USDA Forest Service
U.S. DEPARTMENT OF AGRICULTURE

Sawtooth, Boise, and Salmon-Challis National Forests | October 2024

Wapiti Fire Burned Area Summary

2500-8 Burned Area Report

Fire Background

The Wapiti Fire was ignited by lightning on July 24, 2024 approximately two miles southwest of Grandjean, ID (figure 1). After weeks of minimal growth and activity, the Wapiti Fire experienced a dramatic increase in fire activity in late August and burned in all directions, with the greatest growth to the north and east. The fire (as of 10/7/2024) encompassed 125,965 acres primarily in a mixed conifer forest. The fire burned a mosaic pattern through most of the area, and the majority burned with low to moderate severity.

Figure 1 The Wapiti Fire started due to lightning just south of Grandjean on the Boise National Forest.

The Forest Service assembled a Burned Area Emergency Response (BAER) team on September 26, 2024. This team of experts in soils, geology, hydrology, engineering, recreation, archaeology, fisheries, and GIS 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.

Watershed Response

Soils

Soils within the Wapiti Fire boundary are generally weakly developed, very well drained, highly erosive granitic soils on oversteepend slopes within glacial valleys. More developed soils are found on shallow slopes on glacial deposits. The fire increases erosion hazard by eliminating vegetation and the forest floor that secures soils and intercepts rainfall. Field reconnaissance found that moderate and high soil burn severity (SBS) generally correlated to areas where forest canopy was completely consumed.

The final SBS maps were developed with Esri ArcGIS software using satellite-imagery-derived Burned Area Reflectance Classification (BARC) and field survey data. The BAER team physical scientists assessed soil conditions as described in the Field Guide for Mapping Post-fire Soil Burn Severity (Parson et al. 2010) (figure 2). Areas with high soil burn severity had complete consumption of organic material by the fire leaving black ash. Given the fast moving fire and coarse texture soil type, fine roots were singed in the top cm of soil but remained intact. The highest-severity areas often have a loose, dusty appearance, and lack soil

cohesion or soil strength. 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. An estimated 42% of the burned area within the Wapiti Fire had high (10%) or moderate (32%) soil burn severity and may have developed water repellent soils as a result (see map on page 7).

Figure 2 Scientists spent multiple days making ground observations about soil conditions.

The highest erosion will occur on the south facing slopes, common within the Grandjean area. Landforms on the west side of the fire appear to have higher slopes and erosion risk where deep soil formed from fractured bedrock and older granitic rocks exists (see map on page 8). Soils with the highest hazard include those on highly dissected mountain slopes with deep weathered gravel and sand-sized material from granitic rocks. Erosion modeling in the moderate and high severity burned area estimate a high of 450 lbs/acre of soil erosion in the most severe slope conditions, but 100-200 lbs/acre more typical on less steep slopes. Vegetation recovery could occur within 3 years except on south slopes where dry sandy soils take longer to regrow and stabilize.

Geology

The Wapiti Fire burn area is underlain primarily by granite and granodiorite. Occurrences of granite and volcanic rocks tend to be highly fractured in outcrop and decompose into lighter colored colluvium and decomposed granite soils that are locally thick and gullied, and prone to rapid erosion and slope and channel instability if stabilizing surface vegetation is removed.

The team 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 post-fire debris flow hazard model estimates increased probability of debris flows in various basins throughout the fire, with the biggest change in the western and southern portions of the burned area (see map on page 9).

Figure 3 The Grandjean area has already experienced multiple debris flows.

An important highway (Highway 21) runs through the burned area in very steep terrain, exposing it to various hazards. A stretch of Highway 21 is nicknamed “Avalanche Alley” due

to its propensity for slides even without the impact of wildfire. Debris flows could impact the highway via inundation or by blocking culverts that cross beneath the road.

Forest Service Road 524 (Grandjean Road) is at risk due to localized rockfall events and debris flows, as observed from a rain event in mid-September. The south-facing slopes above the Grandjean Road are particularly susceptible to debris flows.

Hydrology

The primary watershed responses of the Wapiti Fire are expected to include: 1) an initial flush of ash and small debris, 2) some rill and gully erosion on steep slopes within the burned area, and 3) potential flash floods and debris flows during short duration, high intensity precipitation events and prolonged rainfall. In steep areas with high and moderate soil burn severity, storms will likely create increased surface flow that could trigger floods or debris flows. In areas that could produce flooding and debris flows, it is expected to be most pronounced during the first 1-3 years after the fire and will become less evident as vegetation and soil-hydrologic function recover. However, areas with extensive high and moderate burn severity on south slopes may take longer to recovery and can produce post-fire flooding or debris flows 3-6 years out. Modeling results show peak flow increases ranging from 5-200 times greater than pre-fire flows for the 2-year, 60-minute storm event, which is likely to occur within the 3–5-year recovery window. Due to the expected recovery of hydrophobic soils and vegetative conditions, hydrologic function will likely not experience long-term negative impacts on National Forest System land.

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 or fallen trees during and after heavy rainstorms (figure 3). 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 general warning signs and communications to travelers on any National Forest System roads and trails within or directly adjacent to the fire.

Roads and Bridges

The Wapiti Fire includes 82 miles of National Forest System Roads, 4 bridges, and several non-system travel routes. Twenty-nine miles of road were identified as inside, or directly below moderate or high soil burn severity areas. Post-fire conditions, in combination with the expected watershed response, indicate there will be increased risk of road failure due to rock fall, debris flow, and flooding. It is expected that debris flows originating from burned watersheds will cause material to flow onto roadways and could clog/block culverts beneath roadways, which may cause localized flooding. As ditches, culvert inlets, and roadway dips become compromised, they become vulnerable to failure and may result in loss of the property and/or structure.

Figure 4 Debris flows from mid-September rains already impacted the Grandjean Road, causing fire crews to use heavy machinery to open the road for fire crews.

State Highway 21 is a heavily used road but is kept clear and open by the Idaho Transportation Department road crew. Critical engineering values addressed in the BAER report include Forest Service System Roads and related drainage features. Treatments for the protection of these roads include road drainage storm proofing (clearing debris in drainage features before approaching storms), storm inspection and response (inspecting drainage features after storms to ensure proper operation), warning signs, and gate closures.

Recreation

National Forest System recreation infrastructure includes campgrounds, trails, and day use areas. Most of the recreation assets within the Wapiti Fire burned area relate to trails, developed campgrounds, and dispersed camping areas. The team identified 121 miles of trails, 8 campgrounds, 8 trailheads, 4 designated dispersed camping areas, numerous dispersed recreation areas, and several non-system travel routes as critical values. Trails exist in wilderness and non-wilderness areas and are designed to provide opportunities for hiking, stock, motorcycle, and motor vehicles less than 50". Like roads, recreation infrastructure could be damaged in post-fire storm events (figure 4).

The team proposes trail drainage stabilization treatments, which include armoring and/or cleaning existing water control features such as water bars and adding additional drainage features to provide additional capacity for elevated sediment laden post-fire runoff.

In addition to trail-specific treatments, the BAER team recommends the removal of hazard trees (fire-killed trees still standing) in areas where crews will be working to implement identified treatments. The team also recommends the placement of warning signs at trailheads of affected trails or logical ingress points to the burned area.

Botany

Aggressive invasive plants are present within the burned area, primarily on travel routes. These infestations are within or adjacent to burned areas, and several survey and manage fungi species important for old growth forest structure. Invasive plants are highly adapted to take advantage of conditions created after fire and can out compete native plants for resources. The Wapiti Fire area contained six noxious Idaho plant species and one non-native invasive plant species. Keeping new or expanding noxious/invasive species from becoming established is a high priority across federal, state, and private lands ownership boundaries. Non-native invasive species often establish rapidly following fire. The presence of non-native invasive species may prevent establishment of desirable perennial grasses and can increase future fire hazards.

Figure 5 This popular boardwalk at Stanley Lake was destroyed.

Prevention and treatment of invasive species prior to populations becoming established and expanded is a key point in restoring desired native vegetation within the burn area and reducing long-term cost of containment, control and eradication. An aggressive monitoring and treatment program is needed to deal with noxious/non-native invasive

plants. Spread of invasive plants into un-infested areas due to conditions created by the fire pose direct competition for resources including water, nutrients, and above and underground growing space. BAER treatments include the survey, treatment, and monitoring of invasive species infestation in 183 acres of at-risk land.

Figure 6 Dozer suppression lines are hot spots for invasive weeds.

Cultural Resources

Research has shown that wildfires have the potential to damage or destroy cultural resource sites through: (1) direct effects of the fire; (2) ground disturbing suppression or rehabilitation activities; and/or (3) erosive soil movement caused by subsequent storm precipitation. These impacts may destroy historic and archaeological resources or alter the context of surface and subsurface cultural remains vital to any scientific analysis or interpretation. Also, wildfires may have an indirect effect, such as increase the accessibility and visibility of archaeological site locations, making them more susceptible to vandalism/artifact looting and unauthorized recreational activity.

The BAER team assessed 26 culturally sensitive sites based on the SBS level on site, SBS level upslope from the site, USGS debris flow predictive modeling, geological unit data, and a hillshade GIS layer created from lidar data to see more clearly the landform's surroundings sites. In some cases, treatments may inadvertently draw attention to otherwise hidden artifacts or sensitive sites. Due to this and a minimal risk of losing these sites, the team does not recommend treatments.

Federally Listed Species - Fisheries

Critical habitat for Federally listed fish species within the Wapiti Fire include Snake River Spring/Summer Chinook, Snake River Sockeye Salmon, Snake River Steelhead, and Columbia River Bull Trout. Impacts to aquatic systems are directly related to the anticipated increases in temperature, debris flows, runoff, erosion, and sedimentation in streams. No emergency stabilization measures were recommended for aquatic resources. However, road and trail drainage, culvert treatments, and storm patrols will benefit listed fish and the designated critical habitat by minimizing loss of roads and trail tread, and sedimentation to streams.

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 county and state roads, private property, 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

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 take immediate actions to implement emergency stabilization measures before the first major storms. The BAER team has identified imminent threats to critical values based on a rapid assessment of the area burned by the Wapiti Fire. 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 BAER treatments are supposed to be submitted by the Forest Supervisor to the Regional Office within 7 days of total containment of the fire.

BAER treatments cannot prevent all the potential flooding or soil erosion impacts, especially after a wildfire-changed landscape. It is important for the public to stay informed and prepared for potentially dramatic increased run-off events. Many burned-area watersheds were already hydrologically responsive to rainfall and prone to erosion and sediment transport prior to the fire and will likely be even *more* responsive due to post-fire conditions. However, vegetation recovery is anticipated to be rapid with ground cover approaching pre-fire conditions within 2-3 years, which will attenuate any post-fire effects on watershed processes. The Forest Service will continue to provide information and participate in interagency efforts to address threats to public and private values resulting from the Wapiti Fire.

The Forest Service will continue to work towards long-term recovery and restoration of the burned area in coordination with efforts to rebuild and restore the communities affected. 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.

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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)

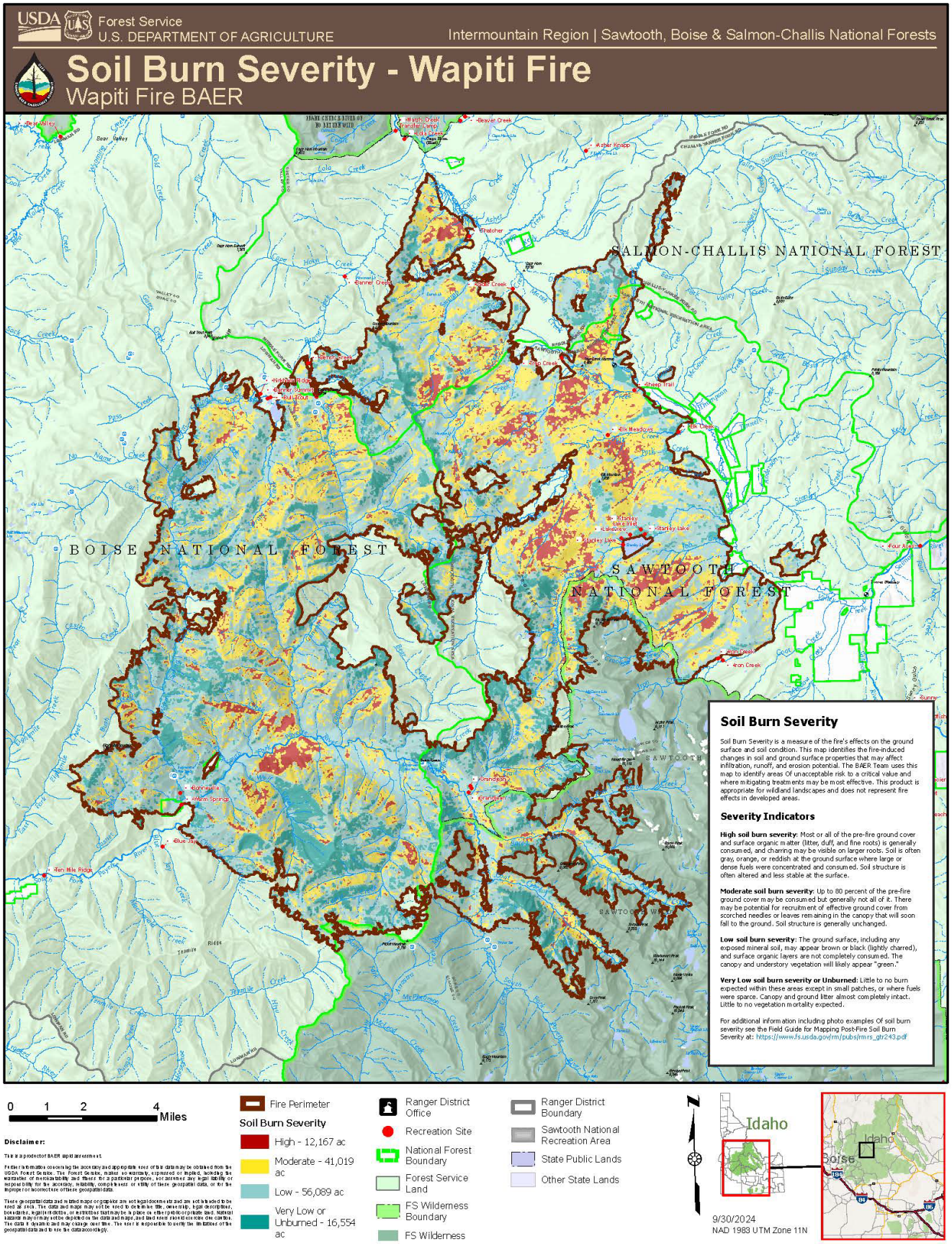

Figure 1 Burn severity map of the Wapiti Fire.

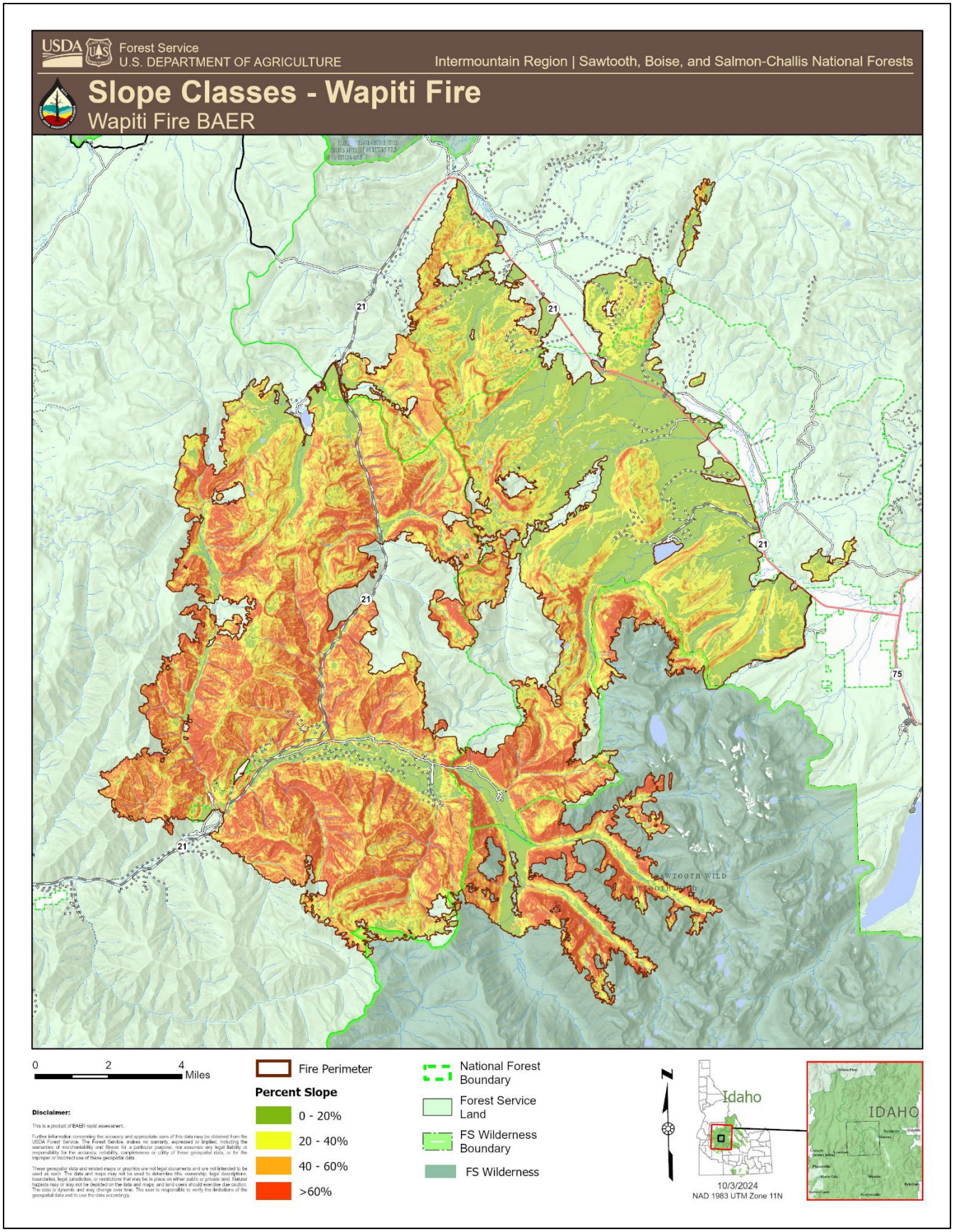

Figure 8 Map depicting the slope of the terrain within the Wapiti Fire.

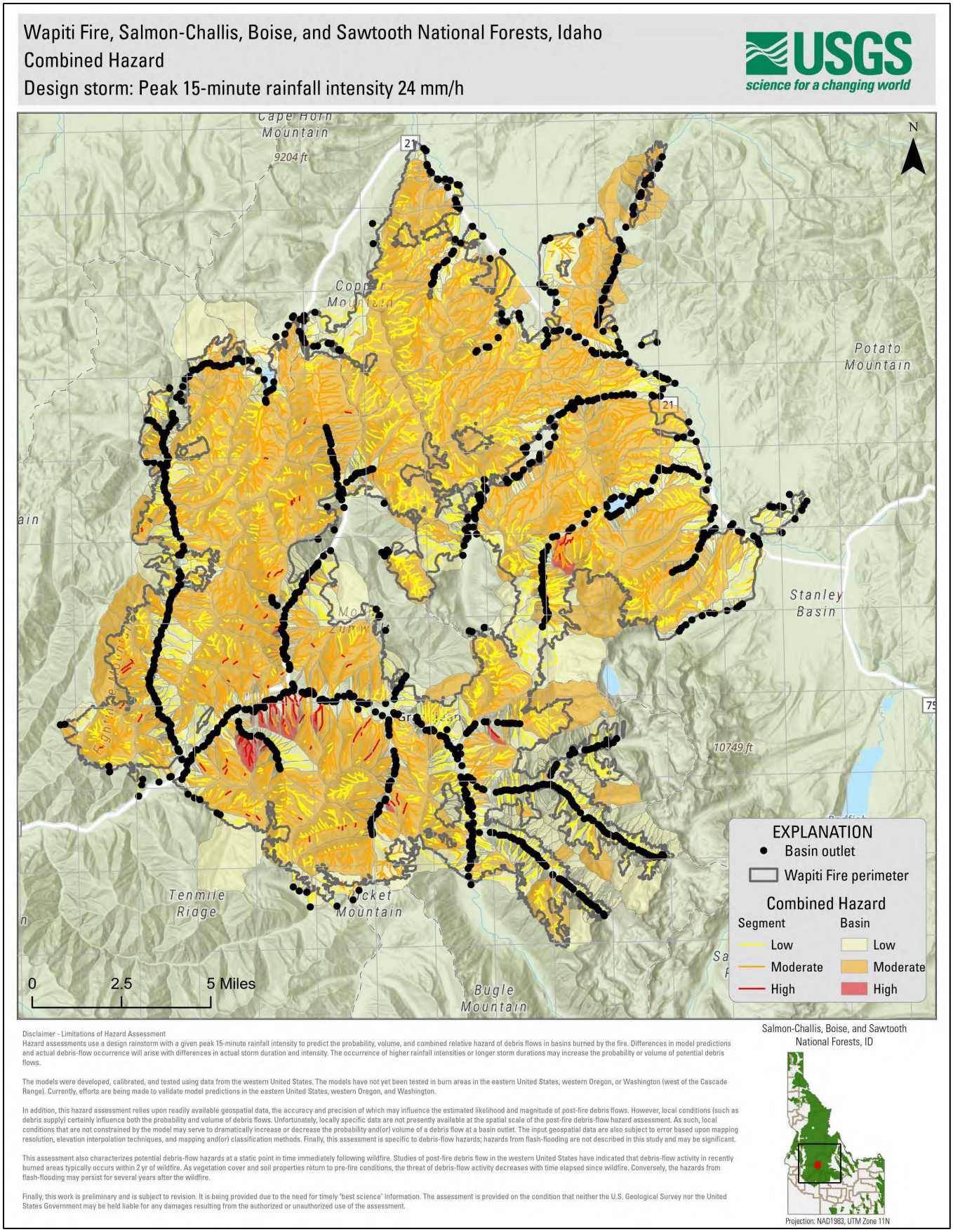

Figure 9 Debris flow hazards for the Wapiti Fire