



# Post-Fire BAER Assessment

## Burned Area Emergency Response (BAER)

### Information Brief

CentralWashingtonFireRecovery.info



## Crescent Mountain Fire 2500-8 Summary

**October 26, 2018**  
**Okanogan-Wenatchee National Forest**

### FIRE BACKGROUND

The Crescent Mountain Fire began as a lightning strike on July 29, 2018. As of the date of this report the Crescent Mountain Fire perimeter includes 52,610 acres. The fire spread through a combination of slow creeping and short runs, spotting, and burnout operations resulting in a mosaic of fire severity on USFS land — 2,285 acres of high, 18,454 acres of moderate, 24,073 acres of low, and 7,715 of unburned. Over 13 miles of dozer line were constructed within the fire perimeter.

In October 2018 the Central Washington Burned Area Emergency Response (BAER) team completed an assessment report of the burned area, and requested approval for initial funding for recommended emergency treatments. The report was submitted to the Pacific Northwest (Region 6) Regional Forester in Portland, Oregon.



### FS-2500-8 BURNED AREA REPORT

### ANALYSIS

#### Physical characteristics of the burned landscape

**Geology:** The headwaters of the Twisp River is dominant by Tonalitic Plutons (Kt) intrusions. Western slopes in the Twisp River drainage are dominated by Napeequa Schist (TKns) and Tonalitic orthogneiss (TKto). Most of these rocks were derived from deep ocean sediments and ocean-floor basalt.

**Dominate Soils:** The dominant soil orders within the Crescent Mountain fire perimeter include Andisols and Inceptisols, with medial, ashy and/or lithic modifiers. Volcanic ash exists in large concentrations within the upper profile of all mapped andic soils.

**Water-Repellent Soils (acres):** Fire-induced or altered hydrophobicity occurred on approximately 22% of soils (100% of severely burned soil and 50% of moderately burned soil), or around 11,491 acres.

**Soil Erosion Hazard Rating (acres):** 738 acres of low; 10,427 acres of moderate; 33,737 acres of high; 6,992 acres not rated, or are rock/water.

**Vegetation Types:** Pre-fire vegetation consisted of two primary zones, each covering roughly half the fire perimeter: a lower elevation Douglas-fir zone and a higher elevation Subalpine-fir zone. The lower elevation zone was dominated by Douglas-fir and Ponderosa cover-types, while the higher elevation zone was dominated by Lodgepole Pine, Subalpine Fir, and some Englemann Spruce.

## Miles of Stream Channels by Order or Class

Stream Type	Miles
Perennial	112
Intermittent	58.3
Artificial Path	.02
<b>Grand Total</b>	<b>170.5</b>

## Transportation System

Trails: 71 miles (~8 miles in designated wilderness)

Roads:

Maintenance Level	Miles
1 - Basic Custodial Care (Closed)	27
2 - High Clearance Vehicles	4.6
3 - Suitable For Passenger Cars	18.6
4 - Moderate Degree Of User Comfort	.07
Non-FS Roads	5.4
<b>Grand Total</b>	<b>56.3</b>

## Watershed Condition

Burn Severity (acres):

Soil Burn Severity by Ownership Acres					
Ownership	Unburned	Low	Moderate	High	Total
NPS	10	12	0	0	22
Private	37	40	12	0	89
State	0	0	0	0	0
Forest Service	7,715 15%	24,073 46%	18,454 35%	2,258 4%	52,500
<b>Total</b>	<b>7,762</b>	<b>24,125</b>	<b>14,465</b>	<b>2,258</b>	<b>52,610</b>

**Water-Repellent Soil (acres):** ~22% of soils (100% of severely burned soil and 50% of moderately burned soil), or around 11,491 acres.

## Soil Erosion Hazard Rating:

- 738 acres: (low)
- 10,427 acres: (moderate)
- 33,737 acres: (high)
- 6,992 acres: (not rated)

Erosion Potential: Up to 3.84 tons/acre

Sediment Potential: Up to 1,534 cubic yard/square mile

**Debris Flow Potential:** Based on review of the USGS model results and associated data tables, the probability of debris flows is likely (above 60%) to very likely (above 80%) for numerous steep side channels within the Scaffold Camp Creek, Oval Creek, War Creek and North Creek sub watersheds and numerous steep drainages directly tributary to the twisp river. To a lesser extent, debris flows are also likely to very likely in steep side channels within the Williams Creek and South Creek sub watersheds.

The USGS Combined Risk Rating is based on both probability and volume. As shown in the embedded map (above), much of the burned area has a combined risk rating of moderate or high. Large areas within the Scaffold Creek, War Creek and North Creek sub watersheds are rated high for combined risk.

## Hydrologic Design Factors

A. Estimated Vegetative Recovery Period	3-5 years
B. Design Chance of Success	80%
C. Equivalent Design Recurrence Interval	5 year
D. Design Storm Duration	1 hour and 24 hour
E. Design Storm Magnitude	5-yr: 1hr.6in 24hr: 2.4 in
F. Design Flow	5-yr, 1-hr: 0 cfs/mi <sup>2</sup> 5-yr, 24-hr: 202 cfs/mi <sup>2</sup>
G. Estimated Reduction in Infiltration	40%
H. Adjusted Design Flow	5-yr, 1-hr: 131 cfs/mi <sup>2</sup> 5-yr, 24-hr: 647 cfs/mi <sup>2</sup>

The majority of the burned area will recover in 3-5 years, but the high soil burn severity areas combined with the high elevation wilderness areas with short growing periods and shallow rocky soils will experience a slower vegetative recovery period.

## **ANALYSIS OVERVIEW**

The Crescent Mountain Fire burned 33% of the Twisp River watershed. As a result of the altered hydrologic function associated with burned soils and vegetation the primary critical values at risk for hydrology are associated with flooding, debris flows, and sedimentation. Watershed response is dependent on the occurrence and magnitude of storm events and should be greatest with initial storm events. The disturbances will become less evident as vegetation is reestablished, providing ground cover and increasing surface roughness.

### **Hydrologic Response**

The Wildcat Rainfall-Runoff Hydrograph Model (Hawkins and Greenburg 2013) was used to predict increases in peak flow resulting from the fire. Two different design storms were used in this analysis: the 5-year, 1-hour and 24-hour storms with magnitudes of 0.6 inches and 2.4 inches respectively. This model uses curve numbers to predict runoff.

The Scaffold, War, Reynolds, and Williams drainages stand out as those with the highest magnitude of change from pre-fire to post-fire conditions.

The Soil Burn Severity map and modeling coupled with field observations were used to assess the level of threat and risk to the values at risk in and adjacent to the burned area, and to develop treatment recommendations.

There is high risk to human life and safety on Forest Service and private land downstream of the burned area. Risk to forest personnel and forest users is elevated based on potential impacts from flooding, debris flows, hazard trees, and rockfall along trails and roads in the Twisp River drainage. Individuals who may find themselves in portions of the burn area along any of the drainages or roads affected by fire are at risk during storm events. Areas that have the highest potential for increased flows resulting from the fires include drainages with large amounts of high and moderate burn severity, especially Scaffold Creek, War Creek, Williams Creek and Reynolds Creek. Debris flows in these areas are a risk to life and safety for forest visitors and workers, and to property including roads, trails, and campgrounds. The FS Road may be impacted by flooding and debris where flood waters cross the road. These hazards are possible anywhere the road crosses a fan, and are more likely where channels currently exist along the fans. Many of these channel networks can be observed in lidar data.

## **RECOMMENDED EMERGENCY TREATMENTS**

### **Objectives**

The objectives of the emergency treatments proposed in this document are to manage identified unacceptable risks from “imminent post-wildfire threats to human life and safety, property, and critical natural resources on National Forest System lands” (FSM 2523.02). The timely application of the proposed treatments is expected to substantially reduce the probability of damage to the BAER critical values identified in the section A, above. Recommended emergency treatment objectives include the following:

### **Land Treatments**

- Foster the recovery of native plant communities, including sensitive species, in the burned area by minimizing the proliferation of noxious weed populations.

### **Channel Treatments**

- No channel treatments proposed

### **Roads and Trails Treatments**

- Reduce risk of road and trail infrastructure damage from elevated post-fire hillslope runoff and flood flows.
- Reduce erosion and transport of fine sediment into area streams, and thus reduce impacts of road and trail network to water quality and aquatic habitat for ESA-listed species.

### **Protection and Safety Treatments**

- Protect human life and safety of forest visitors through raising awareness of the risks present in a post-fire forested mountain setting by installing informational and warning signs at trail and road portals in and adjacent to the burned area .
- Protect human life and safety from post-fire flood and debris flow hazards at key sites where forest visitors and administrative personnel congregate, including Horse Camp Campground and several trailheads.
- Protect human life and safety of administrative and public road users on FSR 4400 and related roads by improving existing drainage features that are not adequate for the projected flow increases; armoring rolling dip/rolling dip to minimize damage to the road surface and divert water off the road; logjam removal/relocation at Eagle Creek; removal of sediment deposit at Reynolds Creek; bridge and culvert inspection and other work.

## Monitoring and Coordination

- Facilitate partner agency coordination for warning of precipitation and runoff events that could threaten off-NFS values.
- Monitor the effectiveness of road and trail treatments and facilitate any needed maintenance of treatments during the first year following the fire.

## Probability of Completing Treatment Prior to Damaging Storm or Event:

Land: 95%

Channel: -- %

Roads/Trails: 75%

Protection/Safety: 90%

## Probability of Treatment Success

	Years after Treatment		
	1	3	5
Land	80	75	70
Channel	NA	NA	NA
Roads/Trails	70	80	90
Protection/Safety	85	90	95

## Land Treatments:

Noxious Invasive Weed Early Detection Rapid Response (EDRR) – Early detection and treatment of invasive plants is critical to maintain relatively weed-free native populations in fire-affected areas. Treatment is most effective when infestations are small and isolated. Timing of treatments is important in order to address the weeds before they can produce seed and proliferate. EDRR is covered under the Okanogan-Wenatchee Forest-wide Site-specific Invasive Plant Management FEIS and ROD (2016) with a range of treatment options including use of nine herbicides. Proposed treatments fall under two categories: suppression repair related mitigation of dozer lines that passed through noxious weed-infested areas on private land and into uninfested national forest system and land protection of sensitive native plant communities.

Following the 2018 update of national weed treatment guidance, BAER is the preferred mechanism to treat suppression-related potential spread of invasive weeds along equipment-installed fire line where equipment is known to have passed through weed-infested areas and into uninfested areas, in the first year following the fire. Dozer lines below 4000' elevation and roads and trails through the burned areas were judged to be at greatest risk for spreading whitetop, dalmation toadflax, diffuse knapweed, sulphur cinquefoil and other aggressive invasive weeds. EDRR in these settings in the first year following the fire should enable OWNF personnel to minimize the spread of these weeds onto previously undisturbed Forest lands.

Sensitive plants that are known to occur in the burned area are *Botrychium crenulatum* (BOCR - scalloped moonwort), *Cryptogramma stelleri* (CRST2 - fragile rockbrake), *Parnassia kotzebuei* (PAKO3 - Kotzebue's grass of Parnassus), and *Pinus albicaulis* (PIAL - whitebark pine). One Survey and Manage population, *Botrychium montanum* (BOMO - mountain moonwort), also occurs within the fire perimeter. Invasive plants are considered to be the primary threat to these populations, especially in the post-fire environment. EDRR by OWNF weeds personnel will ensure that invasive weeds do not gain a toe-hold in these areas in the first critical year following the fire.

## Channel Treatments:

No channel treatments are prescribed

## Roads and Trail Treatments:

Within the fire perimeter, there are approximately 51 miles of Forest Service system roads. Approximately 22 miles of road are located on or below moderate and high soil burn severity areas, and were determined to be at elevated levels of risk of damage in the post-fire environment. Road treatments are designed to improve drainage in order to remove higher levels of runoff from roads before extensive damage or loss of infrastructure can occur.

Roads proposed for treatment are vital for public and administrative access in addition to resource protection. Efforts were made to prescribe the least-cost alternative to accomplish the desired mitigation. Treatments were prescribed on 14 out of the 50 miles of maintenance level 3 roads.

Roads and trails were prioritized in an effort to limit treatments to the routes serving the greatest number of values that were most vulnerable to post-fire damage. Similarly, efforts were made to prescribe the least-cost alternative to accomplish the desired mitigation.

Roads considered highest in priority to protect are proposed for improved road drainage (additional drainage dips) and stream crossing protection at sites considered to be highly vulnerable to damage or failure due to post-fire runoff events. The least-cost effective treatment for

protection of vulnerable stream crossing sites was determined to be installation of armored relief dips at the crossings. These structures increase the overflow capacity in the event that an undersized culvert is plugged, or its capacity exceeded in a flow event.

In addition to added road drainage and culvert relief dips, the third road treatment prescribed is storm inspection and response. Many of the roads that are vulnerable to damage from post-fire runoff and erosion were not specified for maintenance treatments or culvert protection and upgrades. On these roads, the proposed treatment is to evaluate the roads during or immediately after significant runoff-producing events in order to remove obstructions to road drainage and otherwise ensure that road drainage is functioning well enough to avoid severe damage or loss to the infrastructure. While this treatment is less likely to be successful than more aggressive (and expensive) treatments, it was judged to be appropriate given the critical values judged to be at risk on these roads. Roads where this work is proposed are listed in the engineering report and summarized in the values table in this document.

Many of the trails in the burned area are at high to very high risk due to the burning of stabilizing brush, roots and logs. Current trail drainage features are not adequate to address the anticipated increased runoff. Treatments are needed to provide sustainability of the trails and to prevent off-site impacts, should the trails erode or fail.

Trail features will be constructed to standard as defined by USFS Trails Handbook 2309.18. Installation should be designed to last no more than three years. Permanent structures are not part of this treatment. If safety risks (e.g. hazard trees) cannot be mitigated for work crews, work will be delayed until threat is reduced or stabilized. Drainage feature installation will be implemented on trail segments passing through and/or immediately below areas of moderate or high soil burn severity. The focus will be on sections of trail that have continuous gradient for a length of greater than roughly 50 feet (depending on trail gradient) and are either insloped (cupped) or show evidence of routing water (rills, gullies). Hazards within or along the trail route that restrict efficient and safe access to work sites will be mitigated (rocks, trees). This treatment is designed to stabilize trails for anticipated increases in runoff. The stabilization methods may vary by site but are designed to reduce trail erosion or damage.

Treatment prescriptions for trail drainage maintenance include:

- Clean existing drainage features
- Installation of rolling grade dips and non-structure water bars
- Berm removal, bank stabilization and the installation of non-structure stream crossings.

**Protection/Safety:** Road and Trail Hazard Warning Signs: Working, traveling, and recreating in burned areas poses an elevated risk to Human Life and Safety. The purpose of this treatment is to acknowledge and alert forest employees and visitors to the existing threats associated with traveling routes (roads and trails) within and downstream of burned areas.

“Entering Burned Area” signs are needed to alert the public to possible threats to life and safety. These signs should contain language addressing risks that warrant heightened awareness such as falling trees, rolling rocks, and flash floods. These warning signs should be posted in key locations to alert travelers to upcoming dangers such as falling rocks, “Flood Risk – No Parking or Standing”, etc. The OBNF has existing templates for these signs.

As described above, rails and trail users could be impacted by flooding, debris flows and rockfall within the burned area. Based on a high risk rating, a temporary closure is proposed for the War Creek Trail to protect public safety. Warning signs are proposed to lower the risk for users of other trails within the burned area (listed above in the critical values/threats section of this report). A trail bridge over the Eagle Creek Fire was partially burned and needs to be assessed before the trail is opened for public use.

Based on high risk ratings for debris flow and flood risk, temporary closures are proposed for two campsites at the the Roads End campground and Horse Camp (along the main stem of the Twisp River) to protect public safety. Warning signs are proposed to lower the risk for users of dispersed campsites near the Gilbert Ghost Town adjacent to North Creek. A comprehensive inventory of dispersed campsites throughout the burned area was not conducted.

Continued coordination with the NWS, NRCS, Okanogan County, and Okanogan Conservation District is also encouraged in support of these entities’ efforts at mitigating flood and debris flow risk to homeowners in areas below the burn.

**Monitoring:** Treatment monitoring will occur as part of the treatments for weeds, roads, and trails. No additional funding is requested for monitoring.