Willamette National Forest

Burned Area Emergency Response Summary – Cedar Creek Fire

November 1, 2022

The Cedar Creek Fire began on August 1, 2022, caused by a lightning strike. The fire started approximately 15 miles east of Oakridge, OR, and 5 miles west of Waldo Lake, on the Willamette National Forest. The fire grew rapidly in the first few days in inaccessible terrain, then was held at control features for around one month. In early September, hot, dry weather and a multi-day episode of strong, mostly easterly winds caused the fire to expand rapidly to the west, and eastward onto the Deschutes National Forest. The fire (as of 11/01/2022) encompassed 127,311 acres, in a variety of forested ecosystems. The fire burned a mosaic pattern through most of the area, and the majority burned with low and moderate severity, although areas of high severity are present north and northwest of Waldo Lake and on high elevation ridges and spurs in the southern and western portions of the burned area. The burned area is 100% on National Forest lands.

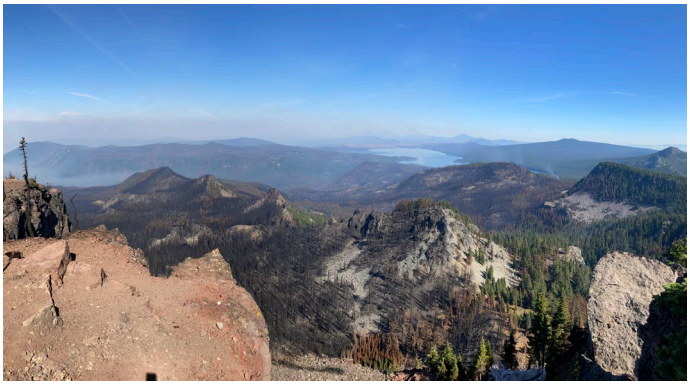

Figure 1. Mosaic of low, moderate, and high SBS – Waldo Lake and Black Creek canyon from Fuji Mountain summit.

The Forest Service assembled a Burned Area Emergency Response (BAER) team on October 3, 2022. This team of experts in soils, geology, hydrology, engineering, botany, recreation, archaeology, fisheries, and GIS, began assessing the post-fire effects to critical values on Forest Service 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), soil erosion and debris flow (geology) potential. The models compare pre-fire conditions to predicted post-fire conditions to estimate relative changes, which are then used to determine the relative risks to different critical values and make treatment recommendations to address emergency conditions. Below 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. Within the Cedar Creek Fire burned area, 36% of mapped areas on FS-managed lands experienced high and moderate SBS. The most concentrated areas of high SBS are found in the Skookum Creek, Upper Salmon Creek, and Black Creek subwatersheds. Only 12% of the total burned area experienced moderate or high SBS on sites with severe soil erosion hazard ratings. Modeled post-fire erosion potential for a three-year storm event (33% probability of occurring in any year) ranges from negligible amounts in lightly burned subwatersheds, to 7.3 tons/acre in the most severely affected subwatershed (Black Creek). Notably, the Waldo Lake drainage areas are predicted to experience mostly very low to some moderate erosion rates, related to their low slope gradient and coarse soil textures.

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. Based on modeling across similar burned areas in western Oregon during the 2020 fire season, and mapping of areas within the Cedar Creek Fire burned area where mulching could be both feasible and effective, the reduction in soil loss achievable by techniques such as aerial mulching would be nominal, and treatments would not be cost-effective. Post-fire precipitation events early in the wet season have already accelerated soil loss on erosion-prone hillslopes, further reducing the prospective effectiveness of land treatments to reduce erodibility. Natural vegetation recovery is generally swift in burned western Cascade landscapes, so allowing for natural recovery is the recommended course of action.

GEOLOGY

We identified 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 and downslope critical values. The fire removed vegetation that helps maintain hillslope and watershed integrity, changed the structure and erodibility of the soil, and altered the stability of the landscape. Knowledge of rock types and characteristics, geomorphic processes, and the types and distributions of geologic hazards helps predict how the watersheds will respond to and be impacted by upcoming storms.

Geologic assessment included identification of critical values within, downslope and downstream of potentially unstable portions 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

Figure 2. Landslide terrain in Black Creek canyon – slide scars predate the Cedar Creek Fire.

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 have provided soil burn severity data to the US Geological Survey Landslide Hazard Program to assist in forecasting the probability, potential volumes, and hazards of debris flows, using their developed empirical models.

Our observations and analysis conclude that there is an elevated risk of instability in the form of rockfall and debris flows across portions of the burned area. Areas with rockfall hazard to human life and safety and infrastructure values are present where forest roads cross steep burned hillslopes and are concentrated on upper hillslopes in the Black Creek and Salt Creek drainages. Elevated debris flow hazard was identified on a number of steep canyon hillslopes where SBS is high and moderate, including in the Salt Creek, Black Creek, and Kelsey Creek drainages. The cumulative risk of various types of slope instability, sediment bulking, and channel flushing is high along a number of slopes and drainages in and below the burned area following the Cedar 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 and safety, we recommend to coordinate warning notifications with the National Weather Service, post warning signs, and enforce administrative closures, especially if rainfall intensities would reach a threshold of 0.75-inch/hour in short duration storms. Cooperation and coordination with partner agencies such as Lane County, Union Pacific Railroad and the Oregon Department of Transportation is recommended to help mitigate risk along the important transportation corridors in the burned area.

HYDROLOGY

The Cedar Creek Fire largely burned within the North Fork Middle Fork Willamette River, Salmon River, Salt Creek and Waldo Lake watersheds, with stand-replacing fire most prevalent in lower-gradient, formerly glaciated landscapes of the High Cascades near Waldo Lake, including the reburned 1996 Charlton Fire burn scar. Wind alignment restricted high intensity fire mostly to the ridgetops in the area west of Waldo Lake. 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 are unlikely to lead to increased water quality concerns for municipal and domestic drinking water providers within and downstream of the fire, due to the mosaic nature of the burn and the high percentage of unburned or low severity fire in most watersheds. Modeled post-fire peak streamflow responses range from 1.0 - 2.3x pre-fire levels, depending on the

Figure 3. Charlton burn scar (1996 – reburned in 2022 Cedar Creek Fire) – note high severity burn, but low slope gradients.

proportion of moderate and high severity burn in the analyzed drainages. Watershed responses are dependent on the occurrence of rainstorms 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. These processes will attenuate over time and should recover to pre-fire rates over the next 2-5 years. Effects to the pristine waters of Waldo Lake are expected to be relatively minor and short-term, due to the low average hillslope gradients and the large portion of unburned landscape within the lake basin. Ash and sediment are expected to settle to the bottom of the deep lake relatively quickly, but delayed water quality effects could linger for up to 2-3 years as a result of nutrient-driven primary production. Treatment recommendations across the burned area to mitigate potential risks to life and safety, property, and water quality include maintaining closures of areas of high risk, posting signage to inform forest visitors about flood risks at campgrounds and gathering places, improving road drainage on high-risk roads, and working with partners to set up early warning systems and continue engagement with water quality stakeholders.

ENGINEERING

The Cedar Creek Fire includes 469 miles of Forest Service roads. Post-fire conditions, in combination with the expected watershed response, indicate there will be an increased risk of road damage or failure due to rock fall, debris flow and drainage structure failure. Due to fire damage, several of the roads in this fire were inaccessible, and will require future assessment. Treatment recommendations include temporary road closures (gates) on FS Roads 2400, 1931, 4290, 4636, 5883 and 5897. On the roads that are remaining open, we recommend road drainage improvements (storm proofing) and storm inspection and response for 42 miles, 15 road hazard signs, and one special bridge inspection following the first winter.

RECREATION

The Cedar Creek Fire burned area and immediate vicinity include numerous campgrounds, boat launches, trailheads, 142 trail miles, 1 Wild and Scenic River, and the high-use Waldo Lake basin. Hazard trees are present around many of these sites and facilities; these will require mitigation (felling) to protect the structures and users. Most surveyed recreation facilities survived intact or with minor damage; the status of the Blair Lake campground facilities is not yet known. In addition to hazard tree felling, hazard and closure signage and preventative erosion control on 18 miles of trail are recommended.

Figure 4. Waldo Lake outlet (North Fork Middle Fork Willamette River source), with gaging station – rare plant site (Marsupella emarginata).

BOTANY

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 to known noxious weed locations within the area. Areas of special botanical concern include stands of whitebark pine (*Pinus albicaulis*), a candidate species for Federal Endangered Species Act listing, on Fuji Mountain and in the Waldo Lake Wilderness, as well as rare and sensitive plant populations and associated special habitats distributed across the different vegetation types within the burned area. The primary threats to native plant communities are non-native invasive plants that readily colonize burned areas. Most documented weed populations occur along roadsides and are expected to aggressively compete with native species for space and nutrients in adjacent burned areas and/or sites disturbed by fire suppression. Early detection and rapid response inspections are recommended for approximately 916 acres, including roadside, suppression disturbance, and riparian areas. Treatments may include chemical (herbicide), biocontrol and/or mechanical removal as appropriate for species and sites. Native grass seeding in one acre of burned whitebark pine habitat is also recommended, to reduce the risk of aggressive non-native grasses invading sites and interfering with whitebark pine regeneration.

WILDLIFE

The Cedar Creek Fire is within the current range of the Northern Spotted Owl (NSO), a species that is listed as threatened under the Endangered Species Act. In critical habitat (CH) for the NSO, 2.664 acres burned with high severity (5% of the CH in the fire area) and 9,045 acres burned with moderate severity (18% 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 Cedar Creek Fire support runs of federally listed North Fork Middle Fork Willamette River spring Chinook salmon (threatened), and bull trout (threatened). Critical habitat for Federally listed fish occurs in the North Fork Middle Fork Willamette River (Chinook), Salt Creek (Chinook and bull trout) and Hills Creek Lake (bull trout). Potential post-fire effects in select tributaries of these catchments 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.

Figure 5. Kelsey Creek channel near confluence with Salmon Creek, showing burnt logs on debris flow deposit.

Catchments or drainages of note which may see higher peak and debris flows 1-2 years post-fire include the North Fork Middle Fork Willamette River, Salmon Creek, Black Creek, and Salt Creek. The magnitude of consequence to federally listed fish and critical habitat resulting from this fire is assessed as minor. These river systems provide habitat for migration, foraging, spawning, and rearing. Unconfined valleys are common throughout the burned area and in downstream reaches, and should provide areas for sediment deposition, reducing acute and long-term effects of fine sediment introduction from burned hillslopes.

Large woody debris available for recruitment into stream channels and valley bottom fish-bearing streams has increased greatly because of the Cedar Creek Fire. Increases in large channel wood will have a long-term benefit on wood loading, geomorphic complexity, and habitat quality in Critical Habitat.

The interaction between post-fire stream flows and debris with roads, recreation sites, and water use/intake systems was considered in addition to risk to critical fisheries values. The BAER team identified emergency treatments to protect infrastructure and water quality that will also benefit federally listed fish designated critical habitat. Road treatments are highlighted in the hydrology and engineering specialists' reports.

CULTURAL RESOURCES

A total of 205 known cultural resource sites are present within the Cedar Creek Fire burned area, or within 0.5 mile of the fire perimeter. Of these, 34 are in areas of moderate to high soil burn severity. Cultural resource types included traditional use areas, pre-contact lithic scatters, pre-contact and historic trails and travel routes, historic administrative structures, and 19th-20th century sites and camps. Some sites were burned or damaged by the fire itself, while others face post-fire threats such as looting, vandalism, erosion, and hazard trees. Several sites were assessed on the ground during the BAER assessment; several others were either assessed remotely or were deemed unsafe to enter due to post-fire safety hazards. While damage or loss was considered possible at several historic sites, the risk was determined to be minor to intermediate at most. BAER treatments recommended include hazard tree felling to protect the historic

Spring Prairie shelter, and further field assessment of the Klovdahl Tunnel historic site. The North Waldo historic snow survey cabin was lost in the fire; no treatment beyond the temporary area closure is recommended for this site.

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 Cedar Creek Fire. The assessment was conducted using the best available methods to analyze the potential for flooding, debris flows and other post-fire emergencies. The findings provide the information needed to prepare and protect against post-fire threats. The Forest Service will continue to provide information and participate in efforts to address threats to National Forest and off-Forest values at risk from the Cedar Creek Fire.