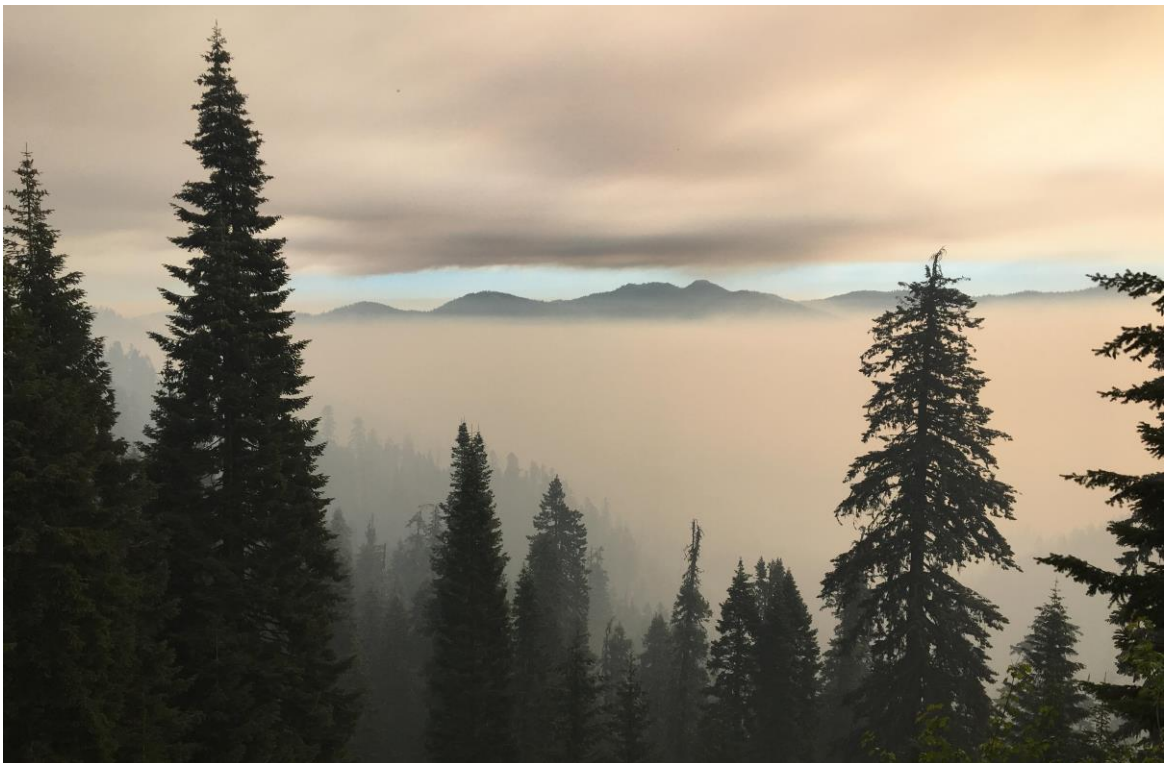
Natchez Fire

Long Term Assessment & Implementation Plan – v2.0, 8/19/2018



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Purpose

The purpose of this document is to provide a synopsis of fire weather and fire behavior during July and August, evaluate the distance from the current fire perimeter to points or areas of interest as represented by management action points (MAPs), provide outlooks for the remainder of the season including potential time frames for season slowing and season ending events, and describe the conditions and suggested actions associated with the MAPs.

Executive Summary

The Natchez Fire started July 15, 2018 on the Rogue-Siskiyou National Forest on a west-facing aspect between two tributaries of Poker Creek at an elevation of approximately 4400 ft. Within the next four days the fire had spread to the south and crossed over the boundary onto the Klamath NF. As of August 18th, the fire size is just under 20,000 acres. It is currently burning west of Highway 48 (Grayback Road), north of Baldy Mountain and the Oak Fire (2017), east of the prominent ridge from Lookout Mountain south to Preston Peak, and south of the Oregon/California border.

Management Implications

The following information captures current conditions and highlights critical information relevant to the remainder of the fire season based on historical fires in the area.

- Measured 1000-hr dead fuel moistures on August 15th were 6% at Shinar Saddle (3100 ft).
- Measured live fuels are at all-time lows for some shrubs. The shrub locally known as buckbrush (*Ceanothus* spp.) has been an important contributor to fire spread as well as huckleberry oak (*Quercus vacciniifolia*) that has also been called acorn brush. As live fuels continue to cure they will become more readily available. To date, manzanita (*Arctostaphylos* spp.) has not been conducive to fire spread but as the season progresses this shrub is expected to contribute to fire behavior.
- Alignment of wind and slope has been a major contributor to fire spread so far, as well as poor overnight relative humidity recoveries, establishment of thermal belts leading to prolonged burning at night, and rollout due to steep slopes.
- The current ERC value (August 16th) is 84 at Slater Butte RAWS, which is above the 90th percentile.
- The Natchez Fire is located in an area that has had few large fires that would affect fire spread with the exception of the Oak Fire of 2017 (Eclipse Complex) that is to the south of the Natchez Fire. The Oak Fire has stalled fire spread to the south and is currently being used as an anchor for burnout operations.
- Historical large fires on the Klamath NF and Rogue-Siskiyou NF have experienced significant spread events from mid-August through September. Local experience especially highlights the potential spread that may occur with northeast winds.
- There are limitations in all of the long-term decision support models, outlooks, and other products. The models utilize forecasts and historical weather records and standardized fuel model mapping. Although expert opinion is used in making adjustments in much of this information, there is a lot of variability in natural systems that cannot be modeled.

Incident History

Within the Klamath NF (KNF) and Rogue River-Siskiyou NF (RSF) area, fire activity was relatively quiet through June despite the moderate drought and dry fuels in the area. That changed with the Klamathon Fire which started on July 5, 2018.

The Natchez Fire was started by a series of lightning strikes on July 15, 2018 (figure 1). Several other fires were also started in the immediate area including Ravine, Poker, and Finley Fires which were all consumed by the Natchez Fire (figure 2); the Klondike and Taylor Creek Fires on the RSF also started during this same thunderstorm. The fire is located just south of the Oregon/California border between Happy Camp, CA and Cave Junction, OR. The Northern California GACC moved to Preparedness Level 3 (PL3) on July 29 and was at a PL4 by August 1. The Pacific Northwest GACC has been in PL5 since July 30.

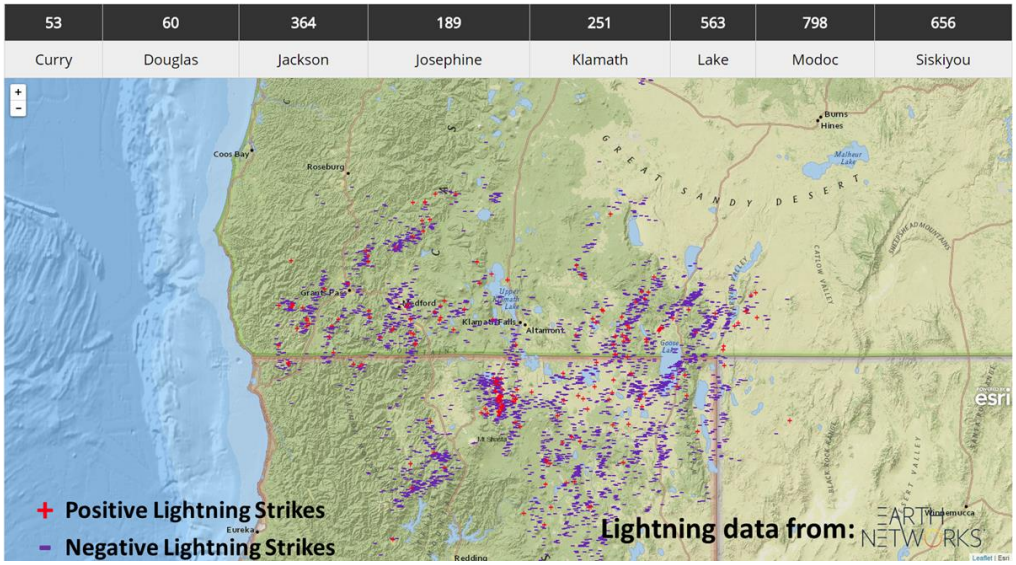

Figure 1. Lightning strikes during the passing thunderstorm system on July 15.

Figure 2. This picture, taken on July 17, 2018 (two days after discovery) from Crazy Peak, illustrates the steep terrain and continuous timber in which the Natchez Fire started.

Fire Growth

Natchez Fire growth averaged 404 acres per day in the first ten days after detection and 877 acres per day from July 27th to August 16th (figure 3). Growth has been predominantly to the southeast, although July 30 and 31st saw limited progression to the northwest. To date, natural fire growth has been fuels and terrain driven. Burnout operations along the eastern flank from Drop Point 18 to the South Fork Indian Creek on August 4th added 1,000 acres while growth on August 5th was due to rollout and uphill runs above the South Fork Indian Creek. On August 12th the fire spotted on the south side of the South Fork Indian Creek across MAP 6 which initiated firing of the burn blocks along the prepped contingency line which became the primary line from Baldy Mountain to the South Fork Indian Creek. Further burnout operations along the primary line from the Baldy Mountain/Boulder Peak area north to the South Fork Indian Creek have added the majority of the acres since August 13th. General spread direction is currently to the west/southwest as influenced by nighttime thermal belts and northeast winds.

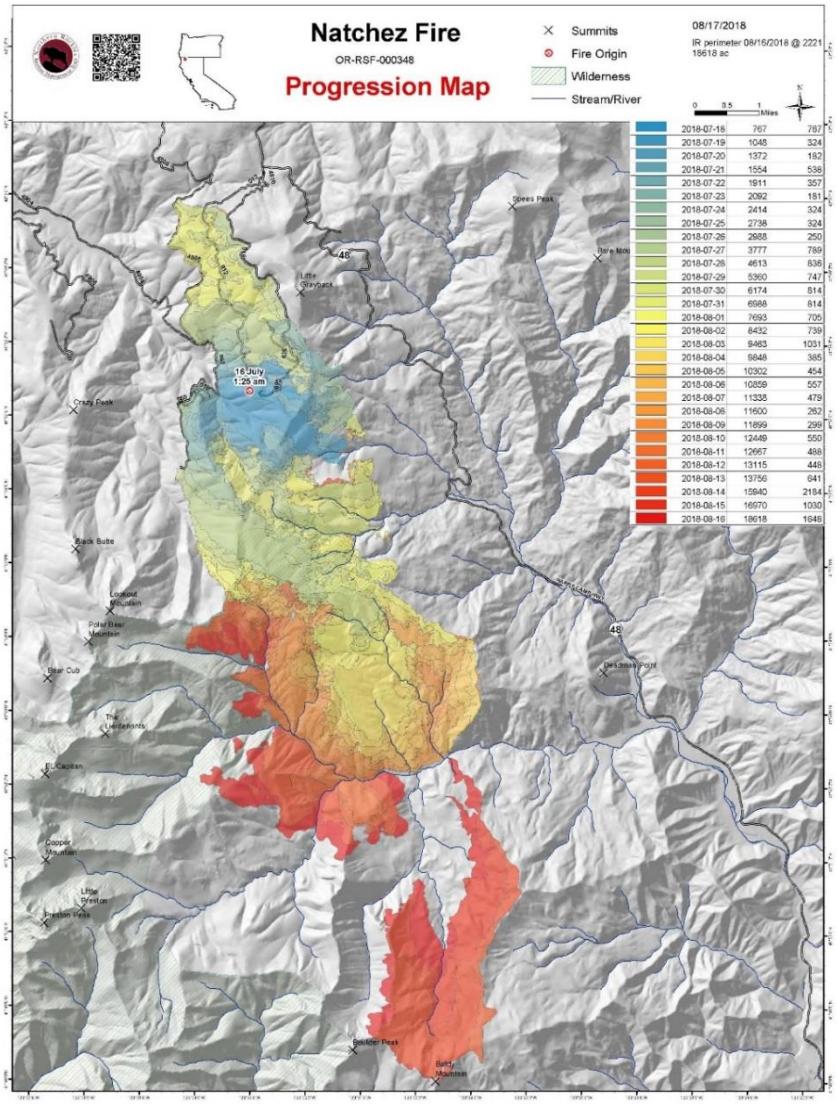

Figure 3. Natchez Fire progression from July 18 – August 16.

The graph below (figure 4) displays the daily acres burned from July 18 to August 16, 2018.

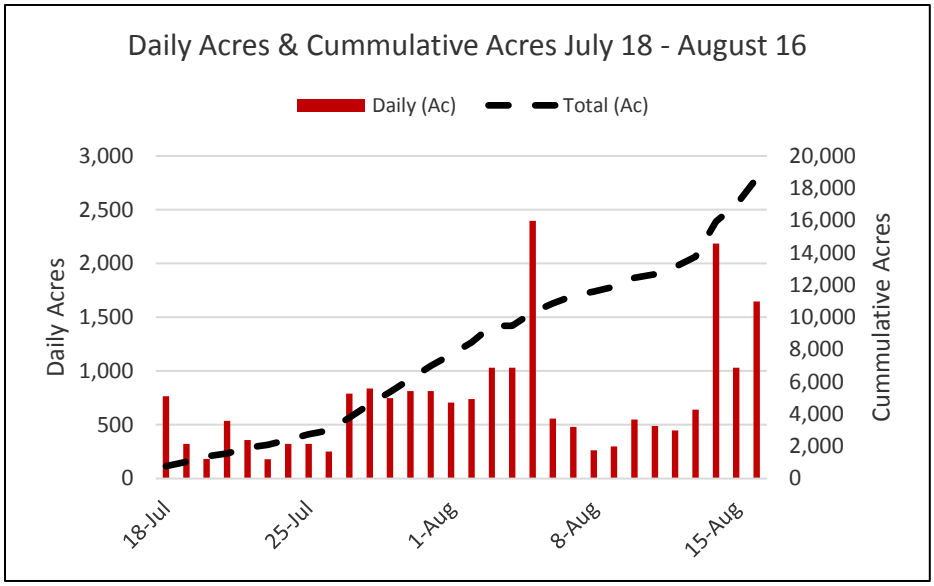

Figure 4. Daily and cumulative acres for the Natchez Fire.

Indicators for Large Fire Growth

Aside from the two natural fire growth events greater than 1,000 acres and the additional acres from burnout operations, a significant fire growth event has not occurred. With few exceptions, growth has been fuels and terrain driven and has also been moderated by smoke inversions which have contributed to limiting significant spread events. Therefore definitive key weather/climatic elements specific to the Natchez Fire have not been identified at this time. However, examination of hourly readings at Slater Butte RAWS and corroborated with incident FBAN's suggest:

- Temperature greater than or equal to 78 degrees F,
- Relative humidity less than 30%, and
- Wind speeds greater than 5 mph with gusts greater than 12-14 mph
- Smoke inversions and the timing of their lifting should also be a consideration

Beyond these potential triggers, the KNF Westside NFDRS Pocket Card identifies greatly increasing fire behavior when the following conditions exist:

- Temperature greater than or equal to 79 degrees F,
- Relative humidity less than or equal to 22%,
- Wind speed greater than or equal to 4 mph, and
- 1000-hr fuel moisture less than or equal to 12%

The recent Eclipse Complex (2017) identified the following combination as triggers for large fire growth:

- ERC greater than or equal to the 90th percentile ERC value
- Temperature greater than or equal to 85 degrees F
- Relative humidity less than or equal to 25%
- Wind speed greater than or equal to 7 mph

Large fires in this general area such as the Oak Fire 2017 (Eclipse Complex) have experienced major growth days from mid-August through September. The Natchez Fire is now entering this time period. Changing weather conditions, deepening drought, and the approach of critical weather patterns will need continual assessment and evaluation through the life of this fire. Days when the inversion is forecasted to lift early or is weak will be a concern.

Fuels

Fire History

The fire history map shows the Natchez Fire location relative to recent fire scars (figure 5). Although this area of northwest California and southwest Oregon have experienced numerous large fires since 2002, the Natchez Fire sits in an area of roughly 210,000 acres that has not had recent large fires.

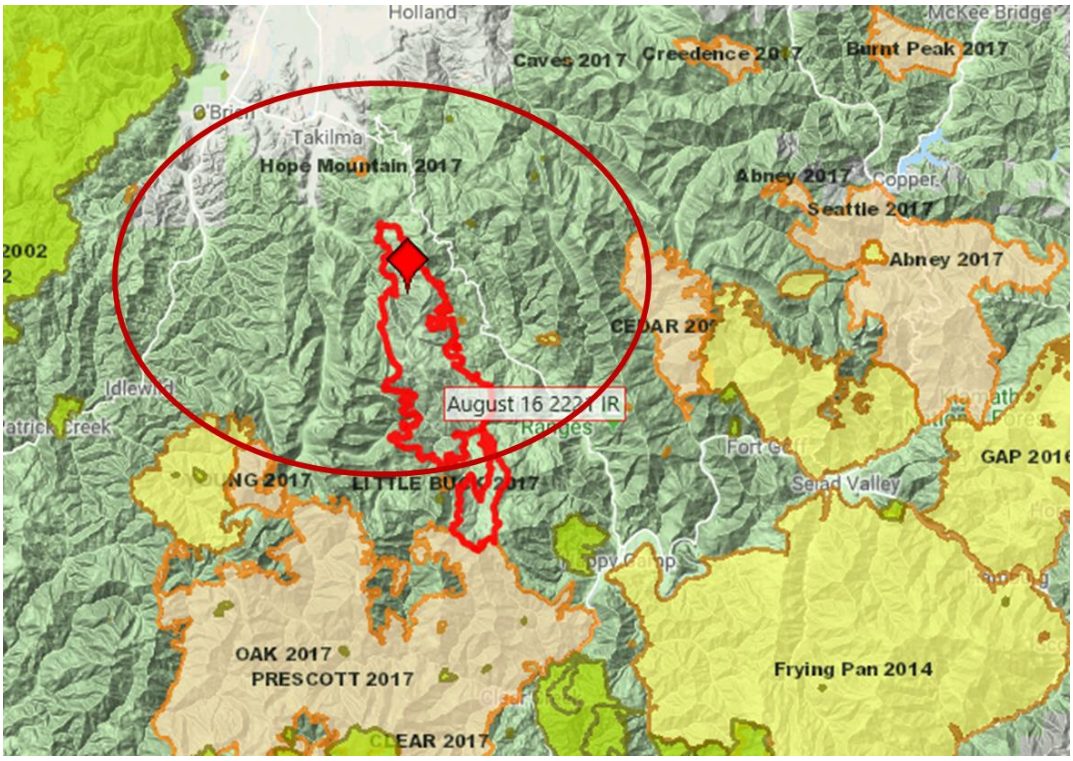

Figure 5. Fire history near the Natchez Fire.

The area immediately surrounding the fire has missed multiple fire return intervals which has contributed to overall fuel buildup including the presence of red fir (*Abies magnifica*), continuous shrub understory, and moderate to high loadings of 1000-hr fuels. The 1000-hr fuels are in varying levels of decomposition and can be a source of long residence time and receptive fuelbed for spotting in the punky logs. This combination of fuels and the steep topography contribute to severe fire behavior and potentially negative fire effects. To date, fire effects from the fire have been of low to mixed severity across the majority of the fire depending on the vegetation type with some areas of high severity.

1000-hr Fuels

Thousand-hour fuel moistures provide an indication of resistance to control due to fuel availability. Thousand-hour fuel moistures measured at Slater Butte RAWS are also tracking below the 1998-2017 average. This is also consistent with the drought monitor and precipitation and temperature departure findings. The local NFDRS pocket card identifies 1000-hour fuel moisture values below 12% as a threshold for potential large fire growth when combined with wind, temperature, and RH.

Thousand-hour fuel moisture dropped below 12% at Slater Butte on July 27th and has trended downward since (figures 6 and 7). As of August 16th the 1000-hr fuel moistures are at 7% (figure 6). Oven-dried 1000-hr fuel moistures collected at Shiner Butte on August 15th were 6%. Table 1 compares 1000-hr fuel moisture values and ERC values during key fire years with analogous ERC trends as 2018 for the August 16th date.

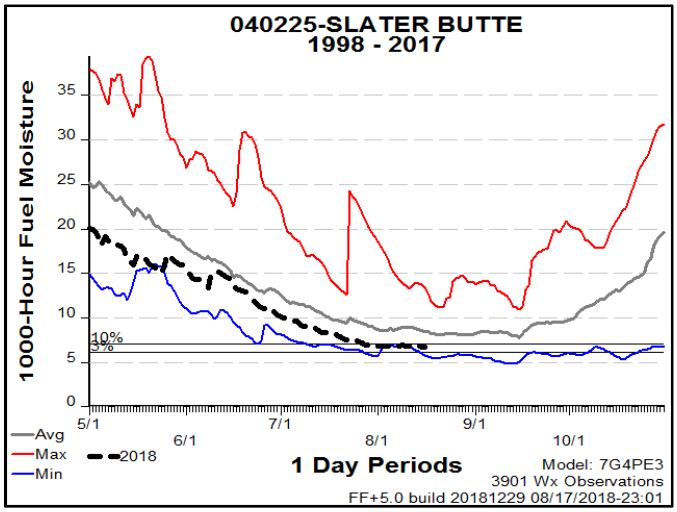

Figure 6. 1000-hr fuel moisture values at Slater Butte RAWS for 1998-2017 with 2018 shown as a dashed black line.

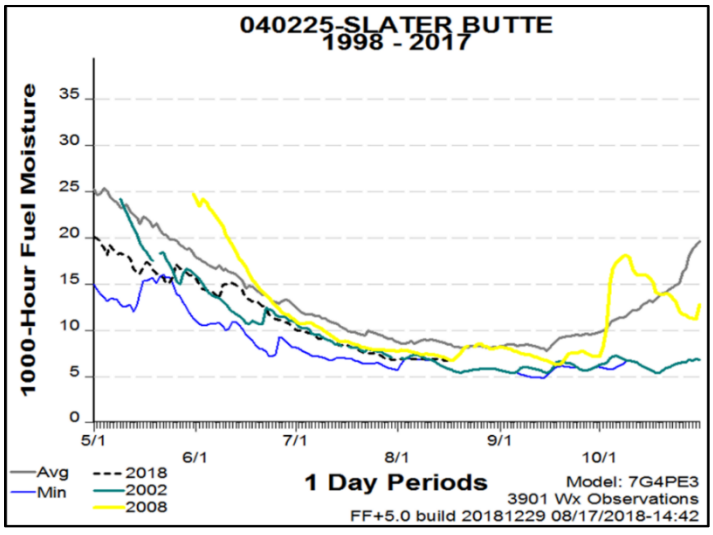

Figure 7. 1000-hr fuel moisture values at Slater Butte RAWS for 1998-2017 with 2018 shown in black and analogous years in green (2002) and yellow (2008).

Table 1. 1000-hr fuel moisture and ERC values for August 16 for the current year and analogous years.

Year	1000-hr (%)	ERC
2002	6	96
2008	7	80
2014	8	74
2017	9	73
2018	7	84

As shown in the figure 8, the fire area has seen 5% of average precipitation for the two-month period from June 18 – August 16. For the same period, the fire area was 2-3 degrees Fahrenheit warmer than average. The North Ops Weather Outlook issued August 1, 2018 reported that July was drier than normal across all but the southeast corner of their operational region, with most of the region warmer than normal by 2-6 degrees Fahrenheit in July.

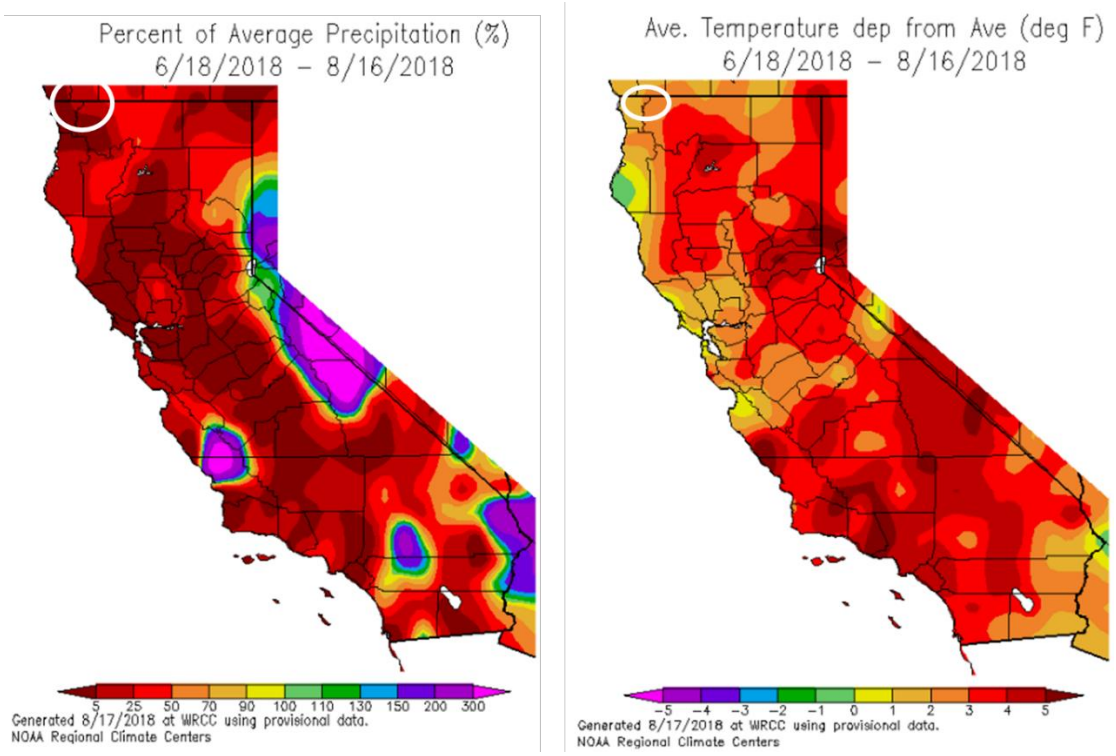

Figure 8. Percent of average precipitation and average temperature departure from average.

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 1989-2003 data (figure 9). The figure below shows the Departure from Average Greenness for the fire and surrounding area as of the week of August 6, 2018. The Natchez Fire area is in the 11 to 20% departure class.

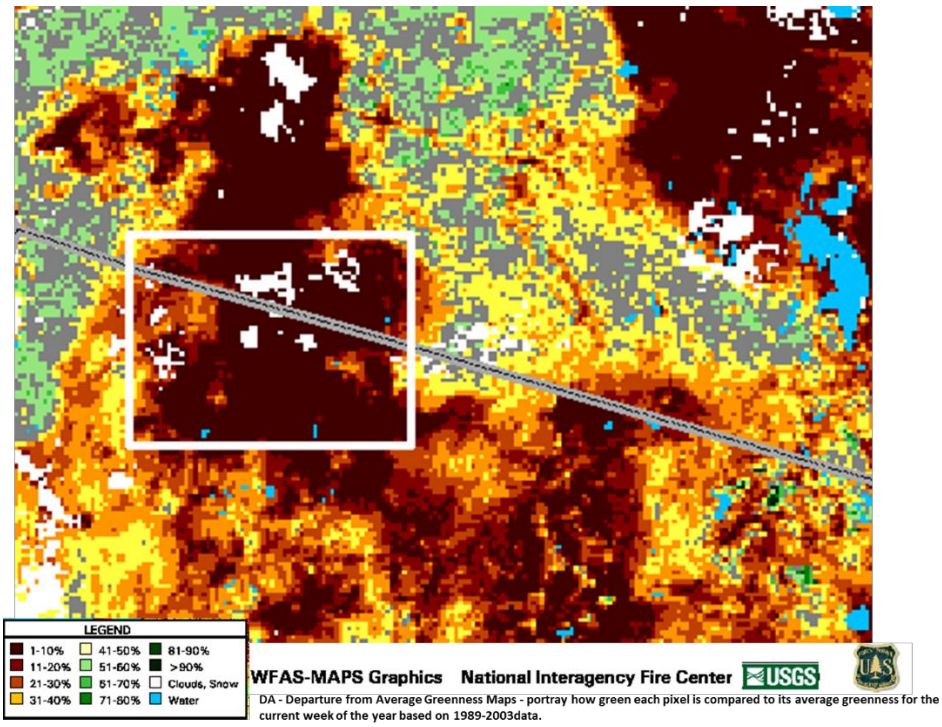

Figure 9. Departure from average greenness (week of 8/6).

Fire Danger and Fire Weather

Fire Danger Indices (ERC)

Energy Release Component (ERC) is an index related to the potential energy of a fire at the flaming front and is generated from weather and fuels inputs. It is considered a good measure for seasonal dryness trends in large dead fuel, making this a good indicator for fire potential on the Natchez Fire. ERC is most often used with Fuel Models G and H which represent dense conifer stands with heavy accumulation of litter and downed woody material.

ERC values in Fuel Model G (Short Needle Heavy Dead) using the Slater Butte RAWS have been above average for most of the current year compared to the 1998 to 2017 period (figure 10). The local NFDRS pocket card identifies the 90th percentile ERC as one of the thresholds for large fire growth. The ERC passed the 90th percentile at Crazy Peak on July 21st and at Slater Butte on July 25th. This is consistent with the moderate drought conditions (U.S. Drought Monitor) and the departure from average precipitation and temperature trends identified by the Western Regional Climate Center. Since June 10th the ERC trend for 2018 at Slater Butte has been above average. On July 25th it crossed the 90th percentile (ERC = 81) and has been hovering around the 90th percentile value since.

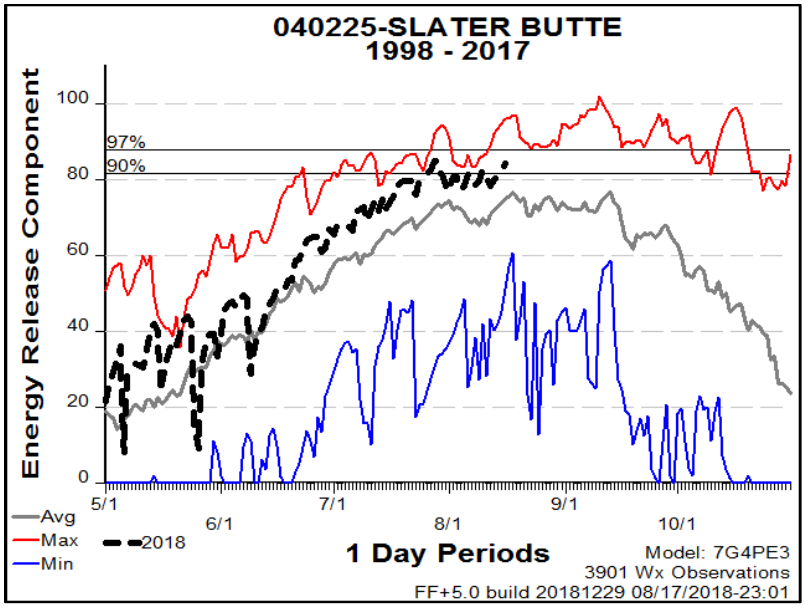

Figure 10. ERC trends at Slater Butte RAWS from 1998-2017 with 2018 shown as the dashed black line.

Multiple years were analyzed to identify similar or analogous years. 2018 is similar to: 2002, 2008, 2011, 2014, and 2017 (figure 11). 2002 is notable because it set maximum values for ERC values for the current period of record for August – September and also set the all-time low for 1000-hr fuel moistures. Yet in 2002 the KNF only recorded 79 fires for a total area burned of 4,596 acres. However in 2002 on the RSF, the Biscuit Fire burned just over 335,000 acres.

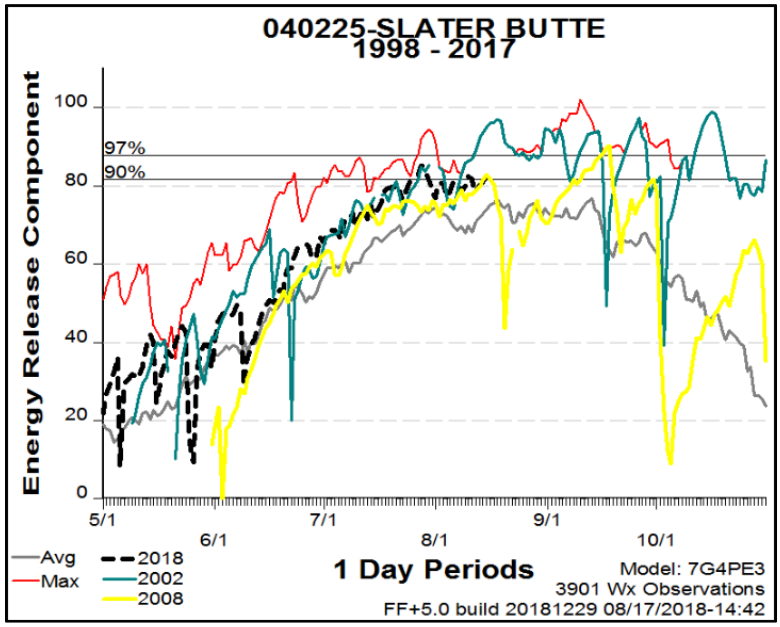

Figure 11. ERC trends at Slater Butte RAWS from 1998-2017 with 2018 (dashed black line) and analogous years in green (2002) and yellow (2008).

Fire Weather

This section provides a record of weather stations evaluated to date, based on the fire's current location. Two stations were evaluated for relevance. The Natchez Fire is located between 3,400 ft and 5,100 ft elevation. Slater Butte RAWS (ID 040225) is located at Slater Butte Lookout at an elevation of 4,621 ft and Crazy Peak RAWS (ID 040106) is located at an elevation of 3,960 ft approximately two miles north of Crazy Peak (figure 12). Based on a review of both stations and the areas of current fire growth and behavior, Slater Butte RAWS was used for analyses to represent temperature, humidity, fuels, and winds for the fire (table 1).

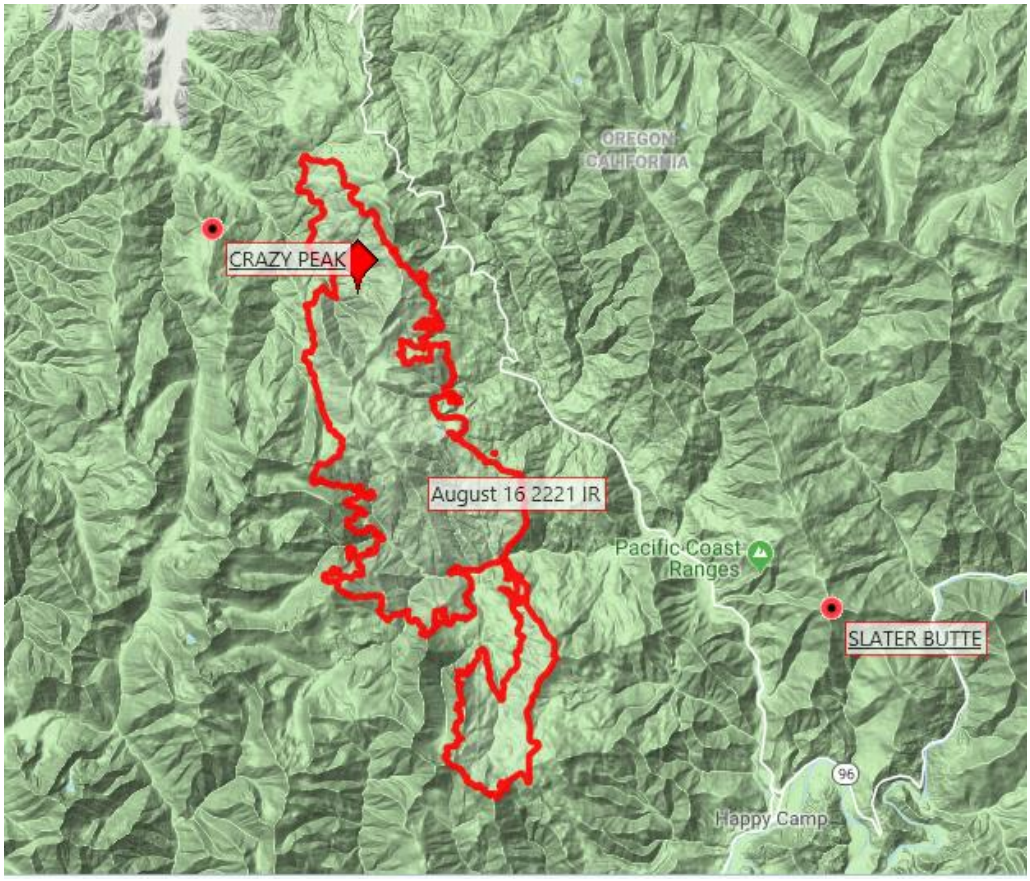

Figure 12. Locations of Slater Butte and Crazy Peak RAWS with the fire perimeter from August 16.

A site visit to the Crazy Peak RAWS raised concerns about its current siting. While it is situated in an opening it may not have adequate clearance from the forest edge to sufficiently pick up the 20-ft wind and its current location may be more reflective of a marine influence. Additionally, the current location information for the RAWS displays it in the incorrect location in WFDSS and Mesowest, placing it 0.7 mile to the east rather than in the opening in which the station is physically sited.

Crazy Peak shows predominant southwest and west winds. Slater Butte records a wider range of wind directions, including southwest and west as well as northwest, northeast, and due east. This northeast and due east component is particularly strong overnight from 1800 to 1000. Table 2 summarizes general information on winds for Slater Butte and Crazy Peak RAWs.

Table 2. Information for area RAWS.

RAWS	Number	Elevation	Distance	Comments
Slater Butte	040106	4,621 ft	12.1 miles	Slater Butte sees a wider variety of winds, including southwest and west as well as northwest, northeast, and due east. This northeast and due east component is particularly strong overnight – 1800 to 1000.
Crazy Peak	040225	3,960 ft	3.4 miles	Crazy Peak has predominantly southwest and west winds during the daytime hours. At night it may pick up a NE component.

Figure 13 shows wind speed and direction from July 25 to September 5 from 0000 – 1000 (nighttime and early morning) at Slater Butte and Crazy Peak weather stations and figure 14 shows wind speed and direction from July 1 to September 30 from 1000-2000 at Slater Butte and Crazy Peak weather stations.

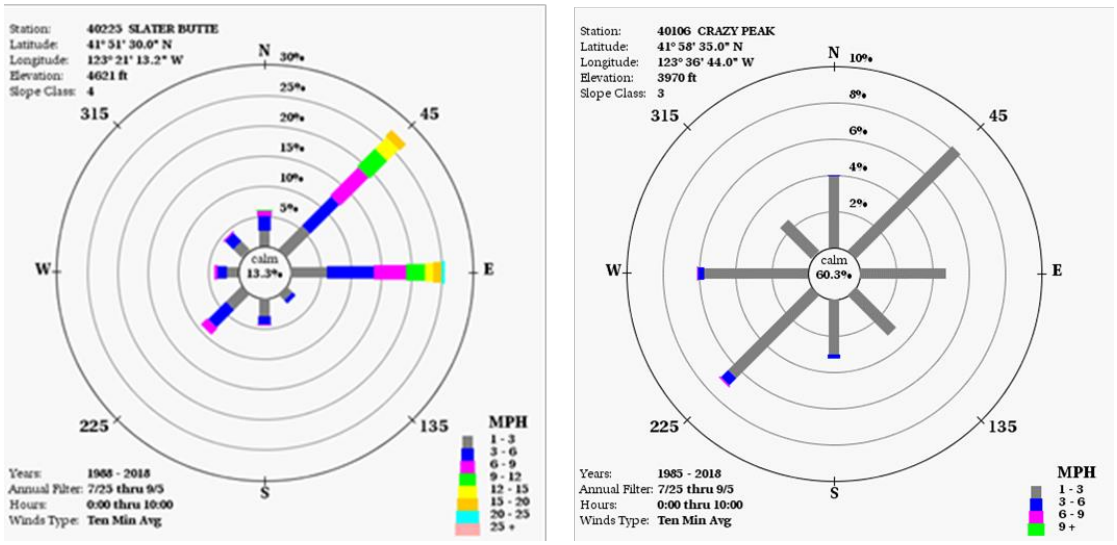

Figure 13. Nighttime (0000-1000) wind speed and directions at Crazy Peak and Slater Butte RAWS.

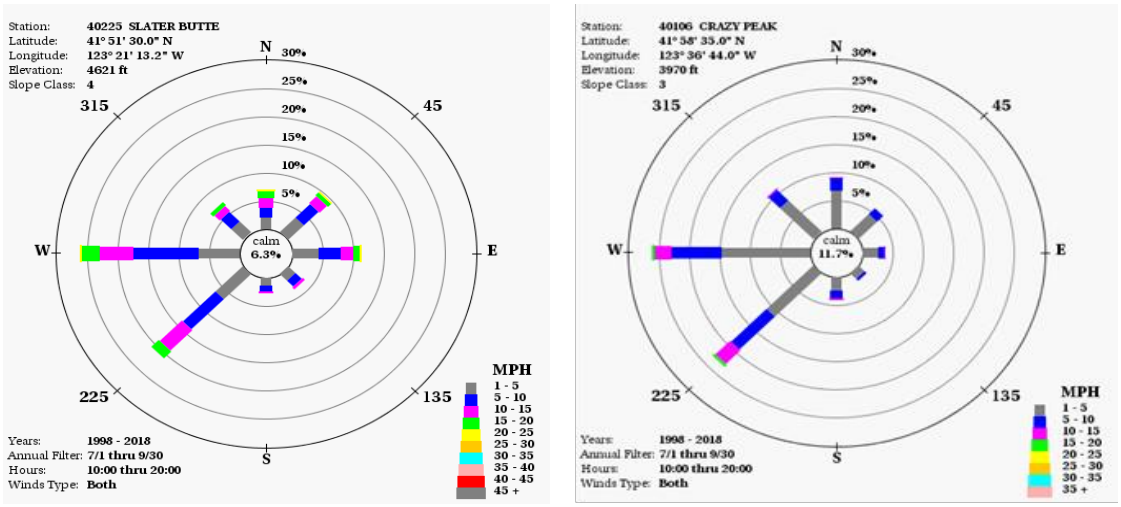

Figure 14. Daytime (1000-2000) wind speed and directions at Crazy Peak and Slater Butte RAWS.

Meso-Scale Winds in the Fire Area

The WindNinja program v. 3.3.1 was used to evaluate terrain affected flow under forecasted winds for August 13th-14th during burnout operations in Division F from drop point 28 north to the South Fork of Indian Creek.

Two runs were completed for day operations using forecasted winds from the northwest and west (figure 15). During the day, winds from the northwest run quarter to the burn blocks and are channeled into the West Fork of Indian Creek and Little South Fork of Indian Creek and run to the south (figure 15a). When due west, it shows winds flowing directly into the burn blocks Units 9-11 (figure 15b). However, modeled winds in the immediate area of the burn blocks are generally light and less-than 10 mph. With winds from the west the simulation also shows lighter winds and associated channeling and eddy effects in the area due west of burn blocks 4-8 and 12.

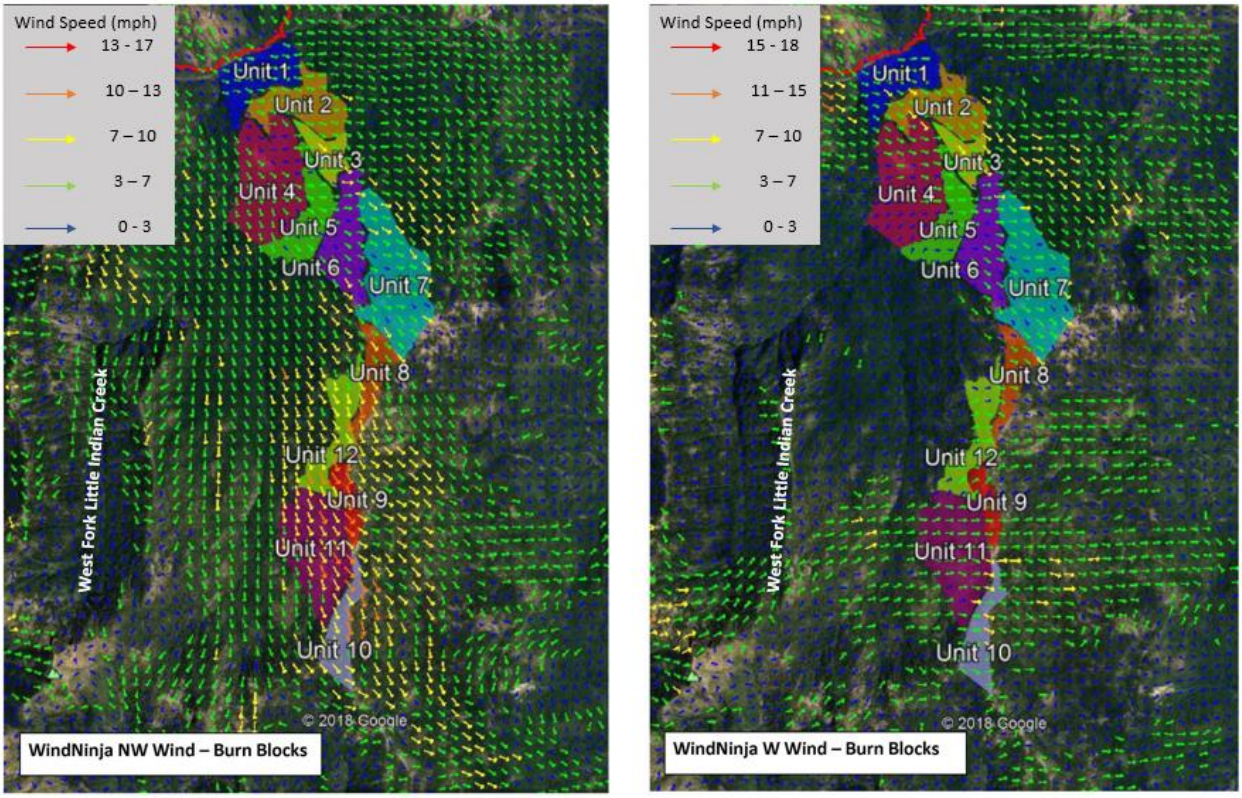

Figure 15. Daytime winds for the burnout area. The left panel (a) displays WindNinja output with general winds from the northwest (NW). The right panel (b) displays WindNinja output with general winds from the west (W).

Two runs were completed for night operations using forecasted winds from the northeast and east (figure 16). Modeled winds in the immediate area of concern are generally light and less-than 10 mph. Winds from the northeast and east are favorable for backing fire along planned control lines in the burn blocks. Winds are also channeled into the drainages of west fork and Little South Fork of Indian Creek and illustrate the potential for the channeling and eddying of winds in the drainages to the immediate west of the burn blocks. Especially along burn block units 4-8 and 12.

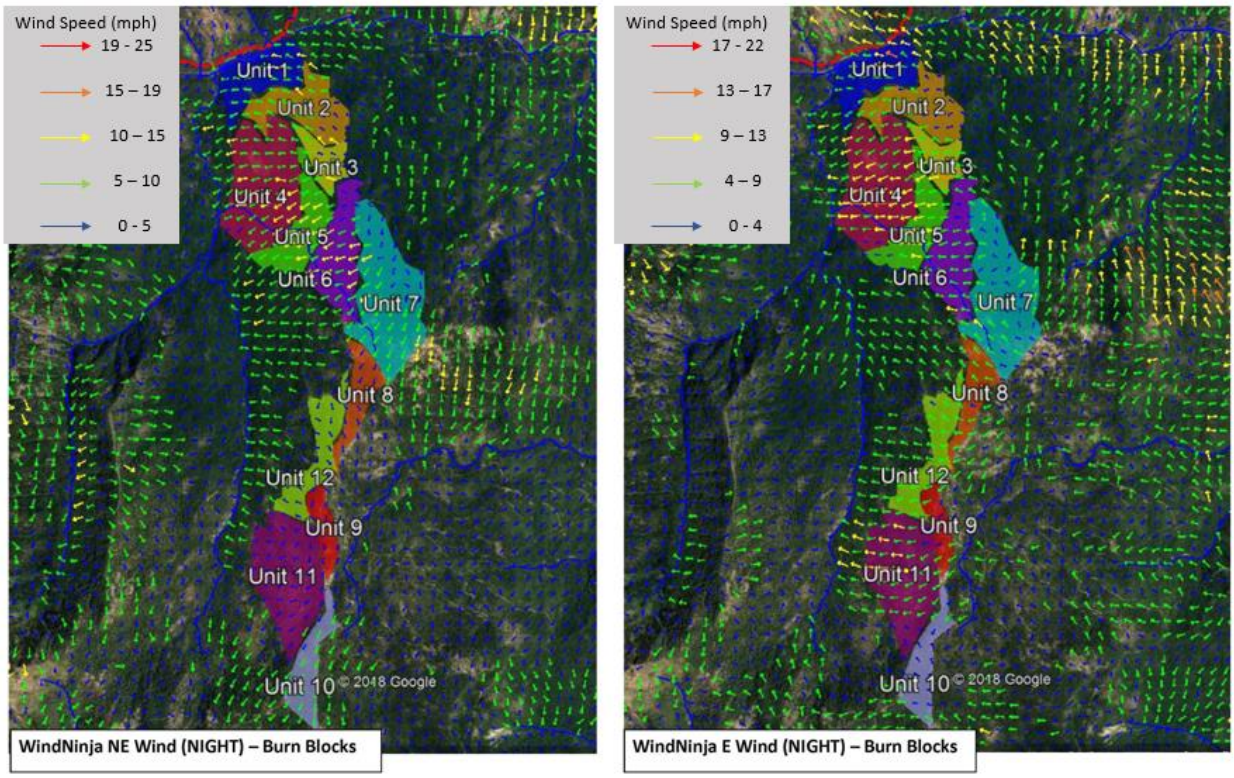

Figure 16. The left panel (a) displays WindNinja output with general winds from the northeast (NE) at night. The right panel (b) displays WindNinja output with general winds from the east (E) at night.

WindNinja runs were also completed for the Division Juliet/Lima break in the Mud Lake/Lookout Mountain area on the boundary between the KNF and RSF for general winds from the southwest (figure 17) and west (figure 18) for the daytime. Note the blue areas indicating light, squirrelly winds.

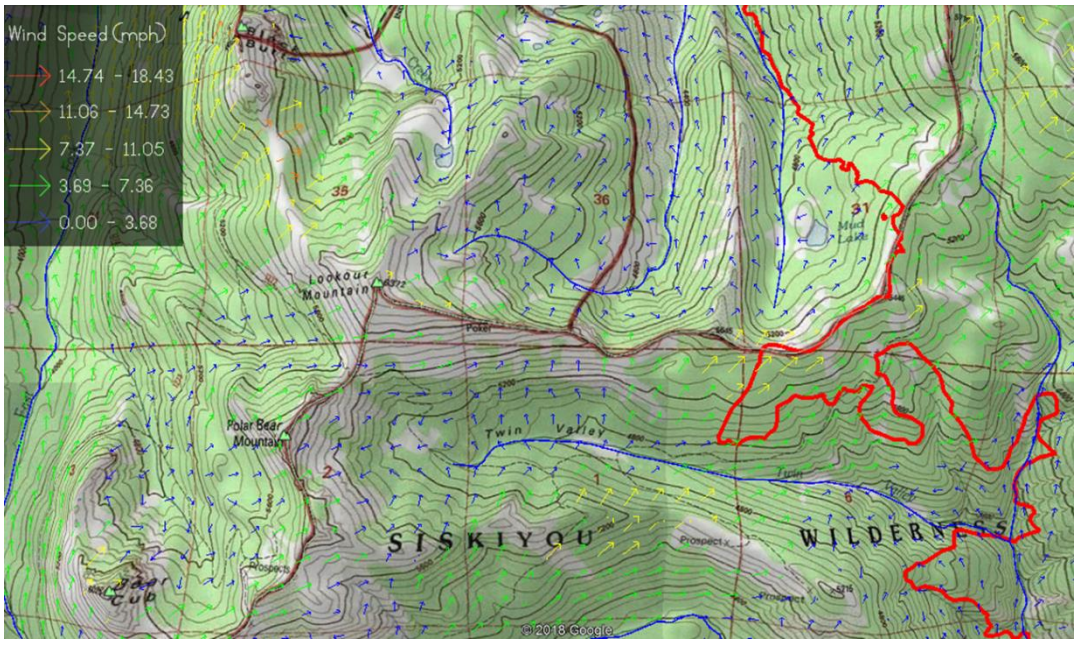

Figure 17. Daytime winds for a general wind from the southwest on the KNF/RSF boundary.

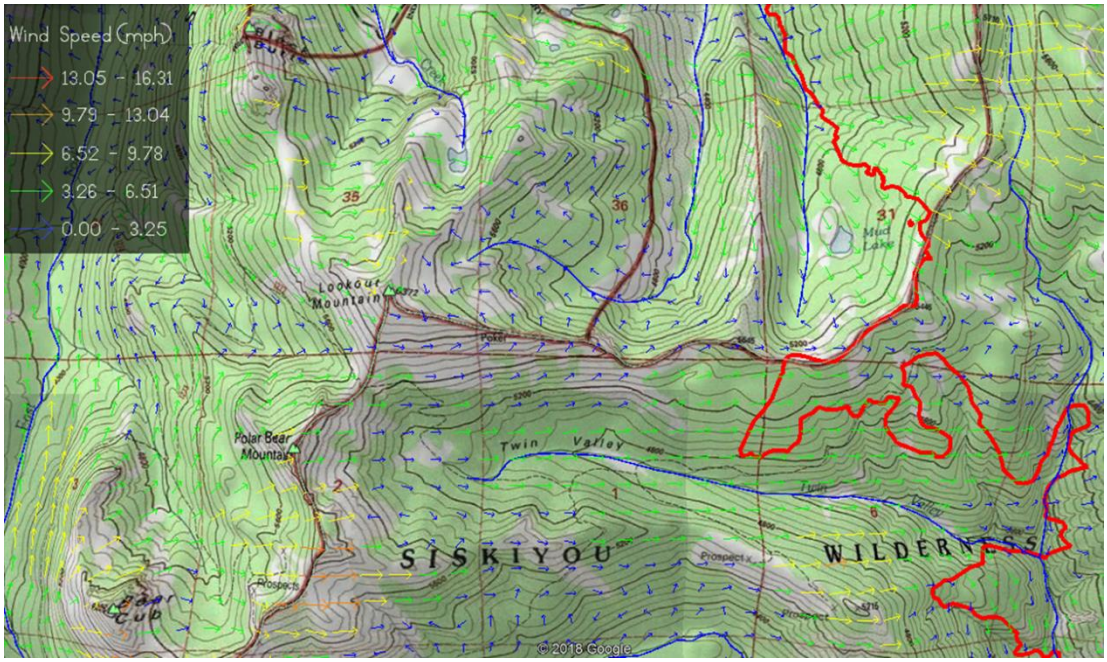

Figure 18. Daytime winds for a general wind from the west on the KNF/RSF boundary.

WindNinja runs for the nighttime for the Division Juliet/Lima break for general winds from the north (figure 19) and east (figure 20) indicate a substantial difference in wind direction and slope/wind alignment. A nighttime wind from the east will most likely aid fire spread toward the ridge.

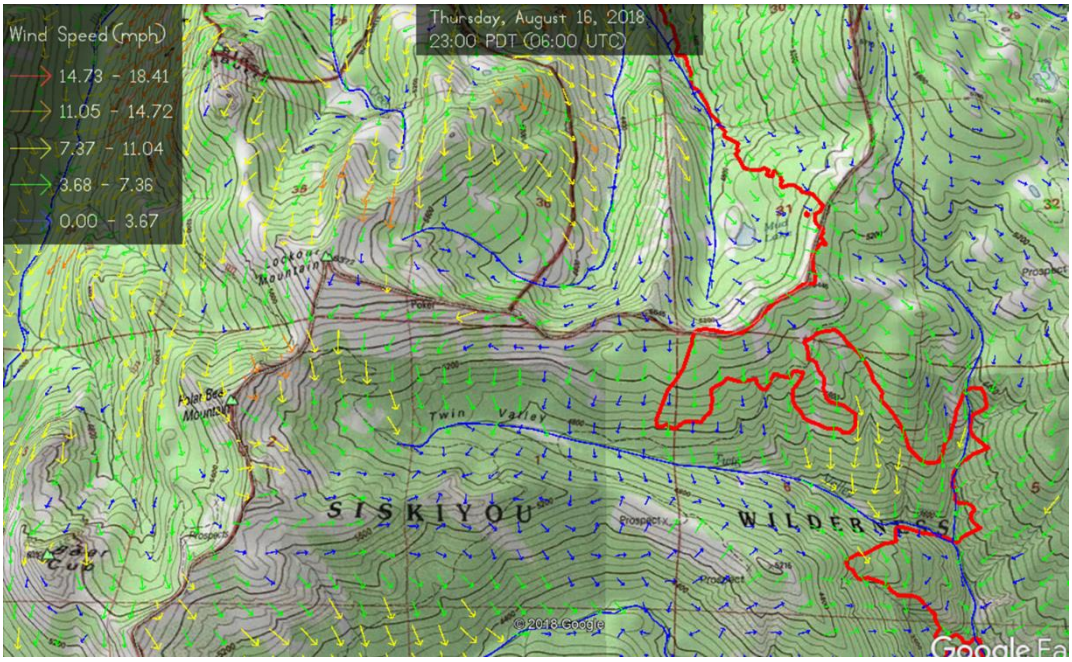

Figure 19. Nighttime winds for a general wind from the north on the KNF/RSF boundary.

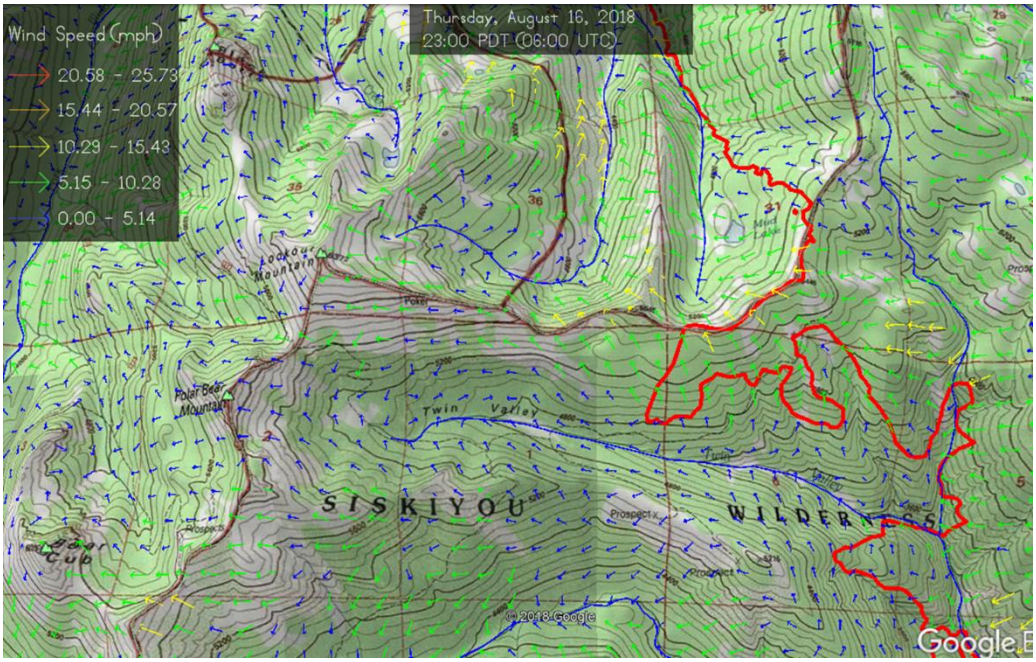

Figure 20. Nighttime winds for a general wind from the east on the KNF/RSF boundary.

Forecasted Weather

The current short term weather forecast indicates a continued dry period with variable wind directions and lifting smoke being the highest potential drivers of fire growth (figure 21).

Nachez Fire Incident General Weather Outlook - 7-Day

* * *For Planning Purposes Only, see the IAP for the Official Forecast * * *

Outlook made 8/18/2018 - IMET Joseph Bower

Day	Sun	Mon	Tue	Wed	Thu	Fri	Sat
Day Number	1	2	3	4	5	6	7
Date	19-Aug	20-Aug	21-Aug	22-Aug	23-Aug	24-Aug	25-Aug
HIGHLIGHTS	Hot, Dry, Smoky	Warm, Dry, Smoky	Warm, Dry, Smoky	Smoky	Warm, Dry, Smoky	Smoky	Smoky
Sky/Weather	Sunny	Mostly Sunny	Partly Cloudy	Partly Cloudy	Mostly Sunny	Sunny	Sunny
Max Temp (F)	90	89	88	84	86	85	85
CWR	0	0	0	0	0	0	0
LAL	1	1	1	1	1	1	1
20-foot Wind Direction*	NW-NE	SW-NW ->NE	SW-NW ->NE	SW-NW ->NE	SW-NW ->NE	SW-NW ->NE	SW-NW ->NE
20-foot Wind (mph)	7	7	6	5	4	5	5
20-foot Wind Gusts (mph)	15	12	12	10	8	10	10
Min Humidity (%)	16	18	20	20	22	22	22
Max Humidity (%)	50	55	55	65	65	65	65
Haines Index	4	5	5	4	4	4	4

KEY:	Neutral - or Not Supportive for Burning	Caution - Values that support burning	Danger - Values that Promote Fire Spread
Maximum Temp	<70 deg	70-89 deg	>90 deg
Lightning Activity Level (LAL)	1	2,3,4,5	6
20-foot Wind (sustained)	< 5 mph	5 to 10 mph	> 10 mph
*Wind Direction	Criticality of wind direction highly dependent on burn operations and/or values at risk		
Min Humidity (day)	> 40 %	25 to 40 %	< 25 %
Max Humidity (night)	> 60 %	40 to 60 %	< 40 %
Fine Fuel Moisture	> 14 %	6 - 14%	< 6 %
Haines Index	2,3,4	5	6

If several "Danger" values line up, it could indicate potential for a Critical Weather Day

Figure 21. Weather matrix prepared by the IMET for 8/17-8/23.

The significant fire potential forecast published on Friday August 17th indicates that the Natchez Fire area has very dry fuels but only a low/moderate potential for large fires in the absence of a high risk event such as wind or lightning (figure 22).

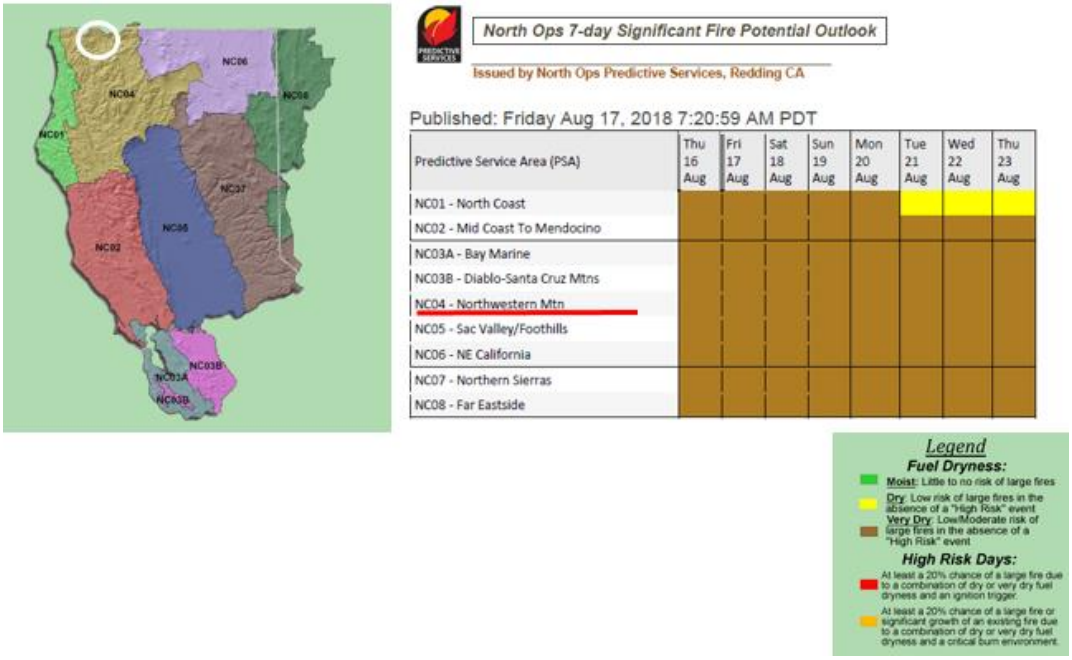

Figure 22. Significant Fire Potential Outlook for 8/16-8/23.

Climate Outlooks

The Northern California Coordination Center is anticipating above normal large fire potential to continue through August, based on the outlook for warmer and variable precipitation under a pattern that will limit the number of monsoon surges into the west side of the region. Fuels will continue to dry under anticipated conditions. Consistent with this precipitation and temperature departure, the August 14 US Drought Monitor identifies the Natchez fire area as 'Moderate Drought' (figure 23). This has changed since August 7 as most of the West was drier than normal, with no rain falling across most of the Pacific Northwest and California. This has allowed the drought to deepen in northern California and the fire area in particular.

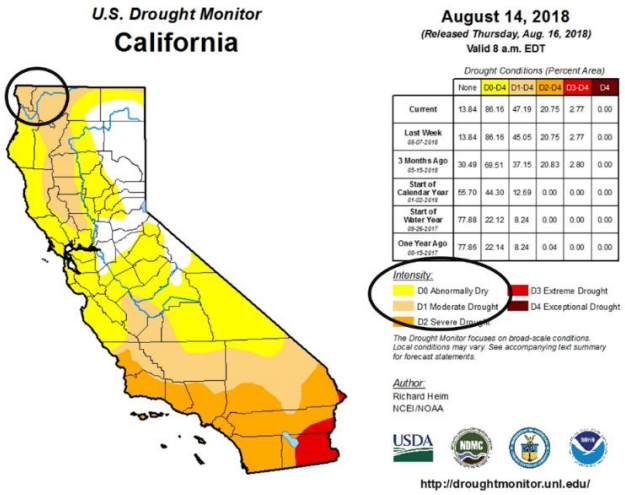

Figure 23. US Drought Monitor for California released 8/16.

All outlook products offered by the Climate Prediction Center suggest that the upcoming period, from six days to three months out, has a 33-50% chance of above average temperatures (figure 24). The outlooks diverge on the potential precipitation relative to normal, but no product indicates more than an equal chance of either below or above average precipitation.

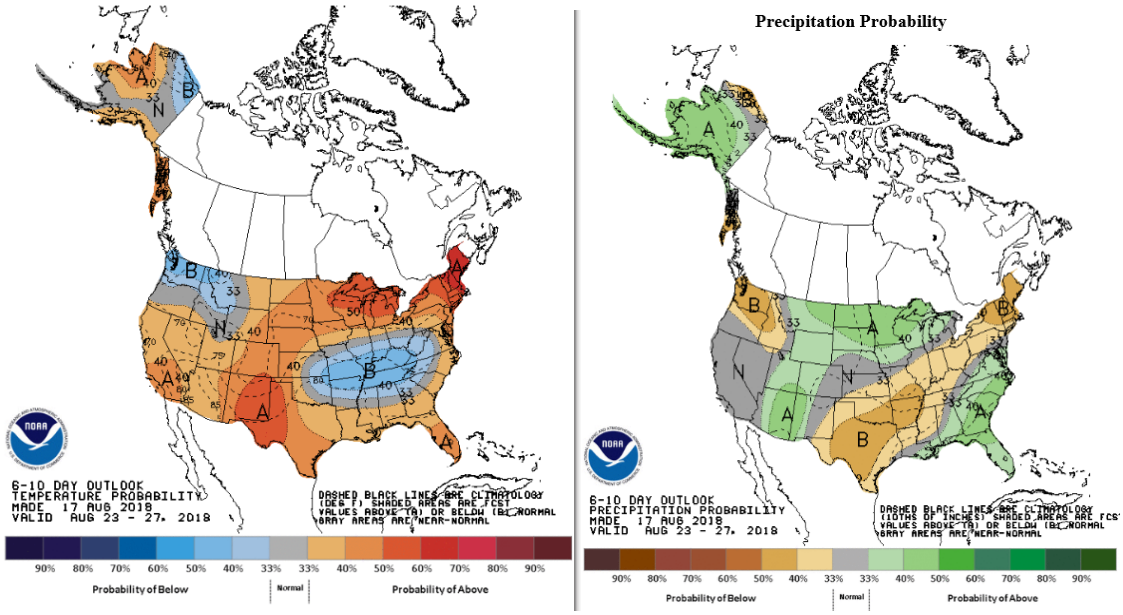

Figure 24. 6-10 days: on the edge of 33-40% chance of above average temperatures and near normal precipitation.

For the month of September there is a 40-50% chance of above average temperatures and equal chances of above, normal, or below average precipitation (figure 25).

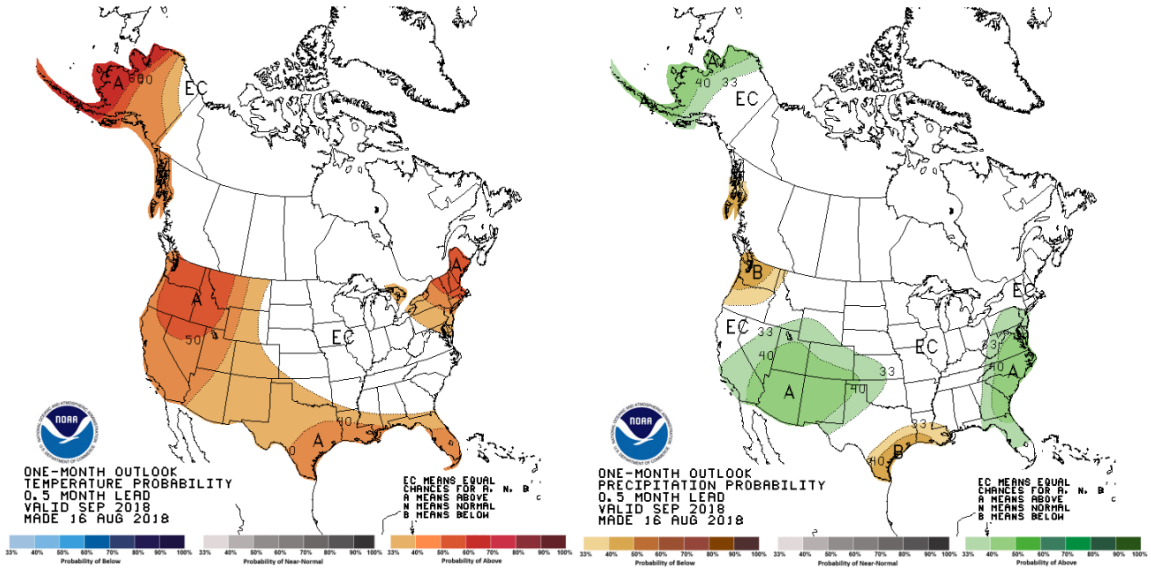

Figure 25. One month (September) temperature and precipitation outlook.

The 3-month outlook (September-November): is on the edge of 40% chance of above average temperature and 30% chance of below normal precipitation (figure 26).

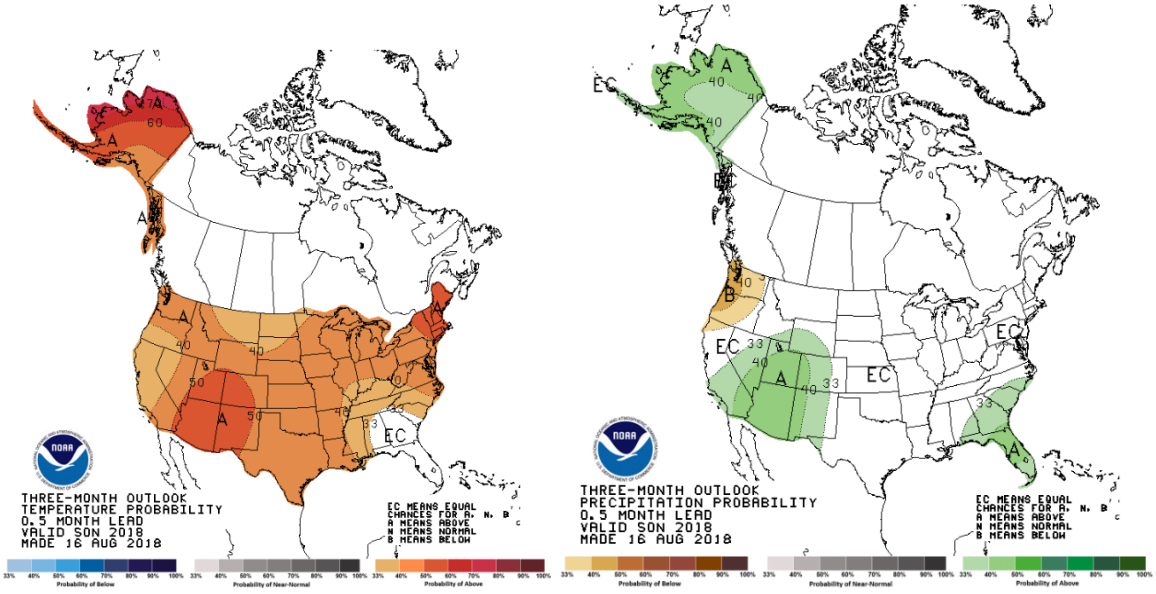

Figure 26. Three month temperature and precipitation outlook.

Season Ending Event/TERM File Information

The probability of a season ending event by a certain date was calculated based on 1998-2017 data from the Slater Butte and Crazy Peak RAWS (table 3 and figure 27). The season ending event criteria for this analysis included: the date after which the ERC dropped below the 60th percentile and did not rebound for more than one week with no large (>10 acre) fires occurring after this date that year. The Slater Butte station suggests season ending events approximately one week later than Crazy Peak. Both stations identify a 75% chance of a season ending event by October 20-22 and a 90% chance of a season ending event by the end of October.

Table 3. Probability and date of season ending event for Slater Butte and Crazy Peak RAWS.

Probability	Date	
	Slater Butte	Crazy Peak
0.25	September 24	October 2
0.50	October 08	October 13
0.75	October 20	October 22
0.90	October 30	October 29
0.99	November 12	November 8

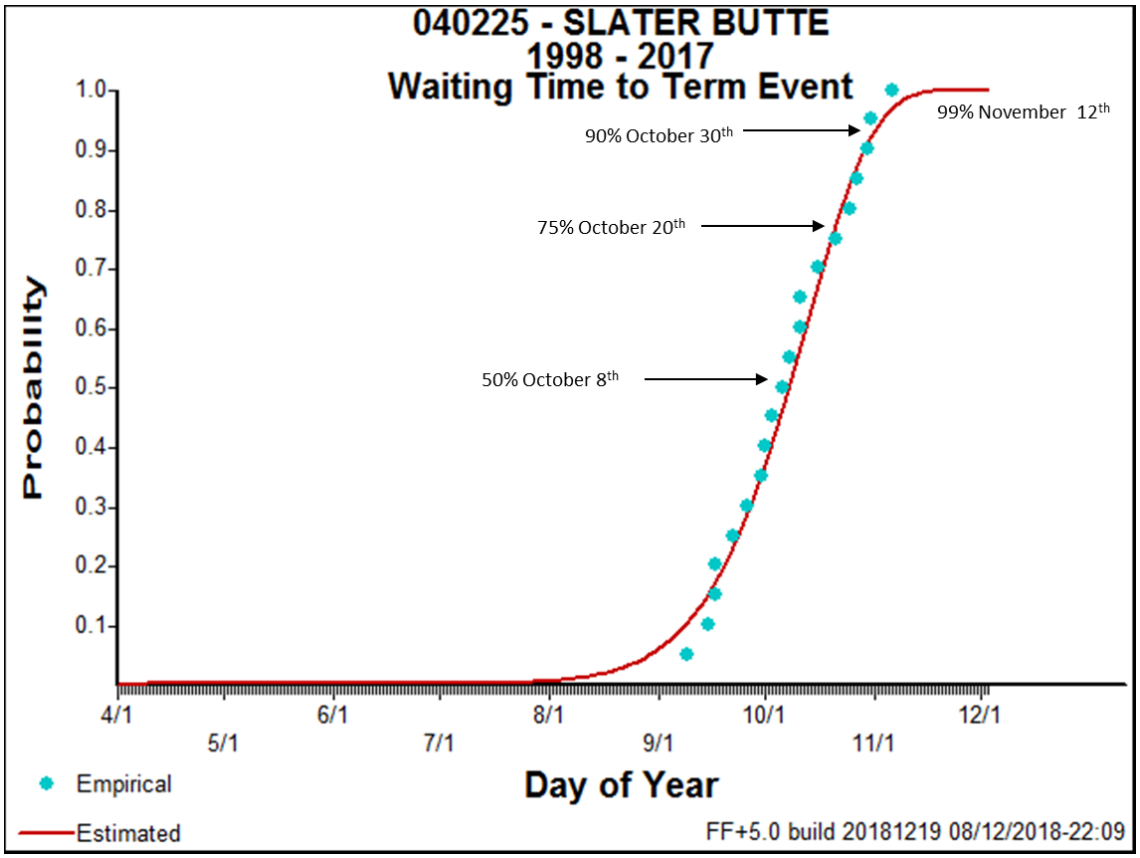

Figure 27. Waiting Time graph from FireFamilyPlus v 5.0.

FireFamily Plus Term Report

Station: 040225 - SLATER BUTTE
Term Name: SlaterButte
Season Start Day: 4\1
Data Years: 1998 - 2017
Alpha: 11.237330
Beta: 0.005099
R-Squared: 0.986021

Comment: Season Ending Event Criteria: An ERC below the 60th percentile that did not rebound for more than 1 week and no large (>10 acre) fires occurred after this date.

Term Dates

Year	Day	#Days	Comment
1998	9/17	169	
1999	10/25	207	
2000	10/ 7	190	
2001	10/27	209	
2002	11/ 6	219	
2003	10/11	193	

2004 10/15 198
2005 9/ 9 161
2006 10/31 213
2007 9/26 178
2008 10/29 212
2009 10/11 193
2010 10/21 203
2011 9/30 182
2012 10/ 2 185
2013 9/15 167
2014 9/22 174
2015 10/ 6 188
2016 9/30 183
2017 9/17 169

Season Slowing Events

Season slowing events were analyzed to aid strategic decision making. Experience on the KNF has shown that the fire season often has a season slowing precipitation event prior to the season ending event. Season slowing event defined as precipitation received greater than or equal to 0.25 inch on a single day. Based on the Slater Butte RAWs (#040255), the following probabilities were determined using the period 1998-2017 (table 4).

Table 4. Probabilities of a season slowing event from August 1 – October.

Criteria	August 15-31 Probability	September Probability	October Probability
>= 0.25 inches of precipitation	0.6%	2.2%	11.6%

Fire Behavior Modeling

Completed fire behavior modeling can be viewed in WFDSS under the Natchez incident. Fire modeling provides products to evaluate long term fire growth to identified points and opportunities for gaming nearer term contingencies and potential fire spread. Persistence fire behavior forecasts – watching what happened on the fire yesterday and applying it to today's spread as long as weather conditions, fuels, and topography remain the same – are likely to be the most accurate short term fire behavior predictor until conditions change.

Consider updating the analyses if:

- Breach or potential breach of one or more Management Action Points occurs
- A significant weather event is anticipated
- The run has expired (for example the seven day FSPro run conducted on August 17 expires on August 23)
- The footprint of the fire has grown outside the footprint of the FSPro probability cloud
- Live fuel moistures change

Note: Smoke has had a significant effect on fire behavior and all modeled fire behavior assumes clear, sunny skies.

Short Term Fire Behavior (STFB)

The STFB model is useful for looking at the influence of various weather and fuel conditions on fire behavior (rates of spread, crown fire activity, flame length, etc). The model treats the whole landscape as if it is available to burn under the given conditions and provides outputs for a snapshot in time under those conditions. STFB is particularly useful for evaluating the unburned landscape, gaming out different situations based on various weather scenarios and fuel conditions, and identifying the potential major travel paths the fire may follow.

Two STFB runs were done to model the potential direction and spread of spot fires occurring during the burnout operation along the primary line consisting of roads and dozer lines in Divisions India and Golf between the South Fork Indian Creek and Baldy Mountain. Both runs simulate outputs for two 10-hour burn periods under a constant wind speed and direction. The first run used a typical daytime wind scenario of west winds at 8 mph, based on an analysis of winds at the Slater Butte RAWS. This represents the most challenging wind scenario for that burnout operation. The second run used the typical nighttime winds of east at 10 mph, again based on Slater Butte RAWS. This represents the most favorable wind scenario for that task. In both runs, live fuel moistures were set to 80% for woody fuels and 40% for herbaceous. Three days of fuel conditioning were used; under the current relatively stable temperature and humidity situation this is sufficient to provide appropriate dead fuel moistures.

In both of the following images, the large blue-green-brown polygons on the west side of the ridge running north from Baldy Mountain represent the planned burn blocks. The yellow-blue-orange-purple contours on the east side of the ridge represent arrival times in five-hour time steps. Red lines within the contours represent the minimum travel paths – these can be looked as wicks through which the fire can move readily. The Natchez Fire perimeter, current as of August 13 at 0055, is outlined in red and the 2017 Oak Fire perimeter is outlined in orange.

The figure below (figure 28) represents the west wind scenario for spots that may occur to the east of the burnout operation. In two 10-hour burn periods with 8 mph west winds with current fuel conditions, any spots occurring east of the contingency line are expected to spread a maximum of 1.25 miles east of the ridgeline. Spots may spread to within 0.1 miles of the bottom of the South Fork Indian Creek by the end of the second burn period.

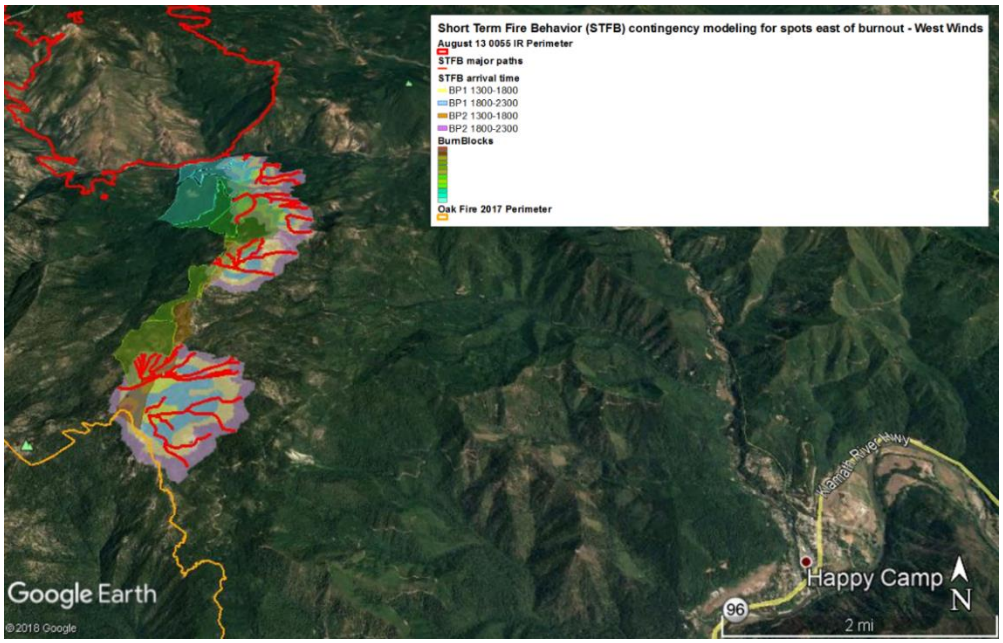

Figure 28. STFB from primary line in Divisions India and Golf with west wind.

Figure 29 represents the east wind scenario for spots that may occur to the east of the burnout operation. In two 10-hour burn periods with 10 mph east winds with current fuel conditions, any spots occurring east of the contingency line are expected to spread a maximum of 0.7 miles east of the ridgeline. Spots may spread to the bottom of the South Fork Indian Creek by the end of the second burn period.

These results should remain informative until live fuel moistures change or a significant variation in the wind is anticipated.

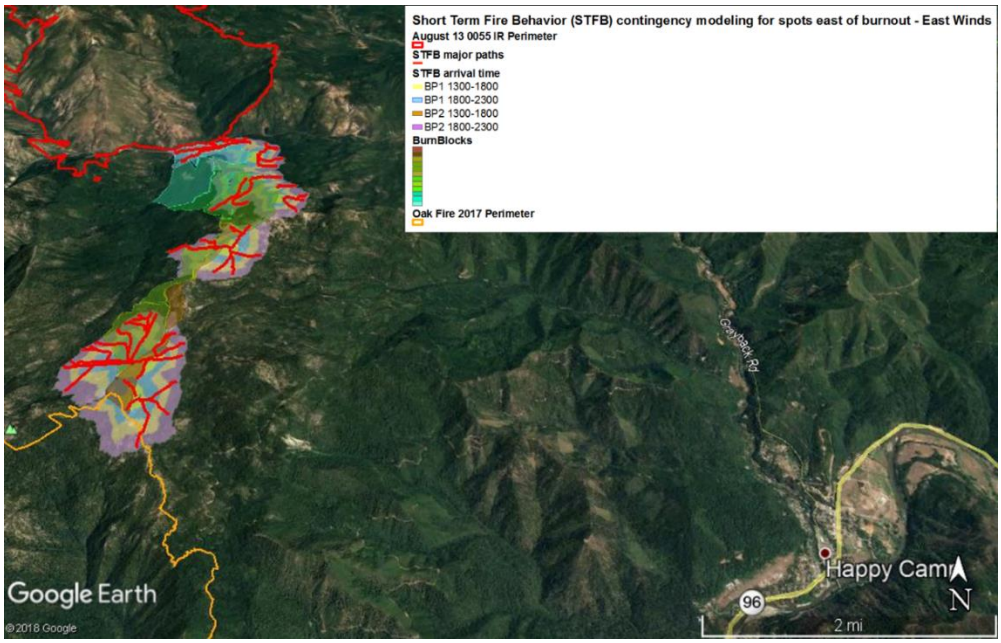

Figure 29. STFB from primary line in Divisions India and Golf with east wind.

FSPro

FSPro provides longer-term information about the probability of the fire burning a certain area (pixel) within the model run time frame. It is important to remember that even though FSPro outputs show color bands, these are probability surfaces and not modeled fire progression. FSPro may use up to three days of forecasted weather but relies on the climatological record for the weather stations selected for use in the run. This allows the model to capture the potential low probability weather and wind events that may have an important impact on fire spread.

The figure below is a 7-day FSPro simulation (August 17-23) using two days of forecast weather and five days of climatology from Slater Butte RAWS (figure 30). Average fire size for the 3,000 simulated fires was approximately 12,000 acres. Daily acres range from approximately 1,600 to 2,100 acres. There is a moderate chance (<60% probability) that the fire will reach the northern portion of MAP 7 near the South Fork Indian Creek in the next seven days. There is a 60-79% probability that the fire will cross into the headwaters of Dunn Creek and <20% probability that the fire will move into the East Fork Illinois River (MAP 8) in the next week. There is a very small chance (rare event as indicated by the <0.2% probability) that the fire will reach the community of Sunstar, Mill Creek Ridge, Spees Peak, or Thompson Ridge in the next seven days. There is a small likelihood (<5% probability) that the fire will spot across the primary line between DP 27 and DP 28 in Division India during the next week.

IR intense heat from the evening of 8/16 was used for the ignition along the main fire perimeter. The units that have been burned out in Division India and Golf were kept as burnable fuel models rather than non-burnable (fuel model 99) to reflect the potential for spotting due to pockets of intense heat that still exist near the line. The primary line in Division India and Golf, consisting of dozer lines and roads, was used as a barrier to surface fire spread but the handline in Division Golf across the South Fork Indian Creek was not included as a barrier. The ridge from Mud Lake to the fireline explosives line along the Division Juliet/Lima break was also used as a barrier to surface fire spread. This run simulates a free-burning fire and does not include any suppression actions or potential fire growth from rollout. This analysis expires on 8/23 and should be refreshed if fire growth exceeds the footprint of the probability cloud.

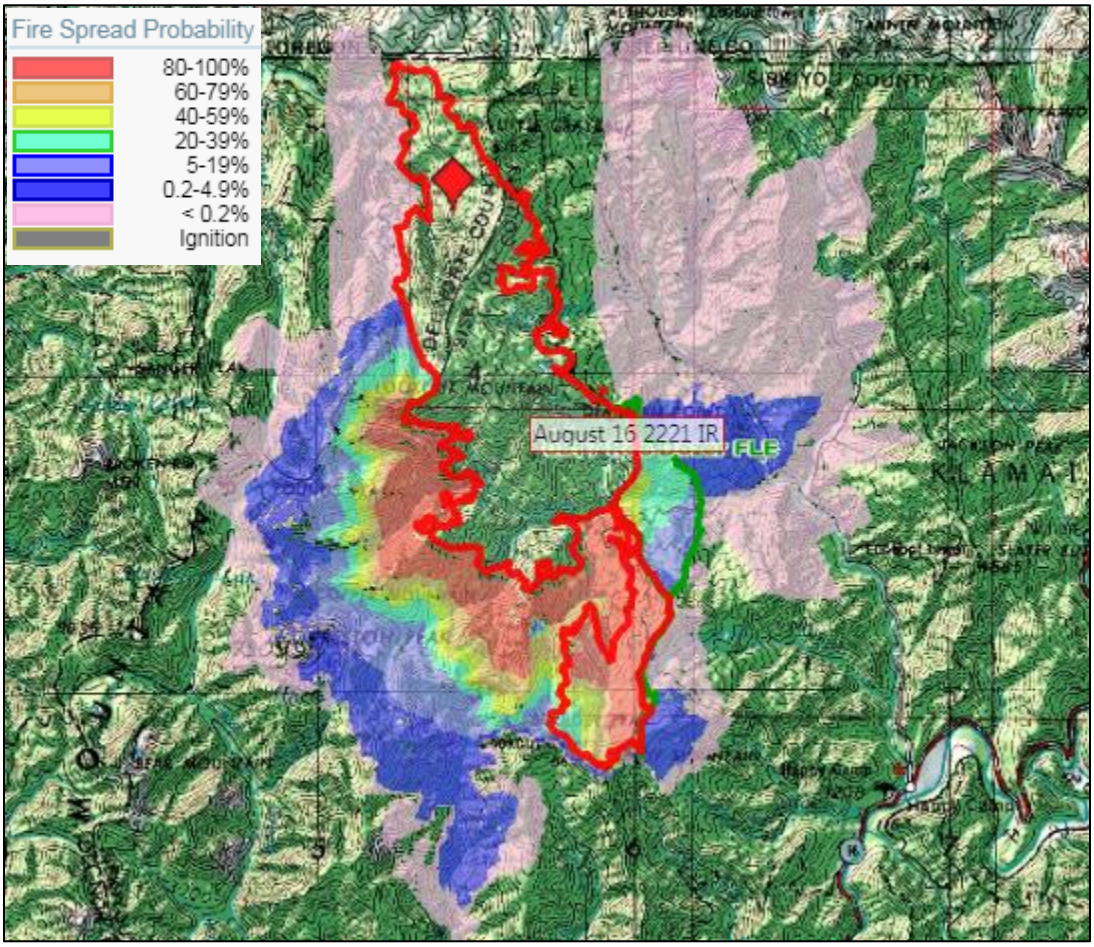

Figure 30. 7-day FSPro run for August 17-23.

Will the Fire Reach Points of Interest?

The fire probability simulation described in the previous section was used to determine if the fire would reach MAPs (Table 5). Additional information regarding the MAPs can be found in the Natchez incident in WFDSS and the Natchez Fire MAP Narrative document provided to the KNF and RSF.

Table 5. Projection of fire impacting points of interest over the next 7 days for the period of August 17-23.

Point of Interest	Distance from fire	Impacted in 7 days?
MAP 7	0.3 – 0.8 mi	<60%
MAP 8	Immediately adjacent (north) – 2 mi	<80% (north), <5% (west)
MAP 9	1 – 2 miles	<80% (north), <5% (west)

Management Action Points

Note: *This is a summary of MAPs active on 8/18 (MAPs 7 and 8) and those in development (MAP 9). Please refer to the Natchez Fire MAP Summary document or the most recent decision in WFDSS for current MAPs that have all necessary information.*

The purpose of the identified Management Action Points (MAPs) is to provide the Incident Management Team, Klamath National Forest, Rogue-Siskiyou National Forest, and other cooperators, partners, and

stakeholders with recommended steps to consider in the long-term management of the Natchez Fire. The MAPs address the actions and decisions that need to be given priority consideration based on fire growth and complexity over the remainder of this fire season.

Recommended Approach to MAP implementation

Refer to the Management Action Point map for the location of each MAP. If more direct tactical opportunities present themselves that differ from the actions identified in the MAPs, those opportunities should be implemented as long as those actions are safe and have a high probability of success.

The key factor in the implementation of the following management actions is *anticipation and timeliness of the action(s)*. It is important to identify when to implement and perform the action(s) ahead of time before you are forced to do so. Actions identified for each MAP are to be based on time of year, fuel conditions, and current and expected weather and fire behavior as well as any other factors that need to be considered for safe and effective implementation of the identified actions.

Resources needed may be in addition to the resources available on the Natchez Fire at the time action(s) are taken for a given MAP. Resources that have been recommended for each MAP may not be available due to critical resource shortage. As the fire grows in size and complexity throughout the remainder of the season or new fires are added within the planning area, reassess the need to change this plan as well as reassessing the interaction of one fire to/with another. Additional management action points and actions may be necessary.

As stated earlier, the key factor in all of these possible management actions is *anticipation*, essentially identifying and performing the action(s) ahead of time. In critical years with high ERCs, mid to long-range spotting, very high rates of spread, and continued hot and dry weather there are NO guarantees that management actions will be successful or they can even be implemented. Running a simulation or drill with key cooperator decision makers and incident management leadership is important and critically essential to successful management of MAPs.

An additional factor to keep in mind is that all actions listed are considerations and not cast in concrete. For instance, if it takes fewer resources to safely and effectively take action then that is acceptable. You are not locked into using the exact resources shown on the table, they are simply recommendations or a beginning point. Operations personnel and others responsible for an action will ultimately determine what is needed to perform the action.

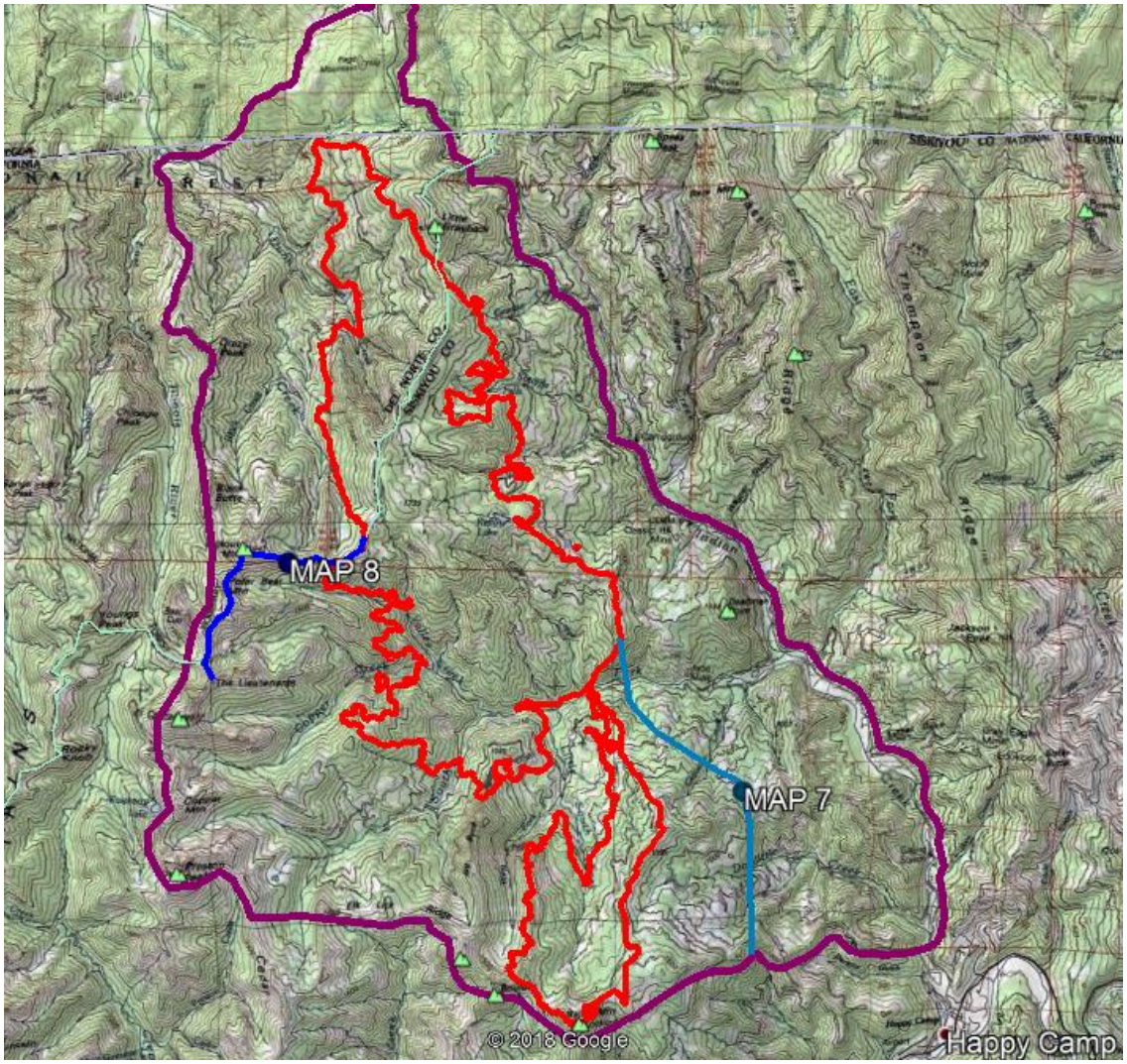

Figure 31. MAPs 7 and 8.

Table 6. Abbreviated information for the management action points (MAPs).
Refer to the latest decision approved in WFDSS for more information.

MAP	Location and Management Intent	Recommended Actions
7	**Location:** From the current fire perimeter at the southeast corner of the fire, south across the South Fork Indian Creek, then continuing to the south to the edge of the planning area boundary south of Doolittle Creek. This MAP is east of the primary line (roads and dozer lines) in Divisions India and Golf and roughly parallel to Indian Creek and Highway 48 (Grayback Road). Firing of the burn blocks along the primary line started on 8/13 once MAP 6 was breached when fire spotted on the south side of the South Fork Indian Creek. **Management Intent:** Consider appropriate evacuation **WARNINGS AND/OR ORDER** for residents along the South Fork Indian Creek, Indian Creek, and Highway 48 corridor (Grayback Road) depending on fire location and current and expected fire behavior to allow sufficient notice to allow a safe and orderly evacuation.	1. Initiate preliminary conversations and coordination with local evacuation authority so that evacuation support personnel have adequate travel time from Yreka and other support locations. These evacuation support personnel may have varying travel times to Happy Camp, however an average travel time of 2 hours has been used as a baseline assumption. Additionally, consider 10 hour minimum requirement to safely evacuate Highway 48 corridor and Happy Camp residents. 2. Consider using aerial resources to limit and check undesirable fire spread. Evaluate and identify aviation resource critical needs and availability, ensuring critical needs are communicated early and often. Consider appropriate point-source suppression strategies and tactics based on current and expected fire behavior. Consider transfer of risk to aviation resources versus mid to long term benefits. Thoroughly evaluate and validate the effectiveness of aviation resources.
8	**Location:** From Mud Lake to the west to Lookout Mountain, then south to Polar Bear Mountain to the west peak of The Lieutenants following the Klamath NF/Rogue-Siskiyou NF boundary. **Management Intent:** The intent of this MAP is to ensure coordination with the Klamath, Rogue River-Siskiyou, and Six Rivers National Forests as the Natchez Fire moves toward, though, and into these administrative units.	1. Coordinate with Agency Administrators to develop a plan that meets their leader's intent. 2. Evaluate need for additional MAPs and add as appropriate. 3. Identify, locate, and prep additional contingency lines. 4. Evaluate, document, and prep structures as needed in Sunstar and Takilma areas. 5. Coordinate with Del Norte County Sheriff and Josephine County Sheriff.
9	**Location:** This is a temporal MAP. **Management Intent:** Schedule a community meeting working in conjunction with county sheriffs to provide fire information, evacuation protocols, and establish citizen alert and reverse 911 for the public.	Notify Del Norte County Sheriff's Office and Josephine County Sheriff.
TBD	Note: NR Team 1 is still working with Josephine County Sheriff to develop MAPs for the Takilma area (also including the Sunstar area with Del Norte County Sheriff) and should be finalized 8/20 or 8/21.	

MAPs to the south were not considered due to the extent of the Oak Fire (2017). At this time, only MAPs related to public safety are being considered in Division Lima (East Fork Illinois River and Dunn Creek) as this area lacks east-west features for suppression actions.