Granite Complex Fire
Wildland Fire Implementation Plan
Stage III
Hells Canyon National Recreation Area
Administered by
Wallowa-Whitman National Forest

Wildland Fire Implementation Plan
Stage III- Long Term Implementation Actions

Table of Contents

Fire Name:	Granite Complex
Fire Number:	165, 161, and 268
Administrative Unit	Hells Canyon National Recreation Area (HCNRA) Hells Canyon Wilderness

Objectives and Constraints 4
Maximum Manageable Area 5
- Acres 5
- Definition 5

Fire Projections and Weather 7
- Fire Weather To-Date 7
- Fire Behavior To-Date 8
- Short-Term Outlook 9
- Fire behavior 10
- Long-Term Outlook and Drought Prognosis 11

Long-Term Risk Assessment 20
- RERAP 20
- Minimum Travel Time 21

Maximum Manageable Area: Description of Segments, Threats, and Mitigations 25
- SEGMENT I 25
- SEGMENT II 25
- SEGMENT III 26
- SEGMENT IV 27
- SEGMENT V 27

Other Threats and Mitigation Actions 29
- Firefighter Safety 29
- Public Safety 29
- Air Quality 30
- Cultural Resources 30
- Threatened, Endangered, and Sensitive (TES) Species 31
- Wilderness 31
- Structures 31

Other Wildlife 32
Resources Needed to Manage the Fire and Estimated Costs 33
Contingency Actions 34
Information Plan 36
Monitoring and Post-Burn Evaluation 37
Signatures 39
PERIODIC FIRE ASSESSMENT INSTRUCTIONS 40
PERIODIC FIRE ASSESSMENT 41
PART 1: RE-VALIDATION CHECKLIST 41
SIGNATURE TABLE 42
Appendix A: Management Action Points 43
Appendix B: Structure Protection 47
McGaffee Cabin 48
Sheep Creek Ranch 48
Low Saddle Comfort Station 48
Cold Springs Cabin 48
Microwave Tower 48
Heavens Gate Lookout 49
Windy Saddle Campgrounds and Guard Station 49
Horse Heaven Cabin 49
Appendix C: PACFISH/INFISH Guidelines 50
Appendix D: Wilderness Visitor Management Plan For Granite Complex WFU 52
Appendix E: Fire Behavior Technical Documentation 55
FARSITE Technical Documentation 56
Landscape layers 56
Weather and Wind 56
Fuel moisture 57
Other parameters 57
Input files 57
Output files 57
RERAP Technical Documentation 58
Assumptions 58
Analysis Inputs 58
Minimum Travel Time Technical Documentation 61
Assumptions 61
Analysis Inputs 61

Objectives and Constraints

- Firefighter and public safety will be the top priority and guide all management actions.
- Manage fire consistent with the Wallowa-Whitman and Payette National Forests Land Management and Fire Management Plans.
- Preserve wilderness qualities.
- Where practical, allow fire to function with a minimum of human interference within the maximum manageable area.
- Protect fish and wildlife habitat from potential adverse effects resulting from suppression or holding activities.
- Protect significant historic and prehistoric structures and sites.
- Coordinate actions and information with potentially affected stakeholders (i.e. permittees, outfitters, Nez Perce Tribe, The Confederated Tribes of the Umatilla Indian Reservation, Northern Paiute Tribe, Shoshone Tribe, local communities, and Nez Perce and Payette National Forests).

Maximum Manageable Area

Acres

Total acres for the Maximum Manageable Area (MMA) are 138,184 acres.

Definition

The MMA for this area covers the entire HCNRA Hells Canyon Wilderness on the east side of the Snake River. It also includes a large area of the Payette National Forest that has a developed Fire Use Plan. The MMA segments are described in detail in the Threats and Mitigation section of this document beginning on page 18.

The boundaries for the MMA are (fig 1):

West: The western boundary of the MMA runs from the confluence of the Snake River and Saw Pit Creek north along the Snake River to the confluence of the Snake River and Willow Creek.

North: The northern boundary of the MMA begins at the confluence of the Snake River and Willow Creek and follows the wilderness boundary east over Storm Point to Cold Springs Peak at 6927 ft elevation.

East: The eastern boundary of the MMA begins at Cold Springs Peak and follows the wilderness boundary south along trail 101 to just east of Horse Heaven Lake. At this point in the trail the MMA boundary leaves the trail and follows an intermediate ridge down to Rapid River.

From Rapid River the MMA passes just east of Rankin Mill and heads southeast up an intermediate ridge to Jackley Mountain. The MMA then turns northeast staying on the ridge top to Bryan Mountain where it picks up the County Line dividing Idaho and Adams County.

The boundary then follows the county line (also the boundary for the Nez Perce and Payette National Forests) east to the section corner of T22N R1W Sections 2, 3, 10, and 11. The boundary then turns southeast, bisecting sections 11 and 12, and continuing south along the east section line of Section 13 to Lockwood Point.

From Lockwood Point the boundary follows the east section line of section 24, bisects section 25 across Campbells Cow Camp, and bisects Section 36 down to Pollock Mountain. From Pollock Mountain, the MMA turns southwest to Cold Springs Saddle following the ridge line across Devils Ladder and Shannon Corral to trail 178 just east of North Star Butte.

South: The boundary follows trail 178 along the ridge top to southern-most point of the MMA to T21N, R1W, section 31. The MMA boundary then turns along trail 229 north to Bear Saddle and leaves the trail just north of Bear Saddle. It then follows the ridge due north out of the drainage to the primary ridge in T21N, R2W, section 24.

The MMA boundary turns west along the primary ridge to Echos No. 2 peak at 8151 ft elevation where it intersects the wilderness boundary. It then follows the wilderness boundary west to Pepper Box Hill to a 4 wheel drive trail at White Monument and continuing west to road 108. The MMA boundary follows road 108 northwest past Kinney Point along the primary ridge to Sheep Rock in T21N R3W Section 2. The boundary then proceeds west into Saw Pit Creek to the Snake River.

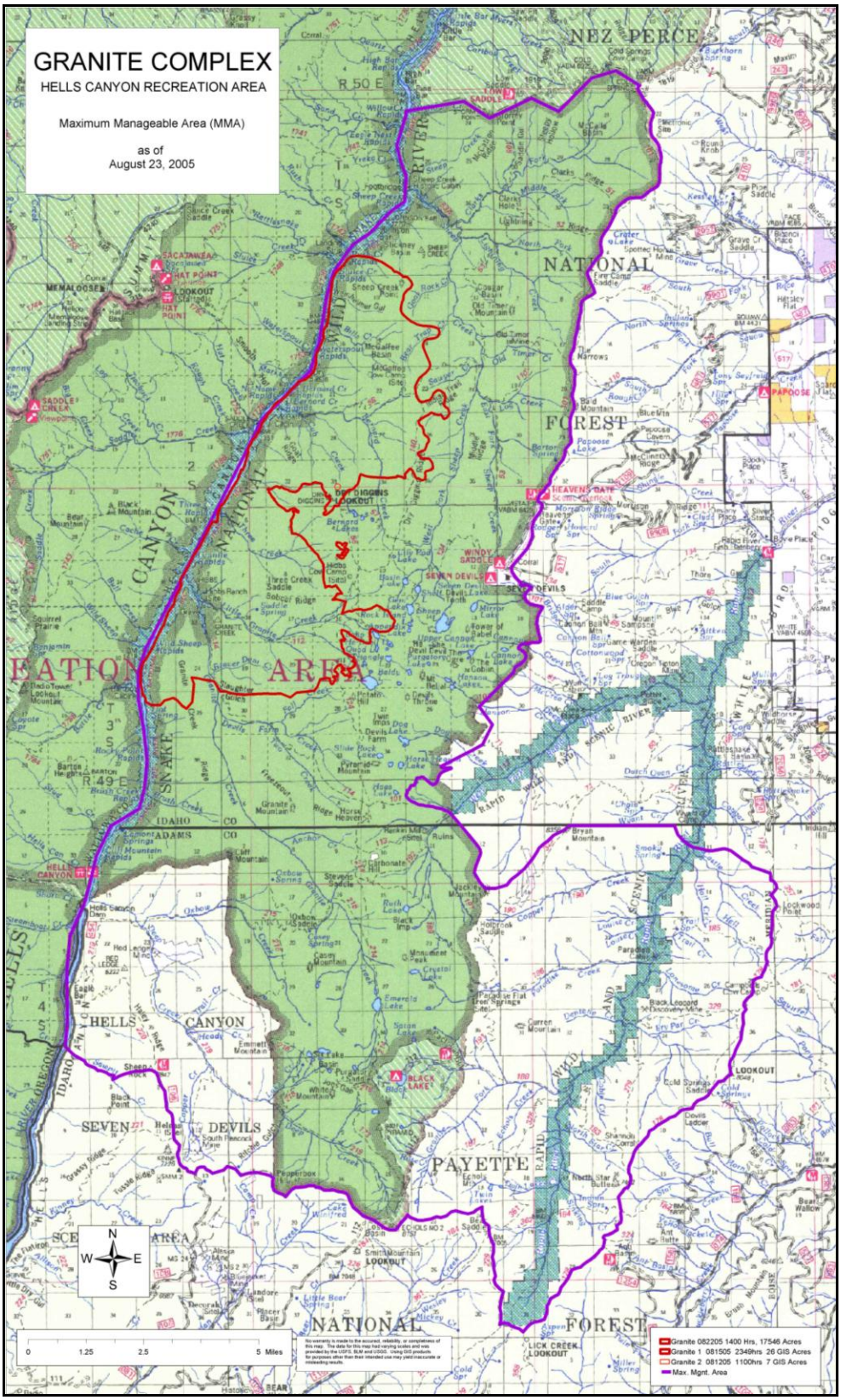

Figure 1. The MMA boundary mostly follows the Hells Canyon Wilderness boundary and natural features.

Fire Projections and Weather

Fire Weather To-Date

The fires began during the usual early August period of high temperatures and low relative humidity. The last rain recorded in the area was on August 1-2. Harl Butte received 0.6 inches, but Pittsburg Landing on the Snake River, more representative of where the fire started, received only 0.03 inches. Hot temperatures and low relative humidity have persisted since. Perhaps more significantly, the maximum relative humidity has generally been 30% or below, with the exception of August 13 and 14 (figs. 2 and 3). With a cold front passage on August 17, temperatures fell and humidity rose. Perhaps more significantly, the maximum relative humidity has only exceeded 50% six nights since the team arrived, the effect of passing cold fronts with no measurable rain.

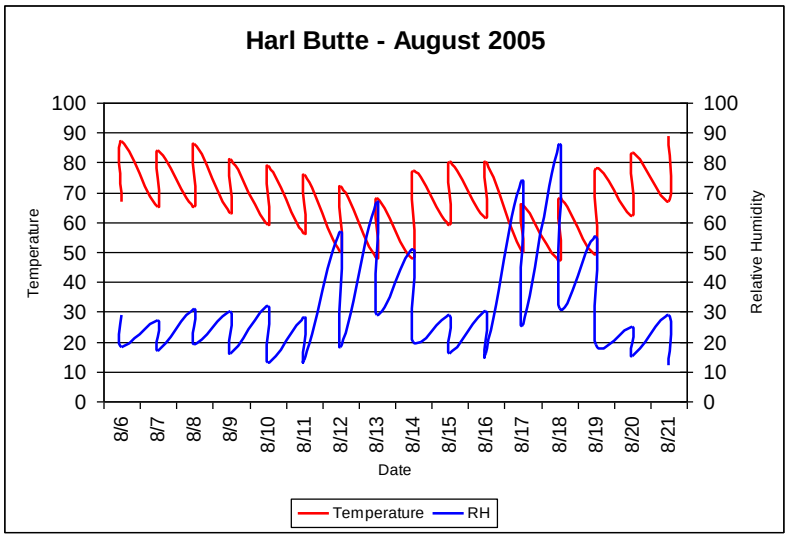

Figure 2. The fire started on August 6. Humidity recovered above 50% only 6 nights out of 16.

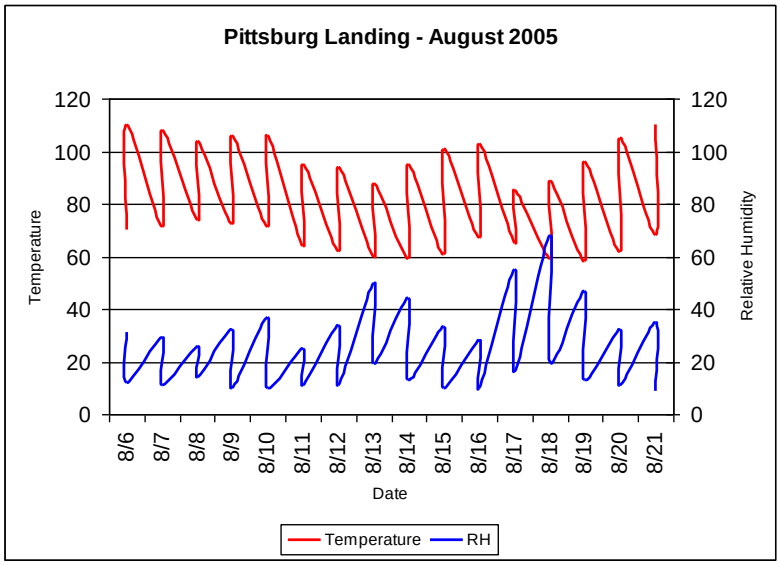

Figure 3. The fire started on August 6. Humidity recovered above 50% only 2 nights out of 16.

Wind speeds since the fires began have generally been light. Wind direction in the Snake River canyon has been up canyon during the day, with the exception of the frontal passage on August 17, which saw a sustained down canyon wind for several hours lasting until early afternoon. Lighter down canyon winds have persisted after dark. Average wind speeds in the canyon have peaked at 1300-1500, averaging 7 mph with gusts averaging 17-18 mph. General winds on Harl Butte have been from the NW, peaking in the evening around 1800-2000 hrs, with averages about 10 mph and gusts to 21.

Extreme fire weather has not occurred on the fire to date, however the weather has been above seasonal averages for this time of year. A Haines Index of 5 (moderate) was predicted for August 7, and again on August 21, but the rest of the days have been either Haines 4 or less. The winds associated with weak cold fronts on August 12-13 and August 17 produced relatively light winds compared to typical frontal winds. Harl Butte recorded 11 mph with gusts to 17 on August 12, and 13 mph with gusts to 25 mph on August 17. The day with the most potential for extreme fire weather was August 21 when Bald Mountain RAWS recorded 76 degrees and 13% RH following several nights of very poor humidity recovery.

Fire Behavior To-Date

Two fires started from lightning strikes a mile apart on either side of Granite Creek within a mile of the Snake River. The fires quickly burned together, becoming the Granite WFU, and moved upslope in cured grass fuels. The Little Granite and Granite 2 fires started in the subalpine zone from a storm on July 28 but spread very little beyond the initial burning period.

The Granite Fire initially spread upslope in the Granite Creek and Little Granite Creek drainages, down to the Snake River, and mostly north down the Snake River canyon in fine fuels. Fine fuel moistures responding to 100-degree temperatures and RH around 10% drove fire behavior. By August 9, the perimeter was almost 3000 acres, spreading in grass and scattered clumps of ponderosa pine. The fire doubled in size by August 11, spreading mostly on the north side of Little Granite Creek and down the Snake River canyon. Fire spread to the south halted on the ridge south of Granite Creek and in rock outcrops on the Snake River face, where it has remained.

The fire continued to spread north, mostly by flanking and backing into the wind on the Snake River face in grass fuels a mile or two a day. Fire spread continued almost all night along the Snake River canyon when humidity recovery was poor. When reaching the drainages, the fire spread rapidly upslope until it reached timbered fuels around 6000 feet elevation.

Along the Snake River, the fire reached McGaffee Cabin at the mouth of Bernard Creek on August 13. It moved up both sides of Bernard Creek on August 14. Monitors observed short crown fire runs on steep slopes to the ridgetop on the afternoons of August 14, 15 and 16, pushing up columns to around 15,000 feet each day. The combination of steep slopes, low humidity, and enough heat below appeared to be the main drivers to initiate crown fire. As the fire reached the 7000-foot level, high live fuel moistures slowed fire spread and flame lengths, especially where brush is present in the understory. On August 16, likely as a result of several days of little humidity recovery, active torching occurred on flat ground at 7200 feet elevation.

The fire continued to spread north along Dry Diggins Ridge, responding to lower elevations and drier fuel conditions as it moved north along this ridge, and slopped over into side drainages of Sheep Creek. On August 16 and 17, the fire moved down the Snake River face toward Sheep Creek Ranch, making a flanking run on the morning of August 17 with down canyon winds before being stopped with helicopter bucket drops.

On August 21, likely the most severe fire weather day since the team arrived, the fire made short runs in subalpine fir at elevations above 7000 feet, mostly on south or west steep slopes. A ½ mile run at 40 chains per hour was observed. The fire moved down Sawyer Creek, Bear Trap Creek, and Goat Rock Creek, slowing within ½ mile of Sheep Creek at the closest location. There was concern that the fire would continue to spread all night and reach Sheep Creek early August 22. This would position the fire for major crown fire runs in the West and East Forks of Sheep Creek, and rapid runs on south facing cured grass slopes to the north.

The passing of two weak cold fronts has moderated fire behavior with higher humidity, limiting spread in grass, but the fire continues to spread under the canopy from mid morning through late evening downhill at the rate of about 10-20 chains/day in the side drainages toward Sheep Creek. At this rate, the fire could reach Sheep Creek in a few days if unchecked.

The Little Granite Fire has shown very slow spread on moderate slopes, but has persisted because of dry conditions. As is typical of subalpine fir, when the RH drops below 20%, torching and short range spotting occurs. The Granite Fire overran Granite 2 on August 14.

Short-Term Outlook

Weather and Fuels: The weather outlook for the next several days (August 23-28) indicates a warming and drying trend, but not the hot weather previously experienced. Minimum humidity is predicted to be 12-20% range, lowest on the Snake River and Haines Index 4 (low) or less. Winds are predicted to be light. The outlook for the next two weeks (through September 6) indicates average precipitation, and average temperatures.

Fuel conditions, particularly the live fuels, vary widely due to the large elevation gradient across the fire area. Live herbaceous fuels are completely cured at the lower to mid elevations, and are still in transition at the high elevations (fig 4), but are cured on most south and west aspects up to about 8000 feet. Live woody fuels still remain a heat sink under canopy at the higher elevations (fig 4). The canopy fuels are dry enough to support crown fire, but without the availability of surface fuels, active crown fire is not likely except on south and west aspects under severe weather conditions.

Figure 4. Curing of grass fuels (left) varies by aspect at the upper elevations while shrub fuels (right) are still quite green. Photos were taken near the eastern Wilderness boundary close to a microwave station at 6900 feet.

Fire behavior

We used FARSITE to simulate fire spread from that portion of the active fire perimeter where fire could potentially threaten the MMA. This area is the perimeter as of August 17 from McGaffee Cow Camp south to where the fire crosses Bernard Creek.

We used a 7-day FARSITE weather stream generated by the NWS office in Missoula, then copied and modified it for another 7 days based on the August 19 spot weather forecast. Based on the climatological analysis these weather and fuel moistures represent persistent unseasonably dry conditions, likely somewhat drier than what the two week forecast predicts. We did not include a rare and significant fire spread day in the weather stream.

The simulation shows the fire could reach Segment II in about nine days and Segment III in about six days (fig. 5), assuming no management actions are used to check spread. In the simulation, the fire spreads most readily from the more northern ignition points to the lower elevation fuel types that have higher spread rates (FMs 1, 5, and 104), and lower fuel moistures. From the higher ignition points on the ridge, the fire would take much longer to reach either Segment, as it would have to back through slower spreading timber types mixed with rocky outcrops at higher fuel moisture levels.

These results suggest the need to check fire spread to the north from about the junction of East and West Forks of Sheep Creek for the short term or until a change in weather in order to keep the fire from spreading to the MMA. Assumptions and parameters of the FARSITE modeling are detailed in Appendix E.

The simulation likely over predicts the rate of fire spread to Segment III, since fuels vary more on the real landscape because of recent fire history. Given the weather for the next two weeks, if fire reaches Segment III, it will spread rapidly at the lower elevations, then slow as it encounters timber and shrub fuels. Crown fire is possible in the few places where canopy is continuous on steep slopes, but topographic breaks well below the ridgeline will likely drop an active crown fire to the surface. The simulation shows the potential for spotting across the ridge and we feel this is likely if the weather becomes more severe than predicted in the next two weeks.

There is a risk of crown fire running up the West Fork Sheep Creek to the south if severe weather conditions develop, if it becomes established at or below the confluence of the east and west forks of Sheep Creek. Below the confluence, fuels would support rapid spread rates in classic FM 2. Approximately two miles above the confluence, mixed conifer transitions to subalpine fir and live fuel moisture increases. An active crown fire is unlikely unless weather changes significantly. Up canyon winds are not predicted to be strong in the near term.

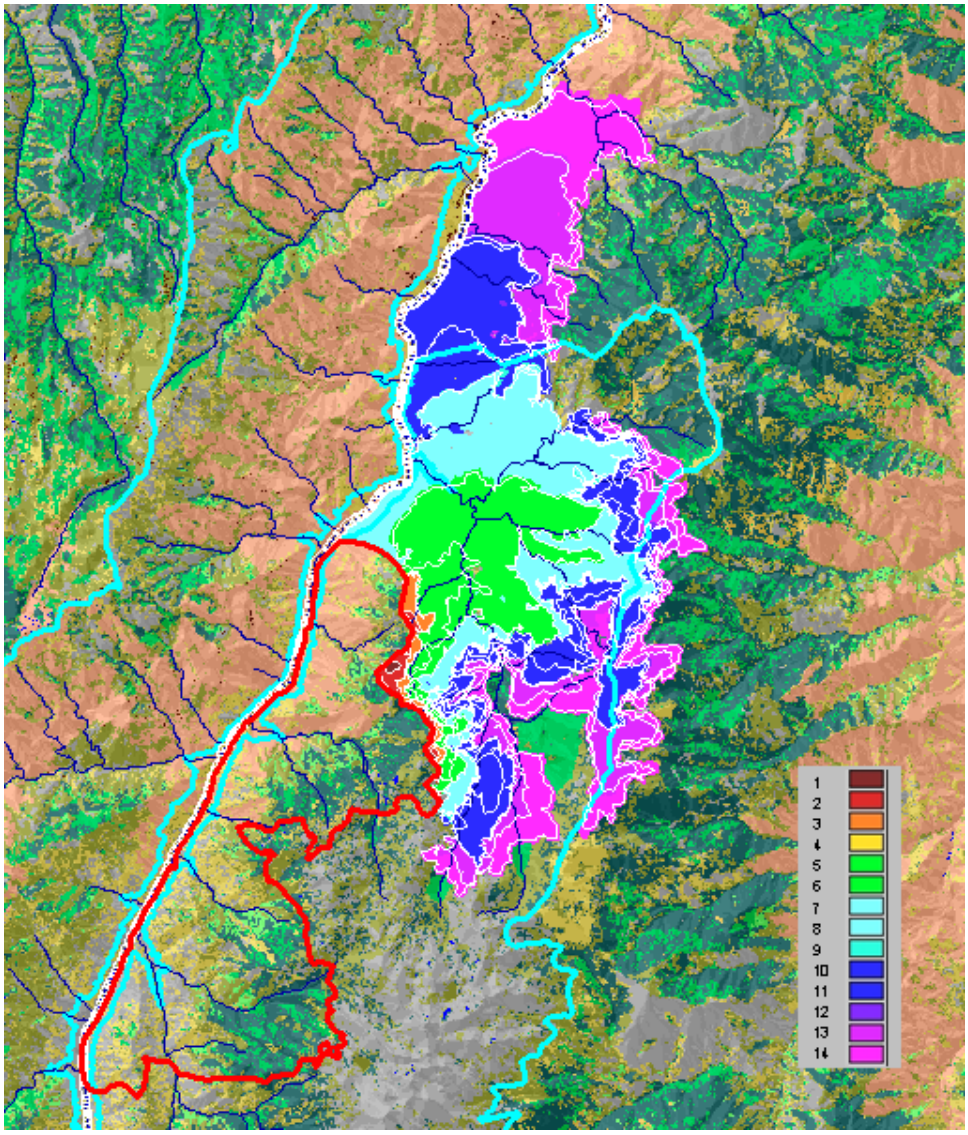

Figure 5. Projected daily spread from FARSITE simulation over 14 days with expected weather

Long-Term Outlook and Drought Prognosis

The long-term outlook and drought prognosis is based on examining weather records at Harl Butte (station 351502) and Slate Creek (station 101037) remote access weather stations (RAWS), and several climatological websites, including but not limited to the Climate Prediction Center, Western Regional Climate Center, Natural Resource and Conservation Service, US Geological Service, and the National Climate Data Center. Other analysis tools include Fire Family Plus, the Fire Area Simulator (FARSITE), the Rare Event Risk Assessment Process (RERAP), and FlamMap.

Harl Butte is located just above 6000 feet elevation in Oregon while Slate Creekis located at 1568 feet elevation along the Salmon River in Idaho. Harl Butte best represents the upper elevations of the fire and Slate Creek best represents conditions along the Snake River, although it is located on the Salmon River. We also examined Snake River (station 101109) and Pittsburg Landing (station 101100) RAWS for utility but decided against both. Snake River is located at 3500 feet elevation south of the fire but the winds were determined to be

unrepresentative, based on observations from the fire. Conditions at Pittsburg Landing are representative, but the station has been on place only since 2001, thereby lacking sufficient data for climatology analyses.

Seasonal Severity: This past winter started out very dry in northeastern Oregon and north central Idaho with very low snowpacks. There was great concern that this fire season would be very severe if the winter's trend continued, particularly given that this climate zone is in its 6th year of drought based on the Standardized Precipitation Index. However, spring and early summer was significantly wetter than average as revealed by record analysis from West Branch Sno-tel site (located at 5560 ft). The October-February precipitation was only 63% of average at West Branch, but the March-June precipitation was 135% of average and most of this precipitation would have been rain. The site is at 82% of average precipitation as of August 18. The Drought Monitor shows this part of Idaho as in moderate drought (fig. 6). River flow levels for the Salmon River at Whitebird (fig 7) and for the Little Salmon River at Riggins, Idaho are running below average, reflective of the lack of snowpack.

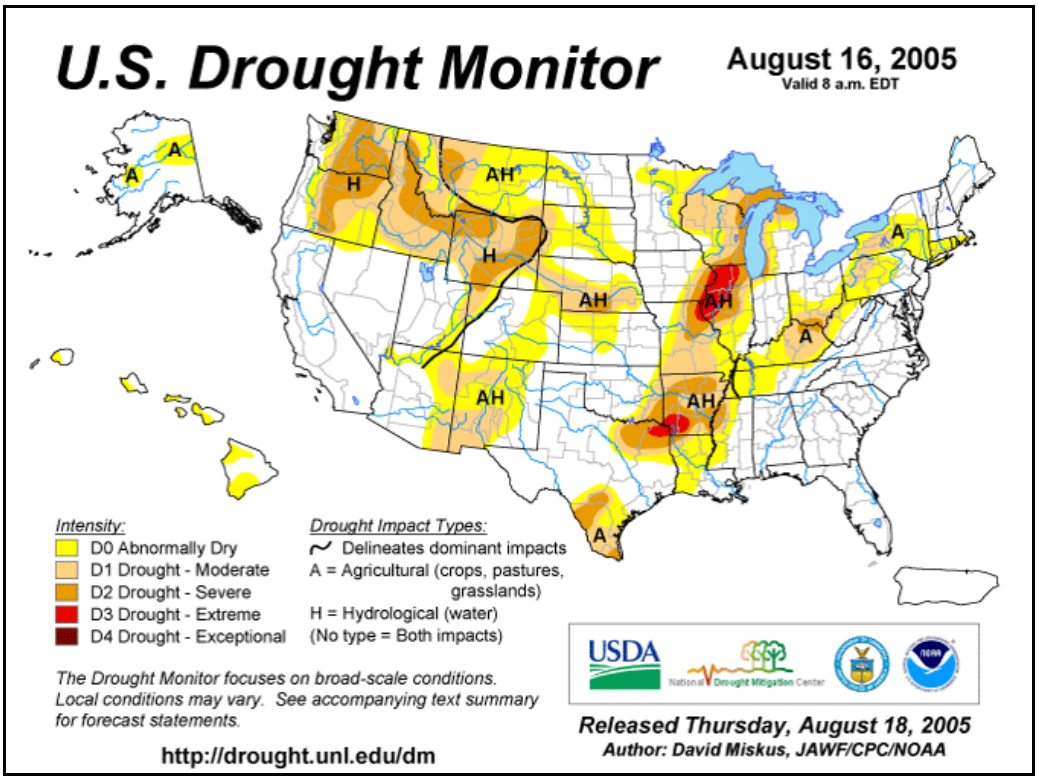

Figure 6. The western border area of Idaho and eastern border area of Oregon are currently rated as in moderate drought conditions.

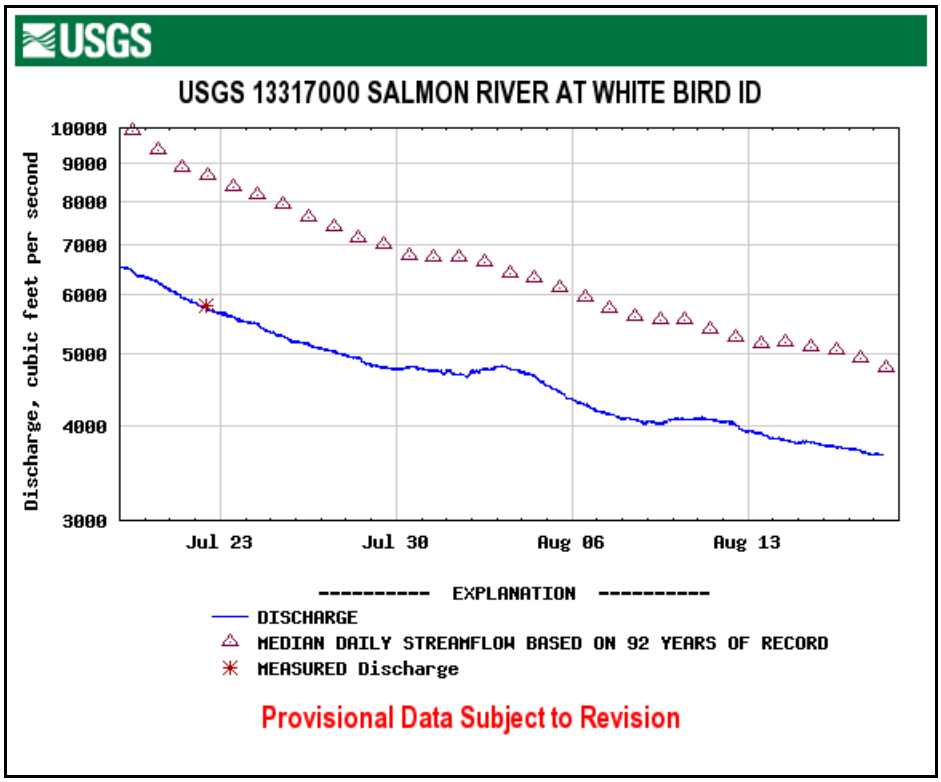

Figure 7. Over the past month, the Salmon River discharge has been approximately 60-70% of average.

Since April, Harl Butte has recorded 7.7 inches of precipitation, as compared to the average of 11.1 inches through July, approximately 70% of average. However, there are several missing days of data in July, which may have included additional precipitation. Slate Creek has recorded 7.2 inches as compared to 7.8 inches, or about 92% of average. Both stations remained near seasonal averages for ERC until mid- or late July. Unseasonably warm and dry conditions then pushed both stations above seasonal averages, where they remain currently (figs 8 and 9).

Seasonal Trends: We compared this year's ERC patterns for the three stations to their historical patterns. The 2005 season so far best matches with the 1998 season at Harl Butte (fig 8) and the 2002 season at Slate Creek. However, the remainder of the season differs between the two years and stations. At Harl Butte, the 1998 season continued to be fairly severe, setting new extremes in late August, but ended rather abruptly in early September. Slate Creek continued well above seasonal averages in 2002 until late October (fig 9).

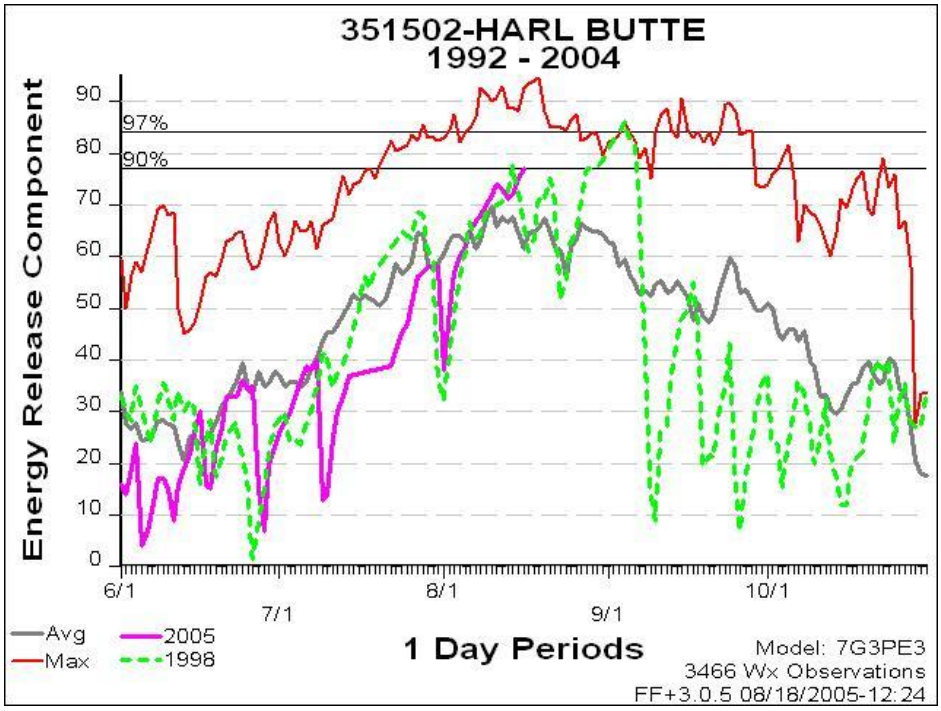

Figure 8. The year that most nearly matches 2005 to date ended abruptly in early September.

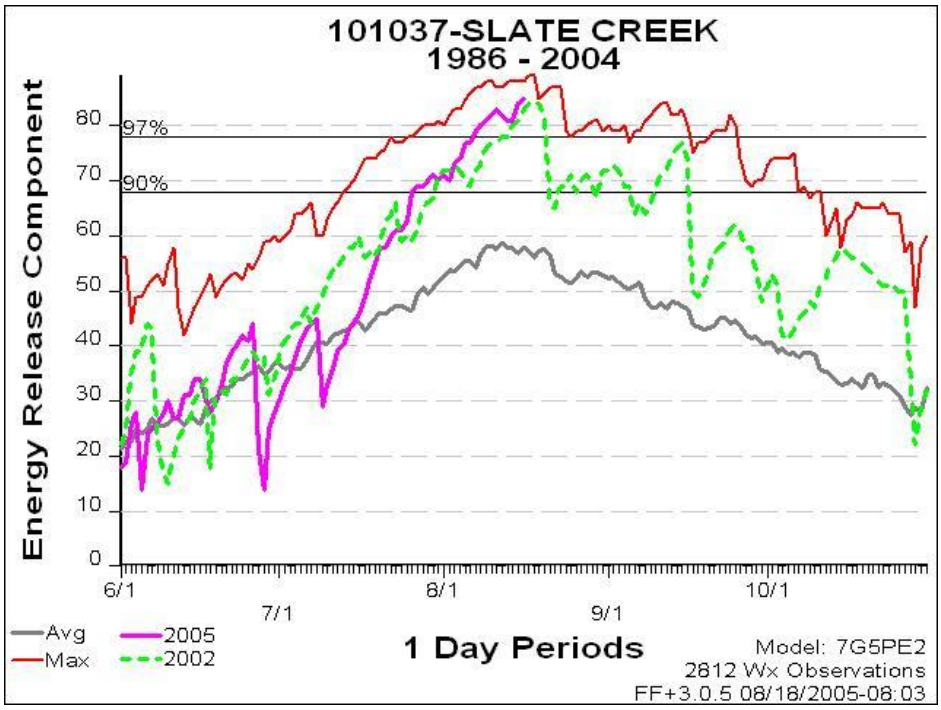

Figure 9. The year that most nearly matches 2005 to date continued well above seasonal averages until late October.

We analyzed winds over two week periods and seasonal averages for maximum relative humidity, minimum relative humidity, and maximum temperature for the remainder of the season at Harl Butte, Snake River, and Slate Creek. At all three stations, fire danger indices

usually peak in mid-August and slowly decline through September and the first half of October.

Harl Butte. Harl Butte is the windiest location of the three analyzed. Ten-minute average wind speeds greater than 24 mph have been recorded in September and early October and wind speeds of 19-24 mph recorded in all time periods analyzed. The strongest winds tend to be out of the southeast, south, and southwest. Winds are most commonly out of the northwest, southeast, and south in all time periods analyzed.

Maximum relative humidity usually reaches its lowest point, near 40%, during the second week of August. It usually rises to above 60% by very early September, although a second dry period occurs in late September. During this period, maximum relative humidity drops in to the 50s and mid-40s. In October, it rapidly rises into the 60s and 70s, reaching into the 80s by the end of the month. For much of the 2005 fire season, maximum relative humidity has been running below seasonal averages.

Minimum relative humidity usually reaches its lowest point, near 20%, also during the second week of August, slowly climbing up to 40% by mid-October. For the 2005 fire season, minimum relative humidity has been running near to slightly below seasonal averages.

Maximum temperature normally peaks between the end of July and mid-August at near 80 degrees. It drops to 60 degrees by early October and then rapidly falls off to 40 degrees by the end of October. The current year has been running near average to slightly above.

Slate Creek. Winds along the river are generally slower than those on the ridgetops and often are more erratic. Unfortunately, that gustiness and erratic change in direction is not well captured in the historical records. The strongest winds at Slate Creek fall into the 13-18 mph category for 10-minute averages. These winds are most often from the southwest, but also have been recorded from the south, southeast, north, and northwest. Most often, the winds are from the northwest and north in all time periods analyzed. The third most common wind direction is more variable and occurs much less frequently that the north and northwest winds. The most common winds are up-canyon, which is what would be expected in a deep drainage with intense heating at midday.

The maximum relative humidity tends to reach its minimum, the low 70s, in early August, rising above 80% by the third week of August. This high humidity recovery reflects the location of this station, which is on a low bench near the confluence of Slate Creek and the Salmon River. So far in 2005, maximum relative humidity has been running well below seasonal averages, down into the mid-40% range.

Minimum relative humidity normally bottoms out in the mid-teens in early to mid-August, rising into the 30-40% range by mid-October. Currently, minimum relative humidity has been in the single digits, below seasonal averages and near the lower extremes for this time of year.

Maximum temperatures normally top out in the upper 90s to 100 from late July to mid-August, dropping into the 80s by mid-September. Currently, maximum temperature has been running near to above seasonal averages.

To summarize, both ridge top and river bottom locations experienced near normal conditions through June and much of July. The departure from seasonal averages is greater in the river bottoms than the ridge tops. In both locations, the poorer than average humidity recovery at night has contributed to fire spread, particularly in lower and mid-elevations and cumulatively is now being expressed at upper elevations. Assuming the remainder of the year is somewhat similar to the closest patterns in 1998 for the upper elevations and 2002 in the lower elevations, then rain could dampen fire spread in early

September at 6000 feet and higher. Below 6000 feet drier than average conditions could persist into October. As an indicator of how different precipitation patterns can be by elevation, the last recorded precipitation at Harl Butte was August 1 at Slate Creek was July 11.

Season End: Determining the potential length of the season is critical to support many operational decisions. The Forest defined a season-ending event as either 0.75 inches of precipitation in a single day or three consecutive days with at least 0.25 inches each day. This definition assumes that such an event actually ends the potential for large fire growth. Experience in many other locations has shown that the fire season rarely ends with such a well-defined event. Often it fades away due to a combination of scattered, smaller precipitation events and changing day length and sun angle which, in turn, translates into lower maximum temperatures, higher relative humidities, and shorter burn periods. Energy release component can serve as an integrator of all these factors.

We first examined the large fire history for Hells Canyon NRA to determine the ERCs associated with large fire start dates using weather data from Harl Butte and Slate Creek and G model. A large fire was defined as 500 acres or greater. The ERC at which more large fires started was 62 (70^{th} percentile) at Harl Butte and 53 (75^{th} percentile) at Slate Creek. We then determined the latest date at which ERC dropped below the identified value at each station and did not recover.

The precipitation-based and ERC-based data were imported into term files in the Rare Event Risk Assessment Process (RERAP) model (table 1). The precipitation-based definition results in the earliest season ending dates, while the ERC-based data from Harl Butte results in the latest dates. The precipitation-based data may be the most useful for average to below-average years at all elevations. The ERC-based data from Slate Creek may be most useful in an above-average year, while the ERC-based data from Harl Butte may be most useful in an extreme year.

Table 1. Eighty percent of the time the season would have ended sometime between September 28 and October 17 and 90 percent of the time between October 7 and 27, depending on the definition used.

Data Source	80^{th} Percentile Date	90^{th} Percentile Date
Precipitation-Based	Sep. 28	Oct. 7
ERC-Based Slate Creek	Oct. 3	Oct. 14
ERC-Based Harl Butte	Oct. 17	Oct. 27

Large Fire Growth Event: The risk of a large fire growth event (500 acres or more in a single burning period) is important in forested areas. Grass areas tend to support large fire growth events quite readily once the grasses have cured, which they typically do by sometime between mid-July and early August. Large fire growth events are associated with thunderstorms in August and dry cold fronts in September and October. Large growth events in the Pacific Northwest and Northern Rockies geographic areas also occur under Haines 6 conditions, but this information is not part of the weather records. Harl Butte is windy enough that it can be used as an indicator of high wind events.

We defined a large fire growth day as one with a minimum relative humidity of 20% or less, wind speed of 10 mph or greater, and ERC of 62 or greater (70^{th} percentile value). All three values together indicate dry, windy conditions. Using the event locator tool in Fire Family Plus, we searched the records between August 16 and October 31 for the days that met all three criteria and found 81 days out of 1001 potential days within the period analyzed.

These results mean an 8% overall chance of a large fire growth event or 6-7 such events, on average, between August 16 and October 31. An event is most likely in September (4% chance or 3 events). The remainder of August has a 2.5% chance (2 events) and October has a 2% chance (1 event).

Fire Slowing Events: Along with large fire growth risks, is an interest in fire-slowing events in forests and fire ending events in grass. Two different types of fire-slowing events were defined:

- 0.10-0.24 inches = slowing for 1-2 days in forest, ending in grass
- 0.25-0.49 inches = slowing for 3-5 days in forest

Because of the difference in precipitation patterns between the upper and lower elevations encompassed by the fire, we examined these probabilities at both Harl Butte and Slate Creek (table 2).

Table 2. Chance of receiving a particular type of fire slowing event and the number of probable events by time period. In the remainder of August, a fire-slowing event of any type occurs every other year on average.

	Harl Butte		**Slate Creek**	
Time Period	*1-2 day*	*3-5 day*	*1-2 day*	*3-5 day*
Aug 16-31	3% (1/2 event)	3% (1/2 event)	3% (1/2 event)	3% (1/2 event)
Sep 1-30	4% (1 event)	4% (1 event)	5% (1-2 events)	2% (1 event)
Oct 1-31	6% (2 events)	2% (1 event)	5% (1-2 events)	3% (1 event)

The higher probability of a 1-2 day fire slowing event in forest or fire-ending event in grass at Slate Creek in September most likely reflects the longer period of record available for that station (19 years verses 13 years at Harl Butte). The lower probability of 3-5 day fire slowing events at Slate Creek in all time periods reflects the lower annual precipitation at that location.

Hard Freeze: A hard freeze that kills then cures herbaceous vegetation and leaves on shrubs is a concern at the higher elevations. If temperatures low enough and for long enough duration occur before the season ends, vegetation can freeze-dry and contribute to fire intensity and spread rates. The effects of freeze-dried vegetation on fire behavior is difficult to include in fire behavior calculations. A hard freeze occurs when temperatures drop to 32^{o}F or lower, but there is a time factor involved. Only a few minutes at 28^{o} are needed for this effect. We used the event locator tool in Fire Family Plus to locate minimum temperatures of 28^{o} or less at Harl Butte and used these data to construct a term file to estimate probable dates. Eighty percent of the time a hard freeze has occurred by October 17 and 90% of the time by October 21. These results suggest that freeze-drying is a concern only in very severe years as high as 6000 feet elevation. A hard freeze could occur early at higher elevations, but likely would not be significantly earlier in the year than the dates indicated by the Harl Butte data.

Drought Prognosis: In September, this area of Idaho and Oregon is expected to have below average precipitation (fig 10). Over the next 90-days, through November, current predictions are for warmer and drier than average. Over this same period drought conditions are expected to persist (fig 11).

There are very few towns with National Weather Service Observer stations present, making it difficult to determine precipitation probabilities. Riggins, Idaho, at the confluence of the Little Salmon and Salmon Rivers, provides the data closest to the fire and approximately representative of conditions along the Snake River. Halfway, Oregon is somewhat

representative of the mid-elevations. The precipitation probabilities minimal chances of precipitation from late July into mid-August and a precipitation event in mid-August (fig. 12). Unfortunately, it appears that this precipitation event will not occur this year (see short-term outlook).

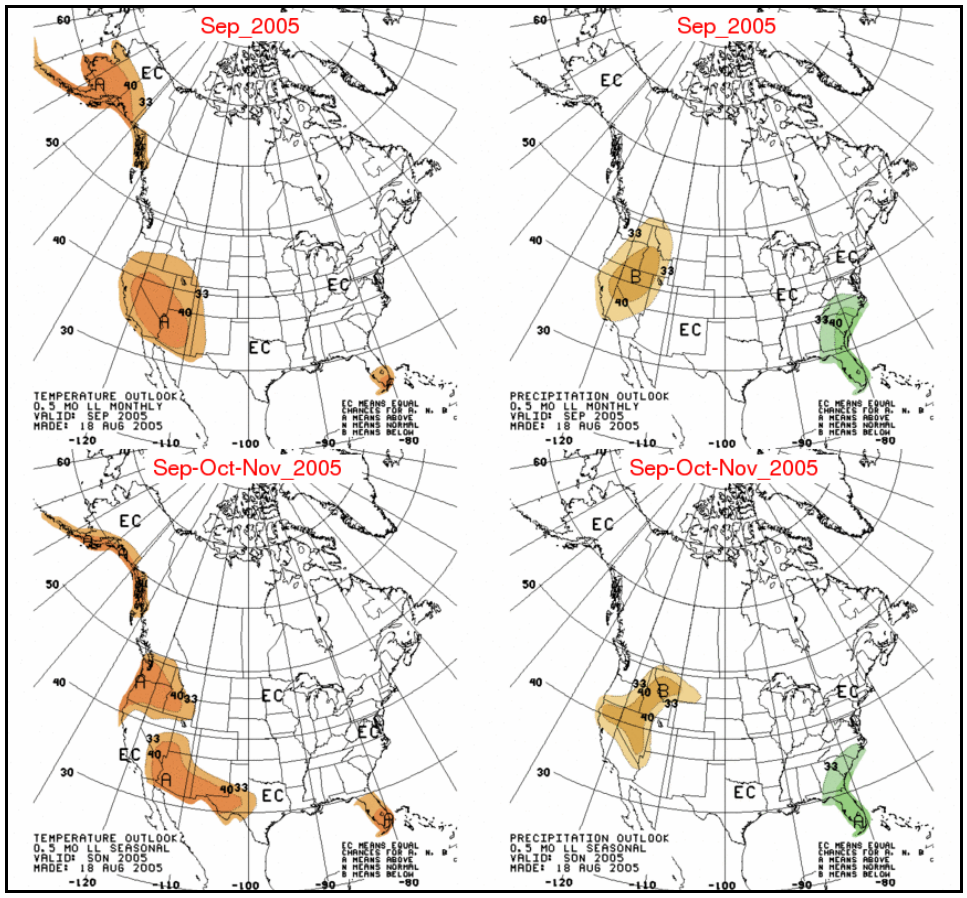

Figure 10. The Hells Canyon area is forecast for a 40% chance of below average precipitation in September and a 40% chance of above average temperatures and below average precipitation through November.

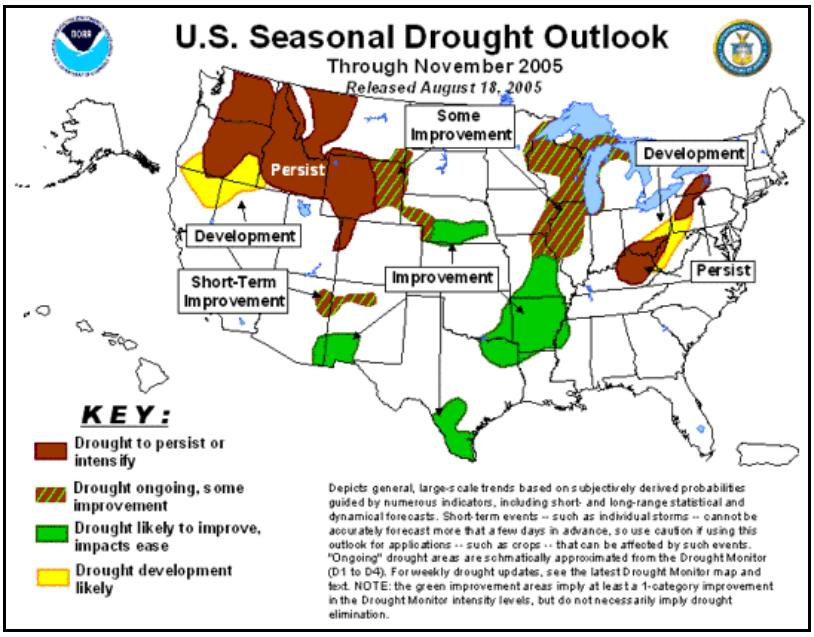

Figure 11. Drought conditions are expected to persist in Idaho and much of eastern Oregon through November.

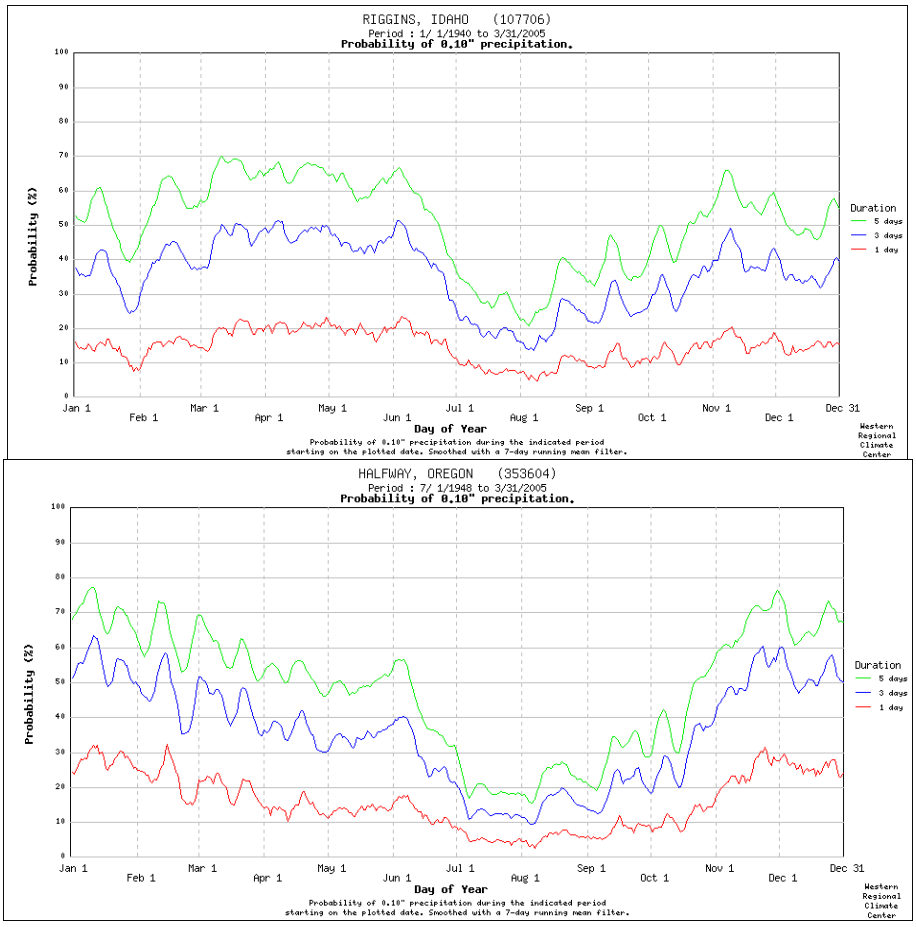

Figure 12. The probability of precipitation events is somewhat higher at Riggins than Halfway.

Long-Term Risk Assessment

RERAP

The RERAP tool is used to estimate the probabilities of the fire reaching specified points of concern based on climatological weather and descriptions of the fuels and environmental conditions along the approximate fire path. The model requires use of several assumptions that simplify the fire environment in order to manage the computations required. Two additional assumptions include:

- The weather and fuels information used is representative of the area analyzed.
- No suppression actions are taken to slow or halt fire spread.

This assessment was to estimate how probabilities change over time should the fire reach the area near the confluence of Clarks Fork and Sheep Creek and burn towards the MMA boundary at Cold Springs Saddle to the northeast (fig. 13). We used Harl Butte's weather data as the most representative of the elevations involved. The drawback to this weather station is the relative scarcity of southwesterly winds as compared to many other, lower elevation, stations in northeast Oregon and north-central Idaho. The percentile weather used spread component and south, southwest, and west winds to derive fuel moistures and the 20-foot wind speeds for low, moderate, high, and extreme burning conditions. Climatological probabilities were not adjusted.

Hours of spread by time period were adjusted in an attempt to 'push' the fire to the point of concern with a goal of estimating the highest probability. Given the simplification of the fire environment required, the actual probability is expected to be less than the calculated probabilities. Counteracting this approach is the scarcity of wind observations in the direction modeled. Exactly how these two factors interact is unknown, lowering the confidence level of this analysis to moderate.

We conducted three analyses, differing only by assessment date (table 3). The results indicate a steep decline in risk after the end of August. In all cases, common daily spread is not sufficient to reach the MMA boundary. Instead a rare event is required. In the remainder of August, that rare event would likely be a thunderstorm downdraft, while in September and October it would be dry cold front passage. The probability of the rare event is lowest in the remainder of August and in October, and highest in the second half of September. These results are in keeping with the previous analysis on large fire growth events.

Table 3. Risk of fire movement from near Sheep Creek to Cold Springs Saddle.

Assessment Start Date	Total Probability	Aug 16-31 Probability	Sep 1-15 Probability	Sep 16-30 Probability	Oct 1-31 Probability
Aug 24	31%	1%	11%	17%	2%
Sep 7	12%	N/A	1%	8%	3%
Sep 21	1%	N/A	N/A	0%	1%

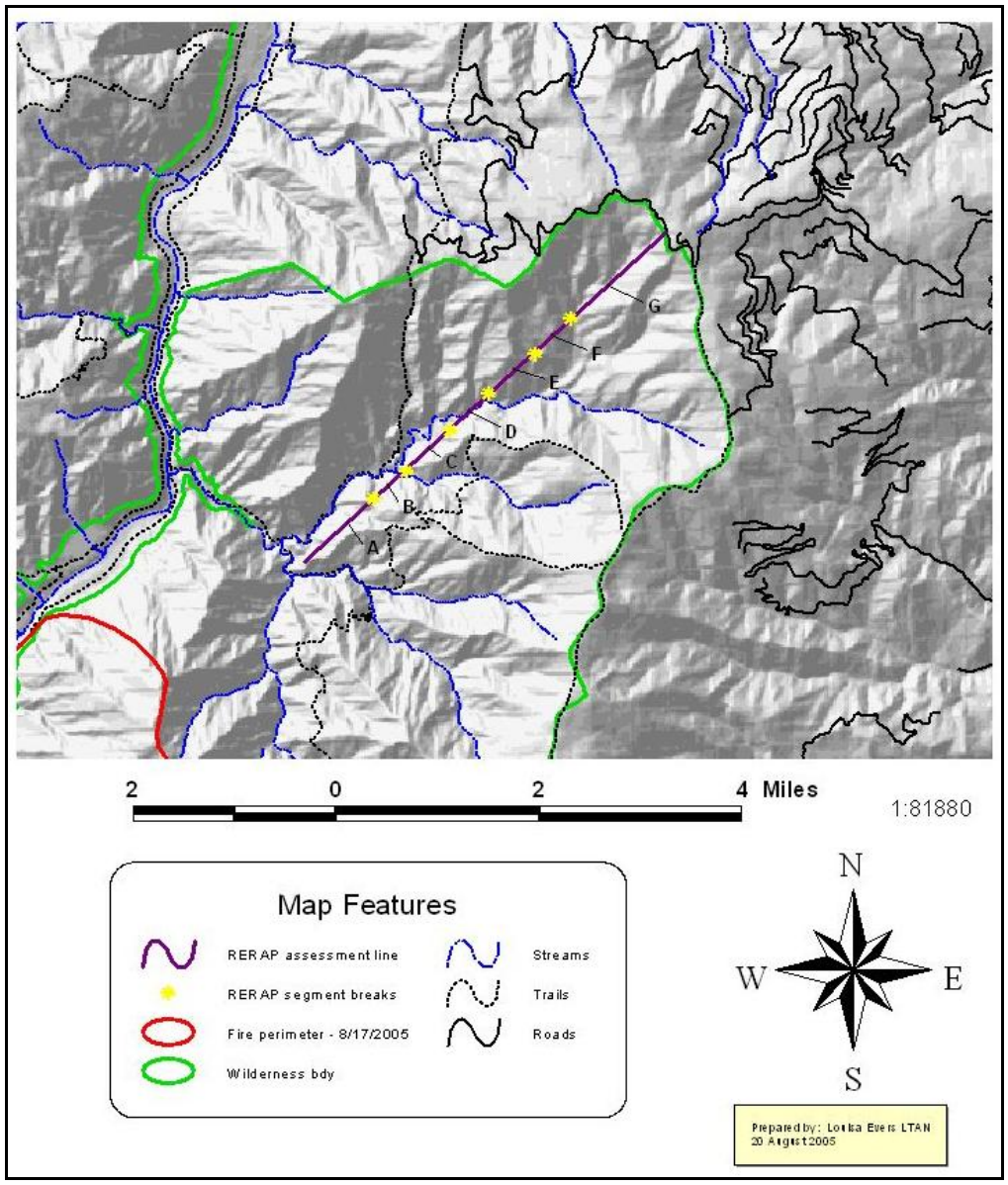

Figure 13. The fire has a 31% chance of reaching the MMA boundary should it be established at the beginning of segment A by August 24.

Minimum Travel Time

We conducted several minimum travel time analyses in FlamMap to determine what pathways the fire is most likely to follow under certain types of winds. A line of fire was initiated using the northeast part of the fire perimeter as of August 17. This line of fire was subjected to a 30 mph wind, at 20 feet above the vegetation from three different directions that correspond to two types of high wind events. We ran all analyses for 25 hours (1500 minutes) in order to get obtain pathways long enough to indicate probable spread directions. In the first two analyses, we looked at the southwest winds typical of conditions ahead of a dry cold front and at the northwest winds typical of conditions just after the front has passed (fig. 14). Under the influence of pre-frontal winds (southwest), the fire moves very slowly towards Sheep Creek and the West Fork of Sheep Creek, but does not reach either one. Under the influence of post-frontal winds (northwest), the fire moves more

rapidly, reaching Sheep Creek from Sawyer, Bear Trap, and Goat Rocks Creeks. It crosses the West Fork of Sheep Creek and toward East Fork Sheep Creek. The fastest pathways are westerly instead of southeasterly. Drainage alignment appears to have some channeling effect on fire movement to the east, at least below the confluence of West Fork and East Fork of Sheep Creek.

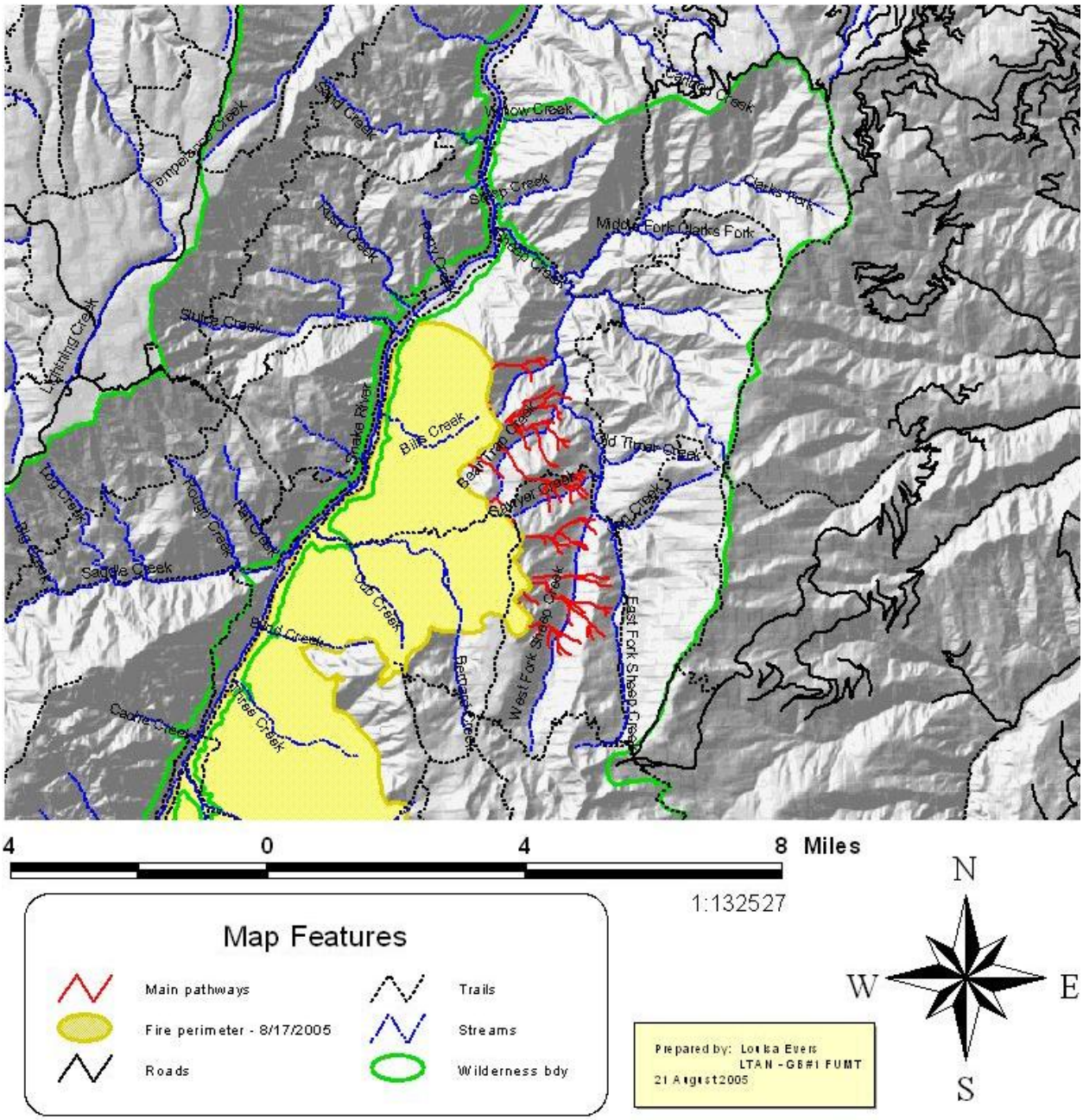

Figure 14. Under the influence of post-frontal winds, fire movement tends to be restricted in the north and somewhat to the east.

The third analysis examined what influence marine push winds would have on potential fire movement (fig. 15). According to local fire personnel, very strong marine push events will reach as far east as Hell's Canyon. Marine push refers to an abrupt transition from warm continental air to cooler marine air in western Oregon (high pressure breakdown). This

event usually brings clouds, cooler weather, and possibly light rain into western Oregon, but very strong west winds in eastern Oregon. Occasionally these winds reach as far as Hell's Canyon. Marine push winds have driven many large fire growth events in the eastern Oregon Cascades and a few in the Blue Mountains.

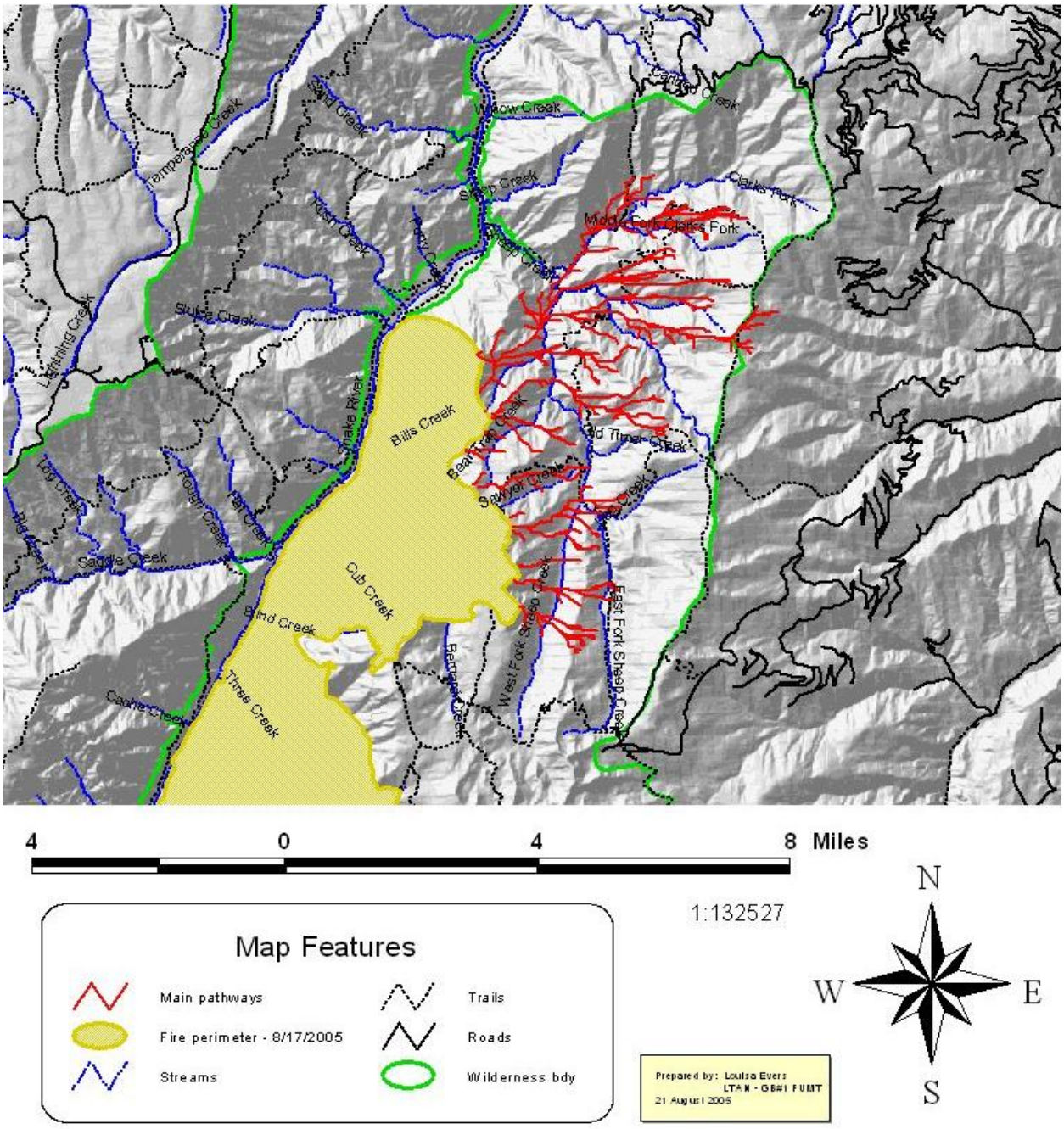

Figure 15. Strong west winds help the fire move to the east up Clarks Fork and Lightning Creek.

Under marine push conditions, the fastest pathways lie down Goat Rocks Creek and up Clarks Fork and Lightning Creeks, potentially threatening the MMA boundary. The fire also moves readily up Old Timer Creek towards the MMA boundary. The westerly winds help

keep the fire from moving readily down Sheep Creek towards the Snake River. Fire spread overall moves further east than under strong northwest winds.

Maximum Manageable Area: Description of Segments, Threats, and Mitigations

A Maximum Manageable Area (MMA) was determined for the incident. The MMA describes the maximum area within which the fire may be managed. The MMA delineates the geographic limits of the fire area as defined by the capability of management actions to meet resource objectives and mitigate risk for a given wildland fire managed for resource benefits. We divided the MMA into five segments, designated I through V (see map in Appendix A). These segments are based on threat of fire advancement towards them, natural defensibility, and landmarks.

We also identified management action points, which are tactical decision points. Management action points may be either geographical points on the ground both inside and outside the MMA or specific points in time where an escalation or alteration of management actions is warranted in response to fire activity, proximity to identified threats, time of season, weather changes, or management decisions. These points are tied to identified threats in the plan. Each management action point will have one or more corresponding mitigation actions described which will need implementation when the fire reaches it or after a specified time period. Appendix A includes management action point descriptions, recommended actions and actions taken to date.

When implementing the actions specified in the MAP descriptions, take advantage of opportunities where checking actions would likely succeed. The best opportunities occur when the fire is burning in grass where tree canopies are open or not present. Anchor the fire to rocky areas or cold black. Checking actions are not likely to succeed during the heat of the day when the fire is spreading rapidly and burning with high intensity relative to the fuel type involved. Checking actions are most likely to succeed when weather has moderated and fire intensities are lower. Because of very dry 100- and 1000-hour fuel moistures, bucket work in forested areas has proven ineffective.

SEGMENT I

Description: Segment I begins at the confluence of Saw Pit Creek and the Snake River. It extends north along the Snake River to its confluence with Sheep Creek. This segment is naturally defendable by the Snake River.

Threats: There are no threats to this segment. Local fire personnel report that no fires have ever spotted across the Snake River within the Hells Canyon NRA.

Mitigation: Monitor the west edge of the fire by aircraft and jet boat using a wildland fire use module, the Hells Canyon River Ranger, or local fire management resources.

SEGMENT II

Description: Segment II begins at the confluence of the Snake River and Sheep Creek, extends north along the Snake River to the first ridge north of the mouth of Willow Creek. It then turns east following the wilderness boundary to road 1819, then follows road 1819 east to road 420. From the intersection of roads 1819 and 420, the segment turns south along road 420 to the electronic site and Boise Trailhead (trail 101). The portion of the segment along the Snake River is naturally defendable; the remainder of the segment is not.

Threats: There are no threats to that portion of the segment along the Snake River. The portion of the segment along the northern wilderness boundary up to Cold Springs Saddle consists of grass 2-3 feet tall, continuous, and cured, and can carry fire readily across the

boundary. West of Low Saddle, the grass has no overstory. South of Cold Springs Saddle, fuels resemble those in Segment III, with variable risk to the MMA boundary.

On the western half of this segment, the MMA boundary is likely to be breached if attempts to halt or slow fire progress are unsuccessful, temperatures remain high and relative humidity's remain low. Grass slopes on the south aspect, located on the north side of Sheep Creek, combined with topographic features, make fire spread north to the MMA/ wilderness boundary a high probability if the Granite Fire were to cross Sheep Creek. Fire in the lower third of Sheep Creek would require immediate actions to prevent breaching the MMA. If the fire crosses Sheep Creek anywhere from Sheep Creek Ranch east to the confluence of Sheep and Lightning Creek, there is potential for fire to reach the MMA within 2 hours.

Fire spread from the upper 2/3 of Sheep Creek, west of Middle Ridge, presents a minimal risk to this segment. On the eastern/ southern end of this segment, threats to the MMA are low.

Mitigation: We developed two MAPs intended to prevent the fire from reaching the MMA boundary.

MAP 5: Management action point 5 begins at the junction of trails 53 and 58 in the bottom of West Fork Sheep Creek, follows trail 58 west to McGaffee Cow Camp, then turns northwest following the primary ridge to Sheep Creek Point, then turns west down the ridge north of Goat Rock Creek to Drop Point 3 in Sheep Creek.

If fire crosses this MAP, initiate bucket drops or retardant drops to slow fire progress to the north and northeast. Use type 1 or type 2 helicopters to drop water to check fire spread towards Sheep Creek in the grass fuels, basing the timing of operations on the information provided at the beginning of this section. On the lower slopes, use a Fire Use Module for direct or indirect holding actions. Initiate a burnout south of Sheep Creek from its confluence with the Snake River to the confluence of Clarks Fork (DP2), supported with hose lays from small portable pumps. Burn out only if fire was certain to impinge on Sheep Creek. The burnout could be extended to the base of Clarks Ridge to preclude fire from moving to the northwest corner of the MMA. Using the information provided at the beginning of this section, assess opportunities to check fire spread in the grass, anchoring to rocky areas and cold black.

MAP 6: Management action point 6 begins at the mouth of Sheep Creek and runs east to the confluence of Sheep Creek and Clarks Fork, turns southeast along a ridge to trail 53, and then follows 53 south to the junction with trail 58 located in the bottom of West Fork Sheep Creek.

Using the information provided at the beginning of this section, assess opportunities to check fire spread in the grass, anchoring to rocky areas and cold black. Evaluate opportunities to halt the northward spread of the fire using east-west ridgelines such as those associated with Log, Old Timer, Lightning, and Clarks Fork for holding or burnout operations and 'herding' the fire towards the Boise Trail. If the fire crosses MAP 6, mobilize the resources identified in the Contingency Plan for this segment and immediately launch three type 1 helicopters with an appropriate aerial supervision platform to drop water along the fire edge in order to check the spread of fire.

SEGMENT III

Description: Segment III begins at the Boise Trail head (trail 101) and runs south along the main ridge to Heavens Gate parking area, and then follows the Heavens Gate road south to Windy Saddle. This segment is no longer naturally defendable, as grasses, sedges, and woodrushes in the large openings along much of the ridge have cured.

Threats: Fire can easily cross the MMA boundary where grasses and sedges have cured. Areas dominated by shrubs under a forested canopy cannot easily carry fire as of August 23 as live fuel moistures remain too high. Areas where downed woody fuels and pine litter are continuous can also carry fire easily across the MMA boundary. Areas where downed woody fuels and pine litter are not continuous or consist of light loadings are not expected to carry fire readily at this time. Crowning and spotting can also carry fire across the MMA boundary where fuels, slopes, and winds are aligned, particularly on steep south and west aspects with a subalpine fir-dominated forest. Areas burned out in 1996 are not expected to readily carry fire until after the first killing frost.

Mitigation: There are two MAPs in this area:

MAP 4: Management action point 4 begins at the junction of trails 57, 124, and 140 just north of Lily Pad Lake and follows trail 140 north to McGaffee Cow Camp. If fire crosses this MAP, begin bucket or retardant drops to slow fire progress to the north and east. Using the information provided at the beginning of this section, assess opportunities to check fire spread as the fire approaches the crest of Middle Ridge, using rock barriers and the 1996 fire scar on the south end of the ridge.

MAP 7: Management action point 7 begins at the south end of trail 53 west of Windy Saddle and follows the trail north along the East Fork of Sheep Creek to the junction of trails 53 and 58. If the fire crosses MAP 7, mobilize the resources identified in the Contingency Plan for this segment. Use single-engine air tankers (SEATs) and bucket drops from type 1 helicopters to slow or halt fire spread at it emerges into the grass to the west of the Boise Trail. Take advantage of changes in fuel type and live fuel moistures and old fire scars to anchor the operations.

SEGMENT IV

Description: Segment IV begins at Windy Saddle and follows the wilderness boundary south to where trail 113 is located near Rapid River. This segment is located on the east side of the Seven Devil Peaks. Much of this segment is naturally defendable.

Threat: Continuous and cured grasses and sedges dominate the area near Windy Saddle.

Mitigation: One management action point was designated for segment IV.

MAP 3: Management action point 3 begins at Horse Heaven Cabin and follows Seven Devils Ridge north-northeast to Sheep Lake then trail 123 northwesterly to the junction of trails 57, 124, and 140, just north of Lily Pad Lake. If Granite Fire crosses MAP 3 use a type 2 helicopter with bucket and a Fire Use Module to halt fire spread toward the MMA. Using the information provided at the beginning of this section, assess opportunities to check fire spread toward the MMA boundary, anchoring to rocky areas, recent burn scars, and cold black. Assess the need to implement structure protection plans for the Windy Saddle facilities.

SEGMENT V

Description: Segment V begins at trail 113 near Rapid River

Threat:

Mitigation:

MAP 2: This MAP begins at Horse Heaven and proceeds south on trail 214 to the junction of trails 214 and 113, then turns west along Anchor Creek to Granite Creek, then northwesterly along Granite Creek for approximately 2 miles, then southwest and up slope out of Granite Creek to the head of Brush Creek, then west down Brush Creek to the Snake

River. This MAP was developed early in the incident when the MMA boundary was anticipated to fall along the southern wilderness boundary, and is no longer in use.

Other Threats and Mitigation Actions

Firefighter Safety

Description: Much of the area within the MMA consists of extremely steep slopes, 50% and greater, with grassy vegetation at the lower elevation, transitioning to forested slopes at the upper elevations. There are extensive areas of the slopes that are covered with loose rock. Riparian vegetation is typically dense and difficult to walk through, with high amounts of poison oak and poison ivy and high concentrations of rattlesnakes that are attracted to the water. The MMA includes numerous areas previously burned and containing high numbers of standing dead trees. Summer temperatures at the lower elevations along the Snake River can reach up to 113° during the day, and lightning storms occur on a frequent basis through August. Access into the river area is by trail, jet boat, or helicopter.

Threat: Fire behavior-related threats to firefighter safety include very high spread rates in grass, crowning runs and spotting in forest, erratic winds and gustiness affecting fire spread direction and rate, and indirect tactics dictated by terrain and fuel types. Environmental hazards to firefighter safety include rolling rocks and trees, snags, steep slopes, poor footing, bees, rattlesnakes, poison ivy, periodic lightning, and hot, dry weather.

Aviation operations include risks such as temperatures that produce high density altitudes, multiple aircraft, low-level flights in extreme terrain, long-line bucket work, and power-lines and dusty roads close to the helibase.

Travel on the Snake River involves fast-moving water, rapids and standing waves, and other powered and un-powered traffic on the river.

Mitigation: Adhere to the 10 Standard Fire Orders, 18 Situations and other fireline safety policies and procedures. Limit firefighter exposure to rolling material and steep terrain whenever possible. Ensure that lookouts, communications, escape routes, and safety zones (LCES) are established and maintained prior to engaging in all operations. Inform firefighters situations where bees, snakes, and poison ivy are likely to be encountered and proper avoidance techniques. Ensure adequate hydration, particularly when working for extended periods in temperatures over 90^{o}.

Adhere to the Interagency Helicopter Operations Guidelines (IHOG) in aviation operations and identify aviation hazards such as rock outcrops, power lines, etc. Identify areas that should be avoided for safety reasons. Adhere to temporary flight restrictions (TFRs) assigned to surrounding fire incidents and all notice to airmen (NOTAMs). Identify flight hazards and inform pilots and relief pilots of those hazards.

Follow approved procedures for water travel, including use of the appropriate personal protective equipment. Obtain a safety briefing from the boat operator. Maintain safe distances from other watercraft on the river. Follow boat operator instructions when traveling through rapids and standing waves.

Public Safety

Description: The upland area within the MMA is a popular with backpackers and equestrian users. Heavens Gate is a popular day use area and Windy Saddle a popular trailhead. There are cattle permitees within the area. Boaters and rafters use the Snake River heavily through summer and well into fall, launching at Pittsburg Landing, Hells Canyon Creek, and Clarkston, WA and Lewiston, ID.

Threat: Rapid fire spread can trap hikers, equestrian users, and permitees moving livestock in the upland areas, potentially leading to a burn-over and, in the worse case, fatalities. Snags falling after fire passage can block trails and hit people, stock, and camps,

causing injuries and fatalities. Trail 124 is of special concern if the fire establishes in the bottom of Sheep Creek. Helicopter operations close to the river attract sight-seers who may venture too close to the aircraft or bucket. Rolling material and slides originating out of the burned area can hit people traveling close to shore, temporarily on-shore, camping within the fire area along the river. Dense smoke, ash, and ember fallout can affect health and personal property of visitors.

Mitigation: Detailed information on visitor management is located in Appendix D. Keep hikers, equestrian users, and permitees informed on fire activities and the trail conditions (snags and blow-down). Inform visitors on fire behavior and activity along trail 124 from Windy Saddle to the Iron Phone intersection when the fire is burning in Sheep Creek. Post information personnel at Windy Saddle to make public contacts and inform public of possible hazards of fire in the higher elevation through the use of Wilderness Rangers. Use River Rangers and firefighters to inform boaters of potential hazards while floating by the fire area. Make helicopter pilots aware of high river use. Electronically mail safety brochures to portal locations for visitor use.

Air Quality

Description: The Hells Canyon National Recreation Area, including Hells Canyon Wilderness, is classified as a Class I area. The remainder of the MMA is in a Class II area. The nearest PM10 nonattainment area is La Grande, OR.

Threats: Dense smoke settling into the river corridor can affect visitors with impaired lung function and small children. Prolonged exposure to dense smoke can affect the health of river guides and campers. Dense smoke limits visibility from the river level and trails on lower and middle slopes, only rarely are inversions deep enough to affect visibility above 6000 feet. Nighttime smoke tends to settle along the Snake River and move northward, potentially affecting popular use areas, in-holdings along the river, and communities. The La Grande non-attainment area may be affected by smoke drift to the west, although prevailing winds tend to carry smoke to the east where it may affect visibility in the Selway-Bitterroot Wilderness or Frank Church – River of No Return Wilderness, additional Class 1 areas, communities along the Salmon River, or communities on the Camas Prairie.

Mitigation: As needed, issue smoke advisories to warn local communities and river users of the potential for dense smoke and possible health effects. Monitor smoke trajectories from the ground and air using fire effects monitors or other trained personnel and administrative flights. During large smoke events, photograph smoke columns and trajectories from the ground and air at several locations and save visible satellite images at either 1 km or 4 km resolution (see http://www.wrh.noaa.gov/boise/satellite.shtml). Track all smoke complaints received. Compare actual trajectories with those forecast through BlueskyRAINS (http://www.blueskyrains.org/). Data on particulate matter concentrations in Grangeville and Lewiston is available at http://www.deq.state.id.us/air/aqindex.cfm. As needed, estimate fuel consumption and emissions production using CONSUME, NFSPUFF, FOFEM, or other emissions models.

Cultural Resources

Description: Several rock art sites (pictographs and petroglyphs) occur near the river, with most found in overhangs and damp areas often free of organic material. Rock cairns that may indicate historical and prehistorical burial sites occur along ridge tops and open areas.

Threats: Rock art is not expected to be affected by the fire, but may be damaged by suppression actions from ground personnel where hose lays are used to suppress the fire

edge. Rock cairns and the area around them could be damaged by fireline construction or other ground-disturbing suppression actions.

Mitigation: Ground personnel using hoses should avoid spraying visible rock art areas and underneath overhangs. Minimize impacts to ground disturbance around rock cairns and potential burial sites. Maintain close contact with Zone Archeologist Keith Miller to assist in identifying the location of these sites.

Threatened, Endangered, and Sensitive (TES) Species

Description: Species federally listed as threatened or endangered include Chinook salmon, steelhead, and bull trout. These species occur in the Snake River and lower Sheep Creek.

Threats: Retardant and foam concentrate entering Sheep Creek and the Snake River could kill fish. Activities that introduce sediment and petroleum products into Sheep Creek could damage spawning and rearing areas and kill young fish.

Mitigation: Adhere to PACFISH/INFISH Standards in Appendix C. Use low-impact technologies and techniques when constructing fireline to minimize the potential for introducing sediment into water. Limit bucket dipping and pump sites in Sheep Creek to deeper pools where impacts to fish will be lowered. Place spill pads under drip torches, fuel cans, and pumps to catch fuel spills. Screen foot and intake valves to prevent fish from being crushed against the intakes. Maintain communications zone Fish Biologist Ken Bronec (541-426-5682) to identify areas of concern.

Wilderness

Description: A portion of the Hells Canyon Wilderness lies within the MMA.

Threats: The highest threat to the wilderness is from suppression action, which would disrupt the natural processes associated with fire. Low-level flights, use of motorized equipment such as chainsaws and small pumps, encounters with fire crews, and encountering constructed fireline may adversely affect visitors' wilderness experience, particularly in the north half of the fire.

Mitigation: Follow minimum impact suppression tactics (MIST) procedures outlined in the Incident Response Pocket Guide (PMS#461) in all fire management activities within the wilderness. Use natural barriers and trails to the extent feasible. Use the minimum tool analysis process to determine when motorized or mechanized equipment is needed to meet tactical and strategic objectives. Document the extent and duration of low-level flights and use of motorized and mechanized equipment.

Structures

Description: Four sites within the MMA and some sites outside the MMA contain historical cabins and structures used administratively or by visitors. Appendix B details the locations, conditions of the structures, and priorities for protection.

Threats: Fire can destroy structures or damage the structural integrity, including exterior and interior materials, site layout/location, landscape features, and other elements of historical sites.

Mitigation: Identify structure locations and set trigger points to allow enough time to assess and provide protection of structures well in advance of fire. Develop structure protection plans historical structures potentially affected. Wrap structures when necessary and protect immediate areas with hose lays or bucket drops. Minimize the amount of disturbance to the area around historical cabins. Management action point 1 was developed by the Forest to protect McGaffee Cabin.

MAP 1: MAP #1 is a line that extends from the confluence of Saddle Creek and the Snake River along the primary ridge east to Dry Diggins Lookout, south of Bernard Creek.

If fire crosses MAP 1, which is a line that extends from the confluence of Saddle Creek and the Snake River along the primary ridge east to Dry Diggins Lookout, south of Bernard Creek, initiate action at the McGaffee Cabin site to protect the structure. Actions would include covering the structure with shelter wrap and burning out to remove flammable fuels adjacent to the structure.

Other Wildlife

Description: The Idaho Fish and Game Department regularly stocks the high elevation lakes with catchable trout.

Threats: Reduction of lake levels can significantly reduce available habitat for trout and trout prey and may result in fish kills.

Mitigation: When dipping out of high elevation lakes, use deeper lakes and monitor water levels. If lakes show signs of stress from dipping, identify alternative lakes for dipping.

Resources Needed to Manage the Fire and Estimated Costs

While the fire is actively burning and posing a high threat to the MMA boundary in one or more locations and weather conditions remain above seasonal averages, a national Fire Use Management Team will manage Granite Complex, along with appropriate additional resources (table 4). As fire activity or threats to the MMA boundary or other resources fall, a qualified FUM2 and type 3 level of organization. Single resource needs for continued management will be dictated by the amount of fire perimeter growth anticipated daily.

With the current and expected volume of large fire incidents within the Pacific Northwest, opportunities for short term re-assignments within the geographic area to assist in rapid filling of needed single resources will continue. The FUM2 should work closely with Northeast Oregon Dispatch and the Wallowa-Whitman FMO to assist in coordination and communications with the Northwest Coordination Center and nearby large incidents.

Table 4. Recommended resources required to manage the Granite Complex Fire Use based on different scenarios.

	Season Ending Event 10/03 **Low Threats to all Segments**	**Season Ending Event 10/03** **Low to Moderate Threats to all Segments**	**Season Ending Event 10/17** **High Threat to at least one Segment**
Resources After 8/27	FUM2 (ICT3 quals) FUM2 (T) 1 T3 Helicopter with Module Forest T2 Helicopter Available for CWN missions 1 Fire Use Module 1 Safety Officer 2 Wilderness Rangers 2 Information Officers	FUMT 1 T3 Helicopter with 1 T2 Helicopter with Module 1 Fire Use Module 2 Wilderness Rangers 3 Information Officers 2 Resource Advisors	FUMT 1 T3 Helicopter with Module 1 T2 Helicopter with Module Forest 1 T1 Helicopter Available for CWN missions 1 Fire Use Module 2 Wilderness Rangers 3 Information Officers 2 Resource Advisors
Estimated Cost thru 8/27	$567,000	$567,000	$567,000
Cost per Day from 8/28 to Season Ending Event	$16,666	$26,222	$29,080
Total Estimated Cost	$1,117,000	$1,511,000	$2,021,000

Contingency Actions

The actions described in the Wildland Fire Implementation Plan (WFIP) are designed to maintain the Granite Complex within the boundaries of the MMA. Mitigation Actions subsection of the plan a series of steps is explained with management action points and associated actions that would be expected to keep the fire in check. As with all wildland fires, there is a degree of uncertainty that exists based upon weather factors.

If the fire crosses the MMA boundary at any point along the perimeter, use resources described under the MAPs to achieve control. Table 5 lists the resources that would be needed if control actions described under the Threats section fail. If it appears that control cannot be accomplished within 48 hours, the fire must be declared a wildfire, and a Wildland Fire Situation Analysis prepared to select the proper strategic alternative and necessary resources.

Table 5. Contingency resources needed by segment and basic strategy.

Segment	Resources by Kind and Type							Strategy
I								No issues requiring strategic planning
II MAPs 5 & 6	2 T2 IA handcrews	T6 engine strike team	3 water tenders	DIVS & ATGS	1 T2 helicopter w/bucket	2 T1 helicopters w/bucket		If fire breaches the MMA between the Snake River and the western end of the FR 1819, there are few holding points. T1 helicopters would be needed to check fire advance in the grass fuels taking advantage of ridges and natural fuel breaks to allow time for a Holding Group to be assembled. The Holding Group would use the road and trail system north of the MMA in the NRA to initiate an indirect holding strategy. Safety zones are limited. The Group should consist of pre-arranged local area resources to minimize mobilization time.
II MAPs 5 & 6	2 T2 IA handcrews	T6 engine strike team	2 water tenders	DIVS & ATGS	1 T2 helicopter w/bucket	1 T1 helicopter w/bucket	3 SEATs	If fire breaches the MMA between the west end of FR 1819 and the Boise Trail trailhead (south end of FR 420) a combination of direct and indirect holding actions would need to be conducted. Safety zones are limited. The Group should consist of pre-arranged local area resources to minimize mobilization time.

Segment	Resources by Kind and Type							Strategy
III MAPs 4 & 7	1 T2 IA handcrew	4 T3-4 engines	2 water tenders	DIVS & ATGS	1 T2 helicopter w/bucket	1 T1 helicopter w/bucket	3 SEATs	If fire breaches the MMA between the Boise Trailhead (south end of FR 420) and Windy Saddle a combination of direct and indirect holding actions would need to be conducted. Safety zones locations are limited.
IV MAP 3					1 T2 helicopter w/bucket			If fire breaches the MMA along this segment the Type 2 helicopter with helitack module would support the FUM already assigned to Granite to perform direct and indirect holding.
V								No issues requiring strategic planning

Information Plan

The primary goal of the Information Plan is to ensure that elected officials, tribal leaders, citizens, key contacts, media, and employees receive accurate and timely information so that they understand the mission of the team, current status of the fire, and future incident plans.

The following activities are planned to meet the primary goal:

Prepare a fire information update daily that is sent to all employees, external/cooperating agencies, media, legislative offices, tribal leaders, local communities, adjacent land owners, and other interested parties on a regular basis. The update will include the current status, detailed map, anticipated planned actions, and other pertinent information regarding such things as smoke management, structure protection, and closures of facilities, roads and trails.

Include messages in the daily update that stress fire use objectives and pre-planning that allows this type of fire to only burn naturally within predefined, designated areas – these concepts are not always well understood or accepted.

Post handouts, maps and other important details on the agency website. Link to other websites as necessary.

Schedule and conduct public meetings when appropriate. Coordinate with the local hosting agency for agenda, handouts, location, and timing.

Order sufficient IOF staffing to station personnel at Riggins that could post updates in all the communities north and south of Riggins, man the trailhead at Windy Saddle to contact users in the Seven Devils area, and to send updates to the forest for inclusion in their forest-wide fire information update and post on the forest web site.

Monitoring and Post-Burn Evaluation

During the incident, document fire weather, fire behavior, fire progression, and smoke dispersal and volume. As needed, sample live fuels to track changes in live fuel moisture over the life of the fire. Monitoring locations will depend upon the fire activity of individual fires and threats from that fire. Base the monitoring frequency on the level and location of fire activity. Track public and internal responses to smoke and management activities.

Table 6 lists monitoring items specific to the incident objectives and approximate contents of the evaluation report. The Forest will need to complete some items after the fire is out.

Table 6. Specific monitoring actions for the incident objectives and approximate contents of the evaluation report(s).

Objective	Monitoring	Evaluation
Firefighter safety	Number of accidents, injuries, and incidents discussed in the After Action Reviews. Adherence to 10 standard fire orders, 18 situations, LCES, and 30-Mile Abatement Plan.	Document specific accidents and injuries. Summarize safety issues surfaced and how resolved.
Public safety	Number of incidents, accidents, and injuries directly related to the fire or management actions taken on the fire. Number of entrapments and number of people involved. Number of trail, road, and area closures enacted, date implemented, and duration.	Summarize incidents involving members of the public and public response to closures.
Consistency with land use plans and FMPs	Check activities against standards and guidelines from land use plan and guidance in fire management plans.	Summarize and document specific instances where actions did not comply and mitigating circumstances or allowable exceptions.
Preserve wilderness qualities	Number and duration of low-level flights. Instances of motorized/mechanized use. Miles/chains of fireline constructed. Minimum impact tactics used. Use of minimum tool analysis	Summarize impacts relative to fire duration and any public concerns/complaints related tactics used.

Objective	Monitoring	Evaluation
Allow fire to function in natural role	Amount of suppression effort taken on the fire and location. Changes in FRCC	Summarize amount of suppression action taken and where. Conduct FRCC analysis and compare to pre-fire FRCC.
Protect fish and wildlife habitat from suppression-related adverse effects	Spills or drops of retardant, foam concentrate, or petroleum products into Sheep Creek or its tributaries and the Snake River. Lakes used for dipping and changes in lake levels resulting from dipping.	Summarize incidents and any known effects on fish populations.
Protect significant historic and prehistoric structures and sites	Protection measures taken and success.	Summarize and analyze probable reasons for any failures of protective measures.
Coordinate with potentially affected stakeholders	Daily updates provided and form of updates. Number of public meetings and attendance. Number of direct contacts with potentially affected individuals and groups.	Summarize and document any concerns or complaints about lack of sufficient information.

Signatures

Prepared by: _____ _____

Gary Cones, Incident Commander — Date

Approved by: _____ _____

Steve Ellis, Forest Supervisor — Date

Wallowa-Whitman National Forest

Approved by: _____ _____

Mark Madrid, Forest Supervisor — Date

Payette National Forest

PERIODIC FIRE ASSESSMENT INSTRUCTIONS

The Periodic Fire Assessment is a process to prevent the unchecked escalation of an individual fire situation or the total fire management situation without evaluation and adequate planning. Part 1 evaluates the capability to continue implementation of the appropriate management response to this fire for achieving resource benefits for a specified period following the assessment i.e., the next 24 hour period or longer, depending upon fire weather and fire behavior forecasts or other anticipated conditions. This assessment will be completed and periodically reviewed for validity. The "assessment frequency" box on page 1 specifies the frequency of assessing the particular fire. Assessment frequencies will be set by the local unit but are recommended to range from every day to every ten (10) days depending on the fuel type and geographic location of the fire. Recommendations for minimum assessment frequency include the following: Grass fuel types = daily; shrub and timber fuel types = every 1 – 5 days; Alaska = every 1 – 10 days.

The "valid date(s)' box is inclusive of those dates where the assessment remains valid, as indicated by the dated signature. When any decision elements change from "No" to "Yes", a new checklist must be completed for documentation purposes. A "Yes" response to any element on the Part 1checklist indicates that the selected appropriate management response is not accomplishing or will not accomplish desired objectives and that a new strategic alternative should be developed immediately through the use of a Wildland Fire Situation Analysis (WFSA).

The Periodic Fire Assessment, Part 2 is a process that must be completed periodically for all wildland fires managed for resource benefits that do not have a completed WFIP Stage III. For isolated ignitions in fuel-limited situations, Part 2 does not have to be completed. When completing Part 2 of this checklist, if the chart indicates that WFIP Stage III is needed, it must be prepared within 24 hours.

When units establish monitoring and assessment frequency, it may be appropriate to develop a "step-up" system based on fire size or levels of fire activity. Then, as an individual fire gets larger or becomes more active, the monitoring and assessment frequency can correspondingly increase. Conversely, as fire activity lessens and fire size increases become less common, monitoring and assessment can "step-down" and become less frequent. Units must identify standards and rationale for establishing assessment frequency, especially "step-up" and "step-down" actions. If fire size is used as a determinant, then past burning rates should be used to formulate standards. If fire activity is used, then levels of burning (acres per day, etc.) must be definable and justifiable.

The Agency Administrator or delegated individual must sign the Signature Page on the specified assessment frequency.

PERIODIC FIRE ASSESSMENT

PART 1: RE-VALIDATION CHECKLIST

Decision Element	*Yes*	*No*
Is there a threat to life, property, or resources that cannot be mitigated?		
Are potential effects on cultural and natural resources outside the range of acceptable effects?		
Are relative risk indicators and/or risk assessment results unacceptable to the appropriate Agency Administrator?		
Is there other proximate fire activity that limits or precludes successful management of this fire?		
Are there other Agency Administrator issues that preclude wildland fire use?		
Do expected management needs for this fire exceed known capabilities?		

PERIODIC FIRE ASSESSMENT

SIGNATURE TABLE

		Fire can continue to be managed for resource benefits (wildland fire use action).	***Fire can continue to be managed under the short-term Implementation Action.***
Assessment Frequency			
Valid Date(s)			
Name/Title	***Date***	***Y/N***	*Y/N/NA*

Appendix A: Management Action Points

Management Action Point Table: Granite Complex

Management Action Point	Area of Concern	Action Needed	Remarks
MAP 1 Snake River at Saddle Creek to Dry Diggins Lookout	McGaffee Cabin	If the fire crosses MAP 1, initiate actions to protect McGaffee Cabin. Actions may consist of wrapping the cabin with fire shelter material, removing or reducing fuels, installing a hose lay, and burning out.	August 11th - rappellers inserted into McGaffee Cabin to begin structure protection. August 12 - fire crossed the MAP late evening. August 13 – bucket drops from a type 2 helicopter slowed fire progress and a partial burnout around the cabin conducted. August 14 - burnout operations around the cabin completed. Mop-up operations conducted around the cabin between August 14 and 18, and the shelter wrap reinforced and left in place. Monitor the cabin site regularly until threats have diminished and wrap can be removed.
MAP 2 Horse Heaven to Snake River at Brushy Creek	MMA Segment V	MAP2 was intended to trigger actions to hold the fire within the first draft MMA.	This MAP is no longer in use. The final MMA boundary was moved well south onto the Payette National Forest.
MAP 3 Horse Heaven to Lily Pad Lake	MMA Segment IV	If the fire crosses MAP 3, use a type 2 helicopter with bucket and FUM to halt fire spread toward the MMA. Anchor to rocky areas, old burn scars, and cold black. Assess the need to implement structure protection plans for the Windy Saddle facilities.	

Management Action Point	Area of Concern	Action Needed	Remarks
MAP 4 Lily Pad Lake to McGaffee Cow Camp	MMA Segment III	If the fire crosses MAP 4, begin bucket and retardant drops to slow fire progress to the north and east. Check fire spread as the fire approaches the crest of Middle Ridge, using rock barriers and the 1996 fire scar on the south end of the ridge.	August 15 – fire crossed the MAP and is slightly over the ridge west of the West Fork of Sheep Creek. August 17 - Unsuccessfully attempted to check fire spread with 3 type 1 helicopters with ATGS supervision being provided by the Tryon Fire.
MAP 5 West Fork Sheep Creek to DP3	MMA Segment II	If fire crosses this MAP, use type 1 or type 2 helicopters to drop water and check fire spread towards Sheep Creek in the grass fuels. On the lower slopes, use a Fire Use Module for direct or indirect holding actions. Initiate a burnout south of Sheep Creek from the Snake River to DP2, supported with hose lays from small portable pumps. Burn out only if fire was certain to impinge on Sheep Creek. The burnout could be extended to the base of Clarks Ridge to preclude fire from moving to the northwest corner of the MMA. Assess opportunities to check fire spread in the grass, anchoring to rocky areas and cold black.	August 17 – fire crossed MAP 5. Aug 15-17 - Bucket drops with 2-3 Type I helicopters and aerial supervision (ATGS) used to slow fire progress. Resources provided by the Tryon Fire. August 23 – Used type 1 helicopter to check fire spread as it emerged from closed forest into open forest and grass. August 24 – Inserted a portion of Bandolier FUM to cold trail area of fire worked by type 1 helicopter the previous day.

Management Action Point	Area of Concern	Action Needed	Remarks
MAP 6 Mouth of Sheep Creek to Sawyer Creek	Segment II	If the fire crosses MAP 6, assess opportunities to check fire spread in the grass, anchoring to rocky areas and cold black. Evaluate opportunities to halt the northward spread of the fire using east-west ridgelines such as those associated with Log, Old Timer, Lightning, and Clarks Fork for holding or burnout operations and 'herding' the fire towards the Boise Trail. Immediately mobilize contigency resources identified for this segment and immediately launch three type 1 helicopters with buckets with an appropriate aerial supervision platform to check the spread of fire.	
MAP 7 Trail 53 from junction with trail 58 to Windy Saddle area	MMA Segment III	If the fire crosses MAP 7, mobilize the contingency resources identified for this segment. Use single-engine air tankers (SEATs) and bucket drops from type 1 helicopters to slow or halt fire spread at it emerges into the grass to the west of the Boise Trail. Take advantage of changes in fuel type and live fuel moistures and old fire scars to anchor the operations.	

Appendix B: Structure Protection

Structure Protection

There are several structures that may require protection in the event of large fire growth threatening the MMA. Protection actions for these facilities are summarized below. A detailed site plan for each facility is filed in the documentation package.

McGaffee Cabin

Historic

MAP 1

Lat-Long: 45° 24′ 02″ x 116° 29′ 43″

Actions: Cabin was wrapped, adjacent fuels burned out, monitored, mopped within 5 chains and monitored on site for four days post burnout until burn out within 5 chains declared cold. Unburned fuels remain inside the burnout line immediately adjacent to the cabin, but it is in a riprarian area. Wrap is scheduled to be removed and backhauled on August 25.

Sheep Creek Ranch

Historic

Lat-Long: 45° 28′ 00″ x 116° 33′ 14″

MAP 5 & MAP 6

Actions: Wrap material is on site but has not been installed as of August 23. Hose lay with pumps established on site to support burn out if fire is threatening. Staff must remain on site unless area is deemed secure and burnout is not needed. If staffing is not available, structures could be wrapped. A caretaker for permittee resides in the cabin.

Low Saddle Comfort Station

Lat-Long: 45° 30′ 25″ x 116° 27′ 52″

(photos)

Actions: Cut grass out to ½ chain around the structure. No additional protection will be needed.

Cold Springs Cabin

Lat-Long: 45° 30′ 24.9″ x 116° 27′ 52″

MAP 6

Actions: Cut grass within one chain around structure. Wrap cabin with shelter cloth. Burnout could be conducted in conjunction with other holding burnouts, but not independently. No safety zone available without burning out. Rocky area to the north was evaluated but deemed too grassy without burnout.

Microwave Tower

Lat-Long: 45° 29′ 14.8″ x 116° 26′ 38″

MAP 6

Actions: Cut grass around the structures to remove the light grass fuels and remove a limited number of snags, approximately 4 hours of work for a 6-person squad. With fuels

removed tower does not need additional protection. A second option is to hold around the tower with a T4 Engine, but safety zones are very limited.

Heavens Gate Lookout

Lat-Long: 45° 22′ 06″ x 116° 29′ 43″

MAP 3 & MAP 4

Actions: Wrap top half of lookout tower, propane tanks, and outhouse with shelter wrap. Clear trees and brush ½ chain around outhouse. Burnout below the lookout could be conducted using the road system. Work would require a 6-person squad (5 firefighters plus leader).

Windy Saddle Campgrounds and Guard Station

Lat-Long: 45° 20′ 58″ x 116° 30′ 44″

MAP 3 & MAP 4

Actions:

Guard Station: Wrap all three structures. Cut grass and remove all debris. Take down log fence. Install a hose lay with sprinklers around the structures. Install a 1500-3000 gallon pumpkin and Mark III pump in Windy Saddle to support sprinkler system. Support sprinklers and pumpkin with water tenders.

Windy Saddle and 7 Devils Campgrounds: Remove picnic tables and clear debris. Neither requires any further protection.

Horse Heaven Cabin

Lat-Long:

MAP 3

Actions: Cabin has already been prepped and wrapped, but was last checked for integrity of shelter cloth on August 19. Re-inspect preparation work if MAP#3 is crossed.

Appendix C: PACFISH/INFISH Guidelines

PACFISH and INFISH Standards and Guidelines

FM-1. Design fire suppression strategies, practices, and actions so as not to prevent attainment of Riparian Management Objectives (RMOs), and to minimize disturbance of riparian ground cover and vegetation. Strategies should recognize the role of fire in ecosystem function and identify those instances where fire suppression could perpetuate or be damaging to long-term ecosystem function, listed anadromous fish, or designated critical habitat or inland native fish.

FM-2. Locate incident bases, camps, helibases, staging areas, helispots, and other centers for incident activities outside of Riparian Habitat Conservation Areas (RHCAs). If the only suitable location for such activities is within the RHCA, an exemption may be granted following a review and recommendation by a resource advisor. The advisor will prescribe the location, use conditions, and rehabilitation requirements, with avoidance of adverse effects to listed anadromous fish or inland native fish a primary goal. Use an interdisciplinary team, including a fishery biologist, to predetermine incident base and helibase locations during pre-suppression planning, with avoidance of potential adverse effects to listed anadromous fish a primary goal.

FM-3. Avoid delivery of chemical retardant, foam, or additives to surface waters. An exception may be warranted in situations where overriding immediate safety imperatives exist, or, following a review and recommendation by a resource advisor, and a fishery biologist, when the action agency determines an escape fire would cause more long-term damage to fish habitats than chemical delivery to surface waters.

FM-5. Immediately establish an emergency team to develop a rehabilitation treatment plan to attain RMOs and avoid adverse effects on listed anadromous fish / inland native fish whenever RHCA are significantly damaged by a wildfire or a prescribed fire burning out of prescription.

RA-2. Trees may be felled in Riparian Habitat Conservation Areas when they pose a safety risk. Keep felled trees on site when needed to meet woody debris objectives

RA-4. Prohibit storage of fuels and other toxicants within Riparian Conservation Areas. Prohibit refueling within RHCAs unless there are no other alternatives. Refueling sites within an RHCA must be approved by the agency administrator and have an approved spill containment plan.

RA-5. Locate water drafting sites to avoid adverse effects to listed anadromous fish or inland native fish and instream flow, and in a manner that does not retard or prevent attainment of Riparian Management Objectives.

Appendix D: Wilderness Visitor Management Plan For Granite Complex WFU

Wilderness Visitor Management Plan For Granite Complex

In the event that the Forest puts a closure of the area into effect or if the fire establishes itself in the lower reaches of Sheep Creek (East and/or West Fork) Operations will work with Safety to begin the notification and escorting of visitors in the Seven Devils and the Windy Saddle area to a safe location. Fire in the Sheep Creek drainage would likely produce heavy smoke, ash, embers and heat to the northern part of the trail that could cause fear and anxiety to visitors already in the area.

Two Wilderness Rangers have been placed into the Seven Devils to make contact with all visitors and establish names, numbers in party, routes to destinations and departure schedule. Each day an information officer is located at the "T" of Windy Saddle and Heaven's Gate lookout road. Daily coordination between Wilderness Rangers, Information Officer and ICP will track numbers and locations of visitors.

If the conditions develop that necessitate the safe removal of visitors from the area (as the result of a closure due to potential threat or as a result of actual fire behavior), make a coordinated sweep of the trail system. The Safety Officer will be responsible for coordinating this effort. The purpose of the fire personnel doing the sweep is to help calm, inform, and escort the visitors to a safe destination. Blockage of the trails could occur that could impact the ability for stock to move out along the pre-determined route. If the sweep is conducted before fire activity compromises the #124 Trail back to Windy Saddle then the visitors and the fire personnel will return via that route.

To accomplish the following sweep an additional 4 fire employees may be needed. (Those employees will consist of the Information Officer at Windy Saddle, Cathy Conover, the Safety Officer, and an employee from Slate Creek to be arranged by Cathy). One person will assure the closed area is not entered and three will help to two Wilderness Rangers in a coordinated sweep and help escort visitors safely out as needed.

Note: Not all users come in from Windy Saddle and therefore a count made only by the Information Officer at the Saddle may not be accurate. However, the Wilderness Rangers will try to make contact with all people who have entered the area from Windy Saddle and from Horse Heaven.

The preferred route for helping the visitors to get out of the area would be to depart along trail 124 back to Windy Saddle. If fire activity in Sheep Creek prevents use of this route then the following alternate routes listed in preferred priority are possible options:

1. Hikers can leave over "Goat Pass". This route is not suitable for pack and riding stock.
2. Horses and hikers could be taken south around the loop and exit around to Windy Saddle.
3. If difficulties arise in preventing the visitors from looping back around to the north on trail 101, escort them to a point south of Horse Heaven.
4. If the combination of fire activity and fallen or fire-weakened snags compromise the trail below Echo Lake and south towards Horse Heaven, escort the visitors and stock into Sheep Lake and remain there until fire activity in Sheep Creek drops to a level that allows safe egress.

Other actions include:

- ❑ Post a closure sign and immediately staff the closure point with Forest Service personnel to assure that no new visitors enter the area. If the area west of Seven Devils is closed then posting would need to occur at Windy Saddle, Horse Heaven,

and Rapid River trail heads in coordination with Payette and Wallowa-Whitman employees.

- ❑ Notify campers in the Seven Devils Campground of the evacuation.
- ❑ The Sheep Lake Trail #123 is 4 miles in length (coming off of trail 124 from Windy Saddle), with Basin and Shelf Lake being the most popular spot by visitors. After sweeping this area and determining the status of visitors, the group will need to sweep the Bernard Lakes area to Dry Diggins LO.
- ❑ Check the outfitter camp at the head of Three Creek as it is a popular place for visitors.
- ❑ Check Hibbs Cow Camp for horse users.
- ❑ Continue the sweep around the lakes until all known visitors are contacted and traveling with the group.
- ❑ If smoke and ash become too thick in the area, or if blow down and snags prevent evacuation through the south end to Horse Heaven, evaluate the feasibility of moving visitors into the Sheep Lake area. Inform the Safety Officer of the selected destination.
- ❑ If people need to evacuate quickly from the Sheep Lakes Trail they can exit over 'Goat Pass'. However, it would be advisable to cache their gear and retrieve at a later point. Horses cannot manage this trail. Do not try to move stock out over it; this trail is literally a mountain goat trail.
- ❑ From a reconnaissance flight on August 19, 2005, it appears that the trail going north from Horse Heaven is open until it enters the fire. At that point the trail was not discernable and numerous trees and snags had fallen in the area. Bringing stock out this route would require considerable caution due to the danger of falling snags and is not advisable.
- ❑ A reconnaissance flight on August 20, 2005 showed numerous, recently fallen trees over the trail south of Echo Lakes toward Baldy Lake and south toward Horse Heaven. During a short reconnaissance of this area, several additional snags fell. This trail is not safe for fire personnel or visitors.

Prepared by: Fred Way, WFU Safety Officer, August 21, 2005

Appendix E: Fire Behavior Technical Documentation

FARSITE Technical Documentation

The Fire Area Simulator (FARSITE, version 4.1.03) was used to estimate fire spread from the current (8/17/05) active perimeter over a two week time period using the inputs listed below for the simulation. Assumptions were as follows:

- Fuel models and weather adequately represent the actual burning conditions
- Initial fuel moistures were representative
- The ignition file adequately represented the active fire perimeter

Landscape layers

We generated a landscape file using grids derived by the Missoula Fire Lab using the layers listed below.

FARSITE Layer	Units	Layer Name
Fire Behavior Fuel Model (FBFM)	See below	fuelmod
Canopy Cover	Units Percent (%)	cncv_utm
Stand Height	Feet	stht_utm
Crown Base Height	Feet	cnbh_utm
Canopy Bulk Density	$Kg/m^3 * 100$	cnbd_utm
Aspect	Degrees	asp_utm
Elevation	Meters	elv_utm
Slope	Percent (%)	slp_utm

Fuel models 14-50 were used in the grid layer from Missoula although they were not true "custom" fuel models with custom parameters. They were derived from satellite imagery using the standard fire behavior models and differentiating them spatially, primarily by elevational differences. For example, models 22, 32, and 42 all had the characteristics of fuel model 2, however they were spatially differentiated to better reflect potential burning conditions and available fuel at different elevations. Because of time constraints and insufficient information about the fuel moistures at various elevations, the "custom" models were simplified to reflect the standard fire behavior models.

It was necessary to correct several polygons coded incorrectly as barren that were actually grass. Fuel model 107 was applied to some of these polygons (primarily in the path of fire spread) in the ascii grid layer based on information from onsite observations of fuel characteristics. This was later converted to fuel model 104 with a conversion file (granite5.cnv) to better reflect fire characteristics observed.

There may still be several other areas miscoded in the landscape layer. Fire use modules assigned to the fire worked on documenting fuels in the area of Heavens Gate and the ridge along the wilderness boundary. Further verification/correction of the data is desirable as time permits as well as varying the starting fuel moistures by fuel model to account for extreme differences in elevation and fuel types over the fire area.

Weather and Wind

The National Weather Service in Missoula provided weather and wind files for the first week of the projection period based on a latitude and longitude location. We duplicated these files for the second week based on the August 19 spot weather forecast. These files have tracked reasonably well with the pattern of observed weather on the upper elevations although the actual weather was slightly warmer and drier than predicted for the first week.

Because of the extreme differences in elevation and fuel types between the bottom of the fire along the Snake River (1400 ft) and the top of the fire (over 8000 ft.) the weather grid feature may be useful for applying different weather and wind information to different portions of the fire.

Fuel moisture

The starting fuel moistures were as follows for all fuel models:

1 hr:	4
10 hr:	5
100 hr:	6
live herb	75
live woody:	100

Measured live fuel moistures near the fire area were 110% on 8/15/05 at 7400 ft. Warmer, drier weather was forecasted and the moistures were lowered in the simulation to reflect significant drying. Due to time constraints and the lack of information about fuel moistures at other elevations, we used the same starting fuel moisture for all fuel models. We did not condition the fuel moistures.

Other parameters

Burning period: 0900-2200
Crown Fire: Enabled
Spotting: Enabled, .5% ignition frequency
Spot growth: Enabled
Timestep: 60m
Perimeter resoulution: 180m
Distance resolution: 180m

Input files

Input	File Name
Landscape	granite_simple.lcp
Weather	wtr_granite_test_14day_new.wtr
Winds	wnd_granite_test_14day_new.wnd
Adjustments	granite1.adj
Fuel moistures	granite1.fms
Burning period	granite_2.bpd
Barrier files	Barrier_snake.shp 081705_1700_per_fobs_granite_u11n27_granitecomplexCopy.shp
Ignition file	ign_0818_refined.shp

Output files

Input	File Name
polygon shapefile	line1_lowfm_run3_104
Time of arrival	line1_lowfm_104_run3.toa
Rate of spread	line1_lowfm_104_run3.ros
Flame length	line1_lowfm_104_run3.fml
Crown fire potential	line1_lowfm_104_run3.cfr

RERAP Technical Documentation

Assumptions

- Harl Butte (station 351502) weather is representative of the area assessed.
- The fuel models used are representative of the area assessed.
- No suppression action is taken on the fire.

Analysis Inputs

Percentile Weather: Using the percentile weather tool in Fire Family Plus, we analyzed 13 years of weather data (1992-2004) for south, southwest, and west winds during late August, September, and October. Spread component was chosen as the basis since the concern was fire spread rather than flame length (burning index), ignition potential (ignition component) or fuel dryness (energy release component). Although Harl Butte has weather for a much longer period of time, years prior too 1992 lack either maximum and minimum relative humidity, maximum and minimum temperature, or both. These data are required for adequate computation of fire danger indices. For the data set used, Harl Butte recorded the combination of south, southwest, and west winds 28-37% of the time, less that most stations in eastern Oregon.

Point of Concern: The specified point of concern was Cold Springs Saddle at the MMA boundary and Drop Point 1. Among other specifics, there is a cabin near this saddle, just outside Hells Canyon Wilderness and surrounded by grass. The fire was not positioned to pose a threat to this particular point. However, Operations wanted to know what the threat might be should the fire move in that direction in order to determine when management action might be needed. Accordingly, the assessment line started near the confluence of Clarks Fork and Sheep Creek, between Clarks Fork and Lightning Creeks, and ran northeast to the saddle. We also conducted the assessment using three different start dates (Sep. 24, Sep. 7, and Sep. 21) to determine how the risk might change through time.

Assessment Line Description: The assessment line was approximately 388 chains or 4.8 miles long. It was broken into seven segments based on topography and fuels. Although RERAP 6.02 allows use of the 40 new models as well as the standard 13 models, we used the standard 13, specifically fuel models 1, 5, 9, and 10. We had been attempting to use the new models but had been unable to verify our tentative assignments through either site visits or fire behavior.

Segments A and C were classified as grass and fuel model 1. Segments B and D were classified as dense ponderosa pine and fuel model 9. Segment E is mapped as rock surrounded by brush. We treated this segment as brush and fuel model 5 since the rocky area was small enough that fire could easily work around it. The last two segments (F and G) were mapped as fuel model 8, but fuel model 10 surrounded the area and the GIS layer used included several inclusions of fuel model 10 within the area fuel model 8. As a result, we used fuel model 10 for the last two segments.

Most slopes were steep, 50-75%, and the assessment line resulted in primarily cross-slope spread (90 degrees from uphill). Segment G was upslope spread to the saddle. The line crosses South Fork Clarks Fork and Clarks Fork creeks. Aspects were northwest and southeast, so were treated as either west or south in RERAP.

Forested areas were classified as partially sheltered from the winds and shaded. Brush and grass areas were classified as unsheltered and unshaded.

We considered all segments as occuring within 1000 ft of weather station, although most segments lie between 2000 and 5000 feet elevation and Harl Butte is located near 6000

feet. The model requires different weather if stations much different than level, but different weather was not available. Harl Butte was preferred due to its wind speed and period of record. Pittsburgh Landing's (station 101100) period of record was too short (3 years only) and the station is too low (1150 feet). Slate Creek (station101037) is also too low (1500 feet). These stations have the same type of problem as Harl Butte in terms of elevation and lack the high wind speeds.

Time Periods and Hours of Spread: We used the following time periods:

- Time Period 1 – August 16-31
- Time Period 2 – September 1-15
- Time Period 3 – September 16-30
- Time Period 4 – October 1-31

Time period 4 included all of October in order to obtain sufficient data for the wind directions analyzed. We based burn period length on sunrise-sunset tables for the latitude of Riggins, Idaho roughly due east of the fire area and the collective experience of the FBAN, LTAN, and local fire personnel.

Time period 1 consisted of a 10 hour burn period. Low conditions were burned for 1 hour, moderate conditions for 6 hours, high conditions for 2 hours, and extreme conditions for 1 hour

Time period 2 consisted of a 9 hour burn period. Low conditions were burned for 1 hour except FM10, moderate conditions for 5 hours, high conditions for 2 hours, and extreme conditions for 1 hour. An error occurred in the model since 0 chains of spread were calculated for FM 10 under low conditions. The model did not calculate expected or average daily spread until hours of spread were set to 0. No similar problem was encountered with any other fuel model or any other period even with 0 spread and 1 hour of spread.

Time period 3 consisted of a 7-hour burn period. Low conditions were burned for 1 hour, moderate conditions for 3 hours, high conditions for 2 hours, and extreme conditions for 1 hour.

Time period 4 consisted of a 4 hour burn period. The reduction in burn period length by 3 hours over time period 3 rather than 2 hours is intended to reflect the entire month included in this time period. Low conditions were burned for 0 hours (no spread for any models), moderate conditions for 1 hour, high conditions for 2 hours, and extreme conditions for 1 hour.

Spread and Rare Event Assignment: All forested segments were classified as crown fires under extreme burning conditions in all time periods. All other burning conditions and fuel types used surface spread. We classified all fire spread of 50 chains per day and greater as rare events, regardless of burning conditions. As a result all spread in segments A and C (grass) under moderate, high, and extreme burning conditions was classified as rare for time periods 1-3. Observations indicated that flanking spread in grass was not as great as calculated. We also classified all fire spread under extreme conditions as rare, regardless of spread distance. Only segment E (brush) had spread rates under 50 chains per day under extreme conditions in all time periods.

Term file: Given the long-term outlook for this year, we decided that conditions were at least above average. We also analyzed the probability of large fires (500 or more acres) based on ERC for a G model using the fire analysis tool in Fire Family Plus. The start dates for most large fires in Hells Canyon NRA are associated with the 75th percentile ERC (62) and higher using Slate Creek weather data. These data produced intermediate season ending dates as compared to the precipitation-based term file data in the Wallowa-Whitman

fire management plan and a similar ERC-based analysis conducted using Harl Butte weather data. The term file used in this analysis estimated the 80th percentile season end date as October 3 and the 90th percentile season end date as October 14.

Program versions:

- RERAP 6.02
- Fire Family Plus 3.0.5

Input files:

- Granite.mdb (includes Harl Butte and Slate Creek weather records and Hells Canyon NRA fire history records)
- Slate75ERC.trm
- HarlSWAug16-31.txt (time period 1)
- HarlSWSep1-15.txt (time period 2)
- HarlSWSep16-30.txt (time period 3)
- HarlSWOct1-31.txt (time period 4)
- Granite_2.rsk

RERAP Reports:

- Slate75ERC.doc
- Granite_2Aug24_run2.doc – ignition starts Aug 24
- Granite_2Sep7.doc – ignition starts Sep 7
- Granite_2Sep21.doc – ignition starts Sep 21

Minimum Travel Time Technical Documentation

Assumptions

- Fuel models used are representative of the area of interest
- Initial fuel moistures used were representative
- Weather used for fuel conditioning was representative
- The ignition file used adequately represented actual hot perimeter of the fire

Analysis Inputs

Landscape information: We assembled a landscape file in FARSITE using 8 layers generated by the Missoula Fire Sciences Laboratory in 2003. The fuels layer was edited somewhat due to a known problem in interpretation of fuels along the river corridor. Most of the grassy slopes along the Snake and Salmon Rivers was interpreted as barren, possibly due to low grass production in the satellite imagery used. The date of that imagery is not known. We selected some polygons along the two river corridors and converted them to fuel model 107, based on information received from the type 3 team that had managed the fire until Cones FUMT assumed management and the information available in the general technical report that described the new fuel models. Subsequent information revealed that fuel model 107 was probably not appropriate; instead fuel model 104 may be a better fit.

The fuels layer was set up with custom fuel models based on the standard 13 models. The naming convention indicated with standard fuel model was appropriate. Fuel models 25, 35, and 45, for example, were all based on fuel model 5. Fuel models were also separated by elevation. For example, fuel models 21, 25, and 28 referred to the subalpine zone. The fuel modeling was done in this manner to allow for initialization of fuel moistures by elevation and fuel model in a fuel moisture file. Given the short time frames involved and the lack of sufficient information about how fuel moisture actually varied by elevation, we used ArcView 3.2a to simplify the map into the standard fuel models based on the naming convention used in the original layer. The final fuel model layer within the area of interest consisted of fuel models 1, 2, 5, 8, 9, 10, 14 (agriculture), 98 (water), 99 (barren), and 107. We did not edit any other layers.

Fuel moisture: The initial fuel moistures were 4% for 1 hour timelag fuels, 5% for 10-hour timelag fuels, 6% for 100-hour timelag fuels, 75% for live herbaceous vegetation, and 100% for live woody vegetation. At 75% live herbaceous fuel moisture; approximately ½ of the live fuel loading in model 107 is transferred into a dead fuel category. All fuel models were initialized with the same information. We conditioned these fuel moistures for approximately 33 hours using predicted weather and wind files in FARSITE format provided by the National Weather Service in Missoula, Montana. (The fire area falls within the forecast area for Missoula rather than Pendleton, Oregon). In an earlier FARSITE analysis, we had copied the original 7 day forecast into a 14-day file, duplicating the original forecast. Since there is no technical documentation or help files for the minimum travel time tool in FlamMap, we were unsure how FlamMap uses these weather files. Therefore, we elected to use the 14-day file in case it was used in a similar manner as FARSITE.

Ignition: The minimum travel time tool requires an ignition file, just as FARSITE does. Using the drip torch tool, we created an ignition file along the northeast part of the fire perimeter, roughly between the top of Bills Creek drainage and the southernmost extent of the fire perimeter to the east of Bernard Creek as of August 17.

Other Inputs: For many elements, the lack of technical documentation means we have to guess what units are meant. The resolution of the calculations was set at 60, we assume

meters since the ASCII grids used to assemble the landscape file are 30 m resolution. We used a maximum simulation time of 1500 minutes (25 hours) in order to obtain pathways sufficiently long to understand where the fire may go. The interval for minimum travel paths was set at 500, the default value; we have no idea what this input means. Twenty-foot wind speed was set at 30 mph for all three simulations. We set wind direction at 225 degrees to assess winds ahead of a cold front, 315 degrees to assess winds behind a cold front, and 270 degrees to assess marine push winds.

Outputs: Outputs produced for each simulation consisted of flow paths, major flow paths, and arrival time contours. The major flow paths were saved as shapefiles and edited in ArcView 3.2a to eliminate pathways that moved back through the burned area. Because FlamMap does not allow us to insert barrier files or edit the landscape file, there is nothing to keep the pathways out of the existing burned area or to keep it from crossing known, effective natural barriers, such as the Snake River. FlamMap creates travel paths by creating a grid and calculating fire behavior at each node on that grid. The fastest spread from node to node is mapped as a straight-line pathway. A given pathway that reaches a node quicker than another pathway, then cuts off spread from the other pathway. Fire spreads very quickly through fuel model 107, which is the predominant model within the fire perimeter in the sector of concern. Since we could not insert a barrier file, there was potential for a pathway burning back through the fire perimeter and then further north and east to cut off a pathway burning through the area beyond the fire perimeter. This risk was greatest for the southwest wind simulation. The results indicated that this potential problem with the outputs was not an issue. A possible fix for this issue is to edit the landscape file in FARSITE to permanently change the fire area into fuel model 99 (barren)

Program Versions:

- FlamMap 3 Beta
- ArcView 3.2a
- FARSITE 4.1.03

FlamMap Simulation Name: granite_3.fmp

Input Files:

- granite_simple_extract.LCP
- granite1.fms – fuel moisture file
- WTR_GRANITE_TEST_14day.wtr – weather file
- WTR_GRANITE_TEST_14day.wnd – wind file
- ign_0818_refined.shp – ignition file

Simulation Names:

- cold_front
- cold_front_nw
- marine_push