Oak Flat Incident

Rogue River -Siskiyou National Forest
Wild River Ranger District

Long Term Assessment and Plan
August 20, 2010

By R6 Long-term Assessment Team

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Table of Contents

Executive Summary

- The 2010 Fire Season thus far can be characterized as a normal season, with fire danger indices tracking about average through mid-late August. The short term projection is for ERC to stay somewhat above average for the next 10 days, and the longer term outlook is for near normal precipitation and below normal temperatures. Most fire seasons locally are over by mid-October, about 55 days from now.
  In comparison to 2002, a recent significant fire season, 2010 is much later in developing and is not nearly as dry. In 1987, another locally significant fire year, July was exceptionally wet, and the ERC levels did not reach the 90th percentile until late August. However, fire danger indices remained elevated until October, dropping and then returning again to high levels twice before November 3. Late seasons are not unusual in southwest Oregon, and fire danger often stays elevated well into October.
- The Oak Flat fire is located in very dissected, rough, forested terrain. A planned perimeter well back from the current fire location, on ridges and favoring roads, was validated by the LTAT as a safe strategy that takes advantage of anticipated fire behavior changes. Fire spread modeling indicates that, left unchecked, the fire will reach most of this planned perimeter within the next 14 days. The strategy of using the roads and ridges, burning out and holding this perimeter resulting in an approximately 5900 acre fire, was validated by the long-term assessment.
- The fire has a high probability of reaching private timberlands in Swede Basin in the next 14 days, and a moderate probability of reaching private lands in the vicinity of the Myers-Briggs creeks junction. There is a 9% probability a free burning fire, starting today, would reach the Oak Flat homes by the end of the season.
  A free-burning fire will likely burn through the stands identified as northern spotted owl nest sites and anadromous fish habitat. However, fire intensity thus far in these types of stands has generally been a lower intensity surface fire, favorable for maintaining live overstory in much of these stands.
- The long term assessment includes plans for developing management action points around the perimeter of the fire, along with the costs, time required, and risks associated with implementing (and not implementing) each action. Most of these MAPs can be thought of as preplanned contingency actions, and each has a trigger to be considered before implementing the action.
- Smoke issues downwind of the fire may become an issue with the public. The LTA includes some thoughts about talking points to use when talking about smoke. These include assurances that fire managers are considering smoke impacts when they make their decisions about how to manage this fire, and that smoke impacts are weighed alongside firefighter safety, costs, and natural resource and private land values.

Introduction

The Oak Flat Fire was discovered on Friday August 13th, on the Wild River Ranger District, Rogue-River-Siskiyou National Forest, approximately 3½ miles northeast of Oak Flat on the Illinois River. The start of this fire is still under investigation, however there was no recent lightning activity detected at the point of origin.

The ORCA Type 2 Incident Management Team was ordered on Saturday August 14 and assumed management of the fire on the evening of Sunday August 15. The PNW Long-term Assessment Team (LTAT) was ordered on August 15 and in-briefed on August 16. This LTAT was ordered to provide information about the long term outlook for this fire. The objectives and key questions facing this team are listed below.

Objective and Risk Assessment

This long-term assessment and implementation plan is intended to evaluate, validate and implement the selected Wildland Fire Decision Support System (WFDSS) Course of Action for the Oak Flat Fire on the Wild Rivers Ranger District of the Rogue River-Siskiyou National Forest. Objectives for this assessment come from the WFDSS, based on the Siskiyou NF Land Management Plan, the SW Oregon Interagency Fire Management Plan, and plans developed by the hosting Agency Administrator specific to current local socio-political and economic concerns.

This plan is a compilation of information pertinent to the extended management of the Oak Flats Incident. The information presented in this plan includes an assessment of the risks that the fire presents to valued resources as well as a preliminary plan for their protection. Each of the actions that the plan would recommend must be validated prior to implementation to account for changes in weather, fire spread, and resource availability, recent experience with similar actions, or other factors that may alter or negate the need for action.

It is essential that this plan be updated as weather changes, fire spread continues, and new information becomes available. The projections are generally based on a 14 day assessment, with less confidence towards the end of that time period. Therefore, should the fire activity continue beyond 14 days, a reassessment is recommended.

The following objectives were provided to the Long Term Assessment team by the Forest Supervisor on August 16, 2010:

1) Do your part to protect public and firefighter safety by recommending appropriate actions and strategies, implementing LCES appropriate for your assignment, and managing fatigue within your team

2) Develop a long term assessment of the Oak Flat Fire, including a projection of fire growth, risk assessment (as it pertains to firefighters), estimate of costs, and recommendations for future actions and their associated triggers

3) Develop a strategy for control until out. Propose and provide data on expected season ending event, proposed organizational needs, (personnel, equipment, aircraft, and specialty supplies) using historical and predicted weather patterns.

4) Work with the IMT and the local unit to help provide for protection of cultural, historic, developed sites, and other resource values indicated in the SW Oregon Interagency Fire Management Plan, Siskiyou NF Land Management Plan or as requested by Agency personnel.

Over the course of the work of the LTAT, and as we interacted with Forest and District staffs and the Incident Management Team, several key questions arose. We focused our assessment on the objectives and these key questions:

- What are the fuels conditions and the anticipated fire behavior in the area of the Biscuit Fire (2002)?
- What is the viability of the planned containment lines? Are there better alternatives and/or backup contingency lines?
- What is the likelihood that the fire will reach the planned perimeter, and when?
- How long should the 2010 fire season be expected to last? How does 2010 compare to 2002 (the Biscuit fire year) and other seasons of note?

Risk Assessment Considerations

The Risk Assessment is intended to evaluate the risk of fire spread to values that have been identified by the local managers, and when appropriate evaluate the impact that the fire would have on those values at risk. A Strategic Risk Assessment (SRA) was completed by the local unit as part of the WFDSS process during the extended attack period. This SRA identified the following Values at Risk, some of which have been modified as better information became available:

- Critical spotted owl habitat, 5 owl nest sites in vicinity, Late Successional Reserves
- Anadromous fish bearing streams, 9 (steelhead and coho). Critical coho habitat downstream from present fire location.
- Private timber lands to the southwest (Oak Flat), southeast (Swede Basin), and northeast (Barr Mine)
- FS Campground to the northeast (Sam Brown CG)
- Active mining operations
- Port-Orford cedar (POC) in several draws within the fire area. Risk of root disease infection from suppression activity vectors.
- Firefighter (FFTR) safety and exposure

The order of values in the above list is not intended to indicate any priority; for example, firefighter and public safety is the first priority for any management action on this fire.

Management Actions Points (MAP)

Five Management Action Points were identified to contain the fire within the WFDSS planning area. Primary objectives for the identified actions are consistent with firefighter and public safety, and the protection of state and private lands. Each MAP includes an objective, the conditions that may be present during the action, the activities to be implemented, and the probability of success of the actions, the resources needed to implement the actions, the cost, and the consequences of not implementing the action.

MAP 1 is designed to inform the agency administrator about options and potential impacts if the Oak Flat fire were to become established near the Biscuit Fire. MAP 1 is that area north, west and southwest of the Oak Flat fire. If a decision needs to be made regarding fire activity in or near the Biscuit Fire, this MAP write up describes options, resource needs and costs. A primary driver for a decision on whether holding action needs to be taken to keep fire out of the Biscuit Fire is timing. The later in the season that a threat to the Biscuit Fire boundary occurs, the less critical the action becomes.

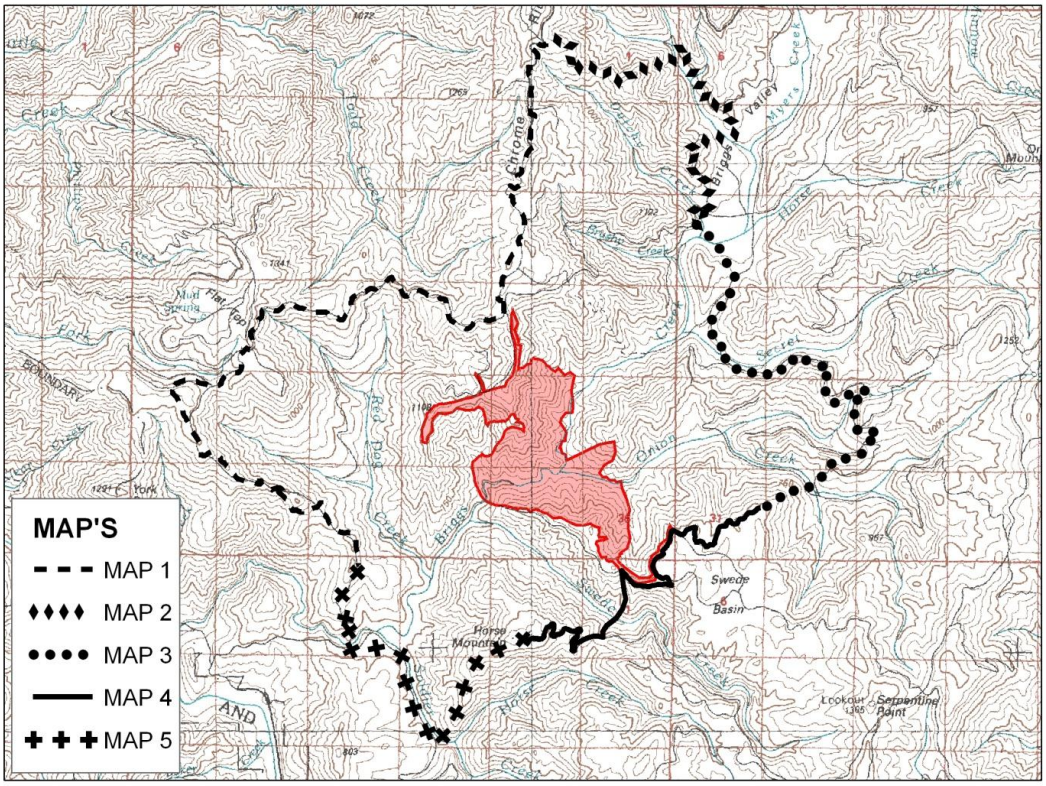
MAP 2 is the area near the Barr mine and west of the 25 road. This MAP is a general fallback position if fire escapes the mid slope fireline in Divisions D and H. In order to utilize the proposed fallback fireline, work should begin as soon as possible. There is some limited dozer work to widen a road, hand line construction and road brushing to complete the project.

MAP 3 identifies a back up contingency line to be used in case the primary firelines fail during fire operations. Its location is approximately 2 miles from the primary fire line. There are limited fallback opportunities east of the Oak Flat fire because Forest Boundary is only 4 miles beyond the identified MAP 3 contingency line.

MAP 4 is that area just north of the Swede Basin private property. There are no appropriate options for an escape across control lines other than full suppression to protect private property. There are adequate roads, dozer lines, timber sales and other features that make direct attack possible and likely successful.

MAP 5 is the southernmost portion of the strategic boundary. It is located near Soldier Creek and Briggs Creek. The objective for MAP 5 is to keep fire from moving southward down either Briggs Creek or Soldier Creek. Fire in Soldier Creek has the potential of moving up drainage into the southern portion of Swede Basin. Fire in Briggs Creek has the potential of moving down drainage into the Oak Flats area. As with MAP 4, there are no good alternatives but to keep fire out of either of these drainages south of the strategic boundary.

Management Action Points (MAP)



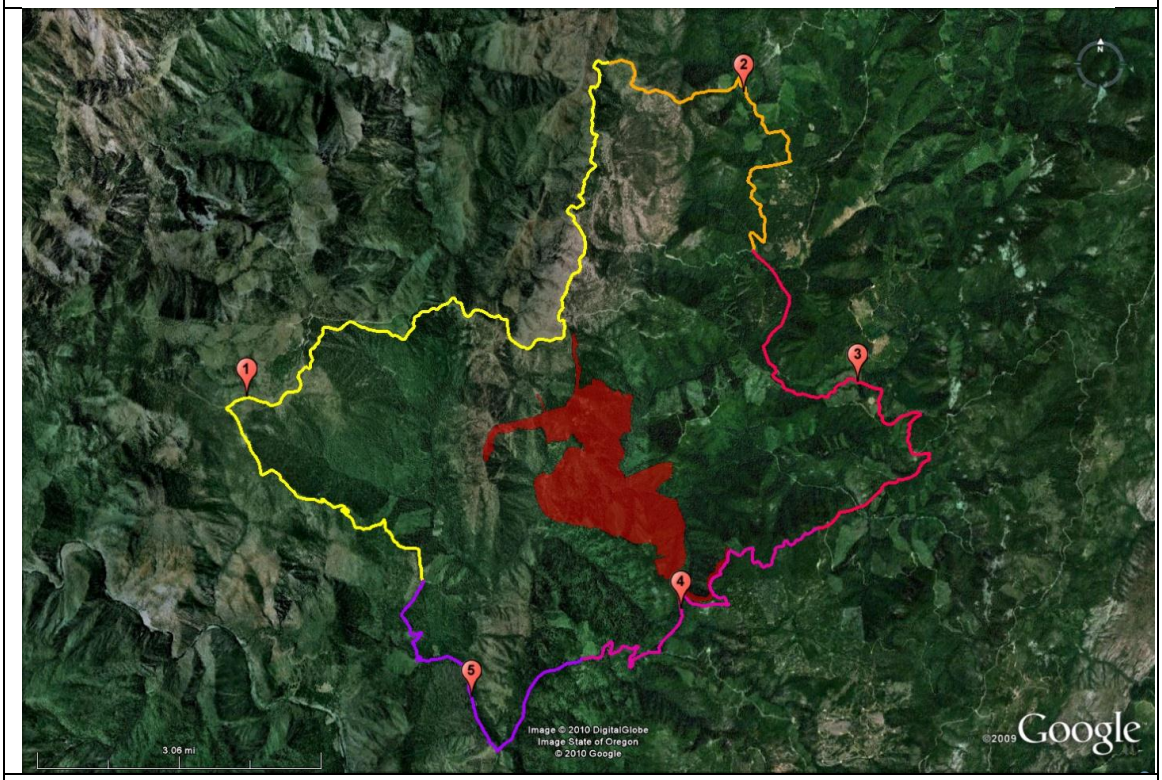


Figure 1 Overview Map

Fire Behavior

Observed Fire Behavior

The fire is burning in the bottom of the Briggs Creek and Onion Creek drainages. The observed fire behavior during 8/16 – 20/2010 has been primarily an under-burn with backing and flanking fire spread with flame lengths of 2 – 4 feet. There have been some areas of short upslope runs with rates of spread averaging 10 – 15 chains/hour, and flame lengths of 6 – 8 feet. Spotting has contributed to the fires spread with a maximum spotting distance of ½ mile. Rolling material has contributed to the downhill spread of the fire. Average fire growth during this time period has been approximately 200 – 300 acres/day.

While most of the area is being under-burned at fairly low fire intensities there are some areas with higher intensities that will result in some overstory tree mortality. Additionally there are small areas where stand replacement runs of small patch size (30 -50 acres) have occurred.

Burning conditions and expected fire behavior is anticipated to remain very similar for the next two weeks. As the fire season progresses into September additional drying of fuels can be expected with some resulting increase in fire behavior and intensities. However this is not a severe fire season and the overall fire effects should not be expected to increase dramatically. Based on the expected low to moderate fire intensities the resulting fire effects on critical habitat areas should be minimal.

Topography

The topography in the Oak Flat Fire area consists of very steep, dissected terrain. It is very steep, rugged, and difficult country for fire fighters to work in safely and effectively. Several additional topographic features are affecting fire behavior.

- The variability of the terrain limits the potential for the development of large up canyon fire runs. The changing topography results in a change in fire behavior as the fires spread encounters different environmental conditions.
- The fire area is surrounded by higher ridges which shelter the fire area from the stronger ridge top winds.
- The area is very conducive to the development of strong smoke inversion layers. The surrounding higher terrain seems to help maintain the inversion and makes it very difficult for the smoke to be scoured out. The inversion will be a very persistent condition throughout the duration of this fire.

Fuels

The fuels discussion occurs in two sections: 1) the natural fuel complexes associated with the immediate and 2) the surrounding areas.

Fire Vicinity

The fuels in the fire area consist of a multi layered fuel complex with a mixed conifer overstory consisting of Douglas-fir, ponderosa and Jeffery pines, and cedar, with Douglas-fir as the predominant species. There is a hardwood/shrub understory consisting of madrone, manzanita, tanoak and other species. Lastly there is the forest litter layer consisting of short needle and hardwood litter. The litter layer is the primary carrier of fire spread. The Fuel Models (FM)

that are representative of this are FM 8, 10 and TU5. TU5 seems to be very representative for modeling the fires spread.

While there is some variability of the fuels on different aspects and different soil types basically this fuel model is rather consistent and continuous throughout the area.

This is a very sheltered fuel model shading the fuels and reducing the winds, which results in this fuel model being a relatively slow spreading fuel model. Additionally this fuel model has a significant live fuel component, and the associated live fuel moistures (LFM) influences the fires spread. Currently the LFM is high enough, estimated at 120 – 140%, to help slow the fires spread. The LFMs will lower as the season moves into the fall and the live fuels will become more available to burn potentially resulting in a slight increase in fire behavior. Modeled rates of spread with the drier live fuels and fairly hot and dry conditions increase to 15 – 30 chains/hour.

Surrounding Area

The fuels in most of the surrounding area are generally very similar to the TU5 fuel model. The one exception is the Biscuit Fire to the west of the fire. The fuels in the Biscuit Fire consist of low brush with significant dead and down woody material and abundant snags throughout the area. The dead and down material as well as the snags results in a high resistance to control for ground resources however aerial resources could be very effective, especially if utilized early. While not a barrier to fire spread the Biscuit area should not be an area of significant problems without slope or wind. This is an exposed area and these fuels will respond to slope and wind and some runs could be expected under the right conditions. If the Oak Flat Fire were to burn into the Biscuit Fire it would be up on the ridge tops and accessible by roads helping to minimize the overall potential.

Seasonal Severity and Short-Term Outlook

The Energy Release Component (ERC, using Fuel Model G) is a measure of the cumulative drying of large fuels, and is a good indicator of fire season severity. Figure 2 is a ERC graph for the Onion RAWS, showing the 2010 season compared to average and maximum ERCs by date, and projected out for the next 10 days.

Thus far, 2010 has been fairly normal across the entire Predictive Service Area W4, and the information from the Onion RAWS reflects this.

In the near future, we anticipate ERC dropping to about average values over the weekend with a period of cooler onshore weather, then a sharp spike as a thermal trough approaches the coast, favoring an offshore flow.

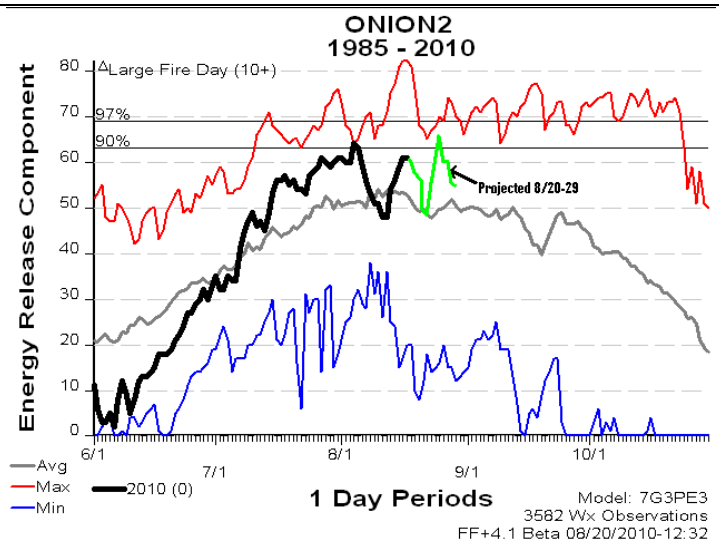


Figure 2 - ERC graph for the template SIG with ERC projected from August 20 to August 29 based on Predictive Services forecasts.

Long-term Outlook

Figures 3 and 4 are the projected temperatures and precipitation compared to normal conditions for the continental United States for the next 90 days. Southwestern Oregon is projected to experience below normal temperatures and near normal precipitation over this time period..

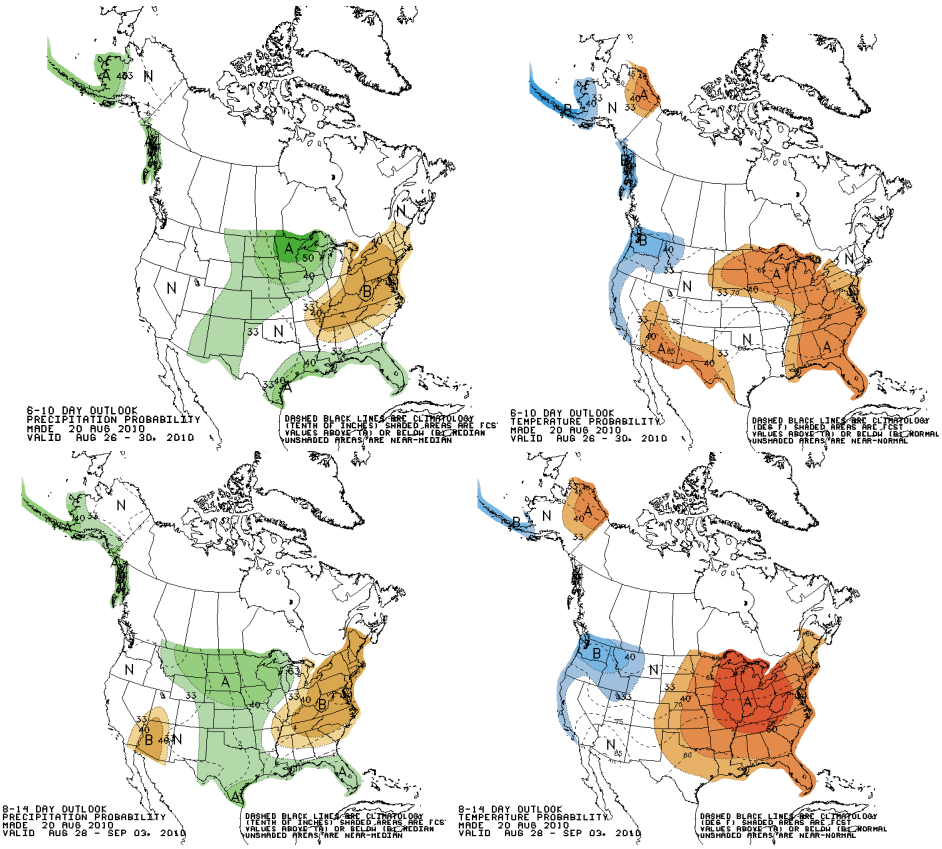


Figure 3 – 6-10 day and 8-14 day probabilities of temperature and precipitation for the continental US. Near normal precipitation and below normal temperatures are the most likely

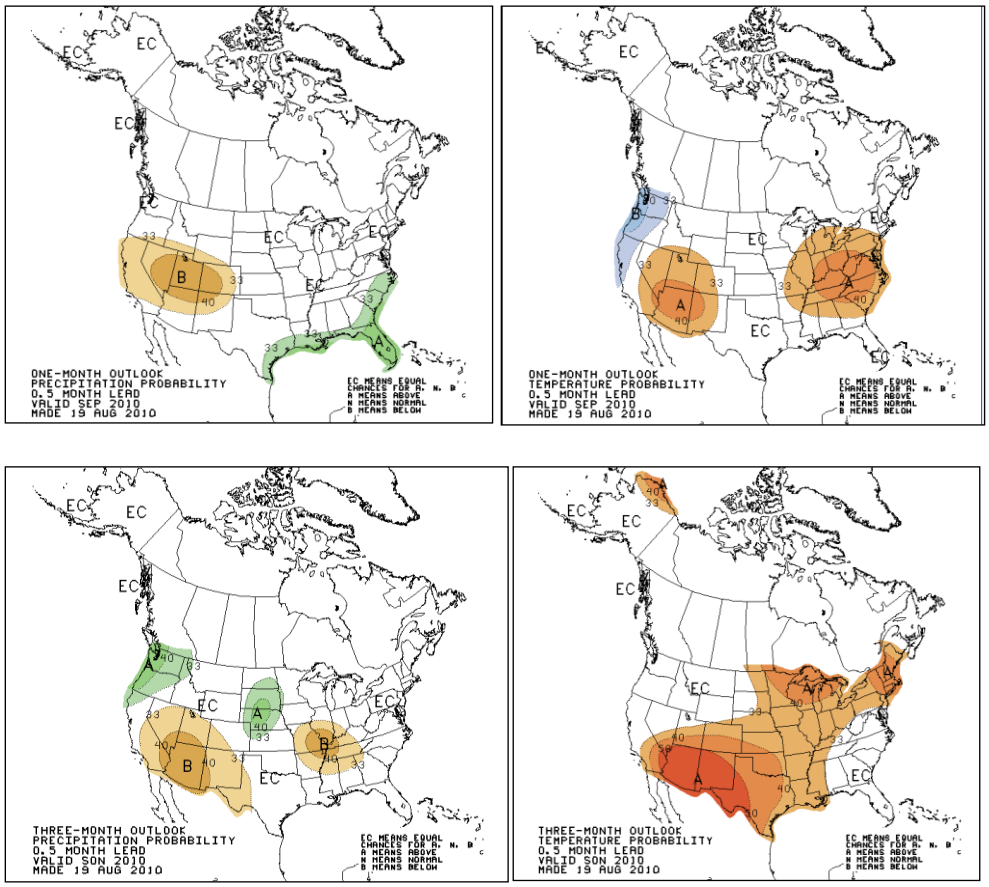


Figure 4 30 and 90 day outlooks for temperature and precipitation for the continental United States, 2010.

Fire Growth

Key Question: What weather events are associated with fire growth, and how many of these events should be anticipated before the end of the season?

Typically, large fires in western forests gain most of their growth on relatively few days during the life of the fire with more modest or even minimal fire growth on most days. These growth days can be associated with wind events, dry cold fronts, thermal troughs, atmospheric instability, or simply the proper alignment of fuels, slope and fire.

Typical, the late summer early/fall weather pattern in this area consists of a high pressure ridge moving in, dominating weather for a few days and blocking the systems that approach from the Pacific Coast. This type of weather creates hot, dry and unstable conditions favoring additional fire growth. Hot dry weather lowers humidity particularly low overnight recoveries and sustained drying increasing number of hours for the burn period.

An evaluation of historical weather records indicates that about 3 or 4 episodes of dry unstable air can be expected between August 20th and October 15th. It is advised that land managers monitor predicted overnight recovery, using predicted overnight relative humidity of less than 40% as a good indicator of large fire growth days. There is some indication in the current

forecast that conditions may establish mid next week (week of 8/23/2010) that could bring these conditions.

Comparison with 2002 and the Biscuit Fire

One of the key questions presented to the LTAT was a comparison of this season with 2002, the year of the Biscuit Fire. The Biscuit Fire started in mid July 2002; 2002 was the second of two drought years, and brought an early start to the fire season. ERC was above the 90th percentile by mid-July, and stayed there until the end of August (Figure 6). In contrast, 2010 is much more normal, with ERCs just now (mid-late August) approaching the 90th percentile.

Another past year worth evaluating is 1987. This year had below normal fire danger index values well into August. A lightning storm event on August 31 then impacted southern Oregon, starting many fires that burned well into late season as fire danger indices remained elevated past mid-October.

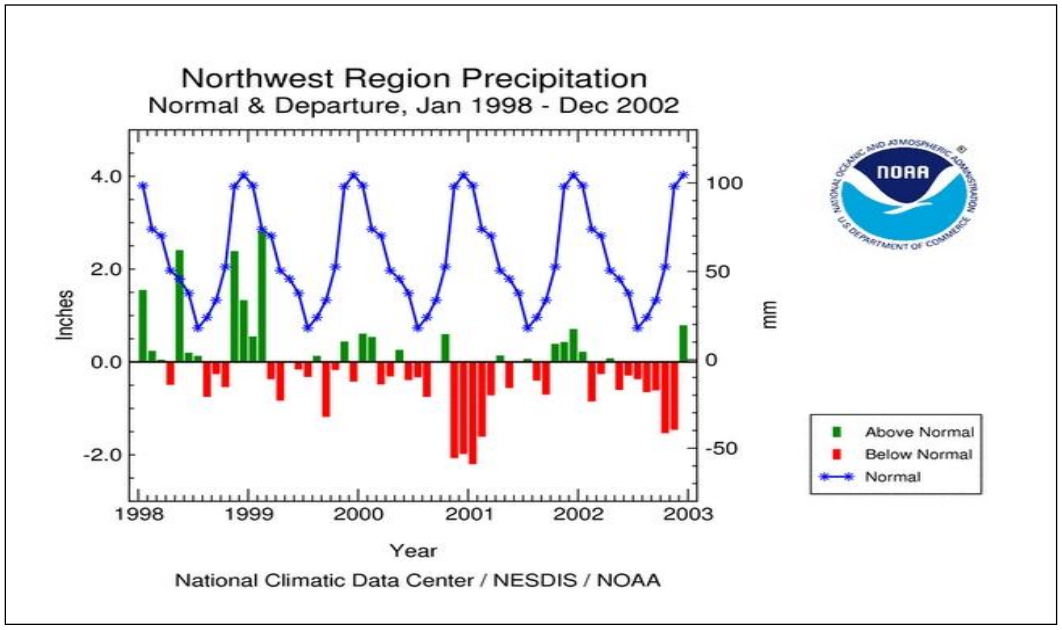


Figure 5. Climatological data for precipitation January 1998 – December 2002.

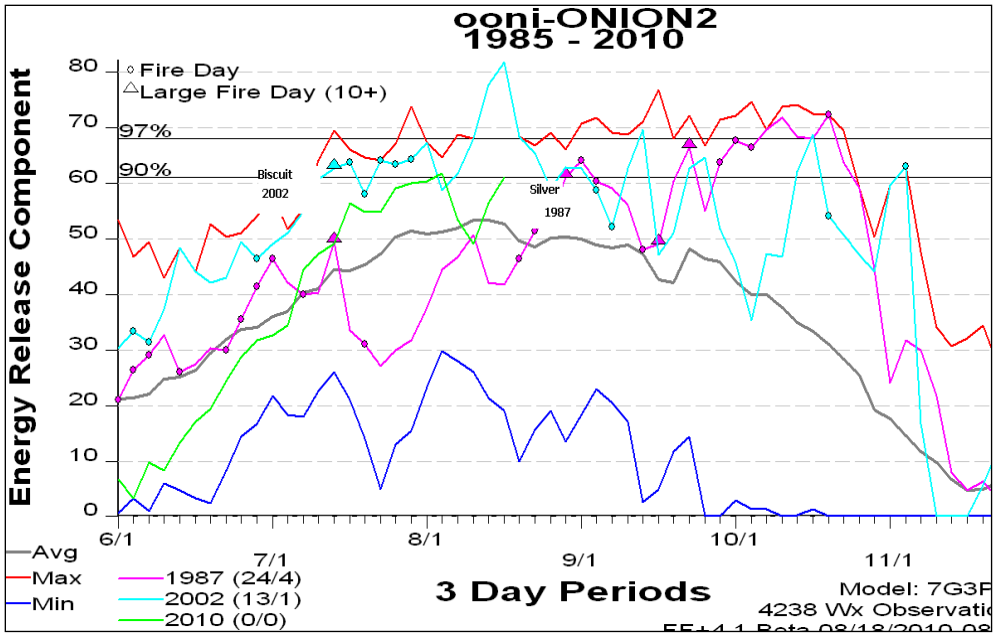


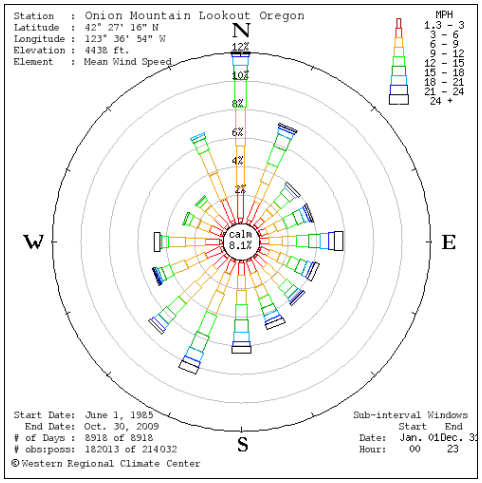
Figure 6. ERC trace for Onion Mountain showing the years 1987, 2002 and 2010 for comparative purposes. Notice that in 2002, ERC reached the 90th percentile in early-mid July, in 1987 and 2010 the 90th percentile was reached in mid-late August.

Winds

Key Question: What are the implications of typical wind events in this area for growth of the Oak Flat Fire?

We extracted data from two RAWS sites (Onion Mountain and Crazy Peak) to analyze wind speed and direction that could be correlated to the Oak Flat Fire. Wind speed on the fire site is best represented by the Crazy Peak RAWS site, as this site is in the same physiographic province and on a similar slope position as much of the fire. The Onion RAWS may give a better representation of wind direction in the general fire area.

Onion Mountain



Crazy Peak

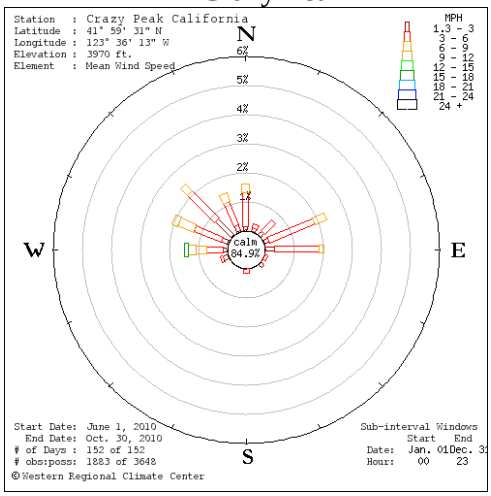


Figure 7 Windrose data for Crazy Peak and Onion RAWS.

Two Wind Ninja runs were generated to simulate 1) east wind 2) northeast wind and the effects of terrain on these winds (Appendix E). The analysis showed that only the very upper reaches of the fire would be exposed to east northeast winds, and the lower slopes and valleys are much more sheltered. The two main drainages (Onion Creek and Briggs Creek) should be protected enough to only see localized terrain influence. It is important to recognize that in the event that strong east winds materialize with, additional fire growth and fire behavior would progress towards the Biscuit Fire.

Based on upon historical weather data (1985-2010), local input and validation by modeling, there is little evidence supporting strong east winds occurring on the fire during an "east wind event," although low relative humidity and poor overnight recoveries can still be expected. Only the most exposed ridgetops will be susceptible to winds but generally would be a moderate breeze. Onion Mountain 6% of the time exhibits 20' 20-24 mph east winds, but is much more exposed then the fire area. Crazy Peak experiences 20' 3-6 mph east winds 2% of the time. The fire is much lower on the slope and can better be represented by the Crazy Peak RAWS observations.

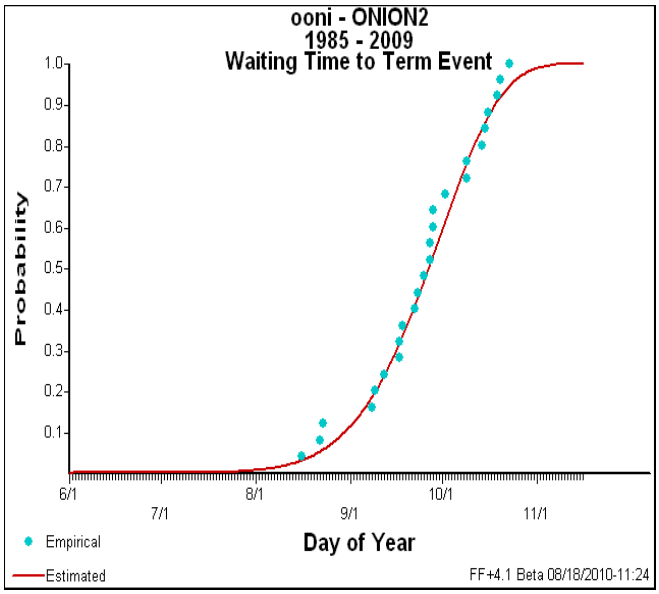
Season Ending and Season Slowing Events

Season Ending Events

One of the key questions for the LTAT relates to the length of the remaining fire season. The potential length of the fire season is important to operational and other management decisions, as the number of burn days left in the season has a direct effect on the likelihood that a free-burning fire will reach any point of concern.

Season ending dates were developed from the past 25 years of RAWS data collected at the Onion RAWS station. A season ending event was defined as a rain event (after August 15) of more than ½ inch of rain over a three day period, followed by a drop in ERC below the 50th percentile, from which the ERC never recovers about the 80th percentile during that year.

Figure 8 displays the result of this analysis. September 27 is the midpoint date; by this date, 50% of fire seasons in the 25 years' records had ended. By October 18, there is a 90% chance that the season will be over. This assessment is somewhat different from some other available estimates of season-ending dates. The Northwest Interagency Coordination Center Predictive Services group calculates season ending dates differently, emphasizing 100hr fuel moisture and fire occurrence data, across the entire PSA. This measure predicts that September 26th is the 50th percentile date for season ending (matching our ERC based estimate), but has a 90th percentile date of October 3, more than 2 weeks earlier than our estimate for the fire area.



Probabilities	Date
.25	September 13
.50	September 27
.75	October 09
.99	November 02

Figure 8 – Waiting Time evaluation of season ending dates. There are equal probabilities that the season will be over by September 27, and 90% of seasons are over by October 18.

Season Slowing Events

Most fire days are not very active fire growth days, as season slowing events occur that hold a fire nearly in place for a short period. It is common to see periods of low fire danger in the mid season that are followed by indices above the large fire threshold before the end of the season. Rainfall of less than .5in, for example, followed by a drying period can result in a return in fire growth in a matter of 7-10 days. More commonly, a drop in fire danger as a result of a cool onshore flow can occur midseason with a relatively rapid return to active fire behavior with the return of an offshore flow period.

Smoke Management

Local managers have asked the Long Term Assessment Team to provide some information useful in communicating with the public about the smoke impacts likely to occur as a result of the Oak Flat fire. There are analytical tools that can evaluate the amount and distribution of smoke resulting from wildland burning, but the tools are best used immediately prior to the event that generates smoke (see http://firesmoke.us/wfdss). What we can provide is talking points that can be used to build products for public distribution in press releases, interviews, public meetings, etc.

- Fire managers have developed a strategy for management of the Oak Flat fire that will eventually burn about 5800 acres. This plan was developed considering firefighter and public safety, fire suppression costs, impacts on natural resources, and impacts on the surrounding communities and forest users. One of these impacts is smoke, as smoke can affect public health, the quality of recreation experiences, and the livelihoods of residents in the tourism industry.

  The strategy that was selected means that smoke from the Oak Flat wildfire can be expected to be visible for at least another 7 days, as fire crews use backfires to secure planned fire lines and the fire itself burns to those containment lines. Smoke will be more evident from areas closer to the fire (Oak Flat, Cave Junction, Selma, and Kerbyville), with the effects less noticeable from Grants Pass, and even less so from Medford.

This short term impact from smoke will be a nuisance in some areas, but if successful, the strategy should result in much less smoke over the remainder of the summer and early fall season.

- Smoke has always been part of the southwestern Oregon landscape during summer and early fall, as lightning fires and fires lit by humans burned through forests, shrublands, and grasslands. Modern land management practices still use fires to restore these landscapes and dispose of accumulated vegetation, but in a controlled fashion through prescribed fires. One of the main objectives of these prescribed fires is to reduce the chances of large, uncontrolled wildfires. Still, wildfires do occur, and when they do occur, fire managers must consider firefighter safety, fire costs, and potential damage to natural resources alongside the impacts of smoke when they are choosing how and where to fight these fires. Therefore, we are less able to control smoke impacts from wildfires than we are able to do from prescribed fires.

Risk Assessment

Key Question: Will the fire reach the planned perimeter before the end of the season? Will it reach any of three private land parcels (Oak Flat, Swede Basin, or the Barr Mine)?

The first question has its foundation in the uncertainty about whether or not fire managers will need to prepare, burnout, and hold the planned perimeter to the east and north of the current fire perimeter (in some cases up to two miles away). The Fire Spread Probability (FSPro) model and the Rare Event Risk Assessment Process (RERAP) were used to evaluate fire spread potential (see Appendix C Risk Assessment for details). .

The FSPro analysis indicated an 80% to 100% probability that the fire will reach the planned perimeter line to the north and east of the current fire within the next 14 days. If left unchecked by management actions, the probability of the fire reaching the Sam Brown camp and Barr Mine is around 20% for the same time period. There is an 80-100% probability that a free-burning fire will impact the private lands in Swede Basin on the southeastern edge of the fire.

We also evaluated the likelihood that a spot fire that becomes established west of the currently contained western fire perimeter will reach the area of the 2002 Biscuit Fire north and west of the current fire. There is an 80-100% threat that a free-burning fire will reach this old burn area within 14 days . This analysis does show that when the fire reaches the 2002 Biscuit fire the probably of the fire spread decline rapidly. The indicates the old burn area is not a barrier to fire spread but the change in fuels will reduce the intensity and spread rates.

Oak Flat Community

Oak Flat, small group of homes and undeveloped land on the Illinois River southwest of the fire, was the highest priority private land for the fire managers. The Rare Event Risk Assessment Process (RERAP) model was used to assess the probability that a free-burning fire reaches this area by the end of the season.

We assumed the fire would become established at the mouth Red Dog Creek and spread southwest though timbered fuels (FM165) similar to the fuel within the main fire. Spread rates in this section reflect spread rates seen on the main fire. The fuels change to brush with an open timber and standing snags (FM142 /FM161) at the perimeter of the 2002 Biscuit fire. These fuels continue to the Oak Flat point of concern. The Biscuit burn area is not a barrier to spread but, due to discontinuity of fuels, spread rates are slower than in the timbered fuels and there is a

low probability of spotting or crown fire. It is also expected that spread would be from a backing fire as it approaches Oak Flat. The analysis concluded that there a less than 9% probability of the fire reaching the Oak Flat area before season end if it started on August 18th and less than a 1% probability of reaching Oak Flat if it started after September 1st.

Start Date	Probability
August 18	**9**%
September 1	<1%

Table 1: Probability of Reaching Point of Concern by Date

The risk by distance chart (Figure 9): shows the fire spread probability by distance of a fire starting on August 18 as it move towards Oak Flat.

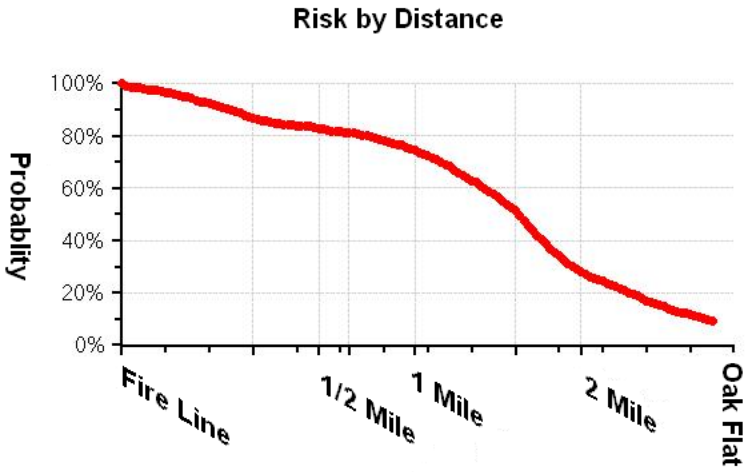
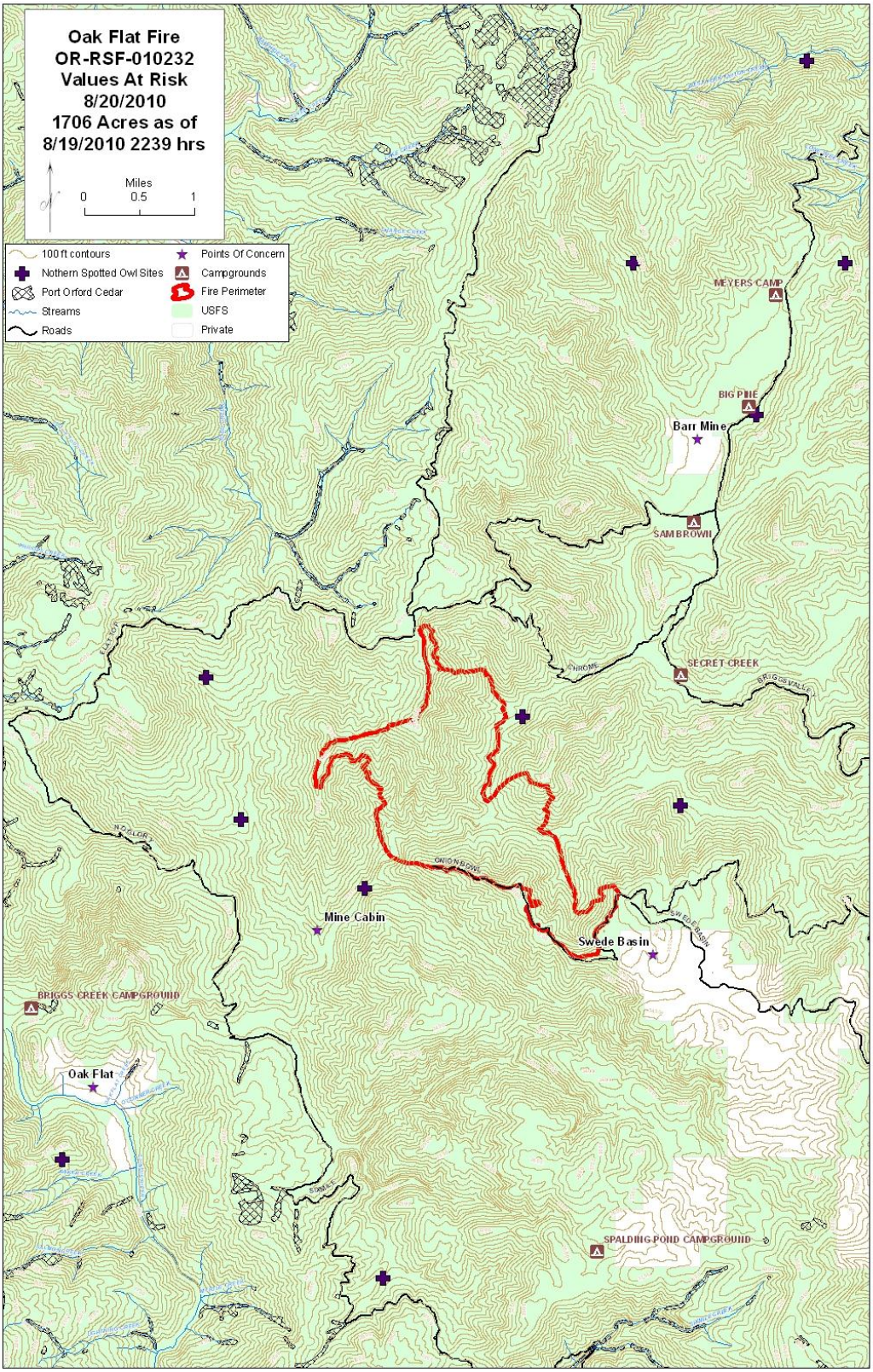


Figure 9 Risk of fire reaching the Oak Flat community from a fire originating near the mouth of Red Dog Creek, based on an origination date of August 18.

Recommendations

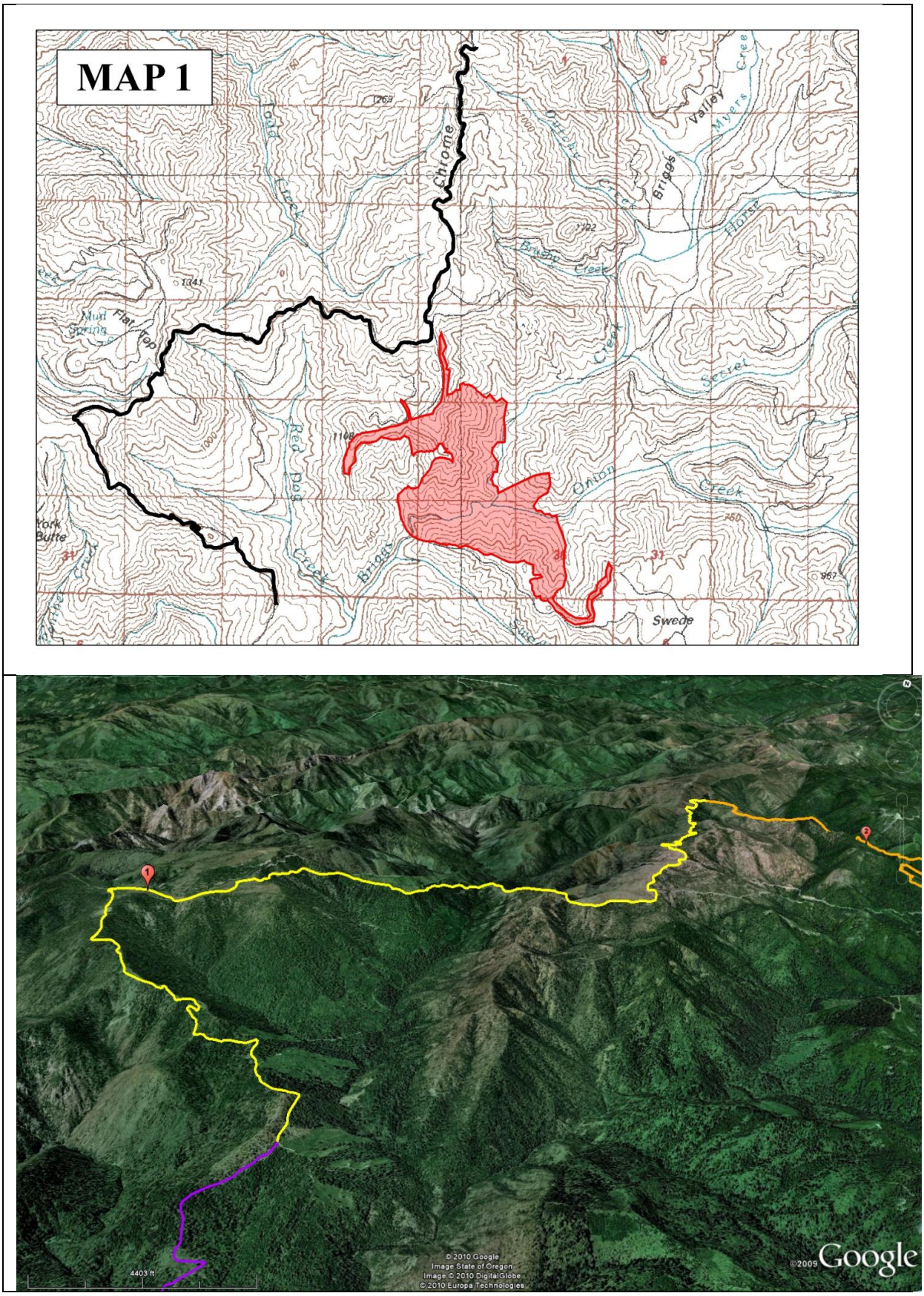
1. We recommend that the local forest and the IMT develop a public information package that anticipates of smoke impacts on communities, forest users, and the recreation industry. Talking points in the smoke management section of this assessment are intended as a starting point. Working with the local media for a longer term, more in-depth story on smoke from the Oak Flat fire, and our smoke management practices and tools in general, could help generate confidence that we are concerned about smoke and that while we attempt to manage smoke, our ability to do so from wildfires is much less than from prescribed burning.
2. We have discovered that the fuels information in WFDSS for at least part of the Rogue-Siskiyou National Forest is incorrect. Specifically, we found that the area of the Biscuit Fire near the Oak Flat fire was assigned fuel models apparently representative of pre-Biscuit fire conditions. There are three different choices for fuels data in WFDSS, and the layer in error is the most recent refreshed LANDFIRE data. We recommend using the Rapid Refresh layer instead of the 2009 update layer for any fires in or near the Biscuit fire area.
3. To anticipate fire growth days, monitor forecasted weather for poor overnight humidity recoveries, instability, and subsidence. Instability and subsidence are best monitored in fire weather forecasts, and overnight humidity recovery can be monitoring at local RAWS stations using the Roman fire weather site (http://raws.wrh.noaa.gov/roman/). Request that the deployed fire RAWS sites remain on site and collect data until the end of fire season.
4. Should the active spreading phase of the fire extend beyond 14 days, or if weather changes significantly we recommend a re-assessment and validation of this long term assessment.

Appendix A - Points of Concern



Appendix B – MAP

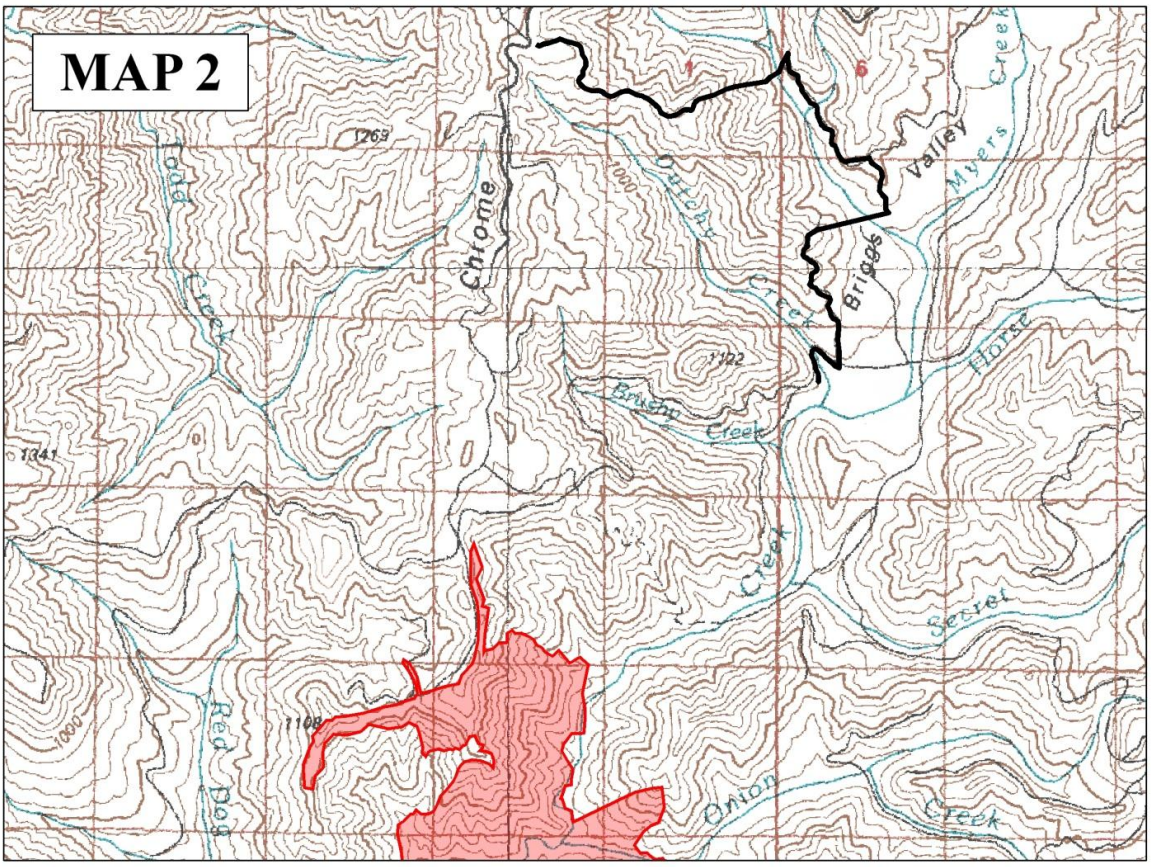
MAP 1

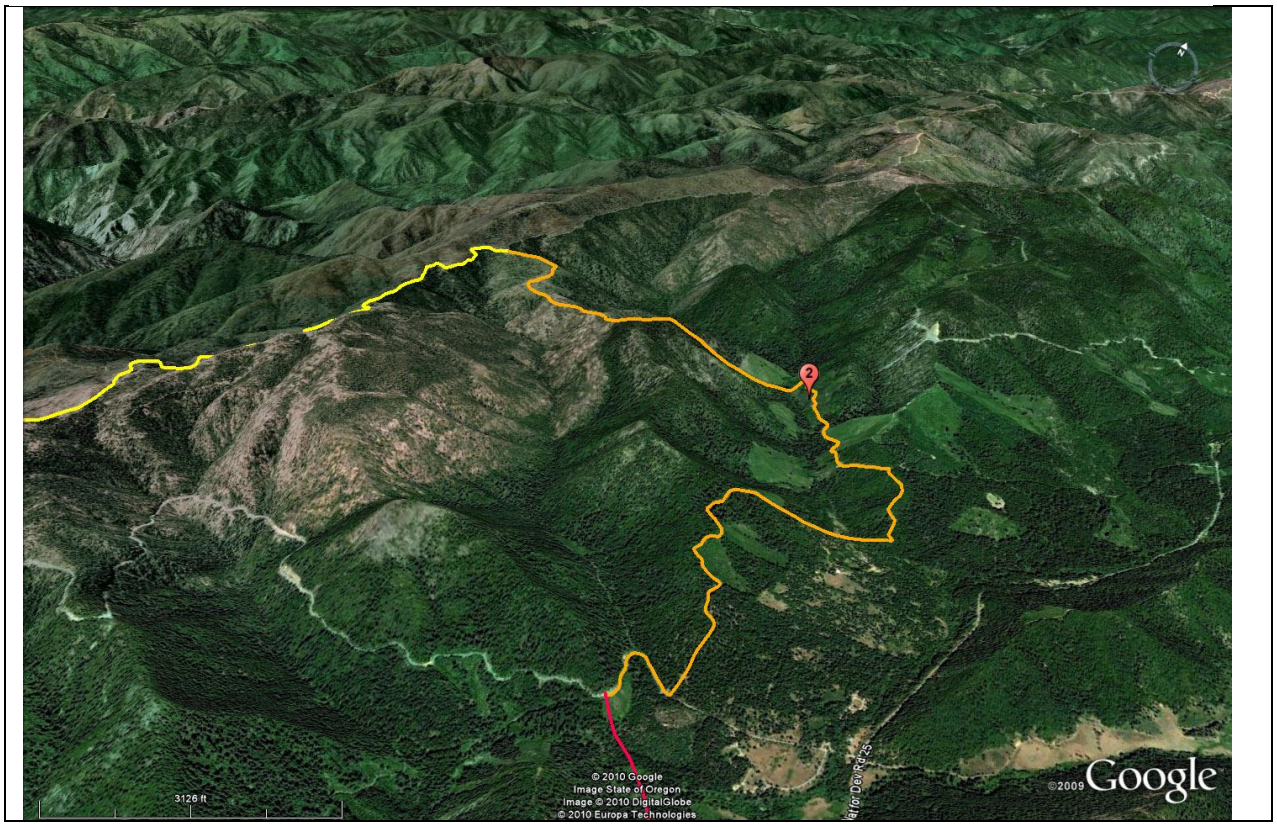


MAP #	Objectives/Conditions	Actions	Resources Needed Cost
MAP 1	**Objective:** Keep fire East of Road 2512 and 2402 out of the Biscuit Fire. Includes Divisions X, B & C and Chrome Ridge. **Conditions:** The decision on what to do if fire gets into Red Dog drainage depends on the seasonality and the fuel conditions at the time. The northernmost portion of this MAP includes Branch 2 on Chrome Ridge in case the fire escapes containment lines in Division D and H.	**Decision Point:** When fire breaches the control lines in Division A in Section 27 and becomes established in Red Dog Drainage. The northernmost portion of the MAP decision point occurs when fire crosses the Division D and H firelines and becomes established. **Action:** Fire out as needed to buffer the 2512 and or 2402 roads from fire running up the drainage to the ridge top where the road is located. Firing should only commence when and where specific areas of the line are threatened. **Alternative Action:** Take no action if fire becomes established near the MAP. **Probability of Success:** > 90%	1 T3 helicopter with PSD, operator and manager, 1 T1 burn boss for 2 days, 2 STLC, 6 crews for 7 days. 1 STEN and strike team of engines for 7 days and 1 WT. Cost: $488,000.

Risk of Implementation: Firefighter exposure to smoke while holding the line, exposure to abundant snags in the old Biscuit fire, and total overall exposure are all expected risks if the burn out is attempted. Additionally, aerial operations expose pilots and ground crews to normal air operations.
Consequences of not implementing: Not implementing a holding action increases the probability of fire spotting into the 2002 Biscuit fire and Kalmiopsis Wilderness. Spot fires in the old Biscuit fire could have mixed impacts. Much of the old Biscuit near Red Dog drainage and on Chrome Ridge consists of low brush with a scattered overstory with many snags. Fire will carry through portions of the area, but will be dependent on live fuel moisture, slope and wind. Short runs may occur but the potential for large scale runs is limited.
Recommendation: If the Oak Flats fire establishes itself in Red Dog drainage and east of Chrome Ridge, consider time of year and live fuel moistures before automatically beginning a holding and burn out action of the 4105 and 2512 Rd. Taking no action on the new spot fires in the Biscuit Fire will likely cause smoldering and creeping fire behavior with occasional short runs. Point protection could be employed in the Biscuit Fire if necessary.

MAP 2

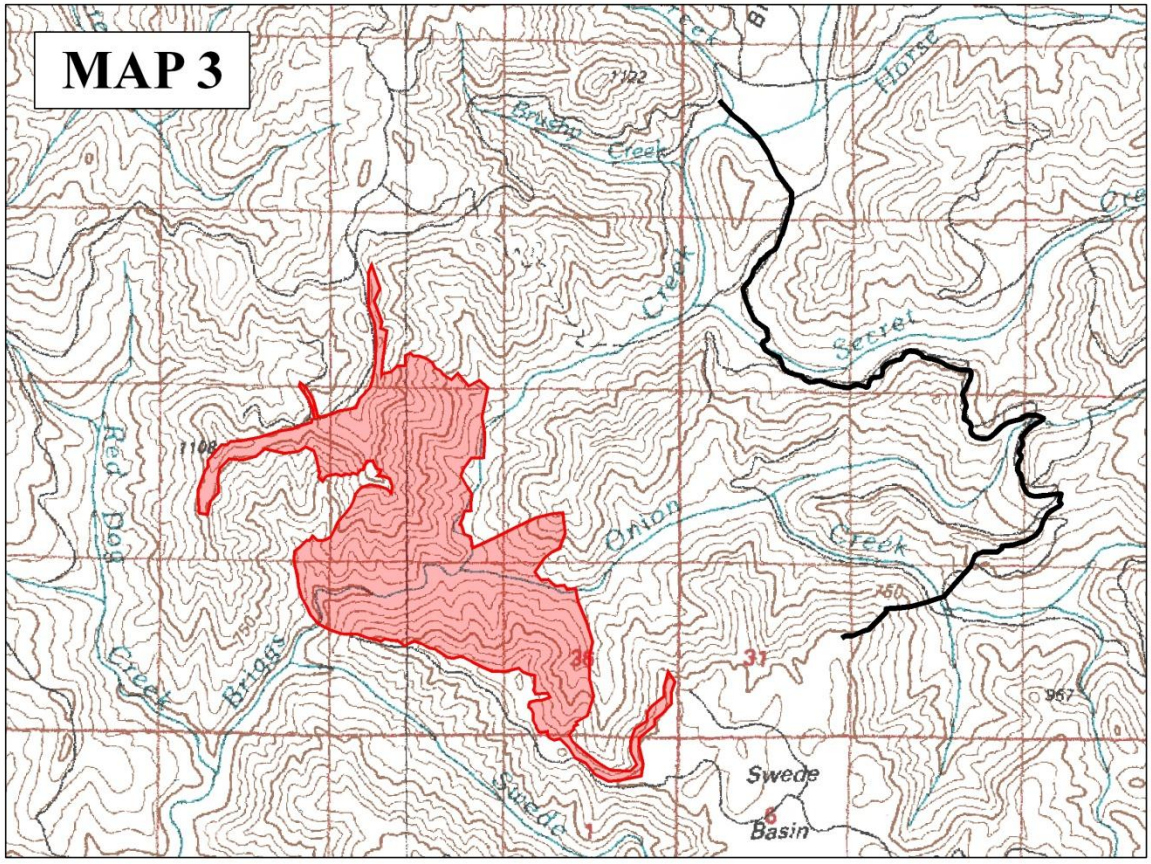

MAP 2
Dog Creek
Chrome
Briggs
Valley
Myers Creek
Horse
Secret
Red Dog
Onion
Creek

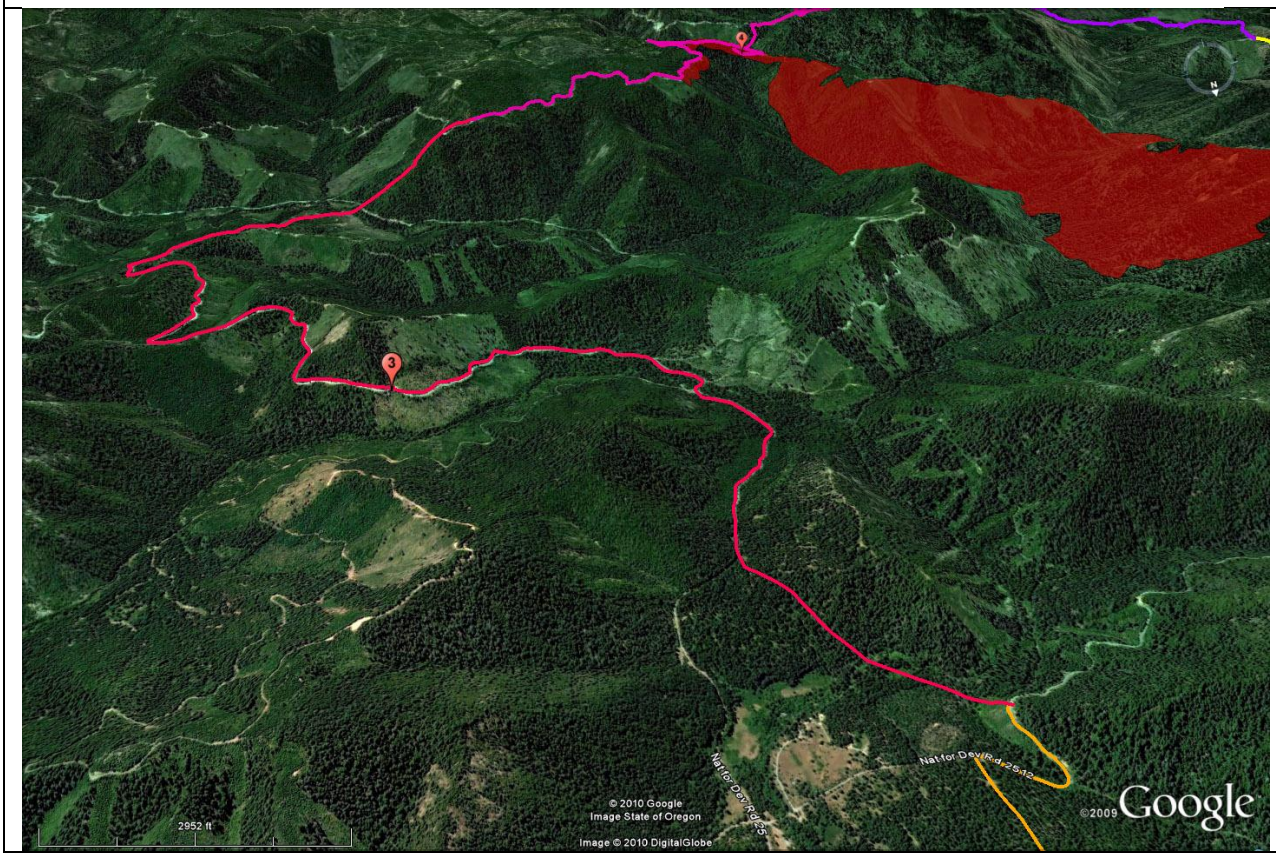

2
3126 ft
© 2010 Google
Image State of Oregon
Image © 2010 DigitalGlobe
© 2010 Europa Technologies
©2009 Google

MAP #	Objectives/Conditions	Actions	Resources Needed Cost
MAP 2	**Objective:** Keep fire south of the 610 road and west of the 100 Rd in Sec. 6 SW/SW. South of new line to be constructed. **Condition:** Fuels across the control lines in MAP 2 were not burned in the Biscuit Fire and are typical fuel model 8 and 10 with areas of clear cuts of various ages. There are several FS campgrounds, private land with structures and numerous placer mining activities in the area.	**Decision Point:** If the Oak Flat fire spots north of the lines in Divisions D and H consideration should be given to using this MAP. **Action:** Direct attack will be the primary approach for spot fires and slop over. Traditional direct attack is one approach to managing fire spread to the north. **Alternative Action:** The fuels in the area of Chrome Ridge are relatively light as a result of the Biscuit Fire. Fire spread through the Biscuit Fire will be dependent upon slope and wind speed. Fire managers can use pre identified indirect control lines on the 25 road and 015 Spur to the 100 Rd in Sec. 6 SW/SW. Line construction from end of the road SW in Sec 1 to the 610 Rd. and tie into Chrome Ridge. Modeling indicates that a spot across control lines in Division D would take approximately 5 days to get to the MAP location. **Probability of Success:** 80%	Resource needs for the alternative line construction: 4 type 1 or type 2 IA handcrews and 1 type 2 dozer for 1 day. **Cost:** $39,000. To burn out and hold the line: Same resources as above plus 1 STEN and 1 engine strike team type 6 and 3 engines. Consider helicopter support. 1 week including burn out and holding. **Costs**: $390,000. Includes above costs.

Risk of Implementation: Firefighter exposure during line construction, dozer operations and burn out operations. Smoke inhalation, rolling debris and falling snags.
Consequences of not implementing: 1) Fire will spread north of the 2512 road will burn actively with continuous fuel loads given the time of season.
Risk Analysis: The next opportunity to hold the fire is located 3 miles to the north near Taylor Mountain and would add an additional 10 miles of line construction/improvement/firing/holding etc with all the accompanying risks.
Success in this area will depend on accurate pre planning and resources on hand.
Recommendation: The proposed line locations for this MAP should be completed and prepped as soon as possible. If the fire lines are compromised in Divisions D and H, then suppression and holding operations can begin at the MAP location if necessary.

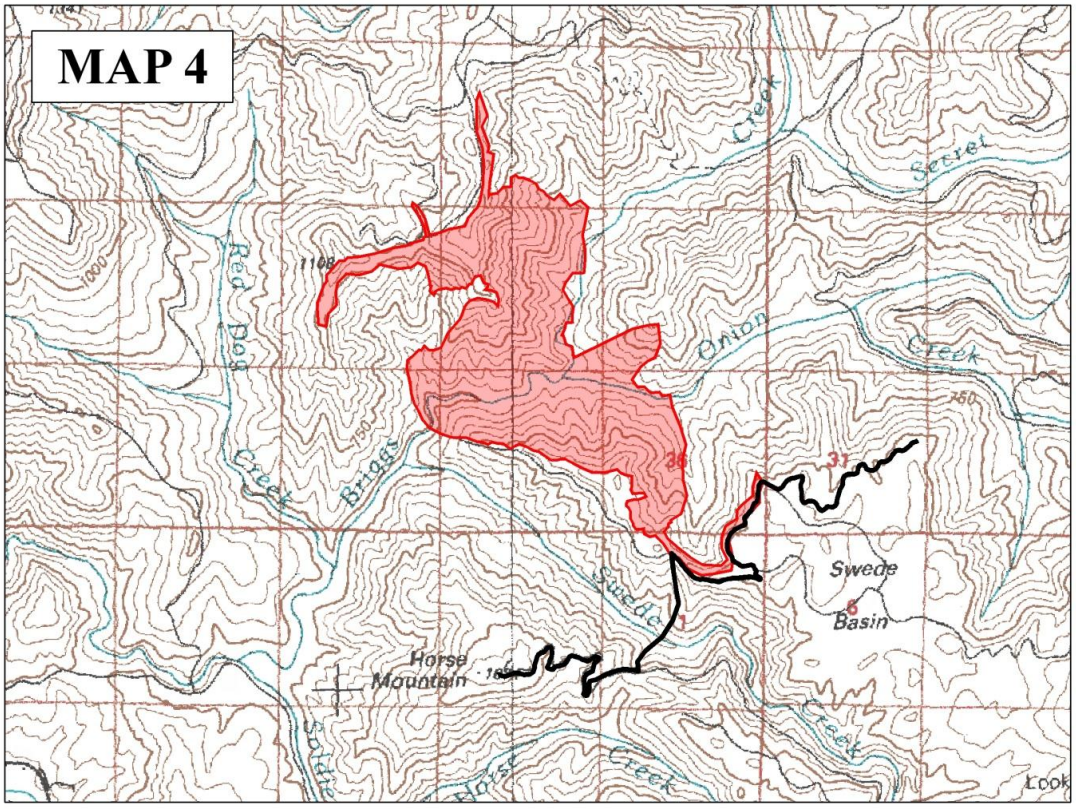
MAP 3

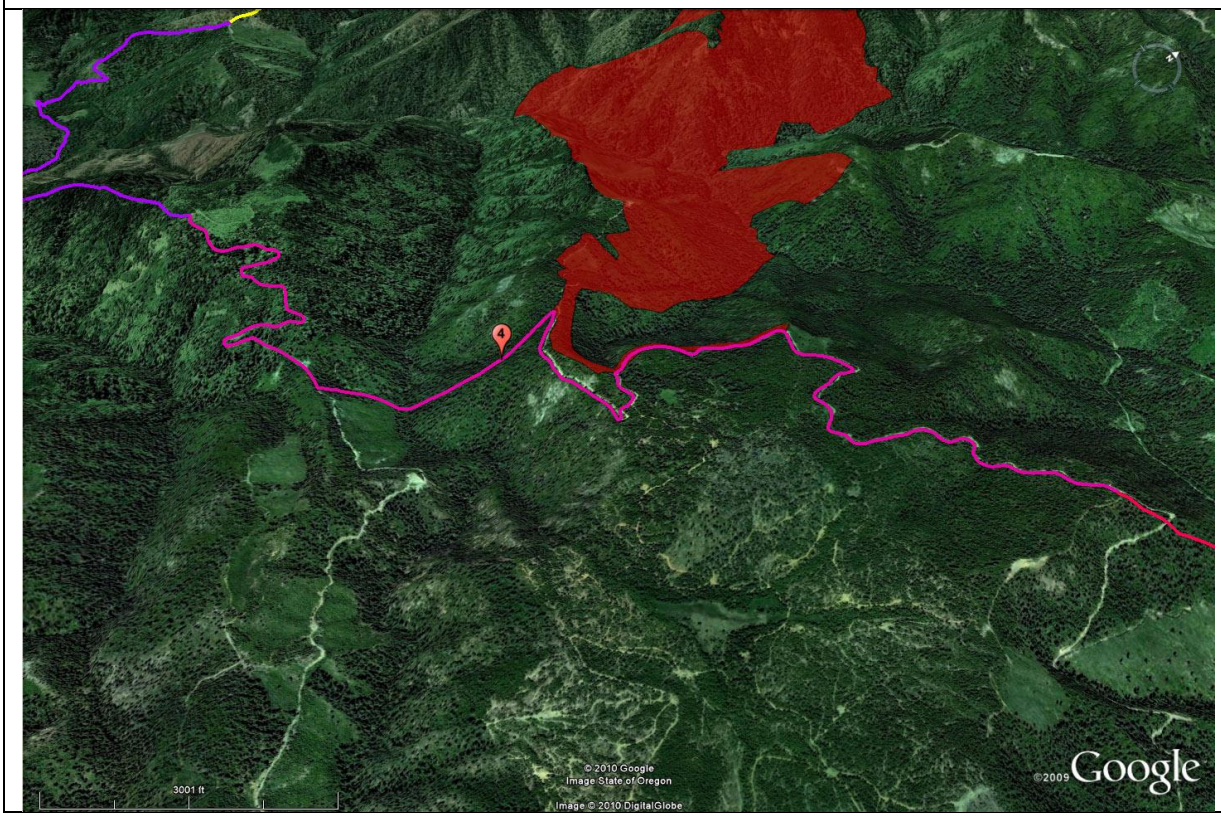

MAP 3
Horse
Briggs Creek
Secret
Red Dog
Briggs Creek
Onion Creek
Swede
Swede Basin
1122
1108
967


3
Nat for Dev Rd 25
Nat for Dev Rd 25
2952 ft
© 2010 Google
Image State of Oregon
Image © 2010 DigitalGlobe
©2009 Google

MAP #	Objectives/Conditions	Actions	Resources Needed Cost
MAP 3	**Objective:** Minimize fire spread east of Division L. **Conditions:** There are several factors east of Division L that require active fire suppression. Fuels, topography and nearby private lands require minimizing the area burned.	**Decision Point:** If fire crosses the current control lines and becomes established then alternative line locations need to be used. **Actions**: There are numerous roads in the area that can be used. These roads have been identified by the Incident Management Team and should be prepared by brushing and opening where necessary. **Probability of Success:** 80%	2 Type 1 and 5 type 2 IA Crews, 1 DIVS, 2 TFLD, 1 Type 2 Helicopter. 1 ST Engines, 1 WT. Line prep has been completed by the ORCA team. Burning out and holding the contingency lines will take a total of 5 days. **Cost:** $436,000.
Risk of Implementation: Firefighter exposure to smoke, heavy equipment and aviation operations will be present if aggressive suppression action needs to take place. **Consequence of not implementing:** If the fire was to jump the lines in Division L and not actively suppressed with the intention of minimizing acres, the risk to the private land in Swede Basin is greatly increased. More private lands are located 2 to 3 miles east of the road system around Div L. Private land is at risk east of Div L. **Recommendation:** Due to the risk to private lands south and east of Div L, it is recommended that active suppression be the long term strategy if fire escapes the control lines.			

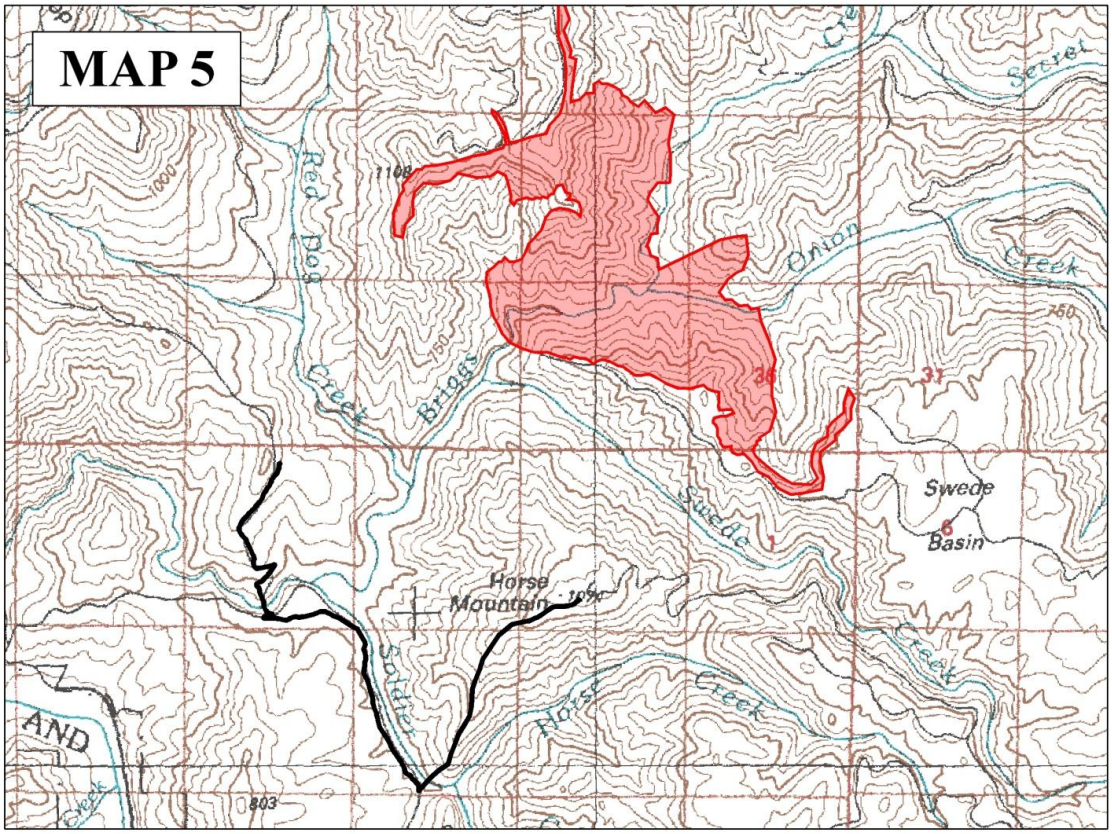
MAP 4

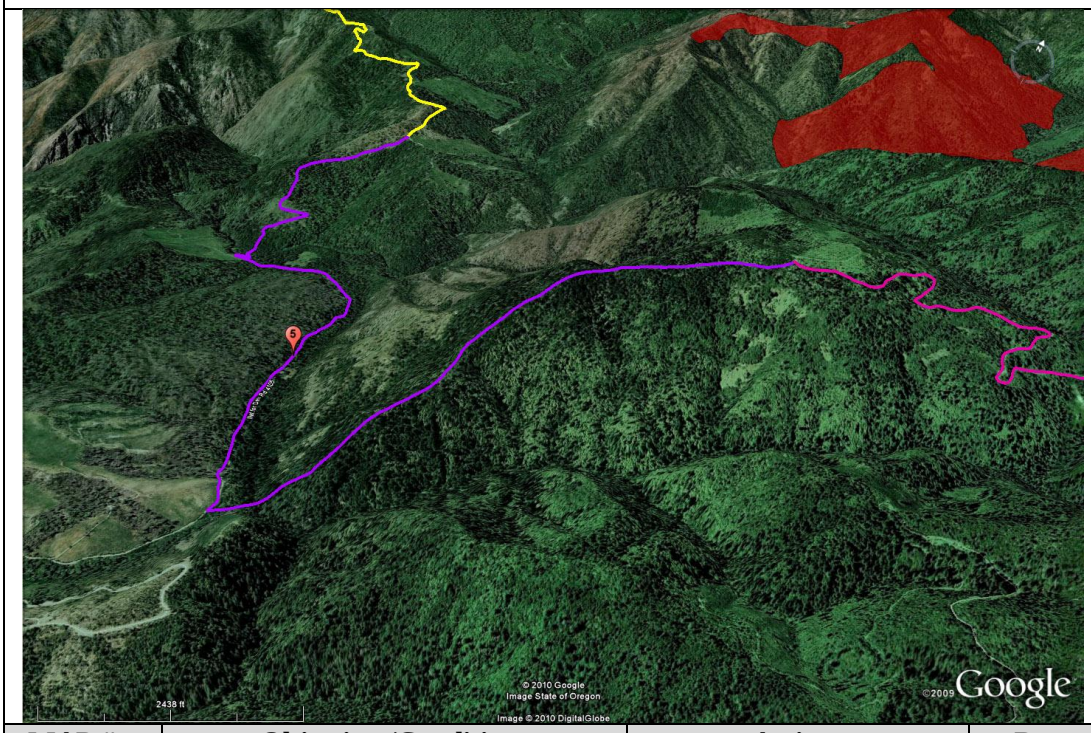

MAP 4
Red Dog Creek
Briggs
Onion Creek
Secret
Swede
Basin
Horse Mountain
Soldier
Horse Creek
Look
31
35
1


© 2010 Google
Image State of Oregon
Image © 2010 DigitalGlobe
©2009 Google
3001 ft

MAP #	Objectives/Conditions	Actions	Resources Needed Cost
MAP 4	**Objective:** Keep fire from moving south from the fire control lines in Divisions S and V. **Condition:** Fire line in Division V is mostly black. Line in Div S has not been burned as of 8-18-10. Fire will be pushing the line within a few days of this writing. This MAP is the closest to private in holdings in Swede Basin.	There is no decision point for this MAP. Any fire across the line is a threat to Swede Basin and should be actively suppressed.	3 type 1 or type 2 IA crews 2 dozers 2 Strike Teams of Engines 1 WT 5 Days for suppression and mop up of fire across the line threatening Swede Basin. **Cost:** $274,000
Risk of Implementation: Firefighter exposure to smoke, heavy equipment and aviation operations will be present if aggressive suppression action needs to take place.			

MAP 5





MAP #	Objectives/Conditions	Actions	Resources Needed

			Cost
MAP 5	**Objective:** Keep fire from the Illinois River and Oak Flats and out of Soldier Creek which leads to the Swede Basin private property. **Condition:** The fire spreads away from current control lines and spreads south down Soldier Creek or west of Brushy Bar.	There is no decision point for this MAP. Any fire across the line is a threat to Swede Basin and should be actively suppressed	3 type 1 or type 2 IA crews 2 dozers 2 Strike Teams of Engines 1 WT 5 Days for suppression and mop up of fire across the line threatening Swede Basin. **Cost:** $274,000
This management action point is between the Biscuit Fire (2002) and the Horse Mountain fire (2008). Fire spread potential through this MAP is low due to current fuels condition. **Risk of Implementation:** The proposed handline construction will be hazardous with a low probability of success. Rolling material during line construction and poor escape routes during burn out operations make this a high risk operation. The risk of taking no action has the potential for the fire to spread south in Soldier Creek and more importantly sets up in the base of Swede Basin and Horse Creek. Both of these topographic features pose a severe risk to the private land in the southeast area of the fire. Timing is critical for this MAP. If fire spread into Soldier Creek occurs late enough in the season (after Sept 15) chances for spread onto the private lands are greatly reduced. Fire spread into Horse Creek and Swede Basin prior to September 15 will require an aggressive approach using existing roads in and around the private land. Risk to the private lands should not be transferred to firefighters.			

Appendix C- Risk Assessment

Fire Growth Projections

Key Question: Will the fire reach the planned perimeter before the end of the season? Will it reach any of three private land parcels (Oak Flat, Swede Basin, or the Barr Mine)?

The first question has its' foundation in the uncertainty about whether or not fire managers will need to prepare, burnout, and hold the planned perimeter to the east and north of the current fire perimeter (in some cases up to two miles away).

The Fire Spread Probability (FSPro) model was used to evaluate fire spread potential. FSPro is a spatial model that calculates the probability of fire spread in all directions from a current fire perimeter or ignition point. FSPro models fire spread of hundreds or thousands of weather scenarios based on local climatological records to determine the probability of a fire spreading through an area over a given time period. FSPro was used to identify the probability that areas of concern could see fire. The outputs are helpful for developing priorities and analyzing values at risk. FSPro evaluates the likelihood that a free-burning fire reaches any given piece of ground during the assessment period. The team was asked to analyze if the fire would reach the Planned Perimeter and several areas of concern especially on the north and eastern edge of the fire. The team conducted 2 FSPro analyses:

FSPro 1 (Figure 10): 14 day assessment starting on August 18th to analyze the probability of the fire reaching the Planned Perimeter, Sam Brown Camp and Barr Mine to the northeast and the private property on the southeast edge of the fire. This analysis used the containment line on the west side of the fire as a barrier to spread and was mostly concerned with fire probability to the north and east.

FSPro 2 (Figure 11): 14 day assessment starting on August 18th to analyze the probability a spot fire becomes established outside the containment line on the west side of the fire and spreads north and west to the Planned Perimeter.

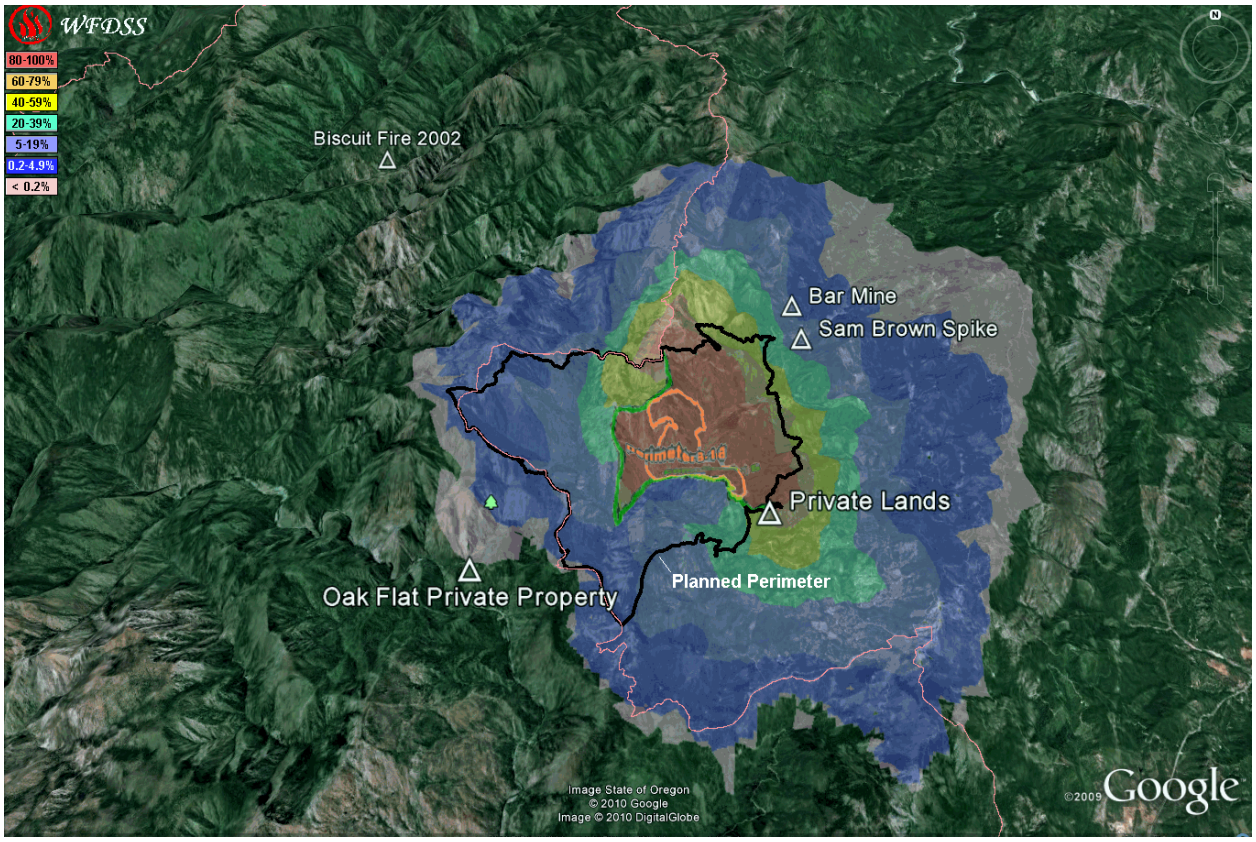


Figure 10: FSPro 1 - Probability of fire reaching Planned Perimeter and other Points of Concern

The FSPro 1 analysis indicated an 80% to 100% probability that the fire will reach the planned perimeter line to the north and east of the current fire within the next 14 days. The probability of the fire reaching the Sam Brown camp and Barr Mine is around 20%. There is an 80-100% probability that a free-burning fire will impact the private lands in Swede Basin on the southeastern edge of the fire. FSPro also produces a fire histogram related to the probabilities and expected fire size. The average fire size for this 14 day period reached 10,125 acres.

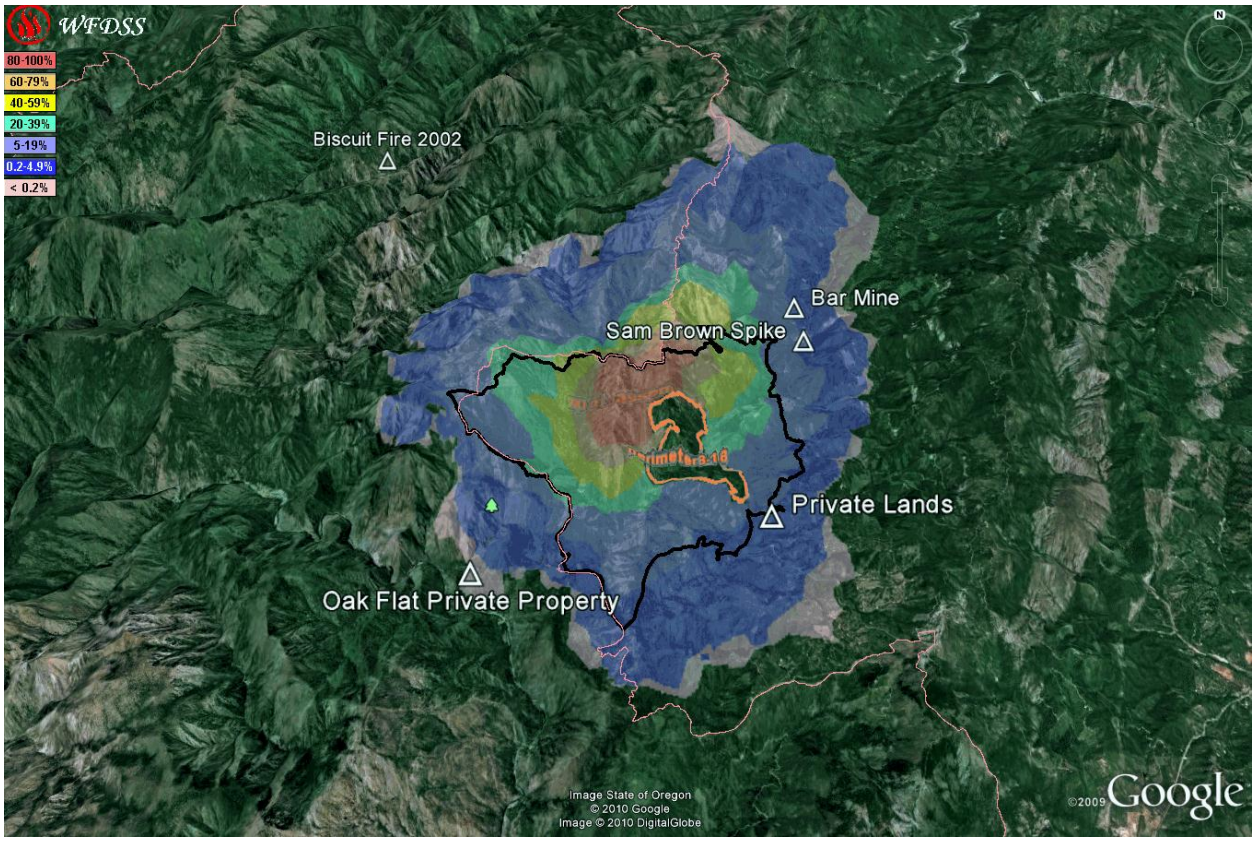


Figure 11: FSPro 2 - Probability of fire reaching Planned Perimeter from a establish spot outside of the western containment line.

The FSPro 2 analysis of a spot fire on the western containment line indicated within the next 14 days an 80- 100% threat that the fire will and reach the Planned Perimeter line just northwest of the current containment line. This analyses does show that when the fire reaches the 2002 Biscuit fire the probably of the fire spread decline rapidly. The indicates the old burn area is not a barrier to fire spread but the change in fuels will reduce the intensity and spread rates if fire reaches this area. The fire histogram for this analysis shows the average fire over the 14 day period at 6,238 acres.

RERAP

Oak Flat was the highest priority private land for the fire managers, as it is the site of about 6 homes and other improvements. There is a concern that the fire may reach the Oak Flat private property located south west of the fire along the Illinois River. The Rare Event Risk Assessment Process (RERAP) model was used to assess the probability over time that a free-burning fire reaches this area. RERAP uses statistical analysis based on historical weather to determine the probability that a fire will reach a specified point of concern before the season end. Weather data from the Onion Flat RAWS station is used to develop percentile weather and a season ending date probability or "term file" for the analysis (similar to the season ending event analysis as described earlier). Fuel models, topography and the representative weather data are used to

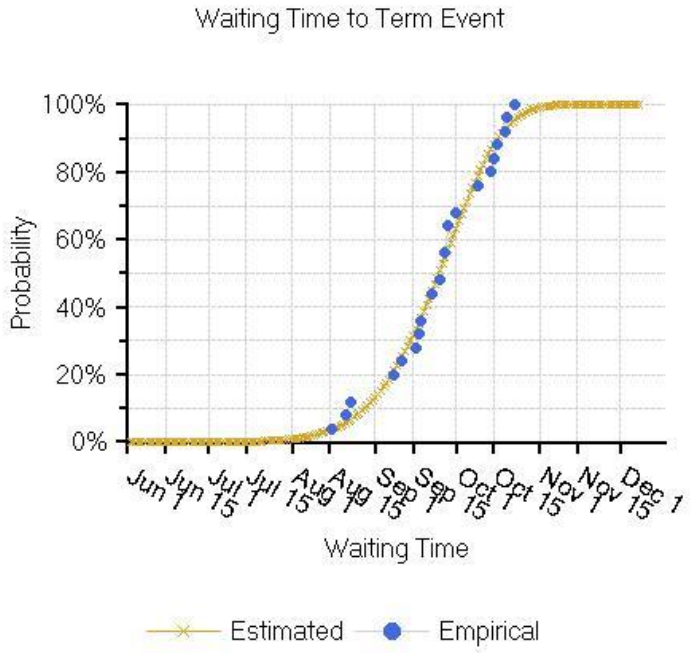
calculate spread rates along a path from the fire to the point of concern. RERAP uses all this data to calculate a probability of when the fire could reach the point of concern.
Data used in the model:

- Onion 2 RAWS data from 1985 to 2010. Development of the season ending date (term file) and for fire spread modeling.
- Land Fire Rapid Refresh Fuel Models. This model is a good representation of the fuels within the 2002 Biscuit Fire area.

Weather data was divided into five time periods to represent the changes in hours of day light, fuel moistures and winds that occur as the fire season progresses.
Time periods: August 16-31, September 1-15, September 16-30, October 1-15 and October 15-30. The last time period includes the 90th percentile date for season end (October 17).

Season end date (term event):

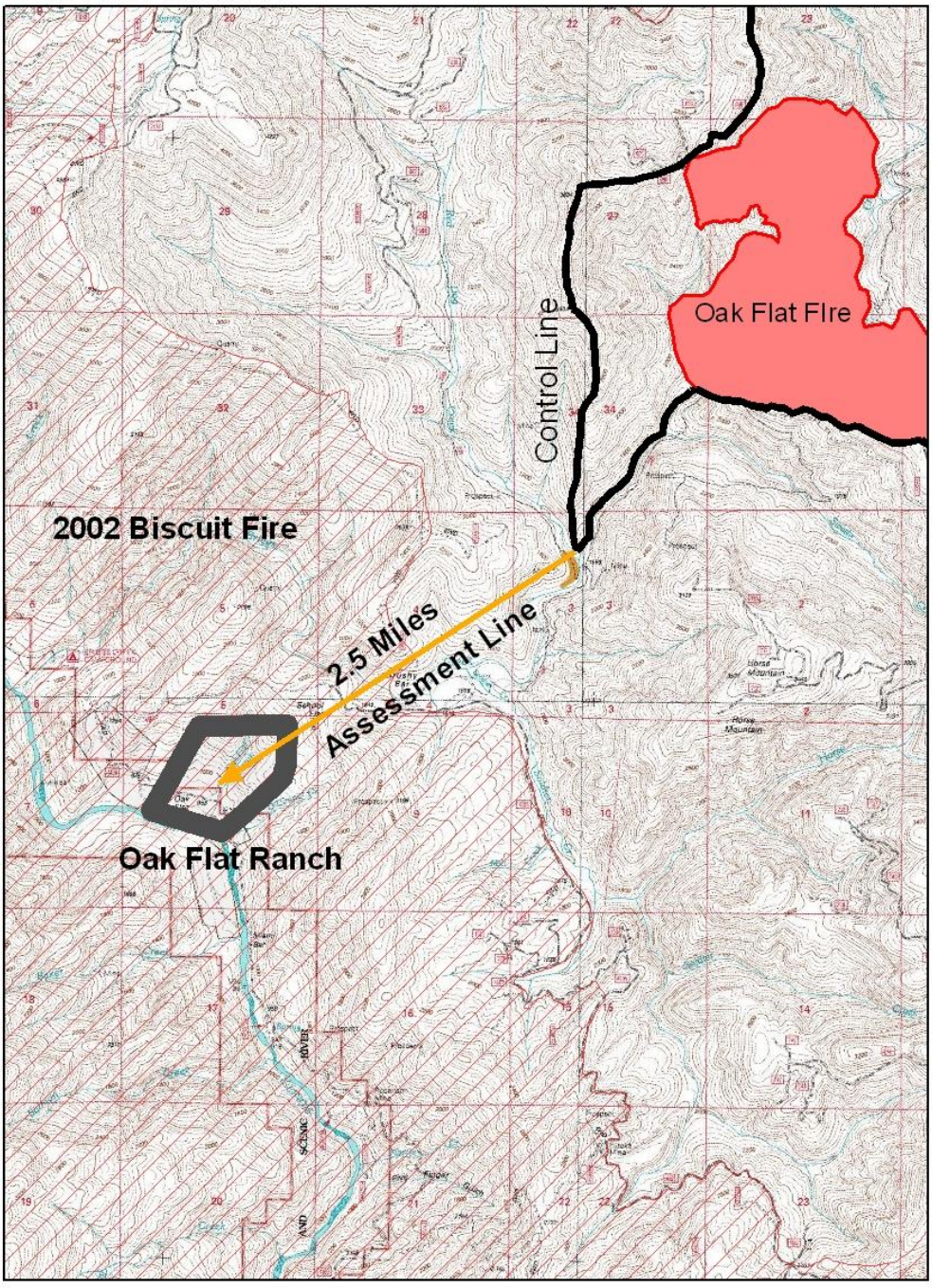
- 50th percentile - September 25th
- 75th percentile –October 7th
- 90th percentile –October 17th



Analysis
The goal of the process was to analyze the highest probability of fire reaching the private property at Oak Flat, if a spot fire became established across the control line on the southwest edge of the fire. RERAP results are based on the following base assumptions:

- The fuels and weather data used are representative of the area,
- No management actions are taken on the fire to slow or halt fire spread.

Oak Flat Fire 2010



Oak Flat Ranch RERAP Assessment

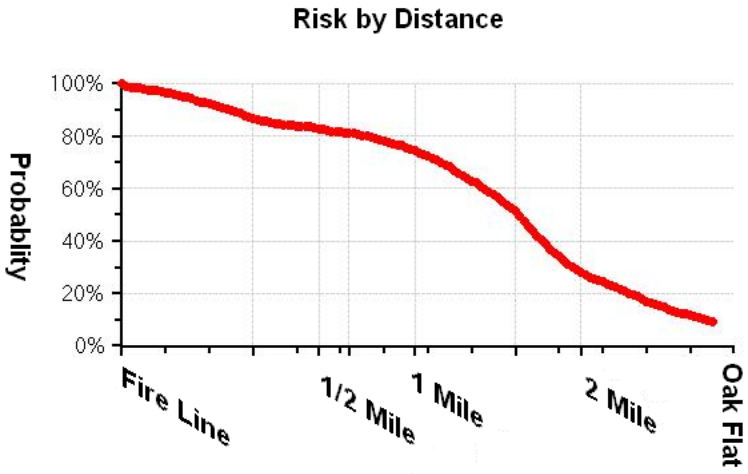
Discussion:
We assumed the fire would become established at the mouth Red Dog Creek and spreads southwest though timbered fuels (FM165) similar to the fuel within the main fire. Spread rates in this section reflect spread rates seen on the main fire. The fuels change to brush with an open timber and standing snags (FM142 /FM161) at the perimeter of the 2002 Biscuit fire. These fuels continue to the Oak Flat point of concern. The Biscuit burn area is not a barrier to spread but, due to discontinuity of fuels, spread rates are slower than in the timbered fuels and there is a low probability of spotting or crown fire. It is also expected that spread would be from a backing fire as it approaches Oak Flat. The analysis concluded that there a less than 9% probability of the fire reaching the Oak Flat area before season end if it started on August 18th and less than a 1% probability of reaching Oak Flat if it started after September 1st.

Table 2: Probability of Reaching Point of Concern by Date

Start Date	Probability
August 18th	**9**%
September 1th	<1%

The risk by distance chart (table 2): shows the fire spread probability by distance of a fire starting on August 18 as it move towards the Oak Flat point of concern.

Table 3: Risk by Distance



Appendix D - Behave Summary

BehavePlus 4.0.0 (Build 273)

Oak Flat Fire, Extreme spread conditions, w/winds
Fri, Aug 20, 2010 at 16:12:40

Input Worksheet

Inputs: SURFACE, SIZE

Input Variables	Units	Input Value(s)
Fuel/Vegetation, Surface/Understory		
Fuel Model		tu5
Fuel Moisture		
1-h Moisture	%	4, 6, 8, 10
10-h Moisture	%	5
100-h Moisture	%	6
Live Herbaceous Moisture	%	
Live Woody Moisture	%	70
Weather		
20-ft Wind Speed (upslope)	mi/h	10, 15, 20, 25
Wind Adjustment Factor		.3
Terrain		
Slope Steepness	%	60
Fire		
Elapsed Time	h	4.0
Notes		

Run Option Notes

Maximum reliable effective wind speed limit is imposed [SURFACE].

Calculations are only for the direction of maximum spread [SURFACE].

Fireline intensity, flame length, and spread distance are always for the direction of the spread calculations [SURFACE].

Wind is blowing upslope [SURFACE].

Results for: Surface Rate of Spread (maximum) (ch/h)

1-h	20-ft Wind Speed (upslope)			
Moisture	mi/h			
mi/h	10	15	20	25
4	14.3	17.8	21.6	25.5
6	12.9	16.1	19.6	23.1
8	12.0	14.9	18.1	21.4
10	11.2	14.0	17.0	20.1

Results for: Flame Length (ft)

1-h	20-ft Wind Speed (upslope)

Moisture	mi/h			
mi/h	10	15	20	25
4	9.4	10.4	11.4	12.3
6	8.7	9.7	10.6	11.4
8	8.2	9.1	10.0	10.8
10	7.9	8.7	9.6	10.3

Results for: Area (ac)

1-h	20-ft Wind Speed (upslope)			
Moisture	mi/h			
mi/h	10	15	20	25
4	111.6	150.2	193.6	241.2
6	91.7	123.4	159.1	198.2
8	78.4	105.6	136.1	169.5
10	69.1	93.1	120.0	149.4

BehavePlus 4.0.0 (Build 273)

Oak Flat Fire, Extreme spread conditions = future/worst case
Fri, Aug 20, 2010 at 16:08:52

Input Worksheet

Inputs: SURFACE, SIZE

Input Variables	Units	Input Value(s)
Fuel/Vegetation, Surface/Understory		
Fuel Model		tu5,8,10,5
Fuel Moisture		
1-h Moisture	%	4, 6, 8, 10, 12
10-h Moisture	%	5
100-h Moisture	%	6
Live Herbaceous Moisture	%	
Live Woody Moisture	%	70
Weather		
20-ft Wind Speed (upslope)	mi/h	10
Wind Adjustment Factor		.3
Terrain		
Slope Steepness	%	60
Fire		

Elapsed Time	h	4.0

Notes

Run Option Notes

Maximum reliable effective wind speed limit is imposed [SURFACE].

Calculations are only for the direction of maximum spread [SURFACE].

Fireline intensity, flame length, and spread distance are always for the direction of the spread calculations [SURFACE].

Wind is blowing upslope [SURFACE].

Results for: Surface Rate of Spread (maximum) (ch/h)

Fuel	1-h Moisture				
Model	%				
	4	6	8	10	12
tu5	14.3	12.9	12.0	11.2	10.6
8	2.8	2.3	2.0	1.8	1.6
10	13.3	12.0	11.1	10.5	9.9
5	37.1	34.9	33.0	29.4	16.8

Results for: Flame Length (ft)

Fuel	1-h Moisture				
Model	%				
	4	6	8	10	12
tu5	9.4	8.7	8.2	7.9	7.6
8	1.3	1.2	1.1	1.0	0.9
10	6.7	6.2	5.8	5.6	5.4
5	7.8	7.5	7.1	6.4	3.9

Results for: Area (ac)

Fuel	1-h Moisture				
Model	%				
	4	6	8	10	12
tu5	111.6	91.7	78.4	69.1	62.0
8	4.4	3.1	2.3	1.8	1.5
10	103.2	84.5	72.3	63.9	57.6
5	836.9	739.4	661.5	523.8	171.6

Oak Flat Fire, Moderate spread conditions = current
Fri, Aug 20, 2010 at 16:15:16

Input Worksheet

Inputs: SURFACE, SIZE

Input Variables	Units	Input Value(s)
Fuel/Vegetation, Surface/Understory		
Fuel Model		tu5,8,10,5
Fuel Moisture		
1-h Moisture	%	8, 10, 12, 14
10-h Moisture	%	9
100-h Moisture	%	10
Live Herbaceous Moisture	%	
Live Woody Moisture	%	120
Weather		
20-ft Wind Speed (upslope)	mi/h	10
Wind Adjustment Factor		.3
Terrain		
Slope Steepness	%	60
Fire		
Elapsed Time	h	4.0
Notes		

Run Option Notes

Maximum reliable effective wind speed limit is imposed [SURFACE].

Calculations are only for the direction of maximum spread [SURFACE].

Fireline intensity, flame length, and spread distance are always for the direction of the spread calculations [SURFACE].

Wind is blowing upslope [SURFACE].

Results for: Surface Rate of Spread (maximum) (ch/h)

Fuel	1-h Moisture			
Model	%			
	8	10	12	14
tu5	8.6	8.2	7.8	7.4
8	2.0	1.8	1.6	1.5
10	7.8	7.4	7.1	6.8
5	7.9	7.7	7.4	6.8

Results for: Flame Length (ft)

Fuel	1-h Moisture			
Model	%			
	8	10	12	14
tu5	6.8	6.6	6.3	6.1

8	1.0	1.0	0.9	0.9
10	4.8	4.6	4.4	4.3
5	2.3	2.2	2.1	2.0

Results for: Area (ac)

Fuel	1-h Moisture			
Model	%			
	8	10	12	14
tu5	41.0	36.5	33.1	30.0
8	2.3	1.8	1.5	1.3
10	35.5	32.0	29.4	27.2
5	38.1	35.7	33.0	27.9

Appendix E - Wind Ninja View Graphs

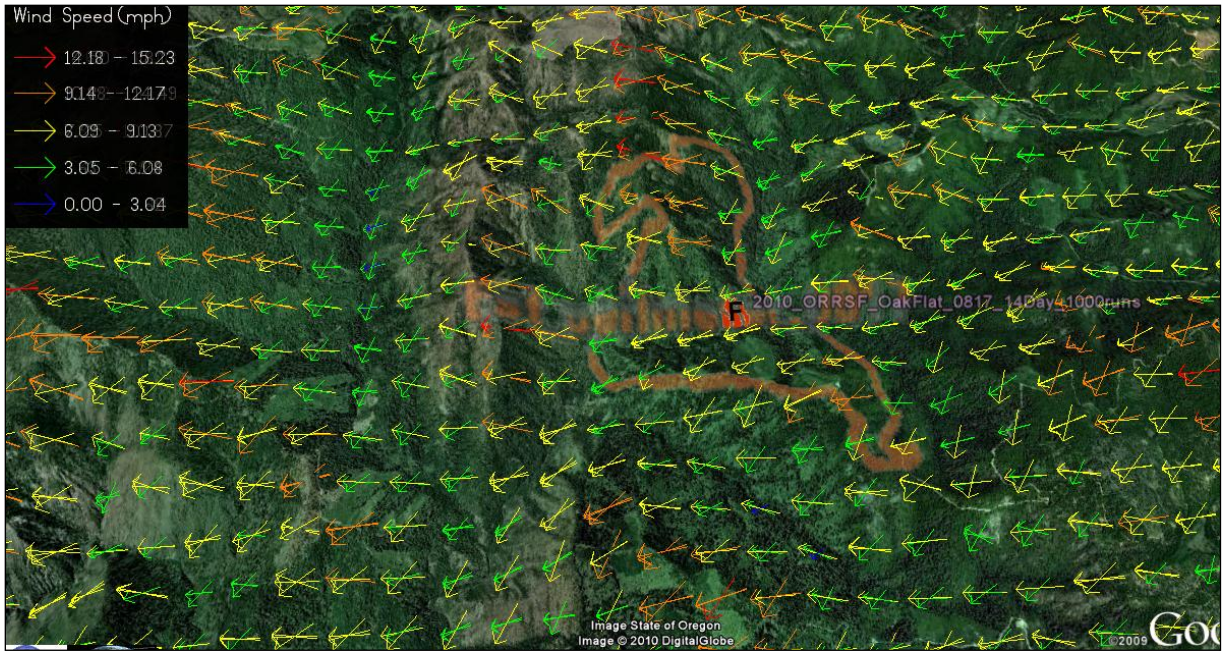


Figure 12 WindNinja model outputs for an east wind impacting the fire area (current perimeter in red). Under an east wind, the downwind (west and south) perimeter of fire is sheltered by terrain.

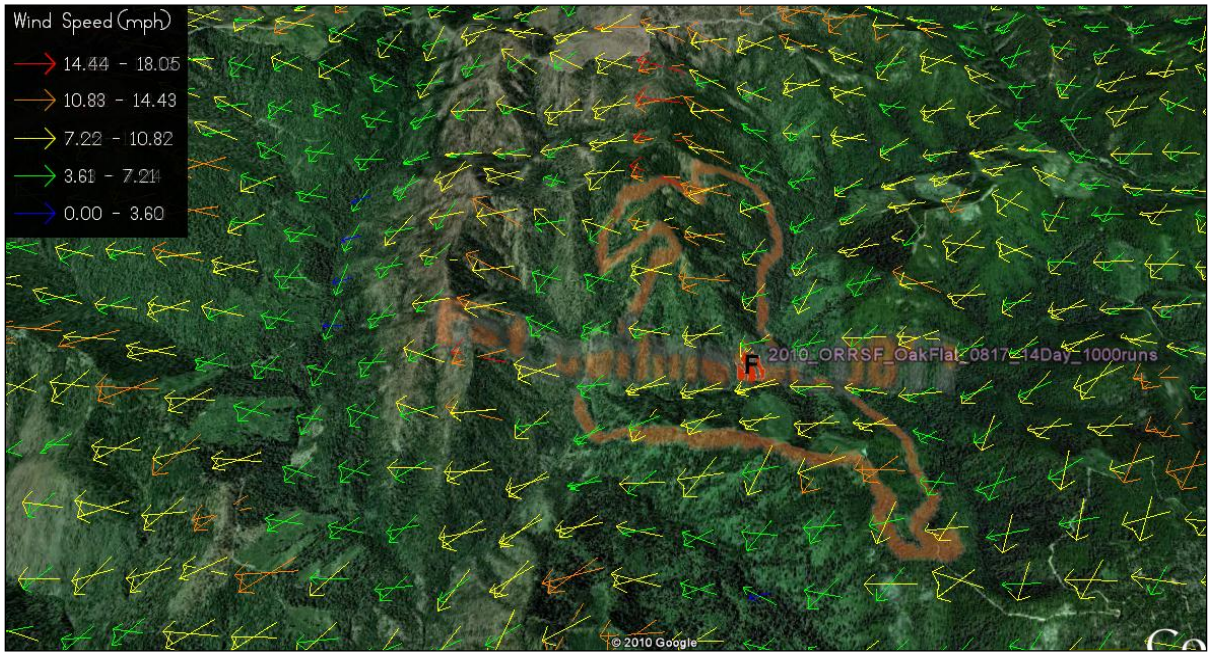


Figure 13 WindNinja model outputs for a northeast wind impacting the fire area (current perimeter in red). Under a northeast wind, the downwind (west and south) perimeters are sheltered by terrain.