BAER Analysis Briefing:
Wolverine Fire 2015

The Wolverine Fire started on June 29, 2015 and burned 65,323 acres in the Lake Chelan, Railroad Creek and Entiat River watersheds in central Washington. Of the total fire area, 62,469 acres are National Forest System lands and 197 acres are private ownership. Approximately 30% of the Headwaters Entiat River subwatershed; 31% of the Three Creeks-Entiat River subwatershed; 29% of the Bear Creek-Lake Chelan subwatershed; 5% of the Devore Creek-Lake Chelan subwatershed; 7% of the Lone Fir-Lake Chelan subwatershed; 7% of the Upper Railroad Creek subwatershed; and 49% of the Lower Railroad Creek subwatershed were classified as moderate or high soil burn severity.

A Burned Area Emergency Response (BAER) team on October 15, 2015 submitted a request for $314,000 in funding for interagency coordination and risk-mitigation projects to improve road drainage, install ALERT storm warning systems, initiate storm patrol, and install burned area hazard signs and gates.

Surface erosion and mass wasting are the inherent hillslope processes, accelerated typically by disturbance, principally wildfire or intense precipitation and high runoff events. Erosion generally becomes accelerated when effective ground cover and a protective forest cover have been removed, or when runoff has been concentrated. When such conditions occur, soils are exposed to erosive forces such as raindrop impact and overland flow that can result in rills and gullies that signify an accelerated rate of surface erosion. The steepest slopes are most prone, particularly where soils are shallow, are somewhat water repellent, or where there is a subsurface restrictive layer. Soils that have developed in volcanic ash and glacial till are easily detachable, having low cohesiveness and structure, and relatively low amounts of organic carbon and moderately thin topsoil horizons.

On the steepest of slopes, the risk of debris flows can be high. Shallow soils on steep slopes in first- and second-order headwater drainages are most prone, such as Pope Creek in the upper Entiat valley or South Lake Creek that flows into Domke Lake. The probability of debris flows is typically relative to the occurrence of a notable storm or precipitation event of high magnitude, which can be exacerbated by the removal of a protective canopy and diminished root strength. Weather events that generate heavy precipitation and runoff in the area typically are associated with seasonal convective thunderstorms. Culmination of debris flows are usually associated with steep drainage-ways and channels where sediment is routed downslope.

There is an increased threat to public life and safety from flooding, debris laden flows and avalanches to people in flood-prone areas in the Entiat and Railroad Creek drainages.

In the Holden area, there is an increased risk to human life and safety for residents and mine remediation workers. The infrastructure and people within the Holden Village footprint are at high risk from avalanches due to vegetation loss and soils burned at high and moderate severity around the village and construction site. The Holden Village footprint includes: Holden water diversion intake, Holden ballpark, foot bridge across

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Railroad Creek, Rio Tinto headquarters, Bypass Road bridge on Railroad Creek, Pool Engineering's Control Base at Lucerne and at Dan's camp, mining water treatment plant including intake and outflow works, upper borrow pit (STP3 borrow), and Ten Mile bridge.

Threats to public life and safety have increased in the Lucerne area from flooding and debris laden flows. There are about 30 drainageways above FR 8301 that may experience increased runoff, erosion and sedimentation resulting in potential road washouts, rock fall and debris, and avalances that may impact safe travel between Lucerne and Holden.

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 life and safety and may impact operations of loading and unloading persons on the ferry dock and barge landing at current location, In addition, there is an increased safey concern for public when using the A-frame shelter, traveling across the Forest Road 8301 bridge during increased flows, use of using staging and parking areas used in mine remediation in the immediate floodplain, LCBC dock, LCBC facilities, sleeping quarters for Pool Engineering employees (Poolville), use of the Forest Service Administration Site, boat dock, and Forest Service campgrounds.

Additionally, a potential threat to human life and safety from damage to water craft on Lake Chelan from flooding and debris flows into Lake Chelan is "high" to "very high". It is expected that flooding can deliver large woody debris that water craft would need to avoid in Lake Chelan

Threats to public life and safety in the Entiat Valley include all persons in flood prone areas downstream of the burn area. People recreating in and around Cottonwood, Spruce Grove, Three Creeks, North Fork, Fox Creek, Silver Falls and Lake Creek campgrounds are at risk. Threat to human life or injury from falling hazard trees on roads, trails, trailheads and campgrounds also exists. Additionally, the North Fork Campground burned over exposing a pit toilet foundation and open hole which creates a high risk to human life and safety by creating a tripping and falling hazard into the newly exposed area.

Threats to property within and downstream of the Wolverine burn area are at increased risk to damage. The following infrastructure the Holden area is at risk of damage from flooding and avalanches as a result of vegetation loss and soils burned at high and moderate severity; Holden Village footprint and housing areas, Holden ballpark, Holden Lodge water system, mining wastewater treatment plant, upper borrow pit, Rio Tino staging area and 10-mile bridge.

Threats to private and Forest Service property downstream of Railroad Creek on the Lucerne Fan are at increased risk of damage from flooding, debris laden flows and avalanches. Infrastructure at risk include; Forest Service Road No. 8301, the Ferry dock, Forest Service Administration Site, Forest Service A-frame, LCBC dock, facilities and vehicles. Other areas on the Lucerne Fan at a slightly lower risk to flooding and debris laden flows include the Mining Administrative Site, the new Marina Dock, Lucerne Bridge, Forest Service guard station and dock, and Refrigerator Harbor Campground.

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In the Domke Lake area, the risk to human life and safety includes increased hazards from danger trees at Domke Lake resort, and Stuart and Hatchery Campgrounds. Hatchery campground (currently closed) is located on an alluvial fan below the Emerald Park drainage which now has an increased risk of avalanches debris flows and flooding.

Forest Road 8301 is within the burned area and may be affected in some way from rock fall or trees blocking the roadway, culverts blocked and overtopped with or without embankment failure, and debris laden flows or avalanches covering the roadway. The road to Refrigerator Harbor and Trail No. 1230 and Trail No. 1240 are also at increased risk to damage.

In the Entiat River drainage damage to property at the Riverside and North Fork recreation residences tracts is possible. The residences are under permit with the Forest Service. 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. Other infrastructure at increased risk includes, several historic structures, the bridge (FR5605) at Cottonwood Campground, Cottonwood Guard Station, historic community shelter at Silver Falls Campground, Cottonwood, Lake Creek bridge, and water systems at Silver Falls, Fox Creek, Pope, Riverside and North Fork campground water.

All roads in the Entiat Valley within and downstream of the Wolverine burn area may be affected in some way. Rock fall or trees blocking the roadway, culverts blocked and overtopped with or without embankment failure, debris flows depositing on the roadway or removing portions of the road prism are all post-fire risks. Forest Service Road 5100 inside and outside of the burn area is at increased risk of flood damage. All campground roads: Forest Service Roads 122, 124, 120, 125 are also at risk from threats listed above.

Trails within and downstream of the burn area are at increased risk to damage such as tread, drainage features, and retaining walls. Slope ravel or failures, debris, and increased runoff or debris flows may affect all or portions of the trail itself.

The increased threats to natural resources downstream of the burned area are a concern. The threat (loss of water control) is exaccerbated by a high proportion of high and moderate soil burn severity within the watersheds. 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. These hazardous conditions may be worsened in the case of a rain-on-snow event, where long-duration rainstorms falling on snowpack can produce high peak flows. Threated resources include the domestic water supply at all campgrounds in the Entiat Valley, Holden and Lucerne, the potential altering the hydrologic functions of stream channels resulting in debris jams, channel scour, and stream bank erosion and reduced soil productivity. The fire has caused bare hillsides that will result in accelerated erosion which could result in damage to aquatic habitat.

There is an increased threat from invasive Dalmation toadflax (*Linaria dalmatica*) a Class B weed and Bull thistle (*Cirsium vulgare*) a Class C weed entering the Wilderness around the Holden area.

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Cultural resources in the Railroad Creek drainage at an increased risk to threats from debris flows, avalanches and hazard trees include the Ballpark Campground, railroad grades, structures at Domke lake, Honeymoon Heights, water diversions, guard station, and the A-frame structure.

Soil loss caused by post-wildfire erosion in some areas will result in a long-term loss of soil productivity. Natural recovery of ground cover vegetation is likely over the next 3-5 years, but in areas that were severely burned, pre-fire conditions may not be restored until a new forest stand is established.

Emergency hillslope treatments to stabilize soils at high risk of accelerated erosion are not being recommended. Slopes greater than 60 percent occur in these sites as well and would not be conducive to a top-dressing application. Installation of wattles or contour felling is also viewed as being marginally imperative, and the amount of standing dead snags in the area and rocky steep slopes would make the exposure to crews far too hazardous a risk. There is also a proportion of the slopes that are at high risk of accelerated erosion that are located on or adjacent to terrain identified as being inherently landslide prone. Top dressing mulches or slope catchment structures would have little effect of reducing above-ground runoff that could trigger a slide should a precipitation event of sufficient magnitude occur.

Rather than focus on slope treatments, it is concluded that higher priority treatments would best focus on protecting roads and infrastructure. These treatments are believed to have greater potential for success than hillslope treatments.

Proposed Forest Service projects for the Wolverine burn area focus on providing early warning to residents about the changed conditions in the watersheds above their homes and travel corridor. The Forest Service is coordinating with Chelan County, NRCS, National Weather Service and EMS to provide information about the increase in flood risk to those living below the fire area. Post-fire work will also include signage, area closures, fire closure signs, and installation of precipitation monitoring stations and ALERT stations.

Questions?

Check for updates on the BAER team website at CentralWashingtonFireRecovery.info or call the Okanogan-Wenatchee National Forest headquarters office at 509-664-9200.