

Cub Creek 2 Burned Area Summary

2500-8 Burned Area Report

Fire Background

The Cub Creek 2 Fire started on July 16, 2021, and burned through dry brush and timber north of Winthrop, WA. This ~71,000-acre fire caused evacuations and multiple closures remain in place due to the fire effects. The fire burned almost entirely within the Chewuch River drainage.



Figure 1 Plume on the Cub Creek 2 Fire

The Forest Service assembled a Burned Area Emergency Response (BAER) team on August 25, 2021. This team of experts in various natural resource disciplines 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 exhibit 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 (geology) potential. The modeled results were then used to determine the relative risk to different critical values and inform recommendations to address risks that were determined to be an emergency. This document acts as a summary of the formal assessment and FS-2500-8, Burned Area Report.

Watershed Response

Soils

Soils within the burned area are formed in materials comprised primarily of glacial till, glacial outwash, alluvium, colluvium, and residuum from various rock sources. The soils vary widely in texture, depth, content of rock fragments, drainage, and temperature. Most of the soils are blanketed with a mantle of volcanic ash of varying thickness. Soils throughout the burned area generally shows weak development since most are derived from glacial materials. Additionally, alluvial and colluvial processes have retarded soil forming processes and the development of strong soil structure.

An estimated 41% of the burned area within the Cub Creek 2 Fire had high or moderate soil burn severity and may have developed water repellent soils as a result. Vegetation mortality in the moderate and high soil burn severity areas ranged from 80 – 100% (see map on page 6).

Geology

Much of the Pacific Northwest is very geologically active and many steep slopes are prone to landslides and debris flows as a natural process. The Cub Creek 2 Fire may speed up some of those natural processes in certain watersheds. Fire increases the potential for debris flows, partly due to the removal of vegetation.

The USGS-derived models estimate a moderate to high level of debris-flow hazard for most of the area burned by the Cub Creek 2 fire. Many stream reaches and drainages have a greater than 40% likelihood of debris flow occurrence at the modeled rainfall intensity. Many of the basins and stream reaches near the center of the burn area have a high (60-80%) to very high (>80%) likelihood of debris-

flow occurrence. These high hazard areas mostly occur in drainages above Doe Creek, Falls Creek, Eight Mile Creek, and the Chewuch River (see map on page 7).

Hydrology

Preliminary hydrologic modeling predicts a substantial increase in runoff over much of the burned area. Flood flows in smaller drainages resulting from the 5-yr 1-hour rainstorm (20% probability of occurrence in the first year following the fire, about 50% probability in years 1-3) are predicted to increase 50 to 200-fold over pre-fire flow levels (see map on page 8).

Critical Values

Roads and Bridges

The watersheds burned in the Cub Creek 2 Fire are predicted to exhibit varying degrees of response through increased runoff, and debris and sediment transport. This creates a future concern for roads (figure 2), culverts (figure 3), bridges, and channels along the drainage paths of the burned watersheds in that they may be plugged, overtopped, or washed away more frequently than experienced under pre-fire conditions.



Figure 2 Hazard trees pose a recurring threat during and after a fire.

Forest system roads within the burn perimeter (325 miles) or connected to it are located on soils derived from alpine glacial till at lower elevations or volcanic ash and pumice over igneous or

metamorphic residuum as elevation increases. Slopes range from moderately steep to very steep throughout the Cub Creek 2 Fire and corresponding drainages.

Potential critical values at risk addressed in this report include Forest Service System Roads and related drainage features.

Roads at risk include 5010100, 5010500, 37, 3700825, 5130, 5130100, 5130300, 5130382, 5140, 5140030, 4140280, and 5140300; also, all non-surveyed roads within or immediately adjacent to high or moderate soil burn severity.



Figure 3 Plugged culverts can lead to a road being overtopped by flood waters.

The proposed treatments include signs warning travelers of the increased danger, temporary closures of roads where safety is at particularly high risk, post-storm inspection, drainage dips, clean ditches and inlets to handle increased flows, and fixing burned holes in the road prism.

Bridges at risk include the Falls Creek Bridge, Falls Creek Utilities Bridge, and Eightmile Creek #1 Bridge.

The proposed treatment is regular post-storm inspections to clean out drainages and any accumulated debris.

Recreation

Many recreation resources are located within or near the perimeter of the fire on NFS lands, including eight campgrounds (figure 4), five trailheads, numerous dispersed use sites, seven terra trails, one sno-park, groomed motorized trails, and two rivers eligible for Wild & Scenic River designation. Recreational use occurs throughout the year within this area and seasonal use occurs at each of the developed infrastructure assets.

Camping: Both campers and infrastructure at Falls Creek, Chewuch, Camp 4, Buck Lake, and Nice campgrounds are at high risk due to the threat of increased flooding and debris flow. These campgrounds are located on alluvial fans from previous debris flow events. Geologists found evidence of debris flows in the not-too-distant past. Based on the combined evidence of the USGS debris flow analysis, site assessments, and preliminary post-fire flow modeling by the BAER team, these sites were judged to be at varying degrees of risk of inundation. This risk is compounded at campgrounds, where people stay overnight and may not be able to respond to rapid events such as flash floods or debris flows.

The recommended treatment includes temporary campground closure, physical closure with gates, and warning signs. To prevent damage to campground water supply wells at Falls Creek and Chewuch campgrounds, pump jacks should be removed and well heads capped. Portable site infrastructure, such as picnic tables, could be removed and stored outside of the flood plain at each campground recommended for closure.



Figure 4 Burned sign at the Nice Campground

Dispersed camping is a popular activity in this area as well. While no infrastructure is at risk in these areas, human life and safety is still a major concern at many of these sites, due to falling trees and flooding. The forest recommends temporarily closing either the dispersed camping or the road corridor between specific points. These roads are discussed in the engineering analysis performed by the BAER team.

Trailheads and Trails: People using the Falls Creek trailhead (518) are threatened by hazard trees that are a high risk to human life and safety. The recommended treatment is temporary closure, installation of warning signs, hazard tree assessment and removal. The Eightmile Ridge trailhead (523) has not been assessed for hazard trees due to the road to the trailhead being blocked by fallen trees. Hazard tree assessment should be completed at the trailhead when access is possible. Based on the assessment, treatments could include temporary closure and hazard tree removal.

The Falls Creek Falls trail (518.1) is an ADA-accessible, highly developed trail located adjacent to Falls Creek, which is at high risk for increased flooding and debris flows. Much of the area surrounding the trail is burned and hazard trees are present. Due to the high use level of this trail, its status as ADA accessible with atypical use patterns, and proximity to Falls Creek, recommended

treatment is to temporarily close the trail, post warning signs, and conduct hazard tree assessment and removal as needed. These treatments address threats to the critical value of human life and safety.

For all other trails in the burned area, the recommended treatment is for warning signs to be posted at all trailheads. Except for the Falls Creek Falls trail and Buck Mountain trail, most trails have not had recent or consistent maintenance, resulting in the trails being in degraded condition prior to the fire. Emergency treatment to stabilize the trail prism from further damage is unlikely to be effective due to the condition of the trails.

There are six groomed winter motorized trail routes within the burned area, but only the Eightmile Road (5130) is recommended for temporary closure due to the amount of the route that travels through high and moderate burn severity areas.

Botany

The Cub Creek 2 fire burned into fire-sensitive riparian and shrub-steppe communities and reburned patches of forests and woodlands recovering from recent severe fire effects. The unknowing introduction and dispersal of invasive weeds into areas disturbed by fire suppression and rehabilitation has the potential to establish large and persistent weed populations. In addition, it is highly likely that extant weed infestations adjacent to the burn area will expand due to their accelerated growth and reproduction and a release from competition with natives.

Approximately 38 miles of dozer line (figure 5) and 12 miles of handline were constructed outside and within the burn perimeter. In addition to causing an increase in weed invasion, the disturbances caused by dozer lines are expected to create accelerated erosion and soil compaction that may also inhibit the recovery of native plant populations. Approximately 25,886 acres (35%) of the Cub Creek 2 fire overlapped with seven different fires that have occurred on USFS land within the past 35 years, including 15,137 acres of

forest plant communities slow to recover from repeated wildfires or whose ecological functions and fire resiliency have been altered due to currently present weedy and invasive species. Forty-four percent of riparian habitat mapped in the burn area was potentially impacted by high to moderate severity fire effects. If weed infestations are not detected and controlled within the first year post-fire, these previously intact native communities will likely type-convert into exotic species dominance.

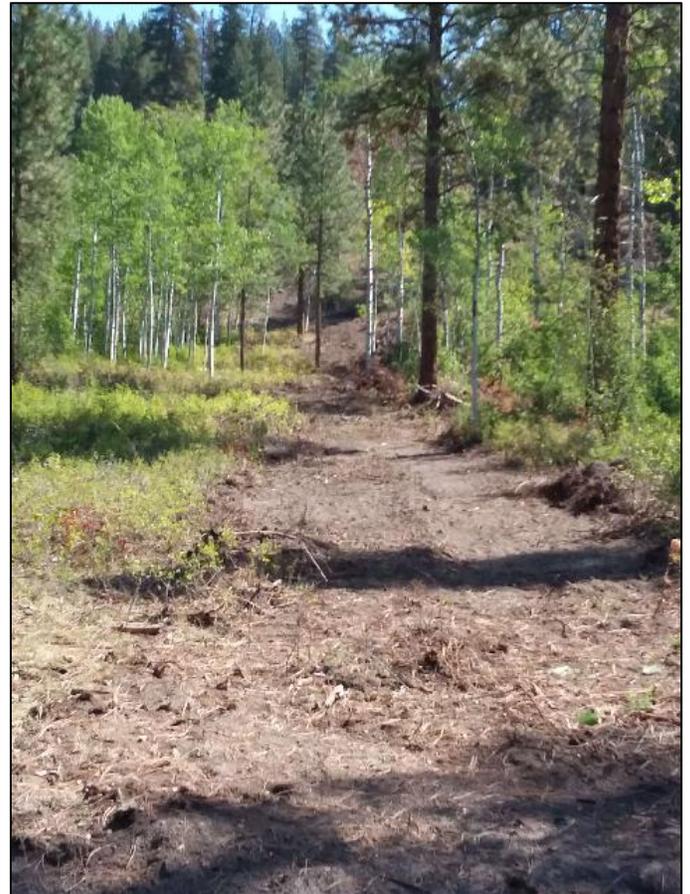


Figure 5 Dozer lines are hot spots for noxious weed infestations after fire.

The Forest recommends a treatment of Early Detection, Rapid Response (EDRR) to monitor for noxious weed infestation and expansion. In areas disturbed due to mechanical suppression activity (approximately 360 acres) and burned areas prone to new noxious weed infestations (240 acres), weed technicians will perform regular surveys and treat new infestations.

Cultural Resources

There are approximately 7 historically significant sites within the Cub Creek 2 burned area and assessments of those sites is planned. While the initial focus of the BAER team was human life and safety, the team also recognizes that heritage resources are critical values. These significant sites will be evaluated as soon as possible by district staff to assess fire damage and new risks from the post-fire conditions.

Wildlife

Impacts to aquatic systems are directly related to the anticipated increases to runoff, erosion, and sedimentation in streams. Proposed treatments for road drainage will help to reduce those impacts to stream habitats. District fish biologists are reviewing the assessment and preparing emergency consultation documentation and coordinating with aquatic habitat restoration partners.

Non-Forest Service Values

Since fire effects know no administrative

boundaries, additional threats exist for assets not owned or managed by the Forest Service. This includes recreation residences, private property, municipal water sources, etc., and the BAER team is already engaged with interagency partners to ensure that off-Forest values covered by other programs are addressed by the relevant responsible entities.

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 Cub Creek 2 Fire. Despite 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 Forest Service will continue to provide information and participate in interagency efforts to address threats to public and private values at risk resulting from the Cub Creek 2 Fire.

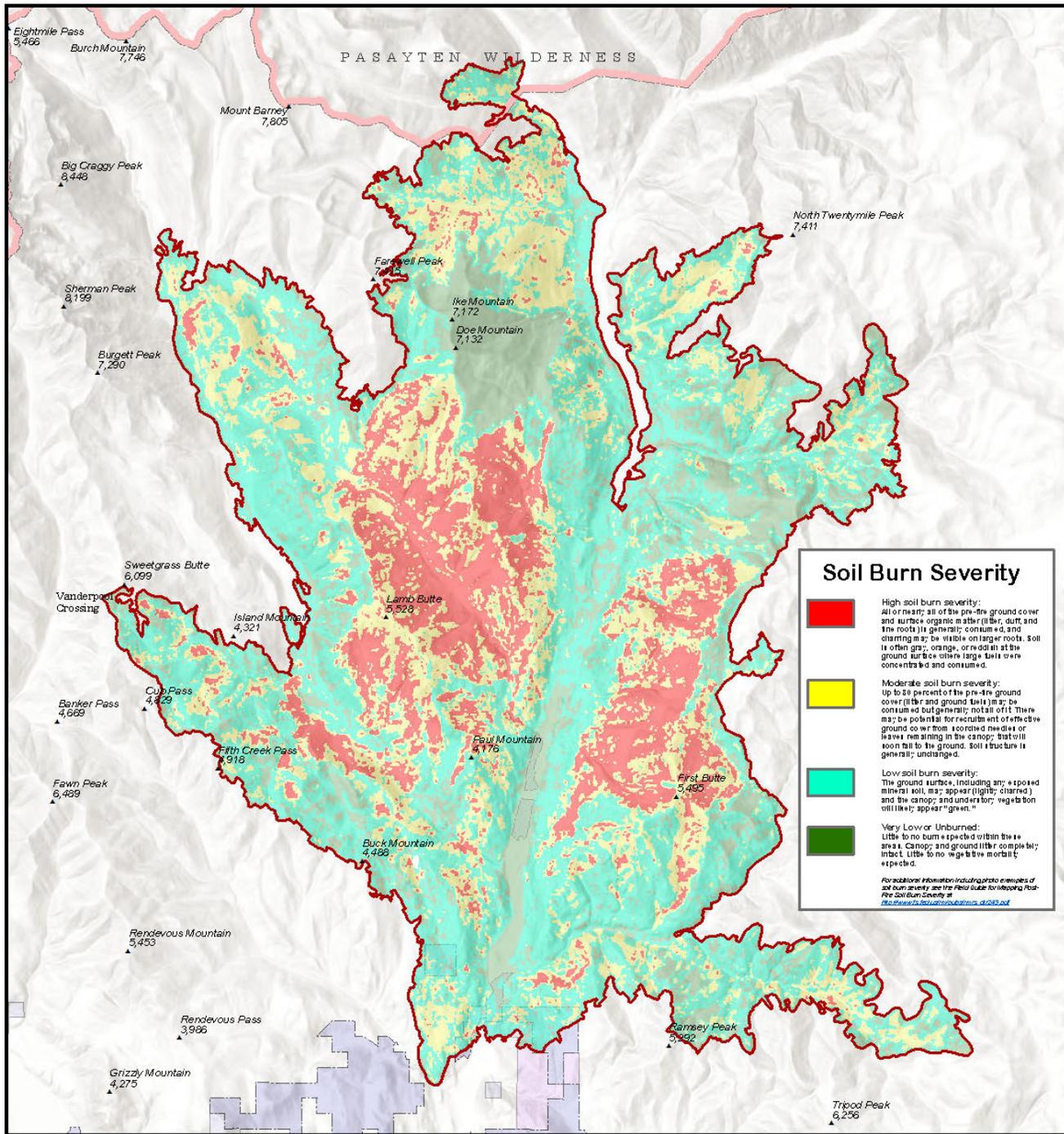


Figure 6 This dispersed campsite was heavily burned and poses substantial risks to potential overnight visitors.



Soil Burn Severity Map - Cub Creek 2 Fire

Cedar Creek - Cub Creek 2 BAER - Okanogan-Wenatchee National Forest



Disclaimer

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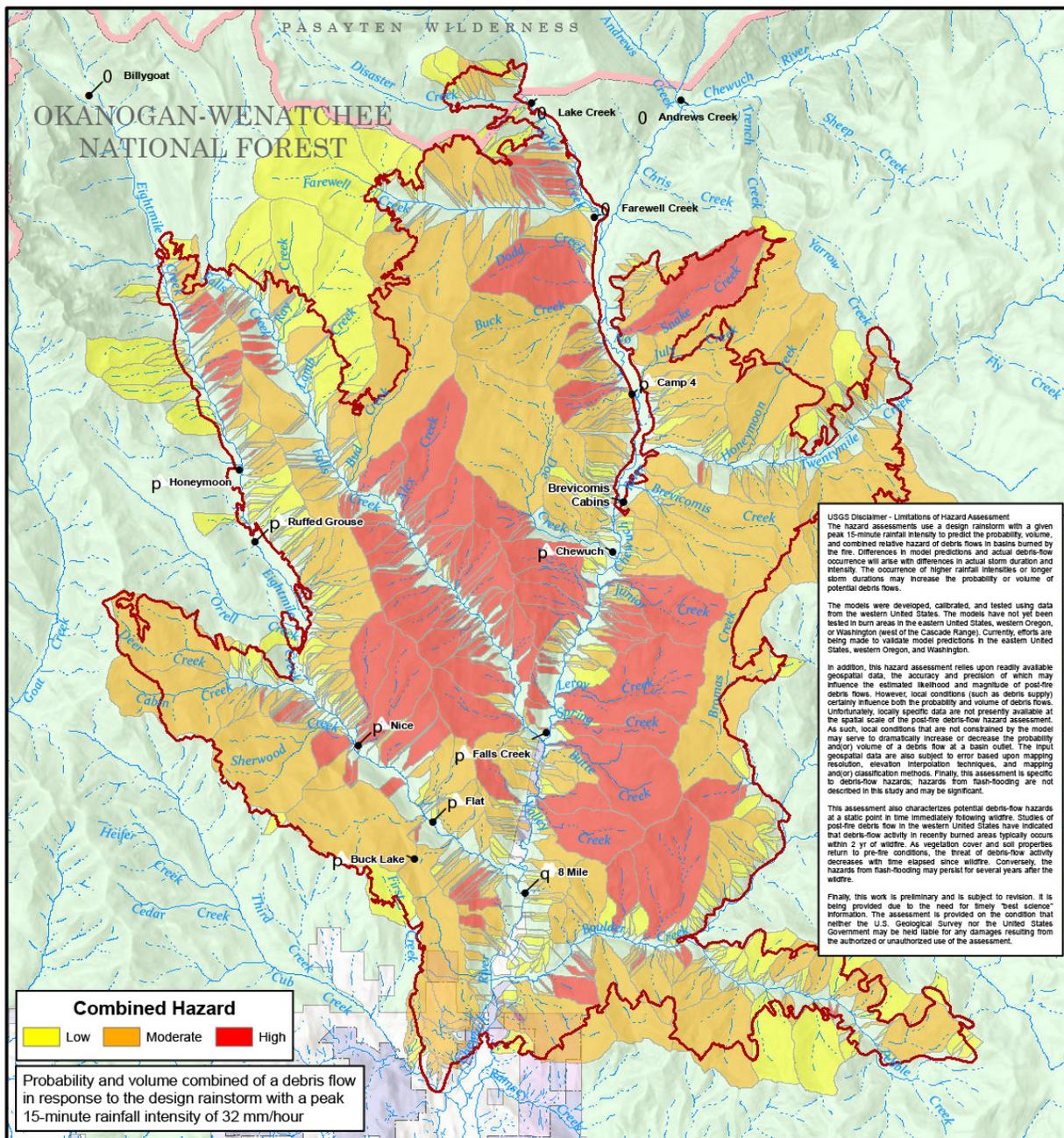


Figure 7 Soil burn severity map of the Cub Creek 2 Fire.



USGS Debris Flow Combined Hazard - 15 minute Intensity of 32 mm/h

Cedar Creek - Cub Creek 2 BAER - Okanogan-Wenatchee National Forest



USGS Disclaimer - Limitations of Hazard Assessment

The hazard assessments use a design rainstorm with a given peak 15-minute rainfall intensity to predict the probability, volume, and combined relative hazards of debris flows in basins burned by the fire. Differences in model predictions and actual debris-flow occurrence will arise with differences in actual storm duration and intensity. The occurrence of higher rainfall intensities or longer storm durations may increase the probability or volume of potential debris flows.

The models were developed, calibrated, and tested using data from the western United States. The models have not yet been tested in burn areas in the eastern United States, western Oregon, or Washington (west of the Cascade Range). Currently, efforts are being made to validate model predictions in the eastern United States, western Oregon, and Washington.

In addition, this hazard assessment relies upon readily available geospatial data; the accuracy and precision of which may influence the estimated likelihood and magnitude of post-fire debris flows. However, local conditions (such as debris supply) certainly influence both the probability and volume of debris flows. Unfortunately, locally specific data are not presently available at the spatial scale of the post-fire debris-flow hazard assessment. As such, local conditions that are not constrained by the model may serve to dramatically increase or decrease the probability and/or volume of a debris flow at a basin outlet. The input geospatial data are also subject to error based upon mapping resolution, elevation interpolation techniques, and mapping and/or classification methods. Finally, this assessment is specific to debris-flow hazards; hazards from flash-flooding are not described in this study and may be significant.

This assessment also characterizes potential debris-flow hazards at a static point in time immediately following wildfire. Studies of post-fire debris flow in the western United States have indicated that debris-flow activity in recently burned areas typically occurs within 2 yr of wildfire. As vegetation cover and soil properties return to pre-fire conditions, the threat of debris-flow activity decreases with time elapsed since wildfire. Conversely, the hazards from flash-flooding may persist for several years after the wildfire.

Finally, this work is preliminary and is subject to revision. It is being provided due to the need for timely "best science" information. The assessment is provided on the condition that neither the U.S. Geological Survey nor the United States Government may be held liable for any damages resulting from the authorized or unauthorized use of the assessment.

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Cub Creek 2 Fire

- Fire Perimeter
- U.S. Fish & Wildlife Service Land
- Forest Service Land
- Bureau of Land Management Land
- State Public Land
- Private and Other Land
- Other State Land

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Date: 9/7/2021



Figure 8 Debris flow hazards for the Cub Creek 2 Fire

