



# COLUMBIA RIVER GORGE NATIONAL SCENIC AREA

## *Burned Area Emergency Response Summary – Eagle Creek Fire*

**October 10, 2017**

As the Eagle Creek Fire moved toward containment, the Forest Service assembled a Burned Area Emergency Response (BAER) team of experts in soils, geology, hydrology, engineering, botany, recreation, archaeology, and fisheries, along with GIS support and public information officers. Starting September 25, 2017, the team conducted a rapid assessment of potential imminent post-fire threats to critical values such as life and safety, property, natural resources, and cultural resources. Their assessment focused on post-fire effects on the landscape, to identify concerns such as increased erosion and sedimentation, flooding, debris flow potential, and the spread of invasive plants. The BAER team identified ‘Values at Risk’ (VAR), a term used to note key concerns about life and safety, property, or natural and cultural resources. The team then developed a Soil Burn Severity (SBS) map to document the degree to which soil properties had changed within the burned area. Fire damaged soils have low strength, high root mortality, and increased rates of water runoff and erosion. Using the SBS map, BAER team members ran models to estimate changes in stream flows and debris flow potential. The models compared pre-fire conditions to predicted post-fire conditions to determine relative changes as a result of the fire. These changes are then used to determine the relative risk to different VARs and recommendations to address those things determined to be an emergency. Below is a summary of the findings of each resource area.



### **SOILS**

An estimated 45% of the area within the Eagle Creek Fire perimeter had high or moderate SBS and may have developed water repellent soils as a result of the fire. Water repellent soils develop when organic material (dead plant debris) on the soil surface burns during a fire, releasing waxy substances that coat soil particles—basically “shrink-wrapping” the soil and filling in the pores that allow water

to soak in during rain events. When water can’t infiltrate into the soil because the pores are blocked, water runs off over the surface causing erosion and downstream flooding.



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Soil erosion models indicate that relative to pre-fire conditions, erosion rates are expected to increase from near zero to 7.1 tons of soil per acre in the Tanner Creek watershed, 4.1 tons per acre in Eagle Creek and 2.1 tons per acre in Oneonta Creek. In places the model predicts localized rates as high as 40 tons per acre. For perspective, one ton per acre is approximately equal to the thickness of one sheet of paper.

### HYDROLOGY

Due to the development of water repellent soils, flood flows are expected to increase across the burned area. Prior to the fire the surface duff and litter acted as a 'sponge' that naturally absorbed water during rainfall events and promoted infiltration into the soils. Post-fire the loss of the surface cover in combination with water repellent soils that won't absorb water results in increased flooding, particularly in areas of high soil burn severity. In areas where recreation use is high these increases in flood potential could be devastating to people, and could also cause overtopping and failure of culverts.

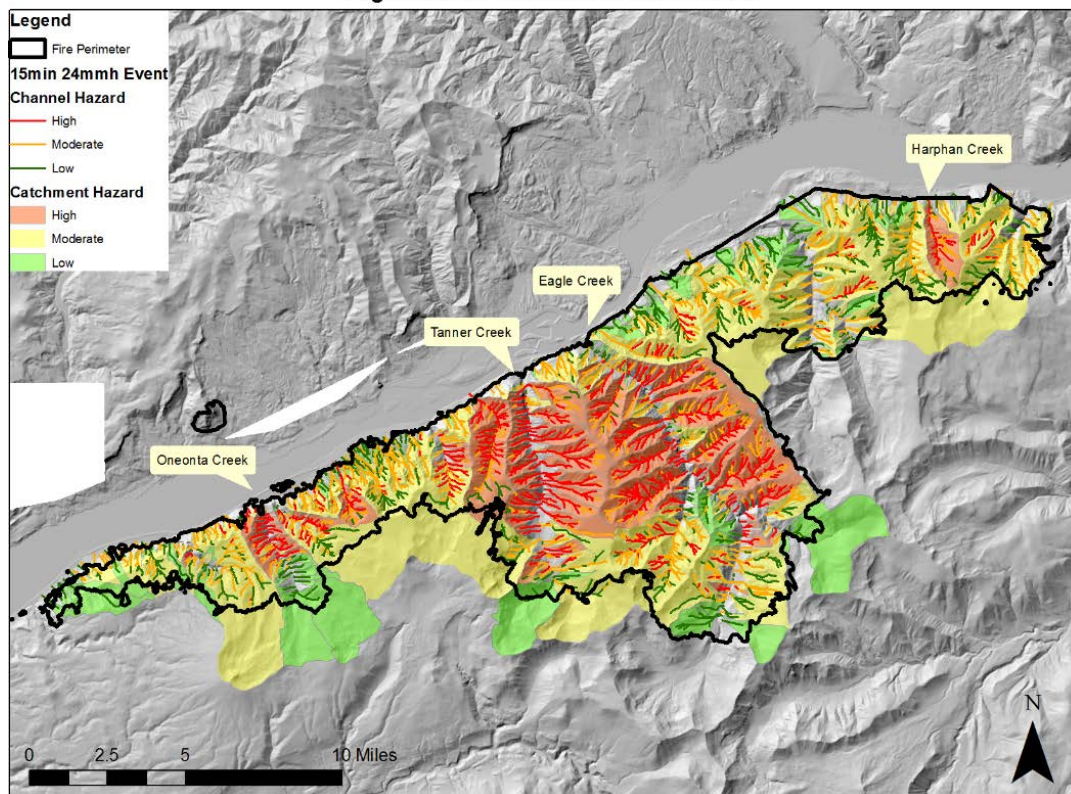
Relative Percent Increase in Flood Flows  
(For a 10-year, 24-hour precipitation event)

Drainage	Percent Change in Peak Flow
Tanner Creek	607%
Eagle Creek	412%
Oneonta Creek	284%

### GEOLOGY

Fire increases the potential for debris flows. The U.S. Geological Survey (USGS) used the SBS map in their modeling to predict risk of debris flow. They found that 31% of the drainages are at high risk of debris flow, 42% are at moderate risk, and 27% are at low risk. The highest risk for debris flow was found in Eagle,

Eagle Creek Fire Debris Flow Hazard



Tanner, Moffett, McCord, Horsetail and Oneonta drainages. While ground observations and model results indicate an increase in debris flow initiation in the headwaters, it is unlikely that they will run out to the I-84 corridor. However, there is a chance that debris will collect and create debris dams and subsequently dislodge during storms when stream discharge is at a maximum. These debris dam outburst floods could pose serious risk to anyone downstream during high flow events

Full map available online at: [https://landslides.usgs.gov/hazards/postfire\\_debrisflow/](https://landslides.usgs.gov/hazards/postfire_debrisflow/)



since they carry logs, rocks, and a deluge of mud and water and could affect I-84, Highway 30 and/or the railroad.

Rockfall also poses a serious threat to people recreating on trails, at viewing locations, and along the Historic Columbia River Highway 30. Rock slides have already deposited piles of gravel to boulder-sized rock fragments onto the Historic Highway and onto trails. We anticipate this will be exacerbated through treefall, and will continue to occur until ground cover grows back. Recently a fire-killed tree toppled on Shellrock Mountain and slid approximately 1,500 feet down to I-84, where it penetrated a retaining wall, slid across the eastbound lanes, and displaced the barriers in the median.

Rockfall and treefall at Multnomah Falls is predicted to increase due to fire damaged trees, and loose mobilized rock. A rockfall fence, located above the lower viewing platform, has already been weakened by post-fire debris and is in need of repair. Due to the towering vertical cliffs at Multnomah Falls and the high visitation of the site, the BAER team proposed rockfall mitigation measures to protect life, safety, and property.

Options for reducing post-fire peak stream flows, soil erosion, and debris flow potential are limited due to the nature of the burn and slope characteristics. As a result, treatment recommendations focus on mitigation measures to minimize loss of life and damage to VARs. These mitigations include closures, warning signs, and public safety approaches such as installation of an early warning system to notify areas when damaging storms may be approaching.



A large rock found on Forest Road 777 illustrates rockfall hazards in the wake of Eagle Creek Fire.

## **RECREATION**

Recreation tourism is a key economic driver for local communities such as Cascade Locks and Hood River. Data from 2012 show that visitors to the CRGNSA spent \$50.1 million at surrounding businesses. One of the attractions for visitors is the extensive trail network, of which 122 miles of trail are within the fire perimeter. Due to safety concerns outlined in the geology and hydrology sections, these trails are currently closed and will remain closed until hazards are mitigated and the trail crews conduct trail repair work. Restoration of the trails will include rebuilding and stabilizing trail tread, reconstructing drainage features, removing fallen logs, and repairing stump holes. Hazard trees will be removed at trailheads, where users are concentrated, but not along trails.

Due to the dangerous and life-threatening conditions present on trails in the burned area, the BAER team has requested funding to install effective barriers on the trails. There have already been numerous reports of the fire closure being breached at popular trails indicating this is going to be an ongoing challenge.

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## ENGINEERING

Road infrastructure is also a concern, and most of the road system within the fire perimeter has inadequate drainage to accommodate expected increases in flood flows as well as sediment and erosion. Hydrologic modeling predicts the greatest increases in peak flows for the Bonneville Powerline Access Road (NFSR 777), with increases ranging from 1590% to 1890% at three of the four road-stream crossings. To prevent impacts to roads and trails and to retain access, stabilization measures are recommended such as increasing culvert capacity, increasing drainage on the travel system, and removing culverts and establishing low-water crossings which will better accommodate the increased sediment, debris, and flows. In some cases temporary closures of roads for 2-3 years to maintain road drainage features may be necessary until natural recovery becomes established, and the water repellency of the soils is reduced.



On Gorge slopes where moss and vegetation burned, scree (small rocks) and talus (larger rocks) can collapse onto trails and roads, creating hazards and blocking routes.

## CULTURAL RESOURCES

Cultural resource sites are categorized into four broad types: pre-contact archaeological sites, historic sites, traditional cultural properties, and Native American sacred sites. The Eagle Creek Fire area and the Columbia River Gorge in general contain cultural resources spanning the last 8,000 to 10,000 years of time. These include task-specific activity areas and camps such as lithic scatters, fishing stations, vision quest sites, historic trails, wagon roads and highways, railroad logging features and artifacts, fish hatcheries, historic structures, and Forest Service recreation and administrative sites. The most noteworthy are the Historic Columbia River Highway 30 and related features which are listed as a National Historic Landmark, and the iconic Multnomah Lodge, which is a contributing property to the historic highway and individually listed on the National Register of Historic Places. The BAER team has recommended a rockfall fence to protect the lodge and stabilizing the trail at Multnomah Falls to preserve the integrity of this very special cultural site. Continued cooperation with the Confederated Tribes of the Warm Springs and the Grand Ronde Tribe has also been identified.

## INVASIVE PLANTS

Invasive species are the most serious ecological threat, due to the fact that large burned areas open the watersheds to the rapid spread of species adapted to colonizing disturbed soils. Many of these are exotics that displace native species and can disrupt ecological relationships and connections, reducing ecosystem stability. The appearance, function, economic value, and resilience of large landscapes can be substantially changed by invasive species.

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Two species of concern are false brome (*Brachypodium sylvaticum*) and garlic mustard (*Alliaria petiolata*). Both produce prolific seeds and can become established as a dense groundcover in disturbed areas, including on fire scars. They can grow in shaded and open locations, are capable of crowding out native species, and have limited use as food sources for wildlife. Multnomah County has a known infestation of garlic mustard and the Eagle Creek Fire provides opportunities for this species to spread. The BAER team recommends conducting weed surveys in areas most prone to the spread of weeds, such as areas adjacent to known weed populations and along roads and trails. Treatment of newly established weed populations will help to minimize this ecological threat.

## **FISHERIES**

Many of the tributaries within the Eagle Creek fire have limited fish habitat due to natural barriers created by waterfalls and steep slopes. However, the habitat and water quality provided by these tributaries are vital for the Lower Columbia salmon populations/runs (spawning and rearing habitat, as well as for the many salmon rearing in these tributaries before migrating further up the Columbia River and its tributaries. Changes in supplies of water and sediment are commonly observed after wildfire. Of the three fish hatcheries within the fire perimeter, Cascade Fish Hatchery, has the highest risk of post-fire water quality related degradation. Currently the hatchery raises 1.5 million coho salmon annually, which is vital to commercial and tribal Columbia River fisheries. Ongoing inter-agency coordination is essential for fisheries as work begins to remove a hazardous trail bridge, fix the water supply for the Cascade Fish Hatchery, and for any other projects that could impact fisheries resources.

## **CONCLUSION**

The BAER team has identified imminent threats to values at risk based on a rapid scientific and engineering assessment of the area burned by the Eagle Creek Fire. The assessment was conducted using the best available methods to analyze the potential for flooding and debris flows. The findings provide the information needed to prepare and protect against serious post-fire threats. Agencies and landowners are encouraged to use the findings to prepare plans and take actions to protect values at risk before winter precipitation events trigger debris flows and rock falls. The U.S. Forest Service will continue to provide information and participate in inter-agency efforts to address threats to public and private values at risk resulting from the Eagle Creek Fire.



This summary was prepared by Liz Schnackenberg, BAER Team Lead. For more information, contact [eaglecreekfire2017@gmail.com](mailto:eaglecreekfire2017@gmail.com).

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