Grandwood Wildfire Mitigation Plan 2018

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GRANDWOOD 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 Grandwood Planned Development. The property is currently ranch land with no existing residence. **Figure 1** shows a vicinity map of the property location on Higby Road.

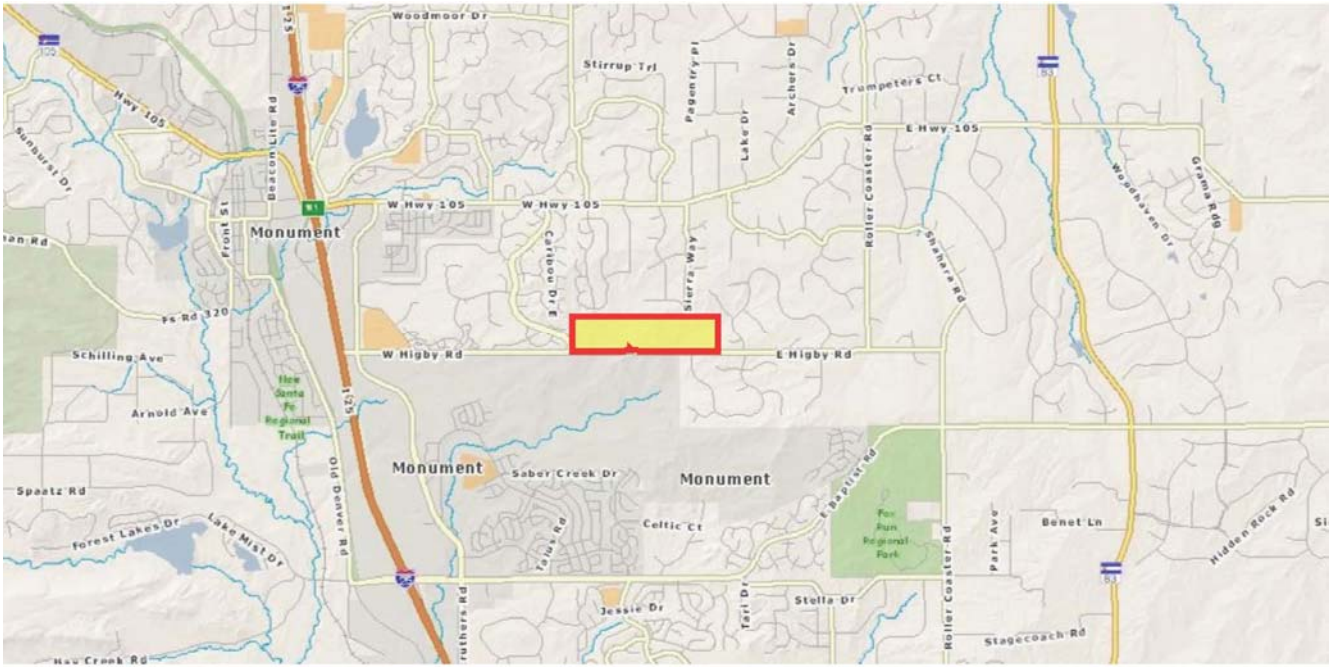

Figure 1. Grandwood Vicinity Map

The 151 acres (m/l) site is proposed for subdivision into 48 residential lots and 5 tracts (see **Figure 2**). Zoning density and acreages are summarized in **Table 1.**

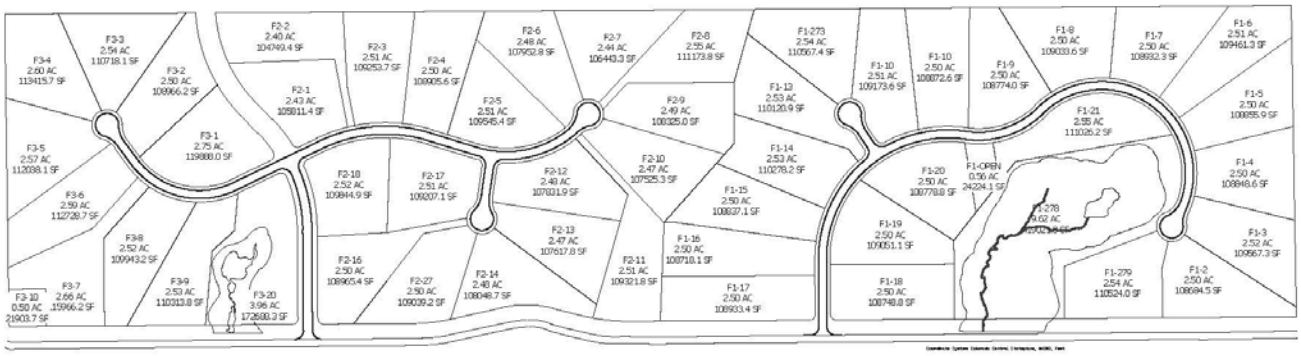

Figure 2. Proposed Plat showing residential planning areas and tracts. (Note: Final plan subject to change. Fire mitigation recommendations will remain the same.)

Table 1. Zoning and Land Use Summary (from PD)

Land Use	Acres	Units	% of Site
Residential	121.05	48	80%
Open Space	16.02	5	11%
Interior and Higby Road R.O.W.	13.93		9%
Other Lands	0		
Total	151.0		100%

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

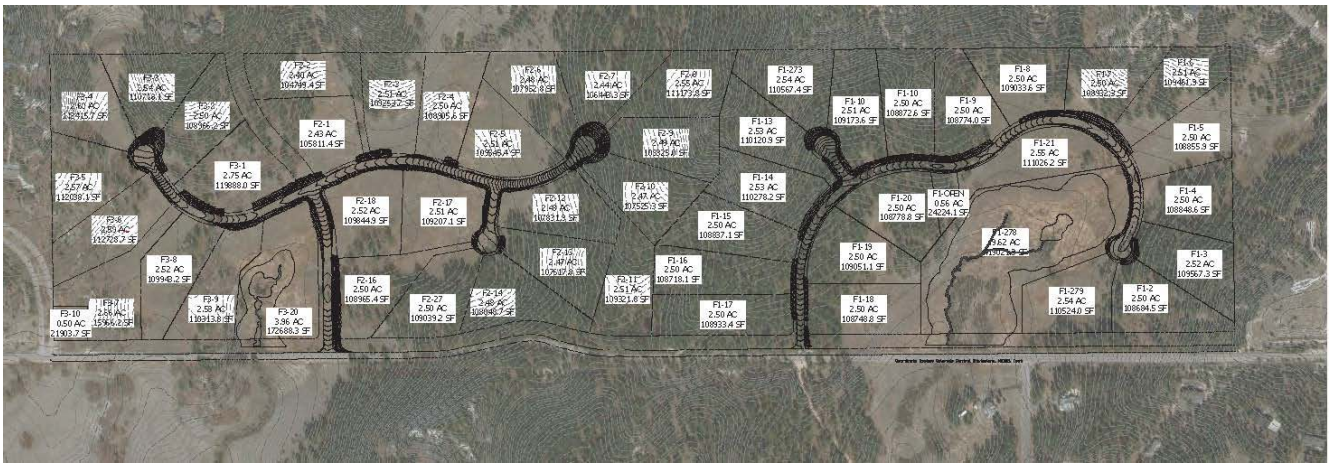

Figure 3. Lot and Road Layout

El Paso County Wildfire Regulations

The subdivision is in the wildland area of El Paso County (EPCO). A Wildfire Assessment and Mitigation Plan is required for approval.

The site is in the Tri-Lakes Fire Protection District, served by the Tri-Lakes Fire Rescue Department (TLFRD). The agency operates under mutual-aid agreements that allow response by the closest available resources. Fire District boundaries are shown in **Figure 4**, with the site outlined in black.

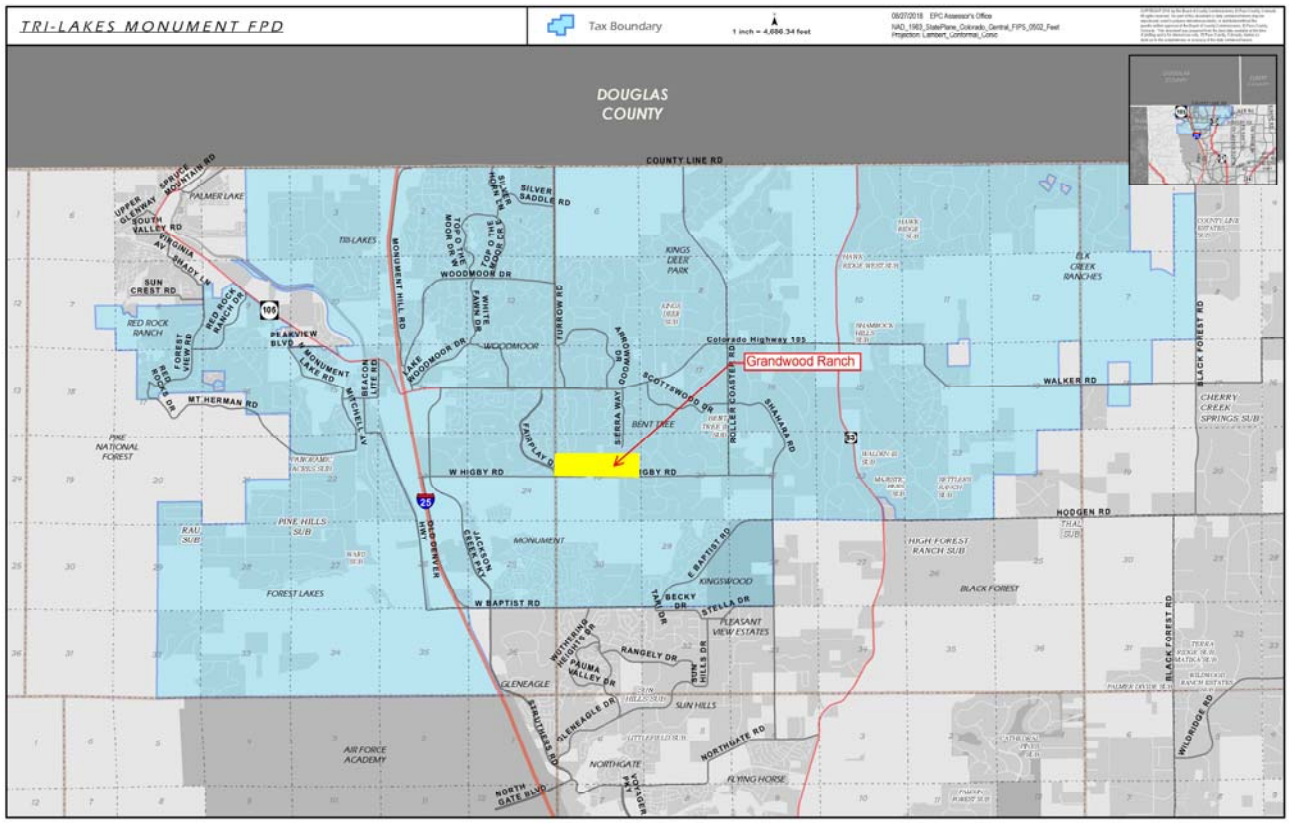

Figure 4. Tri-Lakes Fire Protection District (blue lines). Site outlined in black.

No central community water supply is provided. However, cisterns are proposed on each entry road. All homes will have individual wells and septic systems. It is anticipated cistern - fed hydrant fire flows will meet standards for residential firefighting based on one structure on fire at one time (minimum of 33,000 gallons of water). All cisterns should be constructed with standardized connections as recommended by TRFRD or Colorado Department of Fire Prevention and Control. An all-weather surface turn-out should be provided at each location and able to accommodate a full-size fire apparatus. All fuels around the cistern location should be managed to allow firefighter access during extreme fire behavior.

NOTE: Water provided in cisterns should be considered a structural firefighting resource; not a wildland firefighting water resource. During wildfires, hundreds of homes are threatened at one time, and requires mobility for firefighting apparatus.

Access

The site will be accessed via Higby Road. Two main entrances are proposed. Roads will be constructed following El Paso County Rural Local Road Standards, or as required by El Paso County Engineering standards. A future extension of Furrow Road is proposed in the west half of the site and provide a north ingress/egress route.

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

Any deviation from EPCO standards, may require road rights-of-way to be considered "Fire Lanes", and posted as such, if required by TLFPD. If on-street parking is allowed, parking should be allowed on both sides.

If other emergency vehicles access easements are proposed, these should be in an easement reserved by El Paso County, and the Homeowners Association. A future second emergency egress may connect to Furrow Road. The following items should be considered for all emergency-only egress routes:

1. Any emergency egress, not part of full-time ingress/egress, should be covered by permanent agreements that clearly spell out responsibilities for funding, operation and maintenance.
2. Coordination with TLFRD for any controlled access (example: installation of Knox Locks® for 24/7 emergency responder access).
3. Appropriate signage will be necessary to direct evacuees during emergencies. All signage should meet MUTCD[1] criteria for evacuation routes.
4. Egress ROW width and driving surface should meet minimum requirements for allowance of two full travel lanes, with parking on both sides (36 feet minimum driving surface).

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[1] MUTCD is the "Manual of Uniform Traffic Control Devices, 9th Edition" available at www.mutcd.fhwa.dot.gov

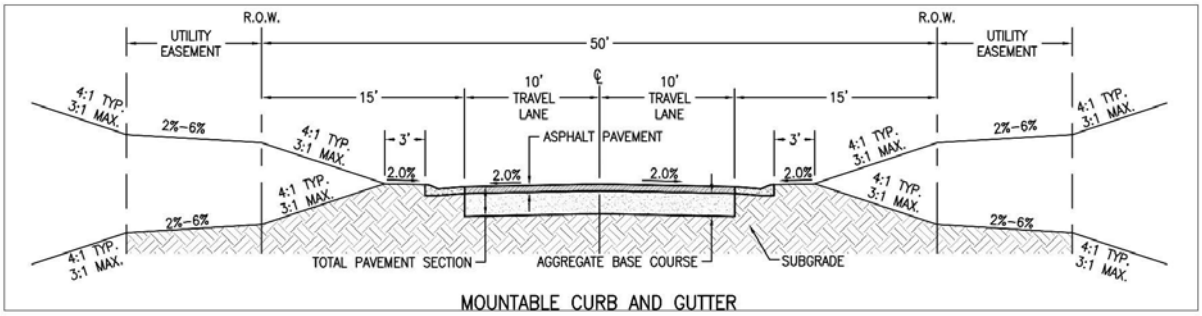

Figure 5. Recommended Minimum Standard for Roadways.

Interior Sprinkler Systems

Residents should consider installation of residential sprinkler systems (RSS) in areas with a single point of access, non-standard (narrow) road widths, or long cul-de-sac lengths. These have not been identified.

If used, interior sprinkler systems should not be considered part of the overall wildfire mitigation for the site, given that wildfire-caused structural ignitions typically occur on the exterior of the home. If RSSs are required, these should be considered as part of the structural fire protection system (based on structural protection standards for one structure on fire at one time, often expressed as an ISO[2] Rating, as opposed to wildland fires in which hundreds of homes are threatened at one time).

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

[2] ISO Rating typically determined by International Organization for Standardization ISO), www.iso.org Often based on water supplies, fire station proximity, department staffing and apparatus available for structural fires.

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

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 Grandwood range from 5 to 40 percent, with an average slope of 15%. Aspect is generally to the south and southwest.

- 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.

- Human caused fire starts pose the greatest risk on a day-to-day basis. Higby Road runs the entire length of the south 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**.

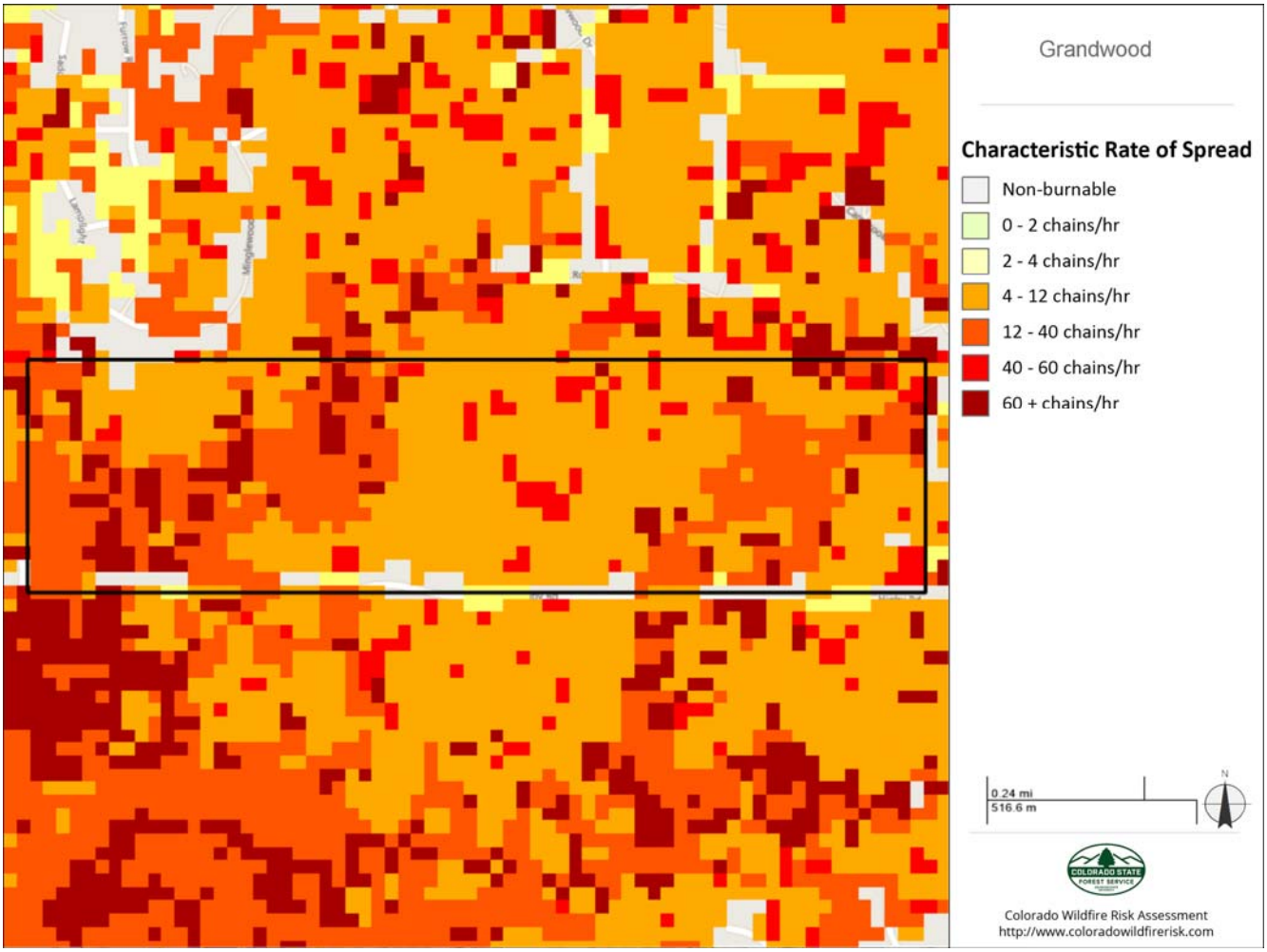

Figure 6. Wildfire Rate-of-Spread Assessment for Grandwood. 1 Chain = 66 feet. Source: Co-WRAP

Current Fuel Conditions

The site is comprised of three fuel types. The first is prairie grass fuels. The second is Gambel oak fuels with scattered ponderosa pines. The third is dense stands of second-growth ponderosa pines. An aerial photo of the site is shown in **Figure 7**. The three main fuel types are shown in **Figure 8**, with oak and pines 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 dead trees removed. Any Russian Olives should be treated as noxious weeds and removed.

Figure 7. Aerial Photo of Site. North is at top of photo. Source: EPCO GIS Mapping Tool

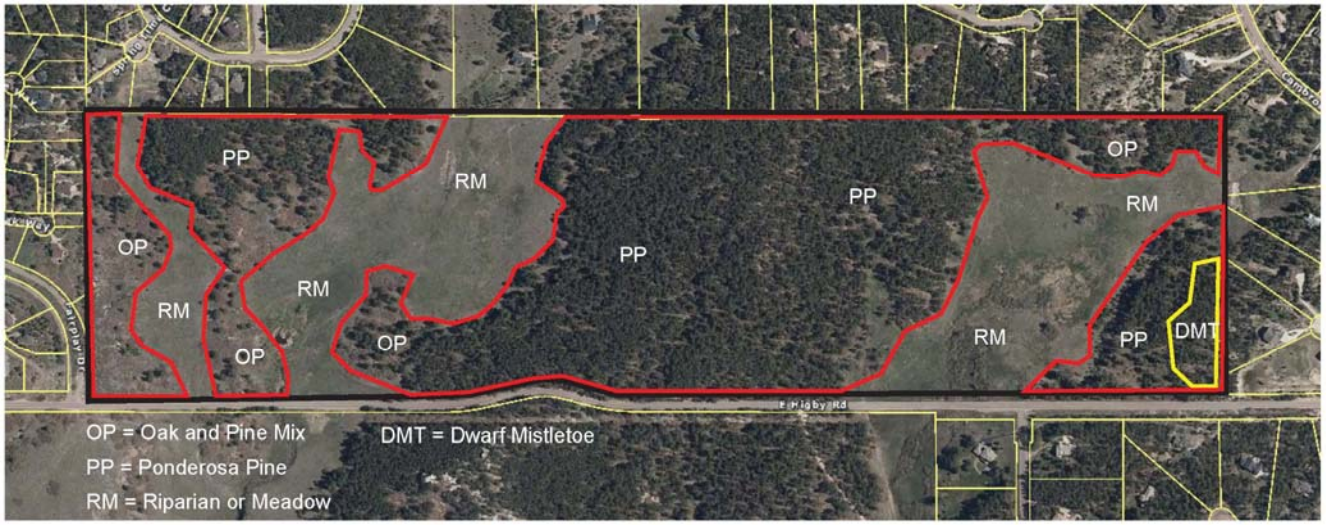

Figure 8. Vegetation Map. North is at top of map. Source: Co-WRAP

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) [4] and USDA Forest Service **National Fire Danger Rating System (NFDRS)** [5]**,** 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). Brush affected by frost and drought kill. 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 to a three-foot height. Recommended clump size and spacing is: Clumps should not be wider than two times their height. Clump separation should be at least 2.5 times their height. Estimated fuel treatment cost is $800 to $1,800 per acre (est. cost based on use of mastication equipment. If hand treated, est. cost can be as high as $2,500/acre).

2. Heavy Forest Fuels, Second Growth Ponderosa Pine Forest (NFDRS Models **U** and **L** FBO Fuel Models **1**and **9)** Vegetation in the study area is dominated by a second-growth ponderosa pine forests with a high percentage of closed crowns, and dense pine understory. Gamble oak present in the understory along meadows.
    a. Prescription for treatment is to remove understory trees that can act as ladder fuels. Areas abutting heavy forest fuels should be thinned to provide 10-20 feet of crown separation, following CSFS shaded fuel break guidelines. Interior forested areas should be thinned to reduce ladder fuel and improve tree separation necessary to promote forest health.

3. 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. Estimated fuel treatment cost is $100 to $220 per acre.

Weather

Weather and climatic events can have a significant impact on wildfire behavior. Two recent wildfires in the region, the Waldo Canyon Fire (2012) and Black Forest Fire (2013), exhibited extreme behavior due to a combination of high winds and extended drought conditions.

The 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

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

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

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 running north to south. Orientation, or aspect, is generally to the south and southwest. 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**.

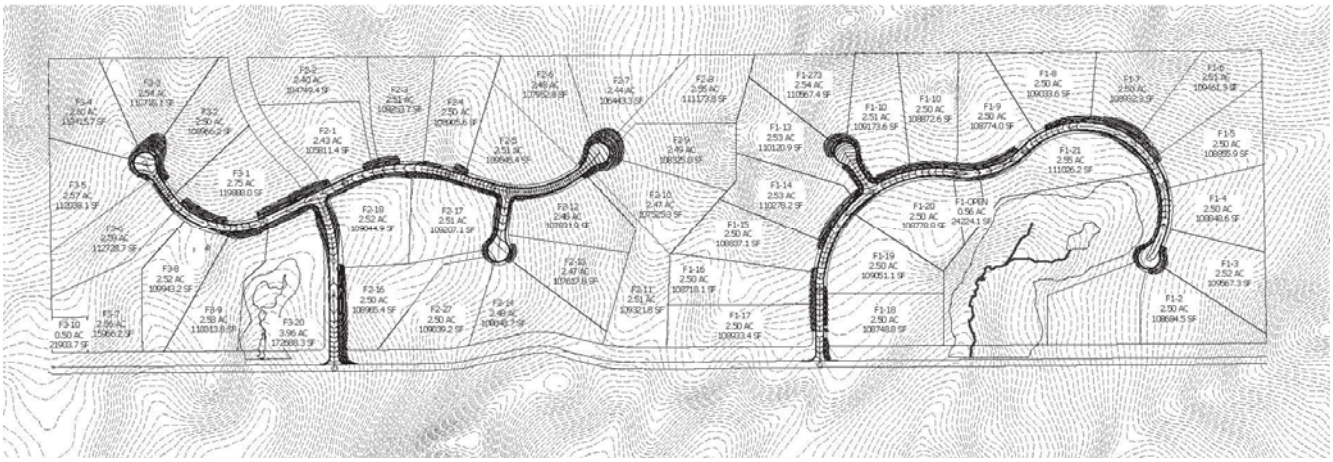


Figure 9. Topography. 5' Contours

Fuel, weather and topography factors, when combined, provide an analysis of wildfire behavior under extreme conditions. This is shown in **Figure 10**.

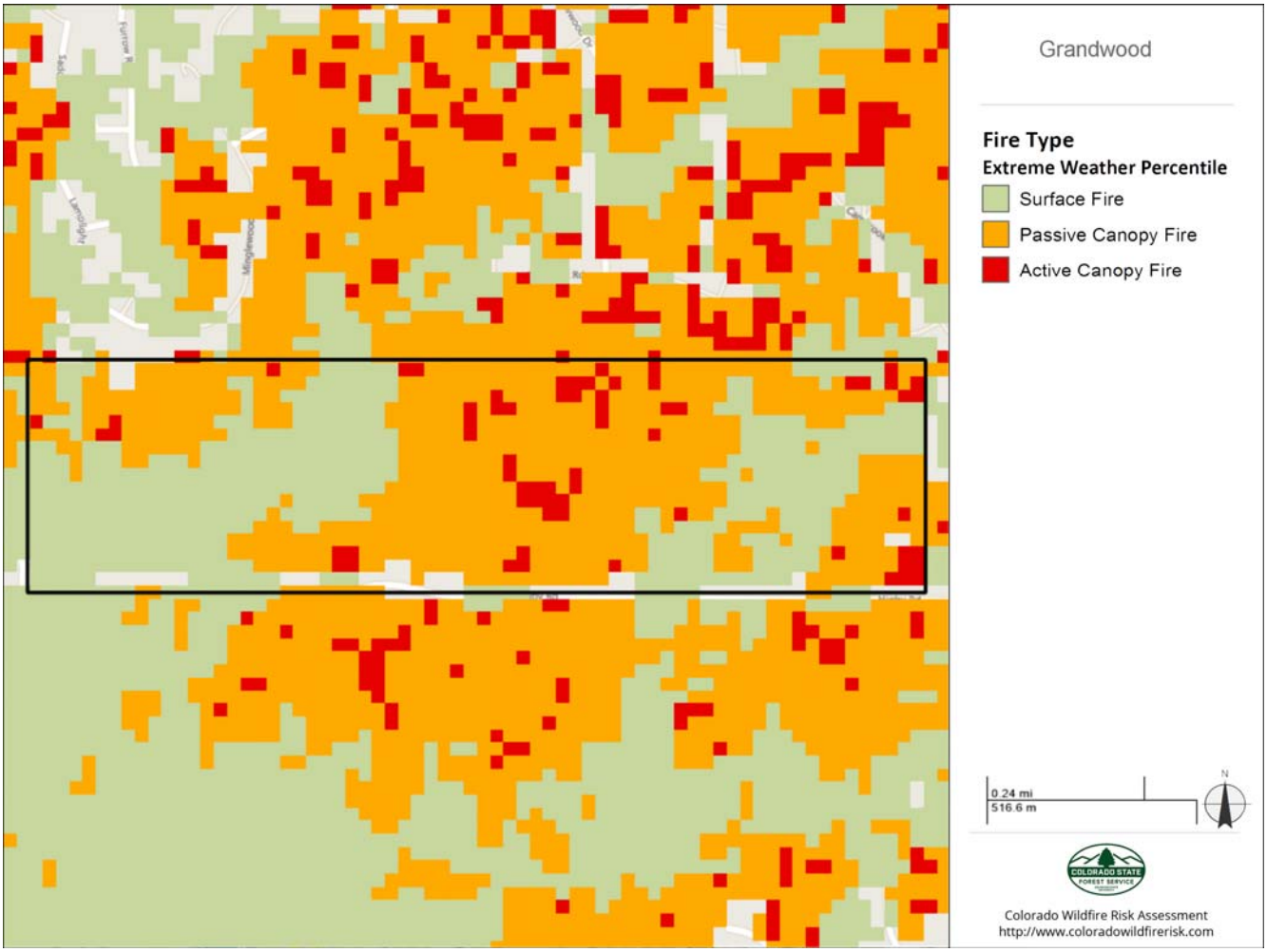


Figure 10. Affects of Extreme Weather. Source: Co-WRAP

Building sites in these zones will require greater setbacks from fuels.

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. Therefore, every home and all fuel treatment areas should be treated to allow for an inevitable fire that will burn at a rate and intensity more consistent with past historic levels.

Firefighting strategies often must rely on the use of fire by fire fighters to protect structures. Terms like “black lining”, burning out, and “backfiring” are becoming more familiar to wildland residents as media coverage increases. The long-range goal of the community should be to treat all forest and brush areas so that use of fire is a viable firefighting tool.

Priorities for Treatment

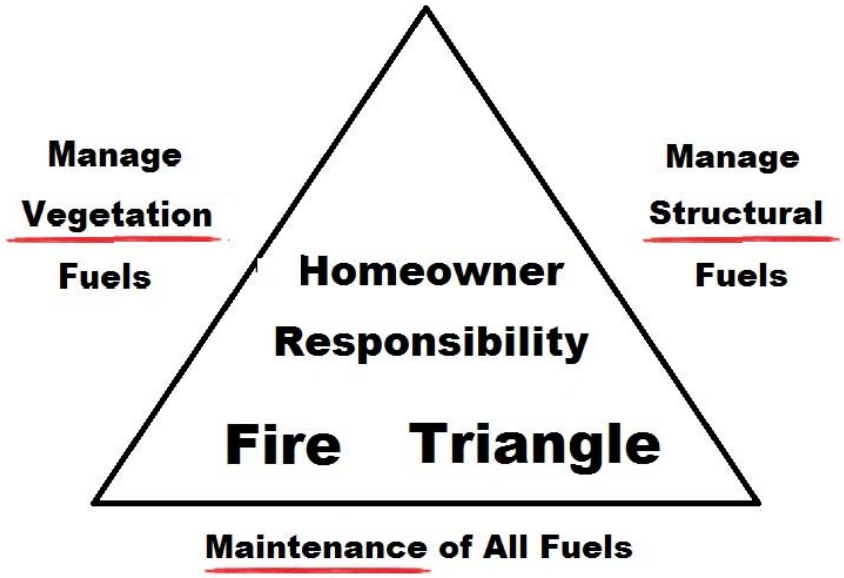
Three main areas are targeted for treatment. These are:

1. Egress/Evacuation Routes- Road rights-of-way are typically 50 feet wide throughout the community. All continuous heavy fuels along roadways should 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. 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- All homes and lots should be treated to a level sufficient to prevent home ignition from both flame impingement and aerial firebrands (embers). This goal will be accomplished primarily through education. Home insurability will also factor into decisions by homeowners to mitigate their homes and properties. Note: All structures must adhere to applicable El Paso County or TLFRD Wildfire Mitigation Regulations at the time of construction. Defensible space or HIZ may be required prior to issuance of a Certificate of Occupancy. The following references should be incorporated into the design guidelines for all neighborhoods in Grandwood:

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)*

Wildfire risk is an on-going exposure. Therefore, maintenance of all structural and landscape fuels is necessary to coexist with wildfire. The following diagram summarizes homeowner responsibility for his or her fuels:



Homeowner Responsibility Fire Triangle

3. Open Spaces or surrounding areas- Areas of heavy native fuels that will affect fire behavior from one lot to the next, or from outside the community. This may include the more remote areas of residential lots well outside the lot owners home ignition zone. Open space trail systems will be part of the community-wide wildfire containment system and should be maintained as pre-existing firelines. Open space treatments will generally follow two guiding documents:

   a. CSFS publication *Fuel Break Guidelines for Forested Subdivisions and Communities*
   b. CSFS publication *6.311 Managing Gambel Oak* (also guideline for other shrub species)

Fuel Treatment Zones

Proposed fuel treatment zones are shown in **Figure 11**. 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-

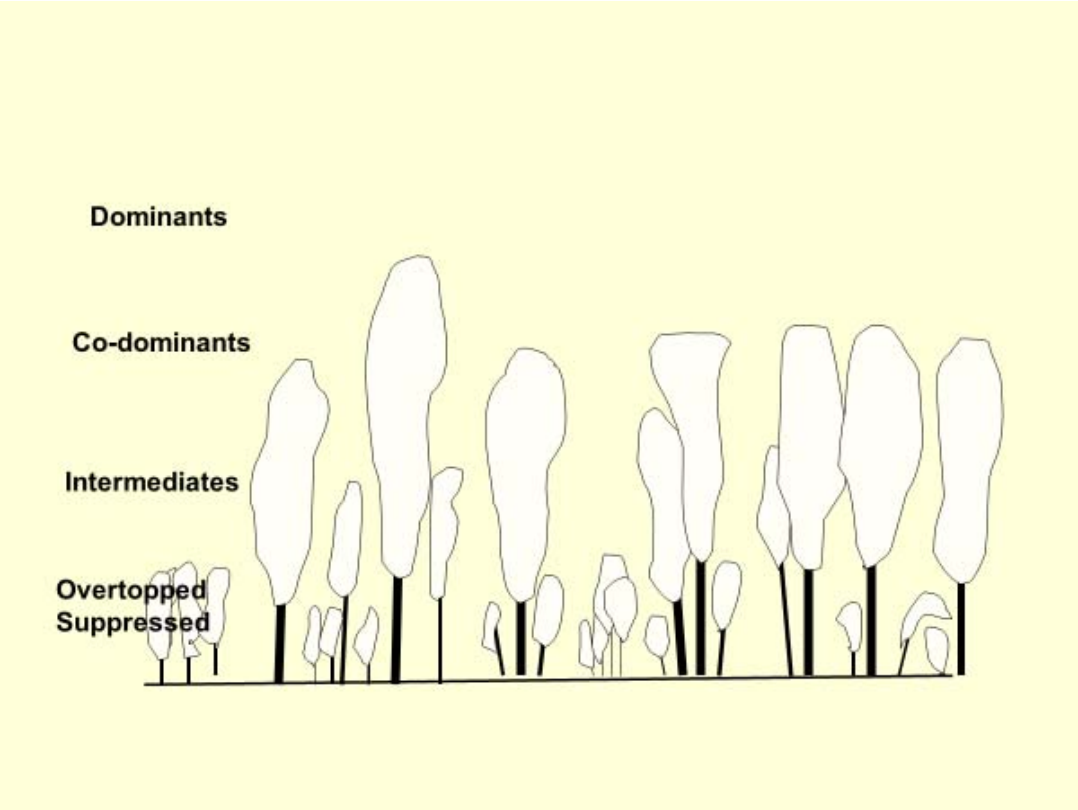
lot grading, road construction and installation of site utilities (drainage, sewer and water lines, detention ponds, etc.). Any area where construction activities remove the vegetation cover should be considered "mitigated". Utility corridors can be used as anchor points for treatment projects. Community wide fuel treatment widths are based on the distance from rear lot lines.

Figure 11. Fuel Treatment Zones as part of land development implementation shown as red (FM) and yellow (SFB) areas.

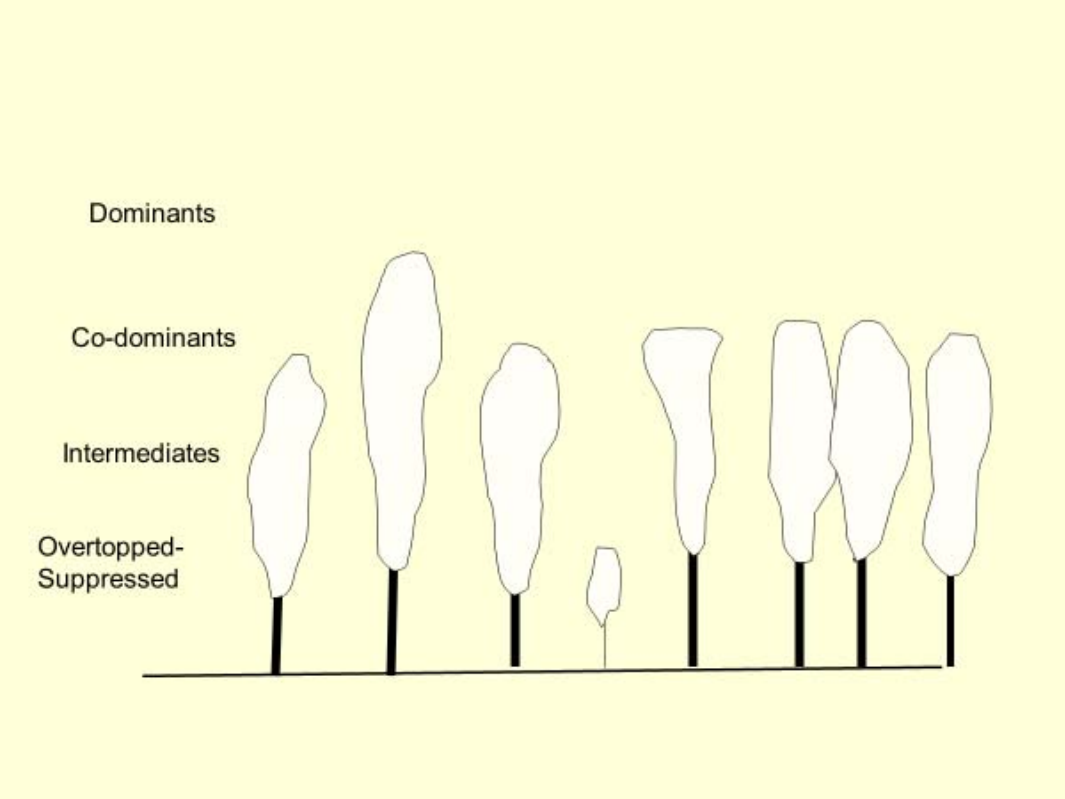
Two main fuel treatment zones are proposed. The first is a community-wide (or phase-wide) zone (shown as yellow areas in Figure 11). The objective is to manage crown fire behavior by implementing "Shaded Fuel Breaks" (SFB) as described in CSFS Publication *Fuel Break Guidelines for Forested Subdivision and Communities*. Tree crown separation is the primary measurement within these zones, along with management of ladder fuels. This guideline primarily addresses forest fuels in coniferous forests. However, the same concepts apply in areas with Gambel oak. Instead of tree or crown spacing, shrub clump spacing will apply as described in CSFS Publication *6.311 Managing Gambel Oak*. These should be an average of 300 feet wide if abutting unmitigated fuels. Guidelines listed above for open spaces should be followed. Suggested project specifications for fuel treatments recommended in this plan are provided in **Appendix B**.

The second zone includes all interior lots with forest or brush fuels or along roads. These will be described as "Forest Management Areas" and are labeled as "FM" on **Figure 11**. It is recommended these areas be treated as one large body of fuels, with no attention paid to interior property lines. Forest health and ladder fuels management are the primary objectives

in these areas. Less emphasis can be placed on tree crown separation so long as overall stand densities are reduced. Typically, “overtopped/suppressed” and “intermediate” trees (see diagrams below) will be removed from the forest canopy due to their poor health or condition. Shrub clump spacing in brush fuels will depend on steepness of the slope below the future structure.



Existing Stand Structure



Recommended Stand Structure

Gambel Oak Treatments to Manage Crown Fire Behavior

Wildfire behavior in Gambel oak can be managed by modifying its horizontal and vertical fuel arrangement. Treatment methods may differ depending on location within the community and relationship to structures or roadways. The first method for community-wide guidelines was covered in the previous section. It is important to note that Gamble oak can be treated to manage wildfire behavior while maintaining its aesthetic qualities.

The photos below show before and after fuel treatments in Gambel oak fuels (shots taken in the Woodlands/Escavera neighborhoods, Castle Rock, Co.). All followed CSFS guidelines.

Before Photo- Heavy Gambel Oak fuels located in the Woodlands "Bowl"

After Photo of the same area. Shrub clump spacing per CSFS 6.311.

It is important to note that community-wide Gambel oak treatments, like those proposed here, had a significant impact on wildfire behavior during the 2012 Waldo Canyon Fire above the Cedar Heights community. Treatment projects implemented by the Colorado Springs Fire

Department in the years preceding the fire allowed safer firefighter access and increased effectiveness of aerial firefighting resources.

The second type of oak treatment is intended for shrub vegetation to be retained within the defensible space of homes or within 100 feet of roadways. It is applicable for retained oak clumps where overall fuel continuity has been interrupted following community-wide treatments. The following techniques can be used to reduce the fuel volume of clumps:

1. Oak clumps with average diameters greater than 5” should be retained as long as horizontal continuity of fuels can be interrupted to meet SFB objectives.
2. Oak clumps retained within defensible spaces or within 100 feet of roadways may be retained if clumps are treated to reduce ladder fuel within the clump. The following may apply:
    a. Overall clump shape is to be retained and crown closure of the oak canopy maintained.
    b. Dead and overtopped stems and branches should be removed. Note: Gambel oak is a “shade-intolerant” plant. Stems within clumps that are shaded by the overhead canopy will die off and should be removed at initial entry into the clump.
    c. Stems located around the perimeter of clumps leaning at less than 60 degrees from horizontal should be removed.
    d. Gambel oak within the driplines of retained pines should be removed.
    e. Loose leaf litter within the clump should reduce. However, a “duff” layer of decomposing leaf litter, 4-6” deep, should retained.
    f. Less combustible plants, such as chokecherry, currant, snowberry, or wild plum, may be retained in the understory of the oak clump if dead stems are removed.
    g. Grass fuels within 20 feet of the treated clump should be kept mown during the wildfire season.

The photos below are examples of how wildfire behavior was modified where oak was retained within the defensible spaces of homes in the Mountain Shadows neighborhood, affected by the Waldo Canyon Fire. In both examples, firebrands started spot fires in native grasses below the homes. Fire remained on the surface, burned under the oak, and stopped at landscape improvements (lawns, retaining walls, paths, etc.) located above the clumps. Little or no firefighter intervention was present.

Example #1 of managed oak fuels, Mountain Shadows, Waldo Canyon Fire

Example #2 of managed oak fuels, Mountain Shadows, Waldo Canyon Fire

No restrictions should be placed on fuel treatment zones that might prohibit future fuels management. Maintenance responsibility of treated 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 owned by a Homeowners Association, maintenance responsibility should be included in the by-laws, covenants, regulations and/or design guidelines. Builders and developers should caution their sales staffs to inform prospective buyers of the on-going need (requirement?) for maintenance of open spaces.

Fuel treatments recommended for implementation as part of the land development construction process are summarized in **Table 2** and **Figure 12** as follows:

Figure 12, Fuel Treatment Units

Table 2, Fuel Treatment Zone Summary

Zone	Acres	Tract or Lots	Prescription
SFB 1	7.6 acres	Perimeter fuel treatment zone	CSFS SFB Guidelines for forest and shrub fuels.
SFB 2	6.0 acres	Perimeter fuel treatment zone	CSFS SFB Guidelines for forest and shrub fuels.
SFB 3	22.7 acres	Perimeter fuel treatment zone	CSFS SFB Guidelines for forest and shrub fuels.
SFB 4	8.1 acres	Perimeter fuel treatment zone	CSFS SFB Guidelines for forest and shrub fuels.

SFB 5	14.2 acres	Perimeter fuel treatment zone	CSFS SFB Guidelines for forest and shrub fuels.
SFB 6	1.7 acres	Perimeter fuel treatment zone	CSFS SFB Guidelines for forest and shrub fuels.
FM 1	7.8 acres	Interior lotted areas	Forest management thinning to promote forest health and manage ladder fuels.
FM 2	1.1 acres	Interior lotted areas	Forest management thinning to promote forest health and manage ladder fuels.
FM 3	30.7 acres	Interior lotted areas	Forest management thinning to promote forest health and manage ladder fuels.
FM 4	1.7 acres	Interior lotted areas	Forest management thinning to promote forest health and manage ladder fuels.
Other	49.4 acres	Prairie or Riparian areas	Seasonal treatment to manage fine fuels and noxious weeds.
Total	**151 acres**		

All acreages in **Table 2** are approximate. Final acreages cannot be determined until final grading and utility plans are completed. These land development activities will reduce the acreage based on over-lot grading, utility construction corridors and detention pond locations.

Wildlife Habitat Enhancement and Wildfire Mitigation

It important to note that all wildfire mitigation proposed in this plan is consistent with both protection and enhancement of wildlife habitats. 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 Grandwood should follow wildfire mitigation guidelines established by El Paso County and TRFRD, as part of Building Codes for the area. At a minimum, builders and developers should follow guidelines per **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.

Insurability of Future Residences

Wildfire is now a concern for insurance companies, given recent losses in what could be described as traditional residential communities. An example is the Mountain Shadows neighborhood impacted by the 2012 Waldo Canyon Fire (City of Colorado Springs). Over 340 structures were lost and numerous other structures suffered smoke damage in what should be considered a typical suburban area.

Insurability will have a market impact on sales. The following will be of concern to builders in Grandwood:

1. Most insurance companies have access to wildfire hazard mapping resources. These often delineate zones from low, to moderate, to high, to severe risk. It is predicted Grandwood will fall within the “high” category.
2. Aerial mapping is generally available to insurers that shows the presence of some level of vegetative fuels.
3. By use of both tools listed above, an underwriter sitting in cubicle in Any City, USA, will make a determination on insurability of the home.
4. ISO rating, as discussed earlier, may be available but is not relied on. This rating is based on resources available to protect one structure on fire at one times. During a wildfire, hundreds of homes are threatened at one time. For example, it is estimated over 2,000 homes were threatened at one time in Mountain Shadows, with multiple structures on fire at one time.
5. Proximity to large bodies of native fuels can impact typical suburban communities. Primary exposure is from embers (firebrands) carried by high winds into the community.

It was estimated that only 10% of the home losses in Mountain Shadows directly abutted native fuels.[6]

6. 100% of future homes in Grandwood will be susceptible to wildfire exposure from embers that can come from either outside or inside the community. These embers enter communities in a horizontal alignment pushed by high wind speeds, parallel to ground surface. Embers don't typically rain down on the community. Delivery is like wind-driven snow, in a blizzard. Wildfire professionals refer to these as "ember blizzards". IBHS research has been demonstrated this under laboratory conditions.[7]
7. Pro-active measures can be taken by developers and builders within wildfire prone areas.

Pro-active Marketing Actions for Grandwood

Wildfire is a manageable risk. Steps can be taken to manage the risk and promote (sell) values afforded by living in Grandwood. Values may include views, proximity to open spaces, natural environment (being close to nature), wildlife viewing and trails. All the wildfire mitigation activities described in the previous section easily fit with these values. Most of the suggestions that follow will primarily affect structural ignitability.

1. Follow all construction recommendations contained in CSFS publication *Firewise Construction: Site Design and Building Material (December 2012)*
2. Follow IBHS recommendations regarding structural ignitibility from ember exposures.[8] These can be incorporated into current building practices with minimal additional costs. Most fall within criteria already established for programs such as LEED® or EnergyStar® that address energy efficiency. Weatherization practices will aid in ember resistance.
3. Incorporate Firewise® building and landscaping guidelines into all homeowner association (HOA) governing documents for all neighborhoods in Grandwood. Sample language is provided in **Appendix A.**
4. Upon establishment of HOAs or sub-HOAs insure inclusion of budget line-items for maintenance of past fuel treatments on common areas or open spaces. Enforcement costs should also be included. Meadow/prairie areas directly abutting lots should be part of any maintenance program.

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[6] Fire Adapted Communities Mitigation Assessment Team Findings: Lessons Learned from Waldo Canyon, 2013. Complete document available at www.fireadapted.org
[7] Institute for Business and Home Safety (IBHS) ember research and videos viewable at www.disastersafety.org
[8] Recommendations from "proposed" IBHS "Wildfire Fortified" program.

5. Obtain Firewise USA® site recognition for Grandwood. This can be done at minimal cost and involves coordination with CSFS and TLFRD. This plan can serve as the required "community assessment". No residents are required at the time of implementation. The guiding document is *Safer from the Start: A Guide to Firewise Friendly Developments*.[9] Note: USAA currently provides a small discount to its customers residing in a Firewise USA® site.
6. Partner with organizations that are raising wildfire awareness. These include:
    a. Rocky Mountain Insurance Information Association (RMIIA)[10]
    b. Colorado Association of Realtors and their Colorado Project Wildfire program.[11]
7. Partner with Tri-Lakes Fire Rescue Department and El Paso County Sheriff's Office to promote community awareness and readiness. Evacuation planning and notifications should be included with all new homeowner packets. Most important is sign-up with 911 reverse-calling (Regional 911 Authority) for emergency notifications.[12] Homeowners without a traditional land-line through CenturyLink will not be in the system. VOIP and mobile phones are not in the system and must be registered with EPSO.

Grandwood is planned as a low-density 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. The shared element, fuel, is the only element that can be managed.

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[9] Document available at www.firewise.org
[10] RMIIA Wildfire and Insurance brochure available at www.rmiia.org
[11] CAR website at www.car.org
[12] Homeowners can sign up at www.elpasocounty.com VOIP (voice over internet provider) numbers must be registered.

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. The ability of future home buyers to obtain affordable insurance in wildfire prone areas is no longer a given. Recommendations in this plan, along with current regulations, will add to marketability of home sites.

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

911 Authority (El Paso County emergency notification system, a.k.a. "Reverse 911")
www.elpasocounty.com

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)

Appendix A

Homeowner Association Governing Documents
And
Recommended Language to Allow
Wildfire Mitigation

Homeowners Association Wildfire Considerations

The following language is intended for placement in appropriate homeowner association HOA documents that may impact future wildfire mitigation actions by individual HOA members or the HOA as a whole.

1. Covenants, Conditions and Restrictions (CC&R's): Covenants typically run with the land and create the obligation to adhere to a set of rules. A major concern is the long-term implementation by the association of measures necessary for public safety. The following items are suggestions for consideration in a special section of the covenants:

    a. Wildfire is a natural part of the ecosystem and requires that homeowners take measures to protect structures and the forest.
    b. All owners have the responsibility to maintain their properties in such a manner to reduce wildfire risk to their properties and adjacent common areas as may be determined by the local fire authority.
    c. Tree cutting is permitted for the purpose of promoting forest health, improving wildlife habitat, controlling insects and diseases, and reducing wildfire risk to homes and the forest. Tree removal shall follow recommendations of a professional forester, natural resource manager or fire authority.
    d. The Association shall establish a Firewise Committee comprised of residents, a local fire official, and a natural resource professional. The ACC may serve in this capacity if a local fire official and natural resource manager are used as part of the site and landscape plan reviews.
    e. The Association shall establish an annual budget and assess its members for the operation and maintenance of common areas, gates, emergency access and wildfire prevention measures.
    f. Access is hereby granted to the Local Fire Authority for the purpose of inspecting and insuring conformance by the Association of maintenance of facilities, common areas, tracts, right-of-ways and easements to insure safe ingress and egress from the community.
    g. Failure to comply with local fire regulations shall be considered a violation of the Uniform Fire Code and enforceable by the Fire Authority through remedies available to it.
    h. Homeowners agree to abide by Firewise guidelines adopted by the Colorado State Forest Service for building, landscaping and living in wildfire prone areas. (CSU Natural Resources Series No. 6.302-6.306 as may be amended from time to time).
    i. Fire may be used as a tool for maintenance of properties and common areas under the direction of the local fire authority. Any use of fire shall require a plan and permit from the fire authority.

2. By-laws: No language should be included that prohibits reasonable wildfire mitigation. Consider using CCIOA statute regarding wildfire mitigation that allows an owner to mitigate, while allowing for some level of HOA controls. See C.R.S. language below.
3. Design Guidelines: Usually, an Architectural Control Committee (ACC) is establish under the CC&R's. The ACC is often the enforcer of rules established by the CC&R's and Design Guidelines. This can be an important document for insuring Firewise development.
    a. All structures shall follow Wildfire Mitigation or Firewise guidelines established by the Colorado State Forest Service or other Emergency Service Providers. Alternatives may be considered If deviating from established guidelines. Technology, information and building materials are constantly evolving that may allow for suitable alternatives.
    b. Forest Management activities shall be done under the direction of a professional forester, natural resources manager, or trained fire professional. Such plans shall be submitted to the ACC for its approval, which shall not be unreasonably withheld.
    c. Wildfire mitigation activities shall include provisions for forest health, wildlife habitat protection, aesthetics, privacy, and protection of property values.
    d. Provisions for maintenance of the defensible spaces, structures and driveways shall be included in building plans, site plans and landscape plans. The "Home Ignition Zone" should be addressed in all plan submittals.

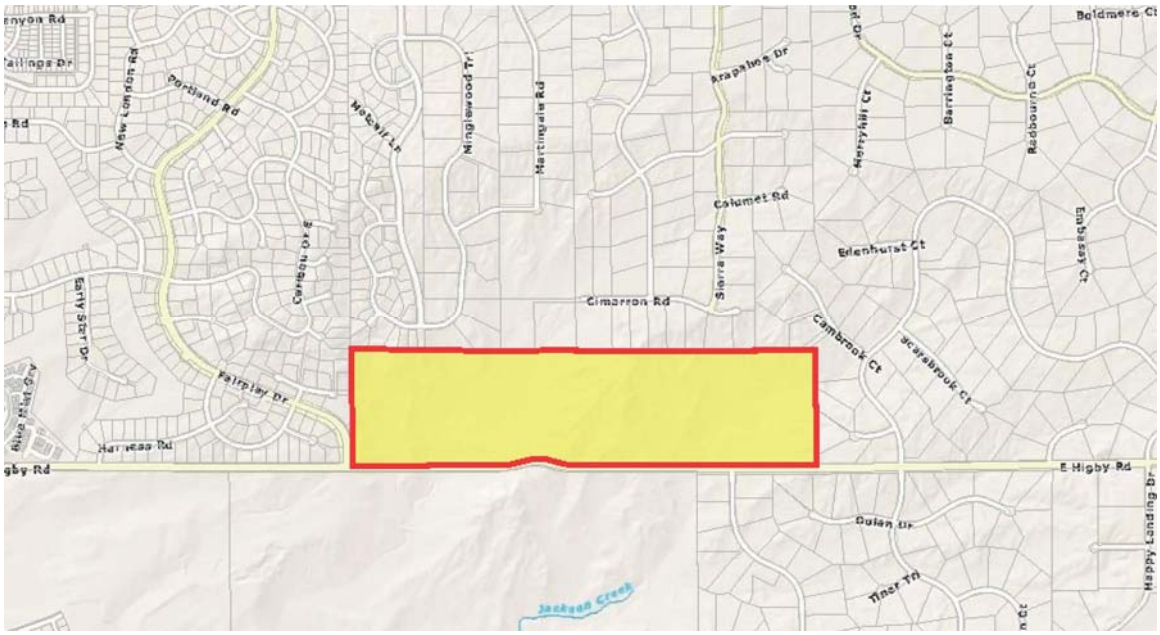
The following is an excerpt from the "**Homeowner Bill of Rights**", an amendment to the Colorado Common Interest Ownership Act. This section references a homeowner's right to implement wildfire mitigation. It is sometimes referred to as SB-100.

C.R.S 38-33.3-106.5 (a.k.a. SB-100) states*: " Not withstanding any provision in the declaration, bylaws, or rules and regulations of the association to the contrary, an association shall not prohibit any of the following: (e) The removal by a unit owner of trees, shrubs, or other vegetation to create defensible space around a dwelling for fire mitigation purposes, so long as such removal complies with a written defensible space plan created for the property by the Colorado State Forest Service, an individual or company certified by a local government entity to create such a plan, or the fire chief, fire marshal, or fire protection district within whose jurisdiction the unit is located, and is no more extensive than necessary to comply with the plan. The plan shall be registered with the association before the commencement of work. The association may require changes to the plan if the association obtains the consent of the person, official or agency that originally created the plan. The work shall comply with applicable association standards regarding slash removal, stump height, revegetation, and contractor requirements."*

Appendix B

Forest Management and Fuel Treatment Project
Sample Specifications

EXHIBIT A
Forest Management Unit
Grandwood Property
Higby Road



Vicinity Map of the Project Area.

Project Area in redlined area, XXX acres

EXHIBIT B
Scope of Work (Specifications)

Fuels and Forest Management Project (____ acres)

Access to the unit shall be from Higby Road and existing interior roadways, unless other access points are approved. Equipment storage and material yarding shall be at agreed upon locations within the treatment area. The Contractor shall use its best efforts to minimize conflicts with users of the county roadway. Appropriate warning signage should be used as warranted.

XXXX acres will be thinned within the 152 acres shown on the map. Approximately XXX acres of the unit are openings and scatted timber areas that will not require treatment. The boundaries of this unit are flagged where no fence, meadow or prior treatment is present. Additional marking can be provided upon request.

This treatment area contains ponderosa pine timber. Trees to be removed may be marked with timber marking paint, if necessary. Standing dead trees, earmarked for retention as wildlife trees, shall be flagged with yellow flagging. Understory vegetation shall be removed at least ten feet from their bases.

Harvestable material will belong to the contractor for utilization. If logs are to be skidded, specific corridors must be approved by the project forester. If removed for harvest, volumes (cubic feet or board feet) must be reported to the project forester.

Special Conditions: Traffic control measures may be required to include warning signs and traffic cones. Personnel operating in the right-of-way shall wear appropriate personal protective equipment. Coordination with property owners adjacent to right-of-way is required. Old fences exist on the property. These should be identified prior to treatment. The Contractor is responsible for location of any above-ground and/or below-ground utilities that could be damaged by its equipment.

EXHIBIT B
Additional Conditions

Additional Conditions:

- Equipment storage and material yarding shall be at agreed upon locations within each Treatment Area.
- Contractor shall use appropriate signage and traffic cones when operating along roadways and accessing the Property.
- Contractor is responsible for location of any above or below ground utilities that could be damaged by its equipment.
- Old fences exist on the Property and should be identified prior to treatment.
- Contractor shall operate its equipment in a safe manner to protect its employees, the public and any adjoining properties from harm.
- Contractor shall use its best efforts to minimize soil disturbance from its activities.
- Contractor shall use its best efforts to minimize damage to the Property. Contractor shall not create new roads or trails and shall not grade existing trails or roadways, unless approved by the Forester.
- Disturbed areas shall be reseeded using an appropriate wildland grass seed mix approved by the Forester.
- Contractor shall clean its equipment before entering the Property and shall use care while on the Property to minimize the spreading of noxious weeds from one area to another.
- Prior to commencement of the Work, Forester will provide initial training for Contractor's employees.

APPENDIX I
to
EXHIBIT B

Methods of Treatment

Treatment shall be by a combination of hand cutting and mechanical treatment (mastication and/or chipping). Both small and large mastication equipment may be used. All hand cut materials shall be removed, masticated, chipped, or stacked for wood utilization. Chips may be placed back on the site, but shall not be concentrated more than four inches (4") in depth. Masticated materials may be left in place. However, concentrations of material shall be distributed evenly in the treatment area and no deeper than six inches (6"). Tree stumps shall not be taller than 2" above ground level, measured on the uphill side and shall be cut flat. Pruning cuts shall not damage branch bark collars or the main trunk.

Conifers (ponderosa pine) should be pruned to a minimum height of ten (10) feet above ground level. However, no more than 1/3rd of live crown is to be removed. All pruning cuts shall be made outside of the branch collar. No "flush cuts" are permitted.

More fire-resistant vegetation shall be retained where possible. These include choke cherry, plum, currant, thimbleberry, hawthorn, serviceberry, mountain maple, willow, cottonwood and snowberry.

Tree marking paint may be used to indicate tree removals. Blue (or agreed upon color) flagging will indicate unit boundaries. Other flagging may be used as needed to clearly delineate treatment areas as necessary.

One fuel type is found in the forest management areas: ponderosa pine forest with dense pine regeneration and/or Gambel oak in the understory. The following criteria shall be followed:

Forest Management (FM) Areas

1. Crown separation of five to ten (5-10) feet between crowns of trees will be implemented except in areas where trees may remain in clumps. If clumps of pines are to be retained, an average of twenty (20) feet of crown separation will be the target crown spacing between clumps, with minimum of 15 feet. Clumps may contain a minimum of two and a maximum of seven trees.
2. Ladder fuels under retained pines shall be removed beyond the dripline.
3. Transplantable trees may be retained in openings but must be at least ten feet from the dripline of retained mature pines. Exceptions may occur where all ladder fuels are removed around retained pines and

transplantable trees, and ladder fuels have been pruned to a height three times the understory vegetation.

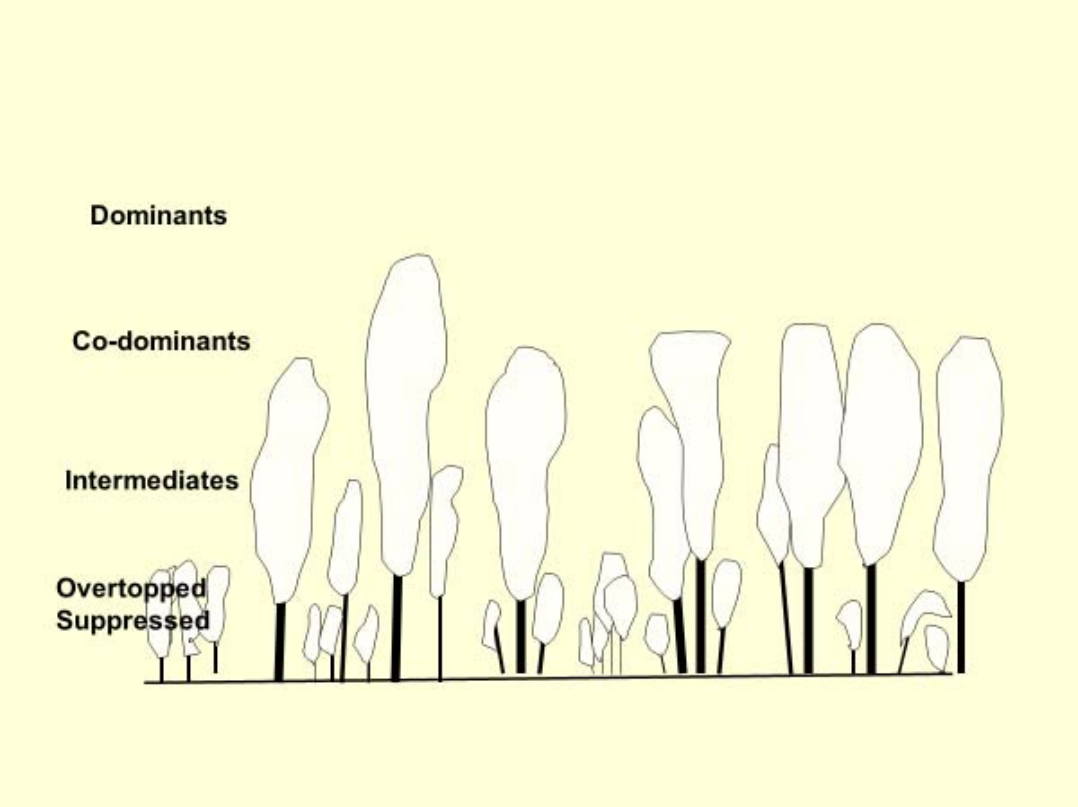
4. Target basal area is between 60 sq. ft. per acre and 80 sq. ft. per acre with an overall average of 70 sq. ft. per acre.
5. Gambel oak clumps should be separated following clump separation guidelines per *CSFS Publication 6.311, Managing Gambel Oak*.
6. Trees along the Higby Road fence line are to be removed where possible.
7. Wildlife trees may be retained in the fuel treatment areas. If encountered, these should be at least 14 inches DBH (diameter breast high, 4.5 feet above ground level measured on the uphill side). Brush shall be cleared away from around the tree's trunk a minimum distance of 10 feet.
8. NOTE: Height to Diameter (H:D) ratios, in some areas, are well in excess of 50%. Opening stands of this nature will result in significant windthrow and breakage. Dominants and Co-dominants shall be targeted for retention. Crown separation may be reduced to five (5) feet or less, so long as the target basal areas are met. Overtopped and suppressed trees are targeted for removal.
9. Pockets of low-quality pines damaged by snow loading shall be treated as ladder fuels and removed.
10. Preferred method of treatment is by "mastication." Pines greater than 10 inches DBH should be harvested for use as firewood or sawlogs. This may be stockpiled in large openings within the property. All felled or cut materials, not retained by the ownership, shall be removed, chipped or masticated within six weeks of cutting to reduce Ips engraver beetle populations.
11. Sapling and pole size pines shall be retained as future spadable trees.
12. If areas of highly erodible soils are encountered, these should be avoided where possible.
13. The diagrams below show existing and proposed stand structure.

Shaded Fuel Break (SFB) Areas

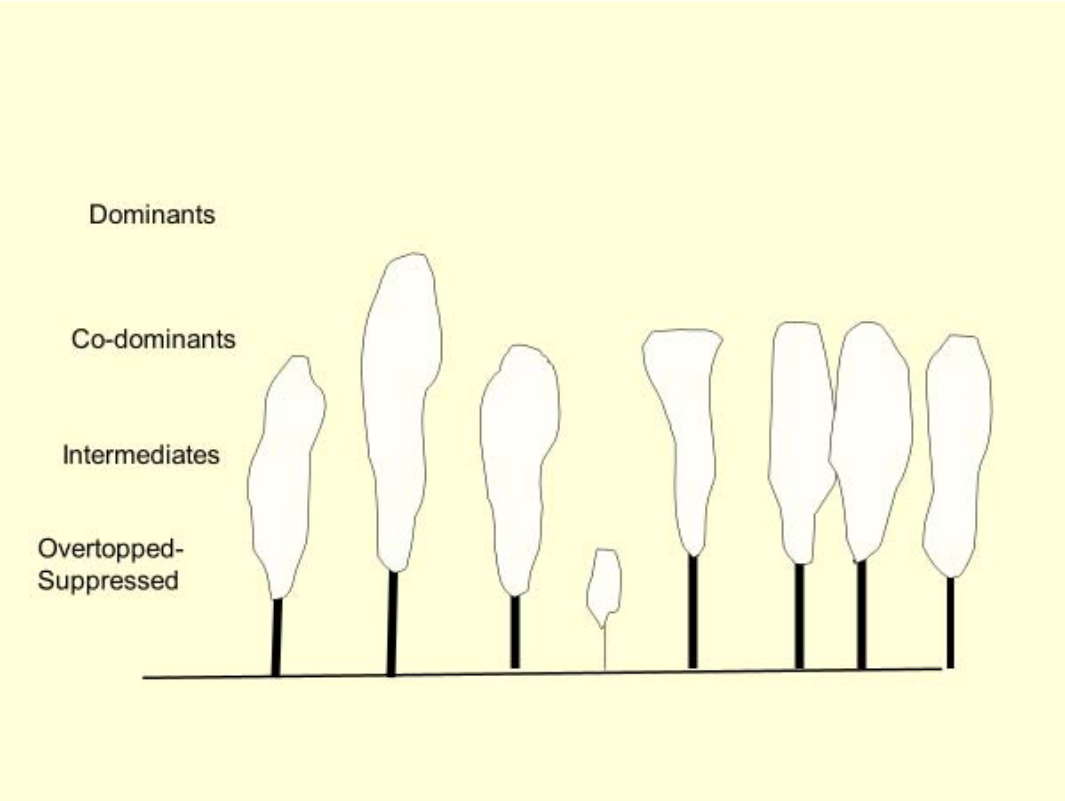
The following criteria shall be followed to modify crown fire behavior:

1. Crown separation of ten (10) feet between crowns of trees will be implemented except in areas where trees may remain in clumps. If clumps of pines are to be retained, an average of twenty (20) feet of crown separation will be the target crown spacing between clumps, with minimum of 15 feet. Clumps may contain a minimum of two and a maximum of seven trees.
2. Ladder fuels under retained pines shall be removed beyond the dripline.
3. Transplantable trees may be retained in openings, but must be at least ten feet from the dripline of retained mature pines. Exceptions may occur where all ladder fuels are removed around retained pines and transplantable trees, and ladder fuels have been pruned to a height three times the understory vegetation.

4. Target basal area is between 40 sq. ft. per acre and 60 sq. ft. per acre with an overall average of 50 sq. ft. per acre.
5. Trees along the Higby Road fence line are to be removed.
6. Gambel oak clumps shall treated following shrub clump guidelines per CSU Publication 6.311, Managing Gambel Oak. Mastication is the preferred treatment method.
7. Gambel oak within the driplines of retained pines shall be removed.
8. Oak clumps with average diameters greater than 5" should be retained as long as horizontal continuity of fuels can be interrupted to meet SFB objectives.
9. Oak clumps retained within 150 feet of roadways may be retained if clumps are treated to reduce ladder fuel within the clump. The following may apply:
    a. Overall clump shape is to be retained and crown closure of the oak canopy maintained.
    b. Dead and overtopped stems and branches should be removed.
    c. Stems located around the perimeter of clumps leaning at less than 60 degrees from horizontal should be removed.
10. Wildlife trees may be retained in the fuel treatment areas. If encountered, these should be at least 14 inches DBH (diameter breast high, 4.5 feet above ground level measured on the uphill side). Brush shall be cleared away from around the tree's trunk a minimum distance of 10 feet.
11. NOTE: Height to Diameter (H:D) ratios, in some areas, are well in excess of 50%. Opening stands of this nature will result in significant windthrow and breakage. Dominants and Co-dominants shall be targeted for retention. Crown separation may be reduced to five (5) feet or less, so long as the target basal areas are met. Overtopped and suppressed trees are targeted for removal.
12. Pockets of low-quality pines damaged by snow loading shall be treated as ladder fuels and removed.
13. Preferred method of treatment is by "mastication." Pines greater than 10 inches DBH should be harvested for use as firewood or sawlogs. This may be stockpiled in large openings within the property. All felled or cut materials, not retained by the ownership, shall be removed, chipped or masticated within six weeks of cutting to reduce Ips engraver beetle populations.
14. Sapling and pole size pines may be retained as future spadable trees if crown separation guidelines are met.
15. If areas of highly erodible soils are encountered, these should be avoided where possible.



Existing stand structure



Proposed Stand Structure