Bald Sisters Fire

Malheur and Wallowa-Whitman National Forests
Long-term Assessment (August 15, 2014)

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Executive Summary

This analysis is intended to aid Agency Administrators and fire managers in planning for the Bald Sisters fire as the season continues. Specifically this report describes the climate, fuels, and general fire environment, analyzes historic fire and weather conditions that contribute to fire growth, and examines historic conditions to identify season slowing and ending events.

The Bald Sisters fire started on August 1, 2014 in the Baldy Mountain Inventoried Roadless Area 12 miles west of Prairie City on the Prairie City Ranger District. The fire was initially four fires ignited by lightning and grew together by 8/11/2014. They made several small runs, spreading in dead and downed Lodgepole pine and through areas of Beetle killed timber. The fire is located in an area where access by fire crews is extremely difficult. There are no structures threatened within the planning area, but there are commercial timber values, grazing allotments; and critical aquatic habitat. The fire is located completely within the Malheur National Forest and is currently 0.5 miles from the Wallowa-Whitman boundary.

From August 12-15 the fire experienced a season slowing event with increased humidities and rain. The incident's Remote Automated Weather Station (IRAWS) received 0.37" of rain.

Weather patterns from 8/12-15 are unusual for this time of year and are more typical of late September patterns. As conditions return to normal, fire favorable weather conditions are expected to continue into late September with periods of large fire growth diminishing with shorter days. At this time the Bald Sisters fire is expected to show only limited growth over the next 4 to 5 days due to the recent high RHs and precipitation. Any new starts in the area would be susceptible to the climatic conditions described in this document.

Conditions for fire spread

The majority of fire growth to date has occurred from 8/4-8/10/14. It is a high elevation fire burning mostly in stands of sub-alpine fir, mixed conifer, and Lodgepole pine with a substantial beetle-killed component. The live fuel moistures are still high for this time of year, therefore the dead and downed fuels and areas of beetle kill have been the main carriers of the fire.

Table 1 Fire Growth and Ambient Trends

Date	Growth Acres	Total Acres	Precipitation	Min RH	Max Sustained Winds
8/4	--	187	0	No Data	No Data
8/5	58	245	0	25%	8
8/6	318	563	0	17%	11
8/7	206	770	0	21%	9
8/8	55	825	0	26%	9
8/9	50	875	0	20%	6
8/10	119	994	0	22%	9
8/11	74	1,068	0	18%	16
8/12	40	1,108	0.15	63%	20
8/13	0	1,108	0	29%	13
8/14	0	1,108	0.18	48%	8
8/15	0	1,108	.04	45%	6

This table shows daily fire growth, precipitation, and the maximum sustained wind and minimum RH observed during the burning period (13:00-19:00).

Fire Growth, Maximum Wind and Minimum RH Trends

Based on onsite weather observations from both ground personnel and the incident's remote weather station (IRAWS), there is a trend that on days of 100 or more acres of fire growth, relative humidities drop below 25% and there are sustained winds of 9 mph or greater. These periods of growth also coincide with the fire progressing into areas of beetle kill in the upper 1/3 of the slope, which made fuels more exposed to drier and windier conditions. The landscape is broken up with roads, past treatments, and past fires which limit growth.

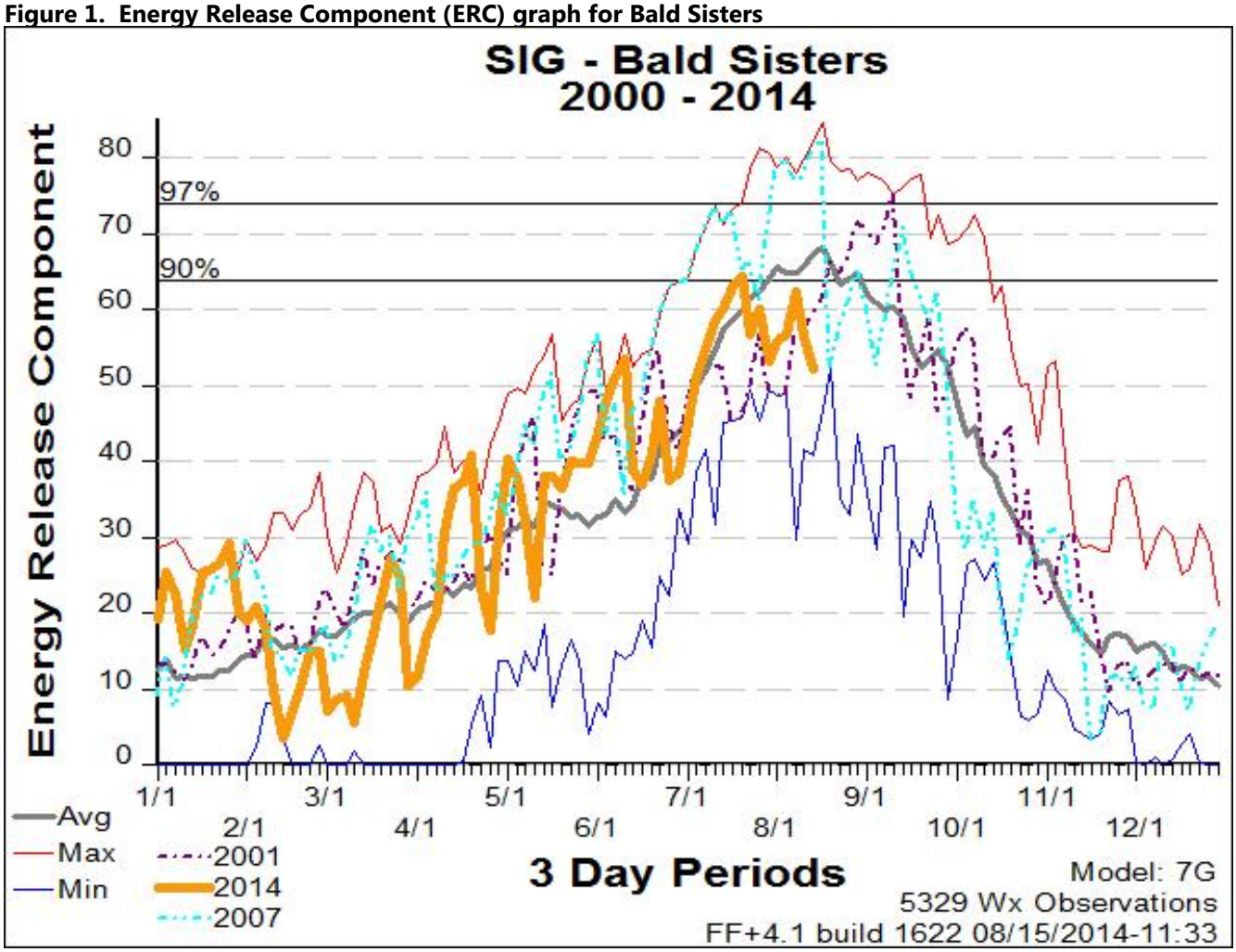
Spotting has been localized. We have not seen any long distance spotting that is greater than 0.3 miles. While spotting has not been a major contributor to fire spread so far, the fuels could become conducive to spotting under drying conditions.

Local and Regional Conditions

Energy Release Component (ERC) values from the Bald Sisters weather stations demonstrate a trend of higher than average ERC values early this winter when below-normal snowpack was received for the area. This has been reflected in sustained fire behavior in the 1,000 hour fuels. However, by mid-February the indices dropped as moisture returned to the area. The moist late winter and early spring resulted in a flush of growth for grasses which have retained their high live fuel moistures through the summer and has inhibited fire spread in many areas.

The 2001 indices are included because that year trended closely to what we have seen in 2014. The 2007 indices are included to represent a significant year for large fires on the Malheur and a year of maximum ERCs.

Figure 1. Energy Release Component (ERC) graph for Bald Sisters



Fuels

The majority of fuels in the fire area are subalpine fir, mixed conifer and Lodgepole pine which are reflected by Fuel Model TU5, Very High Load, Dry Climate Timber-Shrub. Areas of beetle-killed timber behave more like SB2, Moderate Load Activity Fuel or Low Load Blowdown and are modified as such for fire behavior runs. Meadows and opening are reflected with Low and Moderate Load Dry Climate Grass-Shrub (GS1 & GS2) which make up some of the planning area. Portions of the fire area include 70 to 80 year old lodgepole and some ponderosa pine which are represented by Timber Litter fuel models, especially TL3 and TL8.

Fuel moistures taken on 8/4 near the fire revealed that grasses were at 248% and shrubs were at 272%. This is high for this time of year and these fuels are only carrying fire when pre-heated by burning dead and downed materials. Grasses on southern aspects are likely to cure out slowly as the season continues but the majority will not cure until there is a widespread frost.

Beetle killed areas are extensive throughout the landscape, but the age of the beetle kill affects the availability of fuels for fire spread. At this time the majority of the areas that have contributed to spread are those killed in 2010. Areas of more recent beetle kill show red needles but have not degraded to the point where they are as ready to carry fire at this time as the 2010 areas.

Figure 3. Beetle Kill in Planning Area

Figure 3 2010 Beetle Kill Overlay

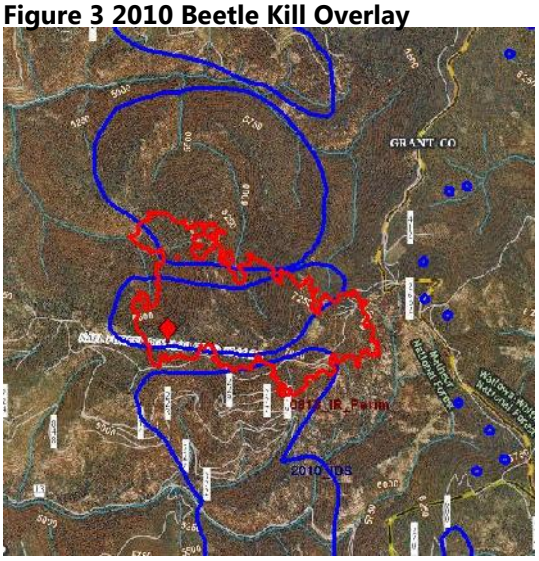


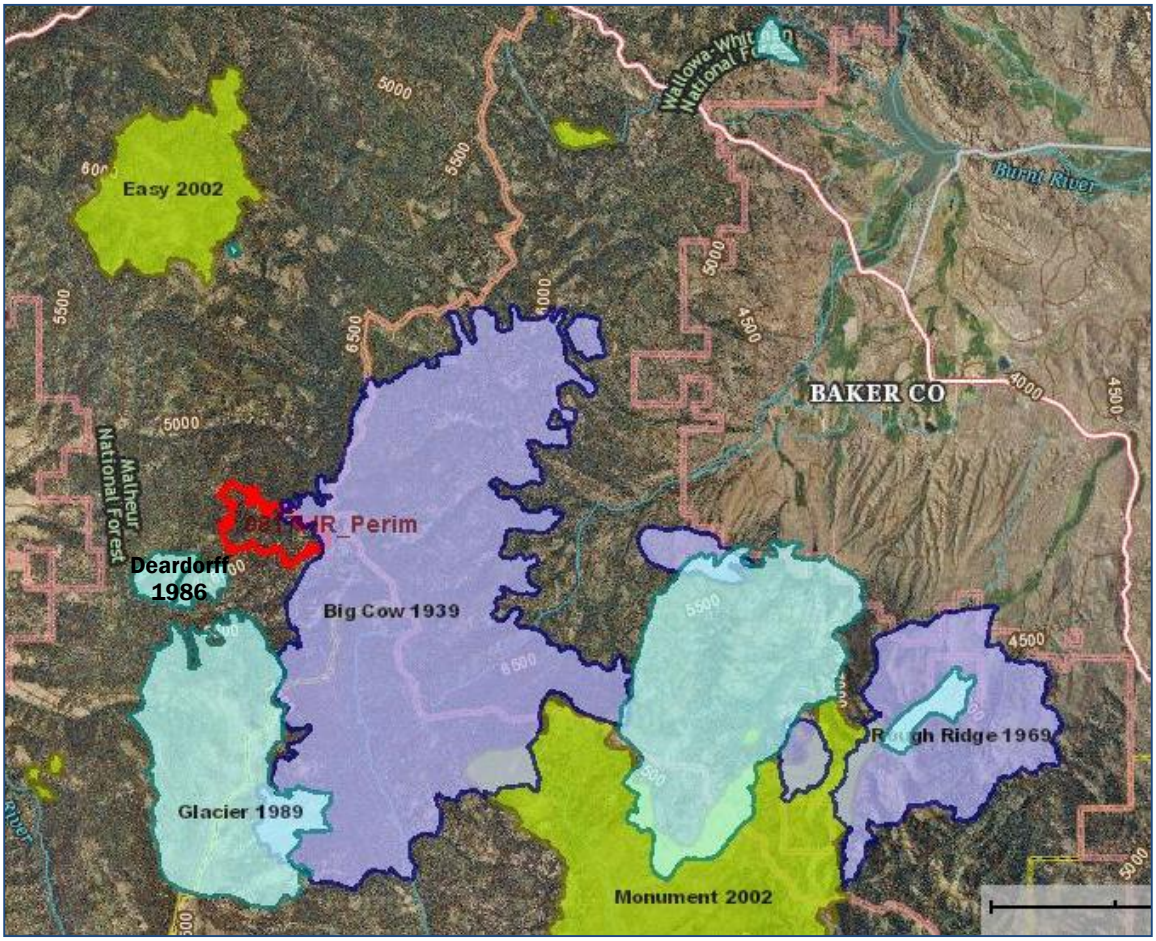
Figure 4. Photo of Lodgepole Regeneration from 2002 Easy Fire

Fire History and Fuels

The fire scars in the area play different roles in fuels available for fire spread. The 2002 fire scars are dominated by regenerating, young Lodgepole pine which will limit fire spread and because of this, may serve as holding areas.

The ages of Beetle kill vary in different fire scars. The dead and dying stands in the 1989 fire scar are estimated to be from 2010 and 2011, characterized with more available fuels and snags. The 1939 Big Cow fire scare is dominated with beetle killed areas from 2012 and 2013, currently showing lower fire behavior than other beetle killed areas.

Figure 5. Fire History in the Planning Area



Seasonal Events Outlook

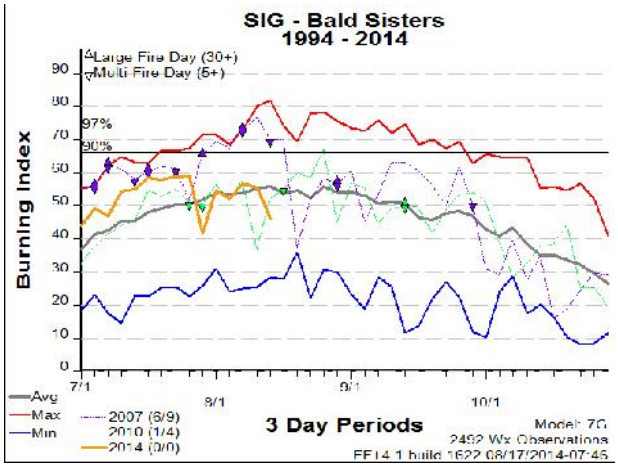
The potential length of the fire season is important to operational and other management decisions, as the number of burn days left in the season have a direct effect on the likelihood that a fire will reach any point of concern. The fire season on the Malheur often continues into late Fall but as days shorten, temperatures drop, and periods of precipitation increase the opportunities for fires to grow diminish. For example, in early August, the burn period can begin mid-morning, end near sunset on very warm and dry days, and extend well into the night in thermal belts. Between August 15 and September 27 at the latitude of Prairie City, OR, the day shortens by 2 hours 7 minutes and the maximum sun angle declines by 16º. These changes reduce the potential burn period and are enough to affect the probability that the lower 1/3 of slopes will carry fire, especially on northerly and easterly aspects. These slope positions are also less likely to dry out sufficiently to carry fire should a precipitation event, even a relatively small one, occur around mid-September. These factors along with changes in weather patterns combine to cause season slowing and later season ending events. Trends in fuel and weather conditions can be monitored to help managers recognize these events and use them for long-term planning purposes.

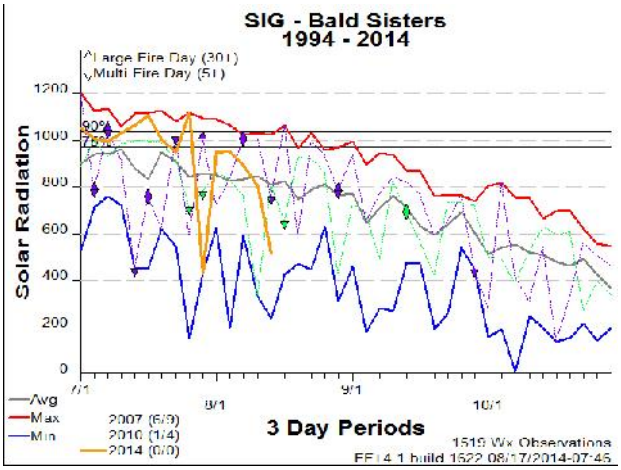
Season Slowing Events

Many things can create a season slowing event, and it is typically a combination of factors that do. On the Bald Sisters fire in mid-August, it was moisture combined with high relative humidities, lower winds (see Table 1 Fire Growth and Ambient Trends); and cloud cover.

When looking ahead for trends to indicate potential slowing events, Solar Radiation minimums below 600 and the Burning Index topping at 48 correlate well. Atmospheric instability includes many factors that contribute to fire spread and is ultimately related to differences in surface and air temperature. Solar radiation helps capture this along with the influence of the changed solar angles during the year . The Burning Index (difficulty of control) is derived from a combination of Spread Component and Energy Release Component, creating a balance of short and long term trends that contribute to fire growth. The graphs below reflect trends based on 20 years of weather data and a similar fire season (2010) and an extreme season (2007) are included for reference.

Figure 6 Burning Index and Solar Radiation Graphs for 7/1-10/31





Season Ending Events

When reviewing indices to define season ending events, high Relative Humidities (RHs) combined with Energy Release Component values below 51 correlated well. High RHs over several days reflect good fuel moisture recoveries, reducing availability of fuels for a longer part of the burning period. Energy Release Component also reflects trends in fuel moistures informed by weather conditions over longer periods of time. The following term file is based on maximum Relative Humidities at or above 90% and max ERC below 51 for 4 consecutive days. According to those criteria the probability of a season ending event by September 27th is 50% and 75% by October 10th. These criteria were developed through discussions with local fire managers, analysis from Remote Automated Weather Stations (RAWS) and fire history records.

Table 2. Key Probabilities for Season Ending Events

Probability	Date
25%	September 11
50%	September 27
75%	October 10

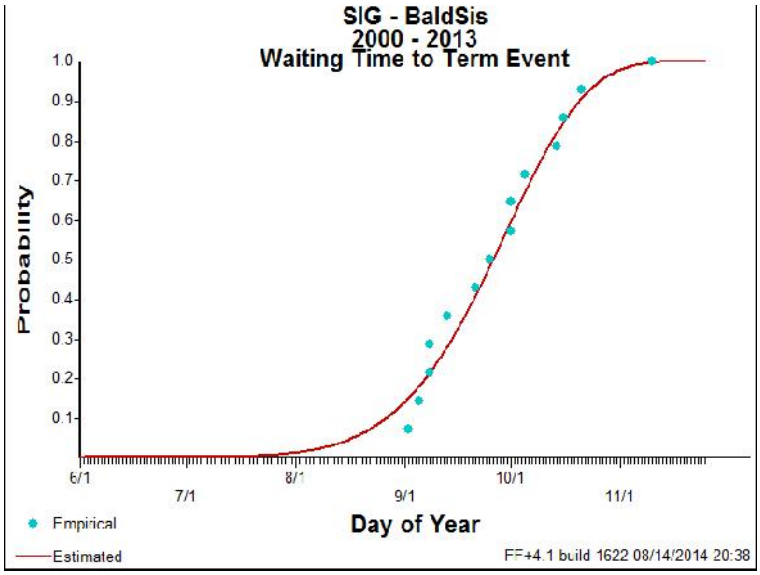


Table 3. RAWS Sites used for analysis

Station	Number	Elevation	Distance
Yellow Pine	352124	4,600’	22.2 Miles
Crane Prairie	352305	5,500’	15.5 Miles
Incident RAWS	TT029	6,145’	On Site

Daylight Reduction and Solar Influence

At this latitude, days shorten and the angle of the sun declines significantly as we transition into fall (see Table 4). This has a noticeable effect on the burning period and translates into a reduced potential for fire, fuels, and weather alignment to develop into extreme fire behavior. North and east aspects are affected more by these changes than south and west aspects. Positions on the lower third of the slope are also more affected than those on the upper third. These slope positions are also less likely through time to dry out sufficiently to carry fire should a precipitation event occur. By the end of October, the burning period will be limited to just a few hours in the afternoon.

Table 4. Changing Day Lengths and Sun Angles

Date	Solar Angle	Sunrise	Sunset	Daylight
8/15/2014	14.03	6:57	20:59	14:02
9/11/2014	4.54	7:28	20:12	12:44
9/27/2014	-1.65	7:47	19:42	11:55
10/10/2014	-6.66	8:03	19:18	11:15
10/21/2014	-10.71	8:17	19:00	10:43
11/06/2014	-15.99	8:38	18:37	9:59

Smoke Management

Smoke sensitive receptor areas (SSRAs) have been identified by the State of Oregon. These areas are provided the highest level of protection under the smoke management plan. Within the greater fire area, both John Day and Burns have been designated SSRAs. Additional areas that have been impacted by the 2014 fire season include:

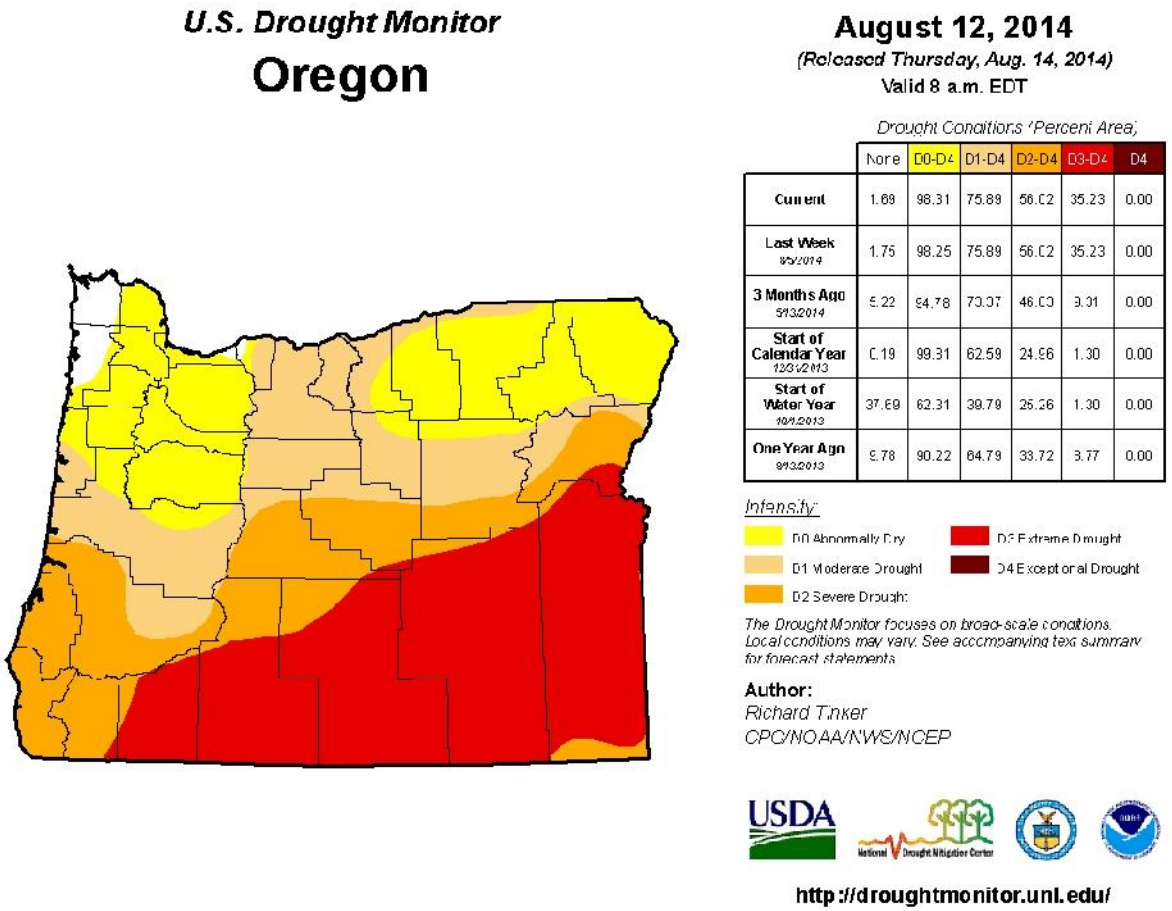
- Unity
- Prairie City
- Seneca

The Strawberry Mountain and Monument Rock Wilderness are class 1 airsheds located within 9 miles of the fire. No impacts to these airsheds have yet been identified.

An Air Quality Resource Advisor (ARRA) was ordered for all incidents in the vicinity from 8/7-8/15/14. Smoke monitoring equipment has been set up in Seneca and Unity and permanent monitors are set up in Burns and John Day. Real time air quality monitoring data is available on the web at http://www.deq.state.or.us/lab/aqm/airMonitoring.htm.

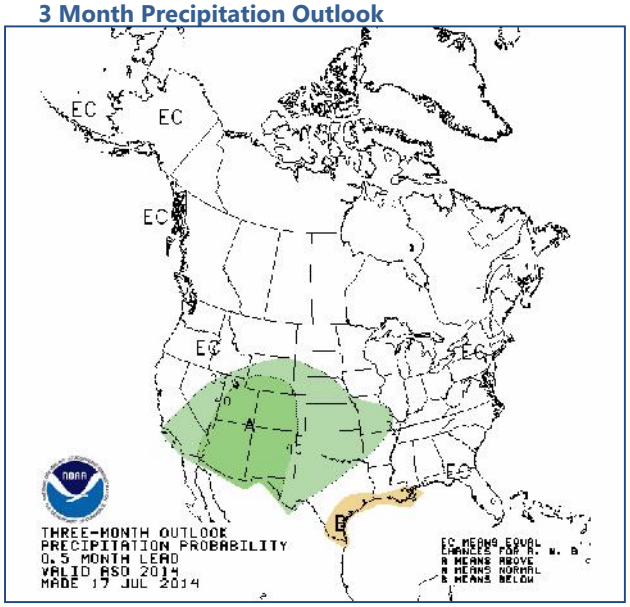
Projected Climatic and Fuels Trends

Oregon has experienced drought conditions in 2014, especially in SE parts of the state. The fire is experiencing severe drought as shown in the August 12, 2014 Drought Monitor map below.

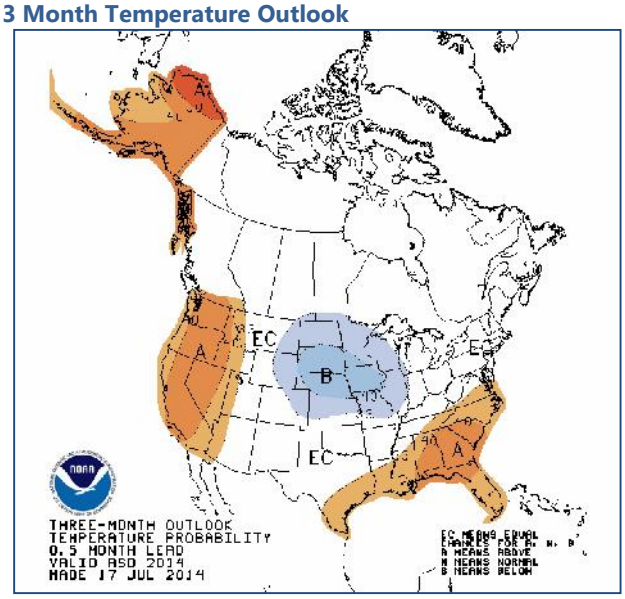


The Climate Prediction Center outlook for the next 3 months shows equal chances to have above or below average precipitation with the possibility for above average temperature. However, current predictions indicate an above average precipitation and temperatures through August.

3 Month Precipitation Outlook



3 Month Temperature Outlook



Conclusion

The potential for extreme fire behavior and significant fire spread, especially at higher elevations, has begun to diminish in the fire area. The heavier fuels remain receptive but the fine fuels at the higher elevations are unlikely to cure in the near future. This trend is likely to continue.

Lower elevation fuels remain dry and receptive should new starts or rollout from the existing fire occur.

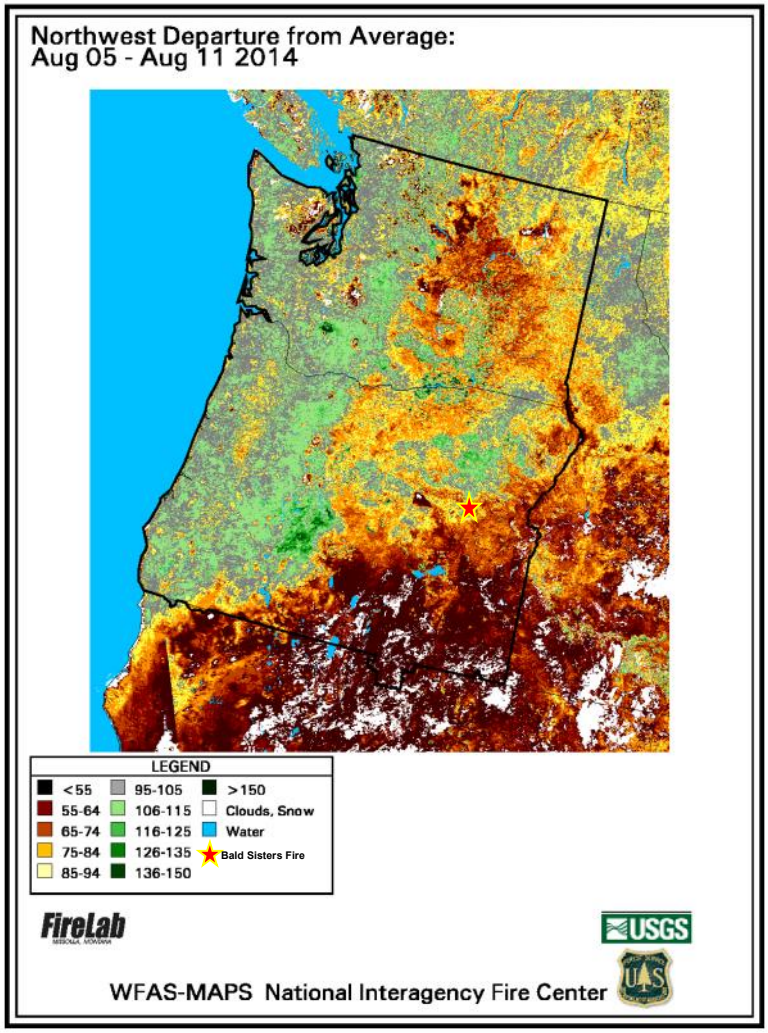


Figure 7. Departure from Average Greenness Maps - portray how green each pixel is compared to its average greenness for the current week of the year based on 1989-2003data.