

## WOLVERINE: FS-2500-8 BURNED AREA REPORT SUMMARY



October 25, 2015

Okanogan-Wenatchee National Forest  
215 Melody Lane  
Wenatchee WA 98801



### Fire Background

The Wolverine Fire started from a lightning strike in the Lake Chelan subbasin on June 29<sup>th</sup>, 2015. The fire began in Wolverine Basin on the south shore of Lake Chelan near Railroad Creek. Fire activity increased beginning on August 4<sup>th</sup> and eventually burned into the upper Entiat Valley and down river north of Tommy Creek near river mile (RM) 33.

The fire burned a total of 65,323 acres in the Entiat, Lake Chelan and Railroad Creek watersheds.



A Forest Service Burned Area Report, including a summary of the Burned Area Emergency Response (BAER) team's assessment, recommended emergency treatments and requested initial funding of \$314,100 for emergency treatments 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 majority of the area is the Duncan Hill Pluton (Eiq) which consists of heterogenous plutons and dikes of gneissose quartz diorite, tonalite, granodiorite, monzodiorite, and rare granite with alpine glacial drift in the drainage bottoms of the North Fork Entiat.

**Soils:** Volcanic ash cap soils-ashy sandy loams, and rock outcrop/rubblelands.

**Streams:** There are 71.47 miles of stream inside the Wolverine fire perimeter. With 19.04 miles of perennial/fish-bearing stream; 2.05 miles of perennial non-fish bearing stream, 26.01 miles of intermittent stream, and 24.38 miles of ephemeral washes.

**Vegetation:** Ponderosa Pine, grand fir, silver fir, mountain hemlock, sub-alpine.

**Transportation System:** The area includes 24 miles of roads (20 miles of Forest Service roads and 4 miles of non-Forest Service roads). There are 79 miles of trail within the burned area.

### Analysis Overview:

On September 12 the U.S. Forest Service Remote Sensing Application Center (RSAC) in Salt Lake City, Utah, provided the BAER team with an initial Burned Area Reflectance Classification (BARC) map derived from a LANDSAT 8 scene acquisition. The team conducted reconnaissance and field verification surveys to finalize a soil burn severity map for this fire.

BAER team assessment estimated that the 62,469 acres burned on National Forest System (NFS) lands includes 7,796 acres of high soil burn severity (13% of the burned area), with 31,627 acres of moderate soil burn severity (51%), and 25,900 acres of low soil burn severity/unburned (42%).

Field assessments of the burned area indicated that approximately 19,700 acres were determined to have strong water-repellent tendency, which was associated with the high soil burn severity areas and half the moderate burn severity areas.

The post-fire area has an estimated soil erosion potential of 24 tons per acre from a 25-year/1-hour storm event of 0.91 inches compared with a pre-fire erosion rate of 0.35 tons per acre. The increased erosion can result in downstream sediment delivery that bulks flows, resulting in increased flooding effects. This additional sediment may impair critical habitat for Threatened and Endangered (T&E) species. The loss of soil can also impair soil productivity in the short- and potentially long-term future.

The burned area requires a recovery period of an estimated 3-5 years to re-establish vegetation. The major concern for vegetative recovery and, in turn, hydrologic recovery is in the high severity burn areas.

### Identified Values at Risk

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**Threats to the values-at-risk below are analyzed by the BAER team for potential impacts from increased water flows, loss of water control, increased sediment delivery, increased debris flow, establishment of invasive weeds, and habitat degradation for federally threatened species.** The team used a risk matrix (Probability of Damage or Loss and the Magnitude of Consequences) to evaluate the risk level for each value identified during the BAER assessment.

### **Threats to human life and safety:**

Threats to life, safety, and property exist in valley bottom areas and in steep burned drainages throughout and downstream of the burned area in Holden, Lucerne, and in the Entiat Valley corridor. The risk of flooding and erosional events will increase as a result of the fire, creating hazardous conditions within and downstream of the burned area. Hazardous in-channel conditions may be intensified by a rain-on-snow event, where long-duration rainstorms falling on a snowpack can produce very high peak flows.

There is a risk to human life and safety in recreational sites within the Entiat drainage the flood prone areas include Cottonwood, Spruce Grove, Three Creeks, North Fork, Fox Creek, Silver Falls and Lake Creek campgrounds.

At Domke Lake, the mouth of Lightning Creek, Holden, Lucerne, and the Entiat Valley corridor structures and roads are sited on alluvial and debris flow fans at the outlets of severely burned drainages; these are at increased risk of debris-laden flows. Post-fire conditions in these areas pose a threat to public safety and property.

In the Holden area, there is a risk to human life and safety for residents and mine remediation workers. The infrastructure within the Holden Village footprint is at “very high” risk of damage from flooding and avalanches from vegetation loss and soils burned at high and moderate severity.

In the Lucerne area the risk to human life and safety is from flooding and avalanches from vegetation loss and soils burned at high and moderate severity. There are about 30 drainages above FR 8301 that may experience increased runoff, erosion and sedimentation resulting in potential road washouts, rock fall and debris, and avalanches that may impact travel and road users between Lucerne and Holden. Culverts, other water conveyances and bridges may now be undersized; many will likely be unable to pass the flood flows.

There is increased risk from flooding in Railroad Creek and increased potential of flooding across the alluvial fan where Railroad Creek drains into Lake Chelan. Large post fire runoff events across this fan increase risk to human health and safety and may impact operations of loading and unloading of the ferry dock and barge landing at current location, use of A-frame shelter, travel across the FS 8301 bridge during increased flows, may impact the use of staging and parking areas used in mine remediation in the immediate floodplain between the bridge and Ferry dock and upstream of the bridge, Lake Chelan Boating Club (LCBC) dock, LCBC facilities, sleeping quarters for Pool Engineering employees (“Poolville”), use of the Forest Service Administration Site, boat dock, and FS campgrounds. Houses and other structures, driveways, other private property, along with county and Forest Service roads in valley bottoms adjacent to or in the floodprone areas or near stream channels are at increased risk of damage caused by flooding and debris flows.

## Threats to Property:

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Threats to roads and culverts, recreation facilities, private homes, and other structures in valley bottoms adjacent to or in flood prone areas or near stream channels are at increased risk of flooding and debris-laden flows. In several locations, structures and roads are located on alluvial and debris deposits at the outlets of severely burned drainageways.

Forest Service roads within or below burned areas are at risk of increased water runoff, sediment delivery, and debris deposits. Resulting impacts include damage to roads and/or loss of access caused by severe erosion of the road surface or deposition of sediment and/or debris. Increased risk exists for temporary loss of access/egress on major thoroughfares and on unpaved roads within and below the burned area. Any damage to or blocking of Forest Road 8301, Forest Service roads in Lucerne could compromise access for Holden residents, mine remediation workers, and emergency service providers. Forest Road 8301 has inadequate cross-drainage for anticipated post-wildfire flows.

There is a very high or high risk of damage to recreational and other infrastructure in the upper Entiat River corridor including: Cottonwood, Spruce Grove, Three Creeks, North Fork, Silver Falls, and Fox Creek campgrounds from flooding and debris. Infrastructure includes a bridge (FR 5605) at Cottonwood CG, historic structures at Cottonwood Guard Station, and community shelter at Silver Falls CG, Cottonwood and North Fork campground water systems. Continued risks of damage to property at recreation residences tracts are high.

There is an elevated risk of damage to property in Lucerne, which is located on the shore of Lake Chelan at the mouth of Railroad Creek. The following infrastructure is at risk of damage from flooding and potential debris flows from vegetation loss and soils burned at high and moderate severity upstream of Lucerne; A-Frame Shelter Structure, Pool Engineering's Control Base, staging area for construction equipment and water tender filling station located at Lucerne and at Dan's camp, Ferry Dock and loading/unloading area, FS 8301 Road Bridge spanning Railroad Creek, Lake Chelan Boat Club (LCBC) dock and facilities, and vehicles, along with Poolville-construction worker housing. The following Forest Service facilities located within the Lucerne fan FS Guard Station, well/pumphouse, generator, out buildings, and boat dock, FS Campground-information board, boat dock, vault toilet, potable water, and Refrigerator Harbor Campground (3 sites). Refrigerator Harbor Campground is located at a higher elevation on the alluvial fan and still could be inundated by flood flows.

There is a cabin on 18.36 acres of private land at the mouth of Lightning Creek that may be subjected to flood and debris laden flows.

In the Holden area, the risk to mine remediation and Holden Village infrastructure—(Holden Village footprint) and housing areas, Holden water diversion intake, Holden ballpark, foot bridge across Railroad Creek to active construction and Rio Tinto headquarters, bridge across Railroad Creek accessing Rio Tinto headquarters, Bypass Road bridge on Railroad Creek, mining wastewater treatment plant including intake

and outflow works, upper borrow pit (STP3 borrow), and Ten Mile bridge (possibly now undersized) is at “very high” risk of damage from flooding and avalanches from vegetation loss and soils burned at high and moderate severity.

In the Lucerne area the risk to infrastructure is from flooding and avalanches from vegetation loss and soils burned at high and moderate severity. There are ~30 slopes above the FR 8301 (the road connecting Lucerne to Holden Village) that can experience increased runoff, erosion and sedimentation resulting in potential road washouts, rock fall and debris delivery, and avalanches impacting travel between Lucerne and Holden. Increased risk from flooding in Railroad Creek and increased potential of flooding across the alluvial fan where Railroad Creek drains into Lake Chelan. Increase in flooding potential across the fan increase risk to human health and safety and may impact operations of loading and unloading of the Ferry dock at current location, use of A-frame shelter, travel across the FS 8301 bridge during increased flows, impact the use of using staging and parking areas used in mine remediation in the immediate floodplain between the bridge and Ferry dock and upstream of the bridge, old Marina dock, Lucerne Resort, sleeping quarters for Pool Engineering employees (“Poolville”), use of the Forest Service Administration Site and boat dock, and FS campgrounds

In the Domke Lake area, the risk to infrastructure at the Domke Lake resort and Stuart and Hatchery Campgrounds. Hatchery campground is located on an alluvial fan below the Emerald Park drainage and has an increased risk of avalanches and debris flow/flooding to the fan area.

Additionally, the threat to personal water craft and commercial boat traffic on Lake Chelan from flooding and debris flows into Lake Chelan is very high. It is expected that flooding can deliver large woody debris that water craft would need to avoid in Lake Chelan.

### **Threats to Natural Resources:**

The risk to natural resources such as soil productivity and hydrologic function is high. Probability is also high that rates of soil erosion and sediment delivery to stream channels will be significantly greater in moderate and high soil burn severity areas. This loss of water control, erosion, and sediment delivery may negatively affect Critical Fish Habitat near the burn area (see Executive Summaries for specifics).

## **Values At Risk Evaluation**

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The BAER team began assessment of post-fire emergencies on September 14. Since then the team has identified the following values at risk for post-fire threats. Interim reports may be submitted as additional assessments are completed.

The risk matrix below – Exhibit 2 of Interim Directive 2520-2014-1 – was used to evaluate the Risk Level for each value identified during assessment. Only values at risk with a risk of Intermediate or above are discussed.

Probability of Damage or Loss	Magnitude of Consequences		
	Major	Moderate	Minor
	RISK		
Very Likely	Very High	Very High	Low
Likely	Very High	High	Low
Possible	High	Intermediate	Low
Unlikely	Intermediate	Low	Very Low

<b>VALUES AT RISK</b>	<b>RISK OR EMERGENCY</b>
<p><b><i>Threat to Human Life and Safety</i></b></p> <p><b><i>ENTIRE WOLVERINE BURN AREA</i></b></p> <p>Threat to human life and safety from <u>flooding and debris flows in flood prone areas</u> on Entiat and Railroad Creek and avalanches in Railroad Creek.</p> <p>Entiat Drainage: The flood prone areas include Cottonwood, Spruce Grove, Three Creeks, North Fork, Fox Creek, Silver Falls, and Lake Creek campgrounds.</p> <p>Bridges (FS and private)</p> <p>Holden: The following infrastructure is at risk of damage from flooding and avalanches from vegetation loss and soils burned at high and moderate severity – Holden Village footprint and housing areas, Holden ball park, mining water treatment plant, upper borrow pit (STP3), and 10 mile bridge (undersized).</p> <p>Lucerne: The following infrastructure is at risk of damage from flooding and avalanches from vegetation loss and soils burned at high and moderate severity – FR8301, Ferry dock, Forest Service Administration Site, Forest Service A-frame, Lake Chelan Boat Club dock, , Domke Lake resort, Stuart and Hatchery Campground.</p>	<p>Probability of damage or loss = Likely</p> <p>Magnitude of consequence = Major</p> <p><b>Risk = High to Very High</b></p> <p>Emergency treatment needed = Yes</p> <p>Emergency actions needed = Yes</p>
<p><b><i>Threat to Human Life and Safety</i></b></p> <p><b><i>ENTIRE WOLVERINE BURN AREA</i></b></p> <p>Threat to human life and safety from <u>damage to water craft</u> on Lake Chelan. Flooding and debris flows into Lake Chelan is expected to deposit large woody debris that water craft may hit in Lake Chelan.</p>	<p>Probability of damage or loss = Very likely</p> <p>Magnitude of consequence = Major</p> <p><b>Risk = Very High</b></p> <p>Emergency treatment needed = Yes</p> <p>Emergency actions needed = Yes</p>

<p><b><i>Threat to Human Life and Safety</i></b></p> <p><b><i>ENTIRE WOLVERINE BURN AREA</i></b></p> <p>Threat to human life and safety from <u>hazard trees</u> on roads and trails and campgrounds and trailheads and other infrastructure within the fire.</p> <p>Very high risk of loss of life or injury from hazard trees falling. Burned trees adjacent to trails present a hazard to the user. BAER hazard tree funding is only available to mitigate hazards to BAER teams.</p>	<p>Probability of damage or loss = Very likely</p> <p>Magnitude of consequence = Major</p> <p><b>Risk = Very high</b></p> <p>Emergency treatment needed = no</p> <p>Emergency actions needed = yes</p>
<p><b><i>Threat to Human Life and Safety</i></b></p> <p><u>North Fork Campground Facility-North Fork Campground</u> was burned over; one pit toilet was also completely burned. All that remains is the pit with concrete foundation. This creates a very high risk to human life and safety by creating a tripping/falling into the newly exposed area.</p>	<p>Probability of damage or loss = Likely</p> <p>Magnitude of consequence = Major</p> <p><b>Risk = High</b></p> <p>Emergency treatment needed = Yes</p> <p>Emergency actions needed = yes</p>
<p><b><i>Threat to Property</i></b></p> <p><b>ENTIAT RIVER drainages</b> –Damage to property at the Riverside and North Fork <u>recreation residences tracts</u>. The residences are under permit. The permit has a clause specifying that the permit holder assumes all risk of loss to the authorized improvements including loss from fire, firefighting, and natural events.</p>	<p>Probability of damage or loss = possible</p> <p>Magnitude of consequence = major</p> <p><b>Risk = very high</b></p> <p>Emergency treatment needed = no</p> <p>Emergency actions needed = yes</p>
<p><b><i>Threat to Property</i></b></p> <p><b>ENTIAT RIVER drainage</b> - Damage to <u>NFS roads</u>. All roads in the burned area may be affected in some way – ravel of hillslope material onto road surface; rock fall or trees blocking the roadway; culverts blocked and overtopped with and without embankment failure; debris flows depositing on the roadway or removing portions of the road prism. FR 5100 inside and outside of the burn area is at risk of flood damage. All campground roads: FR 122, 124, 120, 125 are also at risk from threats listed above.</p>	<p>Probability of damage or loss = likely to possible</p> <p>Magnitude of consequence = major</p> <p><b>Risk = very high</b></p> <p>Emergency treatment needed = no</p> <p>Emergency actions needed = yes</p>



<p><b><i>Threat to Property</i></b></p> <p><b>ENTIRE WOLVERINE BURN AREA</b></p> <p>Damage to <u>trail infrastructure</u>, including tread, drainage features, and retaining walls.</p> <p>Slope ravel or failures, debris, and increased runoff or debris flows may affect all or portions of the trail itself.</p>	<p>Probability of damage or loss = Possible</p> <p>Magnitude of consequence = Minor</p> <p><b>Risk = Low</b></p> <p>Emergency treatment needed = no</p> <p>Emergency action needed = yes</p>
<p><b><i>Threat to Property</i></b></p> <p><b>ENTIAT RIVER drainage</b> - Damage to the <u>Silver Falls Interpretive Trail</u>. The trail includes a paved walkway and many interpretive signs along the trail. The modeling results indicate that there will be a substantial change increase in runoff characteristics since a large portion of the watershed burned within and above this campground.</p>	<p>Probability of damage or loss = Likely</p> <p>Magnitude of consequence = Minor</p> <p><b>Risk = Low</b></p> <p>Emergency treatment needed = no</p> <p>Emergency action needed = no</p>
<p><b><i>Threat to Property</i></b></p> <p><b>ENTIAT RIVER drainage</b> - Very high or High Risk of damage to infrastructure in the <u>Cottonwood, Spruce Grove, Three Creeks, North Fork, Silver Falls, and Fox Creek campgrounds</u> from flooding and debris.</p> <p>Infrastructure includes, several <u>historic structures and bridge (FR5605) at Cottonwood CG, Cottonwood Guard Station, historic community shelter at Silver Falls CG, Cottonwood and North Fork campground water systems</u>.</p>	<p>Probability of damage or loss = Possible to Likely</p> <p>Magnitude of consequence = Moderate to Major</p> <p><b>Risk = High</b></p> <p>Emergency treatment needed = Yes</p> <p>Emergency action needed = no</p>
<p><b><i>Threat to Property</i></b></p> <p><b>ENTIAT RIVER drainage</b> – High risk of damage to <u>infrastructure near Lucerne</u>. The following infrastructure is at risk of damage from flooding and avalanches from vegetation loss and soils burned at high and moderate severity – <u>Lake Creek CG, Cottonwood Creek CG water systems, Cottonwood Bridge, Lake Creek bridge trails 1424, 1423, Pope and Riverside, Silver Falls, and Fox Creek water systems, Forest Roads 5605, 5606, 5608</u>.</p>	<p>Probability of damage or loss = Possible to Likely</p> <p>Magnitude of consequence = Moderate to Major</p> <p><b>Risk = High</b></p> <p>Emergency treatment needed = yes</p> <p>Emergency action needed = no</p>

<p><b><i>Threat to Property</i></b></p> <p><b>RAILROAD CREEK drainage</b> – Very high or High Risk of damage to <u>infrastructure near Holden</u>.</p> <p>The following infrastructure is at risk of damage from flooding and avalanches from vegetation loss and soils burned at high and moderate severity – Holden Village footprint and housing areas, Holden Ballpark, mining water treatment plant, upper borrow pit (STP3), and 10 mile bridge (undersized). Rio Tinto staging area.</p>	<p>Probability of damage or loss = possible</p> <p>Magnitude of consequence = major</p> <p><b>Risk = High</b></p> <p>Emergency treatment needed = yes</p> <p>Emergency action needed = no</p>
<p><b><i>Threat to Property</i></b></p> <p><b>RAILROAD CREEK drainage</b> – Low to intermediate risk of damage to <u>infrastructure near Lucerne</u>. The following infrastructure is at risk of damage from flooding and avalanches from vegetation loss and soils burned at high and moderate severity – Mining Admin Site, new Marina Dock, FS guard station/dock, Refrigerator Harbor CG, Domke Falls CG, Domke Falls dock, Lucerne Bridge.</p>	<p>Probability of damage or loss = unlikely</p> <p>Magnitude of consequence = major</p> <p><b>Risk = Low to intermediate</b></p> <p>Emergency treatment needed = no</p> <p>Emergency action needed = no</p>
<p><b><i>Threat to Property</i></b></p> <p><b>RAILROAD CREEK drainage</b> - Very high or High Risk of damage to <u>infrastructure near Lucerne</u>.</p> <p>The following infrastructure is at risk of damage from flooding and avalanches from vegetation loss and soils burned at high and moderate severity – FR8301, Ferry dock, Forest Service Administration Site, Forest Service A-frame, old Marina dock, intake house and Tanuir fill site, Domke Lake resort, Stuart, Hatchery Campground.</p>	<p>Probability of damage or loss = Likely to possible</p> <p>Magnitude of consequence = Major</p> <p><b>Risk = High to very high</b></p> <p>Emergency treatment needed = Yes</p> <p>Emergency action needed = Yes</p>
<p><b><i>Threat to Property</i></b></p> <p><b>RAILROAD CREEK drainage near Holden</b>– Low to intermediate risk of damage to infrastructure.</p> <p>The following infrastructure is at risk of damage from flooding and avalanches from vegetation loss and soils burned at high and moderate severity – Holden Lodge water system, mining footbridge, tailing piles, mining vehicle bridges, Forest Service GS (west), and lookout.</p>	<p>Probability of damage or loss = unlikely</p> <p>Magnitude of consequence = major</p> <p><b>Risk = Intermediate</b></p> <p>Emergency treatment needed = No</p> <p>Emergency action needed = No</p>

<p><b><i>Threat to Property</i></b></p> <p><b>RAILROAD CREEK drainage</b>  Damage to National Forest System roads and trails.  Road 8301 is at risk of flood damage, road to Refrigerator Harbor, trails 1230/1240.</p>	<p>Probability of damage or loss = likely to possible  Magnitude of consequence = major  <b>Risk = High to very high</b>  Emergency treatment needed = yes  Emergency action needed = no</p>
<p><b><i>Threat to Natural Resources</i></b></p> <p>Threat from debris flows and flooding and loss of soil productivity and hydrologic function to <u>domestic water supply</u> at Holden and <u>wells</u> at Lucerne.</p>	<p>Probability of damage or loss = Very Likely  Magnitude of consequence = Minor  <b>Risk = Low</b>  Emergency treatment needed = No  Emergency action needed = No</p>
<p><b><i>Threat to Natural Resources –</i></b></p> <p><b>Hydrologic function and soil productivity</b>  The fire has altered the hydrologic functions of stream channels resulting in debris jams, channel scour, and stream bank erosion. The fire has caused bare hillsides that will result in accelerated erosion and reduced soil productivity.</p>	<p>Probability of damage or loss = Very likely  Magnitude of consequence = major  <b>Risk = Very High</b>  Emergency treatment needed = no  Emergency actions needed = no</p>
<p><b><i>Threat to Critical Habitat</i></b></p> <p><b>Essential Fish Habitat</b>  The fire has altered the hydrologic functions of stream channels resulting in sedimentation, debris jams, channel scour, and stream bank erosion. The fire has caused bare hillsides that will result in accelerated erosion which would result in damage to aquatic habitat.</p>	<p>Probability of damage or loss = Very Likely  Magnitude of consequence = Moderate  <b>Risk = High</b>  Emergency treatment needed = No  Emergency action needed = No</p>

<p><b><i>Threat to Natural Resources</i></b></p> <p>Threat from invasive Dalmation toadflax (<i>Linaria dalmatica</i>) Class B weed and Bull thistle (<i>Cirsium vulgare</i>) Class C weed entering the Wilderness at Holden.</p> <p>Dalmation toadflax reproduces both by seed and creeping roots. Mechanical and chemical treatments are used for control. Bull thistle is a biennial plant that reproduces by seed.</p>	<p>Probability of damage or loss = Possible</p> <p>Magnitude of consequence = Moderate</p> <p><b>Risk = Intermediate</b></p> <p>Emergency treatment needed = No</p> <p>Emergency action needed = NO</p>
<p><b><i>Threat to Cultural Resources</i></b></p> <p>Holden: Threats from debris flows and avalanche and hazard trees to Ballpark Campground, railroad grades.</p> <p>Domke Lake: Threats from debris flows and avalanche and hazard trees.</p> <p>Lucerne: Threats to Honeymoon Heights, water diversions, guard station, A frame, Domke Lake, hatchery and lookout).</p>	<p>Probability of damage or loss = Possible</p> <p>Magnitude of consequence = Major</p> <p><b>Risk = High</b></p> <p>Emergency treatment needed = yes</p> <p>Emergency action needed = no</p>

## Recommended Emergency Mitigation Treatments

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### Emergency Treatment Objectives:

- Mitigate effects of changed post-fire watershed response on human life and safety, particularly where Forest roads and cross drainages are at risk of damage and where floods and debris-laden flows present a hazard to Forest Service visitors and road users on private roads and South Lakeshore Road.
- Coordinate with partner agencies to mitigate risk to human life and safety on roads and in downstream communities.
- Mitigate effects of changed post-fire watershed response on Forest Service developed sites such as campgrounds and administrative sites.
- Mitigate potential for loss or damage of road infrastructure within the burn area.

### Land Treatments:

No treatments proposed with this initial request. Early Detection Rapid recovery (EDRR) deferred and will be included in a subsequent Interim request.

### Channel Treatments:

No treatments proposed with this initial request.

### Roads and Trail Treatments:

The road within the burned area may be affected by slope ravel, rock fall, cross-drain failure, culvert blockage or failure, or debris flows.

### Protection/Safety Treatments:

Send letter to cooperators (Chelan County, NRCS, City of Chelan, City of Entiat, WA Fish & Wildlife, State Parks, Domke Lake Resort, Holden Village and Mining Company) to describe the changed watershed conditions and provide burn severity maps or describe the areas of concern.

Manage woody debris that is delivered to Lake Chelan from near Lucerne. Install booms at the mouth of Lightning Creek and Railroad Creek (this may impact commercial boat docking operations and may necessitate the need for an alternative docking location).

Closure Gates - install closure gates at locations to reduce the risk to public being caught in a debris/runoff event or being hit by fire-killed trees. Area closure signs will be included in the sign totals to inform users that a closure order is in place and highlight the post-fire hazards to people ignoring that order. Use the existing closure gate installed below Pope Creek after the Duncan Fire and add closure gates on FR 8301 at Lucence and below Holden village. This will add another layer of mitigation if that road stays in use.

Work with the National Weather Service and Washington Department of Ecology to facilitate permitting, locating, and placement of two Automated Local Evaluation in Real Time (ALERT) stations for areas affected by the First Creek Fire. An ALERT system provides real-time rainfall and flow/stage data to NOAA to evaluate the potential for flooding in specific areas.

Develop and maintain for 2015 fires the “Central Washington Recovery.Info” website to provide information sharing with partners, local, state and federal agencies and public.

Provide support for public information sharing and technical transfer through the use of a PIO and BAER subject matter expert.

At FS Campgrounds/Trailheads provide for protection of recreation site infrastructure that could be damaged in elevated post-fire flows and debris flows. Trailheads will have danger trees removed to provide safety zones for BAER Implementation.

While sites are closed user safety is provided for but the infrastructure itself could be damaged in post-fire enhanced flood flows. Also where sanitary facilities are concerned there is a potential for flooding to entrain human waste into flows resulting in sanitary issues downstream. Primary protection will likely be achieved by removing pump jacks and capping drinking water wells to protect integrity of water supply and by simply by moving the infrastructure (picnic tables, fire rings, interpretive trail signs, trash cans and other moveable infrastructure out of floodplains and debris fans.

The Cottonwood Guard Station has a pumphouse, shower house, barn, corral, and propane tank in the floodplain. The Silver Falls Guard Station has a pumphouse, shower house and a garage. The pumphouse and shower house may be wrapped and sandbagged to reduce damage from floodwaters. The propane tank should be removed out of the floodplain. No treatment recommended for the outbuildings and corral.

Pump, sanitize, close and lock vault toilet restroom facilities at recreation use sites that could be impacted by post-fire floods. This will help to minimize the risk to the facilities along with reducing the potential for downstream water quality degradation. Toilets that were burned in the fire and need to be treated to protect water quality.

## **Field Monitoring:**

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Use of USGS landslide/debris flow modeling is limited in eastern Washington because of lack of calibration. Planned work with USGS and Washington DNR will allow placement of one recording rain gauge within or immediately adjacent to the burned area. Analysis and results will be managed by USGS and shared with the Forest Service and other coordinating agencies.

## **Post-wildfire rain gauges:**

The USGS Landslide Hazards Program requests permission from the Okanogan-Wenatchee National Forest to install three non-telemetered rain gauges as part of a 2-

year research effort to improve predictions of post-wildfire debris-flow hazards. Two gauges would be installed in the 2015 Wolverine Fire area. A third would be installed in the area of the 2014 Duncan Fire.