Forest Service
U.S. DEPARTMENT OF AGRICULTURE

Boise National Forest | October 2024

Snag and Dollar Fire Burned Area Summary

Burned Area Report

Fire Background

On August 5, 2024, a storm system moved through Cascade, Idaho producing cloud to ground lightning and multiple wildfires starts. Due to this storm system, Snag and Dollar Fires ignited and started to burn National Forest System lands on the Boise National Forest - Cascade Ranger District. As of October 15th, 2024, the Snag fire was 33,332 acres in size and 90% contained, and the Dollar fire was 4,360 acres in size and 8% contained.

While many wildfires cause minimal damage to the land and pose few threats to the land or people downstream, some fires result in damage that requires special efforts to reduce impacts afterwards. The Burned Area Emergency Response (BAER) program is designed to identify and manage potential risks to resources on National Forest System lands and reduce these threats through appropriate emergency measures to protect human life and safety, property, and critical natural or cultural resources. BAER is an emergency program for stabilization work that involves time-critical activities to be completed before damaging events to meet program objectives.

The Forest Service assembled a BAER team on October 4th, 2024, for both the Snag and Dollar Fires. This team of experts in various resource disciplines began assessing the post-fire effects to critical values on Forest Service lands. Impacts to the soil are the primary indicator of potential post-fire changes in watershed response, as well as watershed recovery. The team developed soil burn severity (SBS) maps to document the degree to which the fires had changed soil properties. Using the SBS map, physical scientists can predict erosion potential, changes to runoff and flood flows, and increased geologic hazards. Field evaluations and modeling results are used to determine relative increases in post-fire risk to different critical values and inform recommendations to address these increased risks.

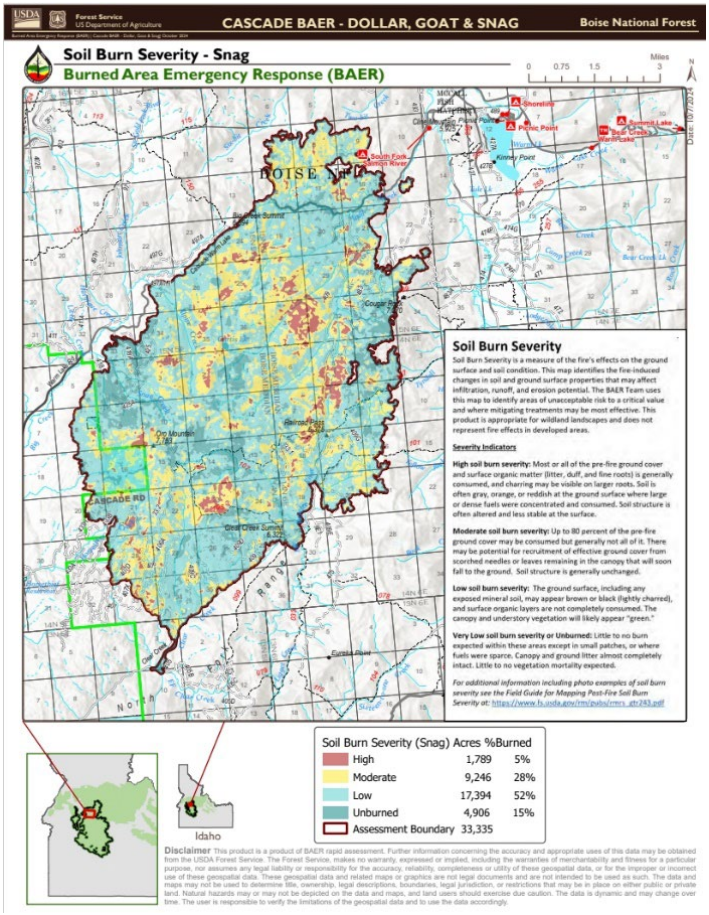

Figure 1. Snag Fire soil burn severity map

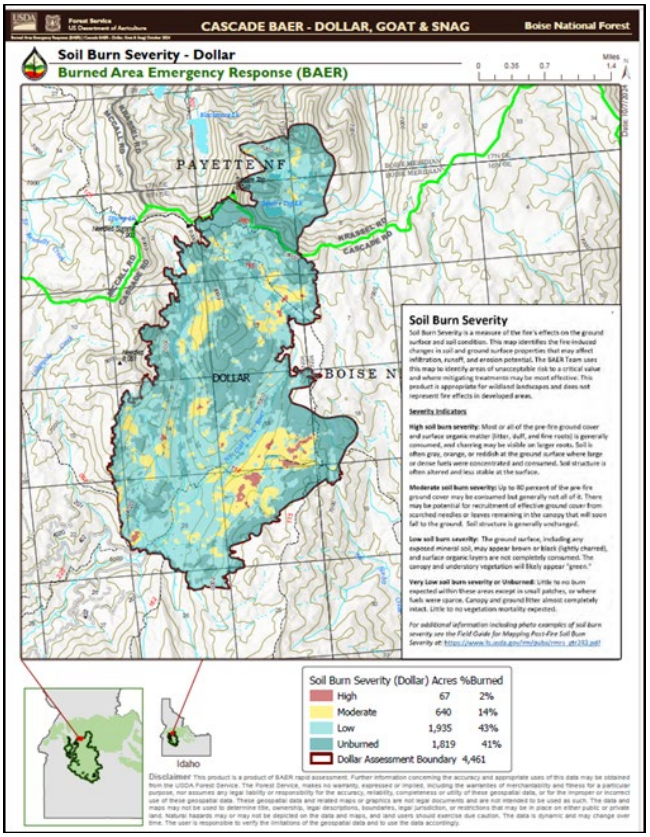

Figure 2. Dollar Fire Soil Burn Severity Map

Soils

Soil burn severity (SBS) is not an assessment of vegetation consumption, but rather an integration of vegetation loss, changes in soil structure and infiltration capacity, remaining vegetation, duff, or ash, and soil color, all of which may indicate relative degrees of soil heating.

The final soil burn severity maps were developed with ESRI ArcGIS software using satellite-imagery-derived Burned Area Reflectance Classification (BARC) and field survey data. Field work included assessment of ash characteristics, ground cover, root condition, soil structure, soil water-repellency, and vegetation burn severity as described in the Field Guide for Mapping Post-fire Soil Burn Severity (Parsons et al. 2010). High burn severity is characterized by a complete consumption of organic material with the surface layers of the soil resulting in a change to single-grain structure. Fine roots are commonly charred or consumed 3-5 cm deep. The highest-severity areas often have a loose, dusty appearance, and no longer have any cohesion or soil strength. Generally, there will be less destruction of soil organic matter, roots, and structure in an area mapped as moderate compared to high. In areas mapped as moderate SBS, soil structure, roots, and litter layer may remain intact beneath a thin ash layer. Low SBS results in very little alteration of soil organic matter and little or no change in soil structural stability.

Mapped and validated SBS for the Snag fire burned area is: High (5%), Moderate (28%), Low (52%), and Very Low/Unburned (15%). For the Dollar fire, the SBS is: High (2%), Moderate (14%), Low (43%) and Very Low/Unburned (41%) (Figures 1 and 2). The more severe a fire's effects are on the soil, the more likely those soils will erode in subsequent rainstorms – especially in locations with steep slopes. Erosion after fires can cause damage to homes and other structures in the years after a fire.

Geology

The team 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. Understanding 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.

Geology influences hydrology, available sediment, and steepness in the burned area watersheds. The entirety of both the Snag and Dollar Fire footprints consist of granodiorite and two-mica granite. Soils are predominantly granodiorite-derived sandy loams with natural background hydrophobicity. The main geomorphic landforms within the Snag and Dollar fire perimeters are glacial trough lands, frost-churned uplands and mountain slopes, depositional lands, and fluvial mountain slopes. Slope gradients averaged between 0-20% on depositional lands, 15-40% in the frost-churned uplands and 30-80% in the

glacial trough lands and fluvial mountain slopes. The surface geology is predominately granite from the Idaho Batholith east of the North Fork. The burned area is underlain solely by granodiorite and two-mica granite of the Atlanta Lobe (85-67 Ma) of the Cretaceous Idaho Batholith. The Idaho Batholith is a composite mass of granitic plutons covering approximately 15,400 square miles in central Idaho.

The team provided a final SBS 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. Estimates of probability, volume, and combined hazard are based upon a design storm with a peak 15-minute rainfall intensity of 12 – 40 millimeters per hour (mm/h) rate. The USGS Post-fire Debris Flow Hazard Model included hazard classes, probability of occurrence and volumes of materials occurring for multiple precipitation events. Figures 3 and 4 below show the combined hazard map using modeled volume estimates and likelihood of debris flow initiation using the 24mm/hr. storm event for both fires.

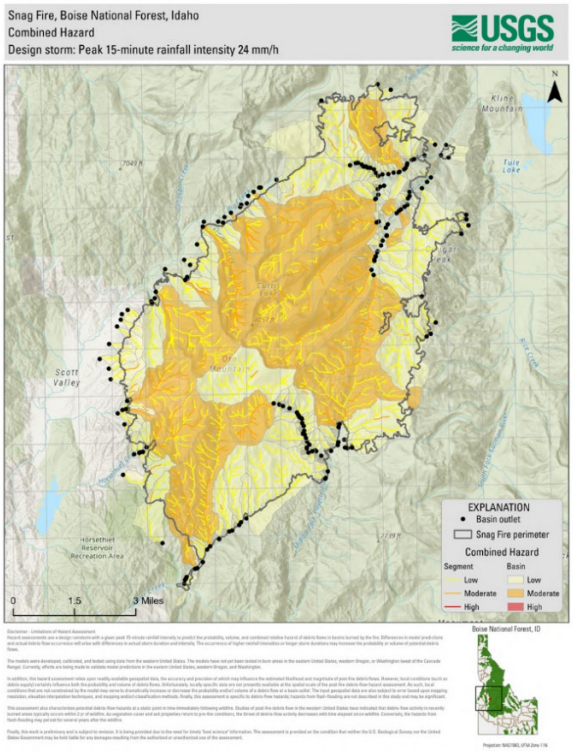

Figure 3. Snag Fire Combined Hazard Map

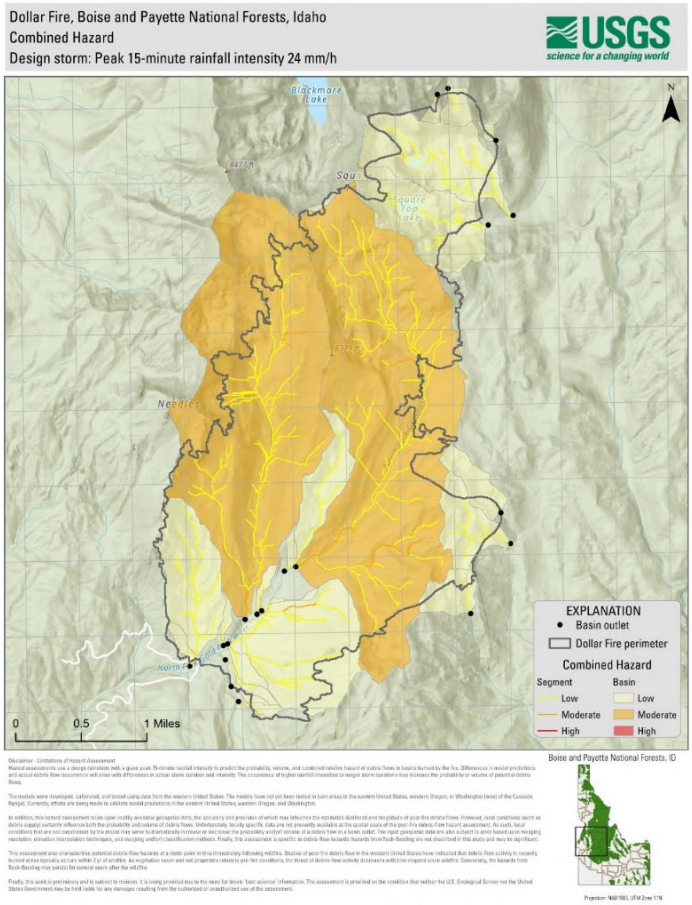

Figure 4. Dollar Fire Combined Hazard Map

Hydrology

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. Watershed response is 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 which slows flow accumulation and increases infiltration.

The north, central and eastern portions of the Snag fire drain into the South Fork Salmon River, an eligible Wild and Scenic River. The Goat Fire,

burning just south of the Snag Fire, also drains into the South Fork Salmon River. A rapid hydrologic assessment suggests that given the low percentage of moderate and high soil burn severity, overall watershed response will be low in most watersheds. In catchments with higher percentages of moderate and high soil burn severities, lack of needle cast potential, and reduced unburned buffer distances, watershed response will be moderate to high. Within both fire areas, hydrophobicity was highly variable and was likely reduced by recent precipitation events which can break down fire-induced hydrophobicity. While water quality in the South Fork Salmon River will be impacted, it is expected to be short-term, episodic, and temporary. Therefore, water quality impacts from both the Snag and Dollar Fires are not anticipated to affect the hydrologic function of the river.

Figure 5. Trail Creek Hot Springs

Critical Values

The first critical value BAER teams assess is always human life and safety on National Forest System lands. During and after heavy rainstorms, Forest Service employees and visitors to National Forest System Lands could be threatened by floodwaters and debris flows. In addition, users of roads within and downstream of the burned areas may be affected by road washouts during and after heavy rainstorms. The National Weather Service can establish an early warning alert plan for areas that are potentially at risk from these events. The BAER team recommends burned area warning signs to alert travelers on any National Forest System road and trail access points within or directly adjacent to both fires. Figure 5 shows a location where a burned area warning sign would be beneficial to users of the hot springs.

Figure 6. Burned slopes above and below roads within the Snag Fire.

Roads and Bridges

Roads in and downstream of burned areas are at risk of damage due to post-fire conditions. The most likely threat due to the fires is clogging of culverts, and other in-channel infrastructure from the higher levels of floatable debris (especially burned trees) in burned watersheds. Once blocked by debris, road drainage structures no longer function and the stream flows over the road, often causing considerable damage and limiting access. Various measures can reduce this risk, including protecting culvert inlets with debris racks, removing large floatable debris from channels upstream of structures before floods, and making heavy equipment available and readily mobilized during storm events to keep structures clear of debris. Debris flows are less likely than debris-laden flood flows, but they pose a greater threat to roads when

they do occur and are difficult to mitigate.

Critical values addressed in the BAER report for both Snag and Dollar fires include Forest Service System Roads and related drainage features (Figure 6). Treatments for the protection of these roads for the Snag fire include storm inspection and response to ensure proper function of roads and motorized trails. Patrol will focus on NFS roads that are within or below moderate to high burn severity, receive the most traffic and are of highest value to the transportation system. Road treatments were not recommended for the Dollar fire due to the lack of road infrastructure.

Recreation

National Forest System recreation infrastructure includes campgrounds, trails, and day use areas. Most of the recreation assets within the Snag and Dollar Fires burned areas relate to trails, dispersed camping and naturally occurring Trail Creek hot springs. Like roads, recreation infrastructure (motorized and non-motorized) could be damaged in post-fire storm events. For both fires, the team proposes installing burned area warning signs at dispersed recreation access areas and at trailheads that enter the burn perimeter (Figure 7). No additional treatments were needed as most trails were in low to moderate severity burns where the possibility of damage to the prism is low.

Figure 7. Burned area warning signs

Botany

Invasive plants adversely affect native plant communities through direct competition for water and resources. Over time, invasive species infestations interfere with recovery by displacing native plant communities, subsequently impacting the ecological stability of the system reducing habitat for native plant and wildlife species. Shifts from diverse native plant communities to non-native invasive plant dominance could alter future fire behavior, intensity, extent, and season of burning.

Figure 8. Non-native invasive plant species that can invade post fire.

Currently there are 8 noxious weed species managed by the Boise National Forest and the State of Idaho that were known to grow within the burned area. Current infestations of spotted knapweed, rush skeleton weed, and yellow toadflax are primarily located along roads, old dozer lines, campgrounds, and trails throughout the burned areas, with interior areas being largely un-infested. Lower elevations of the Snag fire were known to be more infested. Whitebark pine (*Pinus albicaulis*), an ESA Threatened species is known to occur at higher

elevations within the Dollar and Snag fires.

The post-fire environment can create conditions for invasive species to outcompete native plants and for an increase in insect and disease infestations to injured Whitebark pine trees that survived fire with bark charring and crown scorch injury. Effects to cone-producing trees from increased insect and disease infestations could have a long-term effect on individuals' survival and fecundity and on population's future recruitment and recovery.

The team recommends a treatment of Early Detection, Rapid Response (EDRR) to detect and prevent the introduction and expansion of non-native invasive plant species in areas disturbed due to suppression activity and burned areas prone to new noxious weed infestations for both the Snag and Dollar fires.

Cultural Resources

The most typical post-fire threats to cultural sites are physical threats such as erosion or damage from (now dead) falling trees. In some cases, newly exposed artifacts are threatened by human damaging activities such as looting or vandalism. Cultural resources were evaluated by the team and treatments considered were capping, hazard tree removal, and signage for both fires. The team recommended hazard sign installation at the Stoney Meadow warming hut impacted by the Snag fire, and no treatments were recommended for the Dollar fire.

Federally Listed Species - Fisheries

The Snag and Dollar Fires are occupied with several federally listed fish species including Columbia River Bull Trout (*Salvelinus confluentus*), Snake River Steelhead (*Oncorhynchus mykiss*), and Snake River Spring/Summer Chinook Salmon (*Oncorhynchus tshawytscha*). Twenty-eight miles of Bull trout critical and three miles of Chinook/Steelhead critical habitat occur within the Snag fire perimeter along Curtis, Trail and Tyndall Creeks and Middle Fork Payette River. Federally designated critical habitat for the Columbia River Bull Trout occurs in the North Gold Fork River, and Blackmare Creek drainages on the Dollar fire.

Impacts to aquatic systems are directly related to the anticipated increases to runoff, erosion, and sedimentation in streams and rivers. Threats include additional loss of spawning habitat in the fire areas due to blowdown, mass soil movement, and flooding events resulting in flushing of spawning habitat. Threats to federally listed fish habitat were evaluated by the team, and natural recovery was recommended for both Dollar and Snag fires. This recommendation was given due to the majority of the existing habitat occurring in low to unburned areas of the fires.

Figure 9. Low gradient stream segment of Curtis Creek.

Anticipated Vegetation Recovery

Post-fire recovery varies greatly based on climate, vegetation types and burn severity. It is typical for recovery to take between 3-5 years for reestablishment of ground cover. The persistence of drought in the years following wildfires also delays the recovery time frame. Even with only a short period of time since fire containment, resprouting of trees and shrubs as well as emergence of forbs have been noted within the burned area. In areas with remaining overstory and low to moderate SBS, leaf litter, needle cast, and woody debris beneath remaining canopies will provide some soil protection and promote water infiltration. The

existence of fine roots and seeds in the low and moderate severity burn areas will aid plant recovery.

Non-Forest Service Values

Since fire effects know no administrative boundaries, additional threats exist for assets not owned or managed by the Forest Service. Post-fire emergency response is a shared responsibility. There are several Federal, State, and local agencies that have emergency response responsibilities or authorities in the post-fire environment. The BAER team and local unit BAER Coordinator have engaged with interagency partners to facilitate consideration of off-Forest values covered through other programs with the relevant responsible entities.

Partner agency contacts:

NOAA National Weather Service – Troy Lindquist-troy.lindquist@noaa.gov
http://www.weather.gov/boi/

USDA Natural Resource Conservation Service – Bruce Sandoval – Emergency Watershed Protection bruce.sandoval@usda.gov

https://www.nrcs.usda.gov/contact/state-office-contacts/idaho-state-office

Conclusion

There are multiple phases of post-fire actions after a wildfire covering suppression repair through long-term recovery. BAER is the rapid assessment of burned watersheds to identify imminent post-wildfire threats to human life and safety, property, and critical natural or cultural resources on National Forest System lands, and the immediate actions to implement emergency stabilization measures before the first damaging storms. The BAER team has identified imminent threats to critical values based on a rapid assessment of the Snag and Dollar Fires. The assessment was conducted using the best available methods to analyze the potential for damage from post-fire threats, including flooding and debris flows. The findings provide the information needed to prepare and protect National Forest System critical values against post-fire threats. The recommended BAER treatments in this report are not yet approved or funded. Because of the emergency nature of BAER, initial requests for funding of proposed treatments are submitted by the Forest Supervisor to the Regional Office within 7 days of total containment of the fires.

BAER treatments cannot prevent all potential flooding or soil erosion impacts, especially from a wildfire-altered landscape. It is important for the public to stay informed and prepared for potentially dramatic post-fire flooding. The Forest Service will continue to provide information and participate in interagency efforts to address threats to public and private values resulting from the Snag and Dollar Fires. Information can be found online at https://inciweb.wildfire.gov/incident-publication/idbof-boise-nf-postfire-baer-2024/forest-service-teams-begin-postfire-assessment-of-boise-national-forest-wildfires-10-05-2024.

The Forest Service continues to work towards long-term recovery and restoration of the burned area. A vegetation burn severity map, or mortality map, may be produced as a part of the recovery efforts to help other scientists, such as wildlife biologists, botanists, and silviculturists understand what to expect from this changed landscape for wildlife habitat, invasive weeds, timber salvage, and reforestation needs.

Local Forest Service Leadership

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References:

Parson, Annette; Robichaud, Peter R.; Lewis, Sarah A.; Napper, Carolyn; Clark, Jess T. 2010. Field guide for mapping post-fire soil burn severity. Gen. Tech. Rep. RMRS-GTR-243. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 49 p.

(https://www.fs.usda.gov/rm/pubs/rmrs_gtr243.pdf)