Wildfire Hazard &
Mitigation Report

Forest Lakes
El Paso County, CO

# Wildfire Hazard Evaluation Report

**For the**

## Forest Lakes Subdivision

## El Paso, CO

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**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 Forest Lakes development in minimizing the dangers and impacts from wildfire hazards. Fire is a natural force and a historical part of forest 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 damage to structures and land uses even though properly permitted and mitigated within designated wildfire hazard areas.

**January 18, 2003**
**Revised December - 2018**

# General Description

Forest Lakes is a private residential development planned for the northern portion of El Paso County, Colorado. This revision is intended to include the development of Phase 2 – West. The initial development plan proposed the subdivision of 13.89 acres into 467 lots with structures. The current phase has the development of approximately 287 acres into 180 residential sites and associated amenities. The property is located at the west terminus of Lindbergh Road in unincorporated land lying southwest of the incorporated Town of Monument, CO and north of the U.S. Air Force Academy (see Map 1).

Elevations within the property range from approximately 6820 feet at the eastern boundary and rise to the west along the Beaver Creek drainage to 7120 feet. The general topography of the area is an east-draining valley with steep north and south facing ridges ranging in elevation from 7000 to 7200 feet.
The slope along the Beaver Creek drainage has an average rise of 6%. The north and south facing ridges contain slopes ranging from 10 – 35%. Roads that exist within the property are maintained or unimproved single-track dirt roads.

This area does have a distinct wildfire history. The site of the Berry Fire can be seen from the property to the northwest. There was a fire north of Baptist Road to the east of the property in late fall of 2001. On May 4, 2002 a wildfire broke on the property and covered approximately 67 acres. More recently, the Beaver Creek Fire burned in August of 2011.

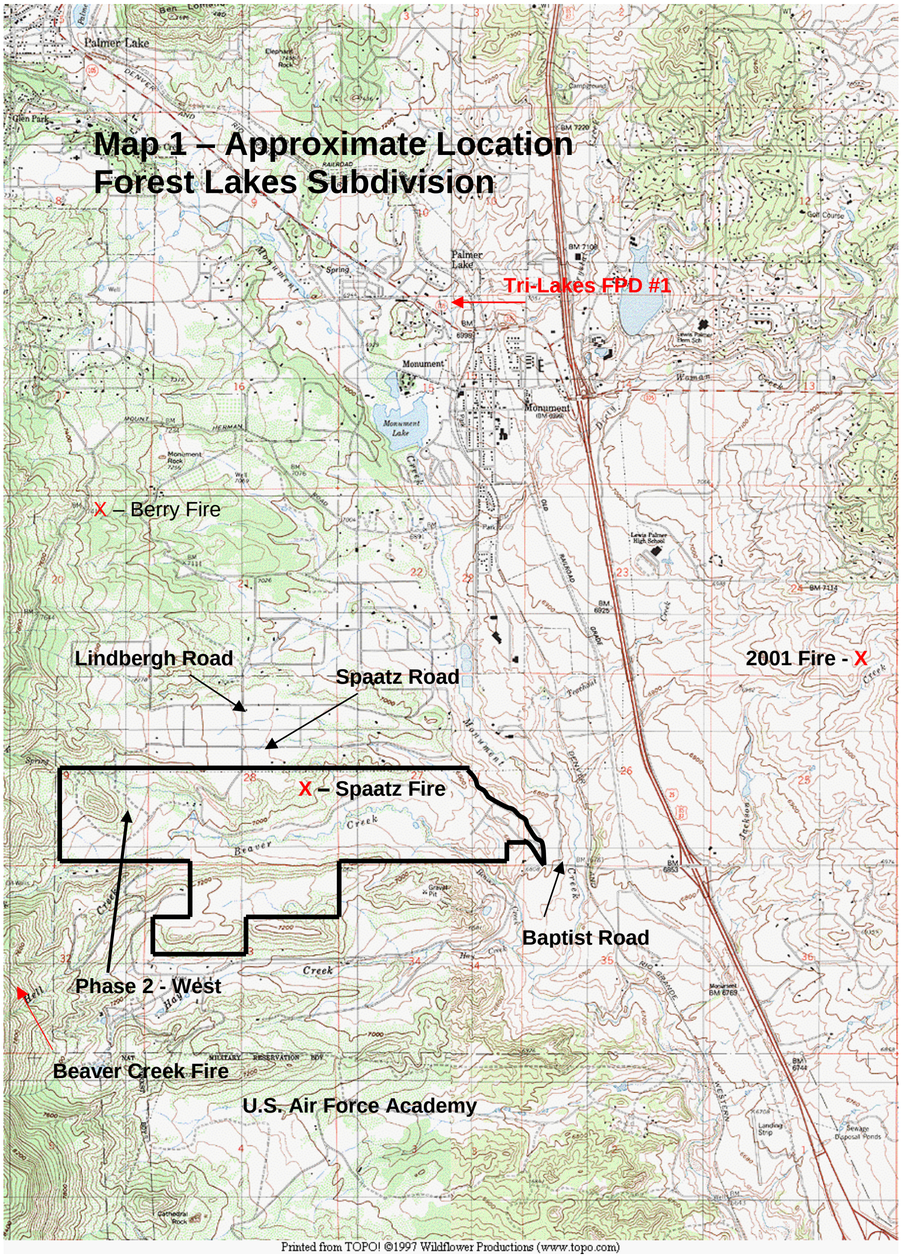
# Wildfire Hazard

Based upon the Wildfire Hazard Area Map (WHAM) developed by the Colorado State Forest Service (CSFS) in 1978, the site of the proposed development of 'Forest Lakes' subdivision contains a low hazard for meadows and a severe hazard brush (Gambel Oak) rating (see Map 2).

Since publication of this hazard report, the CSFS developed a wildfire risk assessment tool in 2012 referred to as the Colorado Wildfire Risk Assessment Web Portal (CO-WRAP). This assessment was just recently updated to include events up to and including 2017.

Within the assessment report, the wildfire risk to the property is classified as moderate to high. Wildfire risk is a composite rating which identifies the probability of loss or harm from a wildfire.

The Burn Probability is the annual probability of any location becoming subject to a wildfire event. The assessment gives the development area a high ranking in this regard. This is not unexpected due to the number of ignitions locally on private and Federal lands



Map 1 – Approximate Location
Forest Lakes Subdivision
Tri-Lakes FPD #1
X – Berry Fire
Lindbergh Road
Spaatz Road
2001 Fire - X
X – Spaatz Fire
Baptist Road
Phase 2 - West
Beaver Creek Fire
U.S. Air Force Academy
Palmer Lake
Monument
Monument Lake
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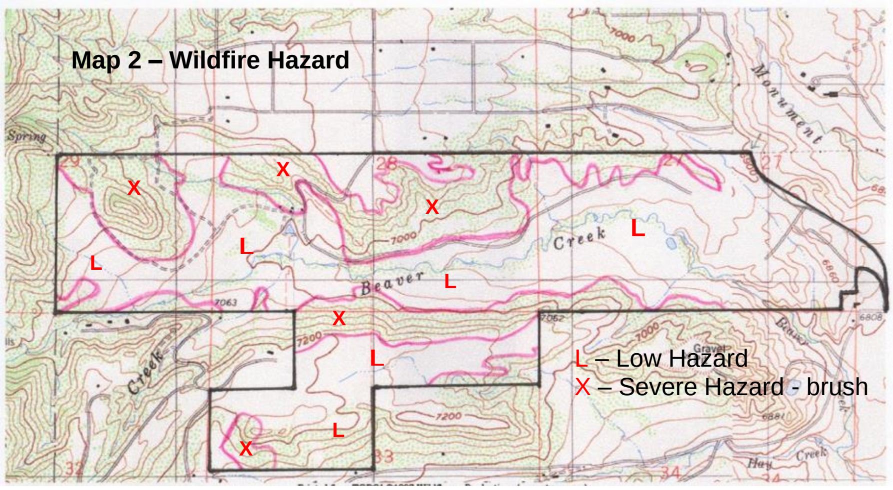



One distinction that can be drawn from the assessment is the selection of the fuel models used in determining the wildfire hazard. The WHAM (Map 2) uses a simplistic approach and delineated between grass and shrub fuel beds.

***Photo 1. Note the complete absence of any shrub layer within the grass. This photo was taken in the SW portion of the property looking back towards the east/northeast.***

The assessment uses a Grass-Shrub fuel model. This is a much more dynamic approach, but it does not delineate between fuel beds but considers them uniform across large areas.

A field inspection was performed on Friday, November 30, 2018 to determine if any change should be made to the original wildfire hazard conclusions. It appears appropriate to delineate between the shrub and grass fuels. While there may a slight mix of grasses within the shrub thickets, the grass areas rarely contain any oak shrubs (see Photo 1).

As the area has been utilized for pasture for cattle, this condition has become even more apparent. This has resulted in the grass fuel being even a lower hazard currently than would normally be expected. It would be misleading to designate these low hazard locations as being a high hazard the CO-WRAP assessment report indicates. Therefore, the original wildfire hazard is retained as low for the grasses and a severe hazard for oak brush.

# Wildfire Behavior

This rating considers the role of the three major components that affect wildfire behavior; fuels, topography and weather. These three components will be examined in relation to "Forest Lakes' development plan.

## Fuels

The area was field checked, and the results of the WHAM were confirmed 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 A).

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.

The meadow areas are best described under Fuel Model 1 (see Appendix A). "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."

Fuel Model 1 can be further refined to GR2, Low Load, Dry Climate Grass. This fuel model was developed by Scott & Brogan in 2005. The primary carrier of a fire is grass. The oak brush, if present, will not significantly affect fire behavior. Caution needs to be expressed here if the dead grass moisture is very low. With a moderate wind speed of 10 – 13 miles per hour, the rate of spread of a wildfire can exceed 160 feet per minute. Flame length in this instance may exceed 10 feet in length making direct attack extremely difficult.

The mountain shrub (Gambel Oak) is best described under Fuel Model 6 (see Appendix A). "Fires carry through the shrub layer where the foliage is more flammable than Fuel Model 5 (fire is generally carried in surface fuels…), but this requires moderate winds.

This can now be described as Very High Load, Dry Climate Shrub (SH7). The primary carrier of a fire is described as woody shrubs and litter. The depth or height of the fuel bed is 4 to 6 feet. This model was selected due to height of the shrub thickets and the high number of dead limbs and twigs that have persisted on the main stems of the oak. Under a condition of very low dead fuel moisture, a fire could spread at a rate of 165 feet per minute under a wind speed of 15 miles per hour. Flame lengths could exceed 25 feet in length.

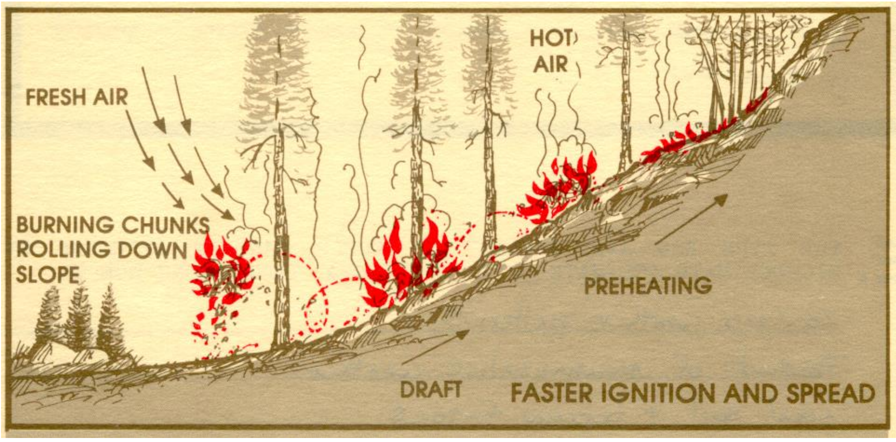
This fuel type encompasses approximately 25% of the total area. A large majority of the area scheduled for development and construction of structures lie within or immediately adjacent to this hazardous fuel type.

## 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 influences 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.

In this instance, one of the most important attributes of topography is the percent of slope of the lands that surround to the property to the north, south and west. 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**




The specific topography of the property is relatively flat from the west to the east. However, the slopes running across the valley to the north and south can range from 10% up to in excess of 35%. Slopes in excess of 25% are considered extreme slopes in their effect on wildfire behavior.

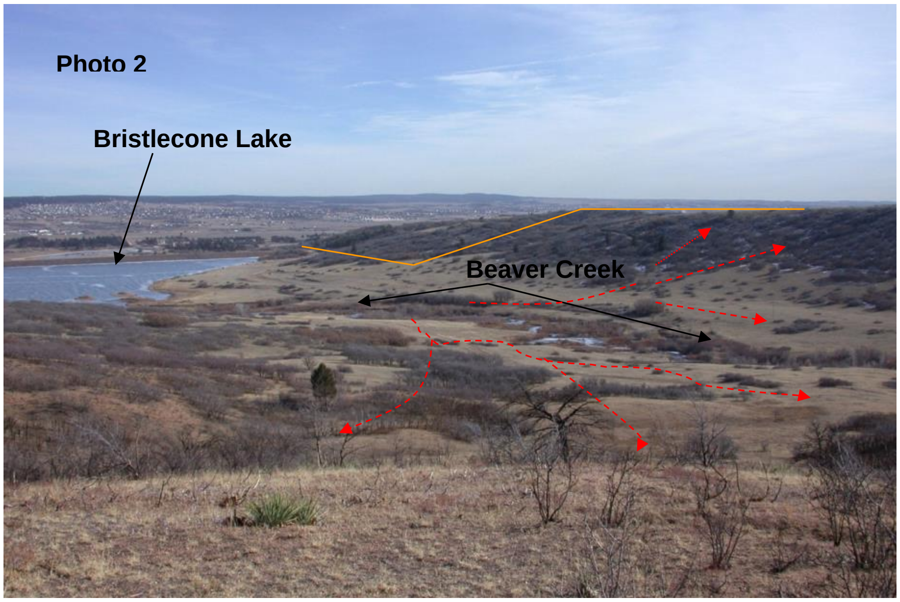



Photo 2 provides a view from the west looking back to the southeast portion of the property. The area in the immediate foreground is the top of the ridge of the south-facing slope located north of the Beaver Creek drainage. The orange line approximates a section of the south boundary of the development.

While the south boundary is not intended to be accurate, it does provide a view of the fuels that will be involved in a wildfire incident. Note that once one leaves the immediate vicinity of the creek, the grass (Fuel Model 1) is the dominant fuel available to a fire. There are patches of shrubs, such as four-leaf sumac, mountain mahogany and oak, but they are spotty in distribution and are not large.

As you proceed further up the slope, the oak brush/shrub (Fuel Model 6) becomes the dominant fuel that would burn and carry a wildfire. Note the rapid increase in the steepness of the slope as it leaves the creek drainage. The red arrows show the predicted movement of a wildfire through this area.

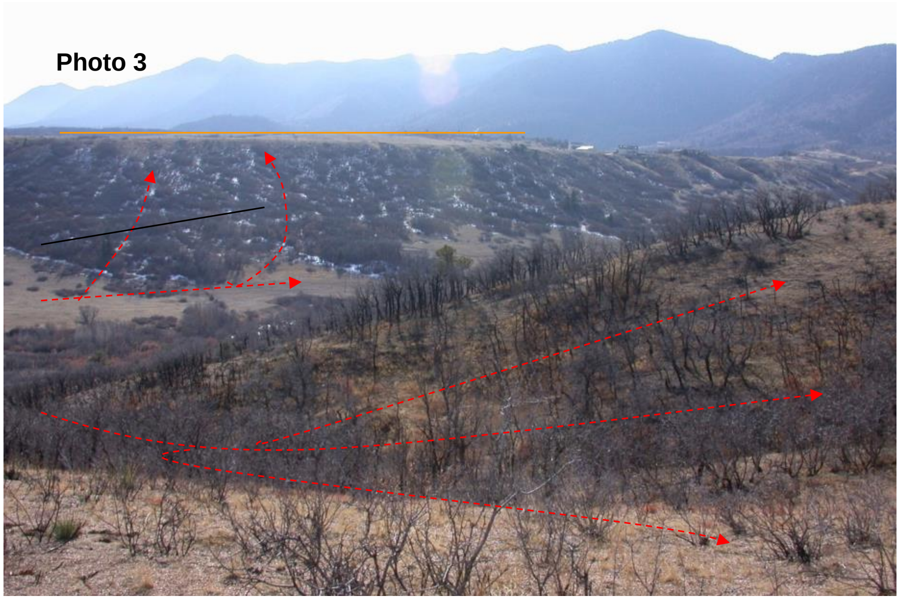



Photo 3 shows a view of the property looking south from the north boundary below the Lindbergh Road terminus. The orange line is an approximate boundary to the south. Red dotted lines indicate potential direction of spread. The area in the lower half of the photo was burned over in the summer of 2002. Note the light brown color, which are the dried leaves on the new sprouts of the oak that was burned. Even though the current fuel type could be considered Fuel Model 1 (grass type), it will not take a very long time for the area to regain the Gambel oak characteristics it exhibited prior to the fire.

The development map indicates that structures are to be constructed on the top of the ridge and not on the steep slope with oak brush fuel.

Photo 4 shows a view of the west and north border portions of the property. The structures that are visible in the lower hand corner of the photo are the original ranch operation buildings.

The large distinct hill in the center background is located just south of the north boundary and east of the western boundary. The base portion of this geographic feature has structures planned for its entire perimeter in both the grass and oak brush fuels. The purple line indicates an approximate vicinity of the proposed location of these structures. Once again, the red lines indicate the possible direction of wildfire.

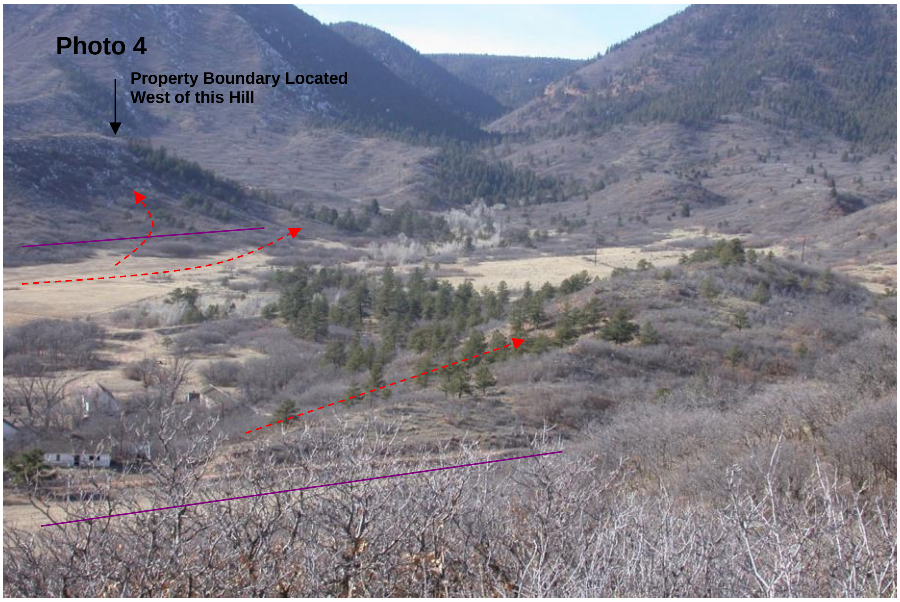



Figure 2 depicts the effect the drainages or box canyons have on a fire. These topography features tend to funnel a wildfire uphill within a narrow profile and the preheating effect tends to ignite the side slopes of the drainage. Structures placed at the mouth of the drainage are most at risk from a wildfire.

The structures and property at greatest risk of loss from wildfire will be those that are constructed at the top of the slopes and drainages. In the proposed development plan, the lots immediately south of Beaver Creek, labeled 169 – 187 and the areas north of Beaver Creek are exposed to this risk.

There are three topographic features that could influence wildfire behavior on the Phase 2 West development (see Photo 5). The first is at the southwest corner of the property. This is the drainage for South Beaver Creek as it flows off USDA-Forest Service land.

The second feature is in the northwest corner where North Beaver Creek flows towards and onto the property. These two topographic features are deep canyons which may funnel winds at a higher speed than might normally be expected or experienced during a wildfire event.

The final feature is the high saddle that could direct winds right into the hill that lies in the middle of the proposed residential lots (see Photo 5). As wind would accelerate over the mountain and down through the saddle, the large hill may deflect the wind to the north and south. These winds may then bend around the base of the hill pushing a wildfire into the residential area (see Figure 2).

***Photo 5. This depicts visually the potential effect of the drainages and the high saddle to affect windspeed and wildfire behavior. The dotted line highlights the top of the hill (refer to Photo 3).***

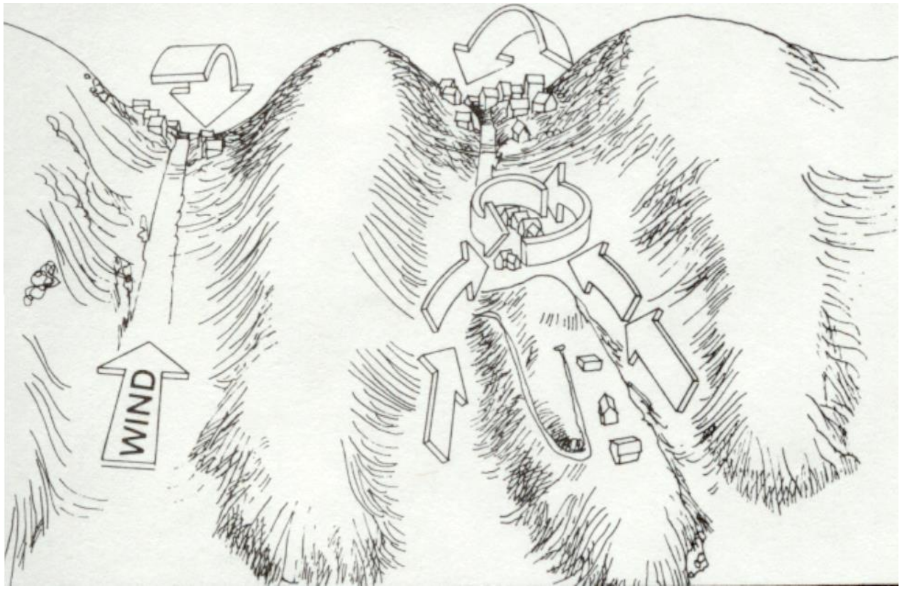
## Weather

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 1,000-hour time lag fuels. This type of 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*

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.

The effect of wind on a fire were on display this past spring (April - 2018) during the 117 Fire in southern El Paso county. This fire grew to over 42,000 acres and destroyed 24 homes. The fuel bed consisted of riparian woodlands and native shortgrass and cholla cactus prairie. High winds carried embers across a railway bed and several county roads. The winds in excess of thirty miles per hour pushed the fire from Highway I-25 easterly past Hanover, over ten miles in just one day.

It should be noted that this level of high wind activity is not uncommon along the foothills where the proposed subdivision is located.

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

## Predicted Fire Behavior

Based upon history, one can expect that if an ignition occurs, a wildfire will spread rapidly and quickly uphill towards the proposed development. Using the USDA – Forest Service Fire Behavior Fuel Model, the following predictions can be made based upon an 80-degree temperature day with a relative humidity of 18% with little cloud cover at 1:00 p.m. in the month of July. The drainage used in this example is Beaver Creek and that the ignition originates just west of Bristlecone Lake.

The fire will spread quickly, at a rate in excess of 1432 feet per hour, or 23 feet per minute. Flame lengths will range from 2 to 2 ½ feet. The probability of fuels igniting in advance of the fire front is 100%. In the fifteen minutes that it may take for the fire to be noticed, reported to the fire department's dispatch office and for the arrival of the initial attack force, the fire could have traveled over 350 feet and be approximately 1.6 acres in size with a total perimeter distance approaching 1,254 feet.

As the fire moves up the Beaver Creek drainage to the west, the fire will be funneled uphill onto the south-facing slope. Here, the fire will accelerate its rate of spread to 2,102 feet per hour or 35 feet per minute. Again, in the time it takes to respond to the fire, it may have moved uphill 528 feet and be approximately 3 acres in size with a total perimeter of 1,782 feet.

It is predicted that local suppression forces will be able to contain the initial fire outbreak with mobile engines and hand constructed control lines within four hours of initial attack.

It should be noted that these predictions are based upon normal weather conditions prevailing over the course of a year. Weather conditions that were exhibited from the fall of 2001 through the present date are outside of normal conditions resulting in the catastrophic losses experienced throughout the western United States this past fire season. Again, the 117 Fire provides an insight in what fire behavior might occur even in the winter season.

If such conditions are present on or in the vicinity of the proposed development site, any wildfire event can be predicted to be more severe and resistant to initial control efforts.

The normal diurnal winds will accelerate the wildfire incident. If the normal diurnal wind patterns are present, a wildfire will move quickly uphill from the east and more slowly from the west. The drainages will draw the fire upslope by increasing wind velocity. This convective heat current will accelerate the pre-heating of available fuel upslope of the fire. It is expected that the fire will move upslope rapidly with high but short-lived heat intensity.

Finally, it should not be assumed that the main periods of fire danger would be in the summer months. As history has shown, out of season fire events are much more common than might be expected by the public.

# 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 eliminated. In the Spaatz Fire, 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.

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.

- **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 may not be practical to remove these types of fuels from the entire property.

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.

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 proximity to the structure. It will also retard the spread of a fire towards adjacent property 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 may be unique for each lot that is developed, it is difficult to make specific recommendations here. However, it is recommended that each lot be treated prior to completion of the structure and the issuance of the occupancy certificate.

Specific information on the development of wildfire safety zones are available through the Colorado State Forest Service in the Quick Guide Series Fire 2012-1, *Creating Wildfire-Defensible Zones* at the following link: https://static.colostate.edu/client-files/csfs/pdfs/FIRE2012_1_DspaceQuickGuide.pdf

- **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?

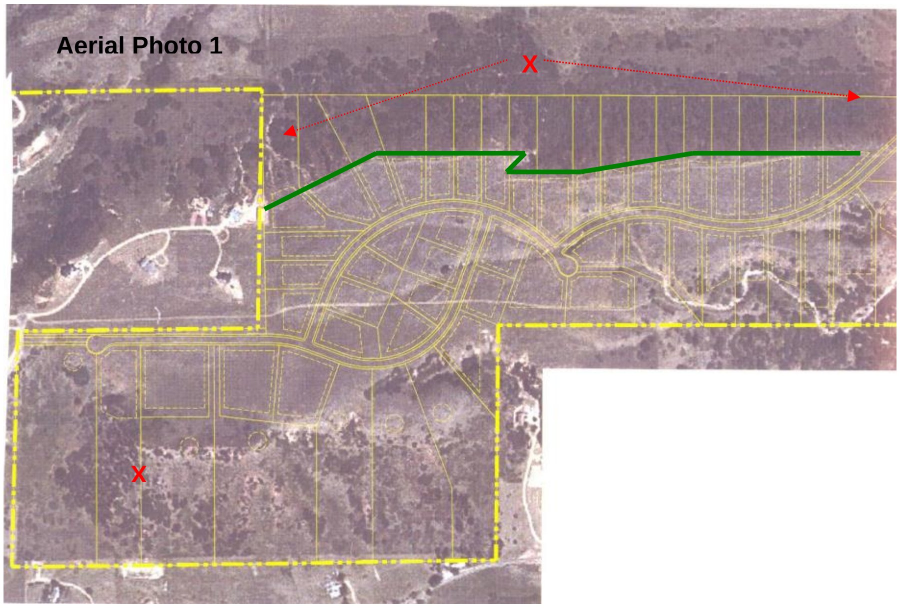
In this instance, the fuels in the shrub fuel model are not continuous. There are open spaces of exposed mineral soil and exposed rock. Where the soil is of a sufficient depth, short prairie grasses provide a break between the oak brushes.

Dead ground fuels under the oak canopy are continuous within the oak itself. These ground fuels may provide enough heat to cause ignition and torching of the fire into the oak canopy. This type of fire activity will be of greater concern in the untreated open spaces that border lots with a residential structure.

**The fire behavior prediction indicates that flame lengths could reach upwards of seven feet. Therefore, oak brush that is left in the landscape of each lot should be minimum of fifteen feet away from any structures, whenever possible.**

**Oak brush that is left within fifteen feet of structures should be thinned adequately enough to allow the annual removal of dead leaves and any other flammable material or debris. Any dead limbs or oak stems should be pruned and removed.**

**In areas where a severe oak brush hazards exists in areas slated for development, spacing between the individual oak clumps should be fifteen feet apart. This will help to reduce the rate of spread of a wildfire. Natural breaks between oak clumps should be utilized whenever possible and the spacing between the clumps should meet the fifteen-foot minimum distance.**




Aerial Photo 1 shows a portion of the southwest area of the Forest Lakes subdivision. The red "X" indicates locations of extreme wildfire hazard. In the area of extreme hazard at the top of the slope south of the Beaver Creek drainage, 18 lots are to be developed. It is suggested here that the actual structures be placed no closer than twenty feet to the transition from the oak brush at the top of the slope and the grassland on top (see green line). This is due to the increased flame length that is expected, as a wildfire would reach the top of the slope.

If a structure is placed within the twenty-foot setback from the slope, the oak brush located within a twenty-foot setback downhill from the structure should be thinned.

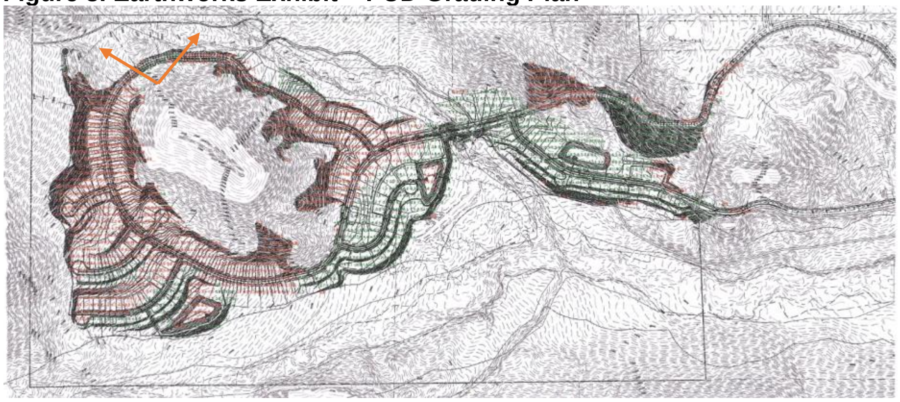
- **Availability**

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 this fuel type should be considered a year-round hazard and not limited to the summer months. Drought conditions and early fall frosts may inhibit the normal leaf drop from the Gambel oak. This would leave a very flashy aerial fuel in place and available for rapid combustion and subsequent wildfire spread. This condition was evident in a wildfire that occurred north of Baptist Road in northern El Paso County in November of 2001.

In the meadows or grass fuel beds, the availability of this fuel has been reduced due to the grazing of cattle (see Photo 1). In addition, both fuel beds will be modified by the grading proposed for the utility plan. It is projected 94 acres will either be scraped to bare mineral soil or have the fuel bed covered with fill material (see Figure 3).

**Figure 3. Earthworks Exhibit – PUD Grading Plan**



The red shaded areas are cuts or where vegetation will be removed to capture soil material for use as fill. The green shaded areas are where the fill material will be deposited, covering mostly grassland or meadows.

The oak brush is impacted by the grading activity but to a much lesser extent. Fuel modification should be implemented in the area to the northwest and north of the proposed road where oak thickets exist (see yellow arrows).

As mentioned previously, the twenty-foot setback from slopes with oak thickets should be followed in Phase 2 West (see pg. 19).

The current weather patterns have contributed to a long-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 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 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 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 infers that 'defensible space', while a good starting point, may not be the whole solution in preventing 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. There are two dead end roads in the proposed site plan that exceed the maximum, but they lie in a low hazard area. The site has been reviewed and approved Tri-Lakes Monument FPD. All dead-end roads should have a turnaround at the closed end (cul-de-sac) of at least 100 feet in diameter.

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 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 type 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.

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. This will prevent flame lengths from reaching the building.

**In areas of extreme wildfire hazard or where lots have a slope exceeding 20%, it is strongly recommended that a five-foot width of stone be installed around the structure and that no plant material should be placed within this (or the first five feet of a larger) rock border.**

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.

## *Construction Considerations*

As the fuel in this subdivision are primarily grasses and oak leaves and small woody debris, 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 accumulation 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 factor in the loss of structures in the Waldo Canyon Fire. 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. Go to the Resources tab and click on e-books.

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

In a 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 was exhibited upon initial installation.

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. 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 oak brush, the opposite will be true. Oak brush has a very high intensity once ignited and there is more fuel available when compared to grass. This additional fuel availability may be adequate to ignite combustible siding materials.

In addition, oak brush is found on the slopes of the development that increases its combustibility due to the preheating effect created by the slopes. These slopes range from as low as 10% upwards to 35%. Slopes in excess of 15% are considered steep and play a major role in a wildfire spread and intensity.

**It is recommended that where slopes exceed 15% in areas where the wildfire hazard is considered extreme, non-combustible siding materials should be used in the construction of structures.**

**Note: The Tri-Lakes Monument Fire Protection District has stipulated four requirements in approving the proposed Forest Lakes Phase 2 West. This document is included as Appendix C.**

## *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. As the project is developed, fire hydrants will become available for use and alleviate this situation.

In the short term, there is one source of water that should be considered for use by suppression forces in case of a wildfire incident prior to and during the development process. This water feature is located on the eastern portion of the property and is referred to as Bristlecone Lake. Due to ownership issues, Pinon Lake is not available for use.

**It is suggested that a series of dry hydrants should be installed at Bristlecone Lake in order to provide a readily available source of water for fire suppression actions within the development.**

**Commented [AB1]:** This doesn't really address the fact that Phase 1 is constructed and fire hydrants are in place. No dry hydrants needed here.

As the Forest Lakes subdivision progresses and the fire hydrant system becomes the primary water source for fire emergencies, the dry hydrant system would be available as a backup system.

The Tri-Lakes Fire Protection District should be consulted on the actual need and location of the dry hydrants. Due to the high density of homes, it is suggested that a dry hydrant be placed along Long Valley Drive at the closest proximity to Bristlecone Lake. A second dry hydrant could be placed along Forest Lake Drive and on the north side of Bristlecone Lake.

NFPA Standard 1231, Water Supplies for Suburban and Rural Fire Fighting, 1989 should be followed in the design and construction of any dry hydrants. A copy of Appendix B – Dry Hydrants is included in this report for informational purposes.

## *Emergency Access Road*

There is an emergency access road planned west of Tract 3, that borders Mesa Top Drive. This is also identified as a proposed County Regional Trail.

Emergency access roads should have no greater than 10% with a clear width of twelve (12) feet at a minimum. A vertical clearance of thirteen (13) feet and six (6) inches should be maintained along the entire length of the proposed emergency access. The road base should be of enough quality to support emergency vehicles in consultation with the fire protection district.

Based upon a field inspection of the proposed emergency access, the proposed route appears to be adequate structurally. The main concern is the proximity of oak brush thickets in the first portion of the road and at its terminus on Mesa Top Drive adjacent to Lot 36.

While it is recognized that the emergency access also serves as a recreational trail, there will be a desire to maximize that experience. The oak thickets serve as a visual buffer between the proposed lots (36-52) and the proposed trail/emergency access. However, as this area is considered a severe wildfire hazard, it may be necessary to remove or substantially thin the stems within these thickets.

As it is projected that flame lengths could reach and exceed twenty-five feet under severe weather conditions, the amount of oak brush in proximity to the road may prohibit use during an emergency. A balance needs to be struck in consultation with the district in this regard.

***Photo 6. This is a view in the vicinity of the emergency access road looking to the east. The limbs of the ponderosa pine should be pruned where a heavy understory of oak exists. If the access road cuts through oak thickets, it may be necessary to remove the oak.***

Where feasible, the emergency access road should be moved away from oak thickets whenever practical. This distance should be based upon the continuity of the thickets themselves. Where sparse, the closer the access road can be. Where the thicket is dense, tall and is continuous, the further the distance.

### *Home Owners Association*

It is assumed here that the Home Owner's Association (HOA) will be responsible for some or all the implementation and annual inspection of the wildfire mitigation activity, particularly regarding fuel availability.

It is suggested here that the HOA schedule cleanup days in the spring and in fall after leaf 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. This is a major concern based upon the number of fatalities in California during the Camp Fire (November – 2018). 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.

During an actual wildfire event, confusion and panic reign. The evacuation plan should be practiced with drills in conjunction with the local fire protection district. This should be an annual exercise that includes residents living in the entire Forest Lakes subdivision.

The HOA should develop an educational plan to help keep the threat from wildfire foremost in the community's mind. A tool available to the HOA is the Firewise USA program sponsored by the National Fire Protection Association. Additional information about this program can be found at https://www.nfpa.org/Public-Education/by-topic/Wildfire/Firewise-USA

This may also include articles in the HOA newsletter, presentations at meetings and even posting the wildfire hazard daily at the entrances to the Forest Lakes community.

# Appendix A

## Fuel Model Descriptions

**Fuel Model 1 & 6 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."

**Low Load, Dry Climate Grass (GR2) Summary Page**
**Very High Load, Dry Climate Shrub (SH7) Summary Page**

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.*

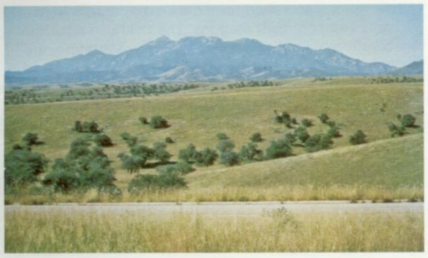


*Photo 2. Live oak savanna of the Southwest on the Coronado National Forest.*

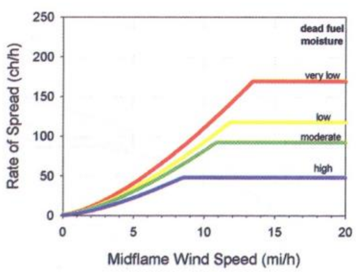
*Photo 3: Open pine—grasslands on the Lewis and Clark National Forest*

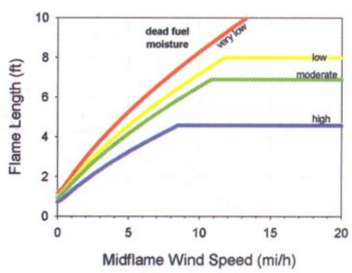
*GR2 (102)*

***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 |



**Fire Behavior Fuel Model 6**

Fires carry through the shrub layer where the foliage is more flammable than fuel model 5, but this requires moderate winds, greater than 8 mi/h (13 km/h) at mid-flame height. Fire will drop to the ground at low wind speeds or at openings in the stand. The shrubs are older, but not as tall as shrub types of model 4, nor do they contain as much fuel as model 4. A broad range of shrub conditions is covered by this model. Fuel situations to be considered include intermediate stands of chamise, chaparral, oak brush, low pocosin, Alaskan spruce taiga, and shrub tundra. Even hardwood slash that has cured can be considered. Pinyon-juniper shrublands may be represented but may overpredict rate of spread except at high winds, like 20 mi/h (32 km/h) at the 20-foot level.

The 1978 NFDRS fuel models F and Q are represented by this fuel model. It can be considered a second choice for models T and D and a third choice for model S. Photographs 15, 16, 17, and 18 show situations encompassed by this fuel model.

**Fuel model values for estimating fire behavior**

| | |
|---|---|
| Total fuel load, < 3-inch dead and live, tons/acre | 6.0 |
| Dead fuel load, ¼-inch, tons/acre | 1.5 |
| Live fuel load, foliage, tons/acre | 0 |
| Fuel bed depth, feet | 2.5 |

*Photo 15. Pinyon-juniper with sagebrush near Ely, Nev.; understory mainly sage with some grass intermixed.*

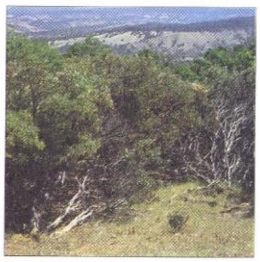
*Photo 16. Southern hardwood shrub with pine slash residues.*

*Photo 17. Low pocosin shrub field in the south.*

*Photo 18. Frost-killed Gambel Oak foliage, less than 4 feet in height, in Colorado.*

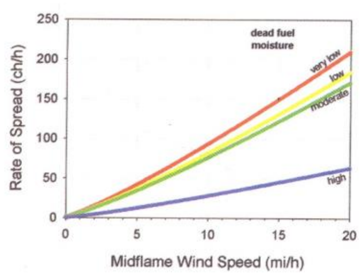
## *SH7 (147)*

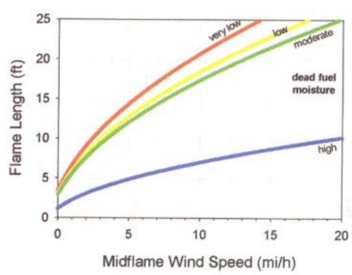
### *Very High Load, Dry Climate Shrub*



**Description:** The primary carrier of fire in SH7 is woody shrubs and shrub litter. Very heavy shrub load, depth 4 to 6 feet. Spread rate lower than SH7, but flame length similar. Spread rate is high; flame length very high.

| | |
|---|---|
| Fine fuel load (t/ac) | 6.9 |
| Characteristic SAV (ft-1) | 1233 |
| Packing ratio (dimensionless) | 0.00344 |
| Extinction moisture content (percent) | 15 |



# Appendix B

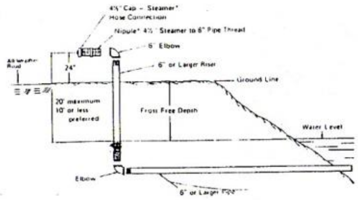
## NFPS Standard 1231– Dry Hydrants

APPENDIX B

## B-5 Dry Hydrants.

**B-5-1 General.** The use of natural water sources and man-made water sources requires an understanding of dry hydrant construction, as the dry hydrant provides a ready means of suction supply without the longer time often involved in direct drafting. Although most rural fire departments are equipped to draft water directly from farm ponds or streams, and all should be, a dry hydrant [*see Figure B-5-1(b)*] with an all-weather road access is preferable.

Figure B-5-1(a) Dry hydrant.

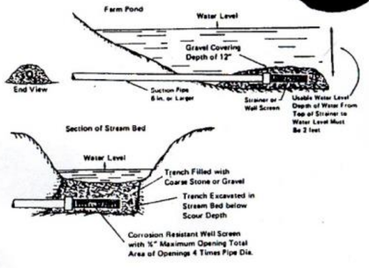



Exploded view of dry hydrant construction

**Figure B-5-1(b) Dry hydrant construction.** [*See Figure B-5-2(c).*]

NOTE: Riser should be protected by post if subject to damage by auto or fire equipment.

*Steamer should be fire department's hard suction hose size and thread type.




Details of screen layout – pond and stream sites.

**Figure B-5-1(c) Details of screen layout — pond and stream sites.**

**B-5-2 Dry Hydrant Construction.** Depending upon the desired flow, the distance to the water, and the difference in elevation between the hydrant and water source, a 6-in. (152-mm) or larger pipe is necessary. The pipe and material should be suitable for the use and installed to manufacturer's standard. In some areas of the country, PVC pipe is being used for the construction of dry hydrants. (*See B-5-2.2.*) However, in other areas of the country, brass or bronze caps and steamer connections are being used along with iron pipe elbows and risers with asbestos cement or bituminized fiber pipe between risers and the water supply. Pipe and material used should be based on local conditions and common usage.

Table B-5-2 may be used to determine pipe size of a given hydrant line basing the flow upon 10 psi or 20 ft of head.

**Table B-5-2**
**Gallons per Minute Flow at 20 Feet of Head on Typical 6-in. Pipe**

| Length | Bituminous Fiber or Steel (C = 120) | Cast Iron (C = 110) | Asbestos Cement (C = 130) |
|---|---|---|---|
| 25 ft | 3,400 | 3,060 | 3,650 |
| 50 ft | 2,300 | 2,100 | 2,500 |
| 100 ft | 1,600 | 1,475 | 1,700 |
| 500 ft | 660 | 615 | 720 |
| 1000 ft | 460 | 425 | 495 |

For SI Units: 1 ft = 0.305 m; 1 gpm = 3.785 L/min.

Based upon the Hazen-Williams formula with estimated values of C.
*Courtesy of Dr. Gilbert Levin.*

A strainer or well screen is needed for the suction end of the pipeline to keep foreign materials out of the pipe and the pumper using the dry hydrant. A well screen as a strainer is shown in Figure B-5-1(c). However, a strainer may be constructed by boring ¼-in. (6.4-mm) or ⅜-in. (9.5-mm) holes through the pipe. The holes should be spaced on ½-in. (12.7-mm) centers, with at least 12 rows drilled. Total area of strainer holes must exceed four times the area of the diameter of the pipe. The end of the pipe -hould be plugged, placed in the deepest portion of the 1 or other water source, and raised off the bottom about (0.6 m) so it will be above any silt that may accumulate. 1 he strainer should be covered with crushed rock to exclude marine growth and to prevent mechanical damage.

For stream bed installations, the strainer must be buried deep enough to prevent scouring action of the stream during periods of high runoff from exposing the strainer and tearing it loose from the supply pipe. The depth at which the pipe is installed should be below the frost free depth for the area. This depth may be obtained from a hydraulic engineer, university extension service, or the U.S. Soil Conservation System. [*See Figure B-5-1(b).*]

For a dry hydrant, the pipe should be laid at a minimum slope [2 or 3 in. (50.8 or 76.2 mm) per 100 ft (30.5 m)] up to the hydrant riser. The riser on a dry hydrant should be exposed above ground approximately 24 in. (610 mm).

**B-5-2.1 Pressurized Dry Hydrant Sources.**

There can be two types of pressurized dry hydrants—those flowing through a dam (or dike) and those coming from an uphill water source emptying at a point downhill from the source. Although the water source uphill can be of extreme advantage when flowed to a downhill source, a major disadvantage could lie in the burying of the PVC pipe below the frost level. For a pressure hydrant, the pipe should be sloped downhill to the hydrant riser and be fitted with a gate valve. Where the supply line passes through the dike of a pond, anti-seep collars should be attached to · pipe to prevent water from seeping and channeling de the pipe.

**B-5-2.2 Design Features and Step-by-Step Procedures for Installing a Dry Hydrant Using PVC Pipe.**

The design of dry hydrant installations have been carefully planned to incorporate several desirable advantages that tend to bring the installation of the PVC dry hydrant within the manpower and financial resource of a large number of rural fire departments or the property owners; however, in areas where other types of material are used, such materials may be substituted for the PVC pipe and fittings. The design features are listed here to simplify the understanding of the installation of the dry hydrant.

I. Design Features for Dry Hydrant.

A. It is recommended that dry hydrants be constructed of 6 in. (152 mm) or larger piping and fittings; however, for very short lengths of pipe, 5 in. (127 mm) may be considered.

B. No PVC piping or fittings of less than schedule 40 should be considered.

C. All piping or fittings exposed to sunlight should be primed and painted.

D. A minimum number of 90 degree elbows, preferably no more than two, are suggested to be used in the total system.

E. All connections should be cleaned and properly ıented so as to have all connections airtight.

F. The strainer may be formed in the end of the pipe by drilling 960, ⅜-in. (9.5-mm) holes along piping. A 4-in. (102-mm) strip should be reserved on the pipe to be installed on top to reduce the possibility of whirlpool during drought periods.

**Figure B-5-2.2(a) A dry hydrant innovation has eliminated the top 90° or 45° elbow on each hydrant.**
(*Photo by Nahunta Volunteer Fire Department, North Carolina*)

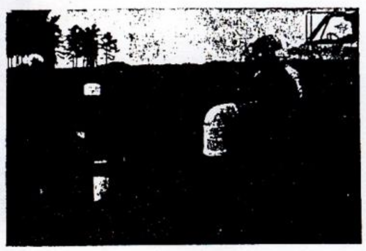


**Figure B-5-2.2(b) Hard suction hose is connected to the pumper. The driver maneuvers the truck as the fire fighter walks the suction end of the hose to the dry hydrant. An "O" ring in the plastic "L" provides a tight fit and allows the operator to draft. This is a quick and simple method to connect the pumper to a dry hydrant.**

II. Step-by-Step Procedures for Installing a Dry Hydrant.

(Installation is made easy by some simple preplanning.)

A. Consider average water level at piping entry location.

B. Lift in excess of 15 ft (4.5 m) needs to be avoided [22 ft (6.8 m) maximum].

C. It is recommended that a backhoe or similar ditching equipment be utilized to excavate entire ditch to a horizontal elevation 3 ft (0.9 m) below water level.

D. The ditch should be excavated beginning at the most distant point from the water (riser location). Maintain a reasonable level and dig the ditch into the pond.

E. The horizontal and vertical portion (pipe and riser) should be assembled and lowered in one piece, as ditch should now have water its entire length.

F. Back-filling should begin at the riser. It is suggested that the soil around the riser be tamped so it is rigidly supported with surrounding soil.

G. The ditch water is automatically forced back to the water source as back-filling is completed. This area should be firmly packed so as not to have low areas occur at a later date due to the settling of the soil.

H. At this point is is necessary to have personnel enter the water and place cement blocks, gravel, or other permanent supports underneath pipe in the water. The support should be heavy and prevent piping from coming in contact with bottom of water source. The strainer or well screen is now to be covered with 12 in. (305 mm) of coarse gravel to secure it in place and to prevent movement and must be at least 2 ft (0.6 m) under water. The supports can also be secured to the pipe with copper wire to stabilize piping.

I. In rapidly moving streams, the pipe will need to have special protection against the rapidly flowing water and various debris and materials washing down the stream against the pipe.

**B-5-3 Maintenance of Dry Hydrant.** These facilities require periodic checking, testing, and maintenance at least quarterly. Checking and testing by actual drafting should be a part of fire department training and drills. Thorough surveys should reveal any deterioration in the water supply situation in ponds, streams, or cisterns.

Particular attention should be given to streams and ponds. They may need frequent removal of debris, dredging or excavation of silt, and protection from erosion. The hydrants should be tested at least annually with a pumper. Back flushing, followed by a pumper test at a maximum designed flow rate, with records kept of each test, is highly desirable. Tests of this kind will not only verify proper condition but also keep the line and strainer clear of silt and the water supply available for any fire emergency.

The pond should be maintained as free of aquatic growth as possible. USDA Farmer's Bulletin, "Waterweed Control on Farms and Ranches," is a source of good information on this subject. At times it may be necessary to drain the pond to control this growth.

Inspections should include safety procedures such as posting warning signs and seeing that life preservers, ropes, etc., are available. Particular attention should be given to local authorities' regulations governing such water points.

It is important to consider appearance of this water point. Grass should be kept trimmed and neat. The hydrant should be freshly painted as needed. The cap can be painted a reflective material to improve visibility during emergencies. All identification signs should be approved by the Department of Transportation prior to installation if they are to be on the right of way or come under state laws.

Location and Directions ______________________

Depth of Water Above Intake ________

Date ________

| DATE OF INSP. | BY | DEPTH OF WATER | AMOUNT OF WATER AVAILABLE | CONDITION OF WATER | EROSION | DRY HYDRANT | | WEED CONTROL | ROAD CONDITION | SIGN | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | TEST | FLOW | | | | |
| | | | | | | | | | | | |

Figure B-5-3.1.

# Appendix C

## Copy of Tri-Lakes Monument Fire Protection District

## October 30, 2018

**TRI-LAKES MONUMENT FIRE PROTECTION DISTRICT**
16055 Old Forest Point, Suite 103
Monument, CO 80132
Bus: (719) 484-0911 Fax (719) 481-3456

Jamey Bumgarner, Fire Marshal

To: Jim Bolton, Classic Homes, Vice President/Project Manager

From: Jamey Bumgarner, Fire Marshal

Subject: Forest Lakes Proposed Phase 2

Date: October 30, 2018

Please accept the following discussion as the comments from the Tri Lakes Monument Fire Protection District (TLMFPD) reference the proposed Phase 2 for the Forest Lakes Subdivision.

After careful review and consultation from many sources including current codes, professional research, and other discussions with fire service professionals TLMFPD would like to provide the following comments.

Based upon alterations to the original proposed plan for Phase 2 you plan to reduce the two roads originally proposed down to one road with a divided median (that is wide enough to accommodate four lanes during an emergency) over the culvert. Furthermore, you plan to construct an additional 180 homes within Phase 2 which are located behind the already existing 200 homes.

The Wildfire Hazard & Mitigation Report (January 18, 2003) prepared by Stephan J. Spaulding states very clearly that the area and acreage within the Forest Lakes Subdivision is frequented by fire events as recently as the 2002 Spaatz Fire that started on the ranch and consumed over 67 acres while taxing the response of local resources even with a rapid 4-minute response. The Berry Fire (1989) and the Beaver Creek Fire (2011) both burned on the adjacent property and required a heavy commitment of local, state, and federal resources to contain the fire and provide structure protection. All these fires occurred with just a few structures (located in the meadow areas) present on the ranch and no resources or very few were required for structure protection. The report also states that the 990-acre subdivision has a low rating for wildfire in the meadow areas and severe rating for wildfire in the brush which is where most of the homes are being constructed in Phase 2. The entire Forest Lakes subdivision lies within the El Paso County hazard map for wildland fires and is considered a Wildland Urban Interface Subdivision per the International Code Council's Wildland Urban Interface code.

By adding an additional 180 homes to the wildfire prone area where most will be built within the severe hazard rated areas, proper actions must be taken. We must ensure that fire resistant construction, mitigation, and design elements are incorporated and adhered to, so we minimize fire danger to the residents, first responders, and create a community that is prepared for wildfire. The community will experience wildfire again as has been demonstrated numerous times over the last 20 plus years.

**TRI-LAKES MONUMENT FIRE PROTECTION DISTRICT**
16055 Old Forest Point, Suite 103
Monument, CO 80132
Bus: (719) 484-0911 Fax (719) 481-3456

Jamey Bumgarner, Fire Marshal

TLMFPD requires the following actions be taken and adhered to fully therefore creating an environment that will protect the safety of responders and residents.

1. Construction: All structures and property within Phase 2 be constructed to comply with the Colorado Springs Fire Department Ignition Resistant and Construction Design manual.
2. Access: The roadways widths be increased to 24 feet each direction with medians being constructed to allow for fire apparatus and responders to drive over them and a minimum of 3 crossovers, location to be determined by the developer and fire district, for responders to access both sides of the roadways. If parking is to be permitted on roadways there should be 9 feet additional added to allow fire apparatus to flow freely alongside parked cars for a total of 33 feet plus medians.
3. Mitigation/Access: All lots will be mitigated to the CSFD Ignition Resistant and Construction Design manual before the construction of the home is completed or a certificate of occupancy issued. This includes creating sufficient fuel breaks to prevent fire impingement to roadways that would inhibit the ability of responders to access the subdivision and the resident's ability to evacuate the subdivision. As stated within the wildfire mitigation report you can never remove wildfire from the property however, removing fuel can reduce the risk.
4. Water Supply: Based upon the calculations provided by JDS Hydro Consultants, Inc it appears that sufficient water pressure and flow exist to support fire protection. The fire district would require that the newly constructed water tank and piping be operational before the homes in Phase 2 are issued a certificate of occupancy.

The entire subdivision of Forest Lakes lies within the Wildland Urban Interface and therefore should be treated as such. Once the completion or build out occurs it will be the responsibility of the HOA's and its residents to ensure that proper mitigation is maintained to prevent catastrophic losses from occurring due to the eventual wildfire.