Forest Service
U.S. DEPARTMENT OF AGRICULTURE

Boise and Payette National Forests | October, 2024

Lava Fire Burned Area Summary

Burned Area Report

Fire Background

The Boulder Fire was discovered on 7.24.2024, the Lava Fire was discovered on 9.2.2024. The two fires merged and were thereafter referred to as the Lava Fire. Fuel types include Sagebrush at low elevations, Ponderosa Pine and Douglas Fir at mid elevations and Engelmann Spruce, Lodgepole Pine, Sublapine Fir, and Whitebark Pine at high elevations. As of 10.10.2024 the Lava Fire was 90% 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 9.28.2024 for the Lava Fire. 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.

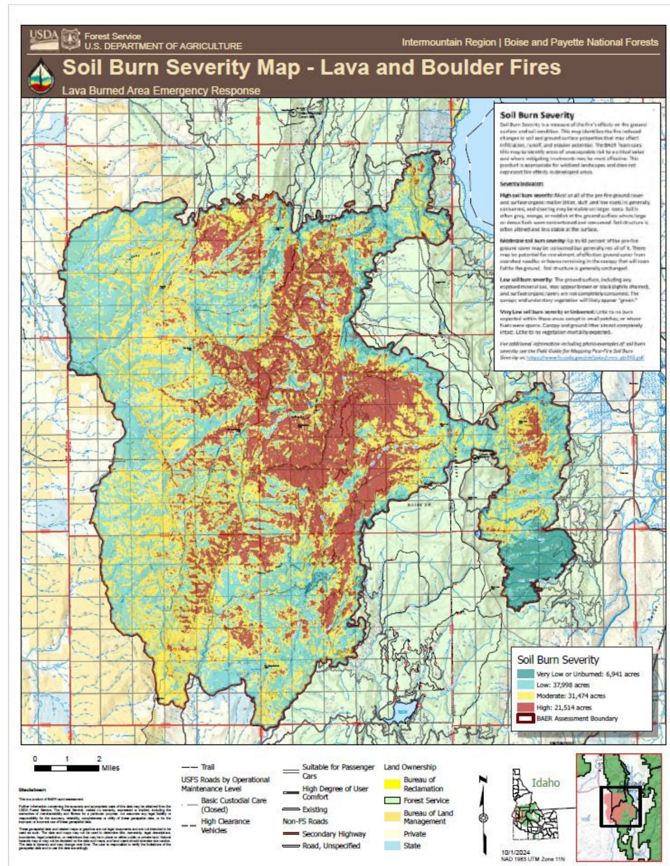

Figure 1. Soil burn severity for the Lava Fire (Full size on pg. 7)

Soils

Soil burn severity 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 soil burn severity results in very little alteration of soil organic matter and little or no change in soil structural stability.

Mapped and validated SBS for the burned area is High (22%), Moderate (32%), Low (39%), and Very Low/Unburned (7%) (see map on page 7). 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 tremendous damage to homes and other structures in the years after a fire.

Figure 2. Collecting field data on soil burn severity

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. 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.

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 postfire debris-flow hazard assessment for the Lava Fire used a design storm with peak 15-minute intensities of 24 mm/h. Estimates were calculated at two scales: the stream segment scale (segment of stream with a maximum length of 200m) and for drainage basins. The maximum drainage area size for calculation of the predictions is 8 square kilometers. Although the debris flow model is not designed to predict it, flood flows (often bulked with sediment and containing floatable material) are a concern in addition to debris flows in drainage basins exceeding 8 square kilometers in contributing area. The model estimates a moderate to high level of debris-flow hazard for most of the area burned by the Lava fire. Certain local conditions not represented by the input data may significantly impact site-specific debris-flow hazard. In the higher probaility areas, debris flows are more likely to be initiated by lower intensity rainfall events. (see map on page 8).

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. Increased watershed response is most likely in areas with high to moderate soil burn severity. 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 watershed modeling and debris flow hazard mapping identify specific areas of concern and magnitude of potential effects. While all burned watersheds are generally of concern, specific basins such as the Little Weiser, Chief Eagle Eye, Third Fork of Chief Eagle Eye, and the east portion of Snowbank Mountain show dramatic increases in peak flows and/or moderate to high debris flow risks.

Peak storm runoff and water conveyance through the burned watersheds is expected to increase significantly for the very likely, likely, and possible storm events (2,5, and 10-year return interval storms). Modeled watershed discharge results indicate that peak storm runoff will increase by an order of magnitude for both a modeled 6-hour duration storm event and a 24-hour duration storm event. The increase in water conveyance through the stream networks could occur in conjunction with an increase in sediment input and transport, along with an increase in fine and coarse woody debris. This will result in an increase in channel scour, reduced carrying capacity for certain streams, channel avulsion, and streambank instability. These effects will last until streamside and watershed wide vegetation establishes enough to stabilize soils, promote water infiltration and percolation, and slow water conveyance through the watershed. This process should be observed over the 2 to 5-year period.

Figure 3. Channel impacts from post-fire flooding

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 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. Warning signs will be placed along roads and trails at strategic entry points into the national forests and burned areas. The closure of the Big Flat Campground and a partial closure of FSR625 is also recommended to protect public safety.

In addition to specific treatments, the BAER team recommends the removal of “danger trees” (fire-killed trees) in areas where crews will be working to implement identified treatments.

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, bridges, 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 include Forest Service System Roads and related drainage features. Treatments for the protection of these roads include storm proofing and drainage dips to establish proper road drainage; culvert removal; road closure devices and water bars to store and stabilize roads; and storm inspection and response to monitor drainage features and road surfaces and complete repairs as needed.

Figure 4. Culvert damage from post-fire flooding

Recreation

National Forest System recreation infrastructure includes campgrounds, trails, and day use areas. Most of the recreation assets within the Lava burned area includes trails and campgrounds. Similar to roads, recreation infrastructure could be damaged in post-fire storm events.

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

Botany

Invasive plants adversely affect native plant communities through allelopathy (suppression of growth of a native plant by release of a toxin from a nearby invasive plant) and direct competition for water and resources. Over time, native plant diversity decreases as invasive plants expand, reducing habitat for native plant species and wildlife. Shifts from diverse native plant communities to non-native invasive plant dominance could alter future fire behavior, intensity, extent, and season of burning.

Native or naturalized communities exist within the more undisturbed parts of the burn scar with invasive species occupying lowland areas along the perimeter. Specialists have identified Canada thistle, spotted knapweed, gypsyflower, diffuse knapweed, and oxeye daisy as possible weed species that will likely take root in disturbed areas. Suppression features create disturbance that could allow invasives to move into the native or naturalized communities. The moderate and high severity burned area creates conditions for invasive species to outcompete native plants. The team 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 and burned areas prone to new noxious weed infestations.

Whitebark Pine habitat is threatened by a potential increase in non-native species in areas with moderate and high SBS. Overall risk to Whitebark Pine is low, there are few suppression features near or leading to Whitebark Pine habitat, and SBS within the habitat is generally a mosaic of low, moderate, and high.

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 proposed as necessary to protect these values from post-fire threats.

Federally Listed Species - Wildlife and Fisheries

The Lava Fire is within the current range of Bull Trout habitat. Threats include additional loss of habitat in the fire area due to loss of channel function, mass soil movement, flooding, and turbidity from sedimentation.

Critical habitat for Federally listed Bull Trout occurs in select river drainages within the Upper Little Weiser River, Pole Creek-Chief Eagle Eye Creek, Third Fork Chief Eagle Eye Creek, Anderson Creek, and Second Fork Chief Eagle Eye Creek subwatersheds. Impacts to aquatic systems are directly related to the anticipated increases to runoff, erosion, and sedimentation in streams.

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 burned areas.

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 has engaged with interagency partners to facilitate consideration of off-Forest values covered through other programs with the relevant responsible entities.

Partner agency contacts:

National Weather Service – Troy Lindquist – Hydrologist – troy.lindquist@noaa.gov

Natural Resource Conservation Service, Emergency Watershed Program – Bruce Sandoval – bruce.sandoval@usda.gov

Bureau of Land Management – Rob Bennet – rjbennet@blm.gov

Valley County Emergency Management – Juan Bonilla – juan.bonilla@donnellyfire.net

Adams County Emergency Management – Carol Walsh – cwalsh@co.adams.id.us

Gem County Emergency Management – Jeff Ulmer – julmer@co.gem.id.us

Figure 5. High severity burn impacts

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 by a BAER team 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 Lava 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. The Regional Forester's approval authority for individual BAER projects is limited. Approval for BAER projects exceeding this limit is forwarded onto the Washington Office.

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 occur in the short-term with ground cover approaching pre-fire conditions within 2-5 years for areas with low and moderate burn severity and 5-10 years for areas with high soil burn severity. This 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 Lava Fire. Information can be found on-line at https://inciweb.wildfire.gov/incident-information/idbof-boise-nf-postfire-baer-2024

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.

Local Forest Service Leadership

Brant Petersen – Boise NF Supervisor

Matthew Davis – Payette NF Supervisor

Local Forest Service BAER Coordinator

Matt Robinson – Boise NF BAER Coordinator

Jen Ford – Payette NF BAER Coordinator

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)

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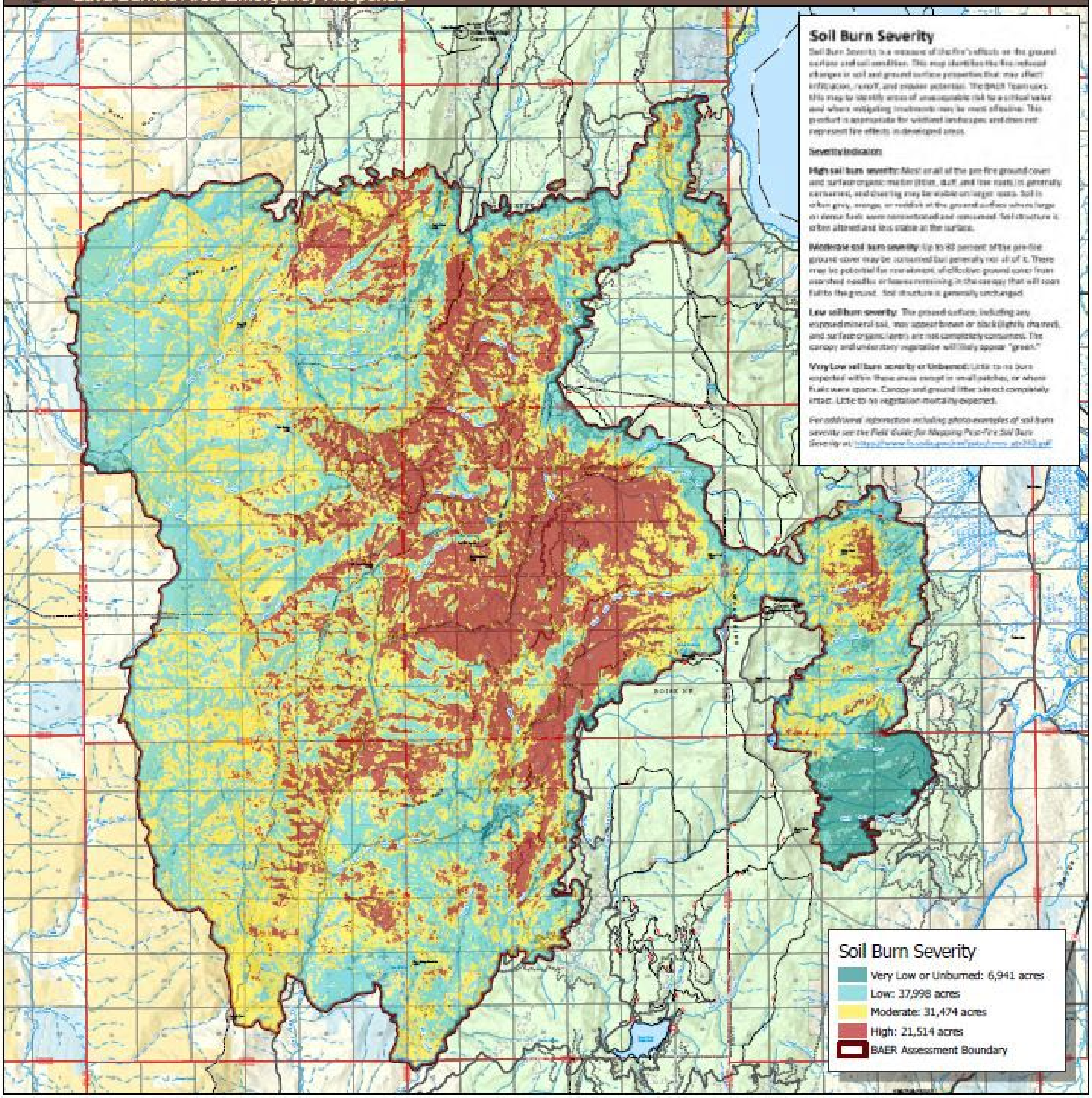
Soil Burn Severity Map - Lava and Boulder Fires

Lava Burned Area Emergency Response



0 1 2 Miles

Disclaimer

— — Trail

USFS Roads by Operational Maintenance Level

Basic Custodial Care (Closed)

High Clearance Vehicles

Suitable for Passenger Cars

High Degree of User Comfort

Existing

Non-FS Roads

Secondary Highway

Road, Unspecified

Land Ownership

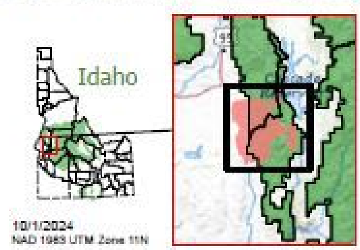
Bureau of Reclamation

Forest Service

Bureau of Land Management

Private

State



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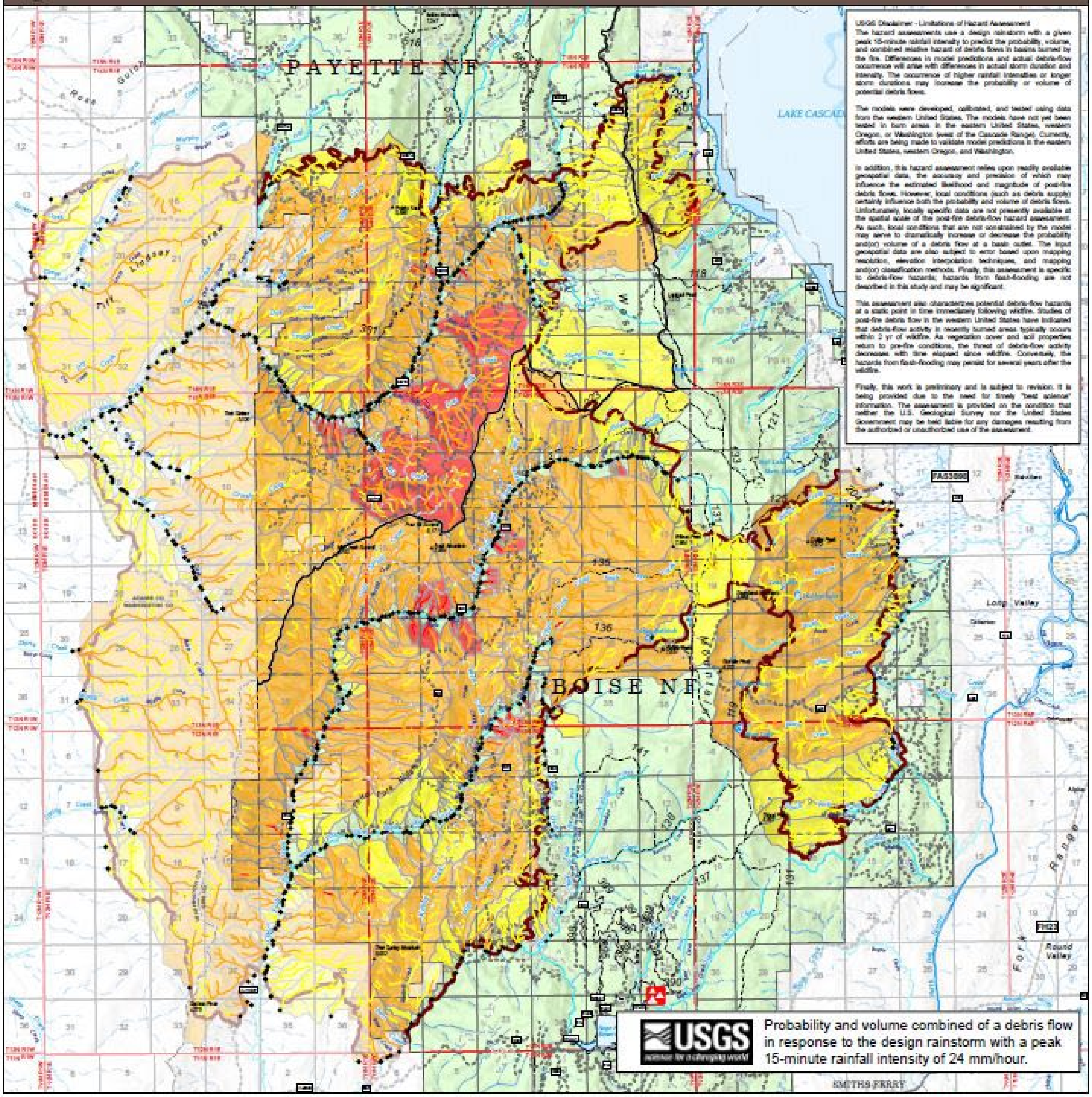
USGS Debris Flow Combined Hazard- 15 minute Intensity of 24 mm/h

Lava and Boulder Burned Area Emergency Response



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 hazard 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.

USGS science for a changing world

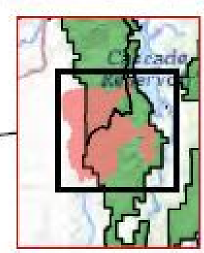
Probability and volume combined of a debris flow in response to the design rainstorm with a peak 15-minute rainfall intensity of 24 mm/hour.

0 2 4 Miles

Disclaimer

This is a product of BAER rapid assessment.

Segments	Basin
High	High
Low	Low
Moderate	Moderate
Basin Outlet	BAER Assessment Boundary



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