Cache Creek Fire Long Term Assessment
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Executive Summary

- The Cache Creek Fire currently covers about 70,000 acres of canyon grasslands and timber stringers in the Hells Canyon National Recreation Area (HCNRA) in far northeast Oregon. Fire spread has largely been through annual and perennial grasses on steep slopes and in timber litter and grass on north and east facing timber stringers. Fire spread has slowed in higher elevation forested benches on the southwest edge of the fire, but still very active in grass and on steep slopes.

- The 2012 Fire Season started out normal, but steady drying since mid-July with no rainfall has resulted in record fire danger indices. The typical late-August or early September rain event is not in the forecast, and managers should expect another 25-30 days of fire season, with a September pattern similar to 2011.

- Based on an evaluation of large fires in recent memory in the HCNRA, a set of weather features was identified that can be used to forecast active fire growth days. The combination of overnight humidity recovery less than 40% and winds stronger than 12mph (all recorded at Harl Butte RAWS) is a good indicator of rapid fire growth in the canyon country. (NWS fire weather forecasts use 45% overnight humidity recovery as the upper limit for "poor" humidity recovery). Fire managers should be able to use this combination to predict fire growth days, useful for communicating with the public and agency partners as well as for making strategic decisions.

- A free burning fire for the next 14 days would cover an estimated 141,000 acres (expected value) and impact a large number of private and federal improvements. The fire spread would be largely up the Imnaha and Snake River Canyons, faster through grass fuels and slower in timber and to the west.

Introduction

The Cache Creek Fire was first reported on August 20, 2012 in the Hells Canyon National Recreation Area (HCNRA) on the Wallowa-Whitman National Forest in far northeastern Oregon. The fire grew rapidly in grass and brush on steep slopes above the Snake River, and after two days, the fire covered about 11000 acres and had spread into Washington, involving private and state lands in addition to National Forest.

The Oregon Incident Management Team 3 began managing the fire on 23 August, and suppression efforts in lighter fuels and gentler terrain on the north end of the fire were successful at containing this portion within a few days. The southern portion continued to move up the Snake River Canyon driven by winds and available fuels, any by August 27 the fire had reached the Imnaha River, approximately 18 air miles from the point of origin. The average daily spread in this direction was about 2.5 miles/day.

As of August 29, the fire is continuing to spread south and west on the southern end of the fire. Indirect lines have been prepared along the entire west flank, and the northern 2/3 of this flank has been burned out and is holding. The north end is contained, and the east flank is the Snake River. The southeast corner breached planned containment lines on August 27 near the confluence of the Snake and Imnaha Rivers, and suppression efforts are now focused on completing containment lines on the southwest corner, including some very steep, rugged ground above the Imnaha. Unit line officers and fire managers are now considering larger scale options for this fire if the current containment efforts are not successful.

Objectives and Risk Assessment

The purpose of this long term assessment is to give decision makers and managers information helpful to direct the long-term management of this fire, including an evaluation of fire risks to public and private values and an understanding of short term and mid range weather effects on this fire for the remainder of the season.

Key Questions:

What is the risk to private lands and natural resource values from this fire?

What weather events are associated with days of rapid fire growth, days of relatively quiet fire activity, and the end of the fire season?

What timing and frequency of these events should be anticipated for the remainder of the year?

Data Sources and Methods for Long Term Assessment

This assessment relies on fuels data in the Landfire 2008 Refresh remote sensed imagery. The weather data comes from several nearby remote area weather station (RAWS) sites, most importantly Harl Butte (46 miles south), Eden (34 miles WSW), and Corral Creek (4 miles NNE). Other RAWS sites are closer to the fire (Pittsburg Landing and Mission Creek, for example) but the weather records from these sites are either not long enough to allow good climatological assessments or are not representative of conditions at the fire site.

The assessment used several models and software packages for analyzing weather and fuels data, including the Wildland Fire Decision Support System (WFDSS) for Fire Spread Probability (FS-Pro), WindNinja for displaying topographic influences on winds, Fire Family Plus for evaluating historical weather and fire danger data, and the term file module of the Rare Event Risk Assessment Proccess (RERAP) for developing season ending and frost date assessments.

Characterization of Fire Season 2012 – past and future

The 2012 fire season started out unremarkably, with fire danger indices at or near average conditions through mid-July. Rainfall was last recorded in the fire area on July 15 (at about .15in). With steady drying from mid-July through the end of August, fire danger indices started reaching daily records about August 10 and are remaining there currently (August 29). Across the Pacific Northwest, August rainfall has been almost absent (Figure 1)

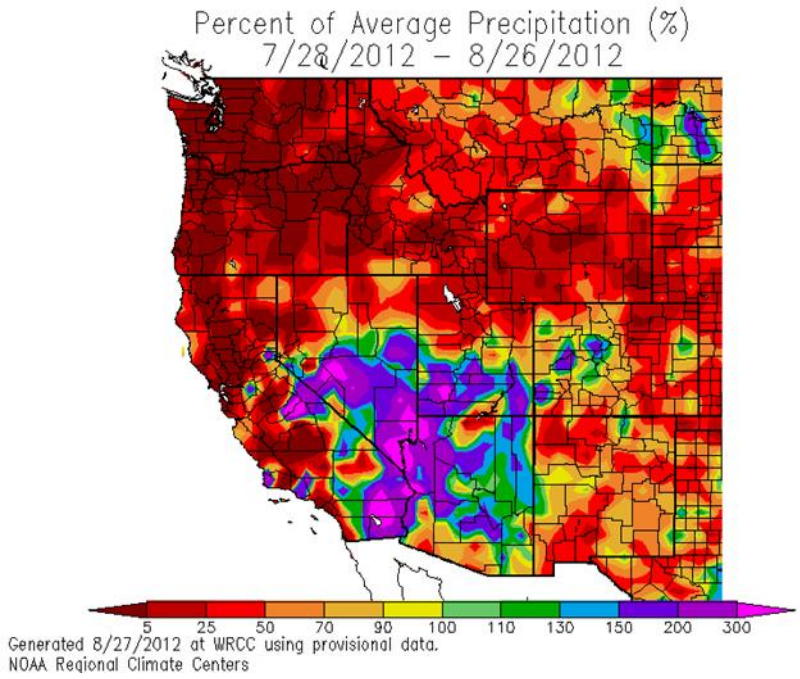


Figure 1: Departure from normal precipitation in the western US for the period 7-28-8/26/2012. Most of the west has received only a very small fraction of their normal rainfall this month.

In many years in northeast Oregon, there is some rainfall in late August – an effect variously known as the "August Singularity" or the "rains during the County Fair" when these occur over Labor Day weekend. While the rain typically comes in just a one or two day period, this precipitation is often enough to moderate fire season, and is then usually followed by an extended warm and dry period of the late summer and early fall. From 1991-2011, about 2/3 of the years had such a pattern, with at least .15in of rain occurring at least once from August 15-September 5.

Fire season 2012 appears to be atypical in this regard, with no late August rainfall recorded, and none in the forecast. Therefore, fire danger indices remain elevated. The Energy Release Component is a fire danger index which reflects cumulative drying of large dead woody fuels. Figure 2 is a graph of the 2012 ERC for data collected at the Harl Butte RAWS, plotted against daily average, minimum, and maximum values over the past 22 years. Note that 2012 has set daily new maximums over the past 7-10 days.

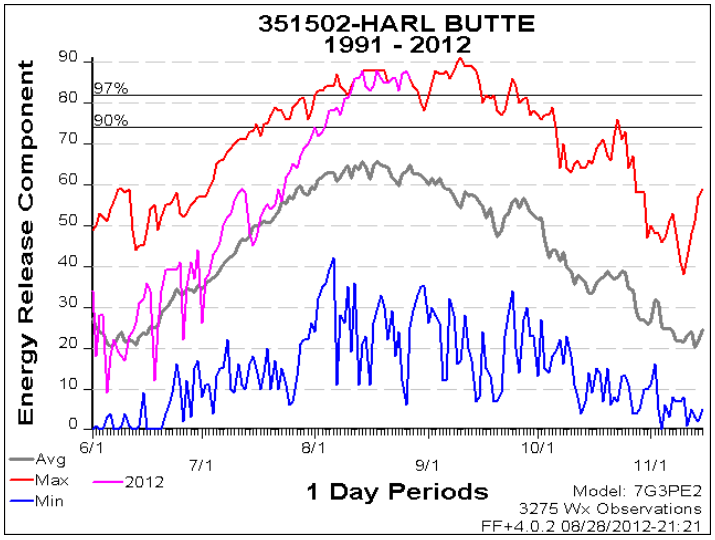


Figure 2: Energy release component fire danger index for the Harl Butte RAWS, based on data collected from 1991-2012. Season 2012 is highlighted in pink, the average line is grey, and the daily maximum and minimum values are in red and blue, respectively.

Analog Fire Years

For the purposes of long term fire analyses, it can useful to identify past years that had similar trends in fire danger indices – this can help managers anticipate conditions for the remainder of the fire season. We searched through past 21 years of weather data from the Harl Butte RAWS to identify a year similar to 2012 with respect to fire danger indices. Fire season 2000 showed a very similar ERC trace to 2012, but in 2000 a rain event at the end of August caused a precipitous drop in ERC and effectively ended the fire season. No such event is foreseen in the short to mid-range weather forecasts for 2012, and it appears that last year (2011) may be the best analog fire season to 2012 in northeast Oregon; in 2011 the fire danger indices remained elevated well above average until October. Figure 3 displays the ERC trace at the Harl Butte RAWS for 2000, 2011, and 2012 as well as daily average, minima, and maxima.

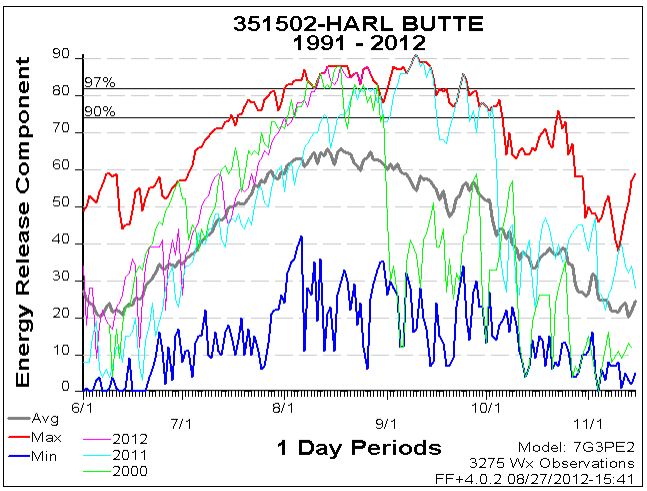


Figure 3: in search for fire season to serve as an analog for 2012, it appears that 2011 is the best match, predicting at least another 30 days of fire season in the HCNRA.

Climatological Outlooks:

Figure 4 is the one and three month temperature and precipitation outlook for the continental United States. These outlooks indicate drier than normal conditions through November 2012, and equal chances for above or below normal temperatures.

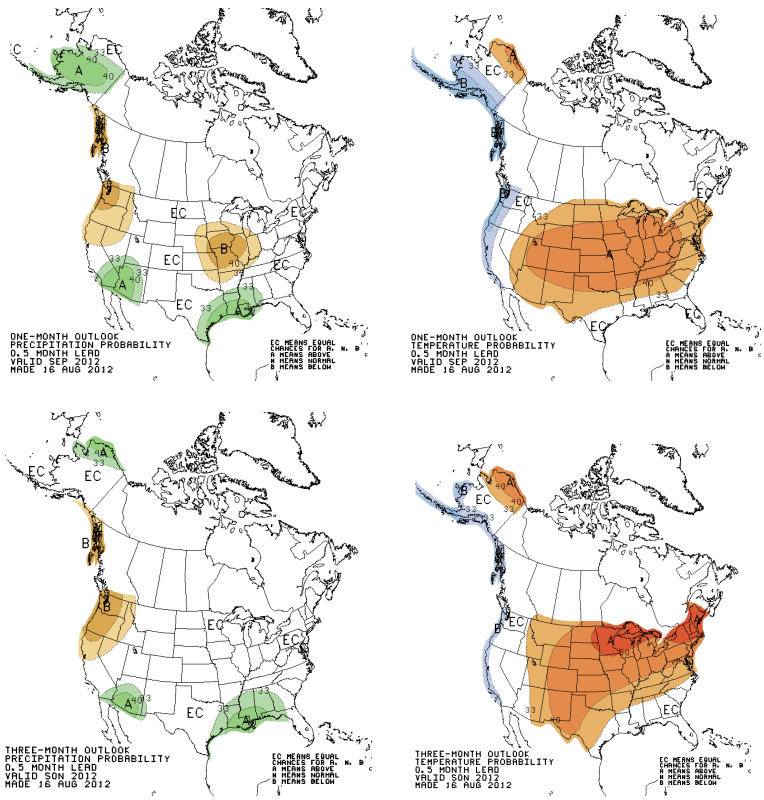


Figure 4: 30- and 90-day outlooks for temperature and precipitation in the continental United States.

Cache Creek Fire Behavior

The Cache Creek fire is burning in the Grande Ronde, Snake, and Imnaha River Canyons, all steep, rocky, and rugged terrain with more than 4000ft elevation difference from top to bottom and >70% slopes very common. The lower elevations are dominated by grass and brush fuels, with scattered stringer forest on north and east facing slopes, trending to more continuous forest fuels at the highest elevations on the southwest corner of the fire. Ponderosa pine is the most common tree species in the stringers, mixed with Douglas-fir and then white fir at higher elevations, and lodgepole pine at the highest locations.

Figure 5 is a fire progression map overlaid on satellite photo imagery, showing how the fire has spread through the available fuels. Primary fire spread has been through grass, with some shrub involvement when slope, dead fuels, and wind are aligned properly to support fire spread. Fire in the crowns of the trees has largely been limited to short upslope runs, and in mistletoe brooms where they are present. Thus far, fire growth has slowed dramatically when the fire enters the dense forest areas on the benches on the southwest side of the fire. In the grass fuels, daily rates of spread of several miles per day have been seen repeatedly, especially late in the afternoon and in the early evening as the winds increase.

The most rapid spread of fire occurs when winds and slope are aligned, fuels are abundant enough to support spread, and there is an ignition source in the right location. Because the canyons in the HCNRA are so steep and dissected, all slope aspects are present and abundant. Additionally, because the canyons are so steep, deep, and convoluted, free air winds are channeled in all directions. Third, as a result of different aspects holding water and soil, vegetation distribution is also very irregular. The upshot is that any burn period can have combinations of wind, slope, and fuels properly aligned *somewhere* for rapid burning when fuels are dry – making fire suppression a challenging and dynamic task in these canyons.

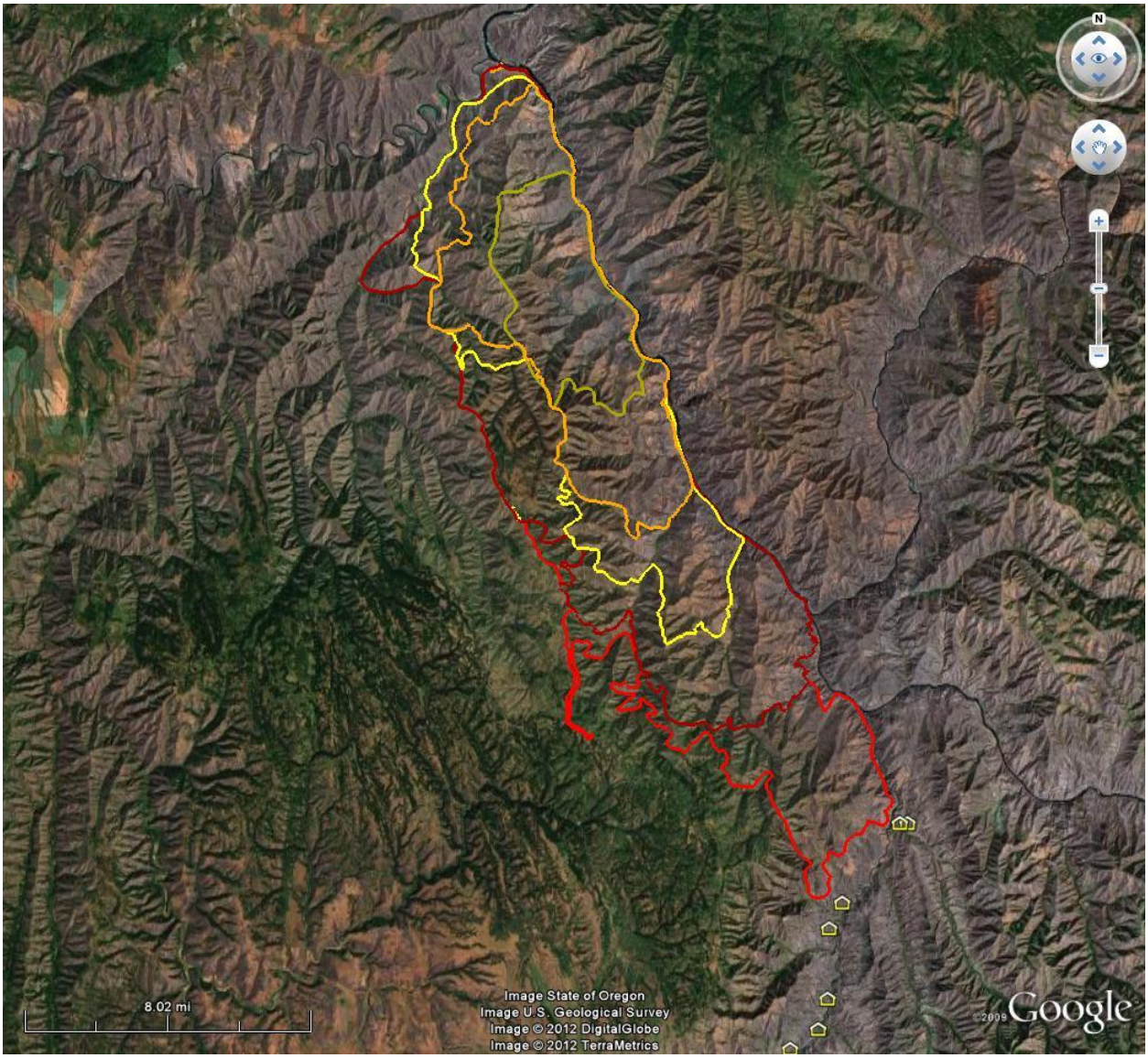


Figure 5: Fire Progression Map for the Cache Creek Fire overlaid on topography and fuels image

Weather Events Associated With Large Fire Growth

This analysis evaluates the weather conditions during significant fire spread days on recent, historical fires in the vicinity of the Cache Creek fire. The purpose of this analysis is to develop some predictive capability, so that local fire managers and suppression resources can anticipate and communicate days when fire growth is likely. Three such recent fires were used: the Battle Creek Complex of 2007, the Jim Creek Fire of 2006, and the Cherry Creek Fire of 2005. In each case, daily fire growth data was gleaned from historical records (mostly archived ICS 209 reports and Incident Action Plan maps), and the days of most significant fire growth were evaluated for weather conditions supporting such growth.

It appears that the combination of low overnight humidity recovery and moderate to strong winds were present on the most active fire growth days on each of these fires. Figure 6 is an example showing hourly temperature, humidity, and windspeed/direction for the Harl Butte remote area weather station during the Jim Creek Fire. The heavy horizontal arrow indicates the days of active fire growth – following this time, the fire grew only insignificantly as weather conditions moderated. Note the depression in peak daily humidity values during the 3-4 days prior to the fire start, and the spikes in wind speed during the fire growth days – as well as moderating conditions at the end of the fire.

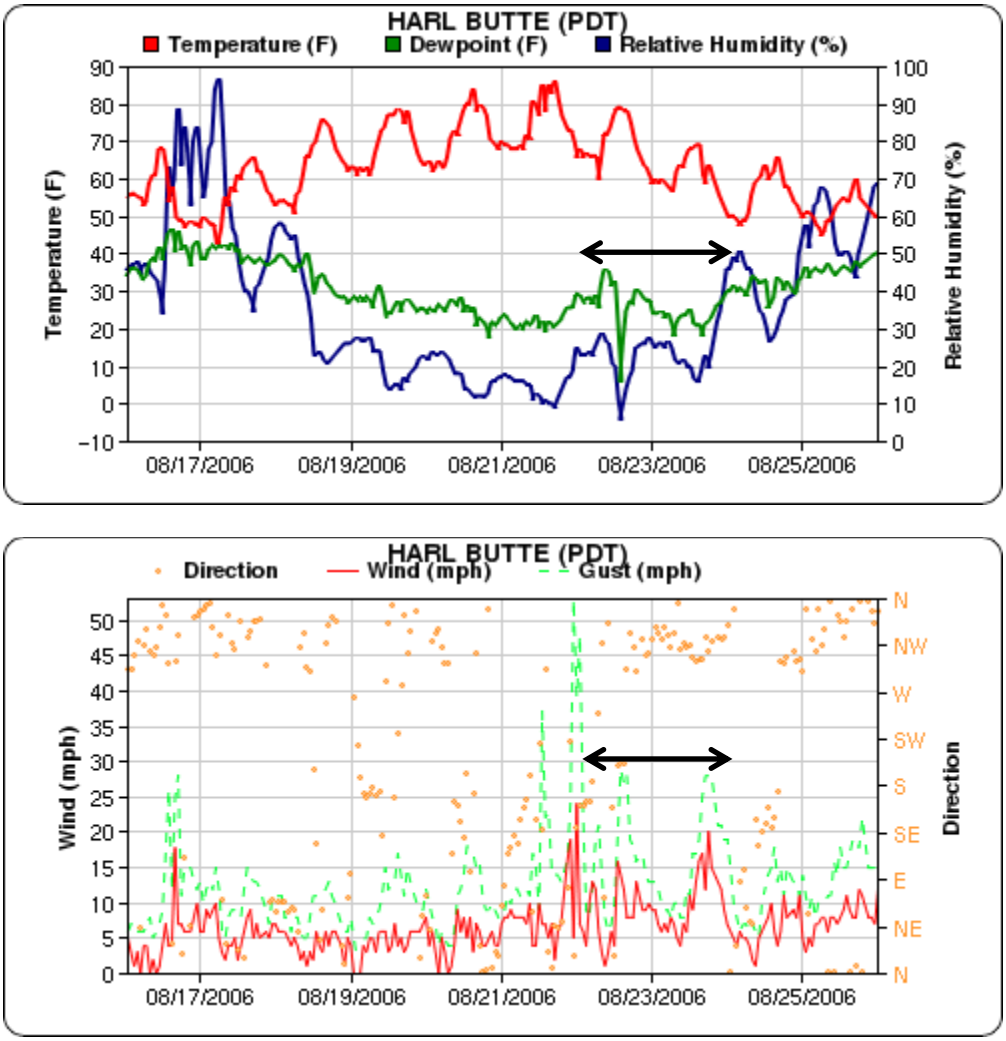


Figure 6: Temperature/humidity and winds recorded at the Harl Butte RAWS site immediately preceding and during the growth of the Jim Creek Fire in 2006

A similar pattern can also be seen for the periods of growth for the Battle Creek complex of 2007 (Figure 7) and the Cherry Creek fire in 2005. Figure 8 is the 2012 trace for the past week, during which time the Cache Creek fire has been actively growing almost daily. Based on this assessment, it appears that the combination of maximum overnight humidity recovery of less than 40% and late afternoon or evening winds of greater than 12mph (not gusts) can be used as indicators of significant fire growth days. Note

that these conditions are as recorded at the Harl Butte RAWS – the RAWS values can be thought of as an *indicator* of large fire growth potential in the canyons, recognizing that actual conditions on the fire scene are likely to be drier and windier.

This combination of weather parameters occurs on average about 4.5 times per fire season between 8/15 and 9/30, based on overnight humidity recovery and 10 minute average windspeed recorded at 1300hrs.

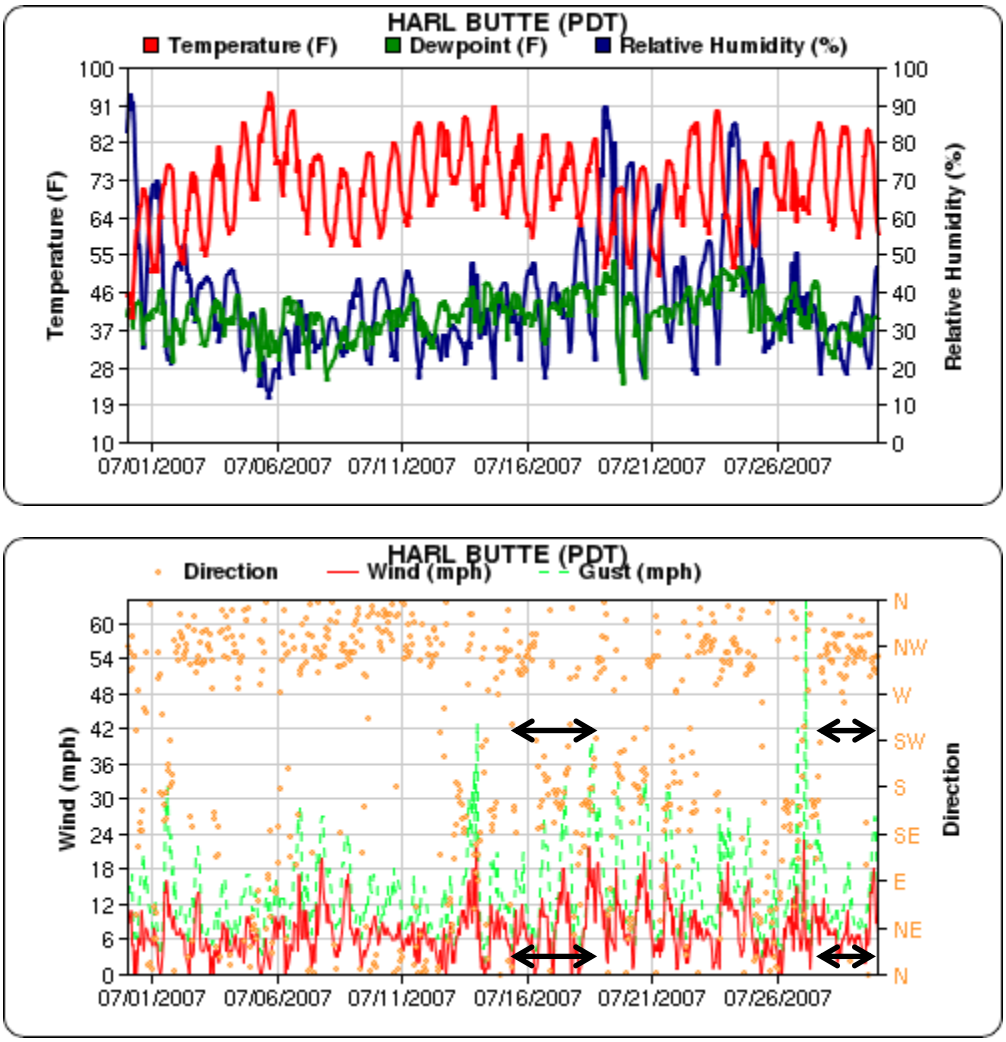


Figure 7: Winds and temperature/humidity trace for 2007 during two periods of active growth of the Battle Creek complex.

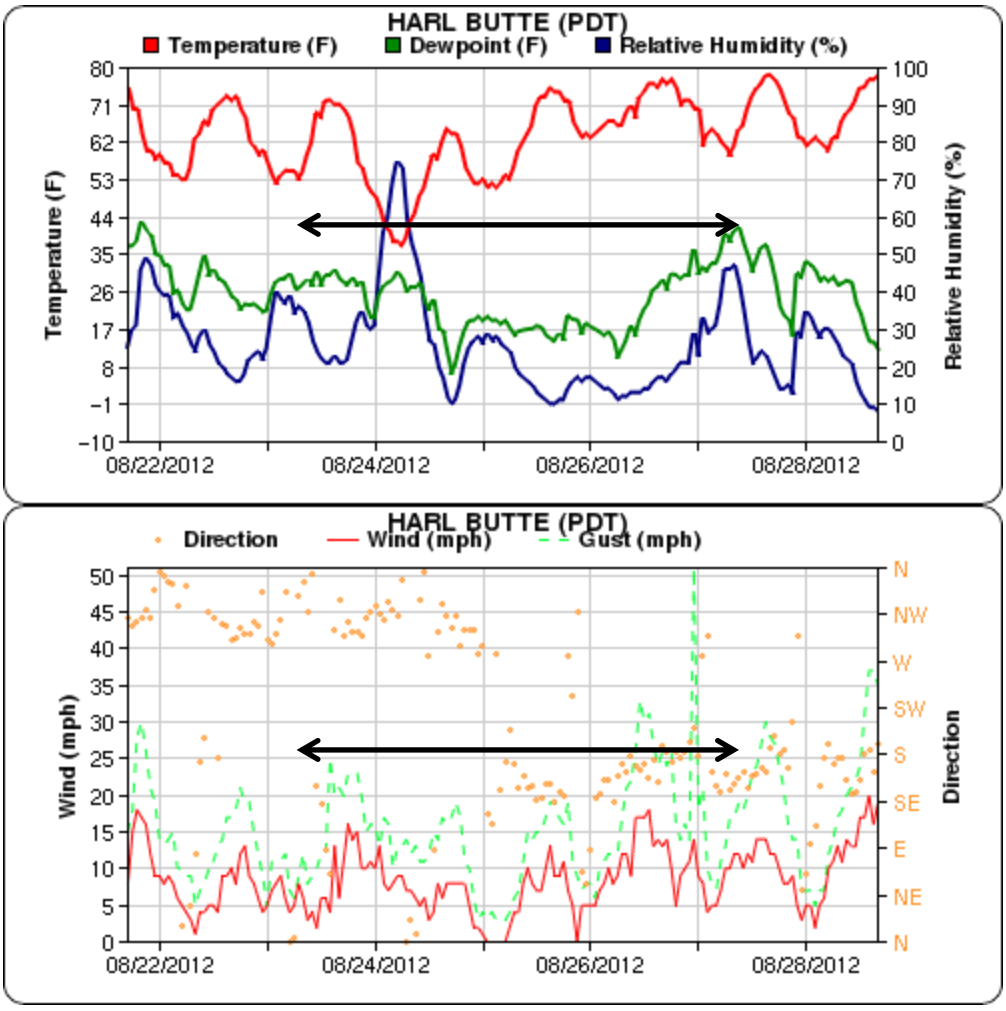


Figure 8: Weather traces for Harl Butte RAWS during period of active fire growth on the Cache Creek Fire, 2012

Season slowing/ending events

A season slowing event is a weather event that temporarily stops fire movement on going fires, or temporarily reduces the fire danger indices before the rebound again before the end of the season. A cool, moist period, even with some rainfall, can cause such a temporary slowing in fire activity. In August and early September, for example, on average there are 3 days per year of >.1in/day of rainfall recorded over the past 20 years at Harl Butte.

A season ending event is most often thought of as a weather event that depresses fire danger indices to such a low level late enough in the year that the indices do not recover by the end of the year. Often times, however, especially in dry climates, the end of the season cannot be attributed to a particular weather event, but rather the accumulated effect of cooler temperatures, higher daily relative humidity, and shorter daylengths. For the purposes of this analysis, an analysis conducted by the Northwest

Coordination Center's Predictive Services group seems to fit the local conditions well. This estimate, based on dates when fire danger drops below a certain threshold and does not return above the threshold for two or more consecutive days, indicates that about half of the fire seasons are over by mid-September. However, the 90th percentile date is October 3. Given the long term forecasts and behavior of analog years, decision makers would be wise to anticipate a later than average season ending date in 2012.

	E4	
	Julian	Calendar
Median	258	9/14
90th	277	10/3
99th	279	10/5

Table 1: season end date probabilities for Predictive Services Area E4

Risk Assessment – FS Pro

The Fire Spread Probability (FSPro) 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 can be used to identify the probability that areas of concern could see fire. The outputs are helpful for developing priorities and analyzing risk to identified values. There are important assumptions in the FSPro analysis: 1) the fire is free-burning and 2) there is no suppression action constraining fire growth.

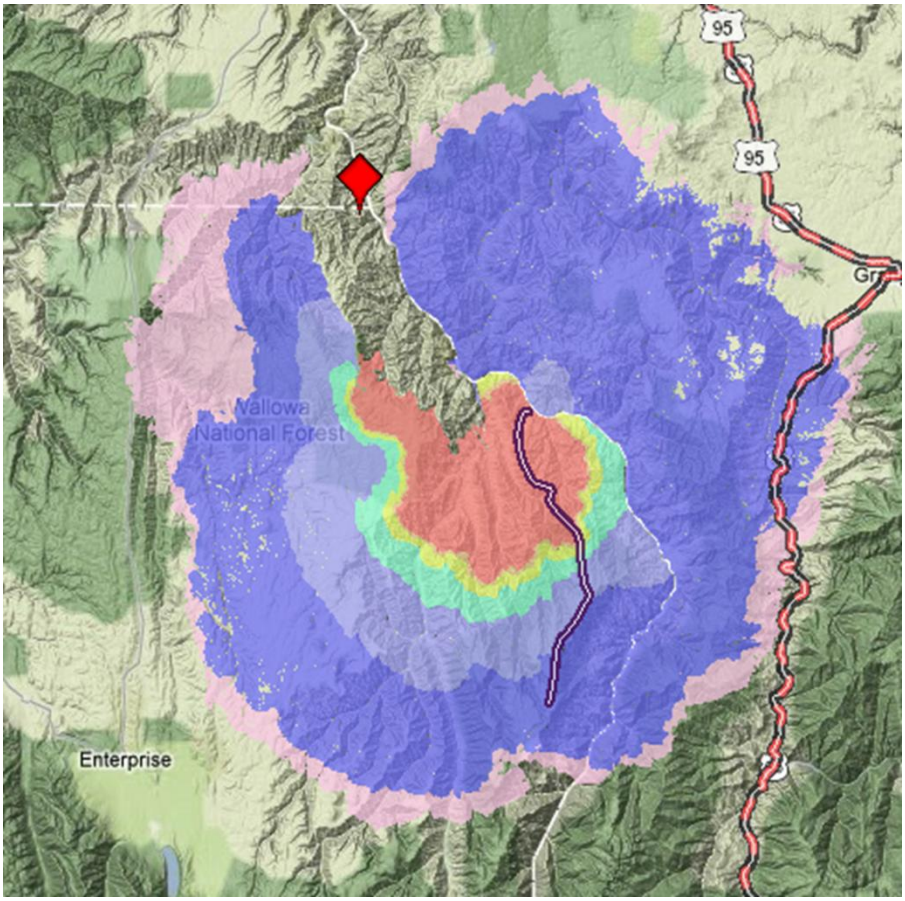
A number of FS Pro assessments were conducted to evaluate the outcome of different fire events – a spot fire across the Imnaha River, a complete breach of the south flank above the Imnaha, continued spread from all active flanks, etc. (attached). It is clear in these assessments that the fire "wants" to move through grass fuels to the southeast, and up drainages south of the Imnaha River (Cow Creek, Lightning Creek). There are rarer weather events that will push the fire strong to the southwest, even as far as Enterprise in a two week period.

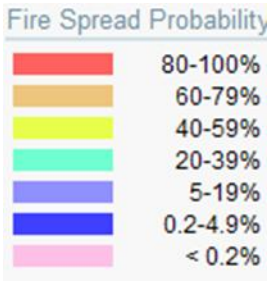
A 14 day assessment starting from the uncontained fire perimeter on 8/29 has an expected value of 32 private buildings or building groups within the fire area, in addition to 28 Forest Service structures, 14 miles of transmission lines, etc.

Recommendations:

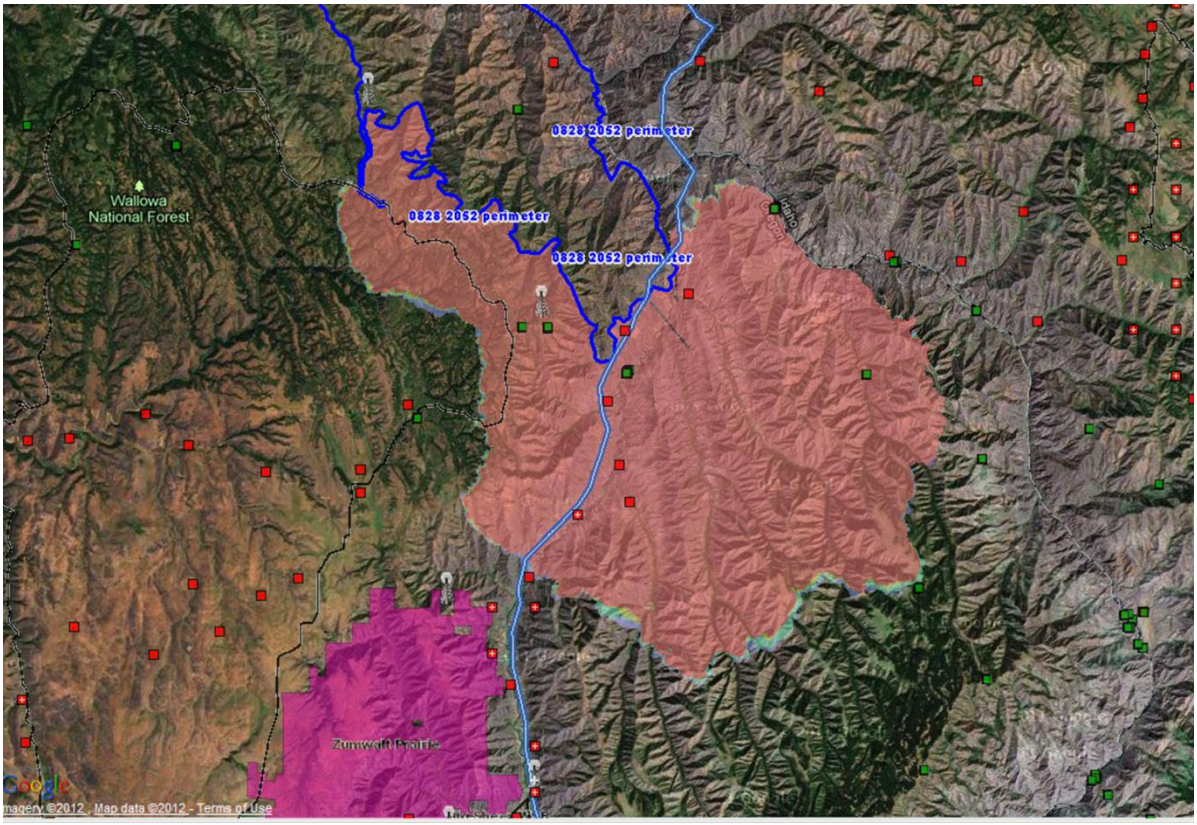
Monitor weather forecasts to anticipate days of more active fire growth from now through the end of the season. For afree burning fire, if the indicator conditions are anticipated, communicate this to interested public so that they understand and anticipate fire activity as well. Use indicators suggested in this LTA, and refine as appropriate. Retain the temporary RAWS sites in situ for the remainder of fire season to allow monitoring on scene weather remotely.

Much of the area prepped as a roadside fuel break/fireline along the south end of the Cold Springs Ridge road are not currently available to burn. As the season progresses, however, the downed green material and live herbaceous and woody fuels will continue to dry. At some point, these currently unburnable fuels will become burnable (will become a heat source instead of a heat sink). Monitor fuel readiness here and fire activity adjacent to these fuels. The open stands of mixed conifers and pure ponderosa pine will be ready sooner, especially if on a slope.



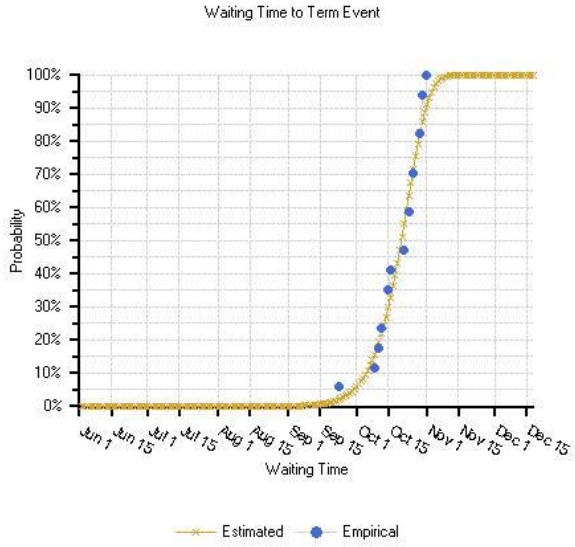


Fire Spread Probability runs for a 14-day period starting 8/29/12, uncontained fire spread. Average fire size 150,000 acres



5-day FS-Pro Run starting 8/29 from the uncontained fire edge, free burning fire with no suppression. Assumes burning condition similar to 8/27 and 28, periods of very active fire growth, ERCs in the 86-88 range, winds 15-18mph. Weather in this 5-day run is “hard wired”, so the fire “footprint” is all high-likelihood.

Freeze Probability waiting time curve, Harl Butte RAWS



Timing of first hard freeze (<25F) at Harl Butte. 50th Percentile date is about 17 October, and 90th percentile is about 1 November.