Canyons South Wildfire Mitigation Plan

January 2020

APPROVED for Implementation
Douglas County Wildfire Mitigation
By:
Date: 1-31-20

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CANYONS SOUTH PLANNED DEVELOPMENT WILDFIRE MITIGATION PLAN

Introduction

This plan has been prepared to aid the developer with reduction of wildfire risks for its future lots in all phases of the newly created Canyons South Planned Development. The property is currently ranch land with one existing residence. Figure 1 shows a vicinity map of the property location in relation to Crowfoot Valley Road and Founders Parkway.

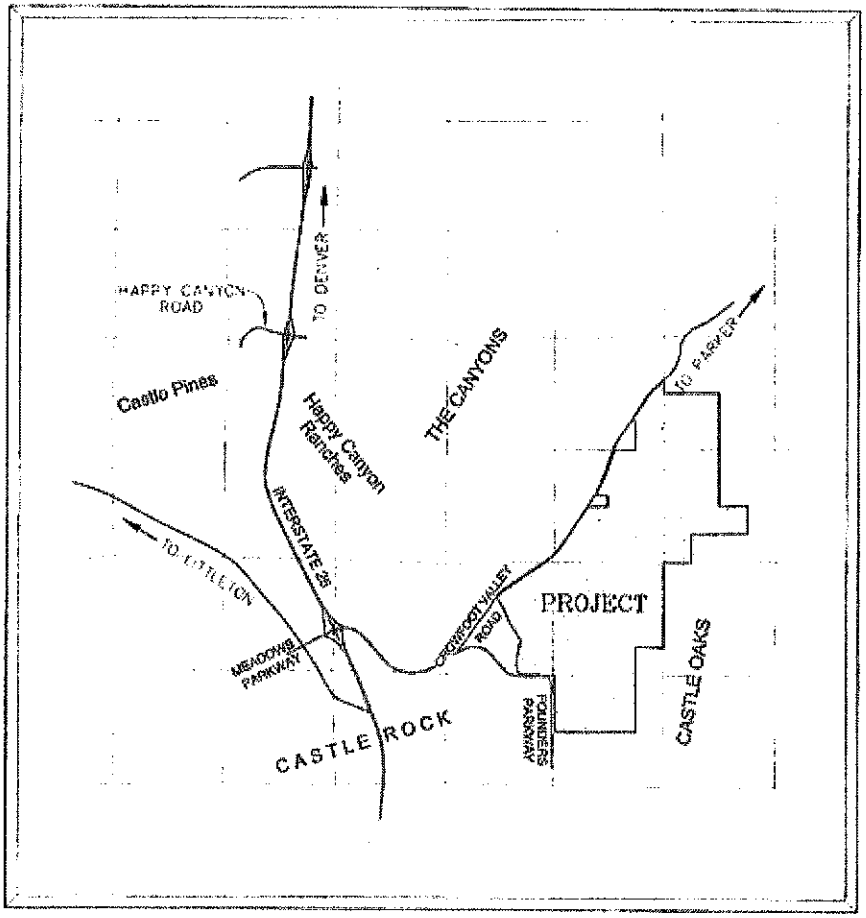

Figure 1. Canyons South (Project) Vicinity Map

The 2,043 acre site is proposed for subdivision into 968 residential lots and numerous tracts (see **Figure 2**). Zoning density and acreages are summarized in Table 1.

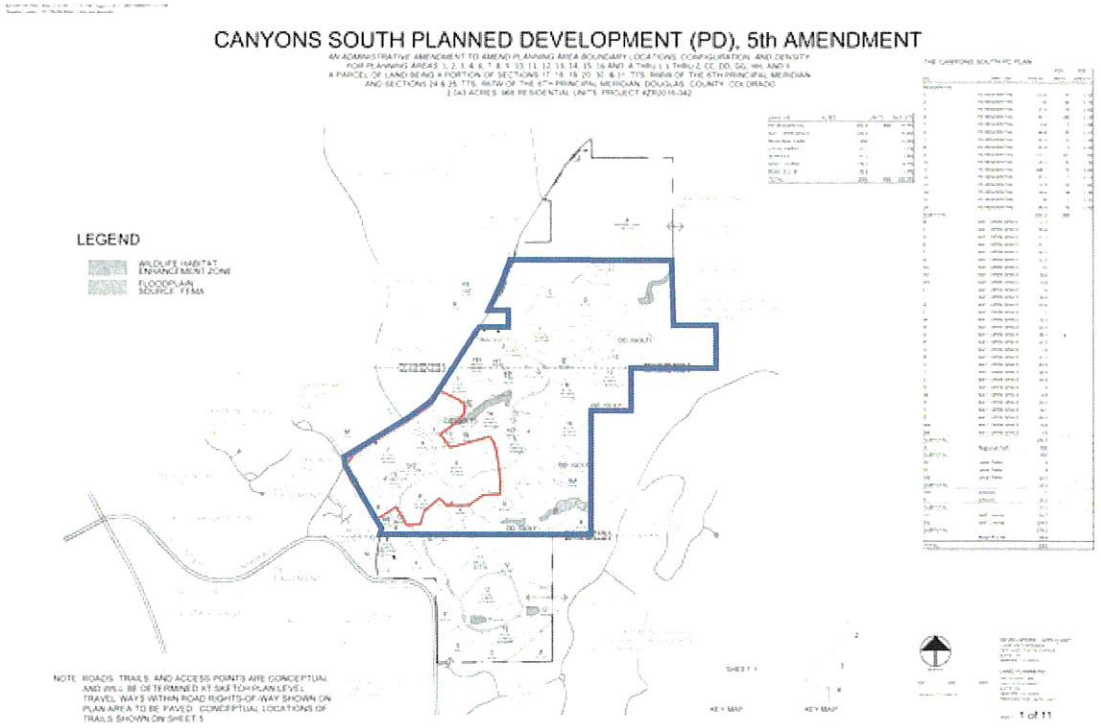

Figure 2. Proposed PD Amendment showing residential planning areas and tracts. Phase 1 outlined in red. Area shown in blue defines the portion of the property subject to this plan. (Note: Final plan subject to change. Fire mitigation recommendations will remain the same.)

Table 1. Zoning and Land Use Summary (from Canyons South PD, 5th Amendment)

Land Use	Acres	Units	% of Site
PD Residential	691.6	968	33.9%
Natural Open Space	526.4		47.8%
			22.0%
Local Parks	22.1		1.1%
	37.1		1.8%
Golf Course or alternative Open Space	276.2		13.5%
Road R.O.W.	39.6		1.9%
Total	2043	968	100.0%

The aerial map shown in **Figure 3** shows the area covered by this plan.

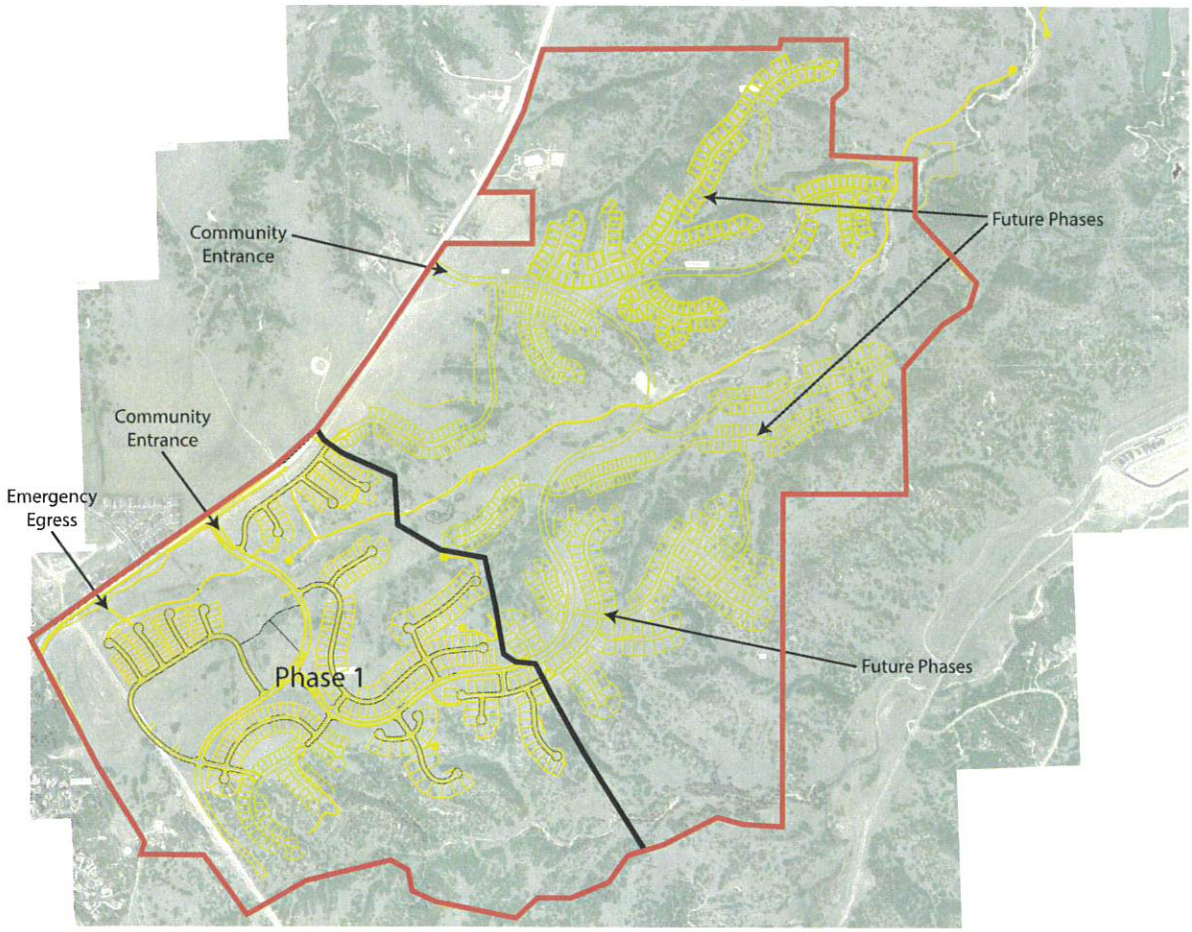

Figure 3. Canyons South PD. Phase 1 shown (black line)

Figure 4 shows lots and phasing. The project is proposed as two phases. Perimeter wildfire mitigation is shown for each phase in **Figure 12**.

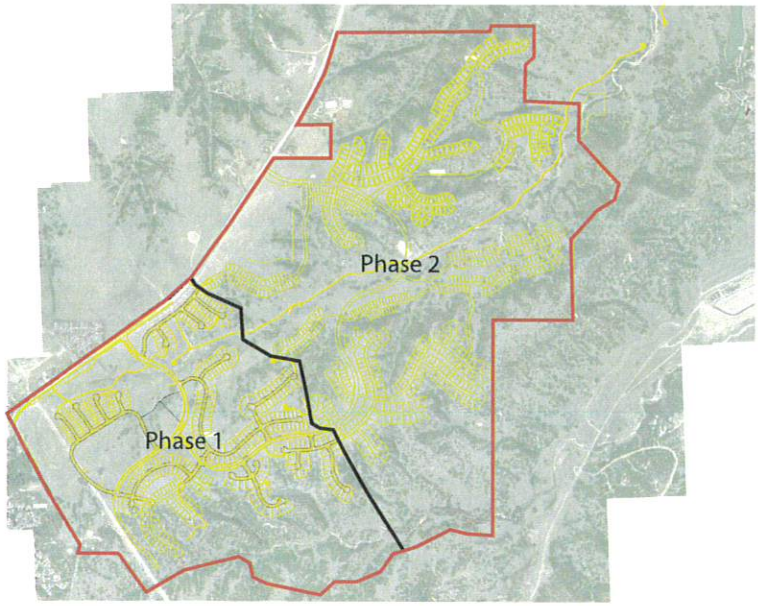

Figure 4. Canyons South PD Phasing

Douglas County Wildfire Regulations

The PD is in the Wildfire Hazard Overlay District, Section 17 of the Douglas County Zoning Resolution. A Wildfire Assessment and Mitigation Plan was approved as part of the original zoning of the PD in 2005.[1] Douglas County Wildfire Mitigation Standards will also apply.[2]

Fire Protection

The site is in the Castle Rock Fire Protection District, served by the Castle Rock Fire Rescue Department (CRFRD). The agency operates under mutual-aid agreements that allow response by the closest available resources. Fire District boundaries are shown in **Figure 5**, with the site outlined in black.

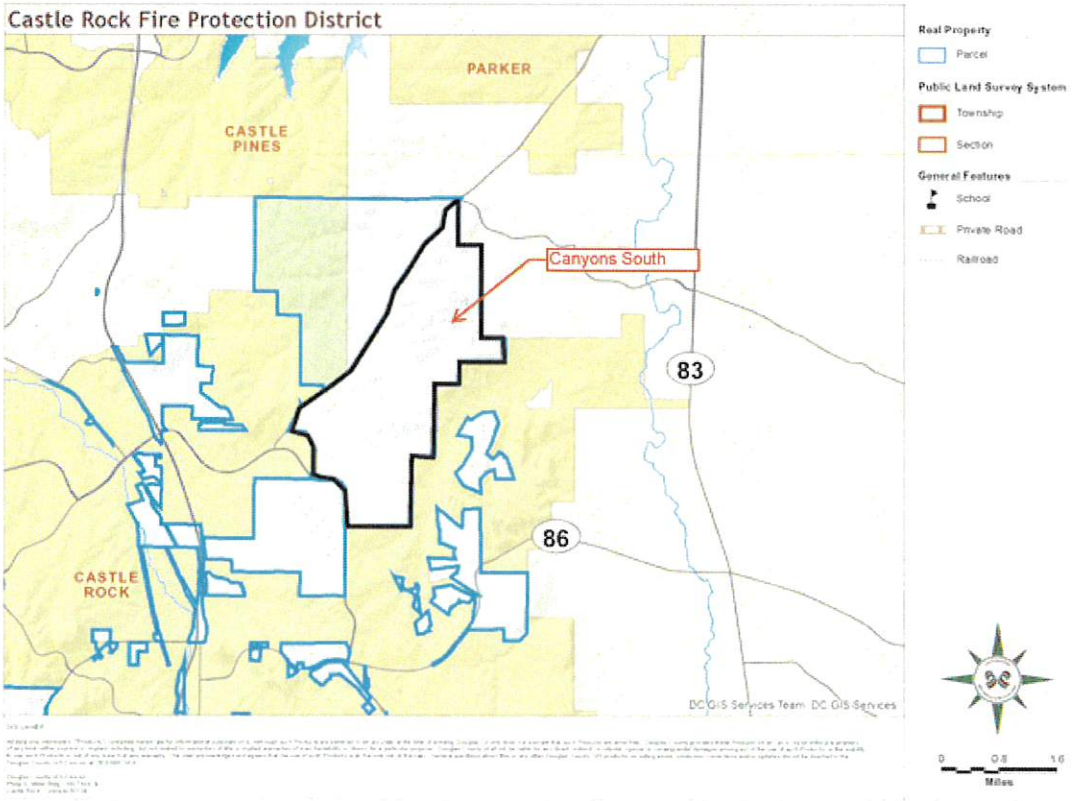

Figure 5. Castle Rock Fire Protection District (blue lines). Site outlined in black.

[1] Canyons South Wildfire Assessment and Mitigation Plan, Greystone Environmental Consultants, Inc, December 2005.

[2] Douglas County Wildfire Mitigation Standards, Appendix 58 of the International Building Code as adopted by Douglas County, including any amendments.

A central community water supply will be in place with fire hydrants along all roadways. All homes are connected to the central water supply. It is anticipated hydrant fire flows will meet CRFRD standards for residential uses.

Access
The site will be accessed via Crowfoot Valley Road. Two main entrances are proposed. Roads will be constructed following Douglas County Engineering standards.

All roads will be paved and have either a gravel road edge or curb and gutter section that provides a minimum of 24 feet of all-weather driving surface. Roads will terminate with cul-de-sacs in right-of-way's having 65 feet radii (50 feet radius for driving surface).

Emergency Ingress/Egress
All emergency ingress/egress routes will follow Douglas County engineering requirements.

Wildland Fire Characteristics That Could Threaten the Area (Fuel, Weather and Topography)[3]

Fire intensity and spread rate depend on the fuel type and condition (live/dead), the weather conditions prior and during ignition, and the topography. Generally, the following relationships hold between the fire behavior and the fuel, weather and topography.

- Fine fuels ignite more easily and spread faster with higher intensities than coarser fuels. For a given fuel, the more there is and the more continuous it is, the faster the fire spreads and the higher the intensities. Fine fuels take a shorter time to burn out than coarser fuels. Grasses are the predominant fine fuel in the community, and wind driven wildfires can be anticipated to move quickly, threatening multiple homes. Open meadows interconnect throughout the neighborhoods. Gambel oak (scrub oak) is also continuous from west to east.

- The weather conditions affect the moisture content of the dead and live vegetative fuels. Dead fine fuel moisture content is highly dependent on the relative humidity and the degree of sun exposure. The lower the relative humidity and the greater the sun exposure, the lower will be the fuel moisture content. Lower fuel moistures produce higher spread rates and fire intensities.

- Wind speed significantly influences the rate of fire spread and fire intensity. The higher the wind speed, the greater the spread rate and intensity. Winds are predominantly out of the west. However, low-pressure weather systems may produce upslope conditions that will generate winds out of the south and south east.

- Topography influences fire behavior principally by the steepness of the slope. However, the configuration of the terrain such as narrow draws, saddles and so forth can influence fire spread and intensity. In general, the steeper the slope, the higher the uphill fire spread and intensity. Slopes in Canyons South range from 5 to 40 percent, with an average slope of 10%. Aspect is generally to the east and northeast.

- Wildfire events will tend to be fast moving and short duration. Continuity of grasses and Gambel oak, if pushed by high winds, can be expected to move through the entire community within one operational period.

[3] Firewise Communities/USA® Community Assessment Template, Firewise Communities Program® www.firewise.org.

- Human caused fire starts pose the greatest risk on a day-to-day basis. Crowfoot Valley Road runs the entire length of the north boundary. Surrounding subdivisions can also be a source of human caused ignitions. Other potential fire sources are illegal fireworks, and human carelessness. Lightning strikes are common during the summer due to fast moving afternoon/evening thunder storms.

When fuel, weather and topography are factored together, an overall wildfire rate-of-spread can be predicted as shown in **Figure 6**.

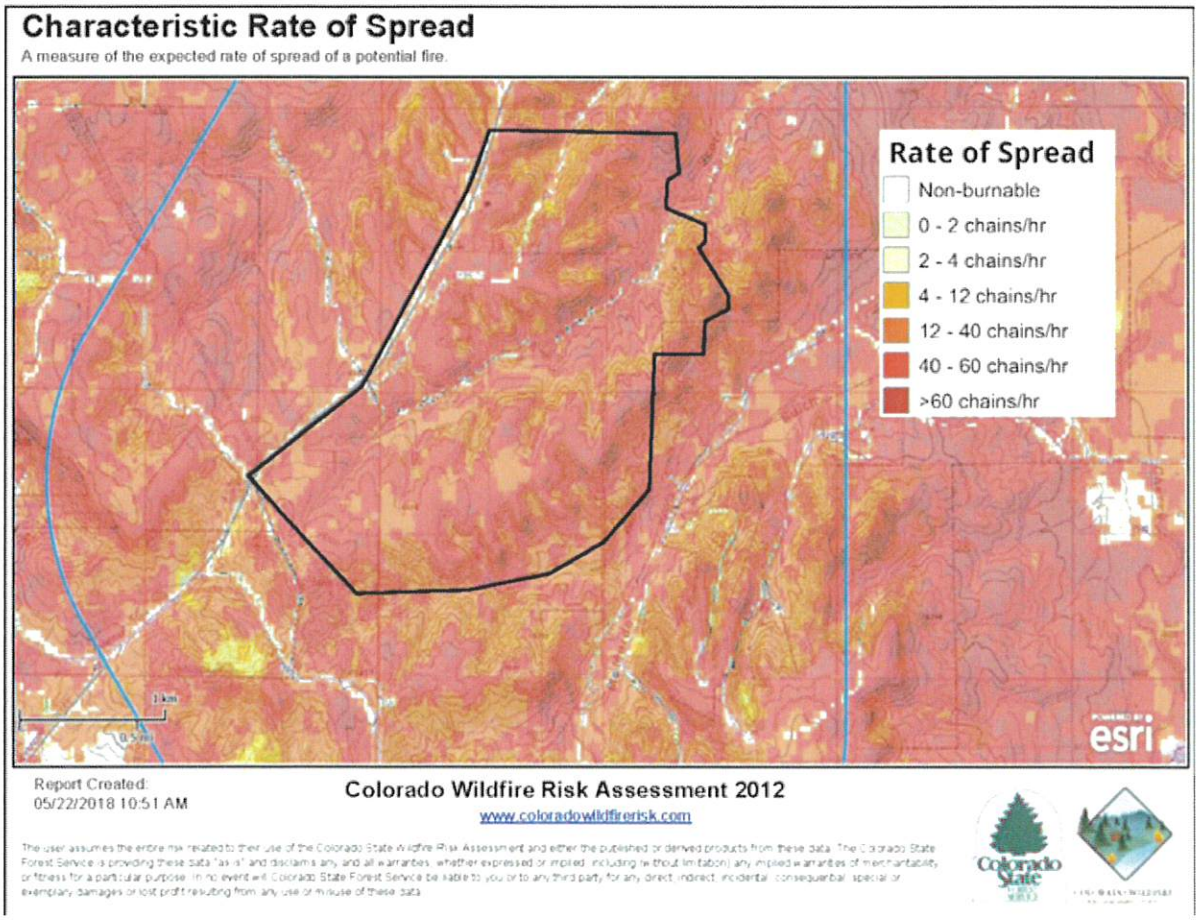

Figure 6. Wildfire Rate-of-Spread Assessment for Canyons South. 1 Chain = 66 feet. Source: Co-WRAP

Current Fuel Conditions

The site is comprised of two fuel types. The first is prairie grass fuels. The second is Gambel oak fuels with scattered mountain mahogany. The only conifers present are Rocky Mountain junipers and scattered ponderosa pines. An aerial photo of the site is shown in **Figure 7**. The two main fuel types are shown in **Figure 8**, with shrubs and prairie grasslands dominating the site. No major forest pests were observed that might contribute to dead fuels.

Valley bottoms are dominated by black willow, cottonwoods, hawthorn and chokecherry. While the wildfire hazard in these areas may be low, any retained trees should be pruned, and ladder fuels removed to minimize wildfire hazard, as defined in this later sections of this plan. If isolated, within valley bottoms, no pruning or dead tree removal is required

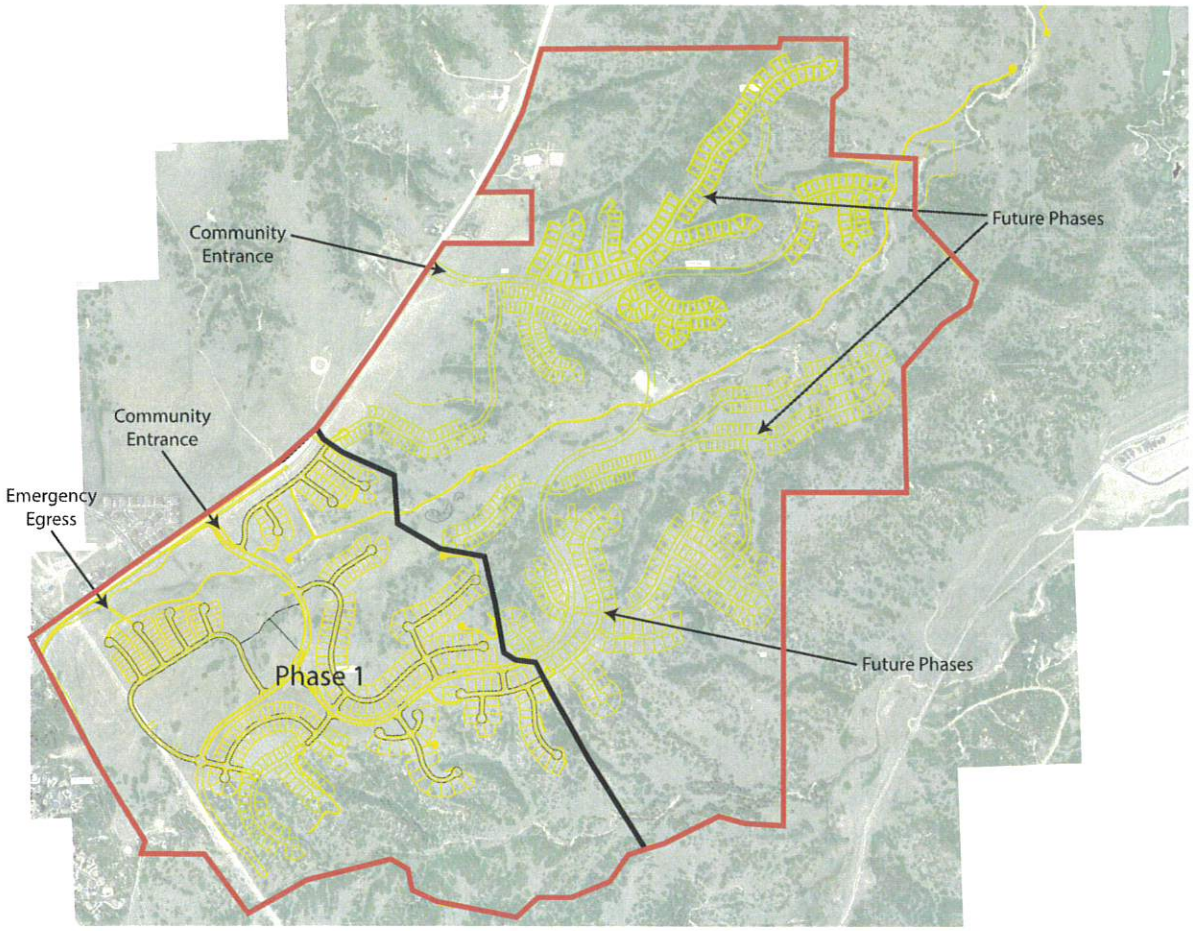

Figure 7. Aerial Photo of Site. North is at top of photo.

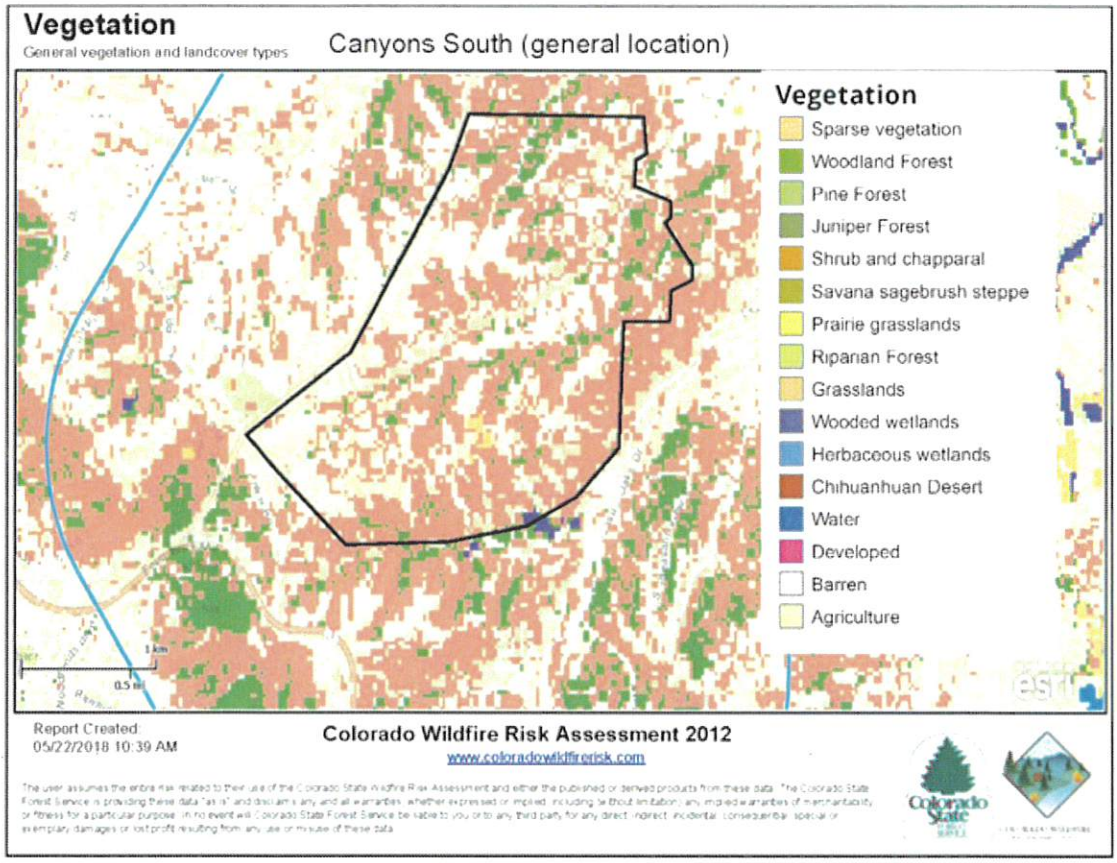

Figure 8. Vegetation Map. North is at top of map. Source: Co-WRAP

Gambel oak is considered a heavy fuel. It is a dense to moderately-dense, flammable vegetation averaging 10' high, with abundant litter and/or herbaceous fuel. Flames heights of 5-20' high, and of brief duration with high spread rates, at least 40 acres/hour. can be anticipated. Humans cannot safely pass through flames but can occupy burned area within about 15 minutes. Short range spotting from blowing embers is common (Source: CSFS).

Current analysis of the density and varieties of vegetation is an integral part of deciding when to schedule projects. Fuel models for the two fuel types, using Andersons Aids for Determining Fuel Models for Estimating Fire Behavior (FBO) and USDA Forest Service National Fire Danger Rating System (NFDRS) (General Technical Report INT-39), are listed below.

1. Mature Brush- (NFDRS Type B/O, FBO Type 4) Areas with heavy brush (gambel oak, three-leaf sumac and mountain mahogany). Heavy cattle grazing has pruned taller shrubs of lower branches.
   a. Prescription for treatment is to break up fuel continuity both horizontally and vertically. Remove dead material and prune clumps.

2. Grasslands, native prairie- (NFDRS Type A/L, FBO Type 1) Typically light, flashy fuels with scattered yucca, three-leaf sumac and noxious weeds.
   a. Prescription for treatment is regular mowing and regular noxious weed control. Timing

of mowing is typically at time of grass curing/drying (July/August). Areas not mowed in late summer or fall should be mowed in the spring if insufficient snow was present to lay down aerial fuels. Mowing should also be timed to allow for adequate reseeding of native grasses and wildflowers.

Meadow, Brush and Riparian fuels in Canyons South, view to east.

View of site from Crowfoot Valley Road to south-southwest.

Weather
Weather and climatic events can have a significant impact on wildfire behavior.

The Canyons South area is prone to high winds from the west, often exacerbated by nearby thunderstorm activity, and related frontal passages. Periodic winds also occur from the south and southeast during upslope weather fronts. It is not unusual for winds to shift 90 degrees within a burning cycle, as frontal passages occur, making fire containment or control difficult.

Topography
Overall, topography on the site is considered gentle to moderate, and is broken up by a series of small ridgelines with steeper grade running west to east. Orientation, or aspect, is generally to the east and northeast. Draws and valleys that bisect the property can have an impact on fire behavior. These act as venturi that can increase wind speeds at ground level. Topography is shown in **Figure 9**. A slope analysis is shown in **Figure 10**.

Figure 9. Topography. 50' Contours

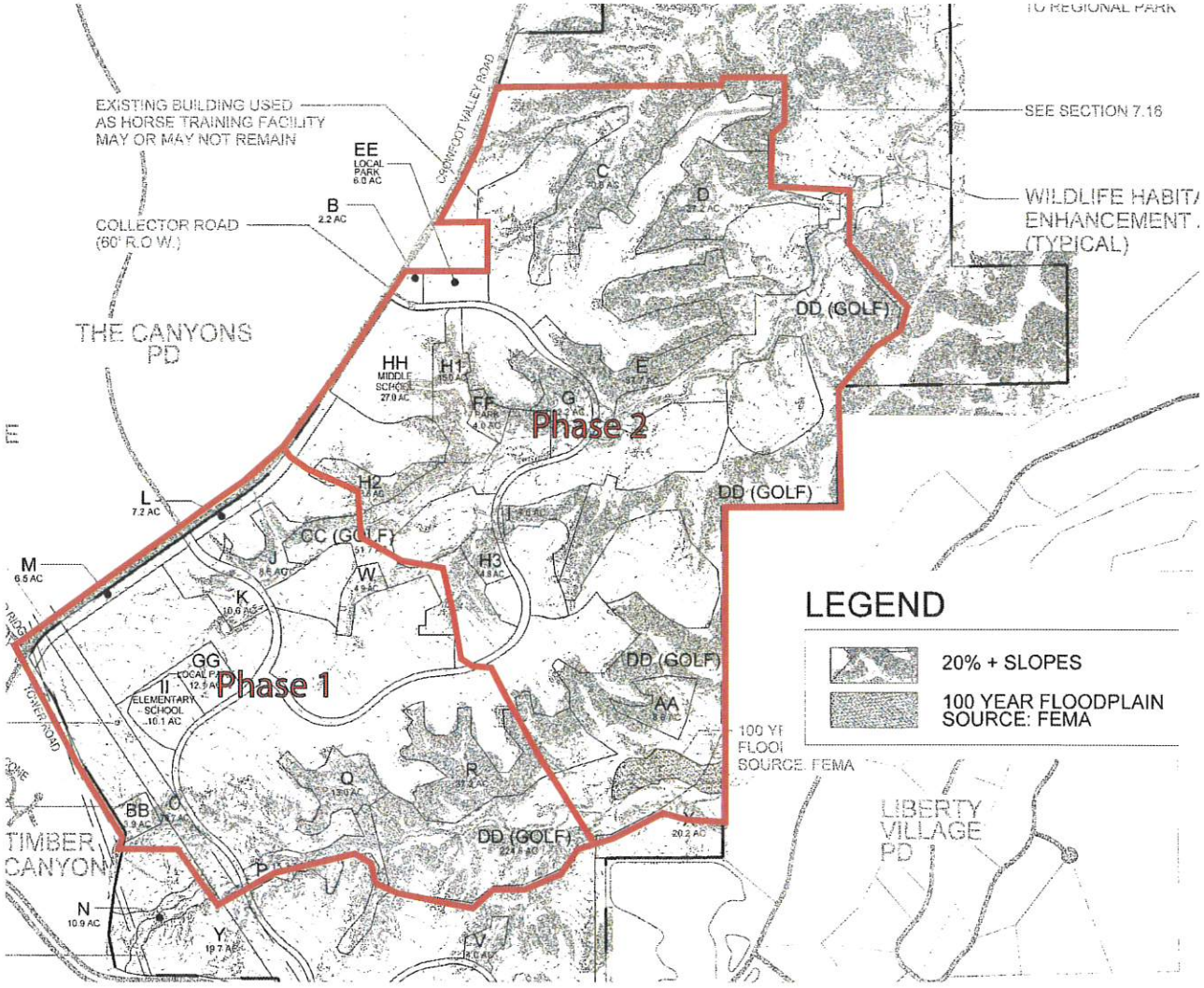

Figure 10. Slope Analysis showing slopes > 20%. Source: Canyons South PD

Slopes, 20% or greater, are identified as gray shaded areas on the slope analysis. Wildfire exposure for building sites at the top of slopes can be mitigated by building setbacks from the slope, or by fuel treatments below structures.

WILDFIRE HAZARD MITIGATION

This section of the Wildfire Mitigation Plan addresses the prioritization of fuel mitigation treatments for high risk wildfire hazards impacting both the site and surrounding community.

Methodology and Strategies

Wildfire behavior in the proposed subdivision will be affected by fuel, weather and topography. No attempt was made to use fuel modeling for determining fire behavior for any one event. Instead, all areas should be treated as if fire can start at any point in or around the community and be affected by an infinite number of probabilities. Wildfire can come from any direction. The primary ignition source will typically be embers blown into residential areas that are not adjacent to native fuels. Proposed fuel treatments should allow for an inevitable fire that will burn at rates and intensities more consistent with past historic levels.

Priorities for Treatment
Three main areas are targeted for treatment. These are:

1. Egress/Evacuation Routes- Any remaining continuous heavy fuels along roadways, after overlot grading, shall be treated to reduce fire intensity to a level that can be survived while in a vehicle. The long-range goal for all roadways is to have flames on the ground in lighter fuels versus dangerous flame lengths that may extend into the roadway. The primary area of concern is the area 150 feet on each side of the driving surface, however the vast majority of these, if not all will be fully mitigated through the grading associated with roadway construction.

Where it is desirable and possible to retain native vegetation along roadways, horizontal and vertical fuel arrangements shall be modified to manage wildfire behavior. This can be done by a combination of brush clump separation and ladder fuel pruning. Roadside treatments will generally follow:

> CSFS publication 6.311 Managing Gambel Oak (also guideline for other shrub species) Landscaping along all roads should avoid use of highly combustible plants, such as junipers. Colorado State Forest Service (CSFS) publications 6.303 Fire Resistant Landscaping, and 6.305 Firewise Plant Materials should be used as guidelines for landscaping along all roadways.

2. Home Ignition Zones- Most, if not all, of the home sites will be over-lot graded prior to construction and not directly impacted by abutting native vegetation. Homes and lots that contain native fuels should be treated to a level sufficient to prevent home ignition from both flame impingement and aerial firebrands (embers). Additionally, all lots will include a split rail fence on the rear lot lines adjacent to open space, and this will be required to have a 10' clear zone of vegetation paralleling the fence. Where possible, isolated small clumps of oak/brush may remain if they are sufficiently isolated, to meet visual quality objectives.

Note: All structures must adhere to Douglas County Wildfire Mitigation Regulations at the time of construction. Defensible space or HIZ must be completed prior to issuance of a Certificate of Occupancy.

The following references should be incorporated into the design guidelines for all neighborhoods in Canyon South:

a. CSFS publication 6.302 Creating Wildfire Defensible Zones, or;
b. CSFS publication FIRE 2012-1 Protecting Your Home from Wildfire (also referred to as "D-Space Quick Guide)
c. CSFS publication Firewise Construction: Site Design and Building Material (December 2012)

3. Open Spaces or surrounding areas- These are areas of heavy native fuels that have the potential to exhibit extreme wildfire behavior, and place multiple homes at risk. Wildfire behavior can be managed by interrupting horizontal fuel continuity. Open space trail systems will be part of the community-wide wildfire containment system and should be maintained as pre-existing firelines (see Figure 11). Trail widths will vary from narrow single-track, natural-surface mountain biking trails to wider gravel-surfaced trails. These will typically be located within fuel treatment zones. The trail surface is the actual "fireline." Open space treatments will generally follow:

CSFS publication 6.311 Managing Gambel Oak (also guideline for other shrub species)

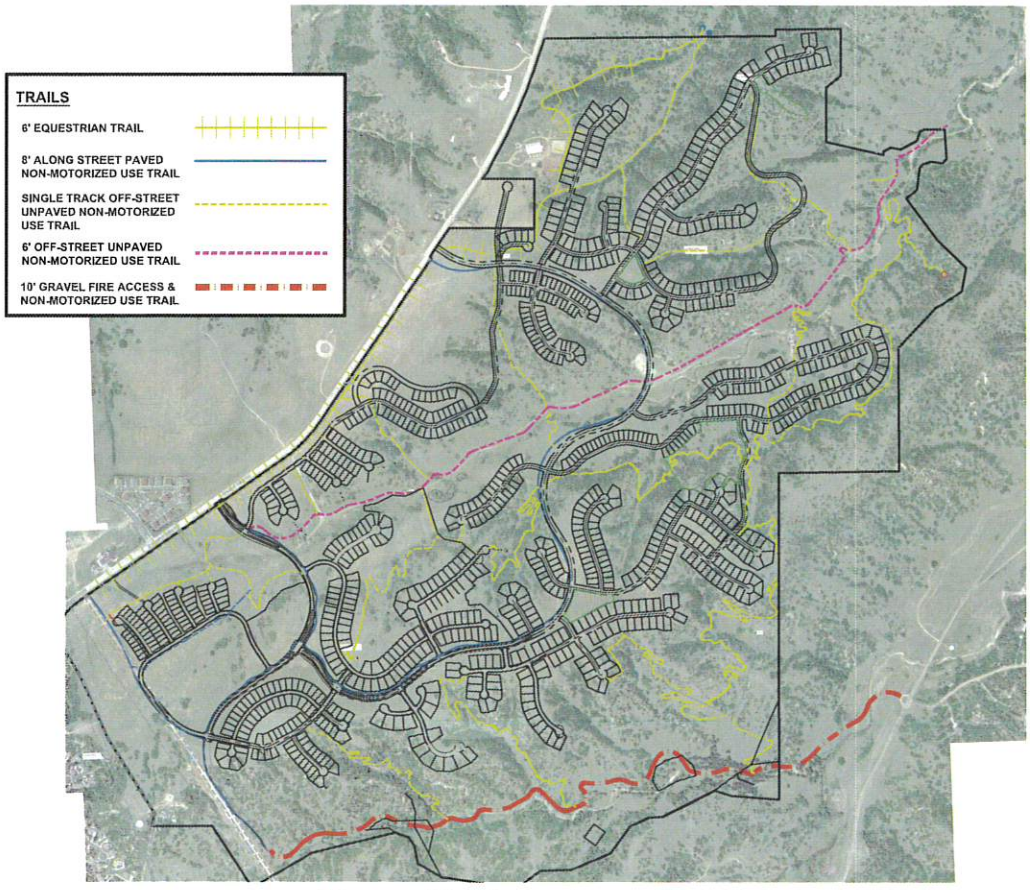

Figure 11. Open Space Trail Network

Fuel Treatment Zones

Proposed fuel treatment zones are shown in **Figure 12.** These areas should be treated as part of the land development construction process, and prior to issuance of building permits. Specific treatment zone widths may be dependent on land development activities such as over-lot grading, road construction and installation of site utilities (drainage, sewer and water lines, detention ponds, etc.). Within Phase 1 these areas are currently well defined. With final design of future phase 2 some refinements to the overlot graded areas versus Zone 1 and Zone 2 may occur. Any area where construction activities remove the vegetation cover should be considered "mitigated". Utility corridors can be used as anchor points for treatment projects. Community wide fuel treatment widths are based on the distance from rear lot lines. In all cases, a 10' clear zone shall be maintained immediately behind the rear lot line.

Outside of the overlotting grading areas, two main fuel treatment zones are proposed. The first is a community-wide (or phase-wide) zone (shown as blue areas "Zone 1" in **Figures 12, 13, 14**). Fuel break widths should extend 300' from the rear of the lots, based upon a Home Ignition Zone (HIZ) concept which is intended to affect fire behavior before it reaches the homes defensible space area. Shrub clump spacing will apply as described in CSFS Publication 6.311 Managing Gambel Oak. As described in the CSFS publication FIRE 2012-1 Protecting Your Home from Wildfire (also referred to as "D-Space Quick Guide) there are three defensible zones in the following categories: 0-15/30 feet, 30-100 feet, and 100+ feet. Generally speaking, the first two zones up to 100 feet will be fully mitigated by overlot grading. If this is not the case, then oak clump separation by mastication will occur to interrupt horizontal fuel continuity, along with removal of dead and dying material from any retained clumps. To be conservative, the area 70 to 100 feet from rear lot lines, in addition to shrub clump spacing (per 6.311), shall include ladder fuel treatments to interrupt horizontal and vertical fuel arrangement. Areas beyond 100 feet from properties shall only require shrub clump separation per CSFS Publication 6.31.

Oak clump spacing should be increased as slopes increase. Adjustment for slopes are show in the Table 3 below. These should be a minimum of 300 feet wide and adjusted for slope, or to the bottom of the adjacent slope, or the greater of the two.

Table 1. Defensible space thinning guidelines.

1 percent to 20 percent slopes =	
Brush/shrubs	75' from structure; 3X height separation distance between vegetation.
Trees	75' from structure; 10-foot crown separation distance between trees.
Grass	30' from structure; mow dead, dry grass to 6 inches or less in height.
21 percent to 40 percent slopes =	
Brush/shrubs	150' from structure; 4X height separation distance between vegetation.
Trees	150' from structure; 20-foot crown separation distance between trees.
Grass	50' from structure; mow dead, dry grass to 6 inches or less in height.
Greater than 40 percent slopes =	
Brush/shrubs	200' from structure; 6X height separation distance between vegetation.
Trees	200' from structure; 30-foot crown separation distance between trees.
Grass	75' from structure; mow dead, dry grass to 6 inches or less in height.

Table 3. Tree and Shrub Clump Spacing Guidelines (from CSU 6.311)

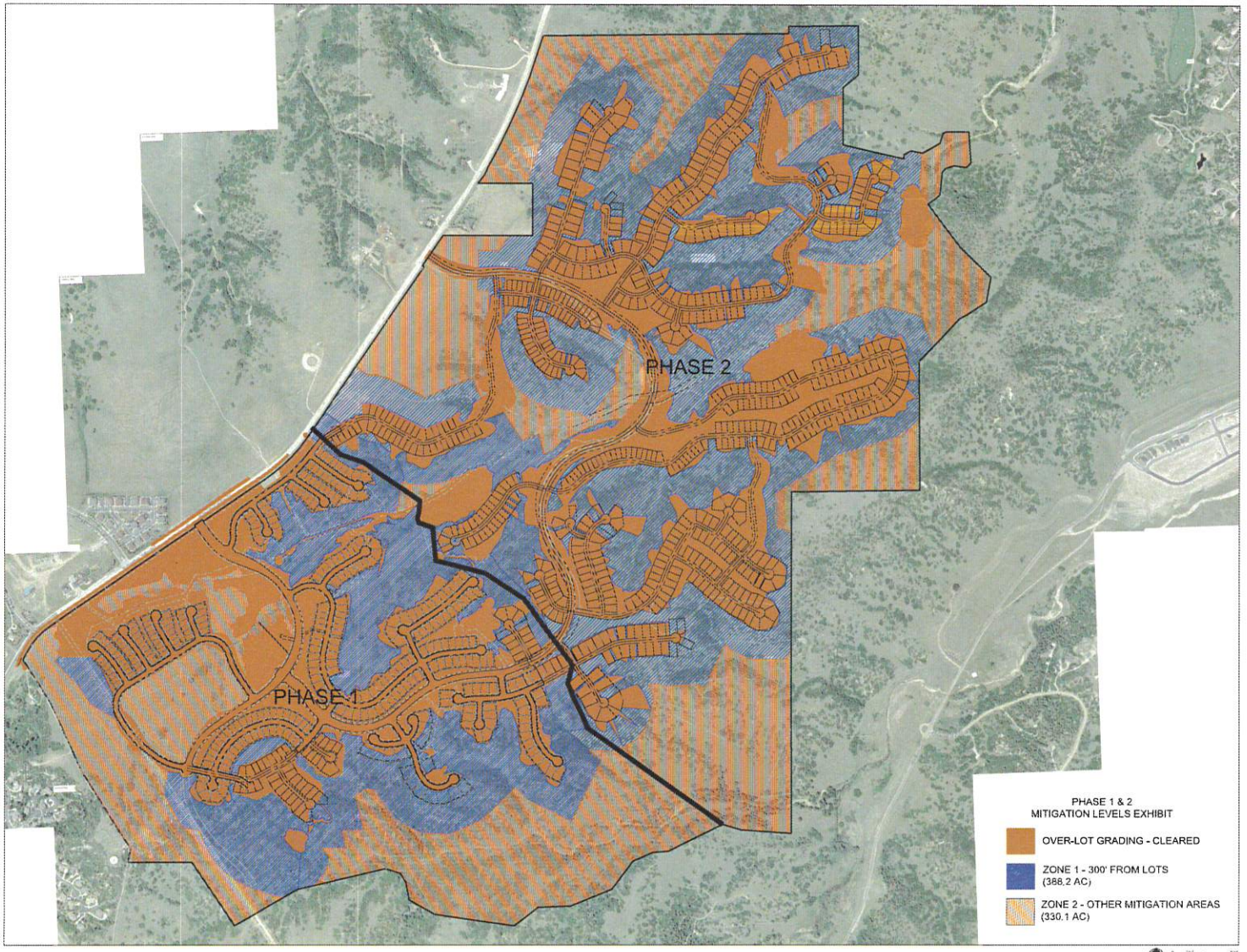

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Figure 12. Fuel Treatment Zones as part of land development implementation.

CANYONS SOUTH PHASE 1 FIRE MITIGATION PLAN

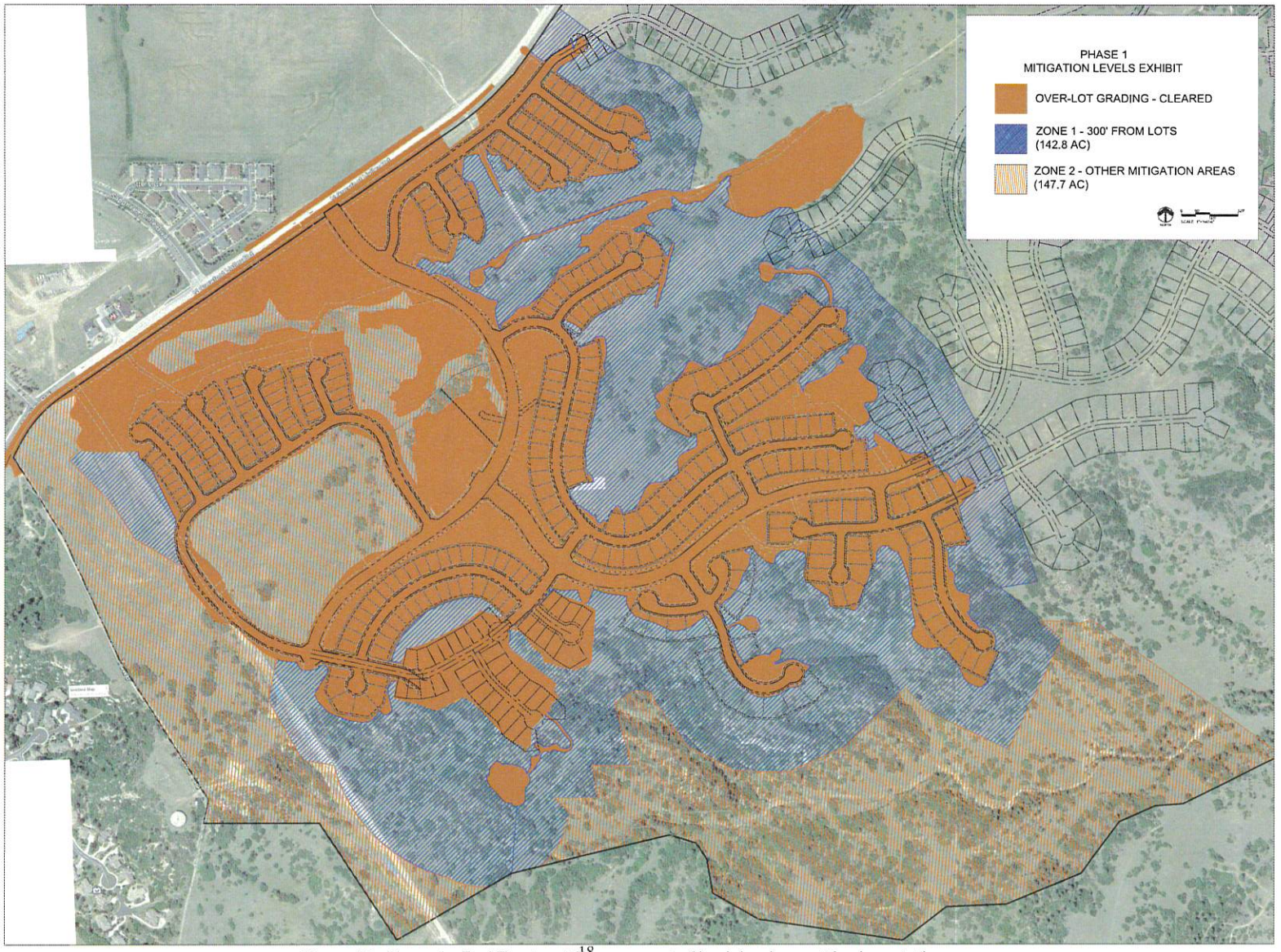

Figure 13. Phase 1 - Fuel Treatment Zones as part of land development implementation.

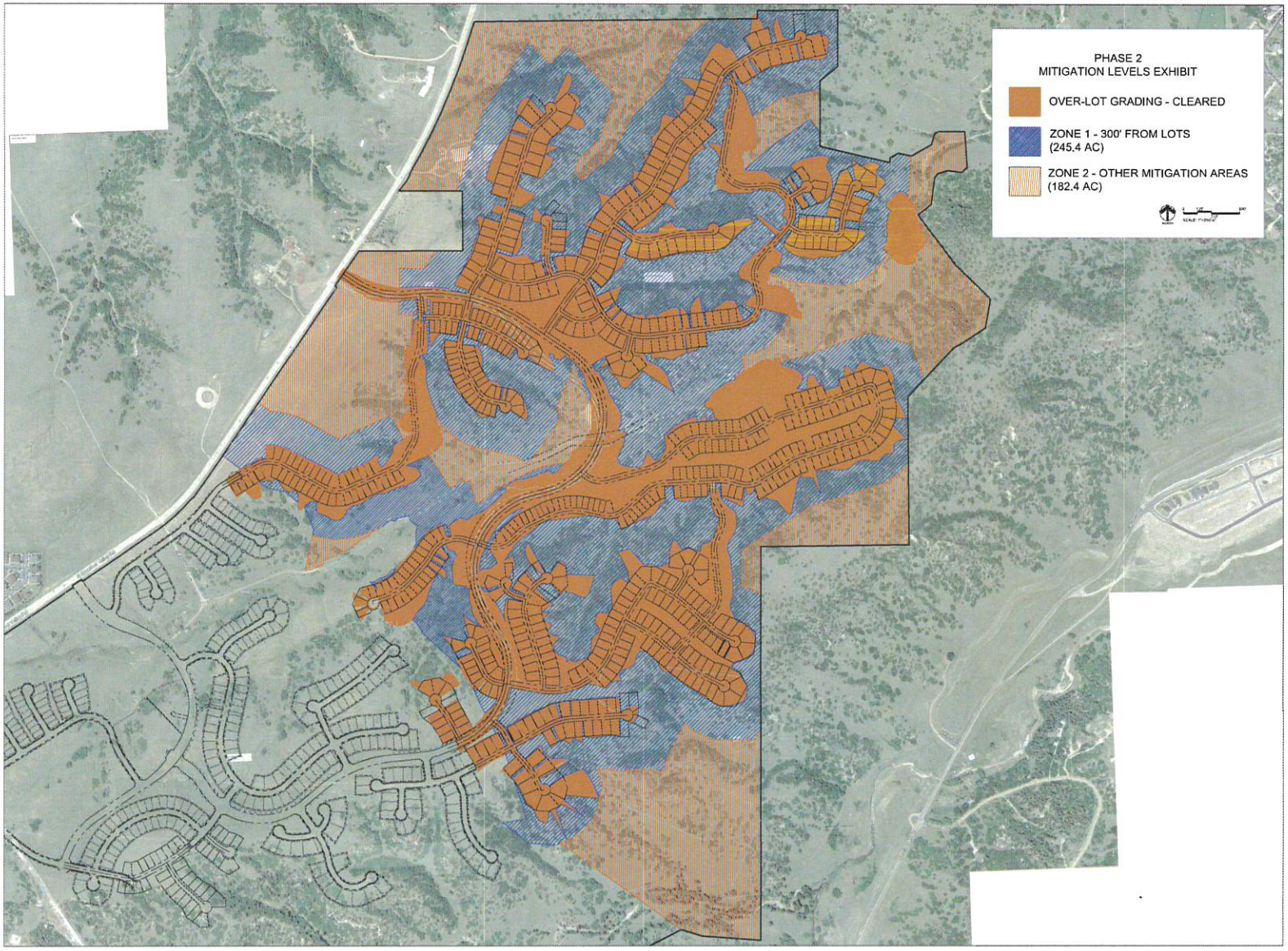

Figure 14. Phase 2 - Fuel Treatment Zones as part of land development implementation.

The areas located in "Zone 2" beyond 300' from the rear lot lines, as shown in Figures 12, 13, 14, shall be primary mitigated to achieve shrub clump spacing per CSFS Publication 6.311, as interupting horizontal fuel continuity is the main objective. Within this zone ladder fuel treatment is not the priority, but it is recognized that some pruning of ladder fuels maybe needed in some instances where large amounts of ladder fuels exist in conjunction with tree canopy areas. Field crews will work with the County to determine if and where these areas exist and where mitigation may be needed.

All open space area vegetation must be treated as outlined herein. Large groups of fuels in "Zone 2", if not broken up by prairie vegetation, should be either isolated or broken up into smaller groupings no larger than one (1) acre in size. Separation between retained groups shall follow maximum shrub clump spacing guidelines, and extend to the project boundary.

No restrictions should be placed on fuel treatment zones that might prohibit fuels management. Gambel oak regrows aggressively. It is recommended that maintenance responsibility of treated open space areas should be clearly spelled out and required as part of the subdivision approval process. Re-treatment of shrub fuels will be required, at a minimum, every five years. If ownership is by a Metro District (special district) the district service plan should include maintenance as its responsibility. If owned by a Homeowners Association, maintenance responsibility should be included in the by-laws, covenants, regulations and/or design guidelines.

Fuel treatments, proposed as two phases, are recommended for implementation as part of the land development construction process and summarized in **Table 2** as follows:

Table 2, Fuel Treatment Zone Summary

Zone	Acres	Treatment Zones	Tract or Lots	Prescription
Phase 1 Zone 1	153.6 acres	153.6 acres	Perimeter fuel treatment zone	Shrub clump spacing guidelines, per CSU Pub. 6.311. Average width of zone is 300 feet. Fuel treatments should terminate at toe of slopes. Ladder fuel removal beyond 70' from property line.
Phase 1 Zone 2	149 acres	149 acres	Open spaces	Shrub clump spacing guidelines, per CSU Pub. 6.311. Ladder fuel removal 70 to 100 feet from property lines.
Phase 2 Zone 1	244.9 acres	244.9 acres	Perimeter fuel treatment zone	Shrub clump spacing guidelines, per CSU Pub. 6.311. Average width of zone is 300 feet. Fuel treatments should terminate at toe of slopes. Ladder fuel removal beyond 70' from property line.
Phase 2 Zone 2	182.4 acres	182.4 acres	Open space	Shrub clump spacing guidelines, per CSU Pub. 6.311. Ladder fuel removal 70 to 100 feet from property lines.
Total	**729.9 acres**	**729.9 acres**		

All acreages in Table 2 are approximate. Final acreages cannot be determined until final grading and utility plans are completed. Land development activities may reduce the acreage, in Phase 2, based on over-lot grading, utility construction corridors and detention pond locations, as these are finalized.

Timing for fuel treatments shall be triggered by Douglas County approval of a final plat, and shall be completed prior to issuance of building permits for each phase.

Exterior fuel treatment zones may include pockets of native ponderosa pines. Areas with pines should follow Fuel Break Guidelines for Forested Subdivision and Communities. Tree crown separation and branch pruning heights will apply.

Interior fuel treatment widths (150-300 feet) differ from perimeter widths (300 feet) due to overlap that will occur from rear lot line to rear lot line. Treatment for interior areas may still total 300 feet of width.

Wildlife Habitat Enhancement and Wildfire Mitigation

The original Canyon South PD describes requirements for wildlife habitat protection. It important to note that all wildfire mitigation proposed in this plan is consistent with both protection and enhancement per the PD. These treatments will serve as vegetation renewal and restoration of diversity necessary for stable wildlife habitats. In effect, fuel treatments can best be described as "mechanical fire" in formerly fire adapted ecosystems.

STRUCTURAL IGNITABILITY

All new structures in Canyons South must follow wildfire mitigation regulations established by Douglas County, as part of the DC Building Codes for the Wildfire Hazard Overlay District. Current regulations reference **CSFS Publication FIRE-2012-1 Protecting Your Home from Wildfire: Creating Wildfire- Defensible Zones** (formerly **CSU Publication 6.302 Creating Wildfire Defensible Spaces**). These publications may be updated from time to time, as knowledge of wildfire science evolves. Canyons South is planned as a suburban community. It will take a unified community-wide wildfire management approach to minimize impacts from wildfires. Wildfires are a given.

All homeowners, even those well away from zones with heavy fuels, should take measures to protect their homes from embers (fire brands). In addition to ember blizzards, embers can be lofted high into the air and carried up to a mile, placing all homes in the community at risk. Prevention measures can be as simple as regular mowing of high grasses or by periodic irrigation. Landscaping using Firewise plants (CSU Extension Publication 6.305) is recommended in all areas. Junipers and other flammable vegetation are readily ignited by fire brands lofted or blown into the neighborhood.

Susceptibility to wildfire for individual homes is the responsibility of each homeowner. Efforts must be focused on educating owners of their risk.

Summary

Wildfire is one of the few natural hazards that can be mitigated ahead of time. If done properly, fuels management can reduce risk of losses, while enhancing aesthetics and wildlife habitats.

Wildfire Information

Colorado State Forest Service- www.csfs.colostate.edu

Pikes Peak Wildfire Prevention Partners- www.ppwpp.org

1. Black Forest Fire Assessment Report
2. Black Forest Fire Video

Code Red (Douglas County emergency notification system, a.k.a. "Reverse 911") - www.dcsheriff.net

Douglas County homeowners who do not have Century Link land lines are not in the emergency notification system. Voice-Over-Internet-Phones (VIOP), such as Comcast, and mobile lines are not in the system. These must be registered at the sheriff's office web site listed above.

Firewise Communities- www.firewise.org

Ready! Set! Go! (RSG)- www.wildlandfirersg.org

Insurance Institute for Business and Home Safety (IBHS)
Web site: www.disastersafety.org

1. Site has regional guides for retro-fitting homes for wildfire.
2. Wildfire Home Assessment & Checklist
3. View videos of ember ignition lab tests.

Fire Adapted Communities (FAC)- www.fireadapted.org

MUST SEE VIDEOS:

- ***Wildfire! Preventing Home Ignitions*** View at www.firewise.org
- YouTube videos: View at www.youtube.com
  - Type "Melody Lane Fire" in the browser (see a wildfire in real time destroy 5 homes)
  - Type "IBHS, Ember" in the browser (see a home ignited by embers in a laboratory setting)