

Date of Report: 10/21/14

BURNED-AREA REPORT
(Reference FSH 2509.13)

PART I - TYPE OF REQUEST

A. Type of Report

- 1. Funding request for estimated emergency stabilization funds
- 2. Accomplishment Report
- 3. No Treatment Recommendation

B. Type of Action

- 1. Initial Request (Best estimate of funds needed to complete eligible stabilization measures)
- 2. Interim Report #
 Updating the initial funding request based on more accurate site data or design analysis
 Status of accomplishments to date
- 3. Final Report (Following completion of work)

PART II - BURNED-AREA DESCRIPTION

- A. Fire Name: 36 Pit Fire B. Fire Number: OR-MHF-000728
C. State: Oregon D. County: Clackamas
E. Region: 06 F. Forest: Mount Hood
G. District: Clackamas River (05) H. Fire Incident Job Code: 0606 P6JEB414
I. Date Fire Started: September 13th, 2014 J. Date Fire Contained: N/A
K. Suppression Cost: \$11,300,000 (as of 10/2/2014)

- L. Fire Suppression Damages Repaired with Suppression Funds
1. Fireline repaired (miles): 25.2 (1.3 miles remain unrepairs on FS lands)
2. Fireline seeded (miles): 9
3. Other (miles): 4.4 non-NFS lands fireline repair

M. Watershed Number: 5,481 acres Middle Clackamas River, (HUC = 1709001104)
 40 acres Lower Clackamas River, (HUC = 1709001106)

Subwatersheds include:

- 39 acres Upper Clear Creek (170900110401)
- 1,397 acres South Fork Clackamas (HUC = 170900110404)
- 173 acres North Fork Clackamas (170900110405)
- 3,911 acres Helion Creek-Clackamas River (170900110406)

- N. Total Acres Burned: 5,521 (10/4/14)
 - NFS = 3,845 acres (70%)
 - BLM = 1,326 acres (24%)
 - State = 0 acres
 - Private = 350 acres (6%)

O. Vegetation Types:

Burned area is within the forested Western Hemlock Zone. The predominant plant association is western hemlock/Oregon grape-salal, with some western hemlock/oxalis-swordfern-moist. Overstory and understory trees are mostly Douglas-fir with western hemlock and western redcedar. Dominant understory plants include vine maple, dwarf Oregon grape, salal, red huckleberry, and Oregon oxalis. Forest structure is mostly closed canopy small conifer (mid seral) stands north of the Clackamas River, including many plantations on the northern and eastern edges of the burn (in/around La Dee Flat). These stands are 40-80 years old, and many have been commercially thinned in the past twenty years. The slopes below La Dee Flat and also areas south of the Clackamas River have larger late seral conifer stands.

P. Dominant Soils:

Very shallow soils on very steep slopes of Mount Hood National Forest Soil Resource Inventory Map Units 200 and 201 have the greatest extent within the fire perimeter. Erosion hazard and slope failures are a high risk when vegetation is removed. These dark brown loams have a weak to medium, fine granular structure and most of their volume is gravel or cobbles. About 3 to 6 inches deep, coarse rock fragment volume increases until reaching bedrock buried around 20 inches deep. Columbia River Basalt is the original source of material making up this soil, and is exposed on cliffs and steep slopes where these soils developed.

Soils 200 and 201 in this relatively warm Mesic soil temperature regime have a low capacity for water storage, allowing groundwater to pass as runoff and contribute to peak flows. Undisturbed, forest floor would be covered with less than one inch of decomposing needles and twigs from western hemlock and Douglas-fir.

Major Soil Map Units - Acres and Selected Soil Interpretations

SRI Code	Surface Soil Texture in SRI	Slope Steepness (% Slope)	Area (Acres*)	Erosion Potential	Runoff Potential**	Phosphorus (ppm)
200 & 201	Cobbly and gravelly loams	60 to 90	3306	Severe to Very Severe	Moderately Low	Not tested
107	Loams and silt loams	0 to 20	684	Slight to Moderate	Moderately Low	1 to 3
323	Gravelly silt loams	0 to 30	277	Slight	Moderately Low	5 to 8
312	Stony and cobbly, silt loams and clay loams	0 to 30	153	Slight to Moderate	Moderately Low	3 to 6
324	Gravelly silt loams	30 to 60	131	Moderate	Moderately Low	Not tested
317	Cobbly loams	30 to 60	78	Moderate	Moderately Low	Not tested
313	Stony and cobbly, silt loams and clay loams	30 to 60	72	Moderate	Moderately Low	Not tested
325	Gravelly silt loams	30 to 60	35	Moderate	Moderately Low	Not tested
316	Gravelly loams	30 to 60	18	Moderate	Moderately Low	Not tested
Misc.	Mostly non-soil	All	391	n/a	n/a	n/a

Source: USDA Forest Service, Pacific Northwest Region. 1979. Mt. Hood National Forest Soil Resource Inventory.

* Including complexes of associated map units.

** Hydrologic Soil Group interpretation

Q. Geologic Types:

The area of the 36 Pit Fire is underlain by nearly horizontally bedded volcanic rocks. The Clackamas River has eroded a very steep-walled canyon through these geologic units, taking advantage of weak zones created by a generally northwest-trending fault system. Three major units are present. The oldest unit is the Columbia River basalt flows which occur in the river bottom and underlie most of the steep valley slopes. The next geologic unit is the Rhododendron Formation, composed of easily erodible pyroclastic deposits and debris flow deposits. This material was spewed from nearby but now long extinct volcanoes. This unit underlies the very top of the hillslopes north of the river and the moderately sloping ground above the very steep slopes south of the river. The very gently sloping ridge top north of the river is underlain by the so-called Younger Basalt Flows. This area is known as La Dee Flat.

Within the Columbia River basalt flows is a prominent interbed known as the Vantage Member. This subunit is located about midway on the steep valley slopes and often forms a topographic bench. The Vantage Member is composed of ashfall and pyroclastic deposits and is prone to landsliding. This material is a barrier to groundwater movement and serves as a slip surface for landslides. The bench is a result of overlying material being removed by landsliding.

R. Miles of Stream Channels by Order or Class:

- Perennial, fish bearing = 7.3
- Perennial, non-fish bearing = 7.7
- Intermittent, non-fish bearing = 15.4

S. Transportation System (within the fire perimeter, does not include roads prepared as contingency holding line during suppression actions)

Trails: 3.1 miles

Roads: 14.4 miles

PART III - WATERSHED CONDITION

A. Soil Burn Severity (acres): Low = 3,128 (57%), Moderate = 973 (18%), High = 110 (2%)

B. Water-Repellent Soil (acres):

Observations from transects and spot samples indicate that there was a slight to moderate degree of repellency at the surface where soil burn severity was either moderate or high. It was non existent however 3 cm below the soil surface. Slight to moderate hydrophobicity then is estimated to extend across roughly 20 percent of the fire.

C. Soil Erosion Hazard Rating (acres): Low = 498 (10%), Moderate = 1,347 (26%), High = 3,306 (64%)

D. Erosion Potential: 91 tons/acre

E. Sediment Potential: 31,206 cubic yards/square mile (assume 1.2 multiplier conversion tons to cu yds)

PART IV - HYDROLOGIC DESIGN FACTORS

A. Estimated Vegetative Recovery Period, (years):	<u>2-5 years</u> (for 75% of effective ground cover to redevelop)
B. Design Chance of Success, (percent):	<u>NA</u>
C. Equivalent Design Recurrence Interval, (years):	<u>2</u>
D. Design Storm Duration, (hours):	<u>24</u>
E. Design Storm Magnitude, (inches):	<u>3.8"</u>
F. Design Flow, (cubic feet / second/ square mile):	<u>53.6</u>
G. Estimated Reduction in Infiltration, (percent):	<u>9</u>
H. Adjusted Design Flow, (cfs per square mile):	<u>58.6</u>

PART V - SUMMARY OF ANALYSIS

A. Describe Critical Values/Resources and Threats:

The BAER team evaluated the critical values/resources and threats in accordance with FSM 2500 Interim Directive 2520-2013-1 (2523.1). Each critical value that was identified was assessed using the Matrix schema displayed in **Table 1**. Critical values concluded to be at a high or very high risk rating were judged to be the greatest priority for treatment. Those values that rated as being an intermediate or low risk were considered to be a lower priority, and no further consideration for treatment is recommended.

Table 1. BAER Risk Assessment Matrix for Determining the Probability of Damage or Loss and the Magnitude of Consequences

Probability of Damage or Loss	Magnitude of Consequences		
	Major	Moderate	Minor
	<ul style="list-style-type: none"> Loss of life or injury to humans Substantial property damage Irreversible damage to critical natural or cultural resources 	<ul style="list-style-type: none"> Injury or illness to humans Moderate property damage Damage to critical natural or cultural resources resulting in considerable or long term effects 	<ul style="list-style-type: none"> Property damage is limited in economic value and/or to few investments Damage to natural or cultural resources resulting in minimal, recoverable or localized effects
RISK			
Very Likely (90% - 100%)	Very High	Very High	Low
Likely (50% - 89%)	Very High	High	Low
Possible (10% - 49%)	High	Intermediate	Low
Unlikely (0% - 9%)	Intermediate	Low	Very Low

The Very High and High Risk are unacceptable risk levels due to threats to human life, property, infrastructure and resources, therefore treatments should be applied. An Intermediate Risk could be unacceptable if human life or safety is the critical value at risk.

HUMAN LIFE & SAFETY - Critical Value at Risk

The fire has increased the likelihood and frequency of rockfall, rock slides, and debris flows by decreasing the holding capacity of vegetation roots (see *Geologic Hazards map*). Dead trees that topple over will dislodge loose rock and soil on the steep slopes when they impact the ground, initiating down slope movement that is likely to continue to the bottom of the slope. Fire-enhanced landslides can damage or destroy Forest Service Roads, State Highway 224, the Clackamas River and directly affect public safety. The greatest danger is along State Highway 224 and the Clackamas River for a 7-mile segment (mileposts 31.5 -38.5) and a 3-mile segment of FS Road 45 (just south of the Memaloose Bridge).

Results of the risk assessment for the critical value of Human Life and Safety are displayed in **Table 2**. Because Highway 224 is the principle ingress and egress route up the Clackamas river corridor, it receives a relatively heavy amount of traffic, particularly in the summer. It is traveled by tourists and recreationists, and is designated a state scenic cycling route. It serves as the primary access to the popular Bagby Hot Springs, as well as the residents and facilities at Ripplebrook, the Timber Lake Job Corps, the Three Lynx community, and PGE hydropower facilities. It is a major haul route for forest products, and the most efficient route for administrative access. It is estimated that on average annually there are 800 cars a day that travel the highway between Estacada and Ripplebrook, and 400 that travel beyond that.

Rocks, debris, and trees have been falling onto the highway from the steep slopes above since the highway was constructed in the early 1950s, and maintenance to remove it or repair damage occurs every year. The fire is expected to exacerbate that inherent instability, increasing its probability of occurrence. There are also many fire-killed trees immediately adjacent to certain segments of the highway that could fall onto it. The increased hazard of debris falling onto these segments of the highway is expected to continue for several

decades as fire-killed trees up on the hillslopes develop into snags that in-time will decay and transition to the ground. The potential for some of that material to be transported to the prone road segments is likely because of the steep and sometimes unstable slopes. Given the degree of heavy use in the corridor and that the probability of debris or trees falling onto the highway is considered to be certain, the risk of post-fire damage or loss is concluded to be very high. The magnitude of consequences has the potential to be substantial, irreversible and possibly result in a loss of life. Similarly, boaters that swarm the river during the summer are also at high risk.

Table 2. BAER Risk Assessment: Human Life and Safety

HUMAN LIFE & SAFETY BAER Critical Value at Risk	Risk	Probability of Damage or Loss	Magnitude of Consequences	Threat/Treatment
People on Hwy. 224	Very High	Likely (50% - 89%)	Major	Severe storm event, debris flow, road fill failure, falling rocks, debris, hazard trees, slides. Fall hazard trees as is feasible (FS), manage traffic (ODOT).
River recreation (whitewater sports): Clackamas River (from Carter Br. to Forest boundary, approx. 7 miles)	High	Possible (10% - 49%)	Major	Fallen trees, snags, debris flows, Severe storm event/ road fill failure Install warning signs, alert permit guides, inform river users via social media.
People in La Dee Flat OHV area	High	Possible (10% - 49%)	Major	Falling hazard trees Install warning signs, alert trail users via social media, close certain trails.
People in general burn area	High	Possible (10% - 49%)	Major	Severe storm event, debris flow, road fill failure. Falling rocks, debris, hazard trees, slides. Close access to the general public.
People on lower 45 (Memaloose) Rd. (jct. Hwy. 224 to 340 spur)	High	Possible (10% - 49%)	Major	Falling rocks, debris, hazard trees, road fill failure, slide Close access to the general public.

PROPERTY - Critical Value at Risk

Because one of the recognized hazards from this fire is the increased frequency of rock fall, rock slides, debris flows, and hazard trees there is a risk of damage to roads and other values (see **Table 3**). The greatest danger is along State Highway 224 for a 7-mile segment (mileposts 31.5 -38.5) and a 3-mile segment of FS Road 45 (just south of the Memaloose Bridge). Both are the principle routes into the west side of the Mt. Hood National Forest and are heavily traveled. They are primary access routes for most forest users, administrative activities, and haul of forest products. Damage from falling trees striking road structures could be substantial, necessitating costly repairs.

There are six cross-drain culverts that have been clogged, probably for years, on the Memaloose road (FS road 45). They no longer continue to function properly to effectively drain the ditchline. Made of two pieces, they have also come apart at a joint where they were banded together. Water that may flow into them seeps under the road where the culverts used to be connected. Failure of drainage structures to function properly has the potential to divert and concentrate post-fire heightened runoff and become erosive to fill slopes, possibly resulting in collapse and rendering the road impassable. Eroded fill material would be deposited directly into the Clackamas River, potentially impacting listed fish habitat. Segments of the lower 3 miles of the Memaloose road (FS road 45) are particularly prone because the slopes above and below its alignment are very steep. Debris has also fallen from steep burned-over slopes into the ditchline, potentially obstructing it and clogging the inlets of functioning cross-drain culverts. It's likely that debris from these slopes will continue to fall for several years, potentially blocking drainage structures. Damage to the identified road segments of Highway 224 and FS Road 45 as a result of post-fire debris is very likely, and its magnitude could potentially be major.

Potential damage to the powerlines from falling hazards such as burned trees is possible. Treatments to protect their lines where they cross over FS lands are not proposed. Tree hazards within the right-of-way (ROW) will be assessed by PGE. As a condition of their FERC license, articles specify PGE's responsibility for addressing those types of hazards. There could be some trees however that are outside of their ROW that could fall downhill into their lines, that the FS would not be able to fell to mitigate their hazard because they are too dangerous.

Table 3. BAER Risk Assessment: Property

PROPERTY BAER Critical Value at Risk	Risk	Probability of Damage or Loss	Magnitude of Consequence s	Threat/Treatment
45 (Memaloose) Rd. (jct. Hwy. 224 to 340 spur)	Very High	Very Likely (90% - 100%)	Major	<ul style="list-style-type: none"> Falling rocks, debris, hazard trees, road fill failure, slides Repair malfunctioning drainage structures
Hwy. 224 (North Fork Reservoir to Carter Bridge)	Very High	Likely (50% - 89%)	Major	<ul style="list-style-type: none"> Severe storm event, debris flows, slides falling rocks, hazard trees. Fell hazard trees as is feasible (FS)
Powerline (PGE)	High	Possible (10% - 49%)	Major	<ul style="list-style-type: none"> Falling rocks, debris, hazard trees, road fill failure, slide PGE to fell hazard trees in ROW
Cross drain culverts: Rd. 4610	Intermediate	Possible (10% - 49%)	Moderate	<ul style="list-style-type: none"> Severe storm event, debris flow, road fill failure
Memaloose Bridge	Intermediate	Unlikely (0% - 9%)	Major	<ul style="list-style-type: none"> Severe storm event, debris flow, road fill failure, falling rocks, debris, hazard trees, slides.
Campgrounds/Day Use Sites: Lazy Bend CG, Carter Br. CG, Big Eddy (Boat Launch)	Intermediate	Possible (10% - 49%)	Moderate	<ul style="list-style-type: none"> Severe storm event, debris flow, road fill failure, falling rocks, debris, hazard trees, slides.
Silver Fox RV Park developed land (no structures at risk)	Intermediate	Unlikely (0% - 9%)	Major	<ul style="list-style-type: none"> Falling rocks, debris, hazard trees, road fill failure, slide
Side channel enhancement structures	Low	Likely (50% - 89%)	Minor	<ul style="list-style-type: none"> Severe storm event, debris flow, road fill failure
Cable-car trams: from Hwy 224 to across Clackamas River to powerlines.	Very Low	Unlikely (0% - 9%)	Minor	<ul style="list-style-type: none"> Falling rocks, debris, hazard trees, road fill failure, slide

NATURAL RESOURCES - Critical Value at Risk

Natural resources at risk are listed in **Table 4**. Of all those identified, the risk of damage or loss is high only for several, but the magnitude of consequences to them is not expected to be substantial. Primarily because high soil burn severity comprises only 2 percent of the fire area, the majority of the fire is rated as low (54%) to moderate (18%) severity and is characterized as a "dirty burn" so fire effects to natural resources was not very extensive (see *Surface Erosion and Soil Burn Severity Map*). The greatest effect was where steep slopes burned the hottest. The rugged terrain of those slopes however, makes any short-term emergency treatment impractical and very difficult to make effective. For those reasons, emergency treatments are not proposed. Rather, natural recovery will be relied upon to lessen post-fire effects to critical natural resource values over time. While fire effects to some values may be unwanted, such as accelerated surface erosion or the loss of mature forest habitat, resiliency of the western Hemlock zone ecotype and its attendant soils and climate regime can be expected to support natural recovery so that physical processes (i.e., hydrologic and erosional) will return to within their normal range of functioning in a relatively short timeframe (2-5 years).

Table 4. BAER Risk Assessment: Natural Resources

NATURAL RESOURCES BAER Critical Value at Risk	Risk	Probability of Damage or Loss	Magnitude of Consequences	Threat/Treatment
NSO suitable occupied habitat: High severity burn	High	Likely (50% - 89%)	Moderate	<ul style="list-style-type: none"> Forest habitat structure burned No near-term emergency treatment prescribed, effectiveness questionable
NSO suitable occupied habitat: Moderate or Low severity burn	High	Likely (50% - 89%)	Moderate	<ul style="list-style-type: none"> Forest habitat structure burned No near-term emergency treatment prescribed, effectiveness questionable
Soil Productivity: High severity burn	High	Likely (50% - 89%)	Moderate	<ul style="list-style-type: none"> Surface erosion, slides No near-term emergency treatment prescribed, effectiveness questionable
Water Quality (NFS): Middle Clackamas R. - Domestic water use and water contact recreation	High	Likely (50% - 89%)	Moderate	<ul style="list-style-type: none"> Sedimentation, debris flow No near-term emergency treatment prescribed, effectiveness questionable
Non-Weedy Riparian Native Plant Community: High severity burn	Intermediate	Possible (10% - 49%)	Moderate	<ul style="list-style-type: none"> Spreading invasive weeds (e.g. Scotch broom, Japanese knotweed, herb robert, shining geranium, English ivy, canada thistle, etc.)
Non-Weedy upland forested Native Plant Community	Intermediate	Possible (10% - 49%)	Moderate	<ul style="list-style-type: none"> Spreading invasive weeds (e.g. Scotch broom, Japanese knotweed, etc.). Weed propagules spread by fire suppression activities
Steelhead suitable occupied habitat: N. Fork Clackamas R.	Intermediate	Possible (10% - 49%)	Moderate	<ul style="list-style-type: none"> Sedimentation, debris flow, increased turbidity, duration and magnitude of sediment load
Steelhead, chinook, & coho Critical Habitat: Middle Clackamas R.	Intermediate	Possible (10% - 49%)	Moderate	<ul style="list-style-type: none"> Sedimentation, debris flow, increased turbidity, duration and magnitude of sediment load
Steelhead, chinook, & coho Critical Habitat: So. Fork Clackamas R. (RM 0.5)	Intermediate	Possible (10% - 49%)	Moderate	<ul style="list-style-type: none"> Sedimentation, debris flow, increased turbidity, duration and magnitude of sediment load
Water Quality (NFS): S. Fork Clackamas R. - Domestic water use	Intermediate	Possible (10% - 49%)	Moderate	<ul style="list-style-type: none"> Sedimentation, debris flow
Non-Weedy Riparian Native Plant Community: Low-Moderate severity burn	Low	Unlikely (0% - 9%)	Moderate	<ul style="list-style-type: none"> Spreading invasive weeds (e.g. Scotch broom, Japanese knotweed, herb robert, shining geranium, English ivy, Canada thistle, etc.)
Non-Weedy Special Habitat: Steep rocky slopes, cliffs	Low	Unlikely (0% - 9%)	Moderate	<ul style="list-style-type: none"> Spreading invasive weeds (e.g. Scotch broom, Japanese knotweed, etc.)
Soil Productivity: Moderate severity burn	Low	Possible (10% - 49%)	Minor	<ul style="list-style-type: none"> Surface erosion, slides
Steelhead, chinook, & coho (proposed) Critical Habitat: N. Fork Clackamas R.	Low	Unlikely (0% - 9%)	Moderate	<ul style="list-style-type: none"> Sedimentation, debris flow, increased turbidity, duration and magnitude of sediment load
Water Quality (NFS): N. Fork Clackamas R. - Domestic water use	Low	Possible (10% - 49%)	Minor	<ul style="list-style-type: none"> Sedimentation, debris flow

Federally Threatened Northern Spotted Owl (NSO)

There was only one NSO site (5441P94) with any mapped high soil burn severity within the Home Range (1.2 mi. radius from nest site). This was less than 59 acres (< 2% of entire Home Range circle). Less than 4% (< 2 acres) of this high severity burn occurred within the core radius (0.5 mi.). The suitable habitat is located near South Fork and Middle Clackamas River confluence.

Soil Productivity

Field observations of soil burn severity generally coincide with the descriptions in the USDA Forest Service Field Guide for Mapping Post-Fire Soil Burn Severity (RMRS-GTR-243). Hydrophobic soil properties are often associated with high temperature burning over long periods of time, especially in thick conifer needle mats. Where all vegetation and soil covering was consumed, expect considerable erosion of surface soil materials and some losses of productivity. Vegetation mortality, most common on Moderate and High Burn Severity areas, will cause an ongoing unstable soil condition into the future as root strength is lost. Particularly on slopes steeper than 60 percent on the valley walls of Clackamas River and major tributaries, SRI map units 200 and 201 (Figure 1) will likely be a source of eroded soil during high precipitation storm events, even where soil burn severity is low to moderate. Mass wasting from the steep slopes in the canyon may also be somewhat more pronounced than the intrinsic background degree of instability due to the fire. Initiation sites and transport pathways could be expected to become poorly productive with soil loss.

High Severity Burn (109 acres, 74 acres on Severe Erosion Potential)

All or nearly all pre-fire ground cover and surface organic matter (litter, duff, and fine roots) is consumed, and charring is visible on some larger roots. Bare soil is exposed and susceptible to erosion, and aggregate structure may be less stable. Prevailing ground color is "black" due to extensive charring or gray where organic matter is completely consumed and eroded away. White or gray ash was rarely observed as covering an area in 36 Pit Fire. Rather, a white and orange fungus known to appear after wildfires known as *Pyronema confluens* was observed. Major tree mortality observed.

Steep slopes of SRI Map Units 200 and 201 are characterized as having thin duff layers, and likely experienced a relatively fast burn time. Since fire-induced hydrophobic properties were not observed on gentle slopes in high burn severity (where it was safe to travel during investigations), it is reasonable to assume erosion potential has not been exacerbated by hydrophobic soil properties.

Moderate Severity Burn (948 acres, 615 acres on Severe Erosion Potential)

Up to 80 percent of the pre-fire ground cover (litter and ground fuels) may be consumed but generally not all of it. Fine roots (~0.1 inch or 0.25 cm diameter) may be scorched but are rarely consumed. Surface is generally blackened. Conifer needles have fallen to the ground and began to serve as ground cover to buffer raindrop impact, sometimes becoming the dominant color on the ground. Soil structure is generally unchanged. Conditions do not seem to correlate with tree mortality, so there may be standing snags, near-dead trees, or live larger trees. Fungus known to appear after wildfire known as *Pyronema confluens* observed.

Low Severity Burn (2,919 acres, 2,025 acres on Severe Erosion Potential)

Surface organic layers are not completely consumed and are still recognizable. Structural aggregate stability is not changed from its unburned condition, and roots are generally unchanged because the heat pulse below the soil surface was not great enough to consume or char any underlying organics. Ground surface, including any exposed mineral soil, may appear brown or black (lightly charred) in areas, but canopy vegetation is predominantly "green."

Native or Naturalized Plant Communities Lacking Non-Native Invasive Plants

Non-native invasive plants already occurred widespread near most roads and OHV trails, including in wet meadow areas adjacent to Rd. 4610. In relatively non-weedy habitats, the fire increased the potential for invasive weed spread from vehicles and people (recreational and resource management), reduced ground cover, and associated threats. Overall risk is mostly low and unlikely. Intermediate risk occurs in the relatively few non-weedy riparian areas with high burn severity (slightly higher probability) and non-weedy forested

areas. Threat is unlikely on the non-weedy cliffs and steep rocky habitats. Potential non-native invasive plant threats include: Scotch broom, Japanese knotweed, herb robert, shining geranium, English ivy, Canada thistle, etc.

Fisheries

Potential values at risk for aquatic species located on MHNF lands are a reduction in both quality of spawning and rearing habitat for both the short (0 to 5 years) and long-term (5 to 50 years) for Federally listed as threatened Lower Columbia River (LCR) steelhead trout (*Oncorhynchus mykiss*), LCR coho salmon (*O. kisutch*), and their proposed critical habitat, Upper Willamette River (UWR) chinook salmon (*O. tshawytscha*) and their critical habitat. Other aquatic species at risk are: 2001 Regional Forester's special status listed as sensitive (Survey & Manage,) Columbia dusksnail (*Colligyrus sp. nov. 1*), have known or suitable habitat in subwatersheds that the 36 Pit Fire burned and or its area of influence. Management Indicator Species (MIS) Native coastal cutthroat trout (*O. clarki clarki*) and rainbow trout (*O. mykiss*), are known to be present in subwatersheds that the 36 Pit Fire burned and or its area of influence, and may experience loss of quality spawning and rearing habitat for both the short and long-term.

The most critical habitat lies in South Fork Clackamas River and the Clackamas River. Regional Forester's special status as sensitive Columbia dusksnails can be found in any perennial spring or cold water stream within the fire perimeter. The most critical habitat ranking for MIS salmonids are: South Fork Clackamas River and Memaloose Creek above the lowest falls on both streams.

Fire caused risks include impairment of fish spawning and rearing habitat quality, as well as aquatic function, particularly due to increases in fine sediment resulting from erosion and/or small debris flows coming off the drainage hill slopes particularly in those drainages, which experienced severity burns.

Water Quality

Water quality can be adversely affected by debris flows that transport large quantities of fine sediment. All the creeks and channels considered where unstable slopes occur within the fire are tributaries to the Clackamas River. The Vantage Member geologic formation is a prominent factor where landslides tend to initiate in the Middle Clackamas watershed. It is comprised of fine-grained sediment that could be transported to the river. The Clackamas River already transports moderate quantities of fine sediment during storm events as a result of numerous active landslides along its banks further upstream from the fire. The volume of fine sediment transported by fire-enhanced debris flows could be large enough to be noticeable in the Clackamas River, if the volume of material deposited were great.

Post-fire accelerated surface erosion is also expected, and the likelihood for sediment to be transported to water during heavy precipitation events is high, particularly during the first wet season. Post-fire sediment delivery is expected to decline to more normal levels steadily over the next several years as an effective ground cover re-develops and plants grow back. In response to an increased level of sedimentation, a rise in the phosphorous load in the water column may become detectable. Blue-green algae blooms known to occur in the North Fork reservoir during the summer months could be influenced by an increase in phosphorous, enhancing algal respiration and activity that might contribute to toxic levels developing. If that were to happen, Estacada's water supply could be threatened. But accelerated surface erosion is not anticipated to be widespread or severe, and perpetual inflow by the river and rains should replenish dilution.

Another water quality concern to watch for is an increase of total organic carbon from fire ash and charred plant materials. If sufficient concentrations were to react with chlorine treated water, disinfection by-products could render it unpotable. Although, an increase of organic carbon can be expected, it is anticipated that it will only occur at certain times and from certain locations, probably when the dilution factor is great. None the less, water providers will need to monitor closely their intake supply and make arrangements necessary contingencies. Real-time water quality monitoring stations maintained by the USGS have been in place on the Clackamas river for years. There is a station upstream of the fire and another downstream, and information from those can be useful for tracking trends in changes to certain water quality parameters or as indicators for additional needs.

CULTURAL AND HERITAGE RESOURCES – Critical Value at Risk

Critical values to be considered during Burned Area Emergency Response for Cultural and Heritage resources are those resources which are listed on or potentially eligible for the National Register of Historic Places, Traditional Cultural Properties (TCPs), or Indian Sacred Sites on NFS lands.

The fire and associated suppression tactics directly affected 18 known heritage sites. Of these sites, 11 are prehistoric sites, five are historic, one is an isolate, and two are multi-occupational sites. A records search of the district files, including historic forest and USGS maps was conducted. The majority of high probability zones within the burn area have already been previously surveyed.

Table 5. BAER Risk Assessment: Cultural and Heritage Resources

CULTURAL & HERITAGE RESOURCES BAER Critical Value at Risk	Risk	Probability of Damage or Loss	Magnitude of Consequences	Threat
Historic artifacts: 665EA117, 665EA126, 665EA32	Low	Possible (10% - 49%)	Minor	Artifact combustion
Historic cabin remains: 665EA61	Low	Likely (50% - 89%)	Minor	Artifact combustion
Historic camp artifacts: 665SE184	Low	Likely (50% - 89%)	Minor	Artifact combustion
Historic and Prehistoric artifacts: 665NA119, 665NA120	Low	Possible (10% - 49%)	Minor	Artifact and carbon combustion
Prehistoric artifacts: 665NA124, 665NA125, 665NA128, 665NA23, 665NA62, 665NA82, 665NA95, 665SN194, 665NA115, 665NA118	Low	Possible (10% - 49%)	Minor	Carbon combustion
Prehistoric site: 665NA28	Low	Possible (10% - 49%)	Minor	Carbon combustion

Primary heritage concerns for the BAER effort focused on ground disturbing activities with the potential to directly impact known and unknown cultural resources within the Area of Potential Effect (APE). The APE for the 36 Pit Fire is based on (1) burn area, (2) locations of suppression activities, and (3) areas potentially impacted by indirect fire effects (i.e., flooding, erosion, landslide risks, etc.).

Indirect affects like landslides or flooding have the potential to bury surface and subsurface cultural resources hindering discovery. The erosion potential of burned soil can increase the likelihood of soil movement altering the context of artifacts, losing critical scientific analysis and interpretation. The fire may also have the indirect impact of increasing the visibility of site locations making them more vulnerable to vandalism and looting.

The Probability of Damage of Loss for all the listed known sites within the APE are all considered Possible (>10% to <50%). The Magnitude of Consequence for the remaining heritage resources is Minor; damage to cultural resources may result in minimal, recoverable or localized effects. No response actions required. Tribal entities have been notified and consulted.

B. Emergency Treatment Objectives:

- Mitigate or minimize as much as is feasible the threats to the critical values of Human Life and Safety, and Property.
- Protect motorists, boaters, and other users from hazards associated with steep and very steep, burned over, inherently unstable slopes above Oregon State Highway 224 and the Clackamas River.

- Mitigate the potential for post-fire debris and heightened runoff to obstruct drainage structures that could lead to failure of the road prism on steep slopes.

C. Probability of Completing Treatment Prior to Damaging Storm or Event:

Land NA % Channel NA % Roads/Trails Possible (10-50%) Protection/Safety Possible (10-50%)

D. Probability of Treatment Success

		Years after Treatment		
		1	3	5
Land	NA	NA	NA	
Channel	NA	NA	NA	
Roads/Trails	High	High	High	
Protection/Safety	High	High	High	

E. Cost of No-Action (Including Loss):

Possibility for catastrophic injury or potential loss of life, as well as damage to property. Tens of thousands could be spent over the next several years repairing damage to road structures from post-fire damage, or vehicles and personal property that could be damaged by falling or fallen debris.

F. Cost of Selected Alternative (Including Loss): \$197,940

G. Skills Represented on Burned-Area Survey Team:

<input checked="" type="checkbox"/> Hydrology	<input checked="" type="checkbox"/> Soils	<input checked="" type="checkbox"/> Geology	<input type="checkbox"/> Range
<input checked="" type="checkbox"/> Forestry	<input type="checkbox"/> Wildlife	<input type="checkbox"/> Fire Mgmt.	<input type="checkbox"/> Engineering
<input type="checkbox"/> Contracting	<input checked="" type="checkbox"/> Ecology	<input type="checkbox"/> Botany	<input type="checkbox"/> Archaeology
<input checked="" type="checkbox"/> Fisheries	<input type="checkbox"/> Research	<input type="checkbox"/> Landscape Arch	<input checked="" type="checkbox"/> GIS

Team Leader: Todd Reinwald

Email: treinwald@fs.fed.us

Phone: 503-668-1769

FAX:

H. Treatment Narrative:

Treatments have only been prescribed for critical values associated with human safety and property that are at a high risk of experiencing damage or loss. These include removal of hazard trees immediately adjacent to the Highway, and restoring function to clogged drainage structures that if left untreated could lead to a fill failure. There are no treatments prescribed for natural or cultural resources. Even if the risk of damage or loss is considered to be likely, the magnitude of the consequences is expected to be moderate, so the effects would not be irreversible. Natural recovery would be relied upon.

Land Treatments:

The risk of damage or loss from post-fire erosion (geologic hazards) to critical values of Human Life and Safety, and Property is high or very high along the State Highway corridor. But because the canyon

terrain of the mainstem Clackamas River and its South Fork is so steep and rocky, the effectiveness of any near-term emergency treatment to mitigate the post-fire risk is considered to be infeasible and unsafe to implement, and exorbitantly cost prohibitive. Longer-term treatments could be prescribed to boost the development of an effective ground cover that could reduce somewhat accelerated surface erosion, but would not be considered effective as an emergency treatment and thus would necessitate a funding authority different than BAER. See the *Treatments Map* for locations of prescribed activities.

Channel Treatments:

Risk of post-fire damage to critical values associated with the Clackamas river channel is considered to be low, and no treatments are prescribed. In fact, post-fire debris such as rocks and large wood that are deposited into the river could be viewed as favorable for fish habitat. Boaters however, could find them an obstruction or nuisance.

Roads and Trail Treatments:

RD 1. FS Road 45 (Memaloose road) Drainage Improvement and Maintenance: The 3-mile segment of the Memaloose road (~MP31 to MP 28) winds its way up steep and in places nearly vertical slopes. The grade of the road exceeds 7% in places. There are six cross-drain culverts that no longer function properly that have probably been clogged for years. They have two sections and have separated where they were banded together. Failure of drainage structures to function properly has the potential to divert and concentrate post-fire heightened runoff and become erosive to fill slopes and the road sub-grade, possibly resulting in collapse and rendering the road impassable. Eroded fill material would be deposited directly into the Clackamas River, potentially impacting listed fish habitat. These segments of the Memaloose road (FS road 45) are heavily traveled, and provide access for a broad variety of forest users and administrative activities. The areas of the forest it provides accesses to are some of the most heavily used on the forest, and some of the most popular to the public, and have been a long-term investment for the FS. To prevent erosion from damaging the road and leading to a fill failure, drainage structures should be functioning properly. The six cross-drain culverts under the road that no longer function will be replaced so that they can accommodate increased post-fire runoff from steep slopes. Included is clean-out of post-fire debris that has been deposited into the ditch line and is obstructing it from functioning properly. It is expected that debris will continue to fall into the ditch from the steep slopes above for the next several years and that subsequent clean out will be needed at the end of the next two wet seasons. Additionally, hazard trees at each of the culvert locations will need to be removed for equipment and laborers to safely work.

RD 2. Storm Patrol: For an estimated 3 days over the next 2 years, the District roads manager or resource specialist will patrol FS roads 45 and 4610 after heavy storm events to watch for any clogged drainage structures that might be jeopardizing the roads integrity and stability, and scout for debris that will need to be removed.

Protection/Safety Treatments:

PS 1. Hazard trees along Hwy 224: To minimize the hazard to the public from dangerous fire-killed trees and snags in close proximity to 7 miles of State Highway 224, conduct a detect-and-respond action to locate and remove those that are accessible and can be safely felled. It is anticipated that as burnt trees die-off over the next few years, there will be a need to fell more trees as follow-up and to mitigate as is feasible the hazards they would pose.

PS 2. Gates on 45 Road: To protect the public from dangerous fire-killed trees, snags, and rocks that could fall from the steep slopes onto this segment of the road, prevent access to it by installing a gate on the Memaloose end of FR 45 (~MP31), and another above at about milepost 28.

PS 3. Warning Signs: To warn river users and the public of the type and potential for post-fire debris from the steep slopes above to be deposited into the river. Signs would be located at 3 boater put-ins and take out locations as well as several other key parking areas popular to users accessing the river.

I. Monitoring Narrative:

Monitoring will include looking for any new hazard trees that might develop along the highway as a result of the fire. Trees will be marked and their size and location noted so they can easily be relocated for treatment. It is estimated that 2 days at the end of the next two winters will suffice to identify and locate hazards.

A day of Implementation monitoring by the roads manager of the FS Road 45 drainage repair work will occur so that its completion can be documented.

ODOT will conduct their own monitoring of the Highway for maintenance needs or repairs (from the top of the cut-bank to the bottom of the fill slope).

Part VI – Emergency Stabilization Treatments and Source of Funds
Interim #

<i>Subtotal Channel Treat.</i>				\$0	\$0		\$0	\$0	\$0
C. Road and Trails									
RD1. FS Road 45 Drainage	project	\$ 81,760.00	1	\$81,760	\$0		\$0	\$0	\$81,760
				\$0	\$0		\$0	\$0	\$0
RD 2. Storm Patrol	Days	\$ 291.57	6	\$1,749	\$0		\$0	\$0	\$1,749
<i>Insert new items above this line!</i>				\$0	\$0		\$0	\$0	\$0
<i>Subtotal Road & Trails</i>				\$83,509	\$0		\$0	\$0	\$83,509
D. Protection/Safety									
P1. Hazard tree removal	project	\$ 88,180.00	1	\$88,180	\$0		\$0	\$0	\$88,180
P2. Gates	each	\$ 14,000.00	2	\$28,000	\$0		\$0	\$0	\$28,000
P3. Warning Signs	each	\$ 500.00	7	\$3,500	\$0		\$0	\$0	\$3,500
<i>Insert new items above this line!</i>				\$0	\$0		\$0	\$0	\$0
<i>Subtotal Structures</i>				\$119,680	\$0		\$0	\$0	\$119,680
E. BAER Evaluation									
	each	\$45,000.00	1	\$45,000			\$0	\$0	\$0
<i>Insert new items above this line!</i>				---	\$0		\$0	\$0	\$0
<i>Subtotal Evaluation</i>				---	\$0		\$0	\$0	\$0
F. Monitoring									
	days	\$ 300.00	5	\$1,500	\$0		\$0	\$0	\$1,500
<i>Insert new items above this line!</i>				\$0	\$0		\$0	\$0	\$0
<i>Subtotal Monitoring</i>				\$1,500	\$0		\$0	\$0	\$1,500
G. Totals				\$204,689	\$0		\$0	\$0	\$204,689
Previously approved									
Total for this request				\$204,689					

PART VII - APPROVALS

1. Nancy A. Lashford
 For: Forest Supervisor (signature)

10/21/14
 Date

2. Jessica Westfall
 Regional Forester (signature)

10/21/14
 Date