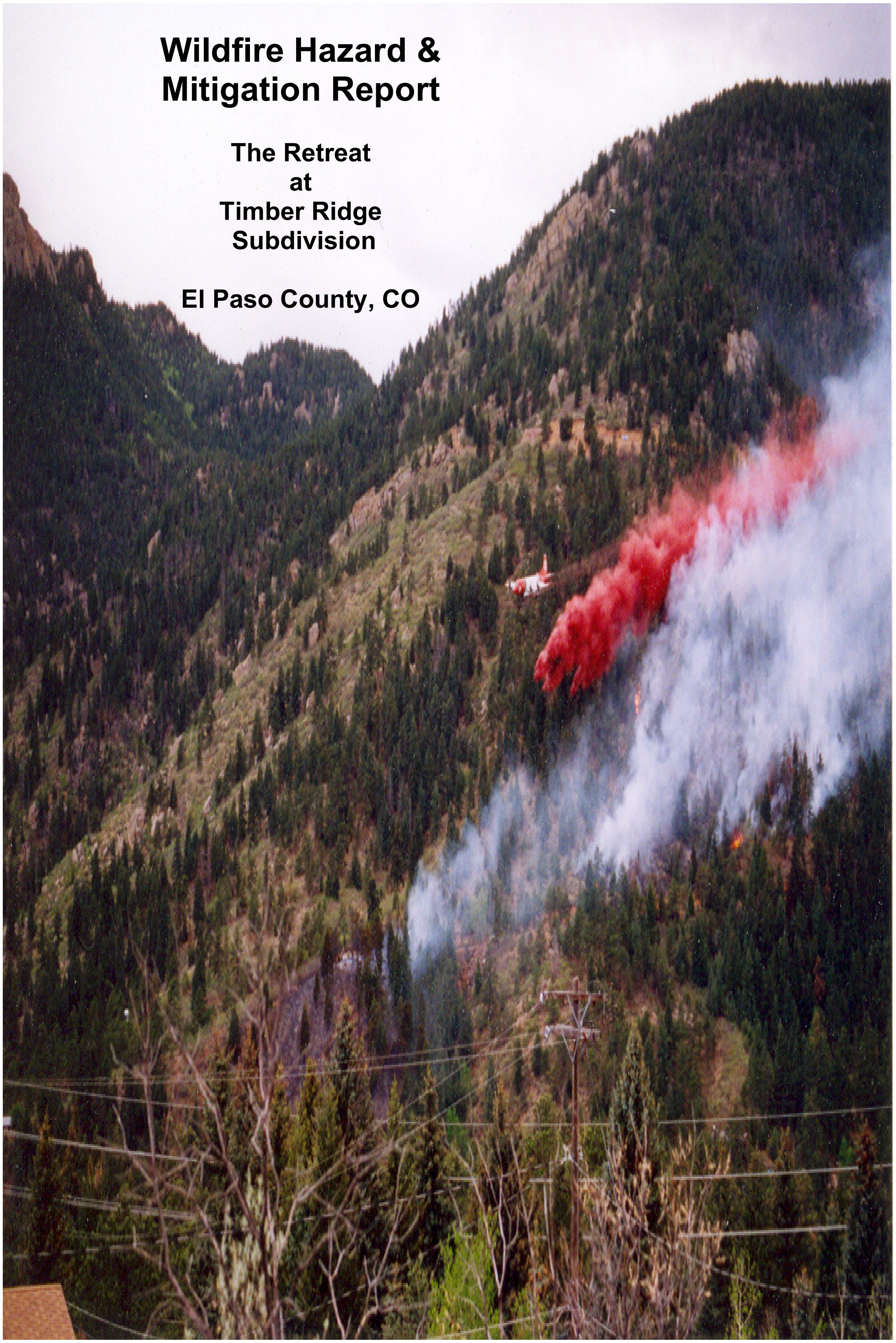
Wildfire Hazard & Mitigation Report

The Retreat at Timber Ridge Subdivision

El Paso County, CO



Fire Hazard Evaluation Report

For the

Retreat at Timber Ridge Subdivision

El Paso, CO

Prepared for: **TimberRidge Development Group, LLC**
2138 Flying Horse Club Dr.
Colorado Springs, CO 80921
(719) 592-9333

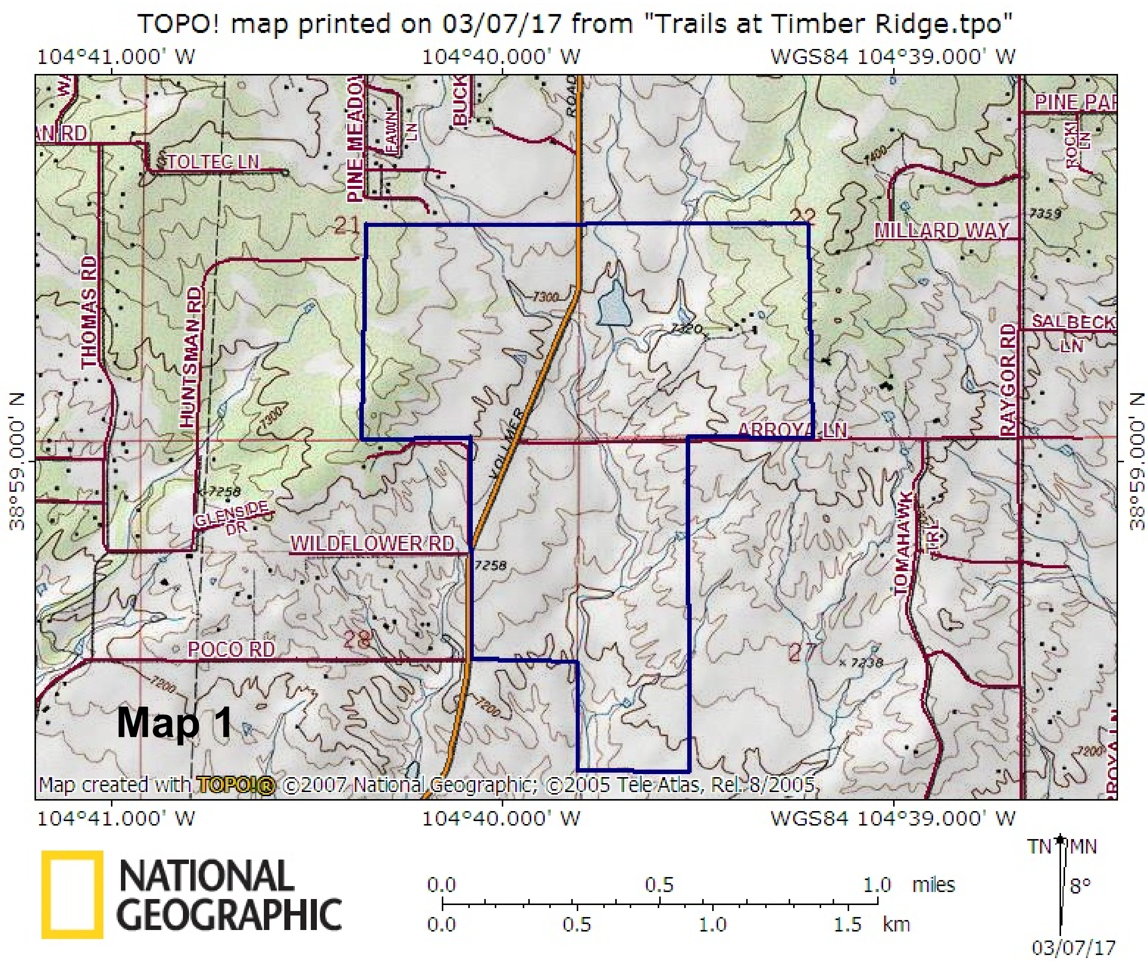
Prepared by: **Stephen J. Spaulding**
Consulting Forester
P.O. Box 96
Green Mountain Falls, CO 80819
(719) 641-0769

Warning and Disclaimer: The degree of protection from wildfire hazards intended to be provided by this plan is considered reasonable for planning purposes. It is based on accepted forestry and fire science methodology. This plan is intended to aid the Retreat at Timber Ridge subdivision in minimizing the dangers and impacts from wildfire hazards. Fire is a natural force and an historical part of the ponderosa pine and native grassland ecosystems. Therefore, unforeseen or unknown wildfire conditions, natural or man-made changes in conditions such as climate, vegetation, fire breaks, fuel materials, fire suppression or protection devices, and ignition sources may contribute to future damages to structures and land uses even though properly permitted within designated wildfire hazard areas.

General Description

The Retreat at Timber Ridge is a private residential development planned for the Black Forest area in northern El Paso County, Colorado. The development plan proposes the subdivision of approximately 3300 acres into 461 lots with structures.

The property is located along Vollmer Road in unincorporated land (see Map 1 below). The parcels included under this report are listed with the following El Paso County Assessor's Schedule Numbers, 5200000398, 5200000397, 5222000024, 5228000019, 5227000003, 5227000001, 5227000004, 5200000393 (Parcel 1 West), 5200000394 (Parcel 2 West) and 5222000023 (Parcel 1 East).



The subject property is partially bounded to the north and northeast by the Forest Gate subdivision and Ranch 51 to the west. The Indian Wells subdivision is located approximately 0.4 miles to the east.

The northern portion of El Paso County area does have a wildfire history. The Black Forest Fire burned in June of 2013. It would become the most destructive wildfire in Colorado's history. Over 14,000 acres were burned and upwards of 500 structures were destroyed.

More recently, the Milne fire burned 3,275 acres of grassland. While this fire was not in the immediate vicinity of the proposed subdivision, it is applicable. This fire burned on February 27, 2017. This was the result of a prolonged period of dry and unseasonably warm weather with high and erratic winds during the fire. incident.

Wildfire Hazard

Based upon the Wildfire Hazard Area Map (WHAM) developed by the Colorado State Forest Service in 1974, the site of the proposed development of 'The Retreat at Timber Ridge' subdivision contains a low hazard for meadows and both a medium and severe hazard rating for trees with ponderosa pine being the primary forest type (see Map 2). While this risk rating is forty-three years old, environmental change occurs very slowly in the Rocky Mountain West, so this rating still provides a relative accurate summary for the property.

The Colorado Wildfire Risk Assessment Portal (CO-WRAP) was recently developed by the Colorado State Forest Service in 2012. The primary goal stated for this project is to "provide a consistent, comparable set of scientific results to be used as a foundation for wildfire mitigation and prevention planning…" This resulted in a web based mapping tool that provides wildfire risk assessment for Colorado. This tool was also used to assess the relative wildfire risk to the property.

Within the CO-WRAP mapping tool, wildfire risk represents "the possibility of loss or harm occurring from a wildfire." The wildfire risk for the subdivision is indicated as having a low to lowest risk (see Map 3).

The wildfire threat is defined as the likelihood of an acre burning. Within the CO-WRAP, the proposed development area is rated at the lowest wildfire threat level.

Based upon the fact that the Black Forest Fire burned through a similar fuel type in 2013, the wildfire threat analytic could be perceived as incorrect. In addition, the recent Milne fire burned rapidly in a low threat grass fuel model. As there are currently a low number of residential structures present, the risk of loss would appear to be relatively correct.

However, a disclaimer is provided as to the use of this tool. It is best used for broad landscape risk assessment and is not appropriate for site specific analysis such as the Retreat at Timber Ridge subdivision. So in order to properly assess the wildfire hazard of the property, a field inspection was undertaken. This was performed on February 16th with forest inventory plots measured as part of the forest management plan requirement.

The majority of the subdivision is composed of grassland which has a low hazard. This is supported by the effects of grazing by cattle and a local pronghorn herd

The forest stand structure within the proposed development has remained relatively constant since the original WHAM assessment. It has slowly expanded in area as pine seedlings invade the grassland along the forested perimeter. There was very little medium to large dead fuel observed on the forest floor. The dead fuel load is composed of a compressed long needle layer, small twigs (<1" diameter) and dead grasses. This level of fuel would not contribute to a sufficient dead fuel load to ignite the live green canopy.

Photo 1. This is a view of the forest stand in the northeast portion of the proposed subdivision. Note the relative absence of dead fuel on the forest floor. The needle litter layer is compressed and not readily available to burn.

Additionally, the forest that was designated as severe does not appear to have the density to be considered a severe wildfire hazard. So in an area of transition from forest to grassland, this could have been considered as medium. Historical grazing activity has suppressed the development of the ponderosa pine regeneration which would normally lead to increased availability of ladder fuel in the forest stand.

Upon completion of the field inspection, the current wildfire hazard within the forest stand should be lowered from severe and considered as moderate. The grassland component is still considered as having a low hazard.

Wildfire Behavior

This section takes into account the role of the three major components that affect wildfire behavior; fuels, topography and weather. These three components will be examined in relation to the 'The Retreat at Timber Ridge' development plan.

Fuels

The area was field checked and the results of the WHAM and the CO-WRAP were modified based upon the observed fuel models on the property. The USDA – Forest Service Intermountain Forest and Range Experiment Station in Ogden, Utah, developed these fuel model descriptions. They are used as aids in estimating fire behavior (see Appendix B).

The criteria for choosing a fuel model reflects that a wildfire will burn in that fuel type which best supports that fire. There may be more than one fuel model represented on any given area of land. In addition, current and expected weather conditions will influence the condition of these fuels.

Photo 2. ***This photo depicts a view from the southeast corner of the subject property to the north along the boundary fence. Note the effect from a lack of grazing on the grassland on the opposite side of the fence.***

The grassland areas are best described under Fuel Model 1 (see Appendix B). "The fine, very porous and continuous herbaceous fuels that have cured or are nearly cured govern fire spread. Fires are surface fires that move rapidly through the cured grass. Very little shrub or timber is present, generally less than one-third of the area." It can be further refined to GR 1 - Short, Sparse Dry Climate Grass (Dynamic) using the models developed by Scott & Burgan (2005). This fuel type encompasses approximately 87% of the total area.

Interestingly, if grazing is halted, the grass fuel model will change, as is evidenced by the property to the east (see Photo 2). This may change the fuel model to GR4 -Moderate Load, Dry Climate Grass. The impact of this fuel is that under moderate wind speeds, about 15 m.p.h., the rate of spread can be upwards of 400 - 500 chains per hour (1/2 mile per hour ±). This is the type of wild fire spread currently being witnessed in eastern El Paso County and other areas in the Great Plains.

The remaining forested area (13%) can be described as Fuel Model 8. "Slowly burning ground fires with low flame lengths are generally the case…"

It can be further defined as TL1 – Low Load Compact Conifer Litter. In this fuel model the primary carrier is compact litter such as needles with a depth of 1-2 inches.

In this instance, the forest along the west boundary lies in the transition from forest to grassland. It would be expected that any crown fire, originating from the west, would drop to the ground. As the fire moves east into the ponderosa pine reproduction, there may be pockets of readily available fuels that may result in longer flame lengths that may be resistant to control. This should cease once a fire reaches the grassland fuel model.

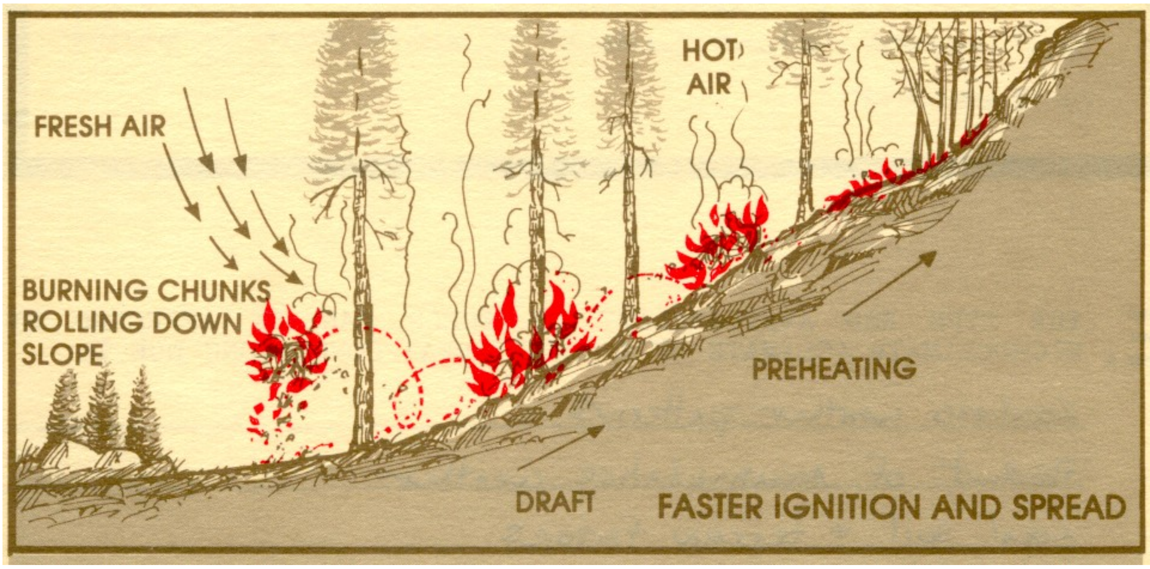
Even at wind speeds of up to twenty miles per hour, a fire's rate of spread and flame length will be very low. However, under severe weather conditions such as high temperatures, low humidity combined with high winds (particularly flow from the south/southwest), this fuel model can pose a significant hazard.

Topography

The topography of the site is one of the main factors that will influence a fire spread. The aspect or compass direction that any slope faces influence the fuel type that exists and the amount of preheating these fuels receive by the sun. Aspect can also influence the effects of diurnal winds, as they move upslope during the daylight hours and down slope during the evening and early morning hours.

As the percent of slope increases, the rate of fire spread by convection increases. In other words, wildfires burn faster moving uphill (see Figure 1).

Figure 1. Slope Affects Fire Spread



Graphic courtesy of the National Wildfire Coordinating Group

The topography of the property drains from the north to the south. The slope running from the southeast corner and up to the northwest corner is 2.8%, a relatively flat position.

The slopes and drainages in the forested areas range from 3-6%. Slopes in excess of 25% are considered extreme slopes in regards to their effect on wildfire behavior. So the topography of the property should not unduly affect wildfire spread or intensity except on a very isolated basis.

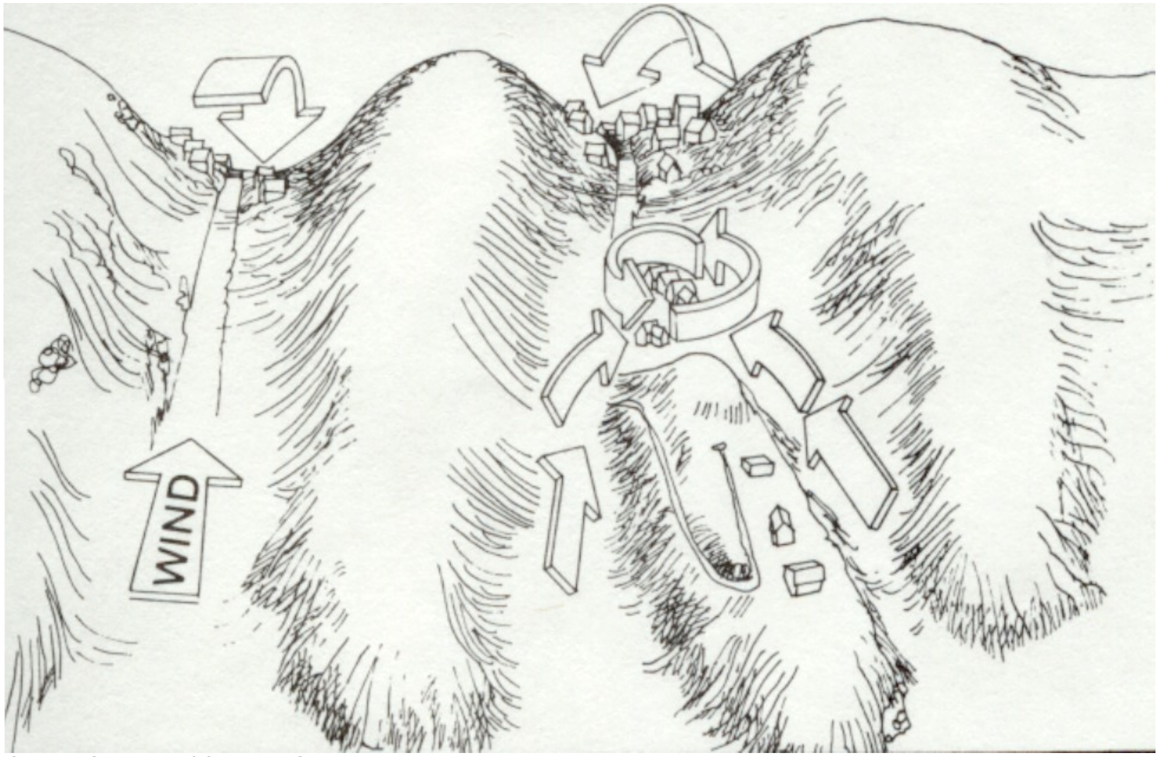
Weather

Weather is the most variable of all the factors. The accumulative effects of weather over time can influence vegetation curing and fuel moisture content.

Grasses, for example, are described as being one-hour time lag fuels. Time lag is a measure of the rate at which a given dead fuel gains or loses moisture. Hence grasses tend to be influenced by the weather conditions on an hourly basis. Wood fuels that are three inches in diameter or larger are considered to be 1,000-hour time lag fuels. So this fuel requires a long period of time of dry or wet weather in order to affect its combustibility.

Winds can influence the direction and rate of spread of a wildfire. Of greater concern is the short spotting of the fire by embers transported by winds ahead of the main fire.

Figure 2. Drainages Tend to Draw in Fire



Graphic Courtesy of Colorado Springs Fire Department

There is narrow and long intermittent creek drainages within the proposed subdivision that may influence winds during a wildfire (see Figure 2 above). This could increase fire behavior on a localized basis if a sufficient fuel load is present but it should not influence fire spread over a large portion of the property or outside the property.

The threat most concerning is the one posed by high winds. While winter winds from the west are always a seasonal concern, hot dry summer winds should not be discounted. While grasses that pose a low hazard in the spring during green-up, can become highly flammable only after a few days of exposure. These southern summer winds will eddy up the elevation gradient that leads to the Black Forest itself and push a wildfire north and west.

Several common weather factors link three recent wildfire events in the Pikes Peak region, the Hayman Fire in 2002, Waldo Canyon Fire in 2012 and the recent Black Forest Fire (2013). The presence of low humidity (4%), high day time temperatures (90^{o} F) and high wind speeds (20-25 mph.) with gusting conditions (30-40 mph.).

While these three weather factors were present over a very short period of time prior and during the Black Forest Fire, a single ignition at the right moment, can lead to catastrophic loss.

Finally, in the event of extreme fire behavior, the fire itself will exercise some degree of influence on its own environment.

So while the weather may contribute greatly to a wildfire event, it is immune to outside influences.

Predicted Fire Behavior

Using the BehavePlus5 fire modeling system, the following predictions can be made for the grass land (1, GR4) fuel model. As the grassland represents the vast majority of the subdivision, it would be the most expected fuel consumed during a wildfire. The inputs are based upon a 95-degree temperature day with a relative humidity of 4% with little cloud cover at 2:00 p.m. in the month of June. These are similar weather conditions that existed during the Black Forest Fire.

The prediction was based on using two different live fuel moistures. As this is a grass fuel, the moisture of the grass is a major factor in determining wildfire spread. At a moisture content of 15%, the spread of a wildfire will not be supported. In addition, as the future use of the grasslands will become residential development, it is reasonable to assume that the grass will have varying degrees of irrigation.

Under a scenario of the live fuel or green grass having a 1% moisture level and is almost totally cured, a wildfire could be projected to spread at a rate of 1,260 feet per minute. The flame length would be about seventeen to eighteen feet long. This is a fire that would probably require indirect attack and would not be easy to control. There is a high probability the fire would jump over any maintained roads it encountered.

Under a different scenario, where the live fuels have a moisture content of just 4%, a substantially different outcome occurs. A wildfire would spread at a rate of around 380 feet per minute. This is about one-third of the rate of spread under the previous scenario. Even more importantly, the flame length is cut in half and would range in eight to nine feet in length. This would lend itself to containment by an improved road within the subdivision or at a minimum by initial attack forces.

Note that this model assumes an untreated grass fuel condition. If the grass is irrigated or even mowed to a lower height, it can be reasonably expected to further reduce the availability of this fuel type to burn

Finally, it should not be assumed that the main periods of fire danger would be in the summer months. As past history has shown, out of season fire events are much more common than might be expected or realized by the public. As noted earlier, the late winter of 2017 has seen multiple grass fire incidents with red flag warnings posted for areas east of Interstate Highway 25.

Wildfire Mitigation

It should be noted here that the occurrence of a wildland fire on this property and any subsequent spread of a wildfire to adjacent land could never be totally eliminated. In the Spaatz Fire near Monument, suppression forces were able to arrive on scene in approximately four minutes after the fire was reported. Even with this rapid response, the wildfire reached a size of 67 acres before it was controlled.

The potential for loss can be reduced and the odds can be improved that initial response forces can be successful in keeping a wildfire to the smallest size possible and structure loss to a minimum. But even with the best efforts of suppression forces, there will always exist a level of risk of loss to a wildfire. For example, even in spite of extensive mitigation in the Cathedral Pines subdivision, a residential structure was still lost in the Black Forest Fire. As previous local wildfire incidents have demonstrated, this loss can occur very quickly with little or no advanced warning.

The only way to reduce the risk of loss from a wildfire is to modify the factors that influence fire behavior. Of the three factors discussed previously, the only factor that could be modified prior to a wildland fire is the fuels. The efforts in modifying fuels can be targeted to their arrangement, continuity and availability.

Due to the recent passage of fire through the forest, specific mitigation treatments are listed under the 'Forest Management' section starting on page twenty-three (23).

- **Arrangement**

The arrangement of fuel considers the size, shape and compactness of the fuel itself. Smaller fuel sizes have a greater surface area exposure for preheating. If these smaller sized fuels are only lightly compacted in spacing this results in easier ignition and increased combustion.

Fuels that are tightly compacted and larger in size have lower surface areas. This reduces the ease of ignition and combustion.

One technique in reducing the readily ignitable fuel level would be to remove fuels, such as dead leaves, fallen limbs and other small organic debris, from the site. However, it is not reasonable nor practical to remove these types of fuels from the entire property.

Based upon the burn evidence from the Black Forest Fire, the existing fine ground fuels were compacted and should remain in place in the future. Whenever possible these fuels should not be raked up or disposed of. The removal may allow the establishment of grasses or woody shrubs, which pose a higher wildfire risk. Retention of the compacted needle/litter layer prevents this from occurring on a large scale.

During the construction phase of any residential structure, the most likely source of ignition will come from personnel and activities. These sources of ignition may come from flammable chemicals, improperly discarded cigarettes, shorts in electrical equipment, and other means. For example, a landscape crew cutting plastic weed barrier fabric ignited a grass fire during windy weather conditions in November 2001. This fire spread through open space in the Jackson Creek development and reached approximately 80 acres in size before its spread was halted by Baptist Road in northern El Paso County.

It is suggested here that the reduction of the most ignitable fuel be done in areas that are within fifty feet of the pad of any proposed residential structures. This will reduce the amount of small, flashy fuel in close proximity to the structure. It will also retard the spread of a fire off of the immediate site and provide suppression forces additional time to contain a fire quickly.

Once a residential structure is built, a wildfire safety zone should be established. Wildfire safety zones are intended to slow a fire down so that it may be controlled and extinguished. There are three zones that comprise a wildfire safety zone.

The first zone is the one that contains the most opportunity for modification. The minimum width recommended is thirty feet and is divided into three segments.

As these zones will be unique for each lot that is developed and the subsequent position of the residential structure, it will be difficult to make specific recommendations here. However, it is recommended that each lot be treated prior to completion of the structure.

Specific information on the development of wildfire safety zones are available through the CSU Cooperative Extension Service in the Quick Guide Series Fire 2012-1, *Protecting Your Home from Wildfire: Creating Wildfire-Defensible Zones*. The web page is linked here at Creating Fire Safe Zones.

- **Continuity**

The second factor affecting fuels that can be modified is their continuity. Is the fuel continuous or patchy in nature? Is the fuel layered in such a manner that it can leave the ground and spread into a vegetative canopy?

In this instance, the fuels in the grass and timber fuel models are continuous. Obviously, the pasture/grasslands contain an unbroken line of fuel reaching from tree line to the east and south to north.

• **Availability**

The final consideration is the availability of the fuel to physically burn. This factor is influenced by the weather on a daily or yearly basis and cannot be readily influenced.

As was mentioned earlier, the availability of any of the fuel models to burn should be considered a year round hazard and not limited to the summer months.

Recent weather patterns have contributed to a short-term drought situation that has influenced the availability of the fuels to burn. The trend of above average day time temperatures and below normal precipitation levels have allowed fuels to reach a higher state of availability than might normally be the case, particularly during the current winter months. This may result in wildfire acting in a manner that might be more characteristic of late summer burning conditions.

Other Considerations

Firebrands & Secondary Ignitions

It is becoming more apparent that a majority of structure loss is not occurring during the passage of a burning wildfire front but from ignition of the structure by firebrands and secondary ignitions. Firebrands are burning materials or embers that are lifted into the air by convective wind currents. Firebrands can be cast hundreds of feet in advance of the fire front.

Research and case studies in Australia have found that there is a 50% probability of loss of structures that are 100 – 200 feet from the fire front. This would seem to indicate that firebrands are a major contributing factor of structure loss.

In the U.S., studies indicate there is 90% probability that a structure with a non-flammable roof and that is at least 100 feet from the fuel bed will not be lost during a wildfire. However, this statistic may be misleading as the Cedar Fire (CA) in 2003 indicated that 60% -70% of the structures lost were ignited by firebrands. This would also infer that solely relying on 'defensible space' for structure protection may not be adequate.

In a professional paper by Scott (2005), the exposure of a structure to burning embers and firebrands is discussed. In an inference to fuel mitigation in the 'defensible space' zones, Scott states that "In no case is complete removal of the forest canopy required to mitigate crown fire potential near a structure." This again seems to infer that 'defensible space', while a good starting point, may not be the only strategy to reduce structure loss.

Currently, fire-safe construction is the recommended protocol for fire brand risk reduction by the professional wildfire community.

Roads and Driveways

Roads and driveways to individual lots should be constructed in accordance with NFPA 1141, *Fire Protection for Planned Building Groups*. Specifically, road widths should not be less than twenty-four feet to allow for simultaneous access of emergency equipment and evacuation of residents. If parking is to be allowed along the constructed roadway at least nine feet of improved width should be included.

Additional space along the roadways is important for on-street parking. There will be times when contractors, landscape companies and visitors along the road may reduce the passable width of a road from on-street parking. This may result in a road being reduced to a single car width. Such conditions may increase the response time of emergency agencies. It is recommended here that the subdivision advise residents to encourage on-street parking users to keep their vehicles along one side of a road and discourage parking use on both sides of a road where it may reduce the passable road width.

Driveways should provide a minimum width of twelve feet and a minimum vertical clearance of fifteen feet. The grade of any driveway should not exceed 12%. The entrance to any driveway from public roads should not exceed a ninety-degree angle. A turnaround should be provided at all structure sites on driveways over three hundred feet in length. These turnarounds should be within fifty feet of any structure.

Dead end roads should not exceed 600 feet in length when the area is classified as having an extreme wildfire hazard. All dead end roads should have a turnaround at the closed end (cul-de-sac) of at least 100 feet in diameter. Under the current design plan, all roads are located in the grassland area which exhibits a low wildfire hazard.

From a detailed wildfire hazard assessment performed in a local subdivision, a common discrepancy found was inadequate or poor visibility of individual residential address numbers. Letters and numbers indicating specific street addresses should be a minimum of 4 inches in height with a ½" stroke. The numbers or letters should be strongly contrasting with the background color so as to readily visible from the main access road.

Landscaping

The vegetation that is used in the landscaping of the structure should be fire resistant. For example, ornamental junipers can be very flammable and easily ignited by aerial firebrands. Planting these shrubs near the exterior walls of any residential structures provide a readily available fuel source that could threaten the structure and divert suppression forces to protect the building instead of controlling the wildfire.

From the historical fire record of the region, the ignition of ornamental junipers around structures is a major contributor of damage and subsequent loss. **For this subdivision, it is strongly recommended that the use of ornamental junipers in the landscape be prohibited within thirty feet of a structure's foundation.**

It is assumed that the majority of lots built on will have some level of irrigated greenbelt. Irrigated lawns around a structure are very effective fuel breaks and serve as defensible space in the event of a wildfire.

If a native landscape is preferred, the use of periodic irrigation helps keep landscapes lush and green, thereby lowering their ability to ignite. There are many irrigation techniques available that can keep plants less susceptible to burning while still adhering to water conservation principles.

If retaining a native landscape, particularly in the grassland, periodic mowing of native grasses will reduce the wildfire hazard and any subsequent spread.

Another alternative to irrigated green space would be to line the footprint of the foundation of the structure with rock. If rock is used, it should be placed at a minimum width of five feet from the foundation. Based upon the fire scarring of tree trunks from the Black Forest Fire, this should prevent flame lengths from reaching the building and causing an ignition.

There are many different sizes and types of rock available. It should be noted here that it would be necessary to remove leaves and other litter from within this rock fuel break on an annual basis. Otherwise the protection initially provided by this technique will be lost.

Within the forested areas, the compressed needle layer should not be disturbed if possible. In its current state, the litter layer will not actively burn. If it is removed and exposes mineral soil, it may provide suitable conditions for grass and weed growth. When this vegetation dries, it will become a higher risk to actively burning during a wildfire incident.

Construction Considerations

As the fuels in this subdivision are trees and grasses, predictable sources of fuel that will burn and allow entry of a wildfire into the structure will be debris that is trapped under or next to the building or the accumulation of needles in the roof gutters. Porch, foundation, roof and attic openings should be screened off or enclosed to keep debris from accumulating and burning underneath. This is particularly important where wooden decks are planned at ground level. This was a major factor in the loss of structures in the historical fire record. These location concerns were also expressed in a joint publication by Green Builder Media and the NFPA. This recently released e-book, 'Design with Fire in Mind', can be downloaded using the link.

It is strongly recommended that all decks that are planned at ground level be required to be sealed off and enclosed in order to prevent the accumulation of flammable debris underneath them.

In a recent wildfire risk assessment in a local development, a significant entry point for fire into a house was through the eaves, overhangs or sofits. These locations can trap embers and combustible gas or heat, that can ignite the structure.

Based upon recommendations from FEMA, overhangs, if used, should be enclosed with a flat, horizontal sofit with a one-hour fire resistance rating. The fascia should be constructed of non-combustible material.

The combustibility of a roof is the one of the most important factors in determining the risk of a structure to damage or loss from a wildfire. The use of combustible materials such as wood shingles does not necessarily increase their susceptibility to fire. However, as a wood shingle roof ages and is influenced by the weather, individual shingles may start to warp, curl and lose the tightness that is exhibited upon initial installation.

Combustible roofs become at risk due to the expected aerial firebrands that will be created as wildfire moves through the proposed development. The lodging of brands in combustible roof materials allows entrance for a wildfire into a structure. In this author's experience of fighting wildfire, it is difficult to defend a combustible roof.

Non-combustible roof materials should be used in the construction of all structures on this site.

An additional consideration is the construction of the roof itself. Whenever possible, complex roof designs should be avoided. Flammable material, such as pine needles, may accumulate to roof to wall edges such as a dormer or chimney. This leaves what may be a non-combustible roof vulnerable to ignition.

Non-combustible materials such as metal flashing should be used at the intersections between horizontal and vertical surfaces if some exposed component would be considered combustible. Roof vents should have mesh screens installed to reduce the risk of embers entering into the attic area.

Siding materials, while not as critical as compared to roof, can help to lower the overall risk of a structure to damage from a wildfire. Where the wildfire risk is low, the primary fuel involved will be grass on relatively flat slopes. A wildfire in these areas can be high in intensity but typically have a low duration. In other words, grass fires burn hot and fast. Therefore, there may not be enough heat buildup to ignite combustible siding materials. In these locations the use of non-combustible siding may not significantly reduce the risk to wildfire, particularly where a stone border is placed around the foundation.

Where a higher wildfire risk is found, such as in the ponderosa pine forest, the opposite can be true. During periods of drought, ponderosa pine needles develop an extra waxy layer of cuticle over the needles to retard moisture loss from the tree. So the needles will become a hotter fuel when ignited. Depending on the proximity of trees, in particular young reproduction, this additional fuel availability may be sufficient to ignite combustible siding materials.

It is recommended that residential lots within the boundary of the existing forest, non-combustible siding materials should be used in the construction of residential structures.

Water Supply

At the present time, there is no readily available water supply for ground suppression fire resources. The local fire protection districts will need to haul water into the site during a fire. The subdivision will be supplied with water by the Sterling Metropolitan District in the future.

At the present time, the Black Forest Fire/Rescue Fire Protection District has the following resources:

1 – Type 1 Engines: 500 gallons' total
4 – Type 3 Engines: 1,750 gallons' total
3 – Water Haulers - 6,000 gallons' total

There are two full-time staff members at Station 1 whose primary responsibility is medical emergencies. The primary resource for fire suppression is volunteer firefighters and has a wide range of response time and availability.

These resources are available for dispatch at the Station 1 located at Teachout Road and Burgess Road, approximately 2.9 miles from the subdivision. Station 2 is located on Hodgen Road between Black Forest Road and Herring Road (7.5 miles away) and is staffed by part-time employees. Based upon the apparatus resources available, there should be a sufficient water supply for any initial attack response on the proposed subdivision.

In the event of an extended suppression event, mutual-aid resources are quickly available from the Falcon Fire Protection District. The main station is located 9.5 miles from the subdivision.

The Black Forest Fire Protection District should be consulted with on any specific requirements of NFPA Standard 1142, 'Water Supplies for Suburban and Rural Fire Fighting' that may not be addressed here.

Home Owners Association

The Home Owner's Association (HOA) will be responsible for some or all of the implementation and annual inspection of the wildfire mitigation activity, particularly in regard to fuel availability. Specific activities should be developed through a Community Wildfire Protection (CWPP). The Forest Gate subdivision to the north is an active CWPP community. This effort is supported through National Fire Protection Association (NFPA) through its Firewise Communities and Fire Adapted Communities Programs. Additional information can be obtained at the website through the link.

It is suggested here, at a minimum, that the HOA schedule cleanup days in the spring and in the fall after needle drop. This will allow an opportunity for the community to work together to improve and maintain their wildfire safety. The Association should budget for the removal and disposal of the material that is collected.

In the event of a wildfire incident, evacuation becomes a major factor in the response efficiency of the fire suppression forces. Once the construction of residences within the development occurs, an evacuation plan should be developed in cooperation with the local fire protection district. This plan should result in the appropriate evacuation routes being designated and signage placed along those routes.

The HOA, at the very minimum, should develop an educational plan to help keep the threat from wildfire foremost in the community's mind. This may include articles in the HOA newsletter, presentations at meetings and even posting the wildfire hazard on a daily basis at the entrances to the Retreat at Timber Ridge community.

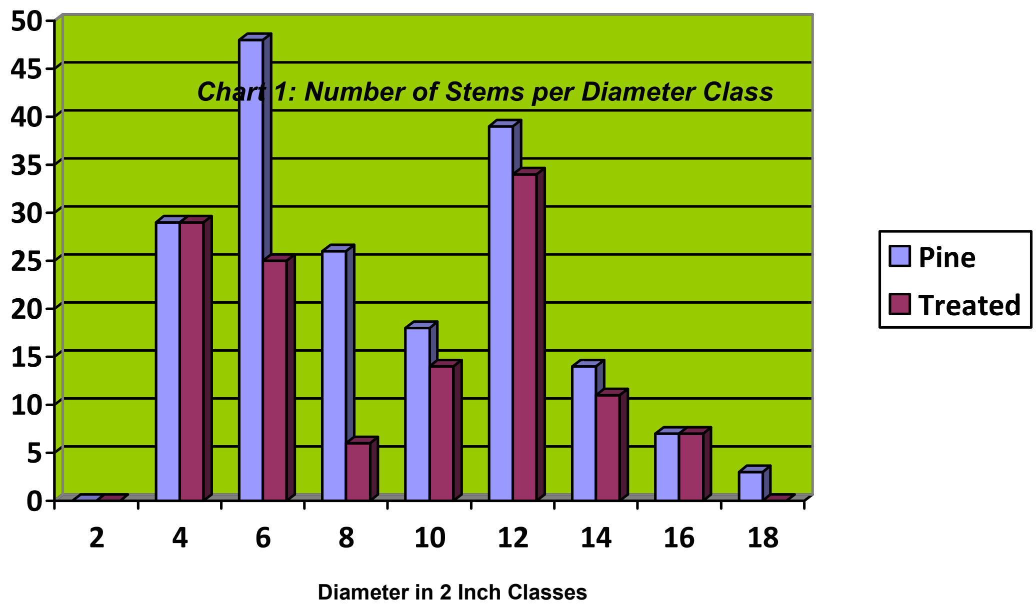
Forest Management

As part of the wildfire hazard evaluation, a forest inventory was performed, the results of which are included here. The intent of the inventory is to provide a current assessment of the forest resource and to provide activities that can be taken to ensure that health into the future. These activities will also maintain or reduce the moderate wildfire hazard that exists.

The forest should be considered as a ponderosa pine forest. As is already occurring, the forest will reproduce naturally to ponderosa pine. This is a fire adapted species and is well suited to the site.

The current forest is composed of ponderosa pine having an average diameter of 11.8 inches.

The following chart depicts the range of diameters of trees tallied during the inventory and the respective number of trees within each diameter class (blue).



The purple or violet bars represent of the number of trees post-treatment. Each plot tallied the trees that would be removed. This selection was made either from sanitation thinning or for overall health.

Based on the post-treatment condition, the average diameter increased slightly to 12.1 inches. The number of trees per acre was reduced by less than one-third, from 183 to 125.

Photo 3. This picture provides a typical view of the forest stand on the west side of the subdivision. A sanitation thinning will reduce the average number of trees per acre to a level that will not sustain an epidemic outbreak of mountain pine beetle.

Growing stock level (GSL) is an expression of the desired number of stems per acre. Presently, the forest has a GSL of 124. The preferred target to suppress large outbreaks of MPB is between 80 to 90 which translates to somewhere between 102 to 115 trees per acre, assuming an average diameter of twelve inches.

While the projected residual stand has a higher GSL (100) than preferred, it should still be fairly beetle resistant.

So the work plan for forest management and subsequent wildfire mitigation are as follows:

Prior to the sale of residential lots,

1. Within the existing ponderosa pine forest stands, any tree that is suppressed, snow-bent or exhibiting poor form should be removed.

2. All material that is cut (slash), such as trees and branches, should be chipped in place or removed from the site in its entirety. This will prevent an increase in the presence of available dead ground fuel and maintain the low hazard provided by the compressed ground fuel bed.

Prior to the occupancy approval for structures on residential lots, the following should be completed:

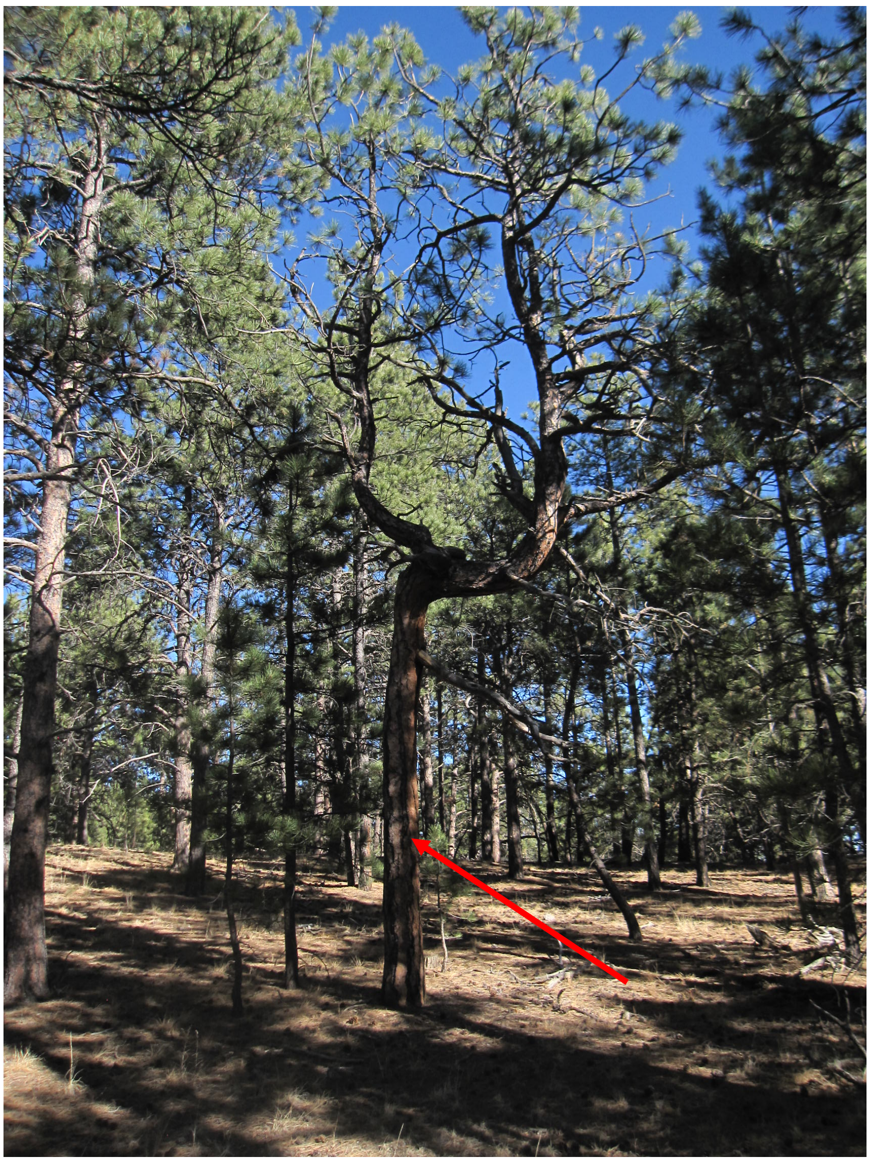
1. Each lot in the forested area should inspected for any additional wildfire mitigation treatment. Any treatment necessary should be completed prior to occupancy.

These inspections can be completed by private consultants, the Colorado State Forest Service or a qualified representative of the local fire protection district.

Ute Indian Prayer Trees/Culturally Modified Trees

Due to an article in the Gazette newspaper in 2000, an interest has been sparked in what is widely acknowledged as culturally modified trees. Locally, these trees, particularly ponderosa pine, are identified as Ute Indian Prayer Trees.

While there is much that is unknown about these trees, it is recognized that the Pikes Peak region contains a large quantity of these trees. The Black Forest region, in particular, is the home of many recognized examples of culturally modified trees.



This photo depicts a Ute Indian Prayer Tree (red arrow). This tree is located in forest along the west boundary.

There may potentially be three trees that are Ute Indian Prayer Trees. Two are found in the forest stand along the west boundary. This area is reserved for future development. The tree shown above is one of the two and has a definitive mark on the east side of the tree where the bark was stripped away some time ago. The second is located in close proximity.

The potential third tree is located in the forest stand lying north of Arroya Lane. This tree will require further study to determine if it is actually a modified tree.

As part of any fuel modification treatment, unusually shaped trees should be inspected prior to any removal. These trees should not be confused with trees damaged by porcupine feeding, misshapen from dwarf mistletoe infection or struck from lightning. While a complete description of the types of Ute Indian Prayer Trees is not included here, of importance to crews working on mitigation is that the majority are older, "yellow bark" ponderosa pine.

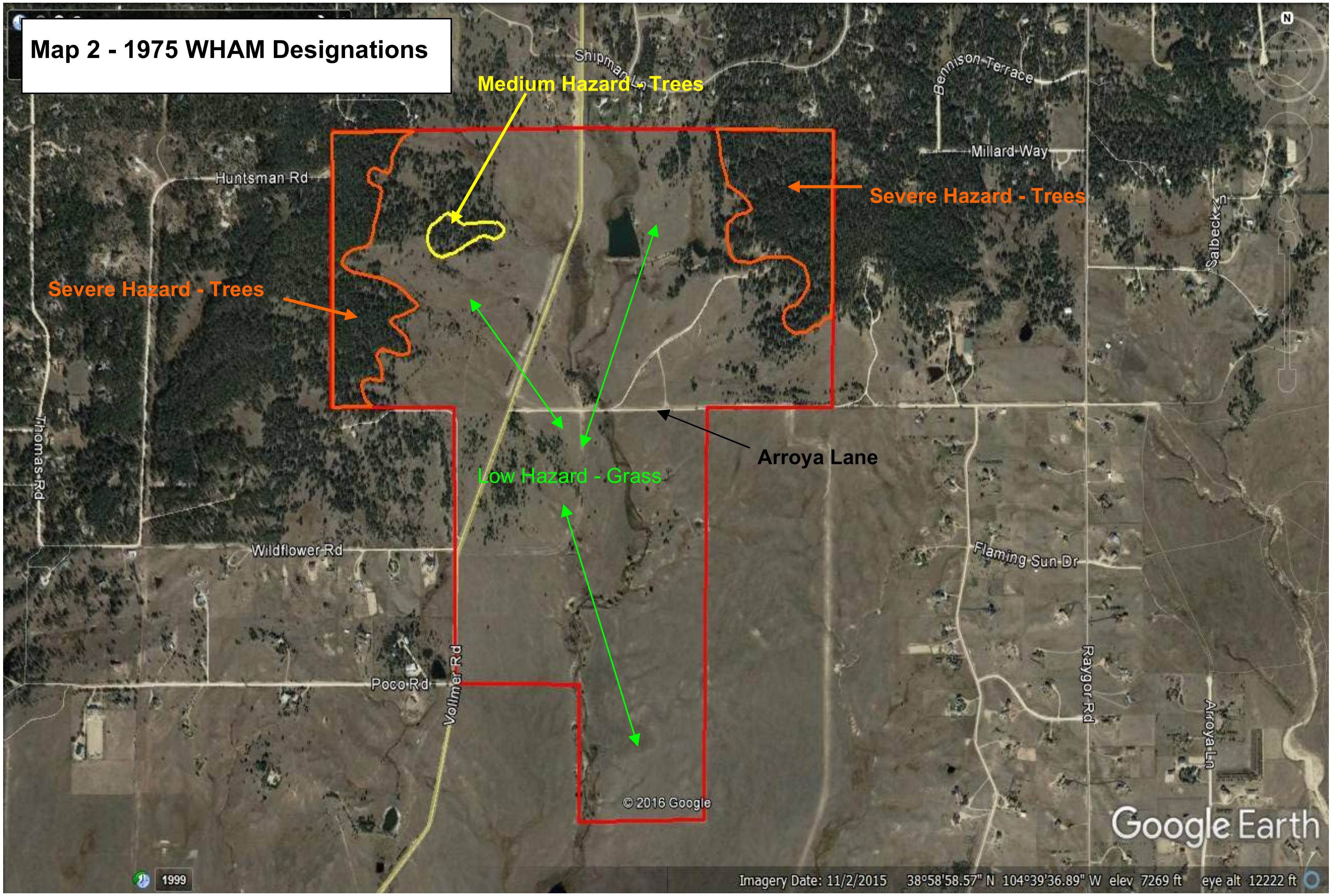
A more detailed description and narrative of these trees can be found in the book "Ute Indian Prayer Trees of the Pikes Peak Region". This volume was authored by former El Paso County Sheriff, John W. Anderson.

Appendix A

Maps

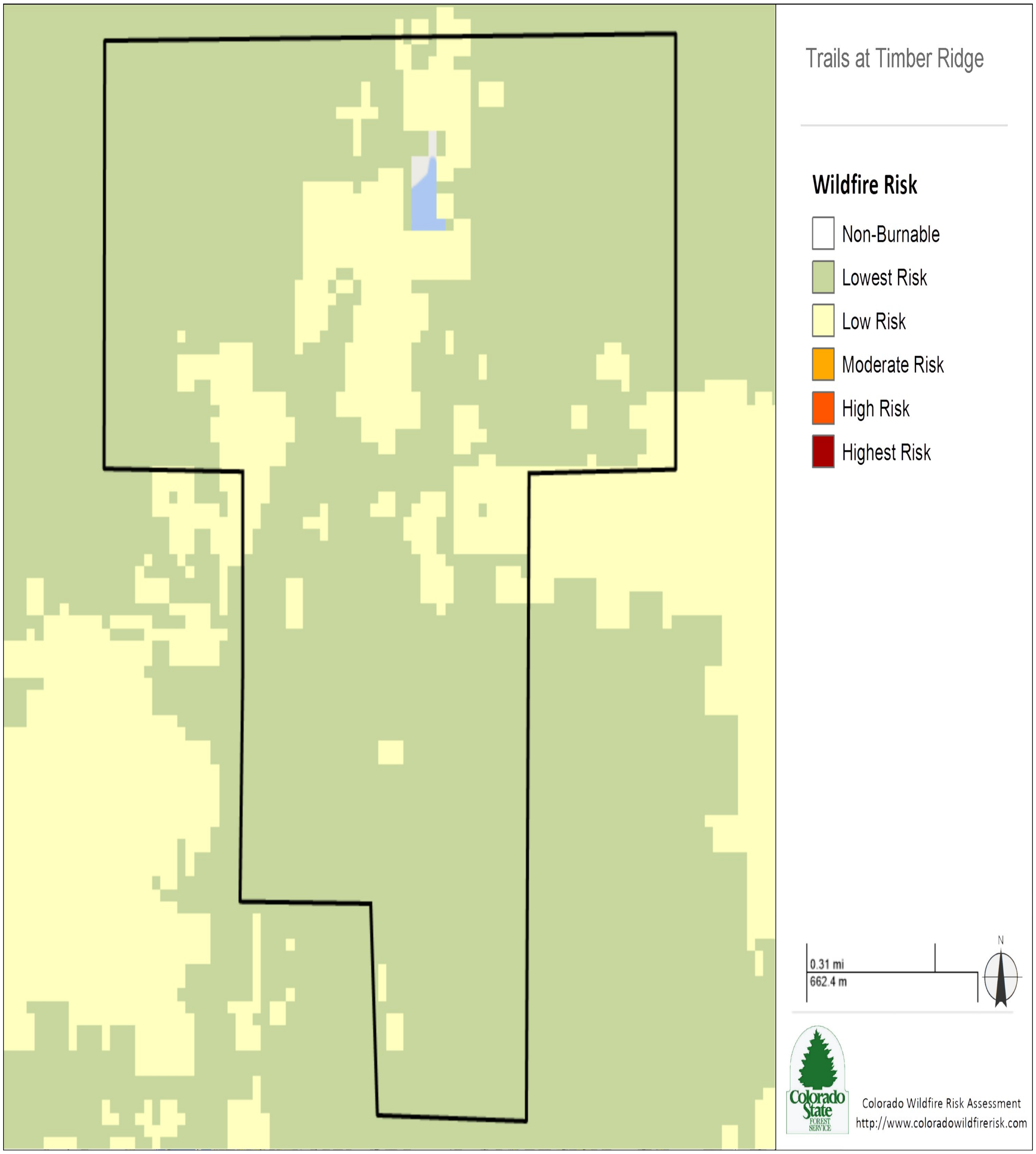
Map 2 - 1974 WHAM Designations

Map 3 - CO-WRAP Wildfire Risk



Map 2 - 1975 WHAM Designations
Medium Hazard - Trees
Severe Hazard - Trees
Severe Hazard - Trees
Low Hazard - Grass
Arroya Lane
Shipman
Bennison Terrace
Millard Way
Salbeck
Huntsman Rd
Thomas Rd
Wildflower Rd
Poco Rd
Vollmer Rd
Flaming Sun Dr
Raygor Rd
Arroya Ln
© 2016 Google
Google Earth
1999
Imagery Date: 11/2/2015 38°58'58.57" N 104°39'36.89" W elev 7269 ft eye alt 12222 ft

Map 3 : CO-WRAP Wildfire Risk



This map displays the wildfire risk that was generated from CO-WRAP. Wildfire risk represents the possibility of loss or harm occurring from a wildfire.

Appendix B

Fuel Model Descriptions

Fuel Model 1 & 8 Summary Pages

Source: Anderson, Hal E. Aids to Determining Fuel Models for Estimating Fire Behavior, National Wildfire Coordinating Group, General Technical Report INT-122, April 1982.

"This report presents photographic examples, tabulations, and a similarity chart to assist fire behavior officers, fuel management specialists, and other field personnel in selecting a fuel model appropriate for a specific field situation. Proper selection of a fuel model is a critical step in mathematical modeling of fire behavior and fire danger rating."

Fuel Model GR2 & TL1 Summary Pages

Source: Scott, Joe H. & Burgan, Robert E. 2005. Standard fire behavior fuel models: a comprehensive set for use with Rothermel's (1972) surface fire spread model. Gen. Tech. Rep. RMRS-GTR-153, Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 72 p.

"This report describes a new set of standard fire behavior fuel models for use with Rothermel's surface fire spread model and the relationship of the new set to the original 13 fire behavior fuel models."

FUEL MODEL DESCRIPTIONS

Grass Group

Fire Behavior Fuel Model 1

Fire spread is governed by the fine, very porous, and continuous herbaceous fuels that have cured or are nearly cured. Fires are surface fires that move rapidly through the cured grass and associated material. Very little shrub or timber is present, generally less than one-third of the area.

Grasslands and savanna are represented along with stubble, grass-tundra, and grass-shrub combinations that met the above area constraint. Annual and perennial grasses are included in this fuel model. Refer to photographs 1, 2, and 3 for illustrations.

This fuel model correlates to 1978 NFDRS fuel models A, L, and S.

Fuel model values for estimating fire behavior

Total fuel load, < 3-inch dead and live, tons/acre	0.74
Dead fuel load, ¼-inch, tons/acre	.74
Live fuel load, foliage, tons/acre	0
Fuel bed depth, feet	1.0

Photo 1. Western annual grasses such as cheatgrass, medusahead ryegrass, and fescues.

Photo 2. Live oak savanna of the Southwest on the Coronado National Forest.

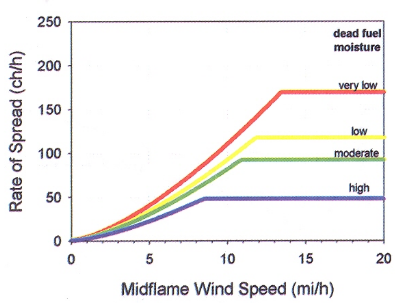
Photo 3: Open pine—grasslands on the Lewis and Clark National Forest

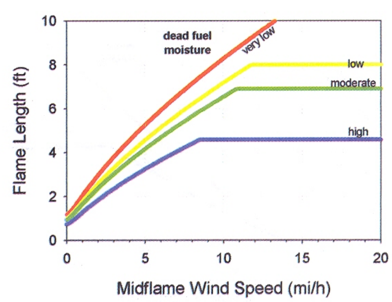
GR2 (102)

Low Load, Dry Climate Grass (Dynamic)

Description: The primary carrier of fire in GR2 is grass, though small amounts of fine dead fuel may be present. Load is greater than GR1, and fuelbed may be more continuous. Shrubs, if present, do not affect fire behavior.

Fine fuel load (t/ac)	1.10
Characteristic SAV (ft-1)	1820
Packing ratio (dimensionless)	0.00158
Extinction moisture content (percent)	15





Timber Group

Fire Behavior Fuel Model 8

Slow-burning ground fires with low flame lengths are generally the case, although the fire may encounter an occasional "jackpot" or heavy fuel concentration that can flare up. Only under severe weather conditions involving high temperatures, low humidities, and high winds do the fuels pose fire hazards. Closed canopy stands of short-needle conifers or hardwoods that have leafed out support fire in the compact litter layer. This layer is mainly needles, leaves, and occasionally twigs because little undergrowth is present in the stand. Representative conifer types are white pine, and lodgepole pine, spruce, fir, and larch.

This model can be used for 1978 NFDRS fuel models H and R. Photographs 22, 23, and 24 illustrate the situations representative of this fuel.

Fuel model values for estimating fire behavior

Total fuel load, < 3-inch, dead and live, tons/acre	5.0
Dead fuel load, ¼-inch, tons/acre	1.5
Live fuel load, foliage, tons/acre	0
Fuel bed depth, feet	0.2

Photo 22. Surface litter fuels in western hemlock stands of Oregon and Washington.

Photo 23. Understory of inland Douglas-fir has little fuel here to add to dead-down litter load.

Photo 24. Closed stand of birch-aspen with leaf litter compacted.

TL1 (181)

Low Load Compact Conifer Litter

Description: The primary carrier of fire in TL1 is compact forest litter. Light to moderate load, fuels 1 to 2 inches deep. May be used to represent a recently burned forest. Spread rate is very low; flame length very low.

Fine fuel load (t/ac)	1.0
Characteristic SAV (ft-1)	1716
Packing ratio (dimensionless)	0.04878
Extinction moisture content (percent)	30