Willamette and Mt Hood National Forests

Burned Area Emergency Response Summary – Beachie Creek Fire

October 21, 2020

The Beachie Creek Fire began August 16, 2020, at 11:15 am approximately two miles south of Jawbone Flats on the Willamette National Forest. An historic windstorm on Monday, September 7, caused rapid spread west through the Willamette and Mt. Hood National Forests, and adjacent private lands and communities.

The Beachie Creek Fire heavily impacted several communities in the North Fork Santiam River and Little North Fork River drainage including Jawbone Flats, Elkhorn, Gates, Mill City, and Lyons/Mehama. Highly valued natural and cultural resources were also threatened or damaged.

The fire includes areas on the Detroit Ranger District on the Willamette National Forest and a small portion of the Clackamas River Ranger District on the Mt. Hood National Forest. The fire (as of 10/12/2020) encompassed 193,556 acres. Vegetation consists of mixed conifer, grass and shrub fields with numerous snags and heavy dead and down fuels. Private lands have various aged conifer plantations, and U.S. Forest Service (FS) lands at upper elevations transition to mature Douglas fir with a significant snag component.

The Forest Service assembled a Burned Area Emergency Response (BAER) team on September 28, 2020. This team of experts in soils, geology, hydrology, engineering, botany, recreation, archaeology, wildlife, fisheries, and GIS began assessing the post-fire effects to critical values on FS managed lands. The team 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 (hydrology) and debris flow (soils and geology) potential. The models compared pre-fire conditions to predicted post-fire conditions to determine relative changes, which are then used to determine the relative risk to different critical values and recommendations to address those things determined to be an emergency. Following is a summary of the findings of each resource area.

SOILS

Soil burn severity (SBS) is the primary characteristic driving post-fire soil erosion response and sediment delivery. When combined with other factors like slope gradient and shape, remaining surface cover, potential for surface cover recruitment, vegetative recovery, natural and fire-induced water repellency, and local climatic factors, we can make predictions about landscape response and soil loss. On the Beachie Creek Fire, 76% of mapped areas on FS managed lands were high and moderate SBS. The highest concentrations of

high SBS are found in the Upper Little North Santiam River (especially the Elkhorn Creek drainage), Headwaters Little North Santiam River, and Opal Creek sub watersheds. Much of the high SBS overlaps with areas mapped with severe soil erosion hazard ratings. Modeled post-fire erosion potential for a five-year storm event (20% probability of occurring in any year) ranges from 12.4 tons/acre to 20.7 tons/acre in heavily burned sub watersheds.

Long-term soil productivity was identified as a critical value with a high risk of damage or loss. However, no treatments are prescribed to mitigate impacts. The team completed additional modeling to examine effectiveness of mulch treatments within identified potentially feasible treatment blocks. These treatments were shown to have a nominal effect on total soil loss and sediment delivery (decreases of 0.7 to 1.6 tons per acre for the five-year storm event). Furthermore, two major precipitation events in the past few weeks have already resulted in significant topsoil loss in high-risk areas. Allowing for natural recovery is the recommended course of action.

Figure 1 - Low to moderate soil burn severity with extensive fungal bloom on soil surface, providing natural recovery and stabilization

GEOLOGY

We identified the geologic conditions and processes that have shaped and altered the watersheds and landscapes and assessed the impacts from the fire on those conditions and processes that could affect downstream critical values. The fire removed vegetation that helps keep slopes and drainages intact, changed the structure and erosiveness of the soil, and altered the stability of the landscape. Using the understanding of rock types and characteristics, geomorphic processes, and distribution of geologic hazards helps predict how the watersheds will respond to and be impacted by upcoming storms.

Assessment of these areas included identification of critical values in and downstream of the burned area, identification of pre-fire slope failures and pre-fire slope and channel failure deposits, measurements of slopes, identification of geological units, field verification of soil burn severity, notes of observations, and photography. In addition to ground and air reconnaissance, we also conducted a review of published

geologic maps and articles, and a study of aerial photography and lidar imagery. We provided soil burn severity field data to the US Geological Survey Landslide Hazard Program to assist in forecasting the probability, potential volumes, and hazards of debris flows through their developed empirical models.

The conclusion of our field observations is that whether the primary post-fire process is rock-fall, debris slides, debris flows, or sediment-laden flooding, the cumulative risk of various types of slope instability, sediment bulking, and channel flushing is high along a majority of slopes and drainages in and below the burn area following the Beachie Creek Fire. Based on this, special attention and caution is recommended in areas where people are living, traveling through, working, or recreating in or below burned areas during and after storm events.

In order to reduce risk to life, it is our recommendation to coordinate warning notifications with the National Weather Service, post warning signs, and enforce administration closures, especially if rainfall intensities would reach a threshold of 0.75-inch/hour in a short duration storm.

HYDROLOGY

The Beachie Fire largely burned within the Little North Santiam and Upper North Santiam watersheds, with stand-replacing fire encompassing almost the entirety of the Cedar Creek and Elkhorn Creek drainages. Primary watershed response is expected to include an initial flush of ash and burned materials, erosion in drainages and on steep slopes in the burned area, increased peak flows and sediment transport and deposition, and debris flows. These responses will likely lead to increased water quality concerns for municipal and domestic drinking water providers within and downstream of the fire. Modeled post-fire peak streamflow responses range from 1-3.5x pre-fire levels, depending on the proportion of moderate and high severity burn in the analyzed drainages. Watershed responses are dependent on the occurrence of rainstorm and rain-on-snow events and will likely be greatest with initial storm events. Disturbances will become less evident as vegetation is reestablished, providing ground cover that reduces erosion and increases surface roughness to slow flow accumulation and increase infiltration. Treatment recommendations to mitigate potential risks to life and safety, property, and water quality include maintaining closures at areas of high risk, posting signage to inform forest visitors about flood risks at campgrounds and gathering places, improving road drainage at high risk roads, and working with partners to set up an early warning system and continue engagement with water quality stakeholders.

ENGINEERING

The Beachie Creek Fire includes 277 miles of FS roads. Post-fire conditions, in combination with the expected watershed response, indicate there will be an increased risk of road failure due to rock fall, debris flow and drainage structure failure. Due to fire damage, many of the roads in this fire were inaccessible. Treatment recommendations include road closures on FS Roads 2207 and 2209. On the roads that are

remaining open, we recommend road drainage improvements (storm proofing) for 4 miles, storm inspection for 2 days and 4 road hazard signs. The Detroit Ranger District Compound also had 2 culverts that were destroyed. To protect access to the critical values at that location, we recommend replacing those culverts.

Figure 2 - Burned trailhead within the Beachie Creek Fire

RECREATION

BAER team members observed 31.1 miles of trails of concern (trails within moderate to high soil burn severity areas), 14 trailheads, 3 campgrounds, 3 day-use areas, and a historic guard station. Closures of the areas to prevent the public from entering areas with hazard tree danger and debris flow damage are necessary until hazards can be fully removed or signage can be placed to indicate the hazards present.

For the area within the fire perimeter we are suggesting restricting public access until the proper hazard tree mitigation has been completed. Areas that the public will be able to access outside of road closures will be posted with warning signs and hazard trees removed. Every location with restrictions in road access will be closed for the winter and will be reassessed in the spring.

BOTANY

Figure 3 - Disturbed areas are prime locations for the establishment of invasive weeds

Native plant communities that were burned at moderate to high severity are threatened by the introduction and spread of noxious weeds. This threat is due to the likelihood that some noxious weed seeds were brought into the area by fire equipment and suppression activity as well as from known noxious weed locations within the area. Several threatened and endangered plant species occur within the burn area including Gorman's aster and several listed species of lichens and fungi. The slow natural regeneration of these native plant communities following

severe burns also leaves some areas at risk, including the Opal Creek Wilderness. Most documented weed populations occur along roadsides and are expected to aggressively compete with native species for space and nutrients in adjacent burned areas. Early detection and rapid response inspections are recommended for approximately 84 miles of roads and 20 miles of trails.

WILDLIFE

The Beachie Creek Fire is within the current range of Northern Spotted Owl (NSO), a species that is listed as threatened under the Endangered Species Act. In critical habitat (CH) for the NSO, 3,331 acres burned with high severity (40% of the CH in the fire area) and 3,160 acres burned with moderate severity (38% of the CH in the fire area).

Threats include additional loss of habitat in the fire area due to blowdown, mass soil movement, flooding, and insects and disease. Each of these threats could result in additional mortality to remaining live trees and further reduce NSO suitable habitat and usable critical habitat and threaten the viability of nesting territories. A secondary issue includes determination if the proposed BAER stabilization treatments could affect spotted owl nest sites or result in disruption of nesting if conducted during the critical breeding season from March 1-July 15. There are no landscape scale treatments that would reduce the risk of the potential loss of additional habitat. During treatment implementation, timing restrictions for NSO and Bald Eagles will be overlaid with proposed treatments to determine any potential conflicts.

FISHERIES

Streams and rivers affected by the Beachie Creek Fire support runs of federally listed Upper Willamette spring Chinook salmon (threatened) and Upper Willamette steelhead trout (threatened). Critical habitat for Federally listed fish occurs in select river drainages. Potential post-fire effects in select tributaries within the North Santiam River, Breitenbush River, and Metolius River include:

- increase in peak flows laden with debris potentially leading to increase in accelerated channel scour and hillslope erosional processes;
- increase in fine sediment leading to direct mortality of eggs and fry and decrease of habitat elements such as pools;
- and increase in the likelihood of other negative effects to habitat from increased flow interaction with infrastructure.

Catchments or drainages of note which may see higher peak and debris flows 1-2 years post-fire include North Santiam River (below Detroit Lake), Sardine Creek, Elkhorn Creek, Little North Santiam River (including Cedar Creek), and Upper Molalla River (headwaters, including Copper Creek and Henry Creek). The magnitude of consequence to federally listed fish and critical habitat resulting from this fire ranges from minor to moderate. These river systems provide habitat for migration, foraging, spawning and rearing.

The interaction between post-fire stream flows and debris with road, recreation residences, recreation sites, and water use/intake systems was considered a risk to critical fisheries values. Geologic, soils and hydrologic analysis determined that potential sediment delivery resulting from modeled precipitation events is moderate to high in several catchments. Therefore, the BAER team identified emergency treatments to protect infrastructure, water quality and federally listed fish designated critical habitat values at risk. In addition to what is identified in this report, other road treatments are highlighted in the hydrology and engineering specialists' reports.

CULTURAL RESOURCES

A total of 15 cultural resource sites within the Beachie Creek Fire area were identified as at risk during this BAER assessment. Cultural resource types included traditional use areas, pre-contact lithic scatters, pre-contact and historic trails and travel routes, historic structures, 20th century mines and camps, and a 19th century railroad camp. Many sites were severely burned or damaged by the fire itself, while others face threats from post-fire threats such as looting, vandalism, erosion, and hazard trees. After evaluating the risks to critical cultural resource values in the fire area, the probability of damage or loss was found to be high or very high for four sites in the Beachie Creek Fire area. A suite of treatments such as road and trail closures, mulching, and hazard tree falling were recommended by the BAER team archaeologist.

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 Beachie Creek Fire. While taking significant precautions to minimize exposure to COVID-19, 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 post-fire threats. The recommended BAER treatments in this report are not yet approved or funded. 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 Beachie Creek Fire.