

# Twentyfive Mile Fire Burned Area Summary

## 2500-8 Burned Area Report

### Fire Background

The Twentyfive Mile Fire was first reported on August 15, 2021, with the cause still under investigation. It is currently reported at 22,217 acres, almost all of which (79%) is within the 26,997-acre Twenty-Five Mile Creek Watershed which drains into Lake Chelan.



Figure 1 Fire activity within the Twentyfive Mile Fire.

The Forest Service assembled a Burned Area Emergency Response (BAER) team on September 16, 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 burn severity 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 severity 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 Twentyfive Mile fire boundary are generally weakly developed, well drained, volcanic ash capped soils on steep (30-60%) to very steep (>60%) slopes. Prior wildfires in the area have resulted in coarse woody debris accumulating on the soil surface as well as dense regeneration of shrub cover in parts of the burned perimeter. Field reconnaissance (figure 2) showed that areas with high soil burn severity (SBS) existed in areas where forest canopy was completely consumed. High SBS was also documented in areas of reburn where the combination of surface coarse woody material and thick vegetative regeneration led to longer residency times and high temperatures. Areas of moderate SBS generally had some woody material left on the surface, complete or nearly complete litter consumption, and browning needles in the canopy. In areas moderate and high SBS water repellent conditions existed.

Mapped and validated SBS acres for the fire are High (21%), Moderate (32%), Low (39%), and Unburned (6%) (see map on page 6). Modeled average erosion rate for the entire burned area is 11 tons/acre producing approximately 883 yd<sup>3</sup>/mi<sup>2</sup>. When the individual catchments were modeled the erosion rate ranged from 9 tons/acre to 19 tons/acre

and sediment delivery was 719 yd<sup>3</sup>/mi<sup>2</sup> to 1,544 yd<sup>3</sup>/mi<sup>2</sup>, respectively. Based on these estimated erosion rates, 53% of the fire is expected to exceed tolerable soil loss thresholds and inputs to stream channels are likely to be significant.



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

## 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 Twentyfive Mile 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 Twentyfive Mile fire. When modeled against a 15 min / 40mm/hour storm (approximately 0.4" rain in 15 minutes), most large basins within the burned area have a high debris flow hazard rating. Both North Fork and the main Twenty-Five Mile Creek should expect to experience debris flows (see map on page 7).

## Hydrology

A lack of canopy cover and an abundance of water repellent conditions mean splash erosion will increase dramatically and limited areas of effective ground cover erosion and runoff will increase dramatically. Initial intensive rainfall events will

transport ash and initiate runoff events that will mobilize and transport bedload and debris disproportional to the amount of flow. Tributaries to Twenty-Five Mile Creek which would not have any projected flows from a 5 yr. / one hour rainfall event could produce flows that will measure in the 100's of cubic feet per second (cfs) (see map on page 8). Over time, as ground cover and canopy cover increase and water repellency decreases, runoff response and soil detachment and sediment transport will decrease. In areas that have reburned and are now classified as high burn severity, this process may take years.

## Critical Values

The first critical value BAER teams assess is always human life and safety. As the team performed its risk assessment in context of physical assets on Forest Service lands, they were first assessed in terms of risk to human life and safety.

## Roads and Bridges

The watersheds burned in the Twentyfive Mile Fire are predicted to exhibit varying degrees of response through increased runoff, and debris and sediment transport. This creates a future concern for roads, 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 3 Engineers and hydrologists evaluate culverts like this one to evaluate its capacity to handle the predicted increased flows.

Forest system roads within the burn perimeter or connected to it are located on sedimentary, metamorphic, and igneous intrusive volcanic and high-grade metamorphic rocks heavily modified by glaciers that carved bedrock and deposited sediments in the area now occupied by Lake Chelan. Slopes range from moderately steep to very steep throughout the Twentyfive Mile Fire and corresponding drainages.

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

Specific roads, their maintenance level (see <https://www.fs.fed.us/eng/pubs/pdf/05771205.pdf> for definitions), and proposed treatments are listed below.

Road #	Maint. Level	Proposed Treatment
5900	3	Dips, remove some berms, repair burned holes in road, storm inspection
5900125	3	Warning signs
5900124	2	Warning signs
5900128	1	None
5900220	1	None
5903	2	Dips, remove some berms, repair burned holes in road, storm inspection, armored dips at stream crossings
5903100	2	Armored dip at stream crossings, storm inspection
5905	2	Repair burned hole in road, remove culverts
8410	3	Storm inspection, clean inlets to restore capacity, remove some berms, and install gate
8410100	3	Warning signs, storm inspection

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8410125	2	Temporary closure w/ existing gate
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In addition to treatments at the specific roads listed above, the BAER team recommends general warning signs and communications to travelers on any USFS roads within or directly adjacent to the fire.

There are two bridges identified that have an increased risk of damage from predicted flooding or debris flows: Ramona Bridge and the North Fork Twentyfive Mile Creek Culvert. The team recommends post-storm inspection and response using heavy equipment, if necessary.

### Recreation

Most the recreation assets within the Twentyfive Mile burned area relate to trails. The team identified 6.2 miles of trails within high or moderate burn severity and recommend storm-proofing as a potential treatment. Storm proofing involves cleaning or armoring existing drainage structures to remove accumulated sediment and add drainage structures to provide capacity for elevated post-fire runoff.

The team identified a total of 8 miles in or immediately adjacent or downstream of areas with high runoff potential. The team proposes trail drainage stabilization treatments, which include armoring and/or cleaning existing water control and adding additional drainage features to provide additional capacity for elevated sediment laden post-fire runoff.



Figure 4 This burned trailhead sign is indicative of the passing fire.

In addition to trail-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. The team also recommends the placement of warning signs at 13 trailheads or logical ingress points to the burned area (figure 4). Finally, the team also identified one burned-over vault toilet that will be pumped, sanitized, wrapped, and sandbagged to reduce the possibility of contamination and discharge into Twenty-Five Mile Creek.

### Botany

Invasive plants adversely affect native plant communities through direct competition for water and resources, allelopathy (suppression of growth of a native plant by release of a toxin from a nearby invasive plant), loss of growing space, changes in microhabitat, and direct suppression and mortality. 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 in dry habitats could alter future fire behavior, intensity, extent, and season of burning.

A check against USFS invasive plant databases, local district records, and the Chelan County Noxious Weed program indicate the following

weeds are known to occur on our adjacent to the burned area: Diffuse knapweed, Spotted knapweed, St. John’s Wort, Bull thistle, Dalmation toadflax, and Tree of Heaven.

Infestations are primarily located on open and closed roads, old dozer lines, campgrounds, and trails through the burned area, with interior areas being largely un-infested. Additional infestations are known at the Twentyfive Mile Fire incident camp and helibase, at an old homestead upslope from the helibase, and off the 8410 and Lone Peak Roads.

Approximately 15 miles of dozer line (figure 5) and 7 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.

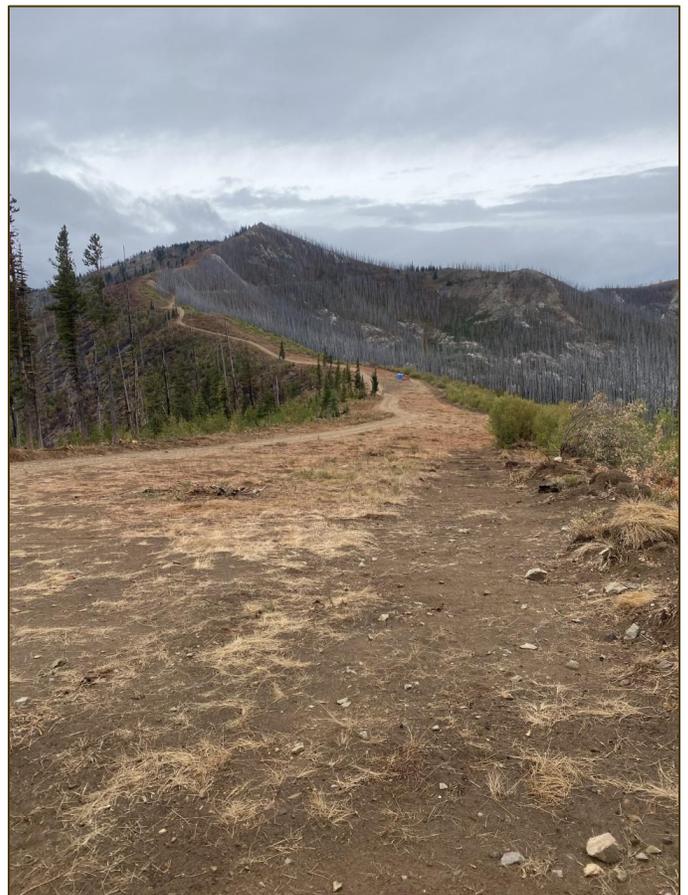


Figure 5 Dozer suppression lines are hot spots for invasive weeds.

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 88 acres) and burned areas prone to new noxious weed infestations (230 acres), weed technicians will perform regular surveys and treat new infestations.

### **Cultural Resources**

While the initial focus of the BAER team was human life and safety, the team also recognizes that heritage resources are critical values. Any significant sites within the burned area 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 a state park, county 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**

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 Twentyfive Mile 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 Twentyfive Mile Fire.

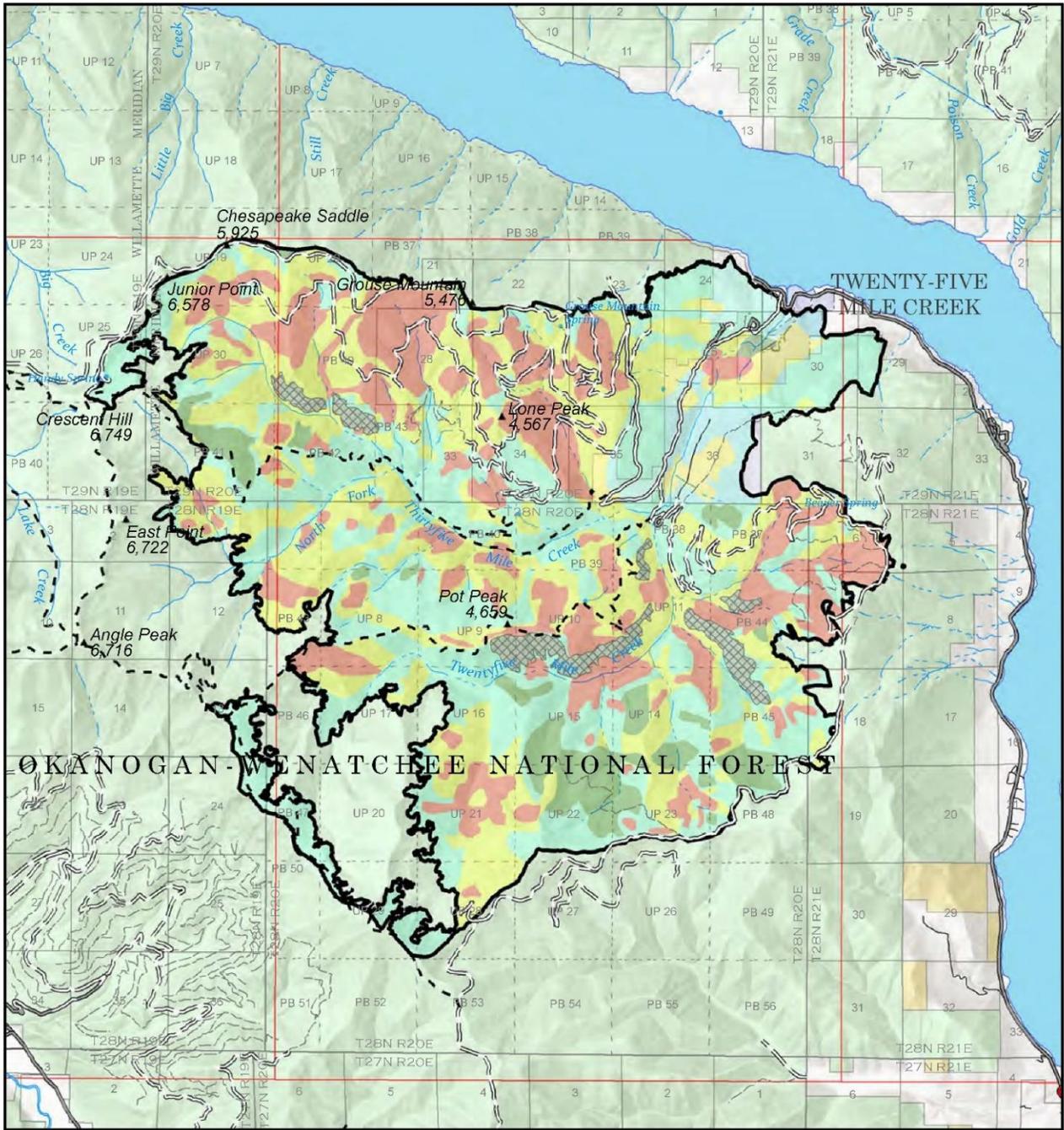


Figure 6 Soil scientist evaluating water repellency on the Twentyfive Mile Fire.



# Burn Severity - Twenty-Five Mile Fire

Twenty-Five Mile BAER - Okanogan-Wenatchee National Forest



0 0.5 1 2 Miles

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**Burn Severity**

<b>Classification</b>	Sept 17 Perimeter	Lake
High	Trails	Forest Service Land
Moderate	Highway	State Public Land
Low	County Roads	Other State Land
Unburned	City, Private Roads	Bureau of Land Management Land
Rock Outcrop	Paved or Gravel Road	
	Dirt Road	
	Unimproved Road	

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Date: 9/27/2021

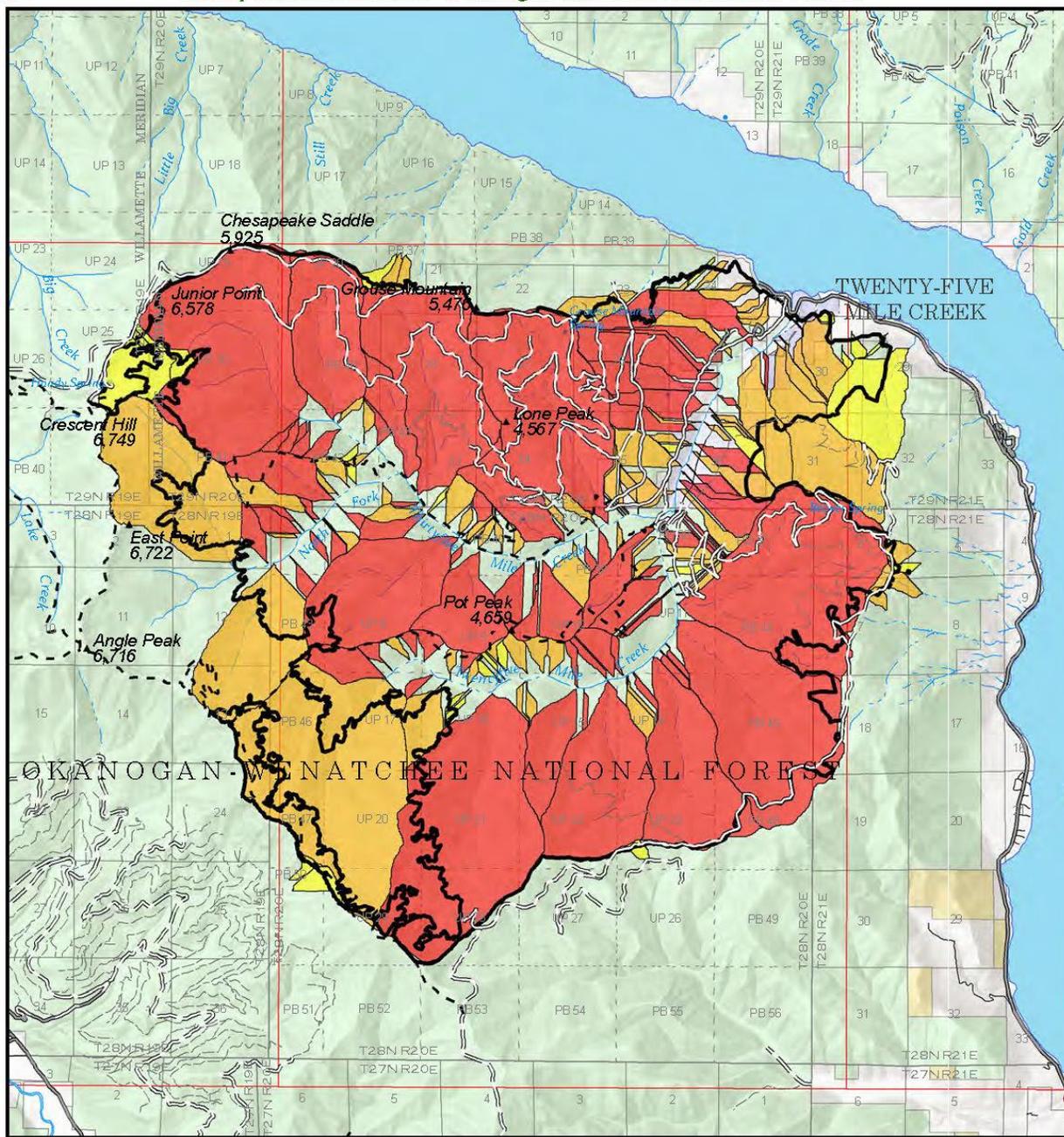


Figure 7 Burn severity map of the Twentyfive Mile Fire.



# Debris Flow Risk - Twenty-Five Mile Fire

Twenty-Five Mile BAER - Okanogan-Wenatchee National Forest



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**Combined relative debris-flow hazard in response to a rainstorm with a peak 15-min rainfall intensity of 40mm/hr. Data generated by the USGS**

**Debris Flow Hazard Rating**

- High
- Moderate
- Low

**Legend:**

- Trails
- Highway
- County Roads
- City, Private Roads
- Paved or Gravel Road
- Dirt Road
- Unimproved Road
- Sept 17 Perimeter
- Lake
- Forest Service Land
- State Public Land
- Other State Land
- Bureau of Land Management Land

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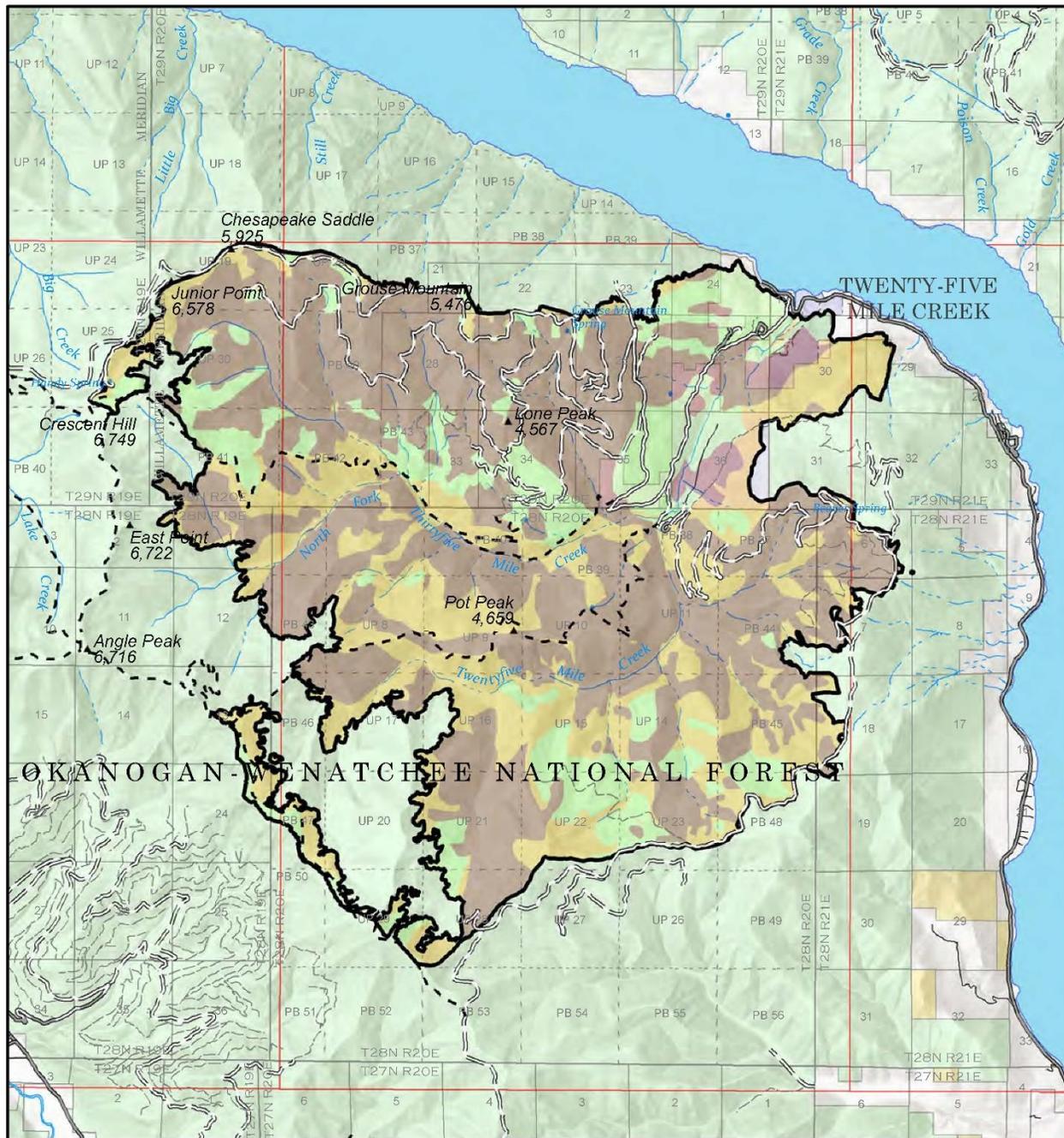
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Figure 8 Debris flow hazards for the Twentyfive Mile Fire



# Runoff Potential - Twenty-Five Mile Fire

Twenty-Five Mile BAER - Okanogan-Wenatchee National Forest



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Runoff Potential	
High	Sept 17 Perimeter
Moderate	Trails
Low	Highway
	County Roads
	City, Private Roads
	Paved or Gravel Road
	Dirt Road
	Unimproved Road
	Lake
	Forest Service Land
	State Public Land
	Other State Land
	Bureau of Land Management Land

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Figure 9 Post-fire modeled runoff potential.