code, then the design for automatic fire protection shall be in compliance with the adopted Pikes Peak Regional Building Code.~~

(c) Areas with Central Water Systems.

- (i) Water Distribution System Pressure.** The water distribution system shall be capable of delivering fire flow at a minimum rating of 20 pounds per square inch for each hydrant connected to the distribution system within the proposed subdivision.

- (ii) **Dead-End Mains.** Dead-end mains shall not exceed 600 feet in length for main sizes less than 10 inches in diameter.
 - (iii) **Fire Hydrant Spacing.** Fire hydrants shall be located so that all residential structures are within 500 feet and all nonresidential structures are within 150 feet of a hydrant. Fire hydrants shall be installed adjacent to a road or emergency vehicle lane at a spacing not to exceed 660 feet of vehicle travel distance. Where the proposed buildings warrant, the ~~Fire Marshal~~**Fire Authority** may ~~require~~ recommend additional hydrants and closer spacing a greater spacing distance or require additional hydrants and closer spacing based upon the applicable Fire Code or NFPA standards.
 - (iv) **Fire Hydrant Accessibility.** Fire hydrants shall be accessible to fire district or fire department apparatus from a road (i.e., maintained public roads, privately-maintained roads, or emergency vehicle access roads) or unobstructed emergency vehicle lanes (i.e., driveway, parking drive aisle, or emergency vehicle lane).
 - (v) **Fire Hydrant Supply Lines.** Fire hydrants shall be supplied by not less than a 6 inch diameter main installed on a looped system, or by not less than an 8 inch diameter main if the system is not looped or the fire hydrant is installed on a dead-end main exceeding 300 feet in length.
 - (vi) **Fire Hydrants in Parking Areas.** Fire hydrants located in parking areas shall be protected by barriers that will prevent physical damage from vehicles without obstructing hydrant operation.
 - (vii) **Fire Hydrant Relationship to Roads.** Fire hydrants shall be located within 6 feet of the edge of the pavement unless there is a conflict with the ECM or the ~~Fire Marshal~~**Fire Authority** ~~determines~~ recommends another location is more acceptable for fire district or fire department use. All roads and emergency vehicle lanes shall be designed to maintain a minimum unobstructed clearance of 3 feet around fire hydrants.
 - (viii) **Fire Hydrant Easements.** Easements for fire hydrants shall be provided and dedicated to the appropriate fire or water authority when the hydrants are not within a public road right-of-way. The easement shall afford accessibility to the hydrant from the right-of-way.
 - (ix) **Release of Financial Assurance for Water Supply Systems.** The contractor, installer, or owner of water supply systems shall demonstrate by testing that the capacity of the water supply system will meet fire protection design requirements prior to release of construction financial assurance for the system. The testing shall be certified by a qualified professional. The tests ~~shall~~may be provided to the ~~Fire Marshal~~**Fire Authority** if requested.
- (d) **Areas without Central Water Systems.**
- (i) **Fire Cisterns.**
 - **Fire Cisterns Required:** Fire cisterns shall be provided in planned building areas which are not served by hydrants, unless the ~~Fire Marshal~~**Fire Authority** has recommended and the approval authority has approved an alternative fire protection water supply system.
 - **Construction Standards:** Construction of fire cisterns shall be in accordance with the approved plans and conform to the requirements of the NFPA standard on water supplies for suburban and rural fire fighting.

- **Design Standards for Subdivisions with More than One Cistern:** For subdivisions where more than one fire cistern is required, fire cisterns shall meet the requirements of the NFPA standards for water supplies for suburban and rural fire fighting. For this type of subdivision, fire cisterns shall be designed for the largest building allowed by zoning in the worst case hazard and construction class.

- **Design Standards for Subdivisions with One Cistern:** For subdivisions where only one fire cistern is required, the minimum capacity of the fire cistern shall meet the requirements of the NFPA standards on water supplies for suburban and rural fire fighting, or shall have a total capacity equal to 300 gallons for each acre within the subdivision plus 3,000 gallons per dwelling unit, whichever is greater.

- **Cistern Turnaround:** A dedicated turnaround shall be placed no more than 50 feet from a fire cistern, and the standpipe shall be within 8 feet of the nearest usable portion of the dedicated right-of-way or approved easement, unless otherwise ~~recommended~~ approved by the applicable Fire Marshal ~~Fire Authority and approved by the approval authority.~~

- **Easements Required:** Fire cistern easements shall be provided and dedicated to the appropriate fire department to afford accessibility of the cistern from a public road. Easements shall be of sufficient size to facilitate maintenance.

(ii) **Dry Hydrants.**

- **Use of Dry Hydrants:** Dry hydrants may be provided in combination with fire cisterns or other approved fire protection water supply systems. Plans for dry hydrants shall be submitted to ~~and approved by the Fire Marshal~~ the Fire Authority for recommendation and approved by the approval authority.

- **Construction Standards:** Construction and installation of dry hydrants shall be in accordance with the approved plans and conform to the requirements of the NFPA standards on water supplies for suburban and rural fire fighting.

- **Accessible:** Dry hydrants shall be located to be accessible under all weather conditions.

- **Clearance:** Dry hydrants shall have a minimum clearance of 20 feet on each side and be located a minimum of 100 feet from any structure. Highway or road traffic shall not be impaired during the use of the dry hydrant.

- **Protected:** Dry hydrants shall be protected from damage by vehicular and other perils, including freezing and damage from ice and other objects.

- **Visible:** Dry hydrant locations shall be made visible from the main roadway during emergencies by reflective marking and signage ~~approved by the Fire Marshal and shall be in conformance with the NFPA requirements.~~ All identification signs shall be approved by the highway authority prior to installation if they are to be located on the right-of-way or are subject to State laws.
 - **Access to Hydrant:** Vehicle access shall be designed and constructed to support the heaviest vehicle.
 - **Maintenance of Dry Hydrant:** Dry hydrants shall be checked and maintained at least quarterly. Thorough surveys shall be conducted, to reveal any deterioration in the water supply situation in ponds, streams, or cisterns. Grass, brush, and other vegetation shall be kept trimmed and neat. Vegetation shall be cleared for a minimum 3 foot radius from around hydrants. The hydrant shall be painted as needed, with reflective material to maintain visibility during emergencies. The Fire Authority may make a recommendation regarding the ownership and maintenance responsibilities for the facilities per the NFPA 1142 Standards. The approval authority will approve the ownership and maintenance responsibilities for the facilities shall be approved by the Fire Marshal.
 - **Maps and Location/Detail Drawings:** ~~The fire department (Fire Marshal/Fire Authority and El Paso County Sherriff's Office where there is no fire department)~~ shall maintain in a safe location, the maps and records of dry hydrant system locations, installation, tests, inspections, maintenance and repairs. When the property is not within a Fire Protection District it is the responsibility of the property owner and El Paso County Sherriff's Office to maintain in a safe location, the maps and records of dry hydrant system locations, installation, tests, inspections, maintenance and repairs.
 - **Easements Required:** Dry hydrant easements shall be provided and dedicated to the appropriate fire department (or County where there is no fire department) to afford accessibility of the dry hydrant from a public road. Easements shall be of sufficient size to facilitate maintenance.
- (iii) **Water Supply Requirements.** The owner of the cistern or dry hydrant is responsible for planning, developing, permitting, and continual provision of a sufficient water supply necessary to maintain the fire protection requirements of a cistern system, to the satisfaction of the ~~Fire approval authority/Marshal with recommendation by the Fire Authority.~~
- (2) **Roads.** This Section shall apply to all roads providing access to a planned building area whether or not they are dedicated as public roads.
- (a) **Roads Constructed to County Standards.** All roads, including private roads and emergency vehicle access roads, shall be designed and constructed according to this Code and the ECM. Emergency vehicle access roads shall, at a minimum, be constructed to the County's gravel road standard if open to the public. Emergency

vehicle access roads which are not open to public travel shall meet the non-road access standards

- (b) **Roads within 150 Feet of Development.** Roads or emergency vehicle lanes shall be provided within 150 feet of all development except single family residential development.
 - (c) **Two Access Routes Required.** Access to a planned building area shall be provided by a minimum of 2 separate routes in accordance with the requirements of this Code and the ECM if the cul-de-sac exceeds the length allowed by the ECM.
 - (d) **Turnaround Required on Dead-End Roads.** Every dead-end road more than 300 feet in length shall be provided with a roadway termination meeting ECM standards.
 - (e) **Road Grades in Wildland Fire Areas.** Within wildland fire areas, road grades steeper than 10 percent may be permitted where the Fire Authority and ECM Administrator recommend that the mitigation measures can be agreed on by them are adequate and the approval authority approves the mitigation measurements. ~~Fire Marshal and the ECM Administrator.~~
- (3) **Non-Road Access.** The following minimum standards shall apply to emergency vehicle lanes, driveways, and parking lot drive lanes serving as emergency vehicle lanes.
- (a) **Emergency Access Provided.** Access for emergency responders, ingress, egress, and evacuation shall be provided for all buildings.
 - (b) **Driveways Required.** Where any point of a building is greater than 150 feet from a road, a driveway meeting these standards shall be provided to within 150 feet of the furthest point on the building.
 - (c) **Emergency Vehicle Lanes Required.** The Fire Authority may recommend emergency vehicle lanes be provided. Emergency vehicle lanes shall be provided as required by the Fire approval authority ~~Marshal.~~
 - (d) **Emergency Access Lane Design.** An emergency vehicle lane shall be designed and constructed to enable fire-fighting apparatus to maneuver broadside or directly forward within a minimum of 5 feet and a maximum of 25 feet of structures.
 - (e) **Width of Driveway and Emergency Vehicle Lanes.** Where the driveway is greater than 150 feet in length, it shall be not less than 10 feet in unobstructed width. Emergency vehicle lanes providing one-way travel shall be a minimum of 16 feet in width, and fire lanes with two-way travel shall be a minimum of 24 feet in width.
 - (f) **Vertical Clearance.** At least 13 feet 6 inches of vertical clearance shall be provided and maintained over the full width of an emergency vehicle lane or driveway.
 - (g) **Turns.** Required driveways shall be designed, constructed, and maintained to accommodate the turning radius of the largest apparatus typically used to respond to that location. A turn in an emergency vehicle lane shall be constructed with a minimum radius of 25 feet at the inside curb line and a minimum radius of 50 feet at the outside curb line.
 - (h) **Grades.** Road grades steeper than 10 percent may be permitted where the Fire Authority and ECM Administrator recommend that the mitigation measures are adequate and the approval authority approves the mitigation measurements. ~~Emergency vehicle lanes and required driveways shall not exceed 10 percent in grade unless steeper grades are allowed where mitigation measures can be agreed on by the Fire Marshal and the property owner.~~
 - (i) **Emergency Vehicle Lanes Connecting to Roads.** Emergency vehicle lanes connecting to roads shall be provided with curb cuts extending at least 2 feet beyond each edge of the fire lane.

(j) **Turnouts and Turnarounds Required.**

- (i) **Driveways.** Where the required driveway is greater than 300 feet, it shall be provided with turnouts or turnarounds at locations approved by the ~~Fire Marshal approval authority with recommendation from the Fire Authority.~~
- (ii) **Turnarounds Required.** ~~The fire authority may provide a recommendation regarding turnarounds.~~ Dead-end emergency vehicle lanes in excess of 300 feet in length shall be provided with turnouts and turnarounds as approved by the ~~Fire Marshal approval authority.~~ The turnaround at the terminus shall have a minimum radius of 50 feet. The ~~Fire Marshal approval authority~~ shall be authorized to approve, as an alternative, a "hammerhead" turnaround to provide emergency vehicles with a three-point turnaround.
- (k) **Load Design.** Emergency vehicle lanes and required driveways shall be designed, constructed, and maintained to accommodate the load of the largest apparatus typically used to respond to that location.
- (l) **Bridges or Drainage Crossings.** A bridge or drainage crossing on an emergency vehicle lane or required driveway shall be designed to accommodate the load of the largest apparatus typically used to respond to that location. The load limit shall be clearly posted at the approaches to the bridge.
- (m) **Landscaping Maintained.** Landscaping or other obstructions shall be maintained in a manner that provides unobstructed access for fire department operations.

(4) **Gates.**

- (a) **Gate Location and Dimensions.** Gates shall be located a minimum of 30 feet from the public right-of-way and shall not open outward. The opening provided through a gate shall be 2 feet wider than the traveled way.
- (b) **Locks.** Fire department personnel shall have ready access to locking mechanisms on a gate restricting access to a fire line. Proposed changes to access shall be approved by the ~~Fire Marshal~~ Fire Authority.

(D) **Construction in Wildland Fire Areas.**

(1) **General.**

- (a) **Applicability.** All structures potentially threatened by wildland fire shall be designed, located, and constructed to comply with this Section.
- (b) **Risk Assessment Required.** A wildland fire risk and hazard severity assessment shall be performed for all structures and groups of structures adjacent to wildland fuels.
- (c) **Maintenance of Property.** After construction, continued maintenance of the grounds and storage of combustible materials shall be performed to maintain these requirements, ~~as acceptable to the Fire Marshal.~~
- (d) **Location of Buildings and Building Envelopes.** Buildings located closer than 30 feet to a vegetated slope shall require special mitigation measures in accordance with NFPA 1144, Standard for Protection of Life and Property from Wildfire ~~as determined by the Fire Marshal.~~ Building envelopes shall not include gullies, fire chimneys, saddles, or other terrain conducive to wildfire spread.
- (e) **Roof Design and Materials.** Only roof covering assemblies rated Class A shall be used in a wildland area. The specific class shall be consistent with the wildland fire risk and hazard severity assessment ~~as determined by the Fire Marshal.~~
- (f) **Accessory Structures.** Outbuildings, patio covers, gazebos, and other accessory structures shall be separated from the main structure by a minimum of 30 feet.

- (g) **Access to Structures.** At least one approved means of vehicular access shall be provided to each structure or other nonstructural fire hazard in accordance with the following:
- (i) For structures or nonstructural fire hazards exceeding two stories or 30 feet in height above average adjacent ground level, or 12,000 square feet of gross floor area, no less than 2 separate approved means of access shall be provided.
 - (ii) Approved vehicular access shall be provided to within 150 ft of any point of the exterior wall of each structure.
- (h) **Access to Structures Not Protected by Automatic Sprinklers.** An approved means of vehicular access shall be provided to within 30 feet of all points of at least 2 exterior walls for any structure not protected by automatic sprinklers that exceeds 2 stories or 30 feet in height above average adjacent ground elevation. Single and two-family dwellings are exempt from this requirement.
- (i) **Access to Structures Protected by Automatic Sprinklers.** For any structure protected by an automatic sprinkler system, an approved means of vehicular access shall be provided to within 400 feet of any point of the exterior wall. For any structure exceeding 3 stories or 35 feet in height above average adjacent ground elevation and protected by an automatic sprinkler system, an approved means of vehicular access shall be provided to within 30 feet of all points of at least 2 exterior walls.
- (j) **Separation Between Structures.** A structure in a planned building area shall be separated from another structure by at least 30 feet and shall be located at least 25 feet from a lot, parcel, or tract line. A structure in a planned building area that exceeds 2 stories or 30 feet in height above average adjacent ground elevation and is not protected by an automatic sprinkler system shall be separated from other structures by at least 50 feet and shall be located at least 25 feet from a lot, parcel, or tract line.
- (2) **Wildland Fire and Hazard Mitigation Plan Required.**
- (a) **General Plan Standards and Requirements.**
- When a subject lot, parcel, or tract falls within a wildland fire area, a wildland fire risk and hazard mitigation plan shall be prepared by a qualified professional and shall be tailored to the stage of development application and the stage of subdivision-related construction. A higher level of plan may be submitted at any stage of the process so long as it is implemented at the final stage of development. Plans shall utilize the Colorado State University (CSU) Guidelines and NFPA standards, as applicable. Additional fire precaution measures may be required because of fire hazard in the following areas:
- (i) Areas depicted as forested on the Vegetation Map;
 - (ii) Areas rated as fire hazards by the CSFS;
 - (iii) Where slopes in or adjacent to proposed development are in excess of 20%; or
 - (iv) Where the local fire protection agency identifies a specific fire danger.
- (b) **Development of Plan.**
- (i) **General Mitigation Plan Requirements.** This plan shall include, but not be limited to, the following:
 - Access, ingress, egress, and evacuation;
 - Fuel modification;

- Water supply;
- Construction, location, and design of structures; and
- Ignition potential.

(ii) ~~Approval of Fire-Marshal~~Wildland Fire and Hazard Mitigation Plan. The ~~Fire Marshal~~Approval Authority shall approve the mitigating measures relative to access, defensible space, water supply, and construction based on the relative risk and hazard rating.

(3) Wildland Fire Risk and Hazard Severity Analysis Required.

- (a) **Risk Assessment to be Performed.** A risk and hazard rating analysis shall be performed to determine the level of the wildland fire threat to life and values at risk prior to building permit authorization in high hazard areas unless completed as part of the wildland fire and hazard mitigation plan.
- (b) **Basis for Mitigation Measures.** The risk and hazard ratings shall be the basis for the implementation of mitigation measures relative to vegetation, other combustibles, and construction criteria.
- (c) **Analysis Rating Factors.** The following shall be considered in analyzing the risk factors:

- The history of local wind, relative humidity, temperature, and fine fuel moisture content shall be considered in determining defensible space.
- All vegetative fuels and other combustible materials shall be evaluated for their potential to contribute to the intensity and spread of wildland fire.
- Slope and aspect shall be evaluated as to their potential to increase the threat of wildland fire to life or improved lot, parcel, or tract.
- The factors determining required defensible space shall include the history of wildland fire for the area.
- Fire-safe routes for emergency service apparatus and for egress shall be evaluated.
- Other factors that can affect the risk of ignition or the spread of wildland fire on improved lot, parcel, or tract, including the risk of structure fires spreading to vegetation, shall be part of the analysis.

(d) ~~Recommendation~~view of Wildland Fire Risk and Hazard Rating. The rating assignments developed to meet the requirements of this Code shall ~~may~~ be reviewed by the ~~Fire-Marshal~~Fire Authority who may provide a recommendation regarding the rating.

(4) **No Permit or Approval Granted without Compliance.** No permit or approval associated with development, construction or occupancy shall be approved or issued until the provisions of this standard are satisfied. Notwithstanding the foregoing, the ~~Fire Marshal~~Planning and Community Development Director shall have the authority to grant

administrative variances to the design standards of this Section upon the finding of two or more of the following criteria:

- The ~~fire district or fire protection district~~ authority responsible for providing fire protection services, as applicable, to the project has adopted a fire code with a more stringent design standard from that contained herein;
- The application of a design standard will cause undue hardship or practical exceptional difficulties; or
- An alternate design standard will satisfy the intent and meet the goals of these Fire Protection and Wildfire Mitigation Regulations.

(5) Defensible Space Requirements.

- (a) **General.** The Defensible Space Requirements in Table 6.8 shall be implemented as minimum requirements in association with development in any Wildland Fire Area.

Table 6-8. Defensible Space Clearing and Structural Summary (Recommendations from NFPA by Wildland Fire Hazard Severity Analysis)

Low Hazard	High Hazard
<p>9.14 m (30 ft) clearance. Class A roof. No portion of trees or other vegetation within 3.048 m (10 ft) of chimney outlets. Trees within defensible space shall be pruned to minimize ladder fuels.</p>	<p>9.14 m (30 ft) irrigated. Class A roof. 30.48 m (100 ft) fuel treatment. Noncombustible siding/decks, and boxed eaves. Selected fire-resistant trees within 9.1 m (30 ft) of structures. Selected thinning of trees and shrubs. Trees within defensible space shall be pruned to minimize ladder fuels. All trees and shrubs pruned of dead material. No portion of trees or other vegetation within 3.48 m (10 ft) of chimney outlets.</p>

- (b) **Maintenance of Defensible Space and Associated Fuel Break Thinning.** Defensible space and fuel break thinning work shall be completed and maintained to the standards described in the Colorado State University's Cooperative Extension Fact Sheet 6.302. The responsibility for maintaining defensible space and associated fuel break thinning lies with the landowner. Noncompliance with defensible space maintenance standards will be enforced as a zoning violation.

(6) Fuels Modification During Development and After Construction.

- (a) **Identification of Modification Required.** Identification of fuel modification measures may be required in order to reduce the threat of wildfire. If fuel modification is determined to be necessary, the plan shall be prepared by a qualified professional. A fuel modification plan shall comply with NFPA requirements. Required elements shall include but are not limited to the following:
- Identification of fuel type, volume and loading, in conjunction with an assessment of slope and aspect, to determine the ability for a wildfire to spread;
 - Reduction of fuel loading and modification of fuel types to reduce the risk to structures or adjacent vegetation, including the creation of fuel breaks; and
 - Creation of defensible space to protect structures from approaching wildfire and reduce the potential for turning a structure fire into a wildfire.
- (b) **Fuel Modification Standards.** When the Wildland Fire Risk and Hazard Mitigation Plan requires establishment of a fuel modification area:
- The modifications shall extend at least 30 feet from structures;
 - Ground fuels within the defined defensible space shall be treated or removed;
 - Live vegetation within the defensible space shall have dead material removed and shall be thinned and pruned;
 - Dead or downed fuels within the defensible space of buildings shall be removed or treated to maintain the fuel modification area;
 - Vegetation under trees within the fuel modification area shall be maintained at a height that will preclude ground fire from spreading in the tree crown;
 - The fuel modification plan shall include a maintenance element with the responsibility for maintenance defined;
 - In these areas all slash (fallen trees, shrubs, pulled stumps, and other combustible materials) may be required to be disposed of from an area extending to at least 150 feet from the road centerline prior to the acceptance of any roads;
 - All slash shall also be removed from the vicinity of the home sites prior to final building inspection; and
 - Continuous proper forest management to maintain a low wildfire danger shall be guaranteed.
- (7) **Combustible Materials.** Propane tanks and other combustible liquids storage shall conform to NFPA 30, Flammable and Combustible Liquids Code, NFPA 58, Liquefied Petroleum Gas Code, and the Wildland Fire Risk and Hazard Mitigation Plan. Other

combustible materials shall be removed from the defensible space or stored in conformance with the fire protection plan ~~as approved by the Fire Marshal.~~

APPENDIX B

CSFS Colorado Wildfire Risk Public Viewer Map Theme Descriptions



Colorado Wildfire Risk Public Viewer

Map Theme Descriptions

The purpose of this document is to explain each of the available map themes/layers that users can select in the Colorado Wildfire Risk Public Viewer. For more information, see the [Colorado Wildfire Risk Assessment Final Report](#).

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Wildfire Risk Themes

Wildfire Risk

Wildfire Risk is a composite risk map created by combining the Values at Risk Rating and the Burn Probability layers. It identifies areas with the greatest potential impacts from a wildfire – i.e. those areas most at risk when considering the four values layers. The Values at Risk Rating is a key component of Wildfire Risk. It is comprised of several individual risk layers including Wildland Urban Interface (housing density), Forest Assets, Riparian Assets and Drinking Water Importance Areas risk outputs. The WUI component is a key element of the composite risk since it represents where people live in the wildland and urban fringe areas that are susceptible to wildfires and damages. The found individual risk layers are weighted to derive the Values at Risk Rating layer. The risk map is derived at a 30-meter resolution. This scale of data was chosen to be consistent with the accuracy of the primary surface fuels dataset used in the assessment. While not appropriate for site specific analysis, it is appropriate for regional, county or local planning efforts.

Burn Probability

Burn Probability (BP) is the annual probability of any location burning due to a wildfire. The annual BP was calculated as the number of times that a cell was burned and the number of iterations used to run the models. The annual BP was estimated for Colorado by using a stochastic (Monte Carlo) wildfire simulation approach with Technosylva's Wildfire Analyst software (www.WildfireAnalyst.com). A total number of 2,342,334 fires were simulated (3,200,000 if we consider those fires outside the Colorado border which were used in a buffer area around the study area to compute BP) with a mean ignition density of 8.68 fires/km². The ignition points were spatially distributed evenly every 500 meters across the state. Only high and extreme weather conditions were used to run the single fires because they usually burn most of the annual burned area. All fires simulations had a duration of 10 h. After simulating all the fires, some cells were not burned by any simulated fire, resulting in a BP value of zero. Some cells were non-burnable due to the associated fuel type (water, roads, towns, agricultural areas, etc.). However, the lowest BP value found in 'burnable' cells was assigned to cells where the simulated fires did not reach. The Wildfire Analyst fire simulator considered the number of times that the simulated fires burned each cell. After that, results were weighted by considering the historical fire occurrence of those fires that burned in high and extreme weather conditions. The weighting was done by assessing the relation between the annual historical fire ignition density in Colorado and the total number of simulated fires with varying input data in high and moderate weather scenarios and the historical spatial distribution of the ignition points. The probability map is derived at a 30-meter

resolution. This scale of data was chosen to be consistent with the accuracy of the primary surface fuels dataset used in the assessment. While not appropriate for site specific analysis, it is appropriate for regional, county or local protection mitigation or prevention planning.

Fire Intensity Scale

Fire Intensity Scale (FIS) specifically identifies areas where significant fuel hazards and associated dangerous fire behavior potential exist. Similar to the Richter scale for earthquakes, FIS provides a standard scale to measure potential wildfire intensity. FIS consist of five (5) classes where the order of magnitude between classes is ten-fold. The minimum class, Class 1, represents very low wildfire intensities and the maximum class, Class 5, represents very high wildfire intensities.

1. Class 1, Lowest Intensity: Very small, discontinuous flames, usually less than 1 foot in length; very low rate of spread; no spotting. Fires are typically easy to suppress by firefighters with basic training and non-specialized equipment.
2. Class 2, Low-Moderate: Small flames, usually less than two feet long; small amount of very short-range spotting possible. Fires are easy to suppress by trained firefighters with protective equipment and specialized tools.
3. Class 3, Moderate: Flames up to 8 feet in length; short-range spotting is possible. Trained firefighters will find these fires difficult to suppress without support from aircraft or engines, but dozer and plows are generally effective. Increasing potential for harm or damage to life and property.
4. Class 4, Moderate-High: Large Flames, up to 30 feet in length; short-range spotting common; medium range spotting possible. Direct attack by trained firefighters, engines, and dozers is generally ineffective, indirect attack may be effective. Significant potential for harm or damage to life and property.
5. Class 5, Highest Intensity: Very large flames up to 150 feet in length; profuse short-range spotting, frequent long-range spotting; strong fire-induced winds. Indirect attack marginally effective at the head of the fire. Great potential for harm or damage to life and property.

The Fire Intensity Scale does not incorporate historical fire occurrence information. It evaluates the potential fire behavior for an area, regardless if any fires have occurred there in the past. This information allows mitigation planners to quickly identify areas where dangerous fire behavior potential exists in relationship to nearby homes or other valued assets.

Since all areas in Colorado have fire intensity scale calculated consistently, it allows for comparison and ordination of areas across the entire state. For example, a high fire intensity area in Eastern Colorado is equivalent to a high fire intensity area in Western Colorado.

The fire intensity scale map is derived at a 30-meter resolution. This scale of data was chosen to be consistent with the accuracy of the primary surface fuels dataset used in the assessment. While not appropriate for site specific analysis, it is appropriate for regional, county or local planning efforts.

Wildfire Effects Themes

Values at Risk Rating

The Values at Risk Rating (VAR) is an overall rating that combines the risk ratings for Wildland Urban Interface (WUI), Forest Assets, Riparian Assets, and Drinking Water Importance Areas into a single measure of values-at-risk. The individual ratings for each value layer were derived using a Response Function approach.

Response functions are a method of assigning a net change in the value to a resource or asset based on susceptibility to fire of different intensity levels. A resource or asset is any of the Fire Effects input layers, such as WUI, Forest Assets, etc. These net changes can be adverse (negative) or positive (beneficial).

Calculating the VAR at a given location requires spatially defined estimates of the likelihood and intensity of fire integrated with the identified resource value. This interaction is quantified through the use of response functions that estimate expected impacts to resources or assets at the specified fire intensity levels. The measure of fire intensity level used in the Colorado assessment is flame length for a location. Response Function outputs were derived for each input data set and then combined to derive the Values at Risk Rating.

Different weightings are used for each of the input layers with the highest priority placed on protection of people and structures (i.e. WUI). The weightings represent the value associated with those assets. Weightings were developed by a team of experts during the assessment to reflect priorities for fire protection planning in Colorado. Refer to the 5 Colorado WRA Final Report for more information about the layer weightings.

Since all areas in Colorado have the VAR calculated consistently, it allows for comparison and ordination of areas across the entire state. The VAR data was derived at a 30-meter resolution.

Wildland Urban Interface Risk

The Wildland-Urban Interface (WUI) Risk Index layer is a rating of the potential impact of a wildfire on people and their homes. The key input, WUI, reflects housing density (houses per acre) consistent with Federal Register National standards. The location of people living in the wildland-urban interface and rural areas is essential for defining potential wildfire impacts to people and homes.

The WUI Risk Index is derived using a response function modeling approach. Response functions are a method of assigning a net change in the value to a resource or asset based on susceptibility to fire at different intensity levels, such as flame length.

To calculate the WUI Risk Index, the WPL housing density data was combined with flame length data and response functions were defined to represent potential impacts. The response functions were defined by a team of experts led by Colorado State Forest Service mitigation planning staff. By combining flame length with the WPL housing density data, it is possible to determine where the greatest potential impact to homes and people is likely to occur. Customized urban encroachment algorithms were used to ensure those fringe urban areas were included in the WUI Risk outputs. Encroachment distances into urban areas were based on the underlying fuel models and their fuel types and propensity for spotting and spreading.

The range of values is from -1 to -9, with -1 representing the least negative impact and -9 representing the most negative impact. For example, areas with high housing density and high flame lengths are rated -9, while areas with low housing density and low flame lengths are rated -1.

The WUI Risk Index has been calculated consistently for all areas in Colorado, which allows for comparison and ordination of areas across the entire state. Data is modeled at a 30-meter cell resolution, which is consistent with other Colorado WRA layers.

Landscape Characteristics

Surface Fuels

Surface fuels, or fire behavior fuel models as they are technically referred to, contain the parameters needed by the Rothermel (1972) surface fire spread model to compute surface fire behavior characteristics, such as rate of spread, flame length, fireline intensity, and other fire behavior metrics. As the name might suggest, surface fuels account only for surface fire potential. Canopy fire potential is computed through a

separate but linked process. The Colorado WRA accounts for both surface and canopy fire potential in the fire behavior outputs.

Surface fuels are typically categorized into one of four primary fuel types based on the primary carrier of the surface fire: 1) grass, 2) shrub/brush, 3) timber litter and 4) slash. There are two standard fire behavior fuel model sets published for use. The Fire Behavior Prediction System 1982 Fuel Model Set (Anderson, 1982) contains 13 fuel models and the Fire Behavior Prediction System 2005 Fuel Model Set (Scott & Burgan, 2005) contains 40 fuel models. The Colorado WRA uses fuel models from the 2005 Fuel Model Set.

The surface fuels for the 2017 Colorado Wildfire Risk Assessment Update uses a dataset based on 2014 LANDFIRE data supplemented with considerable enhancements and calibration to update the dataset to 2017. This included several calibration activities such as 1) removal of LANDFIRE mapping zone seamlines, 2) adjustments for disturbances that occurred from 2013-2017 including wildfires, treatments, and insect and disease, 3) fuel adjustments to consider high elevation fire behavior, oak shrublands, pinyon-juniper vegetation, and SH7 fuel model assignments. A team of local fuels experts led by the CSFS and supplemented by private industry and federal agency experts led this effort. More detailed information including a description of methods used for the CO-WRAP fuels calibration can be found in the [2017 Colorado Fuels Calibration Final Report](#), July 2018, Colorado State Forest Service.

Value	Fuel Model Name	Description
101	GR01	Short, sparse dry climate grass
102	GR02	Low load dry climate grass
103	GR03	Low load, very coarse, humid climate grass
104	GR04	Moderate load dry climate grass
105	GR05	Low load humid climate grass
106	GR06	Moderate load humid climate grass
107	GR07	High load dry climate grass
108	GR08	High load very coarse humid climate grass
109	GR09	Very high load humid climate grass
111	GR01	10,000 elevation
112	GR02	10,000 elevation
121	GS01	Low load dry climate grass-shrub
122	GS02	Moderate load dry climate grass-shrub
123	GS03	Moderate load humid climate grass-shrub

124	GS04	High load humid climate grass-shrub
131	GS01	GT 10,000 Elevation
141	SH01	Low load dry climate shrub
142	SH02	Moderate load dry climate shrub
143	SH03	Moderate load humid climate shrub
144	SH04	Low load humid climate timber-shrub
145	SH05	High load humid climate grass-shrub
146	SH06	Low load humid climate shrub
147	SH07	Very high load dry climate shrub
148	SH08	High load humid climate shrub
149	SH09	Very high load humid climate shrub
157	SH07	Oak shrubland without changes
161	TU01	Light load dry climate timber-grass-shrub
162	TU02	Moderate load humid climate timber-shrub
163	TU03	Moderate load humid climate timber-grass-shrub
164	TU04	Dwarf Conifer with Understory
165	TU05	Very High Load, Dry Climate Timber-Shrub
181	TL01	Low load compact conifer litter
182	TL02	Low load broadleaf litter
183	TL03	Moderate load conifer litter
184	TL04	Small downed logs
185	TL05	High load conifer litter
186	TL06	Moderate load broadleaf litter
187	TL07	Large downed logs
188	TL08	Long-needle litter
189	TL09	Very high load broadleaf litter
201	SB01	Low load activity fuel
202	SB02	Moderate load activity or low load blowdown
203	SB03	High load activity fuel or moderate load blowdown
204	SB04	High load blowdown
91	NB01	Urban
92	NB02	Snow and Ice
93	NB03	Agriculture
98	NB08	Water

99	NB09	Bare Ground
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Vegetation

The Vegetation map describes the general vegetation and landcover types across the state of Colorado. In the Colorado WRA, the Vegetation dataset is used to support the development of the Surface Fuels, Canopy Cover, Canopy Stand Height, Canopy Base Height, and Canopy Bulk Density datasets.

The 2014 LANDFIRE program data product (Existing Vegetation Type) was used to compile the Vegetation data for the West Wide Risk Assessment and the Colorado WRA. This reflects data current to 2014. Some modifications were completed to reflect recent disturbances such as large wildfires and pine beetle infestations prevalent in central Colorado over recent years. The LANDFIRE EVT data was classified to reflect general vegetation cover types for representation with CO-WRAP.

Wildland Urban Interface

Colorado is one of the fastest growing states in the Nation, with much of this growth occurring outside urban boundaries. This increase in population across the state will impact counties and communities that are located within the Wildland Urban Interface (WUI). The WUI is described as the area where structures and other human improvements meet and intermingle with undeveloped wildland or vegetative fuels. Population growth within the WUI substantially increases the risk from wildfire.

The Wildland Urban Interface (WUI) layer reflects housing density depicting where humans and their structures meet or intermix with wildland fuels. In the past, conventional wildland-urban interface data sets, such as USFS SILVIS, have been used to reflect these concerns. However, USFS SILVIS and other existing data sources did not provide the level of detail needed by the Colorado State Forest Service and local fire protection agencies, particularly reflecting encroachment into urban core areas.

The new WUI data set is derived using advanced modeling techniques based on the Where People Live (housing density) data set and 2016 LandScan USA population count data available from the Department of Homeland Security, HSIP data. WUI is simply a subset of the Where People Live data set. The primary difference is populated areas surrounded by sufficient non-burnable areas (i.e. interior urban areas) are removed from the Where People Live data set, as these areas are not expected to be directly impacted by a wildfire. Fringe urban areas, i.e. those on the edge of urban areas directly adjacent to burnable fuels are included in the WUI. Advanced encroachment algorithms were used to define these fringe areas.

Data are modeled at a 30-meter cell resolution, which is consistent with other Colorado WRA layers. The WUI classes are based on the number of houses per acre. Class 9 breaks are based on densities well understood and commonly used for fire protection planning.

Historical Wildfire Occurrence

Federal Fire Ignitions

Fire history statistics provide insight as to the number of fires, acres burned and cause of fires in Colorado. These statistics are useful for prevention and mitigation planning. They can be used to quantify the level of fire business, determine the time of year most fires typically occur and develop a fire prevention campaign aimed at reducing a specific fire cause.

Federal wildfire ignitions data for Colorado were compiled for the period 1992-2017. The primary source was the dataset compiled by the USFS Fire Sciences Laboratory (Karen Short). Federal wildfire ignitions are spatially referenced by latitude and longitude coordinates. All ignitions references were updated to remove duplicate records and correct inaccurate locations.

Please reference the following publication for more information about the primary source: Short, Karen C., 2017. Spatial wildfire occurrence data for the United States, 1992-2015 [FPA_FOD_20170508]. 4th Edition. Fort Collins, CO: Forest Service Research Data Archive. <https://doi.org/10.2737/RDS-2013-0009.4>

Fire Occurrence

Fire Occurrence is an ignition density that represents the likelihood of a wildfire starting based on historical ignition patterns. Occurrence is derived by modeling historic wildfire ignition locations to create an ignition density map.

Historic fire report data was used to create the ignition points for all Colorado fires. This included both federal and non-federal fire ignition locations.

The class breaks are determined by analyzing the Fire Occurrence output values for the entire state and determining cumulative percent of acres (i.e. Class 9 has the top 1.5% of acres with the highest occurrence rate). Refer to the Colorado WRA Final Report for a more detailed description of the mapping classes and the methods used to derive these.

The Fire Occurrence map is derived at a 30-meter resolution. This scale of data was chosen to be consistent with the accuracy of the primary surface fuels dataset used in the assessment. While not sufficient for site specific analysis, it is appropriate for regional, county or local protection mitigation or prevention planning.

Non-Federal Fire Ignitions

Fire history statistics provide insight as to the number of fires, acres burned and cause of fires in Colorado. These statistics are useful for prevention and mitigation planning. They can be used to quantify the level of fire business, determine the time of year most fires typically occur and develop a fire prevention campaign aimed at reducing a specific fire cause.

Non-federally reported fire ignition locations for Colorado were compiled for 2009 to 2017. All ignitions data sources were updated to remove duplicate records and correct inaccurate locations. The original source of the data is reported by local fire departments through the National Fire Incident Reporting System (NFIRS). It is the system used by structural (regular) fire departments for collecting all kinds of fires. Wildland fires are just a portion of them. It is administered nationally by FEMA. Reference info <https://www.nfirs.fema.gov/>. Annually, the Colorado Division of Fire Control & Prevention sends data to CSFS of the wildland fires that are reported within NFIRS. CSFS then formats and submits that data through the National Association of State Foresters to the USDA-Forest Service Data Warehouse, Fire and Aviation Management Web Applications (FAMWEB) site where it is hosted for all the federal, state, and local wildland fire management agencies. Reference site is <https://fam.nwcg.gov/fam-web/>.

APPENDIX C
CSFS Home Ignition Zone Guide



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.

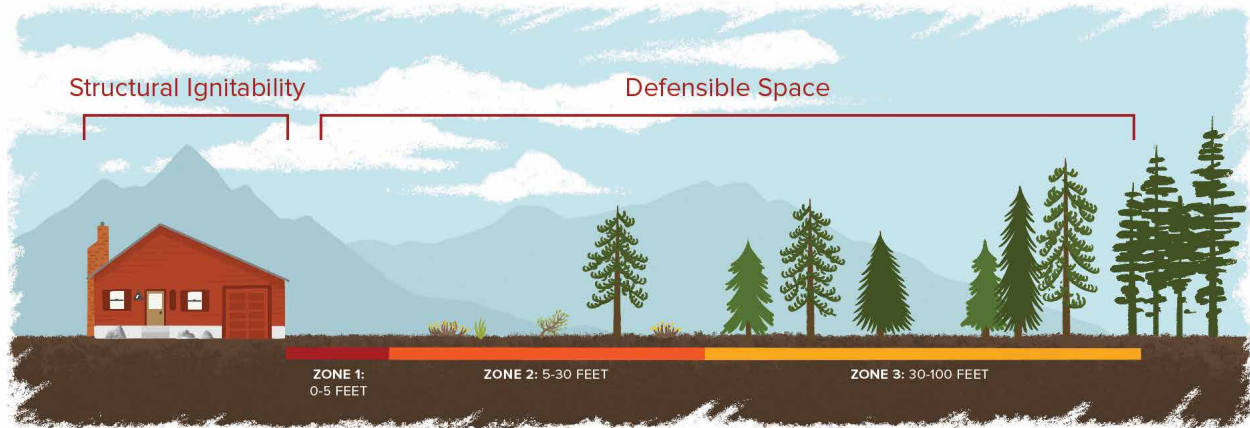


Illustration: Bonnie Palmatory, Colorado State University

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

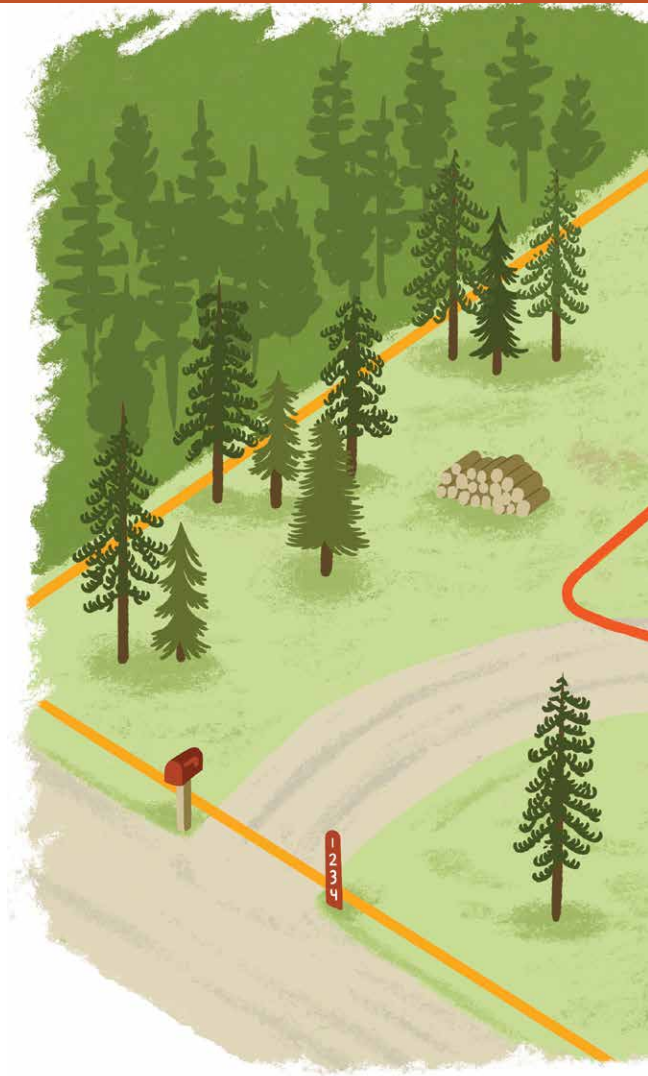
5-30 FEET FROM THE HOME

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.

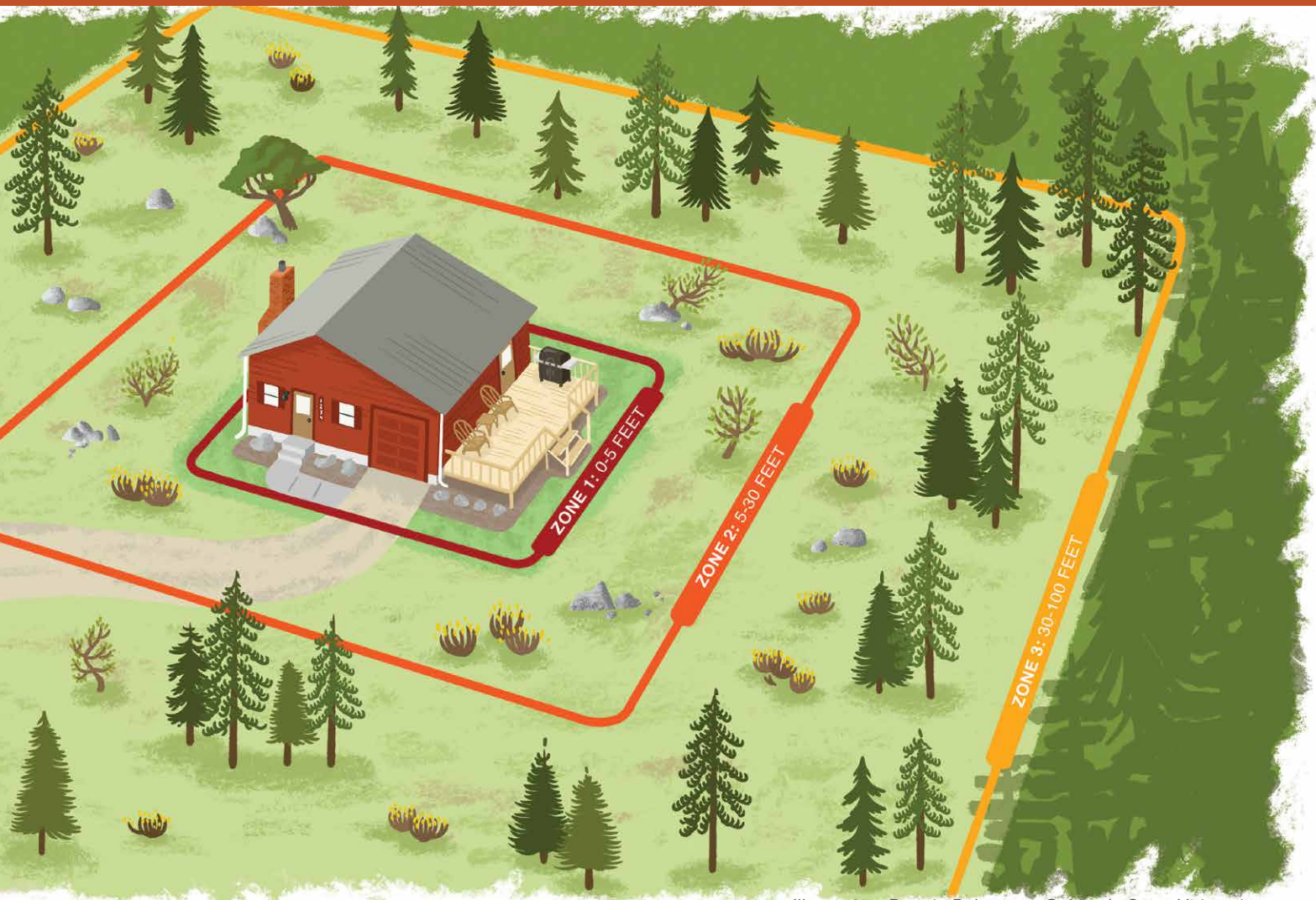


Illustration: Bonnie Palmatory, Colorado State University

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.



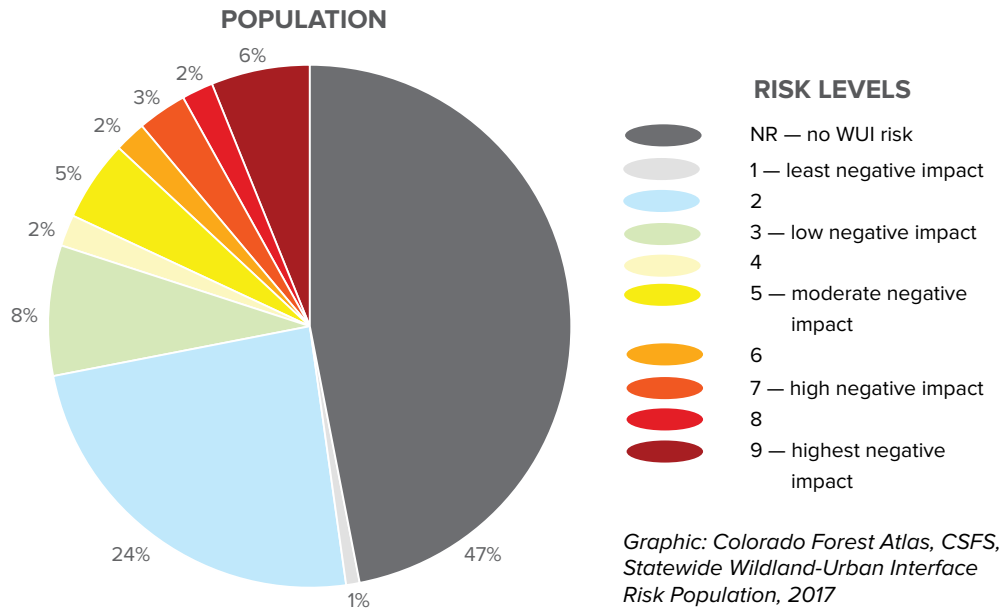
The Colorado State Forest Service works with communities to reduce wildfire risk and become recognized Firewise USA® sites, an accomplishment Piñon Ridge Estates in Chaffee County earned in 2021. CSFS forester Josh Kuehn, right, presents Craig Sommers of Piñon Ridge, with a sign for the community after 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

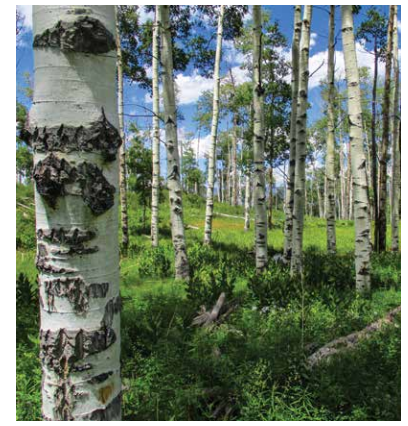
Spruce and fir trees tend to grow in association with each other.

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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Fort Collins, CO 80523-5060
.....

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OUR MISSION

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

The Colorado State Forest Service is a service and outreach agency of the Warner College of Natural Resources at Colorado State University. CSFS programs are available to all without discrimination. No endorsement of products or services is intended. 052021.10000

APPENDIX D

El Paso County Sheriff's Office Community Wildfire Protection Plan for Unincorporated El Paso County

Community Wildfire Protection Plan for Unincorporated El Paso County

“A Continuing Process”



**El Paso County Sheriff's Office
Emergency Services Division**

101 West Costilla Street, Colorado Springs, CO 80903

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From the beginning of the planning process in January 2010, through final approval, the staff of CUSP provided essential guidance, research, and GIS mapping. The El Paso County Office of Emergency Management gratefully acknowledges CUSP's many contributions to this CWPP.



Supporting agencies

Throughout 2010, the following organizations enthusiastically gave of their time, energy, and resources to assist the development of this CWPP. The El Paso County Office of Emergency Management gratefully acknowledges their contributions to this effort.

Fire Departments

Big Sandy Fire Protection District
John Hillman, Fire Chief

Black Forest Fire/Rescue Protection District
Dave Ury, Fire Chief

Broadmoor Fire Protection District
Ron Ruckdeschel, Fire Chief

Calhan Fire Protection District
Shane Gattis, Fire Chief

Cascade Fire Protection District
Steve Lewis, Fire Chief

Cimarron Hills Fire Department
Matt Love, Fire Chief

Colorado Centre Fire Department
Tom Byes, Fire Chief

Colorado Springs Fire Department
Steve Cox, Fire Chief

Crystal Park Volunteer Fire Department
John Hennessy, Fire Chief

Donald Wescott Fire Protection District
Jeff Edwards, Fire Chief (ret)
Vinnie Burns, Fire Chief

Edison Fire Protection District
Mark Anderson, Fire Chief

Elbert Fire Protection District
John Gresham, Fire Chief

Ellicott Fire Protection District
Nellie Roop, Fire Chief

El Paso County Sheriff's Office Wildland Fire Crew
Bobby White, Superintendent

Falcon Fire Protection District
Trent Harwig, Fire Chief

Fort Carson Fire Department
Glen Silloway, Fire Chief

Green Mountain Falls Chipeta Park Fire Protection District
Steve Murphy, Fire Chief

Hanover Fire Protection District
Carl Tatum, Fire Chief

NORAD-Cheyenne Mountain Fire Department
Chris Miller, Fire Chief

Peterson Air Force Base Fire Department
Cindy Litteral, Deputy Chief

Palmer Lake Volunteer Fire Department
Shawna Ball, Fire Chief

Peyton Fire Protection District
Jack Rauer, Fire Chief

Schriever Air Force Base Fire Department
Michael Haynes, Fire Chief

Security Fire Protection District
R. Ski Stambaugh, Fire Chief
Dennis Carlson, Assistant Chief

Southwest Hwy. 115 Fire Protection District
Mel Ryan, Fire Chief

Stratmoor Hills Fire Protection District
Ian Bruzenak, Fire Chief

Tri-County Fire Protection District
Jeremy Gardner, Fire Chief

Tri-Lakes Monument Fire Protection District
Rob Denboske, Fire Chief

United States Air Force Academy Fire and Emergency Services
Ernst Piercy, Fire Chief
Kent Halverson, Deputy Chief

Woodmen Valley Fire Protection District
Barry Pleshek, Fire Chief

Forestry and Natural Resources

Coalition for the Upper South Platte

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Natural Resource Conservation Service

Greg Langer, District Conservationist

United States Air Force Academy, Natural Resources Department

Diane Strohm,
Natural Resource Planner and Forester
Steve Wallace, Forestry Technician

US Fish and Wildlife Service

Leslie Ellwood, Wildlife Biologist

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El Paso County Sheriff's Office, Emergency Services Division

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United States Air Force Academy

Steve Reed, Emergency Manager

Fort Carson

Russ Roux, Emergency Manager

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El Paso County Development Services Department

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Raimere Fitzpatrick, Planner II

El Paso County Information Technology

Mike Duysen, GIS Specialist II

Utilities

Colorado Springs Utilities

Eric Howell,
Water Natural Resource Planner

Mountain View Electric Association

Darryl Edwards, Member Services Manager
Claud Hugley, Operations Manager
John Gresham, Inspector

Local Community Wildfire Protection Plans in Unincorporated El Paso County

At this writing, in May 2011, the following communities in unincorporated El Paso County have completed their own Community Wildfire Protection Plans. These plans were valuable sources of information during the development of this CWPP for the unincorporated County.

Black Forest CWPP (2007)

Carroll Lakes CWPP (2007)

Crystal Park CWPP (2006)

Palmer Lake CWPP (2008)

Southwestern Highway 115 Fire Protection District CWPP (2007)

Ute Pass CWPP (2007)

Wissler Ranch CWPP (2010)

Woodmoor CWPP (2006)

An up to date list of all approved CWPPs is maintained on the Colorado State Forest Service web site¹.

Communities are highly encouraged to work together to create new local CWPPs that are tailored to the needs and priorities of their residents. These local plans provide the specific detail necessary to plan and execute local mitigation projects.

¹ "Colorado Community Wildfire Protection Plans," 3 May 2011
<<http://csfs.colostate.edu/pages/CommunityWildfireProtectionPlans.html>>

Introduction

Purpose, constraints, and goals

This Community Wildfire Protection Plan (CWPP) was created to comply with a mandate of the Colorado Legislature, while also meeting the requirements of CWPPs as defined in the Healthy Forest Restoration Act (HFRA). It was intended to do both of these things in a way that provides useful information to local communities as they plan for their own wildfire protection.

The Legislative mandate: A CWPP for the unincorporated County

Colorado Senate Bill 09-001, “Concerning the Establishment of Community Wildfire Protection Plans by County Governments,” requires each county government to prepare a CWPP “to address wildfires in fire hazard areas within the unincorporated portion of the county.”

In SB 09-001, the Legislature directed that this CWPP should only address the unincorporated portion of the county. This plan adheres to this direction, and does not set goals for municipalities.

However, we also recognize that small towns are the most significant values at risk in some rural fire protection districts, and that a wildfire that escapes control in an unincorporated area can quickly threaten municipal neighborhoods.

Municipalities are also important pieces of the overall picture of wildfire mitigation and suppression. For example, all of the County’s municipal fire departments maintain strong mutual aid relationships with fire departments in unincorporated areas.

This plan does not replace local CWPPs

At the beginning of this planning process, the Colorado State Forest Service (CSFS) advised El Paso County that this all-County plan would not replace any existing CWPPs that have already been completed by local communities. As a matter of fact, existing local CWPPs were used as reference sources in the development of this plan.

The CSFS also directed that this all-County CWPP does not remove the need for small local communities to develop their own CWPPs.

Local community CWPPs – prepared for individual towns, neighborhoods, or fire protection districts – capture the level of detail needed to take specific local actions. The development of local CWPPs brings together the neighborhood groups that plan mitigation projects and, in many cases, do the hands-on work.

Therefore, CSFS directed that this all-County CWPP should not be so detailed that it leaves nothing for local community planners to do. This approach respects the spirit of the national standards for CWPPs, which require local plans

to be specific about wildfire hazards, community values at risk, and the projects needed to protect those values.²

The special role of military installations

Community Wildfire Protection Plans are intended for non-Federal lands. Military installations prepare wildfire management plans for their own lands, but these plans are not the same as CWPPs.

However, El Paso County is home to five military installations, some of which control large areas of land in or near the wildland-urban interface. Because of this intimate relationship, the CSFS also directed the County to include the military in the planning process. Our military communities graciously participated in the development of this plan.

An umbrella... or a foundation

To comply with both the Legislative mandate for an all-County plan, and the spirit of the ideal CWPP as a detailed local product, the CSFS directed that this all-County CWPP should serve as an “umbrella plan” that encompasses more specific local plans.³ We prefer the image of this CWPP as a foundation that provides a common body of information to aid small communities as they develop their own, more detailed, CWPPs.

This plan uses a broad brush to paint a basic picture of wildfire behavior in El Paso County, and document the public policies and other issues that affect wildfire mitigation and suppression. We have also attempted to point out issues that local CWPPs should consider, and identify reference documents that local planners may find useful.

As each local community develops its own CWPP, it can avoid duplicating this research by referring to this foundation plan. The local CWPP can then focus on the details of its small area, documenting its specific wildfire hazards, community values at risk, and projects that can protect those values.

According to SB 09-001, “CWPPs can be as simple or complex as a local community desires.” In that spirit, we have aimed for this plan to be as simple as possible, while achieving the purposes described above.

² Society of American Foresters, “Preparing a Community Wildfire Protection Plan: A Guide for Wildland Urban Interface Communities” March 2004

³ Colorado State Forest Service, “Minimum Standards for Community Wildfire Protection Plans (CWPP)” 18 November, 2004

The process of developing this CWPP

The standard guidance for developing a CWPP advises a community to first form a core team that includes all local stakeholders. That team then meets frequently to guide every step of the process, from research through draft writing, then public comment and eventual adoption.

Some counties have successfully used this approach to develop all-County CWPPs. However, El Paso County is large, highly populated, and politically diverse.

Its jurisdictions (some of which overlap) include eight municipalities, twenty-one fire protection districts, two metropolitan districts with fire departments, five military installations, a state park and a national forest. Some parts of the County have many active citizen groups, while other areas have very few.

Its 2,158-square-mile area consists of arid plains, dense forests, and high alpine environments, each with different wildfire concerns. A person from the southeastern grasslands would be challenged to represent or understand the interests of someone in the northwestern foothills.

As we looked at this complex picture, we quickly saw that a core team that included all stakeholders would be too large and cumbersome to be effective. But to form one that was small enough to be manageable would require selecting representatives who still might not be able to represent all local concerns.

We settled on a hybrid approach that took all the traditional steps of CWPP development, but in an untraditional order.

A small steering team

We began by forming a very small steering team of only three people. This team concentrated on guiding the project through the process of gathering initial public input, conducting research, producing maps, and writing the draft, and submitting that draft for public comment and eventual adoption. The steering team functioned as staff for larger groups of community participants. However, the steering team did not make decisions about wildfire hazards or community values at risk, and did not determine priorities for mitigation.

The Steering Team

Kathy Russell, Emergency Preparedness Planner for the El Paso County Office of Emergency Management, worked with the County's many local fire chiefs to gather their input and concerns. She served as the lead researcher and principal author.

Marti Campbell, CWPP Facilitator for the Coalition for the Upper South Platte (CUSP), served as an overall consultant to ensure that the process and the final product would meet the published requirements for CWPPs. She also coordinated the production of the plan's maps, working with the GIS staff of CUSP. She facilitated each public meeting, and ensured that the public input process gathered the right type of information. Marti also located the state and federal subject matter experts who provided key input about land management and critical infrastructure protection.

Dave Root, Assistant District Forester for the Colorado State Forest Service (CSFS), made sure that the plan we were developing would meet CSFS requirements. A veteran of many CWPP projects, he helped us develop a valid planning process that worked for El Paso County.

Initial data gathering: Fire protection districts and sub units

One of the steering team's first tasks was to gather data and local concerns from community participants.

We gathered survey information from individual fire protection districts (FPDs), and metropolitan districts that operate fire departments. This made the most sense, because most unincorporated areas are not represented by a homeowners' association, but almost all are served by a local fire department.

We also needed to have initial face-to-face discussions with local communities, to gather their input about local wildfire hazards and the community values they want to protect.

It was impractical to hold a separate meeting in each of these special districts, so we settled on a middle-ground approach that divided the County into three "sub units" based on terrain and vegetation types. These sub units also tended to reflect the mutual-aid arrangements of local fire protection districts.

When presented with this two-level approach, the county's fire chiefs agreed that the surveys allowed each of them to express their individual ideas, while the sub unit meetings provided a way to discuss local issues without meeting with each individual FPD.

El Paso County CWPP Sub Units

Northeast: Hwy. 24 Corridor

Big Sandy FPD
Calhan FPD
Cimarron Hills FPD
Elbert FPD
Falcon FPD
Peyton FPD

Southeast

Colorado Centre Metropolitan District
Edison FPD
Ellicott FPD
Hanover FPD
Security FPD
Stratmoor Hills FPD
Tri-County FPD

Foothills

Black Forest FPD
Cascade FPD
Crystal Park Metropolitan District
Donald Wescott FPD
Green Mountain Falls Chipeta Park FPD
Southwestern Hwy. 115 FPD
Tri Lakes – Monument FPD
Woodmen Valley FPD

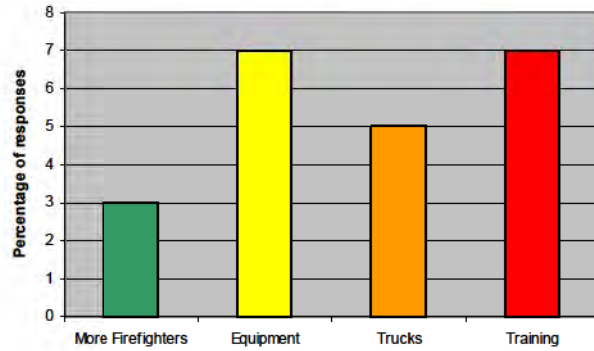
(Broadmoor FPD was not included in this sub unit because almost all of its territory is overlapped by the city of Colorado Springs.)

Fire Chiefs' surveys and maps

We began by sending a simple survey to each fire protection district; those surveys asked the fire chiefs to describe their district's readiness to respond to wildland fire, and list resources that they need to better respond. Each chief also received orthographic and topographic maps, and was asked to mark those maps with areas of concern.

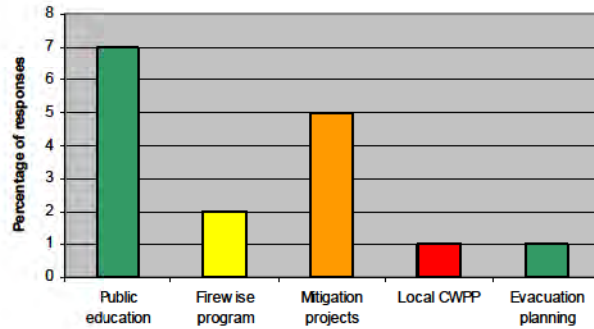
"Describe what your fire department needs most to improve your wildland firefighting capability."

All responses (11)



"Describe what your district - as a community - needs to be better prepared for wildland fire."

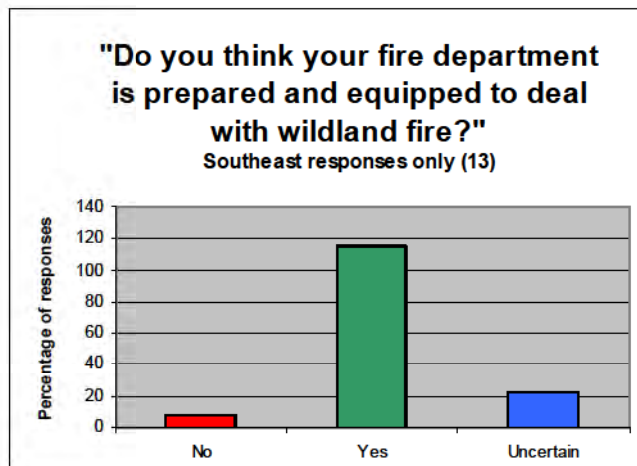
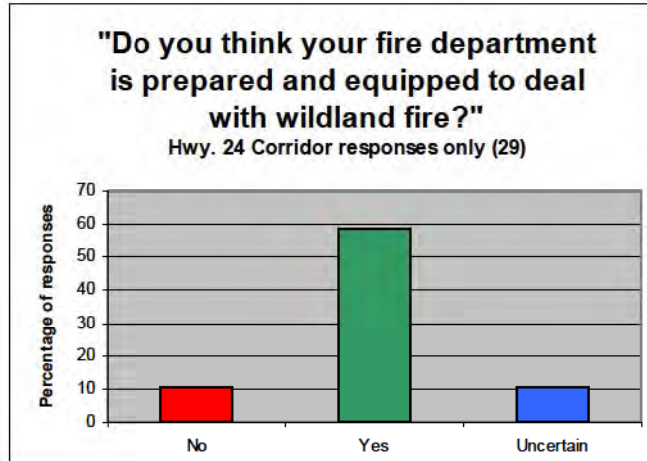
All responses (11)



Citizen surveys

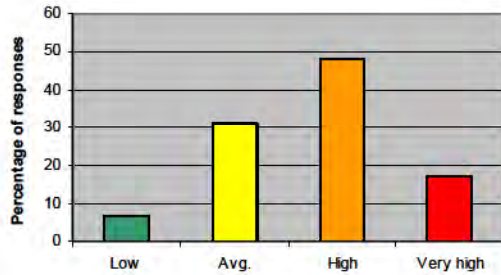
We also prepared a different survey for citizens, and asked each fire chief to distribute as many of these as possible. These surveys asked citizens to describe known local wildfire hazards, and describe community values that should be protected from wildfire.

We also asked questions to determine the level of citizens' confidence in their local first responders. It was gratifying to see that most citizens have a high opinion of their local fire departments, and are confident of their ability to respond to wildfire.



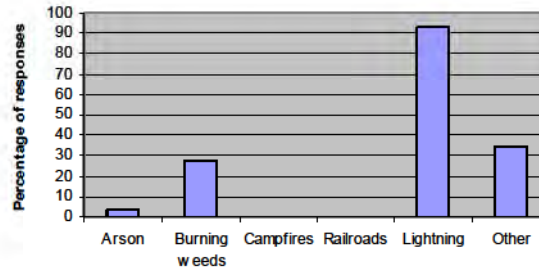
"How would you rate the wildfire risk in the area where you live?"

Hwy. 24 Corridor responses only (29)



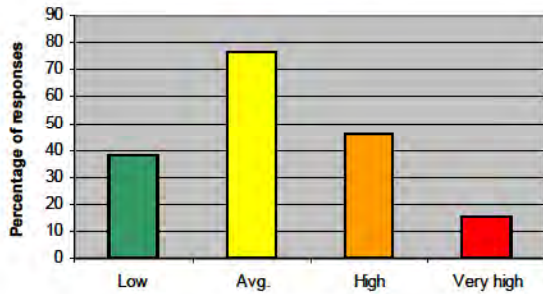
"What factor do you think is most likely to cause a wildfire in your area?"

Hwy. 24 Corridor responses only (29)



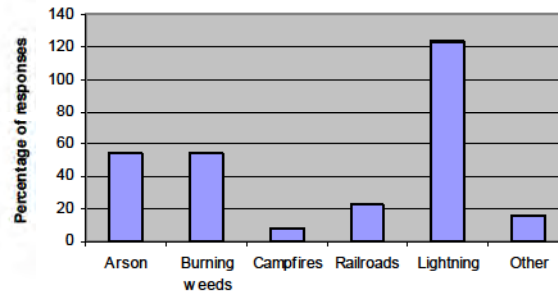
"How would you rate the wildfire risk in the area where you live?"

Southeast responses only (13)



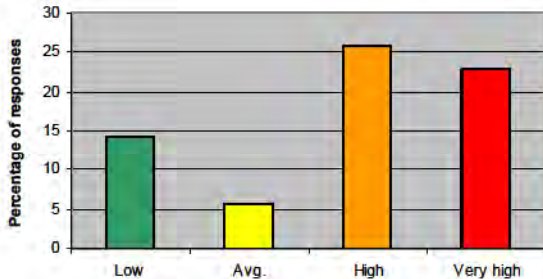
"What factor do you think is most likely to cause a wildfire in your area?"

Southeast responses only (13)



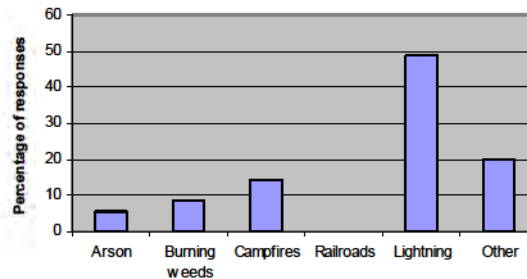
"How would you rate the wildfire risk in the area where you live?"

Foothills responses only (35)



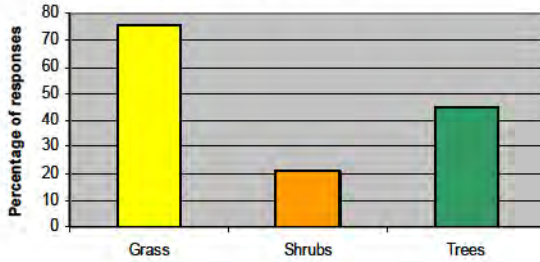
"What factor do you think is most likely to cause a wildfire in your area?"

Foothills responses only (35)



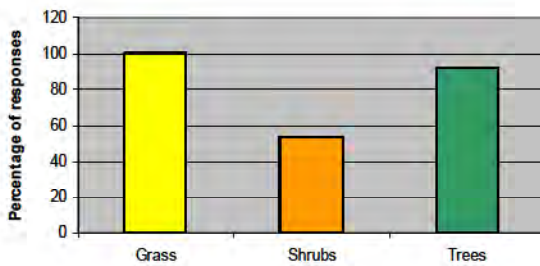
"What type of vegetation poses the greatest risk of wildfire in your area?"

Hwy. 24 Corridor responses only (29)



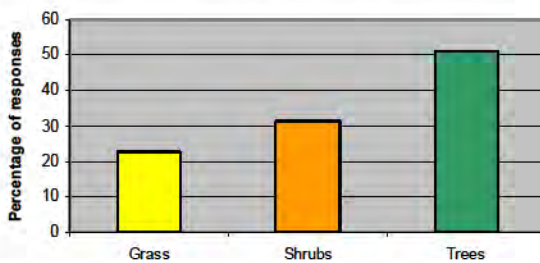
"What type of vegetation poses the greatest risk of wildfire in your area?"

Southeast responses only (13)



"What type of vegetation poses the greatest risk of wildfire in your area?"

Foothills responses only (35)



Public meetings to gather concerns

After most of the surveys had been returned and tabulated, we held a public meeting in each of the three sub units. At each meeting, we explained the goals of the CWPP and the process that would be used to develop it. We then presented the results of the survey to date.

The most important activity of each meeting was gathering input about each sub unit's specific wildfire hazards and values at risk. Citizens were provided with a large map of their sub unit, and asked to mark the map with known hazards and values at risk. Local community values typically included public buildings, such as schools or fire stations. Citizens also identified unique values at risk; for example, one Southeast community noted that its historic cemetery has wooden grave markers that could be destroyed by fire.

Even though the all-County CWPP does not describe local wildfire hazards or specify local projects, we felt that asking for local data could potentially help us identify patterns that applied to the County as a whole.

We looked for geographical patterns, such as wildfire hazards that extend across the boundaries of communities. We also looked for conceptual patterns, such as concerns about unsafe uses of fire, gaps in public education, or needs of local firefighters.



**Public Meeting; Northeast Sub Unit:
Hwy. 24 Corridor**
Thursday, July 1, 2010
Host: Falcon Fire Protection District



By capturing local data early in the process, we also saw another opportunity to help community leaders develop local plans. We made a commitment to preserve all of the local data gathered in surveys and meetings, and return the compiled data to each fire protection district for use in creating future local CWPPs.

These sub unit meetings brought together the people who would most likely work together on local wildfire mitigation projects. Not all local fire chiefs in each sub unit were able to



Public Meeting: Southeast Sub Unit
Thursday, July 8, 2010
Host: Ellicott Fire Protection District



Public Meeting: Foothills Sub Unit
Thursday, July 15, 2010
Host: Stratmoor Hills
Fire Protection District

attend each of these meetings. However, because of the way the sub units had been created, they were comfortable that their concerns would be represented by one of their local mutual aid partners.

To create the most complete picture possible, we requested that all fire protection districts participate in the surveys and meetings, even if a fire protection district already had a CWPP. Several districts with existing CWPPs took the extra time to provide data and participate in meetings.

Research

Before, during, and after the process of gathering initial public input, the steering team researched published literature, existing CWPPs, and hazard mitigation plans. We also consulted subject matter experts for technical guidance. These sources are noted in the footnotes.

Draft review process

The steering team sent the near-final draft of this CWPP to every person or agency that had participated in the development process to date, as well as some who had expressed interest, but had not been able to attend meetings. A total of 68 participants received copies of the draft.

Along with the draft, the steering team also sent a list of proposed implementation actions. These proposed actions were developed based on the input gathered from sub-unit meetings, surveys, and meetings with stakeholders and subject matter experts.

Reviewers were asked to complete a short online survey, within two weeks, to prioritize the proposed implementation actions and provide comments on the draft.

The steering team incorporated the comments and prioritized actions into the final draft, which was presented for approval to the Colorado State Forest Service, the El Paso County Sheriff's Office, and the El Paso County Board of County Commissioners.

Adoption

A copy of the final draft was submitted for approval to the following:

- Colorado State Forest Service: District Forester Larry Long
- El Paso County Sheriff Terry Maketa
- El Paso County Board of County Commissioners: Chair Amy Lathen



El Paso County: The physical landscape

El Paso County is approximately 50 miles south of Denver⁴, and encompasses 2,158 square miles⁵.

The county shares boundaries with the counties of Douglas to the north, Elbert to the northeast, Lincoln to the east, Pueblo to the south, Fremont to the southwest, and Teller to the west.



The western edge of the County is extremely mountainous, as the Rocky Mountains rise abruptly from the dry plains that form most of the eastern portion of the County. Elevation ranges from 5,095 feet at the southern county line, to 14,110 feet at the summit of Pikes Peak.

The mountains that form the County's western edge capture most of the precipitation from east-moving weather systems. As a result, the County is a semi-arid alpine desert, with approximately 250-285 days of sunshine and 13-20 inches of precipitation per year. Relative humidity tends to be low, often in the single digits or the teens.

Average annual snowfall is 35-42 inches⁶; however, the snow is quickly melted by intense sunshine, and does not remain on the ground for very long in many parts of the County. Winds, including the occasional warm Chinook, also help melt snow and moderate the winter climate. In the spring, strong Chinook winds can rapidly reduce fuel moisture, and can create dangerous wind-driven fire behavior.

Physiographic Descriptions⁷

Northeast Sub Unit: The Highway 24 Corridor

Soils on mild, semiarid foothills and plains: The soils in this area are on fans, terraces, ridges and side slopes in the central and northeastern parts of the county. The soils are nearly level to extremely steep. Soil textures are mostly

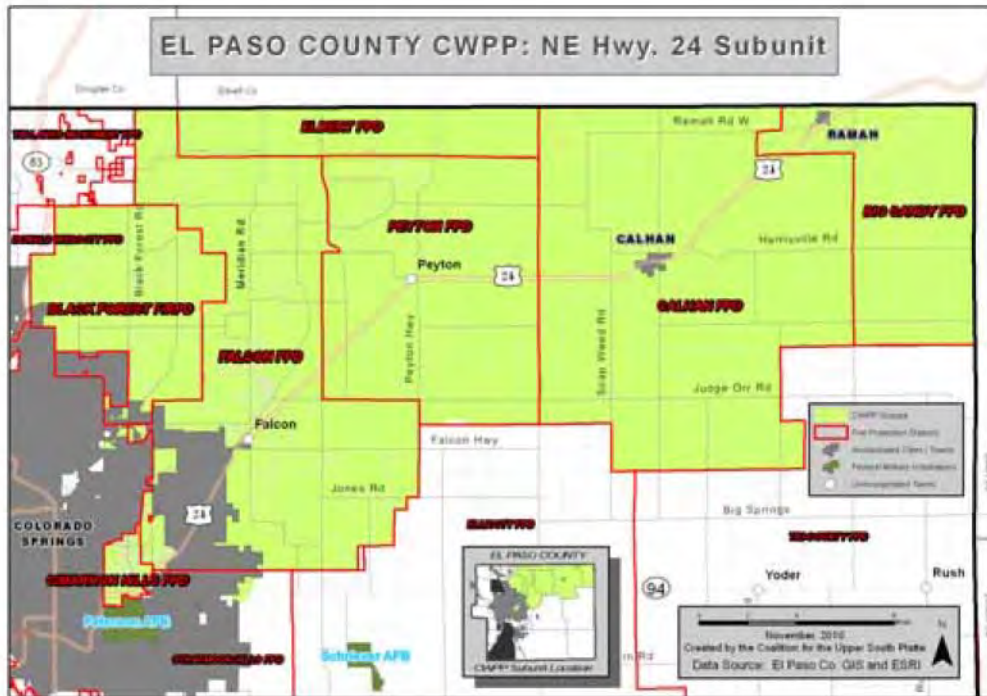
⁴ Map: 4 March, 2011 <<http://adm2.elpasoco.com/Maps/images/mtnview.JPG>>

⁵ "About El Paso County, Colorado," 10 Aug. 2010 <http://www.elpasoco.com/About_elpaso_county.asp>

⁶ Patricia Baxter and Cynthia Sirochman, *Pre-Disaster Mitigation (PDM) Plan for El Paso County* (El Paso County Office of Emergency Management, 2006) 14.

⁷ Greg Langer, District Conservationist, Natural Resources Conservation Service (NRCS)

sandy loam, but range from cobbly sandy loam to loam. The majority of these soils were formed in material weathered from arkosic sedimentary rock. Others were formed from sandstone, shale and red sandstone.



Average annual precipitation: 13-17 inches

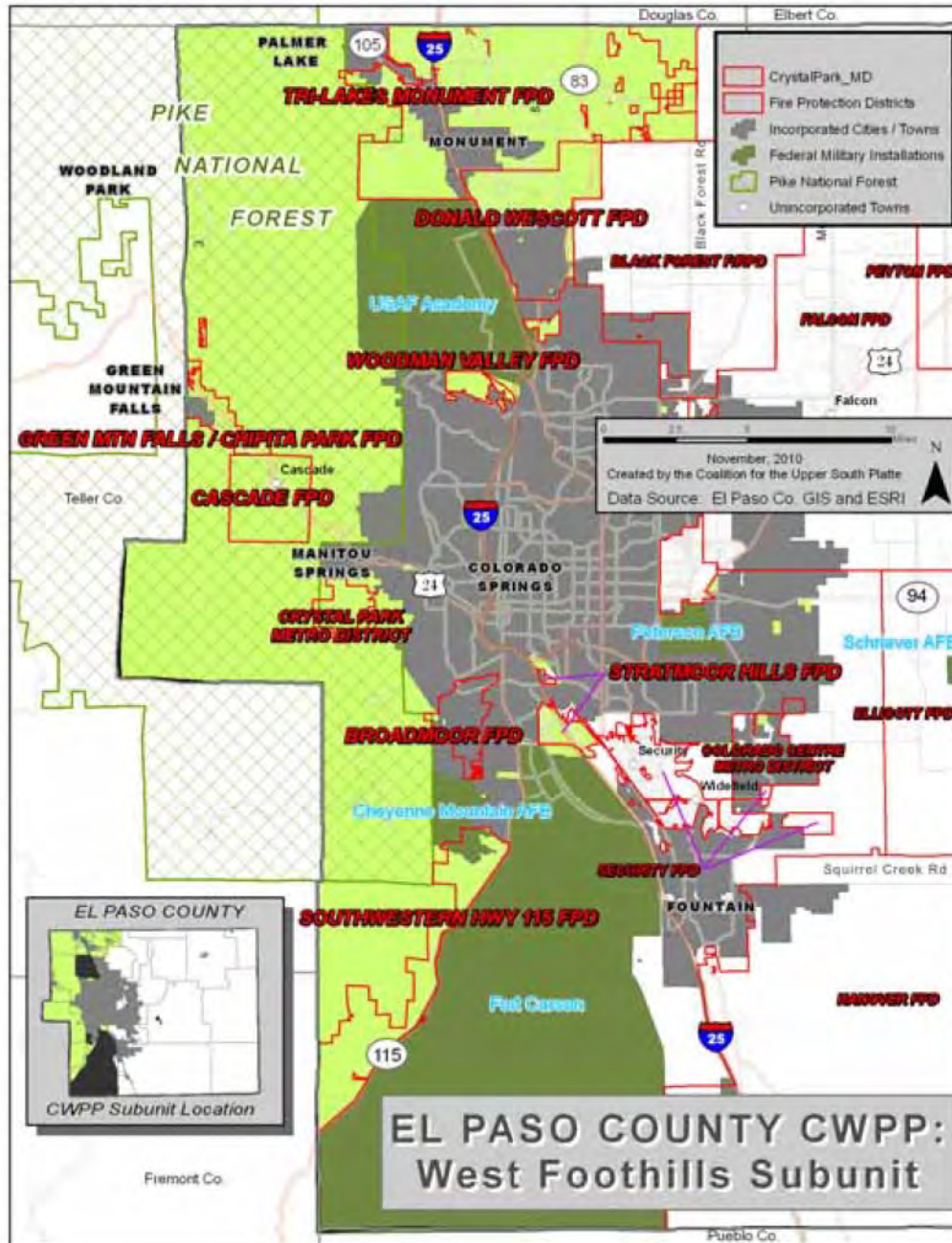
Vegetation: 5% forest, comprised of ponderosa pine; nearly 75% native grass or short grass prairie; and about 20% cropland that ranges from annually cropped land to Conservation Reserve Program (CRP).

Population: This unit is moderately populated, with suburban-density subdivisions in the Cimarron Hills and Falcon Fire Protection Districts. 35-acre lots are common and scattered throughout.

Agriculture: Native grass pastures are predominantly used for livestock grazing.

West Sub Unit: The Foothills

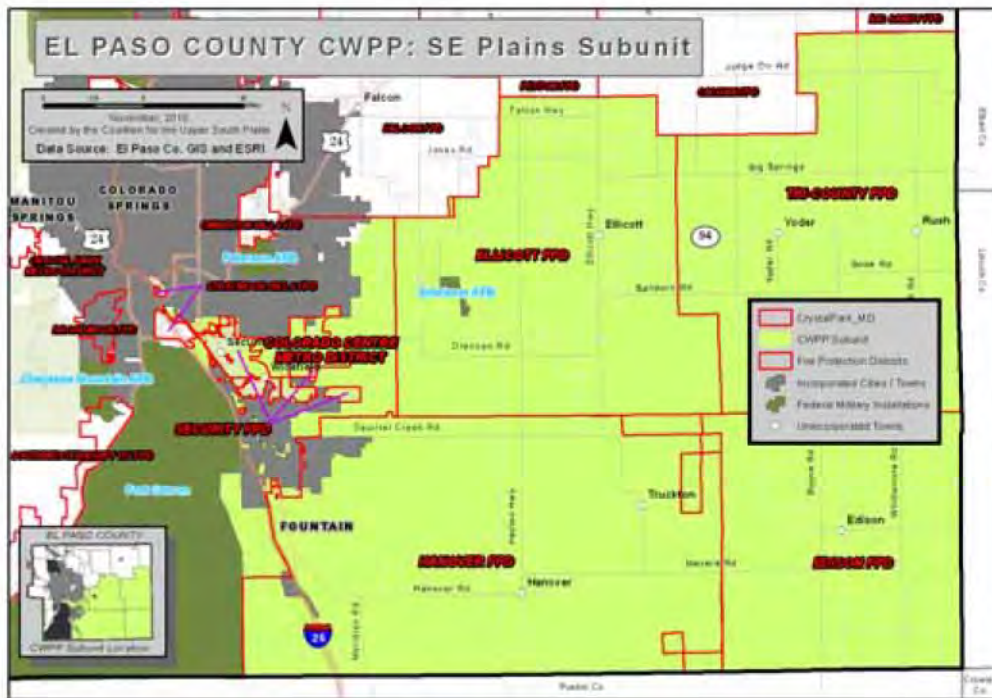
Soils on cold, subhumid to semiarid mountains and foothills: The soils and rock outcrop in this unit are on fans, terraces, ridges and side slopes of mountains and foothills at the higher elevations in the north central and western parts of the county. The soils are nearly level to extremely steep. Soil textures range from rock outcrop to sandy loam. All of these soils were formed in material weathered from igneous and sedimentary rock.



Agriculture: Agricultural land covers maybe 15% of the total area, with grazing being the dominant land use.

Southeast Sub Unit: The Plains

Soils on mild, semiarid to arid plains: The soils in this unit are on fans, terraces, hills, ridges and side slopes throughout the southern half of the county. The soils are nearly level to steep. Soil textures are mostly sand to loamy sand and range from gravelly loam to clay loam. Most of these soils were formed in alluvial and eolian material.



Average annual precipitation: 11-13 inches

Vegetation: This unit consists of roughly 85% native grass pasture or short grass prairie. Nearly 15% is considered cropland that is either hayed or Conservation Reserve Program (CRP).

Population: This unit is lightly populated with scattered subdivisions comprised mainly of 35-acre parcels.

Agriculture: Native grass pastures are predominately used for livestock grazing.

The human landscape

A brief history

The human history of El Paso County began at least 15,000 years ago with nomadic hunters and gatherers. Native American tribes were well established in the Pikes Peak region until the mid 1800s, when European trappers began establishing trading posts along the Arkansas and South Platte rivers.⁸

In 1858, the discovery of gold in Colorado brought an influx of population to the region. Population boomed again in 1891 when gold was found on the western slope of Pikes Peak, at Cripple Creek. In the western foothills of what would become El Paso County, many settlers provided supplies and services to mountain-based miners. In the eastern plains, ranching became the major occupation.

El Paso County was created just after the Colorado Territory was established in 1861; in 1876, Colorado became the thirty-eighth state of the Union.

According to the U.S. Census Bureau, the total population of El Paso County was 622,263⁹ in 2010, an estimated 20.4% increase since 2000. The County has eight incorporated municipalities, with a total combined 2010 population of 456,758. The population of the remaining unincorporated area was 165,505.

Today, the human landscape of El Paso County still follows the patterns begun in the 1800s. The eastern portion of the county, with its flat, dry grasslands, is sparsely populated and rural. The western part is home to most of the county's population, clustered in towns, cities and suburbs.

City of Colorado Springs	416,427
City of Fountain	25,846
City of Manitou Springs	4,992
Town of Palmer Lake	2,420
Town of Monument	5,530
Town of Calhan	780
Town of Green Mountain Falls	640
Town of Ramah	123

The eastern-facing foothills have become heavily populated, due to their natural beauty and sweeping views. However, these slope-side communities, with heavy fuel loading of Ponderosa pine and Gambel oak, are highly vulnerable to fire. Many neighborhoods are accessed by only one narrow road, which makes it difficult to simultaneously evacuate residents and provide ingress to first responders. Fire,

⁸ Patricia Baxter and Cynthia Sirochman, *Pre-Disaster Mitigation (PDM) Plan for El Paso County* (El Paso County Office of Emergency Management, 2006) 15.

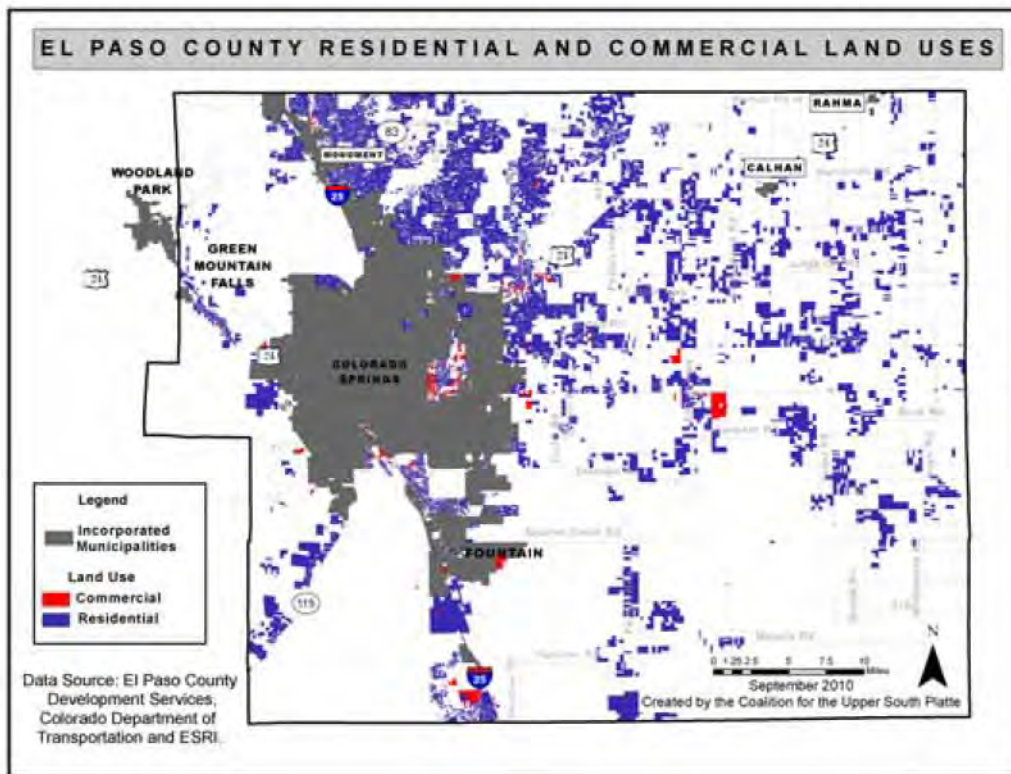
⁹ United States Census Bureau, *The Most Populous Counties and Incorporated Places in 2010 in Colorado: 2000 and 2010*, 4, March 2011 <http://2010.census.gov/news/xls/cb11cr39_co_2010redistr.xls>

¹⁰ Colorado Department of Local Affairs, *2010 Population and Percent Change; Colorado Places – Total Population*, 4, March 2011 <<http://dola.colorado.gov/dlg/demog/2010data/total%20pop%20change.pdf>>

smoke, or traffic congestion can block these single escape paths, endangering both residents and first responders.

Private ownership

Most of the unincorporated County is privately owned, in parcels that range in size from small lots to large ranches. Land use on small lots is primarily residential, including small home-based businesses. Large holdings are primarily used for cattle ranching and dry-land farming. Farm land enrolled in the U.S. Department of Agriculture's Conservation Reserve Program (CRP) has been planted to resource-conserving vegetative covers.



Public lands

Pike National Forest

The largest area of public land in El Paso County is the Pike National Forest, which forms the county's mountainous western edge. Many communities border the Pike, and a few small communities are surrounded by it.

Military installations

El Paso County is home to five major military installations:

- **Cheyenne Mountain Air Force Station** is the site of the subterranean Cheyenne Mountain Complex of the North American Aerospace Defense Command (NORAD). The installation consists of rugged mountain terrain, bounded by the Pike National Forest and the city of Colorado Springs.
- **Peterson Air Force Base** is located within the city limits of Colorado Springs, in short-grass prairie at the eastern edge of the city's suburban neighborhoods.
- **Schriever Air Force Base** sits several miles east of Peterson, surrounded by unincorporated prairie land.
- **The United States Air Force Academy** is Colorado Springs' immediate neighbor to the north, and also shares boundaries with three fire protection districts and the Pike National Forest. Its rolling wooded foothills, and sudden transition to steep mountainsides, are typical of the Foothills sub-unit.
- **Fort Carson**, the U.S. Army base at the southern edge of Colorado Springs, is also a neighbor to the city of Fountain and four fire protection districts. Most of its 137,000 acres are in El Paso County, with some of its area extending into Pueblo and Fremont Counties. Fort Carson's soldiers use most of this large area for mission-critical live-fire artillery and small arms training. This activity occasionally starts fires, some of which have extended beyond the base boundary.

All of these installations are located near to civilian neighborhoods, and three of them are located in traditional forested wildland-urban interface conditions: Fort Carson, Cheyenne Mountain Air Force Station, and the U.S. Air Force Academy. A fire that starts on one of these installations could potentially threaten residential neighborhoods, and vice-versa.

Some military infrastructure and activities also extend beyond the main base boundaries. For example, Fort Carson's railway spur runs through nearby neighborhoods in the Stratmoor Hills Fire Protection District. Weed control and other fire mitigation on those parcels remains the responsibility of Fort Carson, which prohibits public access to those areas.

State Trust Lands

The State Board of Land Commissioners (also known as the State Land Board) was established in 1876 to manage more than 3 million acres of land and 4 million acres of mineral rights that the federal government gave to Colorado to generate revenue for public education and some of the state's institutions.

The State Land Board generates revenue for its trust beneficiaries, by leasing State Trust Land for grazing, farming, or mineral development. El Paso County has 184,798.88¹¹ acres of State Trust Land, most of which is located in the eastern half of the County.

County-owned land

County parks represent the County's largest land holdings. County government does not own a significant portion of the overall area of the County, but the management of these areas is highly visible and can serve as demonstration projects.

Municipal lands

Municipally-owned lands in the County consist mostly of parks in the cities of Colorado Springs and Fountain. A few of the larger municipal parks include significant areas of natural terrain, such as Garden of the Gods and Cheyenne Canon, both in Colorado Springs.

Colorado Springs Utilities

Colorado Springs Utilities (CSU) is an enterprise, owned by the City of Colorado Springs, that provides electricity, natural gas, water and wastewater services to city residents.

Since the late 1800s, the City of Colorado Springs has acquired large tracts of land on Pikes Peak, to support the goal of ensuring a reliable supply of clean water. These lands – 13,000 acres in 2010 – have been set aside by City Ordinance to be held in trust as watershed reserves. Colorado Springs Utilities manages these lands to protect the water supply, water infrastructure, and forest resources.¹²

Mitigation challenges and constraints

Private ownership

Individual landowners are responsible for wildfire mitigation on their own properties. This is consistent with our current understanding of fire behavior in the wildland-urban interface (WUI). As research scientist Jack D. Cohen explains:

“The congruence of research findings from different analytical methods suggests that home ignitability is the principal cause of home losses during wildland fires. ... Home ignitability also dictates that effective mitigating actions focus on the home and its immediate surroundings rather than on extensive wildland fuel management. Because homeowners typically assert their authority for the home and its immediate surroundings, the responsibility for effectively

¹¹ Trust Land Ownership by County (as of June 2010), 25 October 25, 2010
<http://trustlands.state.co.us/MapsandData/Documents/county_acres1_060310.pdf>

¹² Naomi J. Marcus, *Pikes Peak Watershed Forest Management Plan* (Colorado State Forest Service, 2010) 3.

reducing home ignitability can only reside with the property owner rather than wildland agencies.”¹³

Many homeowners in El Paso County have embraced this principle, and have done substantial work to make their homes and properties more fire-resistant and defensible.

However, others have declined to manage vegetation, for a wide range of reasons. Owners of small lots value the visual privacy that thick brush provides. Others are discouraged by the large amount of work and expense required to mitigate their properties, and take the fatalistic attitude that “it’s insured.”

Economic factors

The cost of forestry work also creates a barrier to mitigation for many residents, even those with small lots. Those who are physically incapable of this work often have lower incomes. These residents cannot afford to hire contractors to create survivable (defensible) space or trim branches, even when they agree with the need to do so.

Owners of large forested holdings also face economic challenges, as these large parcels can be very expensive to thin. Standing timber in the County is generally too small or too inaccessible for commercial use, and there has been little commercial demand for small diameter wood or slash.

However, this economic picture may be changing. At this writing, some local industries are making plans to adapt their heating and power-generation systems to use woody biomass as fuel. Colorado Springs Utilities has redesigned one unit of its Martin Drake Power Plant to burn a mixture of ground wood and coal, and is seeking grants to fund the new systems to process the wood materials and inject them into the fuel stream.¹⁴

Home Owners’ Associations and covenants

A Home Owners’ Association (HOA) has the authority to dictate what changes homeowners may make to the exterior of their homes, such as paint color, landscaping style, or roof material. Some HOA rules and procedures have discouraged homeowners from removing vegetation to create defensible space. According to Colorado law, an HOA cannot prohibit homeowners from removing vegetation for fire mitigation purposes. However, homeowners are still required to submit their mitigation plans for HOA approval.¹⁵

Some county HOAs in WUI areas originally required wood shake roofs. Since then, El Paso County¹⁶ building regulations require the use of Class A

¹³ Jack D. Cohen, *Reducing the Wildland Fire Threat to Homes: Where and How Much?* (USDA Forest Service Gen.Tech.Rep. PSW-GTR-173. 1999)

¹⁴ *Woody Biomass*, 23 March 2011

<<http://www.csu.org/residential/environment/renewable/biomass/item5143.html>>

¹⁵ Colo. Rev. Stat. § 38-33.3-106.5 (Mitchie 2011)

¹⁶ *El Paso County Land Development Code: 6.3.3 Fire Protection and Wildfire Mitigation*, 25 October 2010

<http://adm.elpasoco.com/Development%20Services/Documents/Land%20Development%20Code/ldc_chapter_6.pdf>

roofing materials when wood shake roofs are replaced on homes in the WUI. Colorado law also prohibits an HOA from requiring the use of cedar shakes or other flammable roofing materials.¹⁷ However, the process of replacing these roofs is slow and gradual, and these roofs will exist for many more years.

Fuel hazards in El Paso County

Why structures burn

In the context of a CWPP, a fuel is a hazard if it can ignite a structure. A burning structure, in turn, can create a hazard to other structures. According to wildfire researcher Jack Cohen, there are three principal ways that wildfires cause structural ignitions:¹⁸

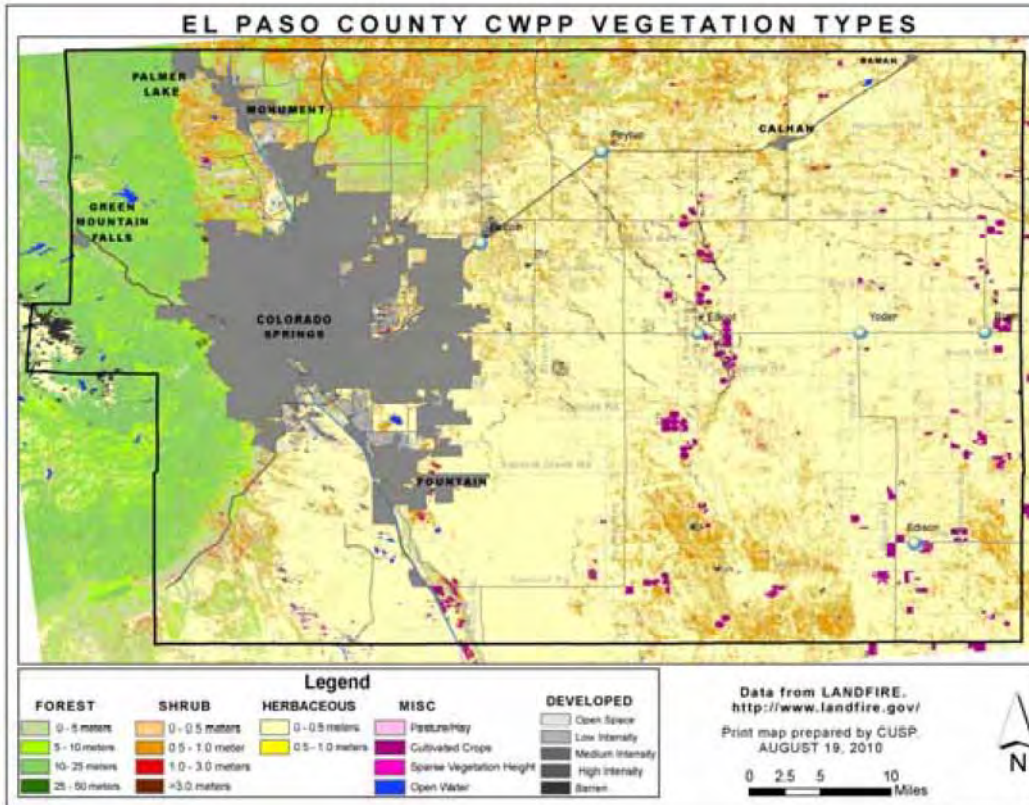
- **Flame impingement** means that flame has contacted the structure long enough to ignite it. This can range from small flames creeping through ground fuels, to large plumes of flame from nearby trees.
- **Firebrands (falling embers)** can blow through heat-broken windows, accumulate on dry decks or wood shake roofs, or be blown into stacks of firewood or piles of yard debris that are close to the structure. These small embers can gradually transfer enough heat to create small spot fires that may grow to destroy a home long after the main flame front has passed. Even a low-intensity fire can generate enough small embers to pose a risk to unprepared homes.
- **Radiant heat** from nearby fuels can ignite the outside of a structure, or break window glass to allow firebrands to enter. The effect of radiant heat on a structure depends on a variety of factors, including the intensity of the heat, the amount of the structure exposed to the heat, and the length of time the structure is exposed to the heat.

Two types of fuel hazards: Grasslands and Forest

As you can see in the *El Paso County CWPP Vegetation Types* map, the County's fuel types follow its topography: In the eastern half, with its relatively flat terrain, herbaceous vegetation (mostly grasses) and shrubs predominate. In the western portion, where foothills rise steeply to the Rampart Range, thick coniferous forests, often mixed with Gambel oak (*Quercus gambelii*), are typical.

¹⁷ Colo. Rev. Stat. § 38-33.3-106.5 (Mitchie 2011)

¹⁸ Cohen, J. D. and Butler, B. W., *Modeling Potential Structure Ignitions from Flame Radiation Exposure*, 1 January 2011 <http://www.firewise.org/resources/wui_hir.htm>



Both of these fuel types carry wildfire, but they do so in different ways and with different intensities. Both types pose risks to structures, residents and firefighters, but for different reasons.

Fire behavior in grasslands

Firefighters describe grasses and small shrubs as “light, flashy fuels.” Fires in these fuels can ignite explosively, and travel quickly, especially when driven by wind. When the wind changes direction, a grass fire will also change course suddenly, potentially putting firefighters and the public at risk. The high speed of wind-driven grass fires often leaves little or no time for public warning or orderly evacuation.

Grassland fires threaten homes from direct flame impingement on the home itself, or by igniting flammable items near or attached to the home. For example, fire will first ignite a fence, deck, trash pile, or stack of firewood, and those things will then ignite the home. Grass fires rarely generate enough heat for long enough to directly ignite structures through radiant heat alone.

Grass fires can also create embers that can roll along the ground with the wind, or be thrown into the air. During the Cross Plains fire in North Texas,¹⁹ many homes burned when embers from grass and shrubs fell onto wood decks, or entered unscreened vents in attics, eaves, or soffits. The vegetation of Cross

¹⁹Rich Gray, et. al., *Cross Plains, Texas Wildland Fire Case Study* (Texas Forest Service – Urban Wildland Interface Division, 2007)

Plains, Texas – fine grasses with shrubs – is similar to many areas of eastern El Paso County.

On the positive side, the low fuel density of grass and low shrubs supports short-duration fires that pass quickly. This type of fire generates relatively low levels of heat, and does not damage the organic material in topsoil.

Fire behavior in forests

Fires in heavy timber typically do not move and change direction as quickly as wind-driven grass fires, though under the right conditions they can move at great speed. During the peak of the 2002 Hayman Fire, the running crown fire traveled approximately one-half mile in four minutes, or more than seven miles per hour.²⁰ Thus, even though timber wildfires usually do not travel as quickly as grassland fires, a wind-driven crown fire can still travel quickly enough to make public notification and evacuation difficult.

These dense fuel loads also support long-lasting fires that can create intense levels of radiant heat for long periods of time, and often generate heavy loads of large firebrands that can be thrown far ahead of the flame front.

The dense forests of the western County provide the heavy fuel loads that can sustain these intense fires. Thousands of homes are located in these forests, often on steep slopes, accessed by narrow roads.

High-severity wildfires also represent one of the greatest potential threats to site productivity, soil resources, and aquatic ecosystems in the Colorado Front Range.²¹ The intense heat of a high-severity wildfire in timber can burn hot enough to consume all organic matter in the upper soil layer. Heavily-burned soils repel water, which not only interferes with germination of new vegetation, but also significantly increases runoff after rains.²² In the first few years after a severe fire, this increased runoff and erosion can create flooding hazards and ecological damage in areas downstream of heavily-burned areas.

²⁰ Patricia Baxter and Cynthia Sirochman, *Pre-Disaster Mitigation (PDM) Plan for El Paso County* (El Paso County Office of Emergency Management, 2006) 48.

²¹ Jan E. Cipra, Eugene F. Kelly, Lee MacDonald, and John Norman, *Hayman Fire Case Study, Part 3: Soil Properties, Erosion, and Implications for Rehabilitation and Aquatic Ecosystems* (USDA Forest Service Gen. Tech. Rep. RMRS-GTR-114. 2003)

²² Jeffrey Kershner, Lee MacDonald, Lynn Decker, David Winters, Zamir Libohova, *Hayman Fire Case Study, Part 6: Fire-Induced Changes in Aquatic Ecosystems* (USDA Forest Service, 2003)

Fire in El Paso County

Fire history

It is difficult to quantify the fire history of El Paso County, because responsibility for wildfire suppression and documentation is divided among many different jurisdictions. Most fires are small local incidents that a local jurisdiction usually manages with its own resources, and occasional help from its closest mutual aid partners. There is no central repository that collects data about all wildfires in the County.

The *Recorded Wildfires in El Paso County* table combines incident data recorded by the El Paso County Sheriff's Office Wildland Fire Crew, and researched by the Colorado Springs Office of Emergency Management.

Recorded wildfires in El Paso County		
Date	Name and description	Estimated acreage
1854	The Big Burn ²³ <i>Began on Cheyenne Mountain, and eventually extended to Wilkerson Pass.</i>	
1890	Cheyenne Mountain Burn ²²	
Jan. 1950	Camp Carson/Cheyenne Mountain Fire ²² <i>Nine fatalities, including a 14-year-old volunteer firefighter.</i>	
4/18/2000	Fort Carson ²²	800
8/15/2000	[no name or location] ²²	2,500
4/15/2002	Milne ²⁴	[>5,000] ²⁵
4/17/2002	Hanover 2 ²³	[1,000-4,999]
4/28/2002	Pine Glen ²²	64
4/30/2002	Hanover 1 ²³	[>5,000]
5/1/2002	North Pole ²³	[10-99]
5/5/2002	Spatz ²³	[10-99]
5/31/2002	near Fountain ²²	4,500
8/3/2003	Ute Trail ²²	4
11/8/2005	Sand Canyon ²³	900
9/28/2007	Manitou Incline ²²	30
3/20/2008	Squirrel Creek Road ²³	[<10]
3/21/2008	Highway 86 & 77 ²³	[100-299]
3/27/2008	Las Vegas & I-25 ²³	[<10]
4/14/2008	TA-25 (Fort Carson) ²³ <i>One firefighter fatality: Gert Marais, BLM pilot</i>	9,800 ²⁶
5/10/2008	Page Road ²³	[>5,000]
6/2/2008	Range 145 Complex (Fort Carson) ²³	600
6/6/2008	NORAD ²³	5.3
8/1/2008	Ellicott ²⁷	~8,000
1/21/2009	Orchard Canyon ²³	175
3/3/2009	Quarry ²³	6,500
12/1/2010	Range 143 (Fort Carson) ²³	111

²³ *Pre-Disaster Mitigation Plan Update*, (Colorado Springs Office of Emergency Management, 2010)

²⁴ Incident Qualification System database report, El Paso County Sheriff's Office Wildland Fire Crew, accessed 2/16/2011

²⁵ Acreage estimates in brackets indicate that an exact acreage was not available. Bracketed acreage ranges correspond to the fire's size code, recorded in the Incident Qualification System database.

²⁶ Acreage from National Transportation Safety Board, Factual Report Aviation
<<http://www.nts.gov/nts/GenPDF.asp?id=DEN08GA076&rpt=fa>> 29 March 2011

²⁷ *El Paso County Fire Destroys Three Homes*, 25 October 2010,
<<http://www.thedenverchannel.com/news/17066840/detail.html>>

But it is safe to say that any vegetation in El Paso County has probably burned, and will eventually do so again. Many local vegetation species, particularly Ponderosa pine and aspen, are so well adapted to fire that it is necessary to forest health.²⁸

The return interval of wildfire depends on many factors.²⁹ Before the early twentieth century, Ponderosa pine forests were typically burned by frequent, low-intensity ground fires every five to thirty years. These fires maintained the Ponderosa forests as open pine savannahs. Today's dense Ponderosa stands have developed only after fire suppression became standard practice.

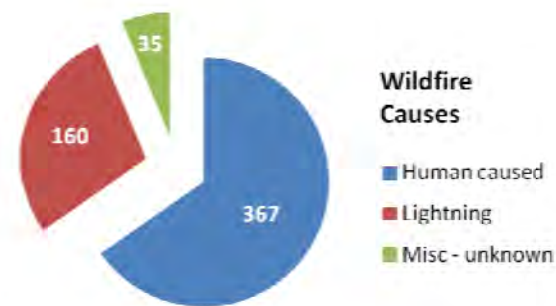
The high fuel density of these forests supports fires that are hotter and more extreme than the ground fires that these species evolved to survive. As a result, a high-intensity crown fire in a Ponderosa pine forest may eliminate entire stands, reducing the chance of a similar fire for many years.³⁰

Higher elevation forests, such as lodgepole pine and spruce, have a longer fire return interval, often as much as 300 years. Infrequent fires are more intense, and usually eliminate forest stands over a large area.

One analysis of available local data on significant wildfires estimates the probability of a significant wildfire occurring in any given year is 27%, or once every 3.5 years.³¹ Smaller fires, in lighter fuels, occur many times per year.

Fire season

The local fire season generally runs from spring through autumn. However, wildfires can and do occur during winter months, especially during mild, dry winters. Even during winters with normal precipitation, Chinook winds can reduce snow cover, dry fuels and create high fire danger.



Fire causes

The Wildfire Causes diagram summarizes thirty years of data from the USDA Forest Service, Pikes Peak Ranger District,³² demonstrating that people cause 57% of wildland fires. Thus, it is expected that areas of higher wildfire risk coincide with areas of higher population.

²⁸ Stephen A. Fitzgerald, *Fire Ecology of Ponderosa Pine and the Rebuilding of Fire-Resilient Ponderosa Pine Ecosystems* (USDA Forest Service, 2005)

²⁹ What is fire ecology? <http://www.rockymountainwildlandfire.info/articles/fire_ecology.pdf>

³⁰ Erik Martinson, Phillip N. Omi, Wayne Shepperd, *Effects of Fuel Treatments on Fire Severity*. Hayman Fire Case Study (USDA Forest Service, 2003)

³¹ *Pre-Disaster Mitigation Plan Update*, (Colorado Springs Office of Emergency Management, 2010)

³² Brent Botts, District Ranger, USDA Forest Service Pikes Peak District, email communication, August 2010.

Definition of wildland-urban interface (WUI)

When asked to describe the wildland-urban interface, most people tend to describe neighborhoods nestled in dense timber or heavy brush, “where the leaves meet the eaves.” In El Paso County, this description is certainly true.

That doesn’t mean that grassland fires are not a concern. Burning grass produces less overall heat than burning timber, but it can ignite unprepared structures. In August 2008, a wind-driven grass fire near Ellicott burned approximately 13 square miles in one afternoon, destroying three occupied homes, along with four unoccupied houses and ten outbuildings.³³

If both of these perspectives are true, then how should we define the wildland-urban interface of El Paso County?

In the term “Community Wildfire Protection Plan,” the key word is *community*. A CWPP is created by a community, and is intended to identify areas in which organized community action is required to protect community values.

In areas where people settle in areas of continuous dense timbered fuels, effective wildfire mitigation often requires significant reduction of fuels over a broad area. Those large-scale projects require cooperative action among groups of neighbors, and sometimes between neighborhoods and government.

In contrast, many homes in grassland areas can be protected by individual protective measures such as mowing, firebreaks, and structural features. Less organized community action is needed to increase the safety of these homes. However, this plan respects the fact that grassland wildfires pose great risks to unprepared homes, and will discuss the actions that individual homeowners can take to reduce the ignitability of structures in the grassland.

WUI = High fuel hazard + structures

Traditional small-area CWPPs typically define wildland-urban interface by outlining a community with a boundary that includes a generous buffer zone. That approach didn’t make sense for a broad foundation plan such as this one, so the steering team stepped back to consider the fundamental purpose of a CWPP.

A CWPP is concerned about the effect of wildfire on the things that a community values. Next to life itself, people value the things they have worked and invested to build: homes and workplaces, schools and community buildings, and shared infrastructure.

Thus, the WUI is a place where human values need protection from wildfire. If people live in a place with little to no fire risk, that place is not WUI. Likewise, if a place has a high fire risk, but no structures, that’s also not WUI.

In this spirit, this plan defines the wildland-urban interface of El Paso County as the areas of high fuel hazard that include human-built structures. To create a map of the County’s WUI, we used geographic information systems to

³³ *El Paso County Fire Destroys Three Homes*, 25 October 2010, <<http://www.thedenverchannel.com/news/17066840/detail.html>>

combine data layers that describe fire risk with those that show residential and commercial land development.

Where are the highest fuel hazards?

To define areas of high fuel hazard, we used data from the Colorado State Forest Service's Wildland Fire Susceptibility Index (WFSI), which was produced as part of its 2008 Colorado Wildfire Risk Assessment. The WFSI is a measure of wildfire threat that represents the probability that a wildfire will occur³⁴ at a given location.

The WFSI model combines the following datasets to derive wildfire threat:

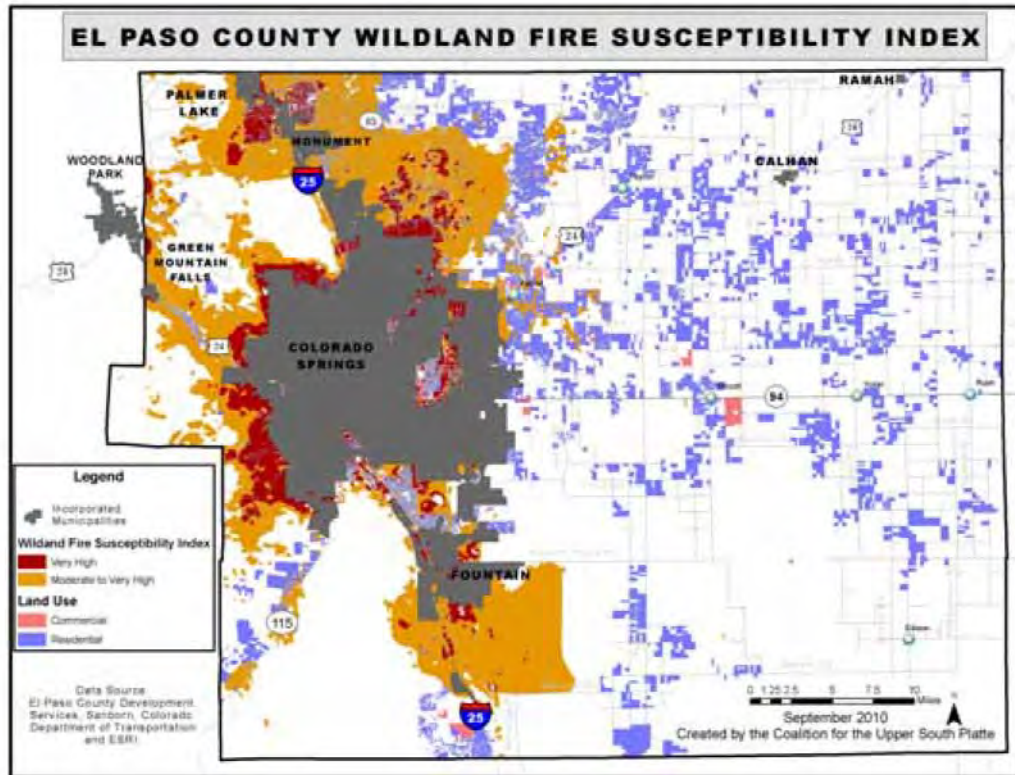
- Landscape characteristics, such as surface fuels, canopy characteristics and topography
- Historical weather observations
- Historical fire ignition locations
- Historical fire report data that reflects suppression effectiveness

The map *El Paso County Wildland Fire Susceptibility Index* shows areas in which the WFSI was rated at Moderate, High, or Very High. These ratings confirm that the County's greatest fuel hazards occur in areas of timber and heavy brush, typically on the east-facing slopes of the mountains, the Palmer Divide, and the Fountain Valley.

Where are the structures?

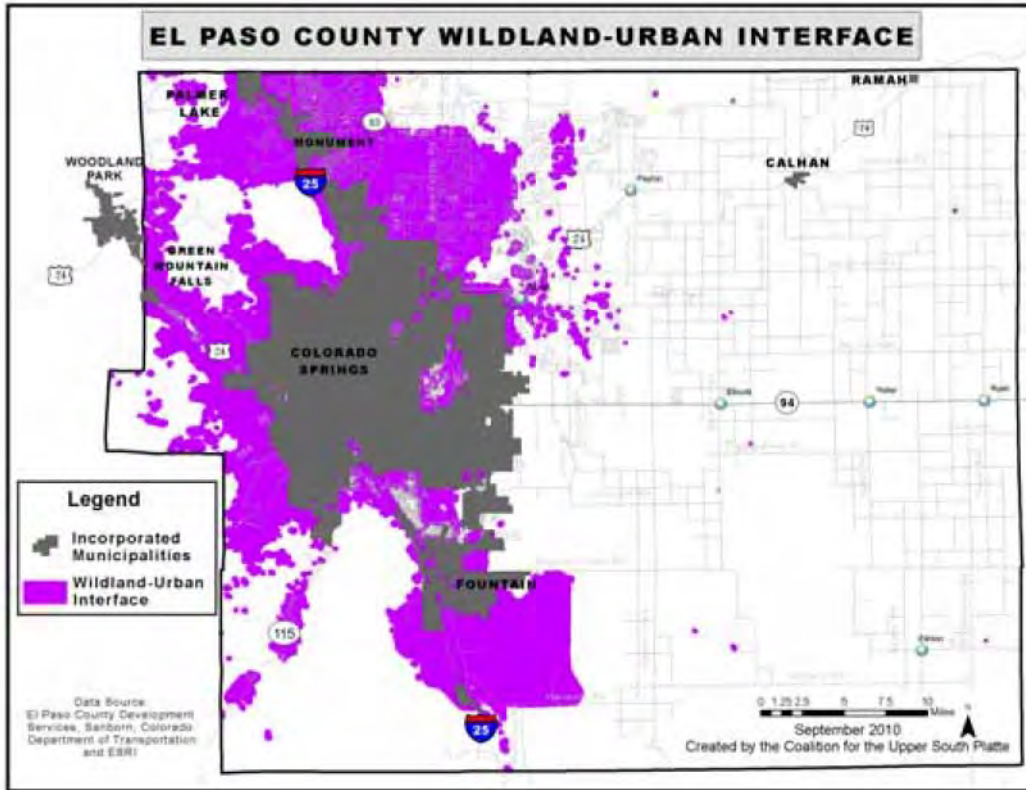
This map also shows land parcels that are currently used for either residential or commercial purposes. We judged that these land uses were most likely to be associated with human-built structures.

³⁴ Joe Duda, Skip Edel, et. al., *Colorado Statewide Forest Resource Assessment: Appendix B. Data Sources and Methods*
<<http://csfs.colostate.edu/pages/statewide-forest-assessment.html>>



The Wildland-Urban Interface Map

To create the *El Paso County Wildland-Urban Interface* map, the commercial and residential land use layer was combined with areas with a WFSI of Moderate or higher. A 100-foot buffer was then added around the resulting combination.



Because population tends to cluster in the more wooded western areas of the county, the WUI in this map coincides with the Moderate, High, or Very High areas of the WFSI map. While the overall potential for wildfire is relatively lower in areas rated Moderate, a fire that does occur there could threaten a large number of structures.

Community values to be protected

Lives and livelihoods

The planners assumed that lives and homes are people's highest values. Citizen surveys asked people to identify other values that they wanted to protect.

Locally important structures

Through surveys, and in community meetings, citizens indicated their concern for the following types of structures:

- Schools and day care centers
- Public buildings (police or fire stations, town halls)
- Historical sites
- Community gathering places (churches, cafes, meeting halls)
- Medical facilities

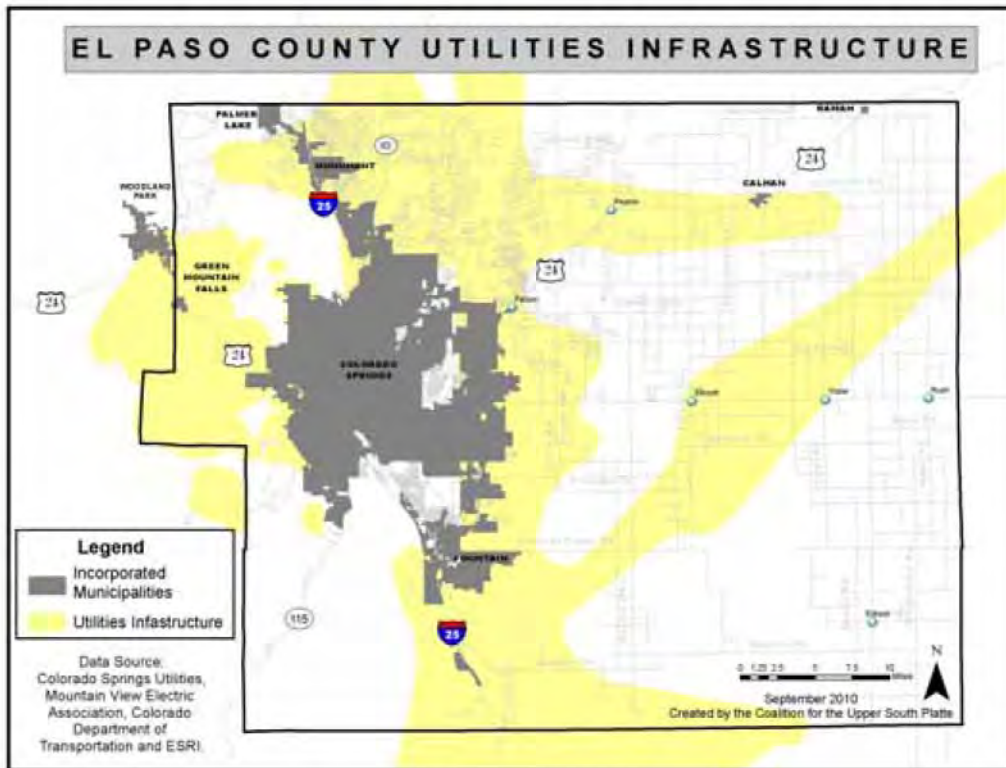
Protecting these individual sites will require local action that should be addressed in local CWPPs.

Infrastructure and lifelines

Citizens also want to protect elements of community infrastructure – those structures and systems that provide essential functions such as water, electricity, or communication.

El Paso County's wildland urban interface is mostly residential. All of the County's major medical facilities, the commercial airport, and most governmental facilities are located in municipal areas. However, the unincorporated wildland urban interface does contain some important critical infrastructure and community lifelines:

- **Electrical distribution facilities** are most vulnerable in local neighborhoods, where power lines are often hung at treetop height and supported by wooden poles.



The *El Paso County Utilities Infrastructure* map indicates areas that contain significant utilities infrastructure. This map intentionally omits details, to respect the security concerns of participating utilities.

As the *El Paso County Utilities Infrastructure* map shows, utilities infrastructure goes where the people are, and typically follows major roadways. However, some inter-regional systems follow separate corridors apart from the highway system.

- **Communication**, such as telephone cabling, is often installed on the same poles as electrical distribution wiring. Wireless communication (telephone, radio, and TV) relies on antenna towers, often located on high points that wildfire naturally seeks.
- **Watersheds and water distribution systems** are threatened by the flooding that commonly follows large fires. After large areas of vegetation have burned away, rain that would have been taken up by plants instead runs off, causing severe erosion. This runoff can be particularly heavy after high-severity fires that consume all organic material in the soil, and create a hydrophobic layer several inches below the soil surface.³⁵ Large amounts of ash, topsoil and debris can wash into streams, and clog reservoirs, pipelines, or treatment facilities, requiring costly rehabilitation and ongoing

³⁵ Jan Cipra, et. al., *Hayman Fire Case Study: Soil Properties, Erosion, and Implications for Rehabilitation and Aquatic Ecosystems* (USDA Forest Service, 2003) 206-207.

maintenance of these systems.³⁶ Water delivery systems that rely on surface water sources are most vulnerable to wildfire damage. According to Colorado Springs Utilities, “Catastrophic wildfire poses one of the greatest threats to water quality and collection system infrastructure.”³⁷

- **Roads and highways** provide evacuation routes for citizens leaving a wildfire-threatened area, and access for first responders attempting to enter. During a wildfire, transportation can be interrupted by smoke, flame from closely encroaching fuels, or falling debris. After a fire, mud and debris runoff can block roads, and flash flooding can wash out bridges and paving. However, when rights-of-way are kept clear of heavy vegetation, roads can serve as fire breaks that reduce the risk of wildfire spread, and as anchor points for firefighting operations.

Natural values

Citizens also expressed concern for natural amenities: parks, forests, and wildlife habitat.

County parks

The El Paso County Parks Department currently owns or manages more than 7,000 acres of park land³⁸, 85 miles of trail, and approximately 1,700 acres of conservation easements.

Most of the parks managed by the Parks Department are regional parks³⁹ that are typically 400 acres or larger. Regional parks are predominantly natural in character, but small portions of each park (usually around 20%) are developed with facilities for active recreation such as playfields, playgrounds, picnic shelters and asphalt play areas.

In 2010 the County began developing two Forestry Management Plans, for Black Forest Regional Park and the Pineries Open Space.⁴⁰

The Department also manages neighborhood parks, trails, recreational areas, and the County Fair and Event Complex in Calhan. The neighborhood parks were acquired before the county limited its role to the provision of larger, regional parks and trails.

Cheyenne Mountain State Park

Cheyenne Mountain State Park adjoins the southern edge of Colorado Springs, the Cheyenne Mountain Air Force Station, and the Southwestern Hwy. 115 Fire Protection District. Located on the southeastern aspect of its namesake mountain, the park consists of 1,680 acres of foothills and steep terrain that is available for public use. Another 1,021 acres, on the mountain’s flanks and top,

³⁶ Dennis Le Master, Guofan Shao, Jacob Donnay, *Protecting Front Range Forest Watersheds from High-Severity Wildfires* (Front Range Fuels Treatment Partnership, 2007)

³⁷ Naomi J. Marcus, *Pikes Peak Watershed Forest Management Plan* (Colorado State Forest Service, 2010) 21.

³⁸ Parks, 5 November <<http://adm.elpasoco.com/Parks/Pages/default.aspx>>

³⁹ *El Paso County Parks and Leisure Services Department Master Plan*, September 2005

⁴⁰ Jerry Westling, El Paso County Parks Manager, E-mail communication, 19 August, 2010

was recently added to the park, and the public use of that land is in the planning stages. Both the main park and the expansion land have written fire mitigation plans.⁴¹

Wildlife habitats

Several areas of the County are owned by the State Land Board, and managed as natural areas or wildlife preserves by The Nature Conservancy.

- **Aiken Canyon Preserve**⁴², located about 16 miles south of Colorado Springs off Colorado Hwy. 115, includes the largest intact foothills ecosystem known from the Front Range. The 1,621-acre area contains one woodland and two foothills shrubland plant communities of special concern.
- **Chico Basin Ranch**⁴³ is a working cattle ranch that derives its income from grazing and running cattle.
- **Bohart Ranch**⁴⁴ is a large, unfragmented example of high-quality sandsage prairie. Like Chico Basin, Bohart is a working cattle ranch. The Nature Conservancy and the ranch manager jointly maintain the ranch's prairie ecosystem and manage its agricultural activities.
- **Hurricane Canyon** is a 520-acre site on the slopes of Pikes Peak. It includes two canyons, cut by the North and South Forks of French Creek.⁴⁵

Due to its great diversity of elevation, vegetation and climate, El Paso County is home to many animal and plant species that are listed as Threatened or Endangered under the Endangered Species Act of 1973, as amended. Among them are the following:

- Arkansas darter (*Etheostoma cragini*) - Candidate
- Greenback cutthroat trout (*Oncorhynchus clarki stomias*) - Threatened
- Gunnison's prairie dog (*Cynomys gunnisoni*) - Candidate
- Mexican spotted owl (*Strix occidentalis lucida*) - Threatened
- Preble's meadow jumping mouse (*Zapus hudsonius preblei*) - Threatened
- Ute ladies' tresses orchid (*Spiranthes diluvialis*) - Threatened

A map that shows individual wildlife habitats would be too detailed for this high-level plan. Important habitat areas occur across the county and may overlap each other. Thus, the *El Paso County Threatened and Endangered Species map*⁴⁶ has

⁴¹ Dave Root, CSFS Assistant District Forester, written comments, 23 March 2011.

⁴² *Aiken Canyon*, 5 November 2010

<<http://parks.state.co.us/NaturalResources/CNAP/NaturalAreasInfo/AlphabeticalListing/Pages/AikenCanyon.aspx>>

⁴³ *Welcome to the Chico Basin Ranch*, 20 Aug. 2010 <<http://www.chicobasinranch.com/index.cfm?id=67c8f9db-d1c8-4c6b-8562e3094336bbd0>>

⁴⁴ *Bohart Ranch: Where Cattle Ranching and Conservation Meet*, 20 Aug. 2010

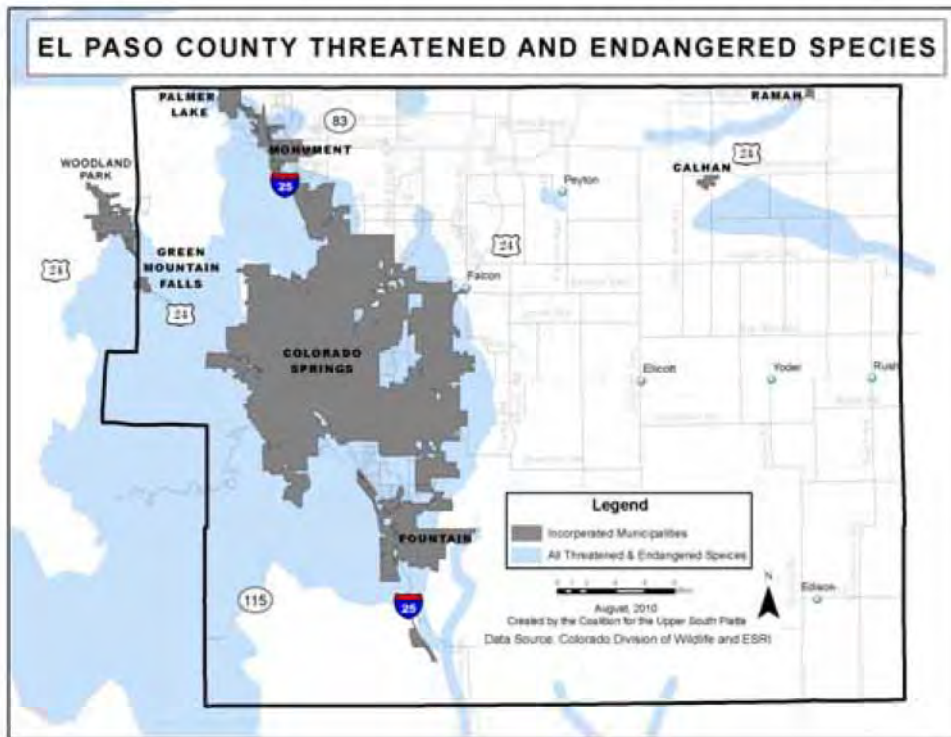
<<http://www.nature.org/wherewework/northamerica/states/colorado/preserves/art519.html>>

⁴⁵ *Hurricane Canyon*, 5 November 2010

<<http://parks.state.co.us/NaturalResources/CNAP/NaturalAreasInfo/AlphabeticalListing/Pages/HurricaneCanyon.aspx>>

⁴⁶ *El Paso County Threatened and Endangered Species*, Leslie Ellwood, Wildlife Biologist. US Fish and Wildlife Service, Ecological Services, Colorado Field Office. 2011

combined the actual or probable habitats of all of these species into a single area of concern. Much of this combined wildlife habitat area overlaps the County's wildland-urban interface, so wildfire mitigation projects must keep wildlife habitat in mind.



Mitigation projects are not necessarily prohibited in wildlife habitat areas. Some areas may be adversely affected by human activity, while other areas and associated species would benefit from fuel modification activities. However, if a mitigation project is proposed in or near an important habitat, the U.S. Fish and Wildlife Service should be consulted.

Wilderness

As of 2011, there are no wilderness areas designated in El Paso County. However the Beaver Creek Wilderness Study Area, on the south slope of Pikes Peak, is under study as a proposed wilderness area. The Study Area consists of 26,150 acres of public land in El Paso, Fremont, and Teller Counties, in granite canyons that are valued as wildlife and fish habitat. A 13,734 acre portion of the WSA is within an Area of Critical Environmental Concern (ACEC).⁴⁷

⁴⁷ Bureau of Land Management: Wilderness, 21 Sept. 2010
<<http://www.blm.gov/co/st/en/fo/rgfo/wilderness.html>>

Recommended methods to reduce structural ignitability

For purposes of this plan, zones one and two surrounding each home in the wildland-urban interface will be considered a polygon that is a high priority area for homeowner mitigation.

To reduce the chance that a structure will burn, two interrelated actions are recommended:

- Reducing or removing vegetation around the structure, to reduce both the radiant heat from burning vegetation, and the chance of direct flame contact to the structure.
- Reducing the flammability of the structure itself, by using fire-resistant building techniques and materials that reduce the chance of ignition from wind-borne embers.

Thinning to create survivable (defensible) space

Survivable space in timbered areas

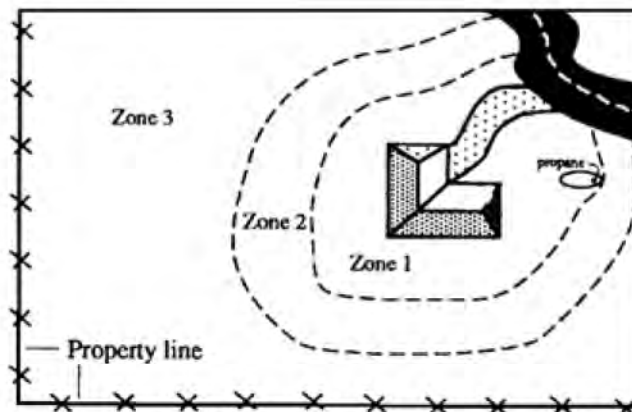
Survivable space (often called defensible space) is a series of reduced-fuels zones designed to protect structures from the heat of wildfires. This space can be natural or human-made. As fire advances through a survivable space toward a structure, the gradual reduction of fuel load causes a corresponding reduction in the speed and intensity of the fire.

According to *Creating Wildfire-Defensible Zones*,⁴⁸ a well-designed survivable space consists of three concentric zones:

Zone One is the space that immediately surrounds a structure; it extends 15 feet from the outermost edge of a structure, including any decks. The goal is to reduce or eliminate most large trees or shrubs within this zone, so that they cannot produce intense flames and heat capable of igniting the structure. A

few tall trees may be left in zone one if the lowest branches are pruned so that they are well above a fire resistant roof.

Zone Two surrounds Zone One. The width of Zone Two depends on the slope angle around the house, particularly on the side that slopes downhill. On the



⁴⁸ F.C. Dennis, *Creating Wildfire-Defensible Zones - no. 6.302*, Colorado State University Cooperative Extension, May 2003; reviewed January 2006.

downhill side of the house, if the average slope angle is less than 5%, Zone Two extends out 55 feet from the outer edge of Zone One. If the slope is more than 5%, Zone Two extends 85 feet from the outer edge of Zone One on the downhill side of the house. On all other sides of the house, the width of Zone Two is 55 feet from the outer edge of Zone One.

The main fuels reduction guideline for Zone Two is to thin the trees so that there is an average of ten feet of space between all tree crowns. All ladder fuels under trees should be removed. The branches of dominant trees should be pruned to a height of 8 feet above ground; small trees should have at least two-thirds of the green needles remaining.

Zone 3 is an area of traditional forest management and is of no particular size. It extends from the edge of the survivable space to the property boundaries.

Survivable space in grassland areas

Survivable space in grassland areas follows the same principles that apply to timbered areas. Homeowners should first remove all flammable vegetation within fifteen feet of the structure.⁴⁹ The survivable space should then be extended outward to a minimum of 70 feet around the home (on flat sites), by mowing grasses to a height of six inches⁵⁰ or less, thinning trees and brush, and removing dead vegetation.

Fire-resistant building practices

The survivability of a structure can be improved through the use of fire-resistant building materials, or by design features that limit the ability of embers to accumulate. Even existing structures can become more survivable when homeowners consider fire protection when upgrading a home or doing routine maintenance:

- When a combustible roof is ready for replacement, choose a non-combustible covering such as metal or tile.
- Cover all open vents with metal window screening, to prevent embers from entering the structure.
- Enclose soffits with solid coverings, to prevent hot gases from rising into the roof structure.
- Replace single-pane windows with double-pane windows.

The specific choice of building materials or design features depends on the vegetation and terrain surrounding the structure. The booklet *Firewise Construction: Design and Materials*⁵¹ offers a wealth of detail to guide homeowners.

⁴⁹ *Are You Plains Firewise? Notebook* < http://csfs.colostate.edu/pdfs/plains_FW.pdf > 4 March, 2011

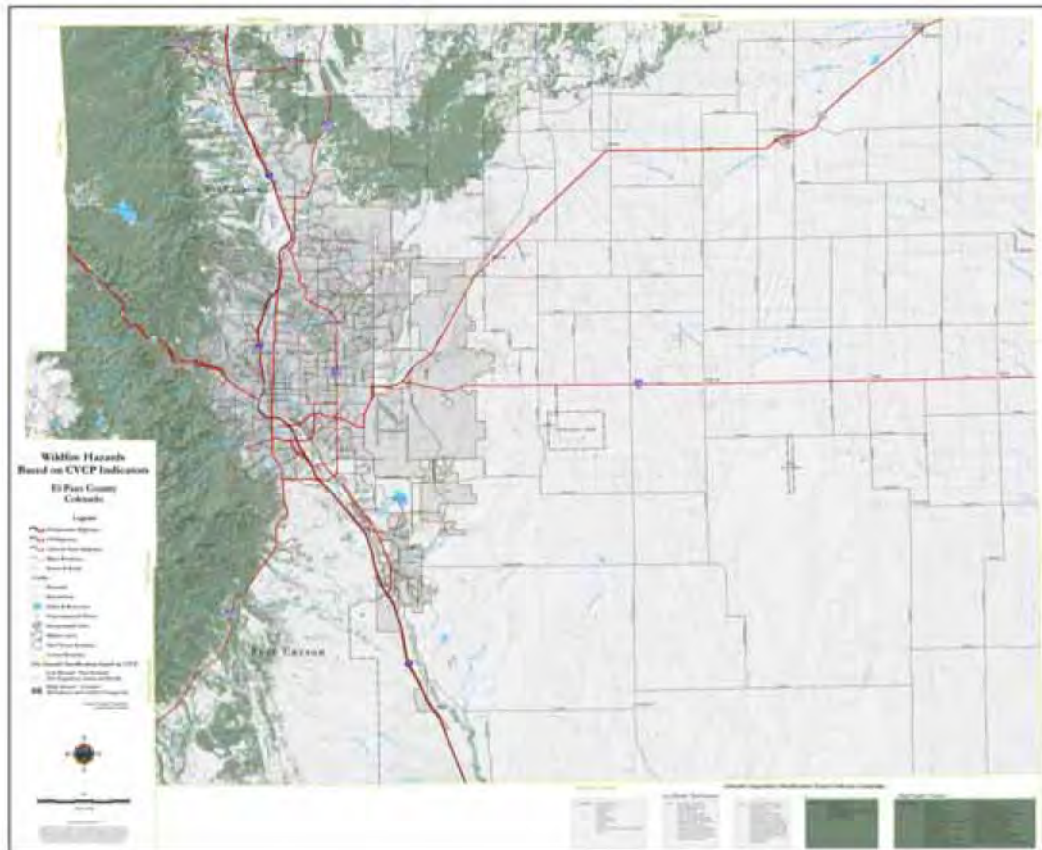
⁵⁰ F.C. Dennis, *Creating Wildfire-Defensible Zones - no. 6.302*, Colorado State University Cooperative Extension, May 2003; reviewed January 2006.

⁵¹ Peter Slack, *Firewise Construction: Design and Materials*, Colorado State Forest Service, 2000

What El Paso County government is already doing

Regulation of new development

The *El Paso County Land Development Code*⁵² regulates new development in unincorporated areas that are forested, or have been otherwise identified as being at risk of wildland fire, according to the Colorado Vegetation Classification Project.⁵³ The County maintains a map to identify the forested areas where the wildland fire standards of the Code apply. This map, *Wildfire Hazards Based on CVCP Indicators*,⁵⁴ appears below.



Before a permit is issued for building in these areas, a builder must commit to take actions to reduce the ignitability of new structures, and to support wildfire suppression activities. Examples of these actions include, but are not limited to:

- Provision of adequate routes for ingress, egress, and evacuation

⁵² *El Paso County Land Development Code, Chapter 6, Section 3.3: Fire Protection and Wildfire Mitigation*, 1 January 2011

<http://adm.elpasoco.com/Development%20Services/Documents/Land%20Development%20Code/lde_chapter_6.pdf> 6-68

⁵³ *Colorado Vegetation Classification Project*, 23 March, 2011 <<http://ndis.nrel.colostate.edu/coveg/>>

⁵⁴ *Wildfire Hazards Based on CVCP Indicators*, 2 February, 2011

<<http://adm.elpasoco.com/Development%20Services/Documents/FireHazards.pdf>>

- Wildland fuels modification
- Provision of water supplies for firefighting
- Wildfire-resistant building design and construction
- Location of structures relative to wildland fuels and terrain

Developers are also required to have new projects approved by the local fire department, which may impose local regulations that are more stringent than those in the Land Development Code.

Support of local mitigation and suppression

Recycling yard waste and tree slash

The El Paso County Environmental Services Department, through its Solid Waste Management Division, and Forestry and Noxious Weeds Division, encourages individual mitigation efforts by providing free disposal⁵⁵ of forest slash, tree trimmings and vegetative yard waste. These programs also reduce the volume of slash sent to local landfills.

- **The Black Forest Slash-Mulch Program**⁵⁶ is highly successful slash recycling site made possible by interagency cooperation and local support. The site itself is owned by the State Land Board, which leases the land to El Paso County at nominal cost. Volunteers manage the site and offer information about mitigation and forest health. County funds pay for a large grinder that converts the slash into mulch, which is then given away.
- **The Yard Waste Recycling Program** is a cooperative effort between the County and private enterprise. A landscape supply business provides a site for free disposal of tree slash and vegetative waste, which it then converts into mulch for sale and use in its landscape projects.

El Paso County Sheriff's Office - Deputy Fire Marshal's Office

According to Colorado statute⁵⁷, the El Paso County Sheriff's Office is responsible for wildfire suppression in unincorporated areas. To fulfill this mandate, the office of the Deputy Fire Marshal manages and supports the El Paso County Sheriff's Office Wildland Fire Crew, an all-volunteer organization.

The Deputy Fire Marshal's office also supports small rural fire departments by facilitating interagency cooperation through both formal agreements and informal interaction. Wildfire suppression training is offered to county fire departments by the Wildland Fire Crew.

⁵⁵ *Recycling Programs*, 1 January 2011

<<http://adm.elpasoco.com/Environmental%20Division/Recycling%20Information/Pages/default.aspx>>

⁵⁶ *Black Forest Slash Mulch Program*, 1 January 2011 <<http://www.bfslash.org/index.php>>

⁵⁷ Colo. Rev. Stat. § 30-10-512 (Mitchie 2010)

In the spirit of more effective wildfire suppression, the Deputy Fire Marshal's office also supports wildfire mitigation and prevention whenever possible. By seeking and administering grant funding, the office has launched and managed mitigation projects that exceed the resources of rural fire departments. In 2010, the office received grants to reduce fuels in the following areas:

- Evacuation routes in the Southwest Highway 115 Fire Protection District
- Black Forest Regional Park in the Black Forest Fire/Rescue Protection District
- Fox Run Regional Park in the Donald Wescott Fire Protection District
- Fountain Creek Regional Park, adjacent to the Security Fire Protection District and the community of Widefield



During 2011, the El Paso County Deputy Fire Marshal's Office trained and sponsored a team of AmeriCorps volunteers to reduce dense fuels in several county parks. The team received training in basic wildland firefighting, and were available to assist the El Paso County Sheriff's Office Wildland Fire Crew with initial attack.

Photo by Daniel Radocckia,
AmeriCorps National Civilian Community Corps (NCCC)

What the Forest Service is already doing

The USDA Forest Service, Pikes Peak District, performs approximately 2,000 acres of fuel mitigation projects annually, concentrating on wildland-urban interface areas.⁵⁸ Cooperation with fire education groups such as Pikes Peak Wildfire Prevention Partners (PPWPP), has resulted in mitigation projects around the Cheyenne Mountain Zoo, as well as other public areas in El Paso County.

What local communities are already doing

International Fire Codes

Some fire protection districts have adopted the *International Fire Code with Local Amendments*,⁵⁹ which requires certain building features and vegetation mitigation for new construction in wildland-urban interface areas defined by each local jurisdiction.

As explained in the Local Amendments, the regulations are "...consistent with nationally recognized good practice for the safeguarding of life and property within the designated urban-wildland interface area." They include

⁵⁸ Brent Botts, District Ranger, email communication, April 2011.

⁵⁹ *International Fire Code® Local Amendments: Falcon Fire Protection District; Tri-Lakes Monument Fire Rescue Authority; Black Forest Fire Rescue Protection District; Wescott Fire Protection District; Cimarron Hills Fire Protection District* (International Code Council, 2003) 50.

actions such as maintenance of defensible space, creation of adequate road access for fire apparatus, and installation of Class A roofing materials.

Public Education

As we have discussed, approximately 57% of all wildland fires are caused by human activity. Therefore, many fires could be prevented by education that changes human behaviors. Fire departments and local community groups are ideally positioned to educate their neighbors about wildfire prevention and safe outdoor fire use.

To support these efforts, high-quality educational materials are available for free download from the web sites of many organizations, such as the Colorado State Forest Service, the USDA Forest Service, the National Fire Administration, the National Wildfire Coordinating Group, and Firewise. This information can be directly delivered by firefighters and community leaders, or provided by linking to these sources from fire department web sites.

The nationwide Firewise program focuses on teaching homeowners how to build and landscape their homes to improve wildfire survivability. Firewise programs have been implemented in several fire protection districts and neighborhoods, to offer homeowner education and home risk assessments. Some programs also organize community mitigation projects, and encourage individual mitigation by providing neighborhood slash disposal.

At this writing, three neighborhoods in unincorporated El Paso County have been officially designated as Firewise Communities: Woodmoor, Ute Pass, and Wissler Ranch. Other small communities are working to earn this national recognition.

Colorado Springs development codes and mitigation programs

Much of the wildland-urban interface of the City of Colorado Springs consists of neighborhoods built in the steep mountain foothills of the city's west side. A line drawn on a map is all that separates these city neighborhoods from the rest of the Foothills Sub-Unit. So while Colorado Springs is not officially included in this CWPP, its mitigation actions in this area have important implications for adjacent unincorporated communities.

Colorado Springs requires new construction in its hillside neighborhoods to comply with its *Hillside Development Design Manual*. Along with best practices for safe and aesthetic development on steep terrain, the Manual mandates three types of actions to reduce wildfire risk: management of fuels and defensible space, fire detection and protection systems, and Class A roofing materials.⁶⁰

The Colorado Springs Fire Department's Wildfire Mitigation section works to build neighborhood awareness of wildfire risk, and guides individual neighborhoods through the process of organizing their own Firewise programs

⁶⁰ Paul Tice II, Brett Veltman, Bonnie Olson, Larry Larsen, *City of Colorado Springs Hillside Development Design Manual* (City of Colorado Springs, 1996) 42.

and mitigation projects. These activities also benefit the unincorporated County, as many residents of unincorporated areas are exposed to these messages and see these projects as they work and do business in Colorado Springs.

Military bases

El Paso County's five military installations encompass very large areas of both developed and undeveloped land. All of them have environmental management programs that align with the environmental stewardship priorities of the Department of Defense.

The U.S. Air Force Academy, located in the northern end of the Foothills Sub Unit, provides a good example of wildfire mitigation that both supports the installation's mission and benefits neighboring communities.

The Air Force Academy uses both prescribed burning and mechanical fuels reduction to improve wildlife habitat, reduce fuel loads, and to modify fuel models to reduce potential flame length and rates of flame spread. Gambel oak reduction along the Academy's northern and southern boundaries is also intended to hinder the spread of fire across the Academy grounds, and to reduce the chance of fire traveling between the Academy and nearby neighborhoods.⁶¹

Fort Carson, in the Southeast sub unit, maintains a fuel break along its perimeter, to reduce the chance that fire will extend across this boundary. The base also conducts an aggressive fuels reduction program to maintain vegetation health and reduce the danger of fire spread.

The base's rolling terrain and scrub vegetation, with few structures, allows more prescribed burning than is possible in other areas. The Fort Carson Fire Department often allows its mutual aid partners to participate in managing these prescribed burns, which improves interagency cooperation and provides valuable training opportunities to area firefighters.

⁶¹ U.S. Air Force Academy Natural Resources Department, U.S. Air Force Academy Fire and Emergency Services, USDA Forest Service, *Wildland Fire Management Plan for the U.S. Air Force Academy, Colorado* (U.S. Air Force Academy, 2008) 24.

Colorado Springs Utilities

Because of the large potential for a major fire to damage water resources, Colorado Springs Utilities conducts landscape-scale mitigation projects. When possible, these projects are designed to also improve the safety of nearby communities.



In the Ridge Road prescribed fire, October 2010, Colorado Springs Utilities reduced fuels on 114 acres on the slope of Pikes Peak, between North Catamount and South Catamount Reservoirs. Photo by Eric Howell, Colorado Springs Utilities

Until recently, most of these fuels-reduction projects used hand crews and mechanical techniques, but agency mitigation goals include the increased use of prescribed fire. In October 2010, Colorado Springs Utilities conducted a successful prescribed burn of 114 acres of the Pike National Forest on the North Slope of Pikes Peak.

Community preparedness to respond to wildfire

Jurisdictions that provide “full service” first response

Fire response in El Paso County is provided by a multi-layered patchwork of jurisdictions. A few areas of the county are not officially included in any of the following jurisdictions, while some areas are served by overlapping jurisdictions.

These “full-service” fire departments respond to both structure and wildland fires, provide emergency medical care, and offer rescue services and initial response to hazardous materials emergencies. They use a variety of staffing models: all-career, all-volunteer, or a combination of career and volunteer members.

Municipalities

All-career departments are typical in larger municipalities, while all-volunteer or combination departments (mix of volunteer and career staffing) are common in small towns and surrounding rural areas. For all-volunteer and combination fire departments, most of whose members work at day jobs, wildfire response time varies according to the day of the week and the time of day.

Fire Protection Districts

A fire protection district is a type of Colorado special district formed to provide firefighting, emergency medical services, ambulance services, rescue, or diving and grappling.⁶²

Most of the unincorporated area of El Paso County is served by 21 different fire protection districts (FPDs). Several of these FPDs extend past the border of El Paso County, to serve areas in two or more counties.

Most FPDs provide fire protection by operating their own fire departments. However, some FPDs provide all of their fire protection, or supplement their own fire department’s capacity, by contracting with a neighboring fire department to respond to emergencies within their jurisdictions.

Metropolitan Districts

Metropolitan districts are special districts that provide a wide range of community services, such as streets, drainage, water distribution, or fire protection. To provide fire protection, some metropolitan districts contract with neighboring fire departments, while others form and operate their own fire departments.

⁶² Colo. Rev. Stat. § 32-1-1002(1)(c) (Mitchie 2010)

Military installations

Each of the County's military installations is protected by its own all-career fire department. These military fire departments maintain strong mutual-aid relationships with their neighboring communities.

Specialized wildland fire teams

In addition to the full-service fire departments, some areas of the County are served by specialized wildland fire teams. Some of these teams respond to fires all over the County, while others concentrate on specific areas.

El Paso County Sheriff's Office Wildland Fire Crew

The El Paso County Sheriff's Office Wildland Fire Crew provides primary response to unincorporated areas that are not part of a fire protection district, all BLM and US Forest Service land within the County, and all State lands within the County. The Crew also helps County fire departments suppress fires in their jurisdictions, by providing firefighters and apparatus.

The Crew supports mitigation projects, such as neighborhood thinning and chipping programs, and prescribed burning operations.

Colorado Springs Utilities: Catamount Wildland Fire Team

As part of its mission to provide a dependable supply of clean drinking water to the City of Colorado Springs, Colorado Springs Utilities has gradually acquired large tracts of land on Pikes Peak⁶³. To protect its watersheds, CSU cross-trains some of its staff as a wildland fire team. The Catamount Team routinely responds to fires on CSU-owned lands, performs mitigation work, and manages prescribed fires in those areas.

Cheyenne Mountain State Park

This Colorado state park, in the southwestern foothills of the County, trains and equips its staff to respond to fires inside the park.

USDA Forest Service

Most of the County's mountainous western portion is part of the Pike National Forest. The Pikes Peak District is home to the Pike Hotshots and Pike Helitack, based near Monument, as well as two engines based in neighboring Teller County. Forest Service teams respond to any fire on National Forest lands, as well as fires within one mile of a National Forest boundary that might threaten National Forest lands.

The Forest Service also maintains multiple first response agreements with local jurisdictions, and participates in interagency training with fire protection districts. The Pueblo Interagency Dispatch Center coordinates air operations for all of southeastern Colorado, including El Paso County.

⁶³ Naomi J. Marcus, *Pikes Peak Watershed Forest Management Plan* (Colorado State Forest Service, 2010) 3.

Inter-jurisdictional cooperation

First responders and community leaders recognize that wildland fire does not respect jurisdictional boundaries, and that large fires can only be managed by pooling resources. As a result, El Paso County enjoys generally good cooperation among its many firefighting entities.

Standardized command and control

All County fire departments use the Incident Command System (ICS)⁶⁴ as a tool to manage interagency response operations. ICS clarifies roles and responsibilities in many common situations, such as when one fire department arrives first at a fire in a neighboring district, when one area belongs to two overlapping jurisdictions, or when an area is not part of any fire protection jurisdiction.

Shared radio communications

Most fire protection districts and municipal fire departments use a common digital radio system that allows them to directly communicate with each other, as well as with Sheriff's deputies or other first responders.

On an Incident Commander's request, the Sheriff's Office can provide enhanced radio communication support, additional command staff members, and a mobile command post for extended field operations.

Mutual and automatic aid

County fire departments have executed several agreements to provide mutual aid to each other upon request.⁶⁵ Groups of neighboring departments have also set up local automatic aid agreements, so that all departments in that group are dispatched to any fire in any of their jurisdictions.

The El Paso County Sheriff's Office participates in the *Annual Wildfire Operating Plan for El Paso County, Colorado*. The Plan, updated annually, describes how County agencies coordinate wildfire suppression activities with those of the Colorado State Forest Service, the Forest Service, and the Bureau of Land Management. It outlines rules and procedures for requesting mutual aid, ordering out-of-county resources, radio communications, and air operations.

An expanding hierarchy of resources

The responsibility for wildfire suppression initially rests with the jurisdiction where the wildfire starts.⁶⁶ The El Paso County Sheriff is responsible for suppression of wildfires that occur on unincorporated, non-federal land that is outside a fire protection district.

⁶⁴ < <http://www.fema.gov/emergency/nims/IncidentCommandSystem.shtm> >

⁶⁵ Civilian fire chiefs have signed the "Intergovernmental Memorandum of Understanding for Mutual Aid Between Fire Departments".

⁶⁶ Colo. Rev. Stat. § 29-22.5-103(1)(a)

If a wildland fire grows beyond a local fire protection district's ability to control, the Sheriff may appoint an incident management team to provide command and control over the fire response. At that point, the Sheriff also may assume financial responsibility for firefighting expenses, on behalf of El Paso County.⁶⁷

If the fire exceeds the County's capability to control, the Sheriff can request assistance from the Colorado State Forest Service, under the terms of the Emergency Fire Fund (EFF) Agreement.⁶⁸ When EFF is implemented, CSFS assumes responsibility and authority for all suppression activity until the fire has been controlled and management of the fire has been returned to the county.⁶⁹

County support to wildfire responses

El Paso County has a mature system for mobilizing County and community resources to support a wildfire response.

Public notification and warning

The Sheriff's Office has several methods to notify and warn people who are threatened by an approaching wildfire:

- Automated telephone notification
- Local news media announcements
- When possible, door-to-door warnings

Evacuation and sheltering

An Incident Commander may request evacuation of specified neighborhoods, or closure of certain roads; the actual evacuation is the responsibility of the Sheriff.

The El Paso County Emergency Operations Center coordinates evacuation and sheltering for displaced persons, as well as their service animals, pets, and livestock.

⁶⁷ Colo. Rev. Stat. § 29-22.5-103(2)(a)

⁶⁸ Colo. Rev. Stat. § 29-22.5-103(2)(c)

⁶⁹ Colorado State Forest Service; El Paso County Sheriff; Board of County Commissioners, El Paso County, Colorado; Forest Service, USDA; Bureau of Land Management, USDI, *Annual Wildfire Operating Plan for El Paso County, Colorado* (2011) 3 May, 2011<http://csfs.colostate.edu/pdfs/2011_El-Paso-County_AOP_Final.pdf> 20.

Implementation Priorities

This Community Wildfire Protection Plan is a broad overview of El Paso County's vulnerability to and preparedness for wildfire, and is not appropriate for specific project planning. Even large "landscape scale" projects only make sense when viewed at close range, in the context of a fire protection district, a community, or a town.

The priorities listed below are, as a result, general recommendations for ways that El Paso County can help its residents to understand and reduce the risk of catastrophic wildland fire.

During the draft review process, survey participants ranked these recommendations in the following order of importance:

Recommendation	Priority
Encourage County land managers and planners to take steps to reduce wildfire risk while achieving other land management goals. Consider wildfire risk, mitigation, and response when codes are revised for areas in the wildland-urban interface.	1
Promote cross-boundary mitigation planning and prioritization with public land managers, military installations, municipalities, utilities, fire protection districts, and unincorporated communities.	2
Maintain cooperation among wildfire first responders by supporting interagency planning and training.	3
Share information about mitigation funding opportunities with local communities, Firewise committees, and fire protection districts.	4
Encourage the creation of neighborhood Firewise committees to coordinate education and mitigation in local communities.	5
Encourage fire protection districts to support wildfire prevention activities.	6
Encourage small communities to create their own Community Wildfire Protection Plans (CWPPs).	7
Advise county managers of opportunities to support the goals of local CWPPs, through normal maintenance of county-owned lands and rights of way.	8
Encourage the development of new industrial uses for small woody biomass.	9
Promote collaborative discussions about fuel reduction along boundaries of US Forest Service lands, including fire protection districts, municipalities, and public utilities.	10
Encourage mitigation projects undertaken by municipalities, military installations, and utilities, especially where adjacent to unincorporated areas.	11



Community Wildfire Protection Plan for Unincorporated El Paso County

June 2011

Approved by:



Amy Lathen, Chair
El Paso County Board of County Commissioners

October 6, 2011
Date
ATTEST: Whebe Ratteree
Deputy County Clerk



Larry Long, District Forester
Colorado State Forest Service

9/20/2011
Date

Terry Maketa

Terry Maketa, Sheriff
El Paso County

9.21.2011
Date

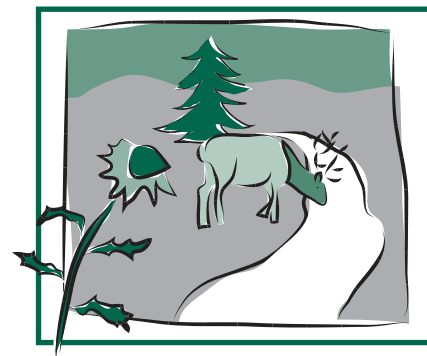
APPENDIX E

Colorado State University Extension Fire-Resistant Landscaping

Fire-Resistant Landscaping

Fact Sheet No. 6.303

Natural Resources Series|Forestry



by F.C. Dennis*

Colorado's population is growing, its urban areas are rapidly expanding, and people are building more homes in what was once natural forest and brushlands. Newcomers to rural areas need to know how to correctly landscape their property to reduce wildfire hazards.

Improper landscaping worries land managers and fire officials because it can greatly increase the risk of structure and property damage from wildfire. It is a question of *when*, not *if*, a wildfire will strike any particular area.

Vegetative clearance around the house (defensible space) is a primary determinant of a home's ability to survive wildfire. Defensible space is, simply, room for firefighters to do their job. If grasses, brush, trees and other common forest fuels are removed, reduced, or modified to lessen a fire's intensity and keep it away from the home, chances increase that the structure will survive. It is a little-known fact that in the absence of a defensible space, firefighters will often bypass a house, choosing to make their stand at a home where their safety is more assured and the chance to successfully protect the structure is greater.

Landscaping Defensible Space

People often resist creating defensible space because they believe that it will be unattractive, unnatural and sterile-looking. It doesn't have to be! Wise landowners carefully plan landscaping within the defensible space. This effort yields a many-fold return of beauty, enjoyment and added property value. Development of defensible space is outlined in fact sheet 6.302, *Creating Wildfire-Defensible Zones*.

Colorado has great diversity in climate, geology and vegetation. Home and cabin sites can be found from the foothills through

10,000-foot elevations. Such extremes present a challenge in recommending plants. While native plant materials generally are best, a wide range of species can be grown successfully in Colorado.

Many plant species are suitable for landscaping in defensible space. Use restraint and common sense, and pay attention to plant arrangement and maintenance. It has often been said that *how* and *where* you plant are more important than *what* you plant. While this is indeed true, given a choice among plants, choose those that are more resistant to wildfire.

Consider the following factors when planning, designing and planting the FireWise landscape within your home's defensible space:

- Landscape according to the recommended defensible-space zones. That is, the plants near your home should be more widely spaced and lower growing than those farther away.
- Do not plant in large masses. Instead, plant in small, irregular clusters or islands.
- Use decorative rock, gravel and stepping stone pathways to break up the continuity of the vegetation and fuels. This can modify fire behavior and slow the spread of fire across your property. It is highly recommended that the first 3-5 feet away from the house be gravel, flagstone, pavers, or some other non-flammable material.
- Incorporate a diversity of plant types and species in your landscape. Not only will this be visually satisfying, but it should help keep pests and diseases from causing problems within the whole landscape.
- In the event of drought and water rationing, prioritize plants to be saved. Provide available supplemental water to plants closest to your house.
- Use mulches to conserve moisture and reduce weed growth. To reduce fire danger, it is best to use a non-organic mulch such as pea gravel or stone, but leaf

Quick Facts

- More people are moving into Colorado's rural areas, increasing the chances of wildfire.
- "Defensible space" is the primary determinant of a structure's ability to survive wildfire.
- Native species are generally the best plant materials for landscaping in defensible space, but others can be grown successfully in Colorado.
- To be a FireWise homeowner, plan well, plant well and maintain well.

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The best tree species to plant generally are those naturally occurring on or near the site.

Mow grass short around shrubs.

Plant low-growing, nonresinous shrubs near structures.

Keep grass mown around structures to a maximum of 8 inches.

Plant wildflowers near structures only if they are well-irrigated and cut back during the dormant season.

Gravel area or mow grass short next to the structure.

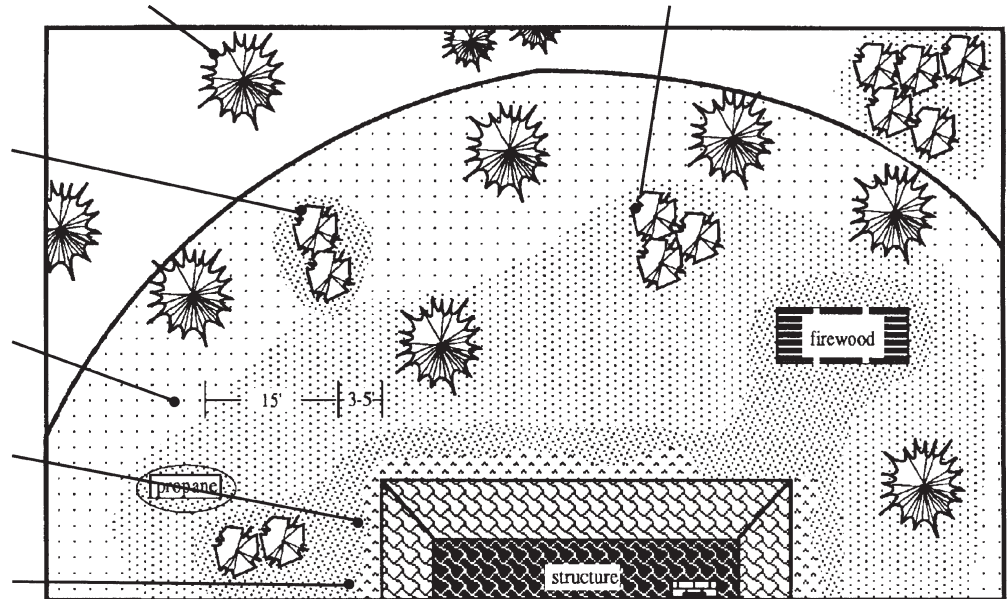


Figure 1: Forested property surrounding a homesite shows optimum placement of vegetation near the structure.

mold or compost is also acceptable. Do not use pine bark, thick layers of pine needles or other mulches that readily carry fire.

- Be creative! Further vary your landscape by including bulbs, garden art and containers for added color.

Grasses

During much of the year, grasses ignite easily and burn rapidly. Tall grass will quickly carry fire to your house. Mow grasses low in the inner zones of the defensible space. Keep them short closest to the house and gradually increase height outward from the house, to a maximum of 8 inches. This is particularly important during fall, winter and before green-up in early spring, when grasses are dry, dormant and in a “cured” fuel condition. Given Colorado’s extremely variable weather, wildfires can occur any time of the year. Maintenance of the grassy areas around your home is critical.

Mow grasses low around the garage, outbuildings, decks, firewood piles, propane tanks, shrubs, and specimen trees with low-growing branches.

Ground Cover Plants

Replace bare, weedy or unsightly patches near your home with ground covers, rock gardens, vegetable gardens and mulches. Ground cover plants are a good alternative to grass for parts of your defensible space. They break up the monotony of grass and enhance the beauty of your landscape. They provide a variety of textures and color and help reduce soil erosion. Consider ground cover plants for areas where access for mowing or other maintenance is difficult, on steep slopes and on hot, dry exposures.

Ground cover plants are usually low growing. They are succulent or have other FireWise characteristics that make them useful, functional and attractive. When planted in beds surrounded by walkways and paths, in raised beds or as part of a rock garden, they become an effective barrier to fire spread. The ideal groundcover plant is one which will spread, forming a dense mat of roots and foliage that reduces soil erosion and excludes weeds.

Mulch helps control erosion, conserve moisture and reduce weed growth. It can be organic (compost or leaf mold) but inorganic mulch is preferred (gravel, rock, decomposed granite). Mulches that carry such as bark chips, straw, pine needles or other flammable material should not be

used, as that can carry fire to the structure. When using organic mulches, use just enough to reduce weed and grass growth. Avoid thick layers. When exposed to fire, they tend to smolder and are difficult to extinguish.

Wildflowers

Wildflowers bring variety to a landscape and provide color from May until frost. Wildflower beds give a softer, more natural appearance to the otherwise manicured look often resulting from defensible space development.

A concern with wildflowers is the tall, dense areas of available fuel they can form, especially in dormancy. To reduce fire hazard, plant wildflowers in widely separated beds within the defensible space. Do not plant them next to structures unless the beds are frequently watered and weeded and vegetation is promptly removed after the first hard frost. Use gravel walkways, rock retaining walls or irrigated grass areas mowed to a low height to isolate wildflower beds from each other and from other fuels.

Shrubs

Shrubs lend color and variety to the landscape and provide cover and food for wildlife. However, shrubs concern fire

Structural Elements of a FireWise Landscape

When building a deck or patio, use concrete, flagstone or rock instead of wood. These materials do not burn and do not collect flammable debris like the space between planks in wooden decking.

Where appropriate on steeper ground, use retaining walls to reduce the steepness of the slope. This, in turn, reduces the rate of fire spread. Retaining walls also act as physical barriers to fire spread and help deflect heat from the fire upwards and away from structures.

Rock or masonry walls are best, but even wooden tie walls constructed of heavy timbers will work. Put out any fires burning on tie walls after the main fire front passes.

On steep slopes, consider building steps and walkways around structures. This makes access easier for home maintenance and enjoyment. It also serves as a physical barrier to fire spread and increases firefighters' speed and safety as they work to defend your home.

professionals because, as the next level in the "fuel continuum," they can add significantly to total fuel loading. Because of the woody material in their stems and branches, they are a potential source of fire brands. When carried in the smoke column ahead of the main fire, fire brands can rapidly spread the fire in a phenomenon known as "spotting."

But the primary concern with shrubs is that they are a "ladder fuel" – they can carry a relatively easy-to-control surface grass fire into tree crowns. Crown fires are difficult, sometimes impossible, to control (see Figure 2).

To reduce the fire-spreading potential of shrubs, plant only widely separated,

low-growing, nonresinous varieties close to structures. Do not plant them directly beneath windows or vents or where they might spread under wooden decks. Do not plant shrubs under tree crowns or use them to screen propane tanks, firewood piles or other flammable materials. Plant shrubs individually, as specimens, or in small clumps apart from each other and away from any trees within the defensible space.

Mow grasses low around shrubs. Prune dead stems from shrubs annually. Remove the lower branches and suckers from species such as Gambel oak to raise the canopy away from possible surface fires.

Trees

Trees provide a large amount of available fuel for a fire and can be a significant source of fire brands if they do burn. Radiant heat from burning trees can ignite nearby shrubs, trees and structures.

Colorado's elevation and temperature extremes limit tree selection. The best species to plant generally are those already growing on or near the site. Others may be planted with careful selection and common sense.

If your site receives enough moisture to grow them, plant deciduous trees such as aspen or narrow-leaf cottonwood. These species, even when planted in dense clumps, generally do not burn well, if at all. The greatest problem with these trees is the accumulation of dead leaves in the fall. Remove accumulations close to structures as soon as possible after leaf drop.

When site or available moisture limits recommended species to evergreens, carefully plan their placement. Do not plant trees near structures. Leave plenty of room between trees to allow for their growth. Spacing within the defensible space should be at least 10 feet between the edges of tree crowns. On steep ground, allow even more space between crowns. Plant smaller

trees initially on a 20- to 25-foot spacing to allow for tree growth. At some point, you will have to thin your trees to retain proper spacing.

As the trees grow, prune branches to a height of 10 feet above the ground. Do not overprune the crowns. A good rule of thumb is to remove no more than one-third of the live crown of the tree when pruning. Prune existing trees as well as ones you planted.

Some trees (for example, Colorado blue spruce) tend to keep a full crown. Other trees grown in the open may also exhibit a full growth habit. Limit the number of trees of this type within the defensible space. Prune others as described above and mow grasses around such specimen trees.

Maintenance

A landscape is a dynamic system that constantly grows and changes. Plants considered fire resistant and that have low fuel volumes can lose these characteristics over time. Your landscape, and the plants in it, must be maintained to retain their FireWise properties.

- Always keep a watchful eye towards reducing the fuel volumes available to fire. Be aware of the growth habits of the plants within your landscape and of the changes that occur throughout the seasons.
- Remove annuals and perennials after they have gone to seed or when the stems become overly dry.
- Rake up leaves and other litter as it builds up through the season.
- Mow or trim grasses to a low height within your defensible space. This is particularly important as grasses cure.
- Remove plant parts damaged by snow, wind, frost or other agents.
- Timely pruning is critical. Pruning not only reduces fuel volumes but also maintains healthier plants by producing more vigorous, succulent growth.



Figure 2: Ladder fuels enable fire to travel from the ground surface into shrubs and then into the tree canopy.

- Landscape maintenance is a critical part of your home's defense system. Even the best defensible space can be compromised through lack of maintenance. The old adage "An ounce of prevention is worth a pound of cure" applies here.

References

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FIREWISE is a multi-agency program that encourages the development of defensible space and the prevention of catastrophic wildfire.



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