CUB CREEK 2 FIRE

Reports

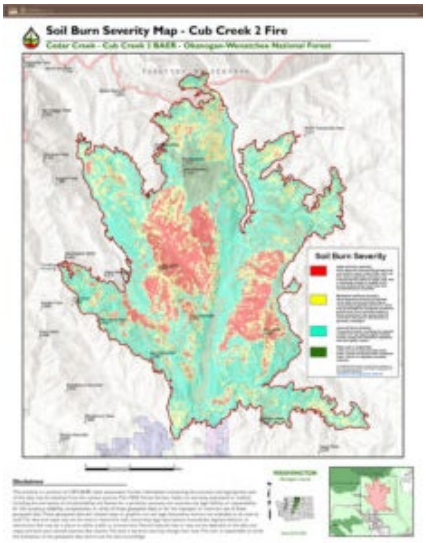
Cub Creek 2 Burned Area Report
[8-page PDF]

The Washington Department of Natural Resources **Wildfire Associated Landslide Emergency Response Team** (WALERT) presentation about geologic hazards due to the Cedar Creek and Cub Creek 2 Fires. See inside presentation for additional links to resources.

WALERT Geologic Hazards Presentation
[29-page PDF]

Maps

Cub Creek 2 Fire Soil Burn Severity Map

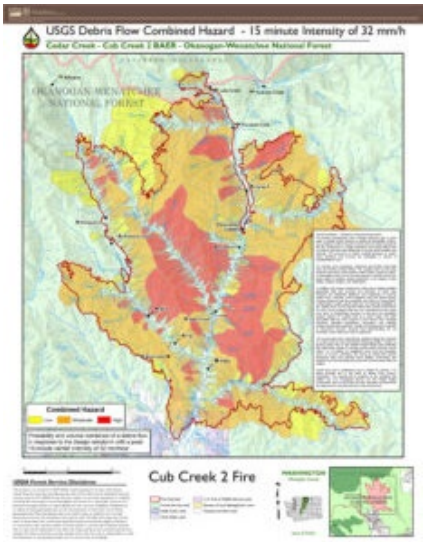


- **JPG** and **PDF** format
- A **KMZ** file is also available to view the map in greater detail in Google Earth (and many other mapping programs). Download the KMZ zip file, then double-click it to extract the KMZ file and save to your computer. Open the Google Earth program. [If you donÕt already have Google Earth, you can download and install it for free **HERE.**] Drag the KMZ file onto the Google Earth program icon or main screen (or in Google Earth, click File, Import and select the KMZ file). After the KMZ file loads, you can zoom way in for more detail, change the angle of view, show or hide each burn severity level, and adjust transparency of levels. Click image below for an example screenshot from Google Earth, showing just high severity level.

More Information on **Burn Severity Levels**

Field Guide for Mapping Post-Fire Soil Burn Severity

Cub Creek 2 Debris Flow Hazard



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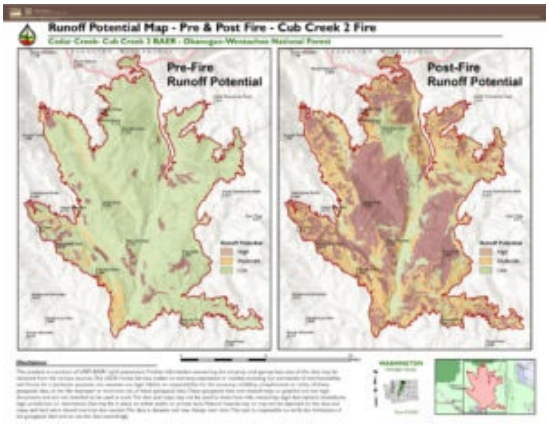
Cub Creek 2 Runoff Potential Ð Pre and Post Fire



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ABOUT THIS SITE

The Okanogan-Wenatchee National Forest assembled a Burned Area Emergency Response (BAER) assessment team to analyze post-fire condition of burned watersheds and to plan emergency stabilization treatments for Central Washington wildfires.

PHOTO

Home page and banner photo: Cedar Creek Fire

SEARCH

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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 aeras, 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

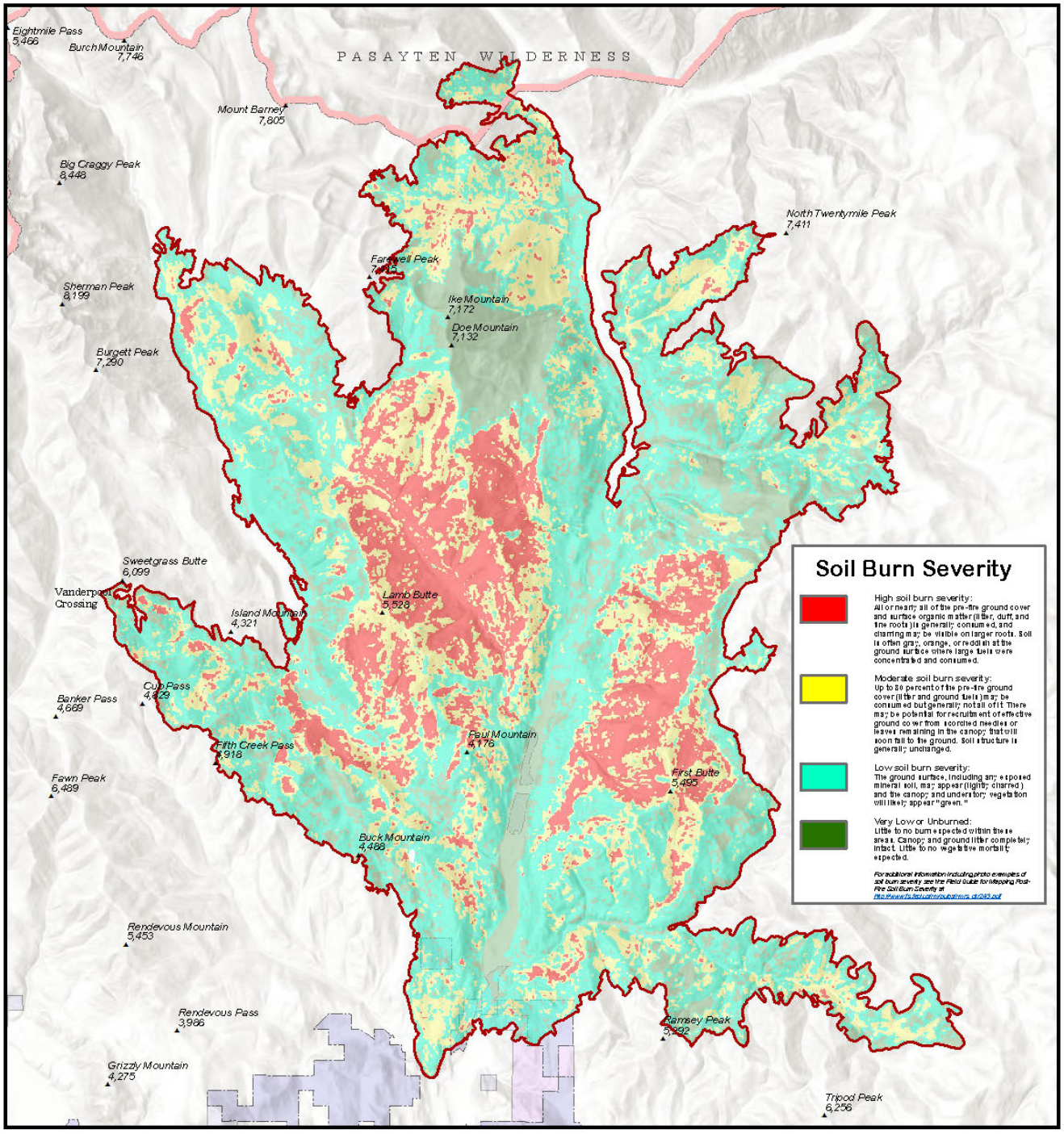

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Figure 7 Soil burn severity map of the Cub Creek 2 Fire.

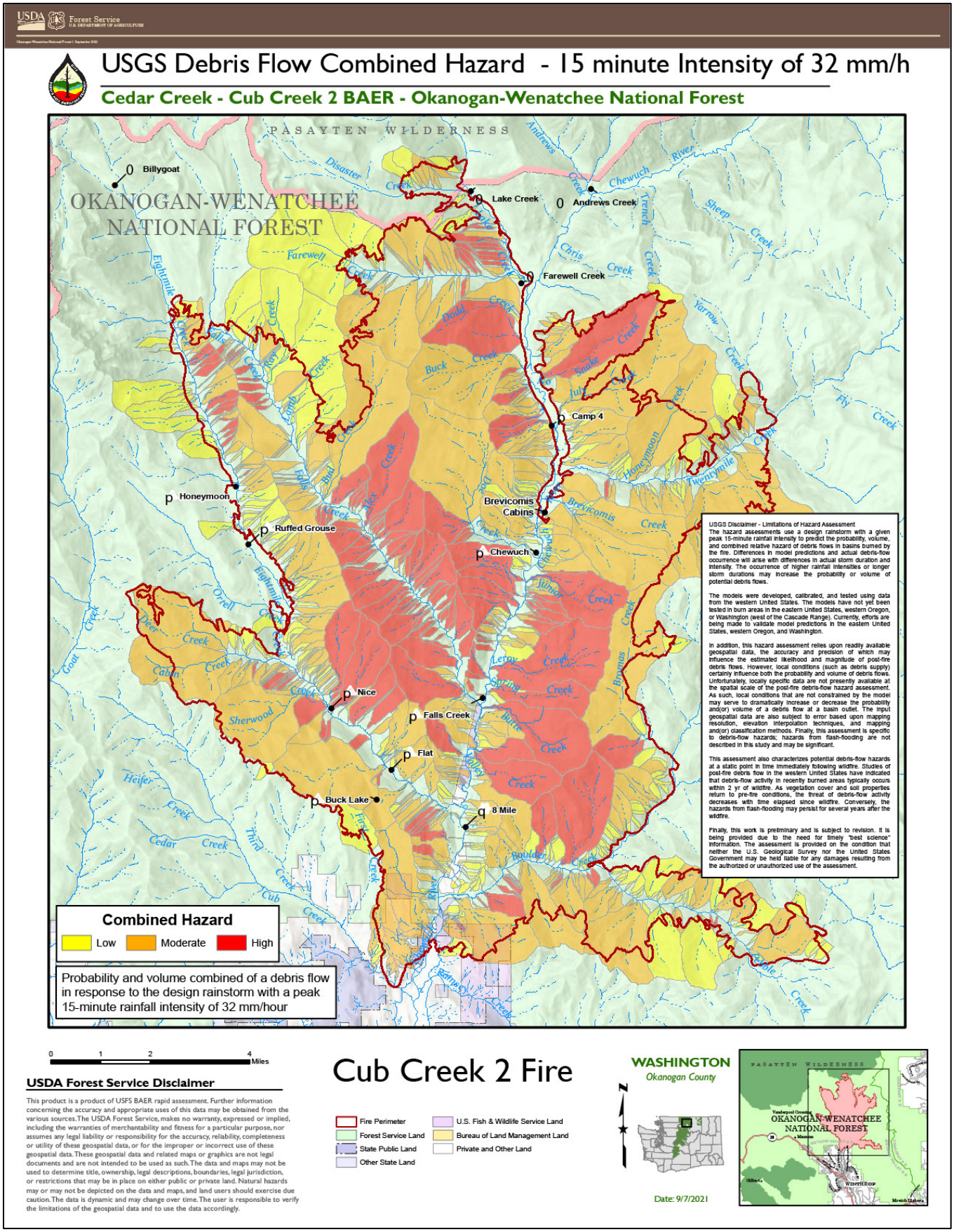
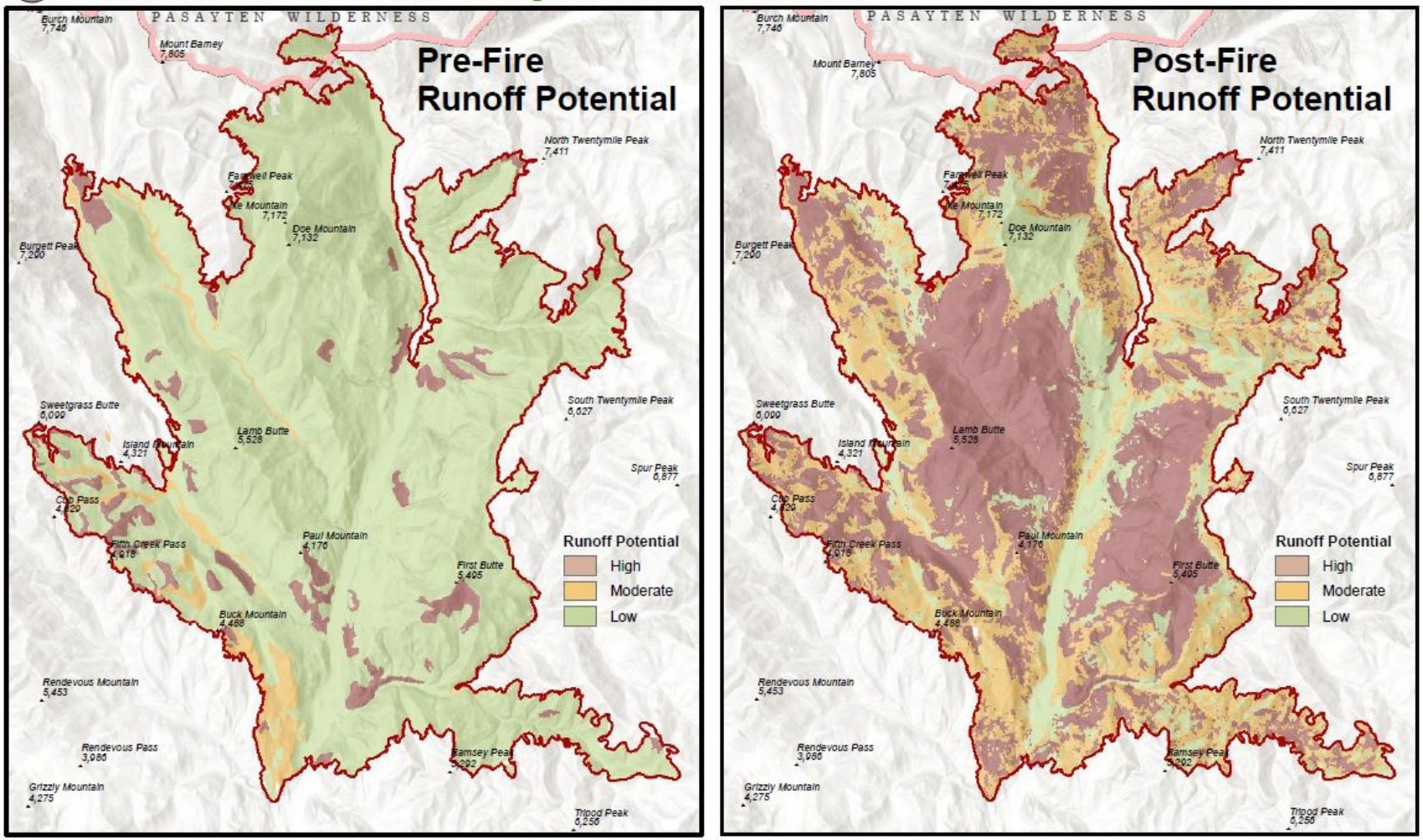


Figure 8 Debris flow hazards for the Cub Creek 2 Fire

Runoff Potential Map - Pre & Post Fire - Cub Creek 2 Fire

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



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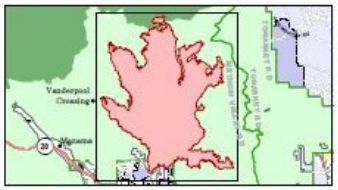

Figure 9 Maps showing pre- and post-fire modeled runoff potential.

Wildfire Associated Landslide Emergency Response Team (WALERT)

Trevor Contreras, L.E.G.
WALERT Team Lead
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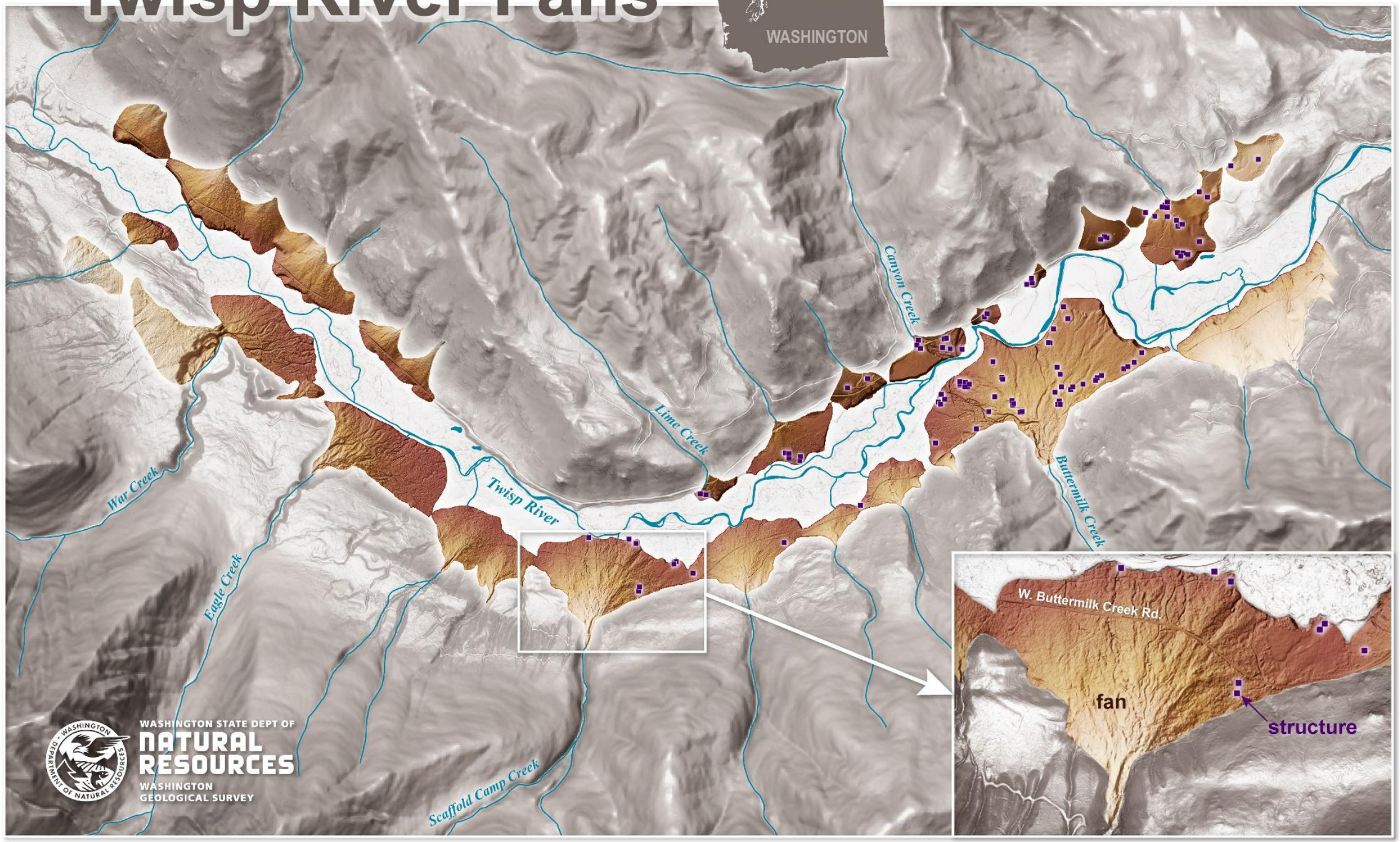
Twisp River Fans



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https://www.dnr.wa.gov/publications/ger_hazards_landslide_walert_report_cedar_cub_2021.pdf

NATURAL RESOURCES

WILDFIRE-ASSOCIATED LANDSLIDE EMERGENCY RESPONSE TEAM REPORT

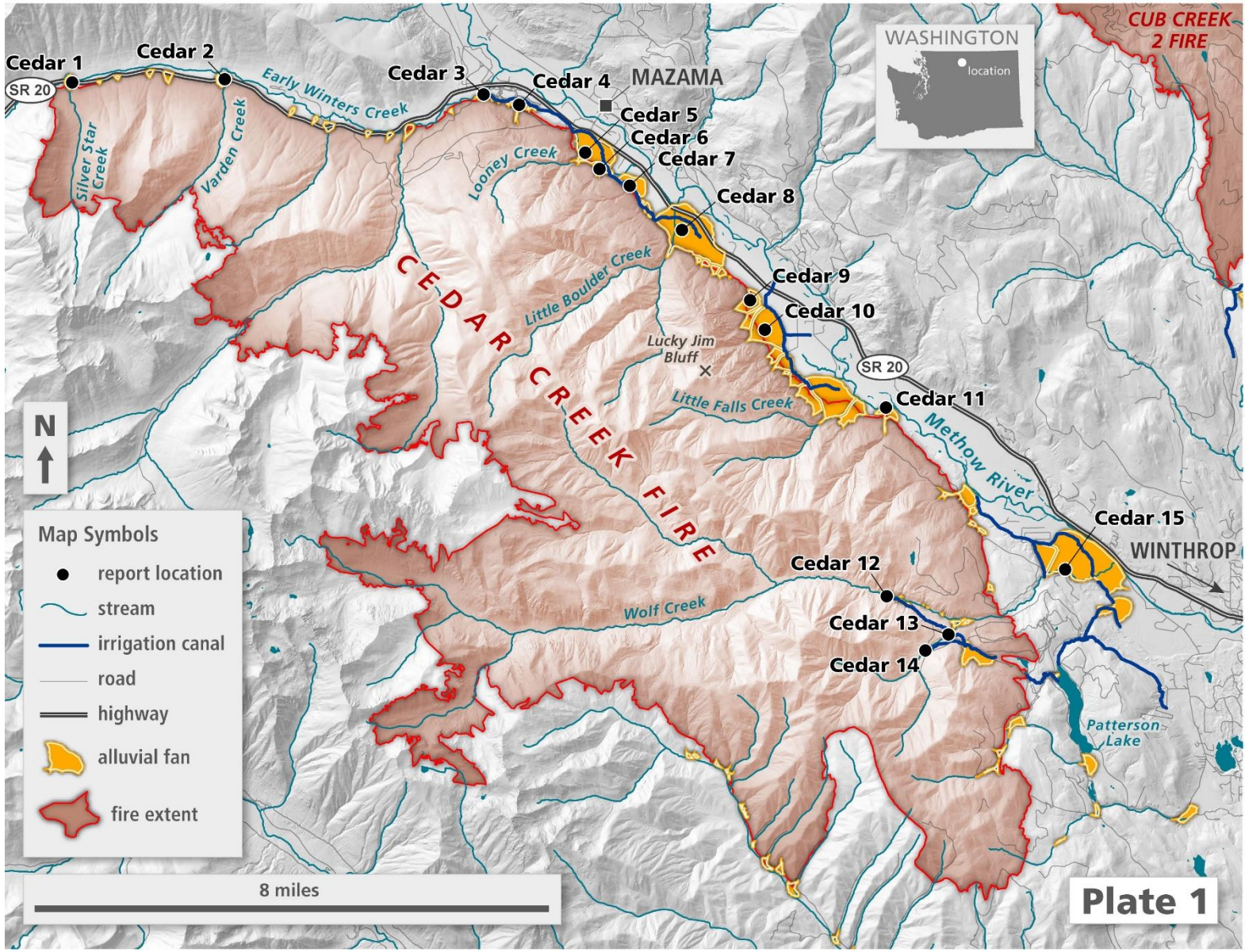
Cedar Creek and Cub Creek 2 Fires

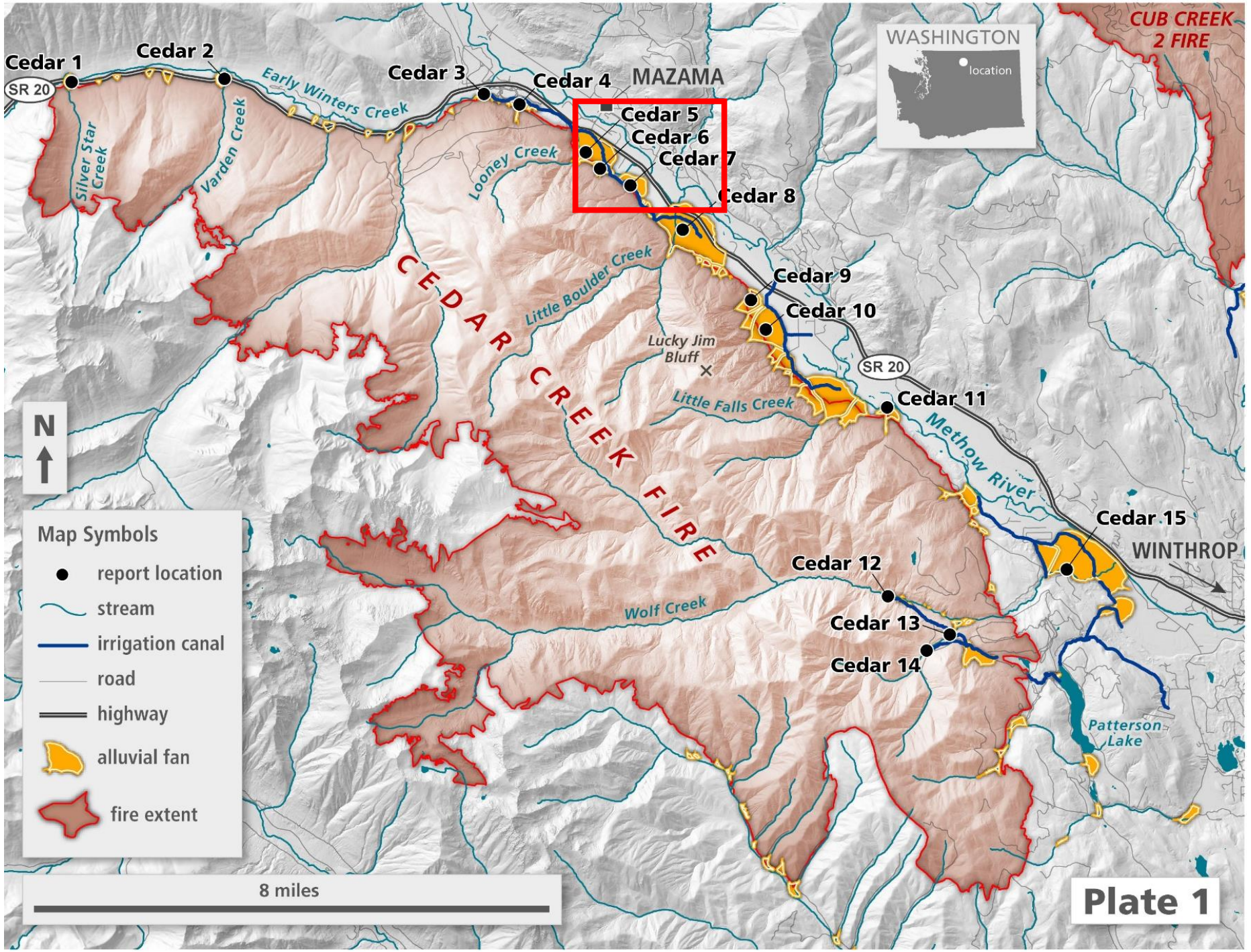
Okanogan County, Washington

by Trevor Contreras and Kate Mickelson

WASHINGTON
GEOLOGICAL SURVEY
WALERT Report
September 8, 2021

WASHINGTON STATE DEPARTMENT OF
NATURAL RESOURCES
WASHINGTON GEOLOGICAL SURVEY

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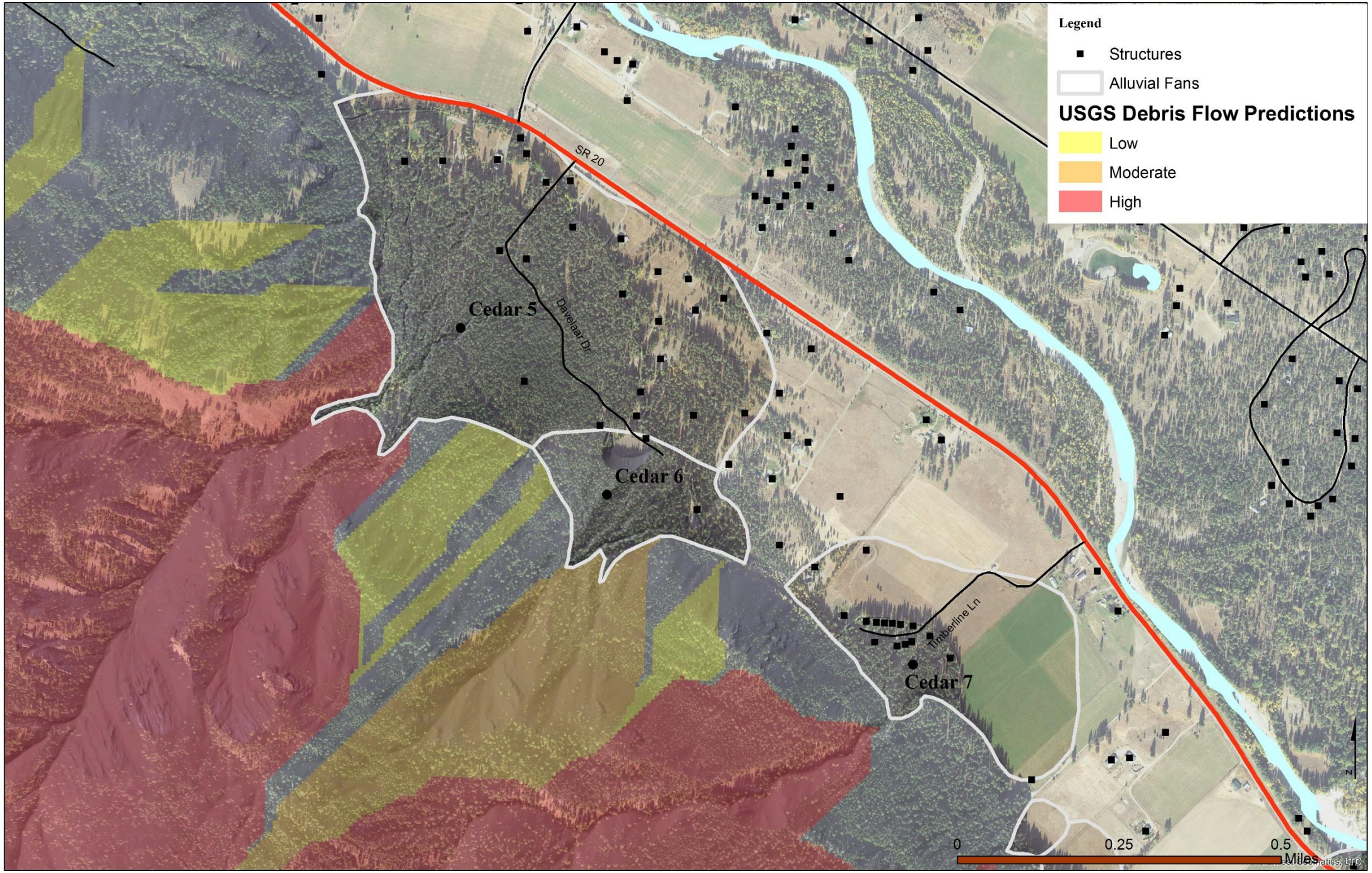
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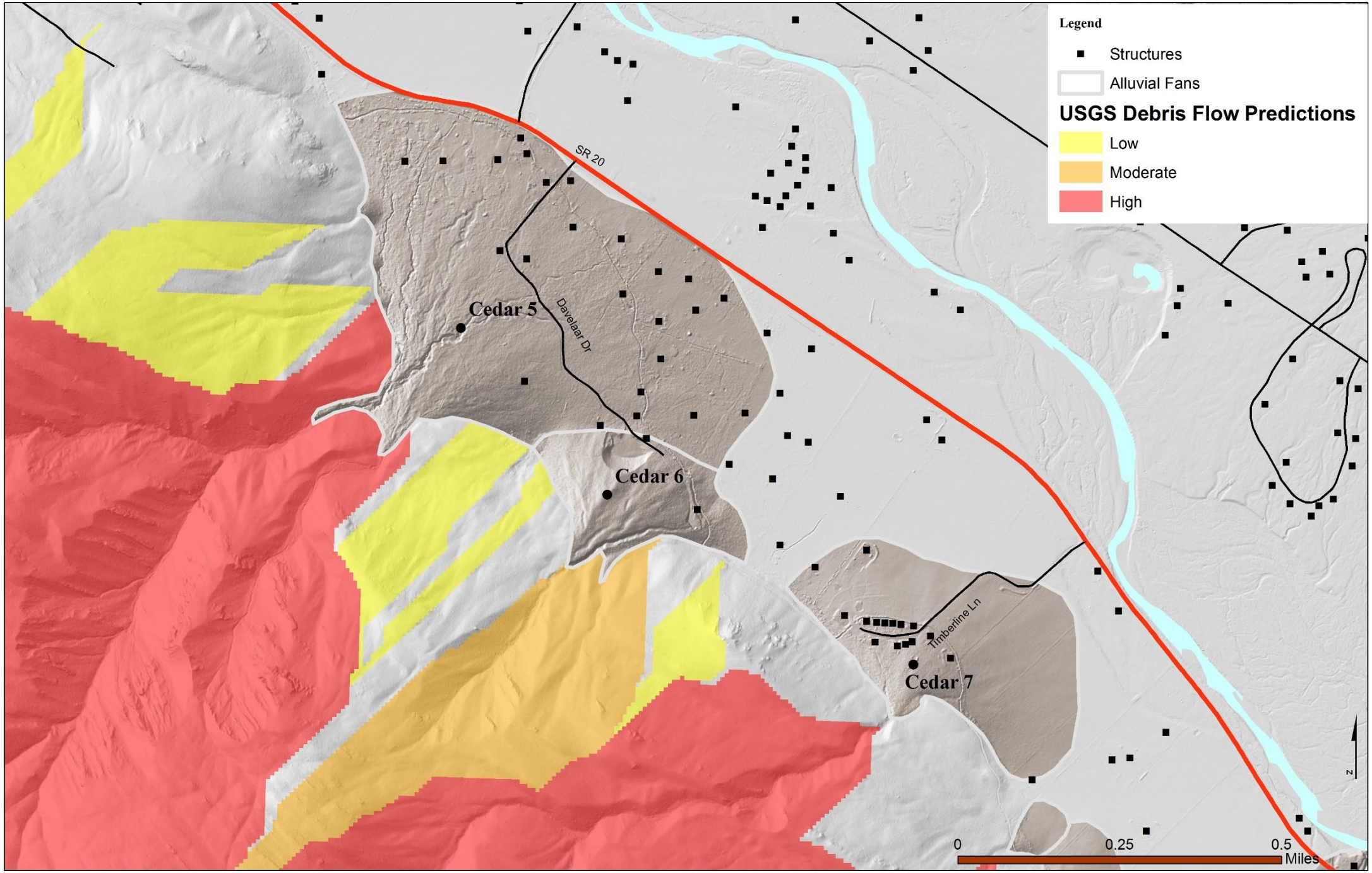
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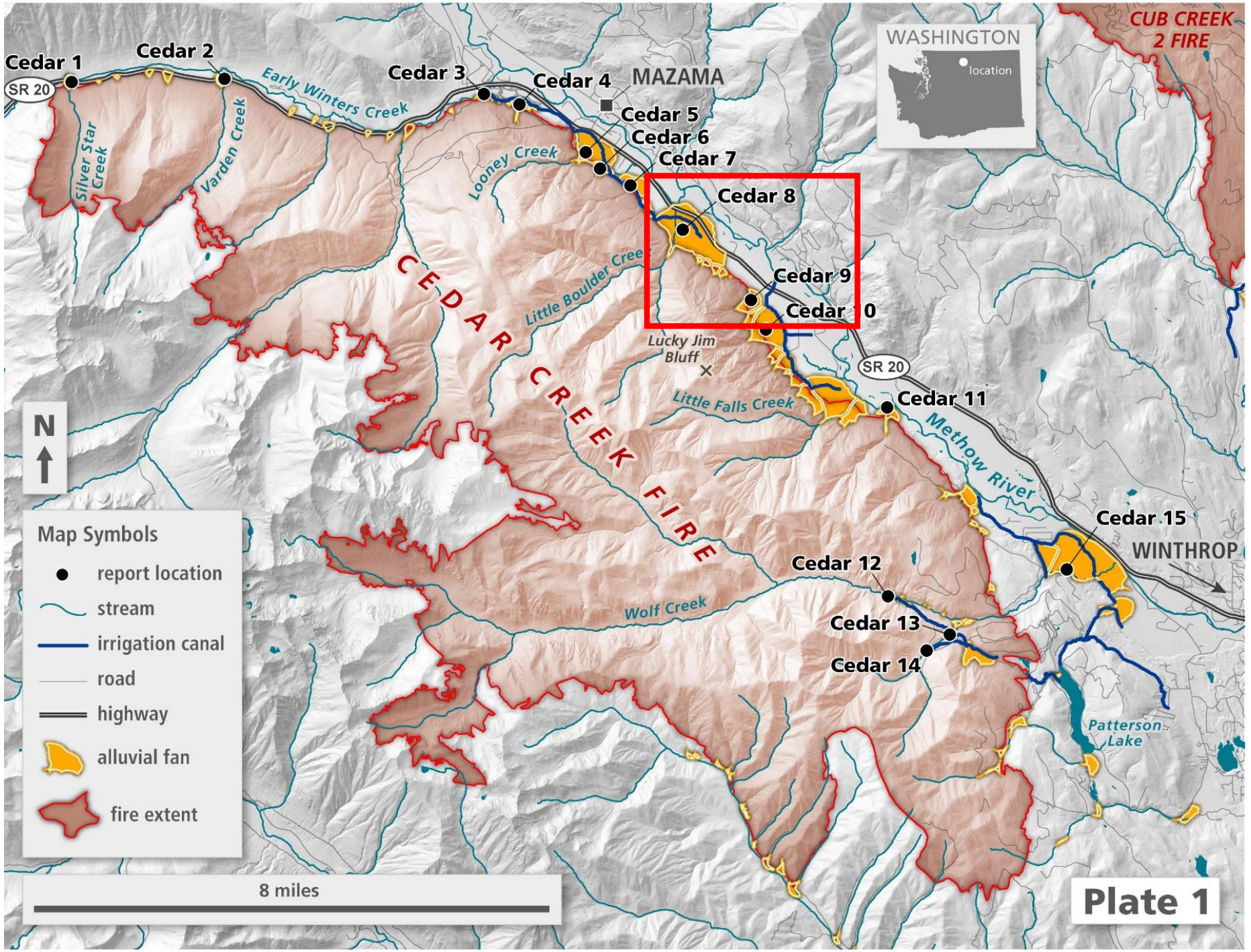
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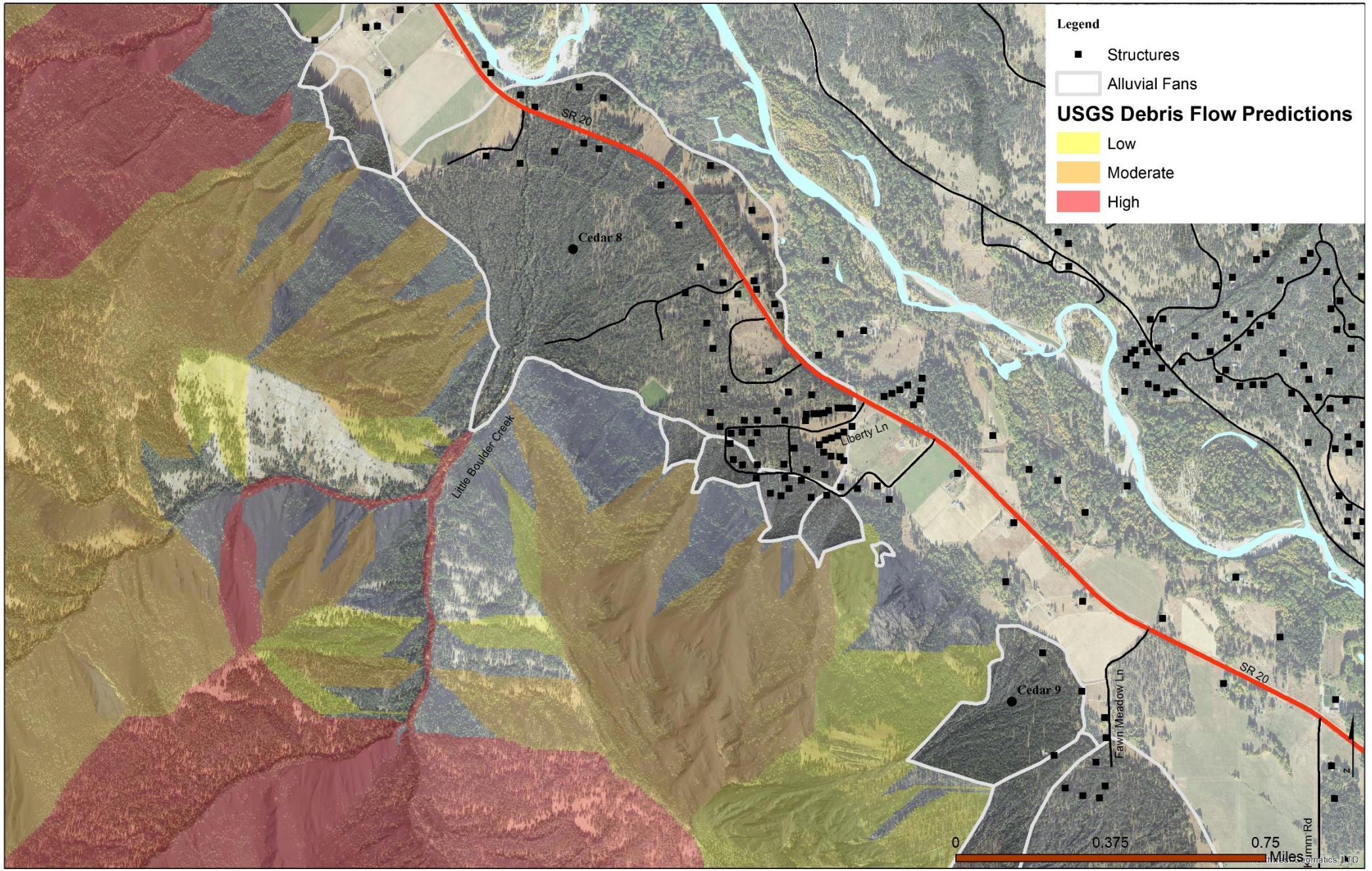
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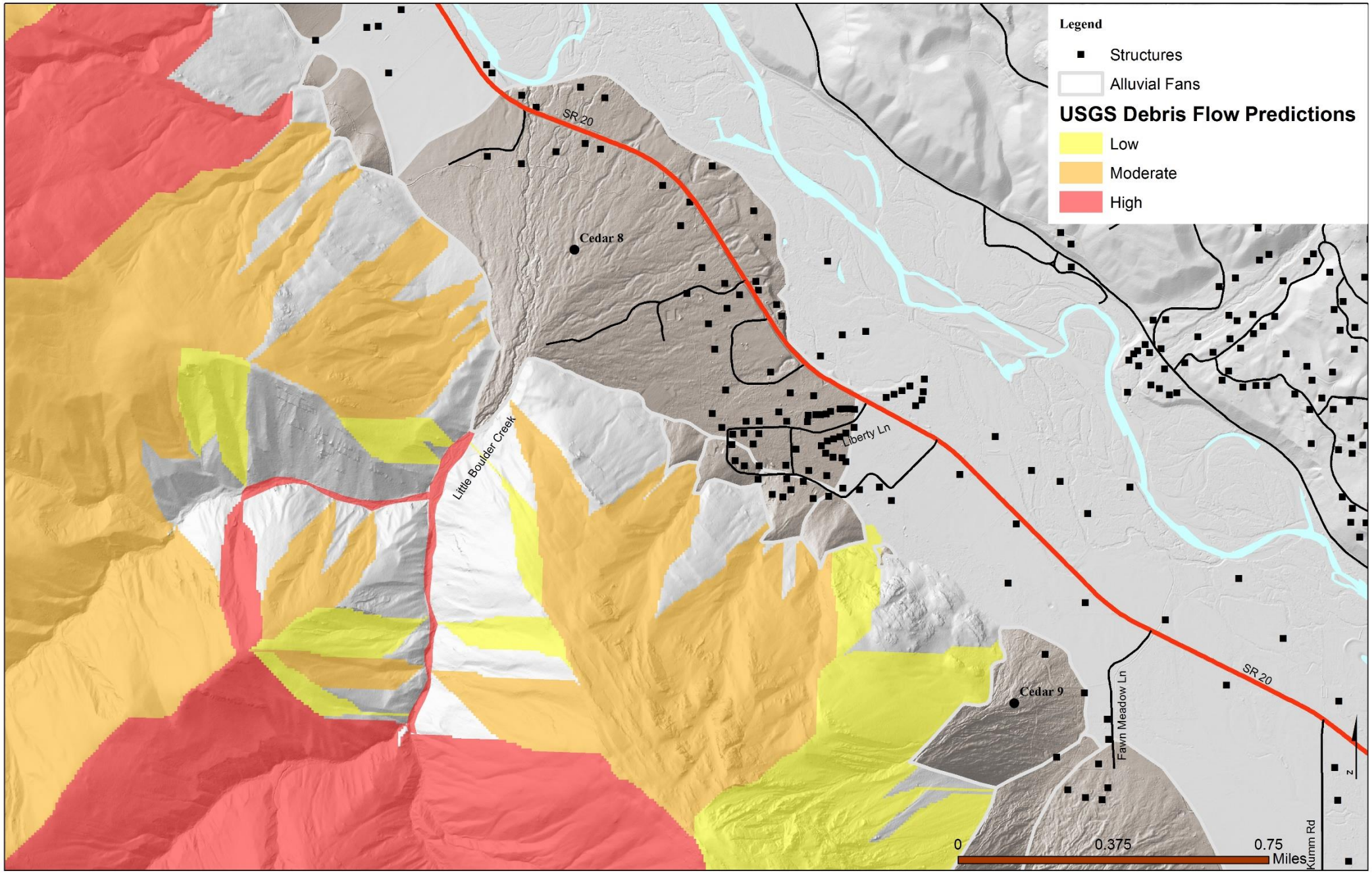
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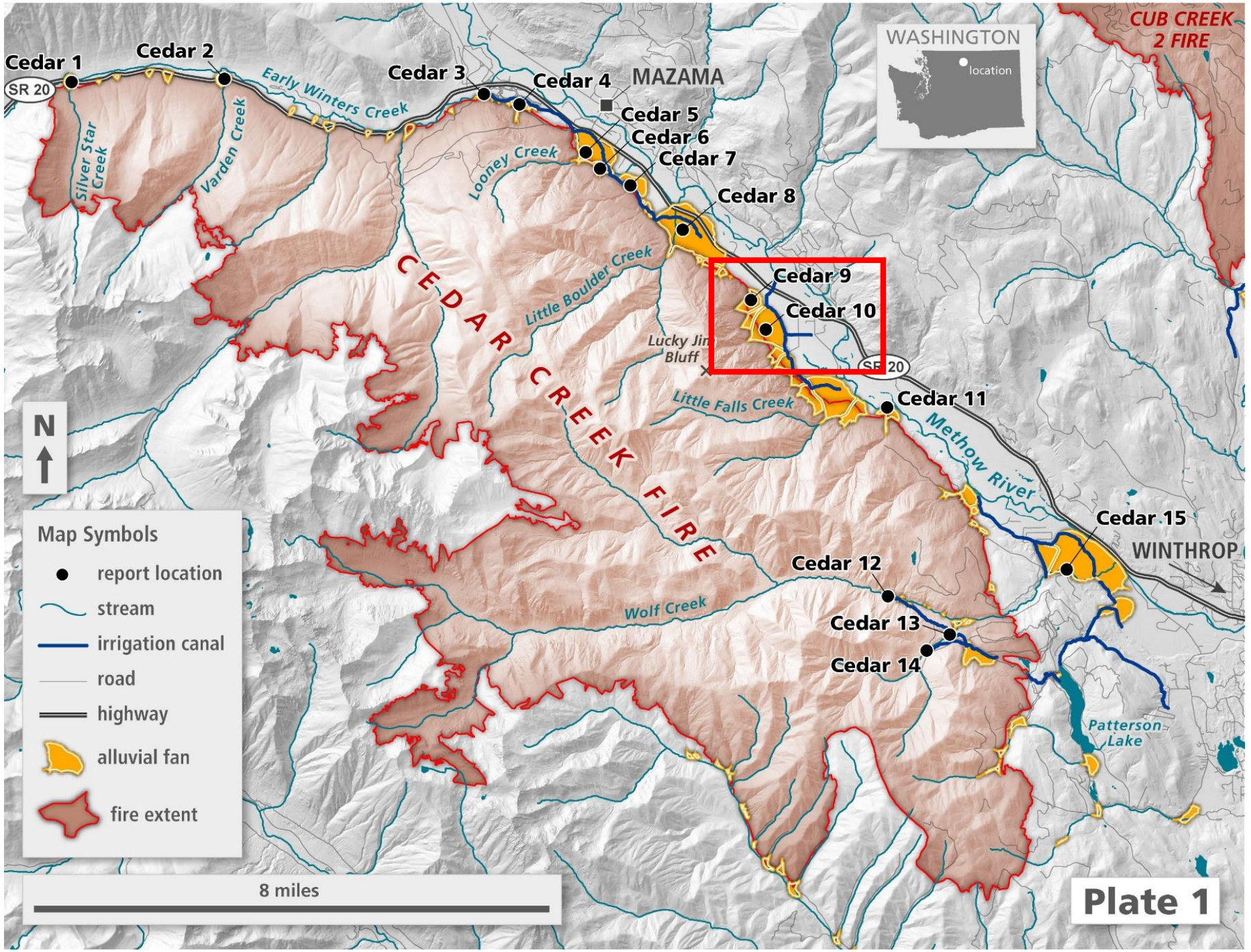
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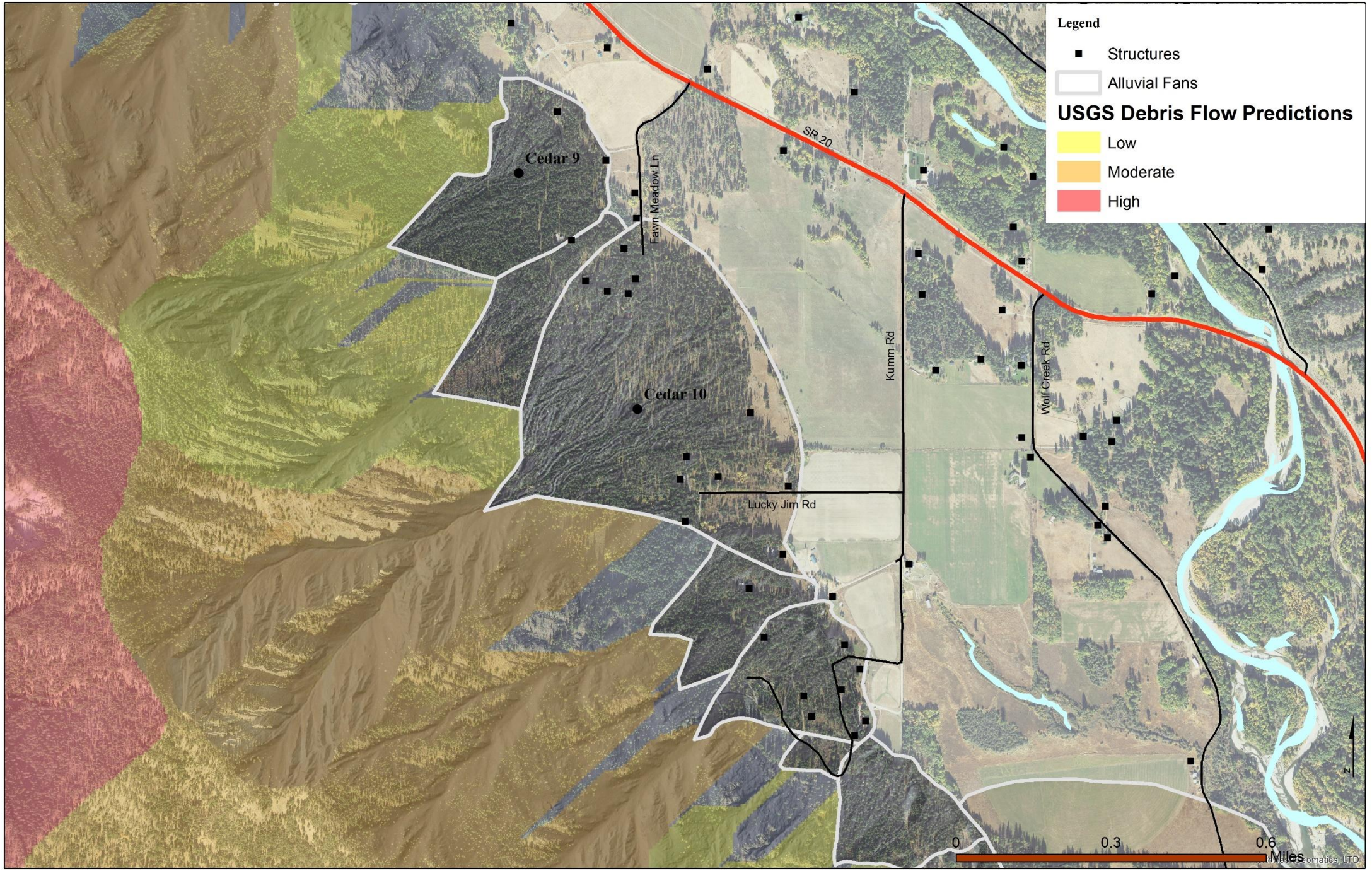
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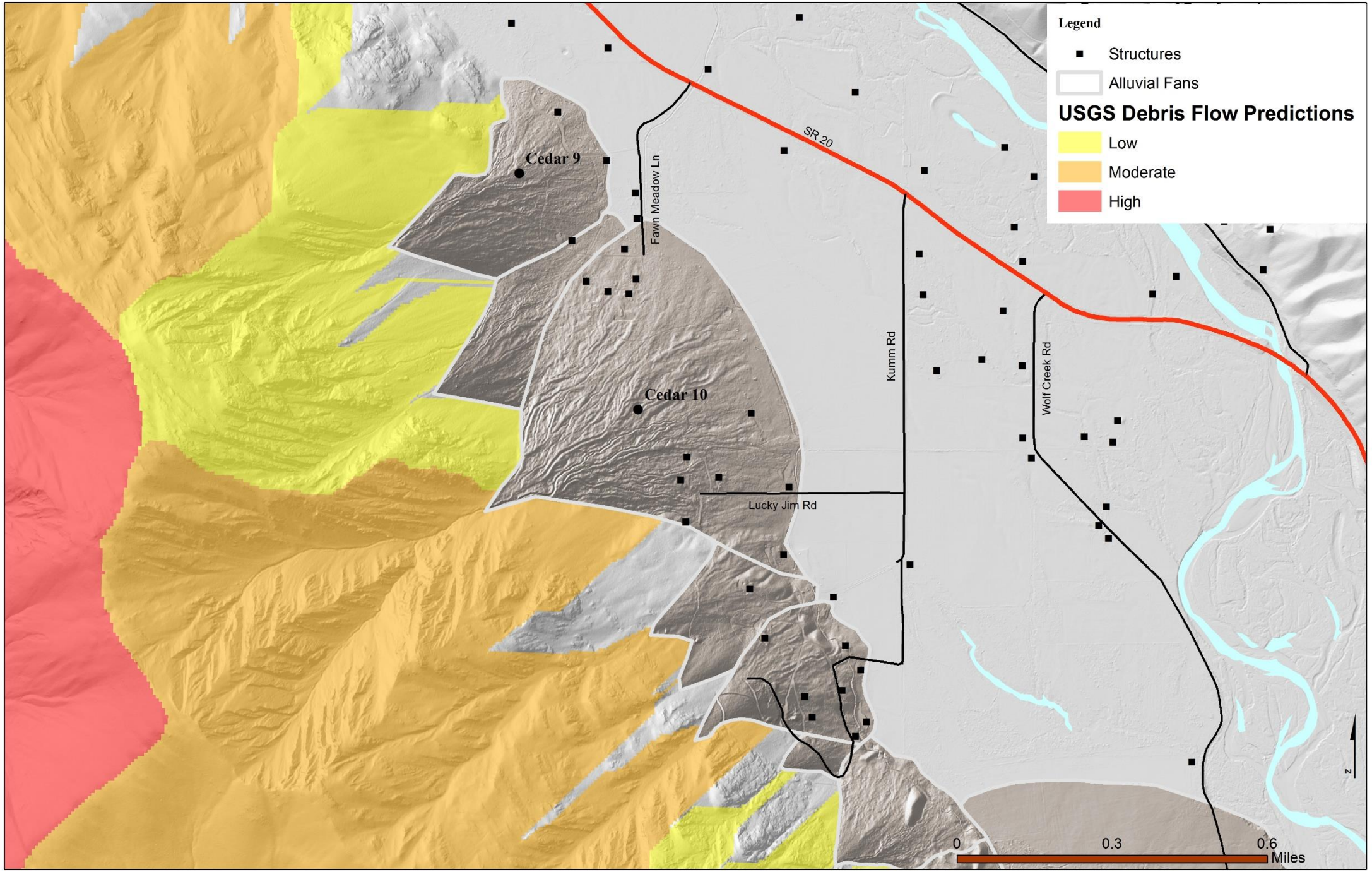
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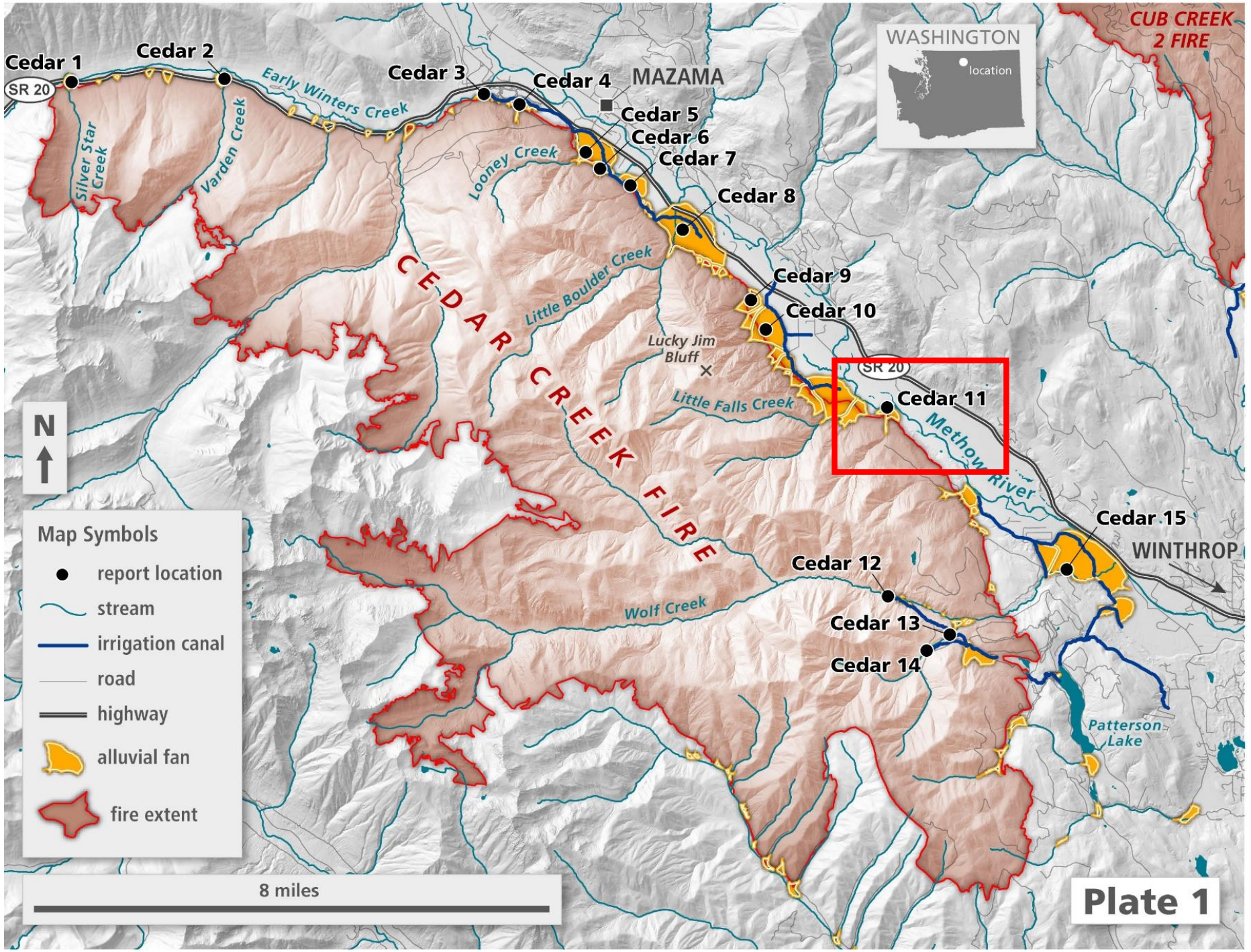
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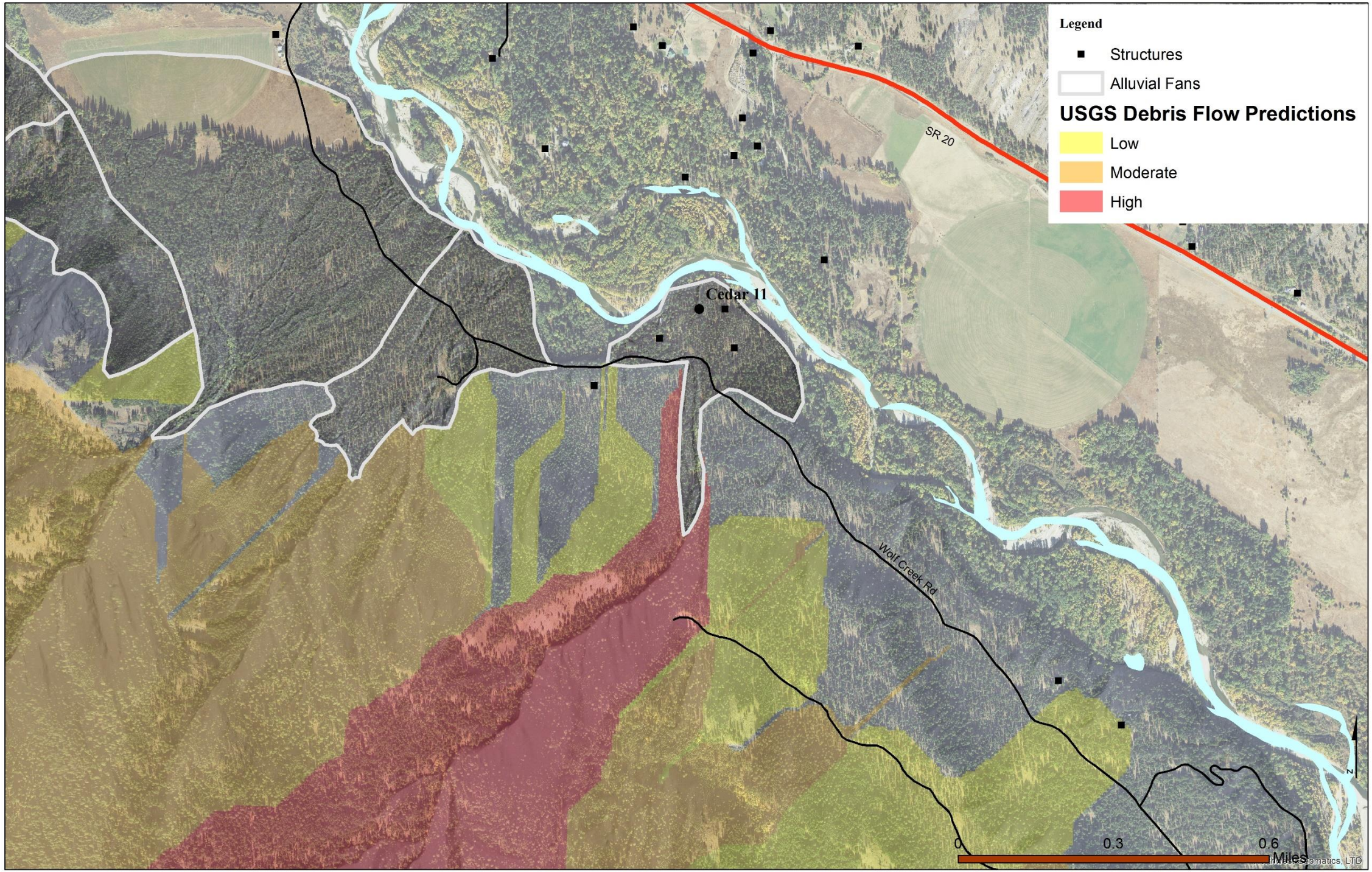
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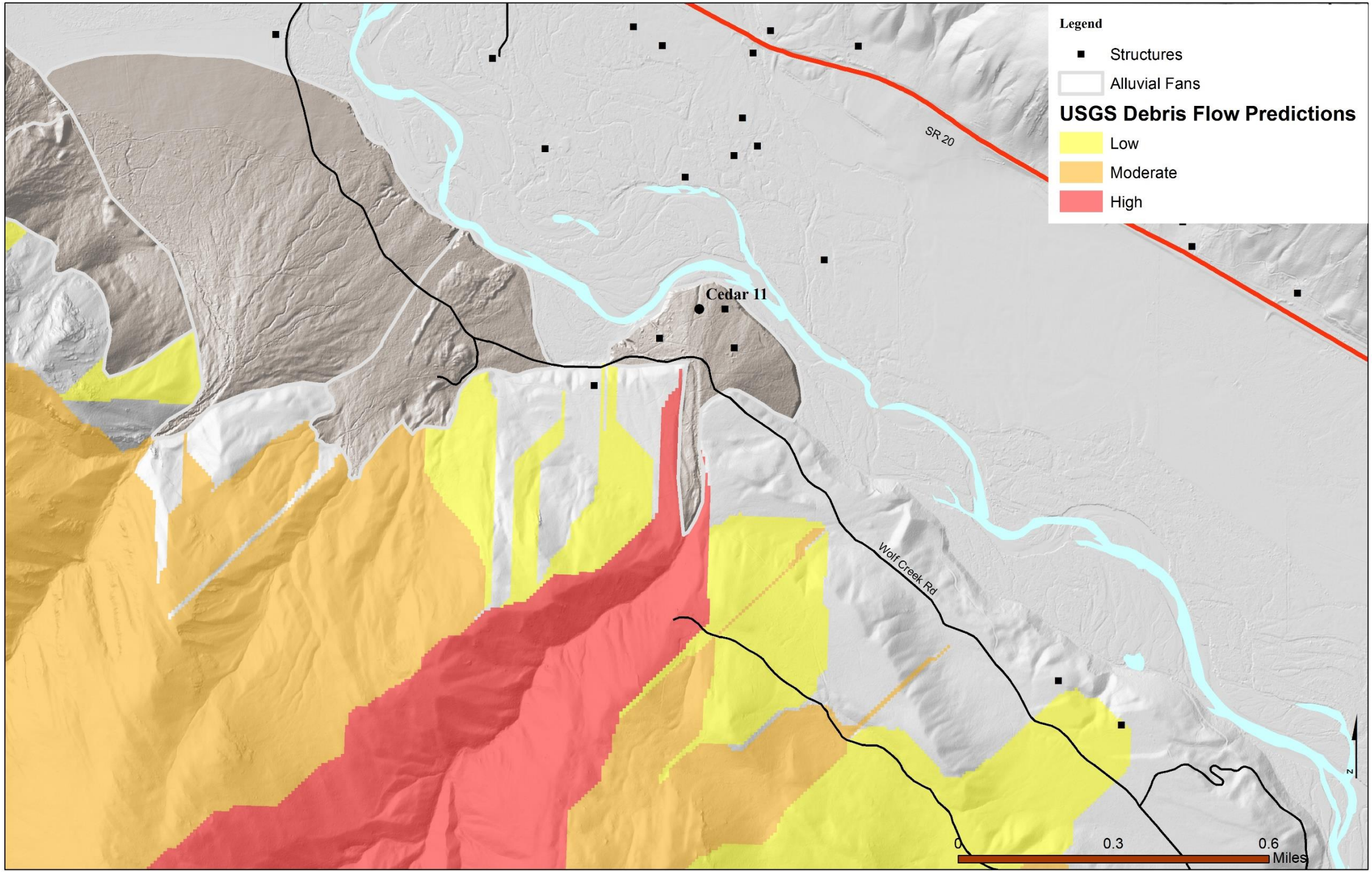
Legend
Structures
Alluvial Fans
USGS Debris Flow Predictions
Low
Moderate
High
SR 20
Cedar 11
Wolf Creek Rd
N
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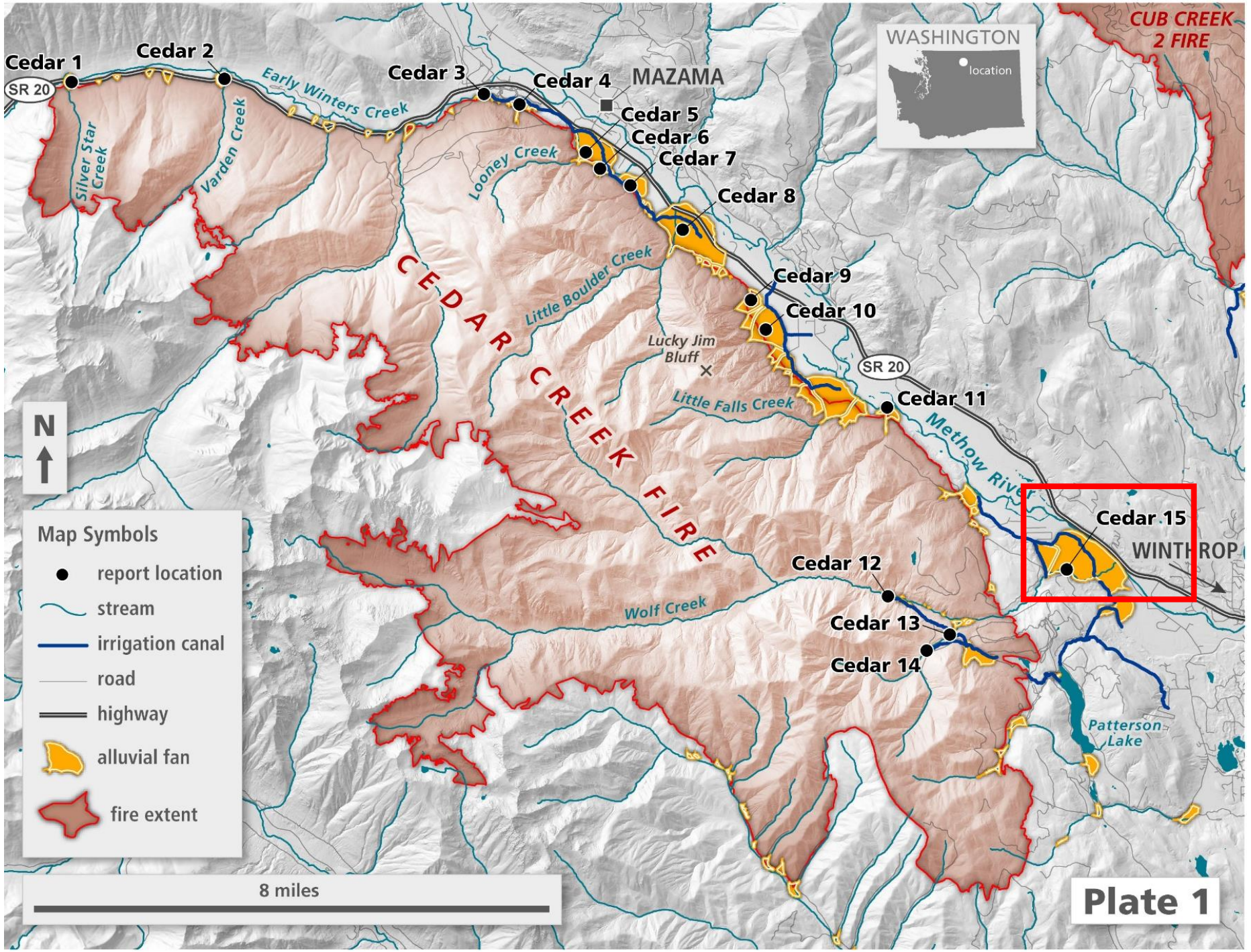
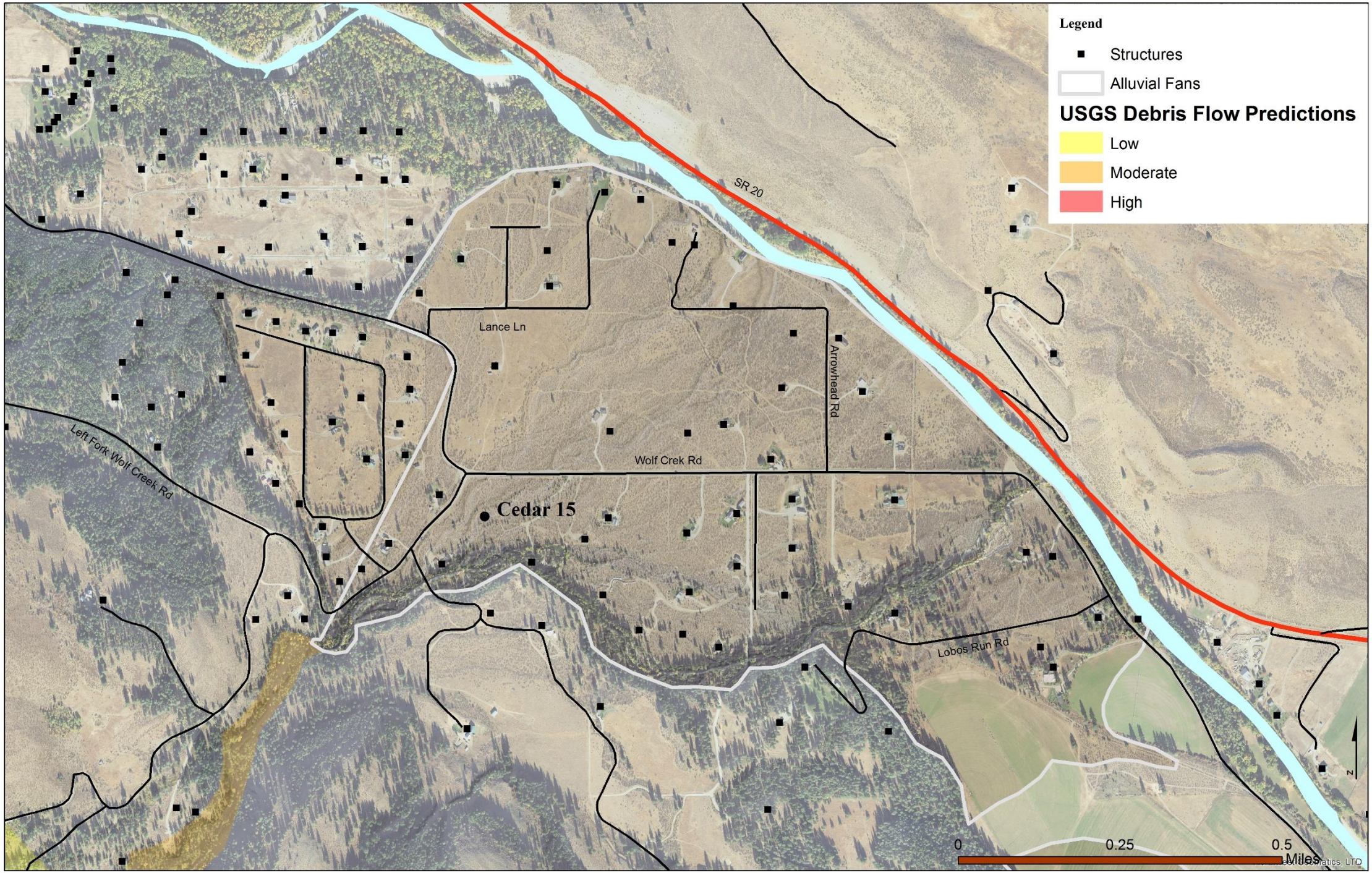
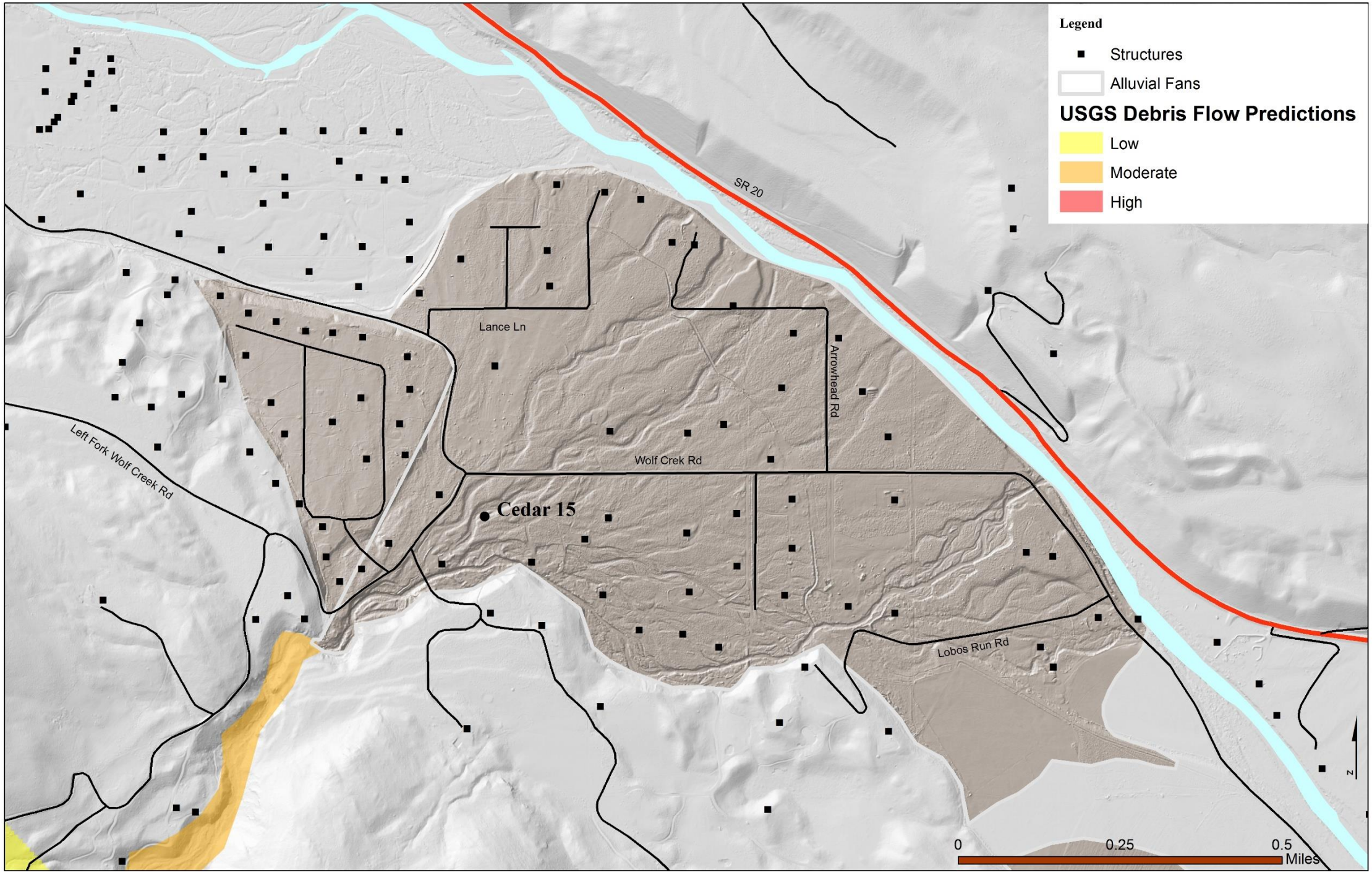
0.3
0.6
Miles


CEDAR CREEK FIRE
CUB CREEK 2 FIRE
WASHINGTON
location
Cedar 1
Cedar 2
Cedar 3
Cedar 4
Cedar 5
Cedar 6
Cedar 7
Cedar 8
Cedar 9
Cedar 10
Cedar 11
Cedar 12
Cedar 13
Cedar 14
Cedar 15
MAZAMA
SR 20
Early Winters Creek
Silver Star Creek
Varden Creek
Looney Creek
Little Boulder Creek
Lucky Jim Bluff
Little Falls Creek
Methow River
Wolf Creek
Patterson Lake
WINTHROP
N
Map Symbols
report location
stream
irrigation canal
road
highway
alluvial fan
fire extent
8 miles
Plate 1


Legend
Structures
Alluvial Fans
USGS Debris Flow Predictions
Low
Moderate
High
SR 20
Lance Ln
Arrowhead Rd
Wolf Crek Rd
Left Fork Wolf Creek Rd
Cedar 15
Lobos Run Rd
N
0
0.25
0.5
Miles


Legend
Structures
Alluvial Fans
USGS Debris Flow Predictions
Low
Moderate
High
SR 20
Lance Ln
Arrowhead Rd
Wolf Crek Rd
Left Fork Wolf Creek Rd
Cedar 15
Lobos Run Rd
N
0
0.25
0.5
Miles

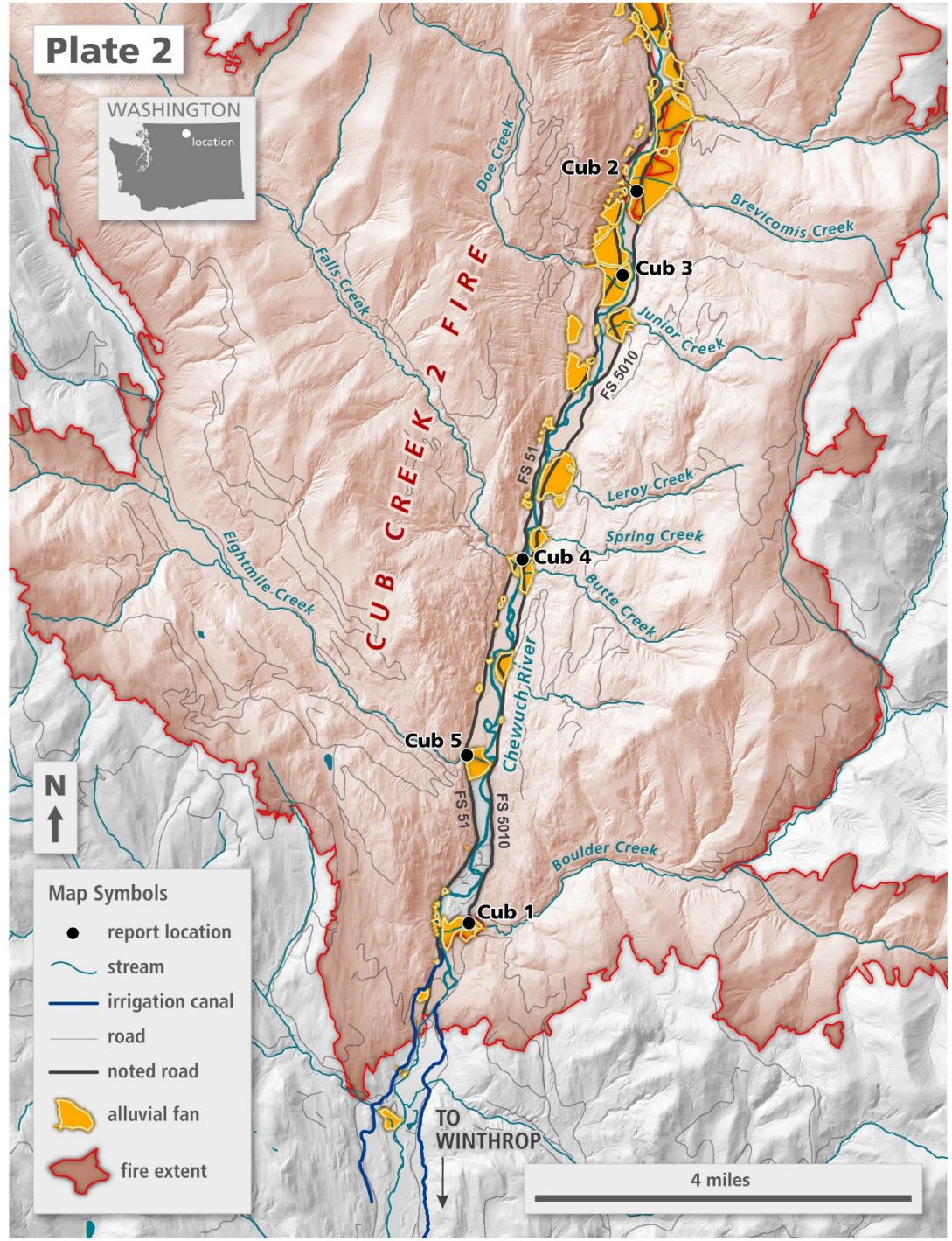


Plate 2
WASHINGTON
location
CUB CREEK 2 FIRE
Doe Creek
Brevicomis Creek
Falls Creek
Junior Creek
FS 5010
FS 51
Leroy Creek
Spring Creek
Eightmile Creek
Butte Creek
Chewuch River
Boulder Creek
Cub 1
Cub 2
Cub 3
Cub 4
Cub 5
N
Map Symbols
report location
stream
irrigation canal
road
noted road
alluvial fan
fire extent
TO WINTHROP
4 miles

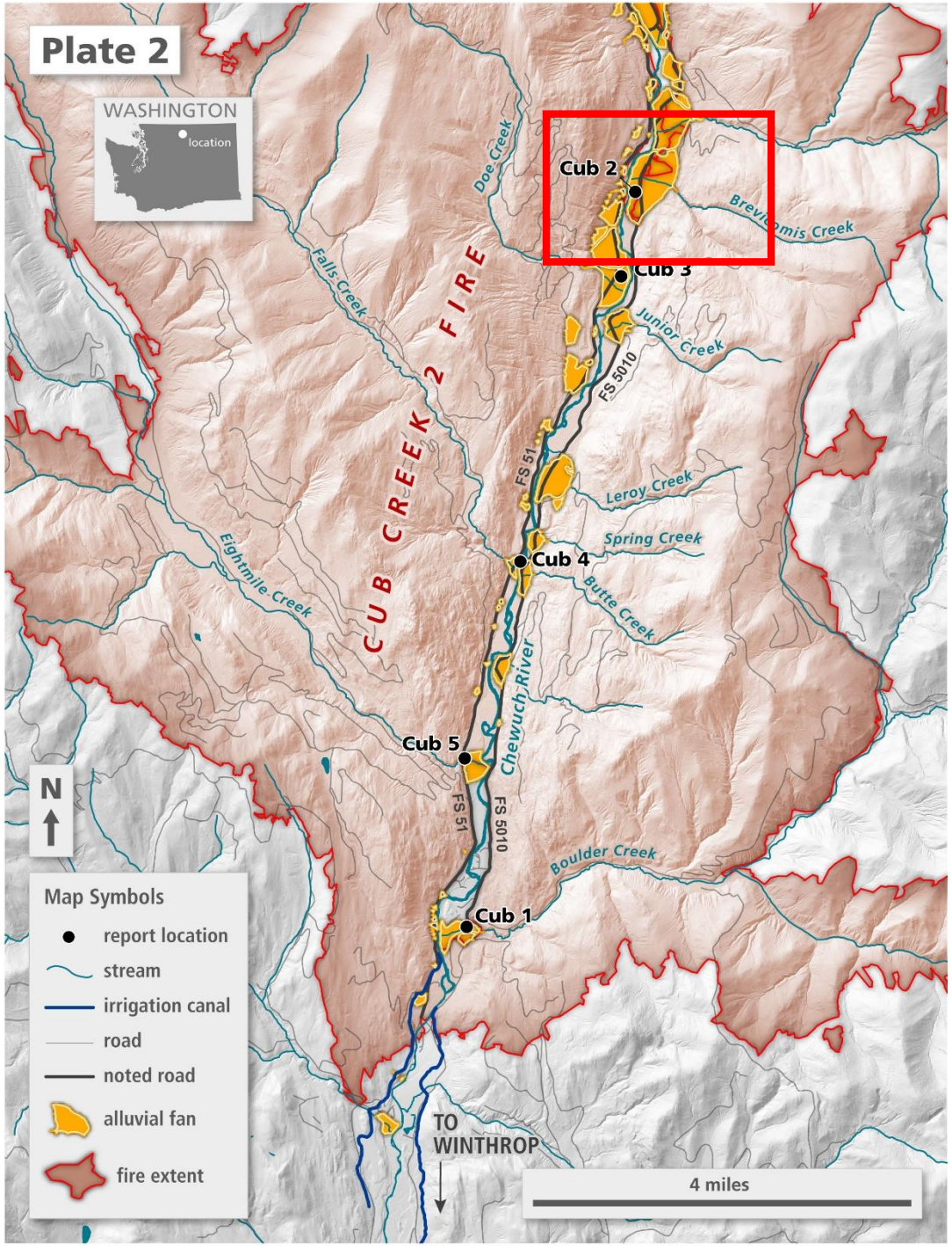
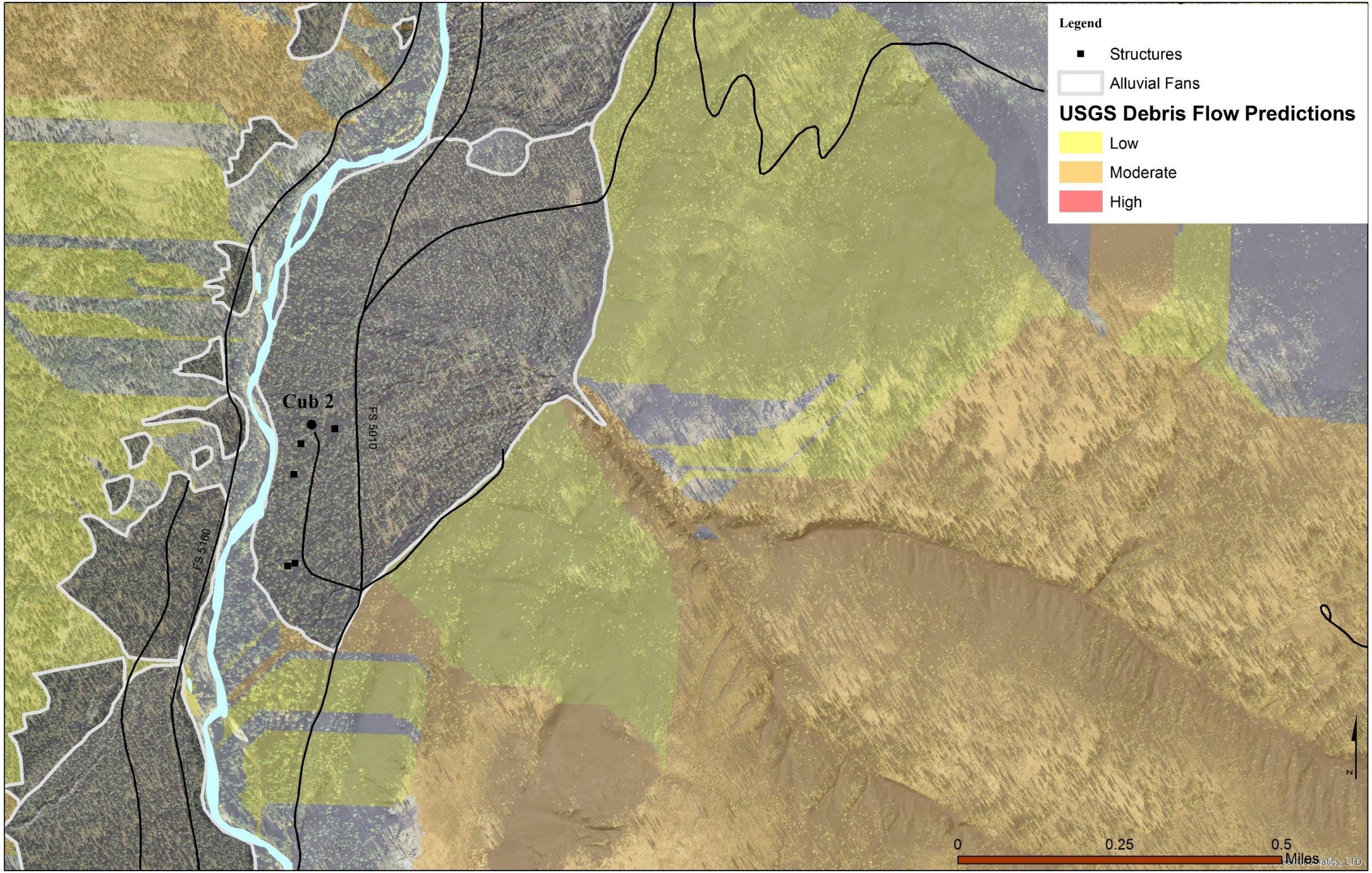
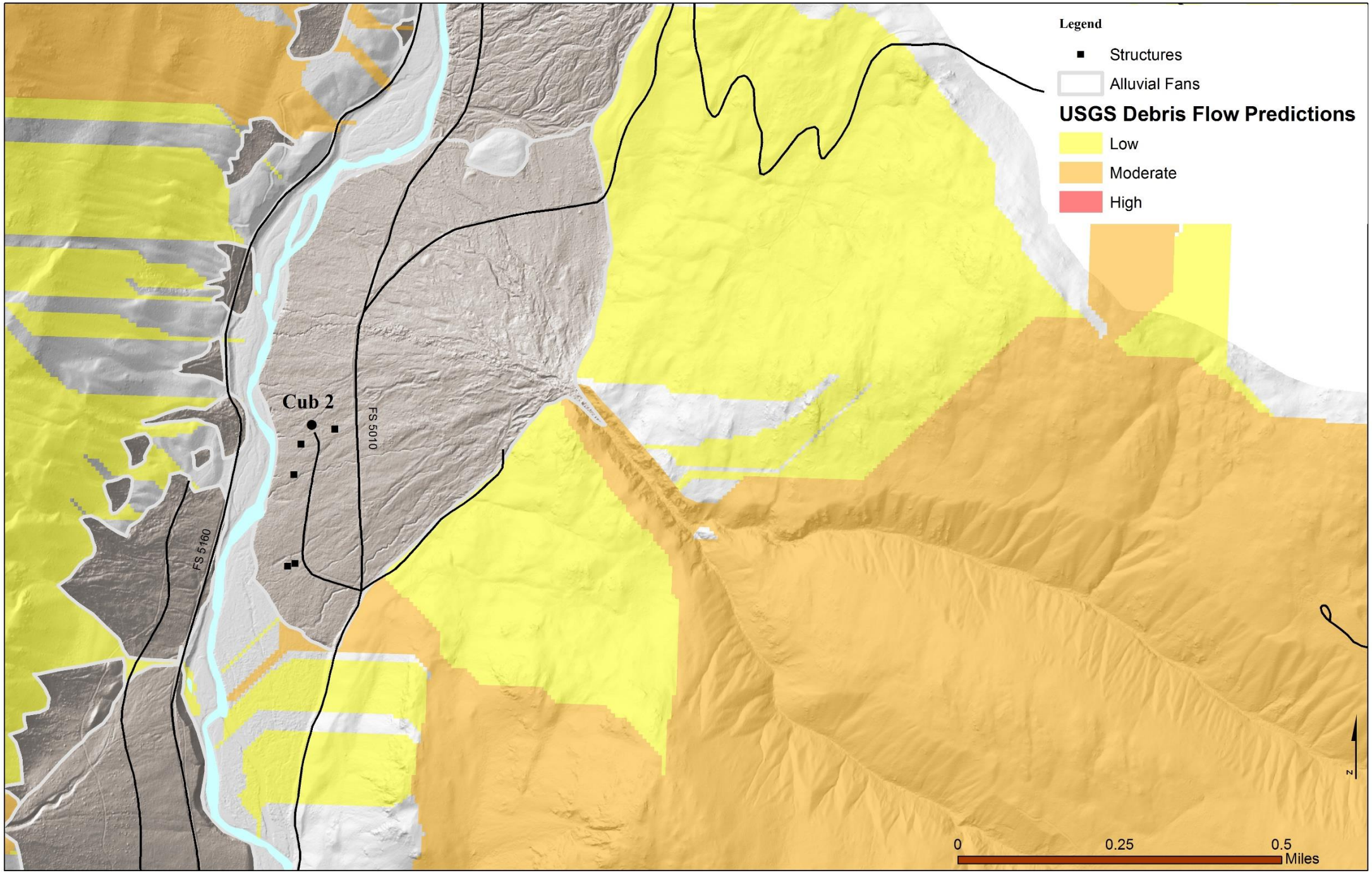


Plate 2
WASHINGTON
location
CUB CREEK 2 FIRE
Cub 2
Cub 3
Cub 4
Cub 5
Cub 1
Doe Creek
Brevicomis Creek
Falls Creek
Junior Creek
FS 5010
FS 51
Leroy Creek
Spring Creek
Butte Creek
Eightmile Creek
Chewuch River
Boulder Creek
N
Map Symbols
report location
stream
irrigation canal
road
noted road
alluvial fan
fire extent
TO WINTHROP
4 miles


Legend
Structures
Alluvial Fans
USGS Debris Flow Predictions
Low
Moderate
High
Cub 2
FS 5010
FS 5160
N
0
0.25
0.5
Miles


Legend
Structures
Alluvial Fans
USGS Debris Flow Predictions
Low
Moderate
High
Cub 2
FS 5010
FS 5160
N
0
0.25
0.5
Miles

FLOODS AFTER FIRES

WHAT YOU SHOULD KNOW ABOUT ALLUVIAL FANS AND WILDFIRES

If you live or work on an **alluvial fan** you could be at risk from potentially dangerous debris flows and floods, especially if you are near a recent wildfire burn area.

What is an alluvial fan?

Alluvial fans are broad, gently sloping, fan-shaped landforms made of sediment and debris deposited when a stream emerges from steep hillslopes onto a wide, flat valley. Because these streams drain upland areas, alluvial fans are more prone to floods and debris flows. These sudden events can be catastrophic. Debris flows roar down into valleys, sweeping away everything in their path, including huge boulders, homes, and cars.

Wildfires and flooding

Wildfires change the properties of soils, causing water to run off more easily. The lack of vegetation also means rain can fall directly onto the ground. This leads to increased flooding.

What makes alluvial fans so dangerous?

Alluvial fans are always changing and often have several active and inactive stream channels. The streambed that is currently filled with water may not be the active channel after a flood. A previously safe structure could quickly become inundated following a major storm. A home far from a stream channel could suddenly be right in the path of a surging wall of mud and debris.

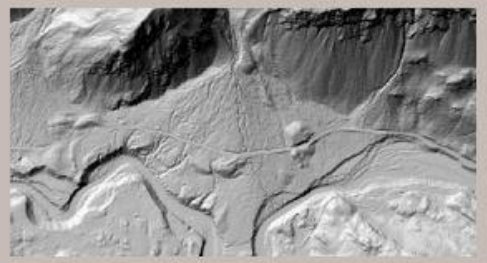
How do I know if I live or work on an alluvial fan?

Look for large piles of cobbles and boulders on and around your property that may have been dropped by previous floods.

Explore our Landslide Inventory on the Washington Geologic Information Portal (https://geologyportal.dnr.wa.gov/)

Look for streambeds near you that seem to originate from a canyon or gully higher up.

Fans are seen most clearly on lidar maps, which you can view on our Lidar Portal (https://lidarportal.dnr.wa.gov/). Look for broad fan shapes at the edges of valleys.



What should I do if I live or work on an alluvial fan?

Watch for impending storms and be prepared with an emergency plan in case you need to evacuate.

Walk your property and identify potential flood pathways. Move outdoor items like furniture, barbeques, and cars to a safer location if they are in a potential hazard zone.

Work with your neighbors and emergency manager to identify evacuation routes.

Buy flood insurance if warranted. Your insurance agent can help you make this decision.

Identify stream channels and culverts in and around your property that may become blocked during a flood. Remove nearby debris, such as rocks, vegetation, and loose garbage.

WASHINGTON STATE DEPT OF NATURAL RESOURCES
WASHINGTON GEOLOGICAL SURVEY

Visit these websites for more information:

- https://www.dnr.wa.gov/wildfire-debris-flows
- https://afterthefirewa.org

E-mail us: geology@dnr.wa.gov **Call us:** (360) 902-1450

https://www.dnr.wa.gov/publications/ger_fs_alluvial_fans.pdf

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Kate Mickelson, L.E.G.
Landslide Hazards Program Manager
kate.mickelson@dnr.wa.gov

For More Information:

WALERT Report: https://www.dnr.wa.gov/publications/ger_hazards_landslide_walert_report_cedar_cub_2021.pdf

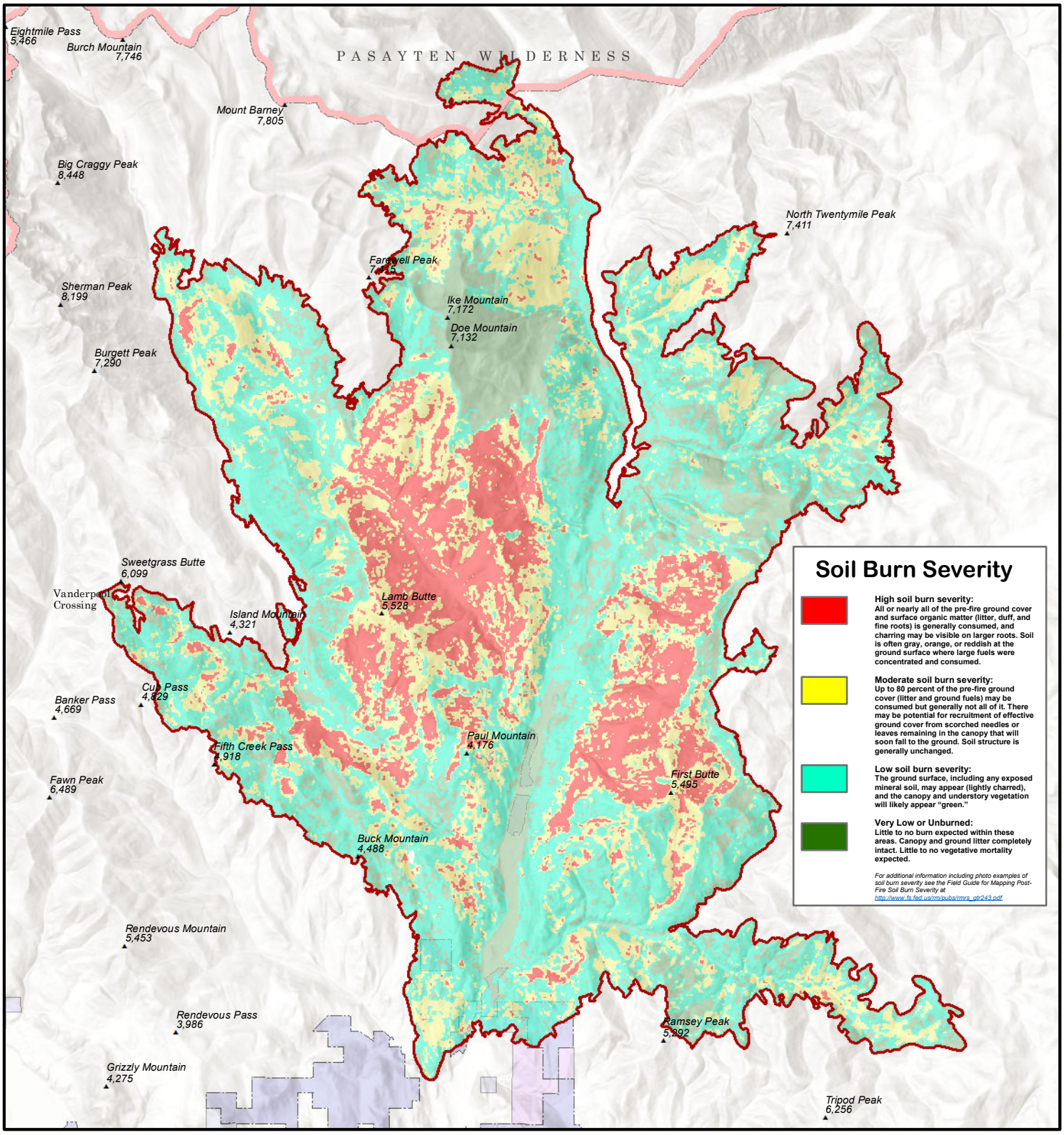
USGS Debris Flow Models:
Cedar Creek: https://landslides.usgs.gov/hazards/postfire_debrisflow/detail.php?objectid=374
Cub Creek 2: https://landslides.usgs.gov/hazards/postfire_debrisflow/detail.php?objectid=370

Lidar Data: https://lidarportal.dnr.wa.gov/#48.57314:-120.35797:13

Alluvial Fan Flyer: https://www.dnr.wa.gov/publications/ger_fs_alluvial_fans.pdf

Soil Burn Severity Map - Cub Creek 2 Fire

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



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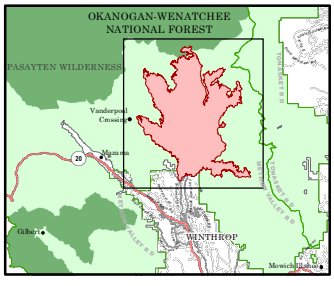
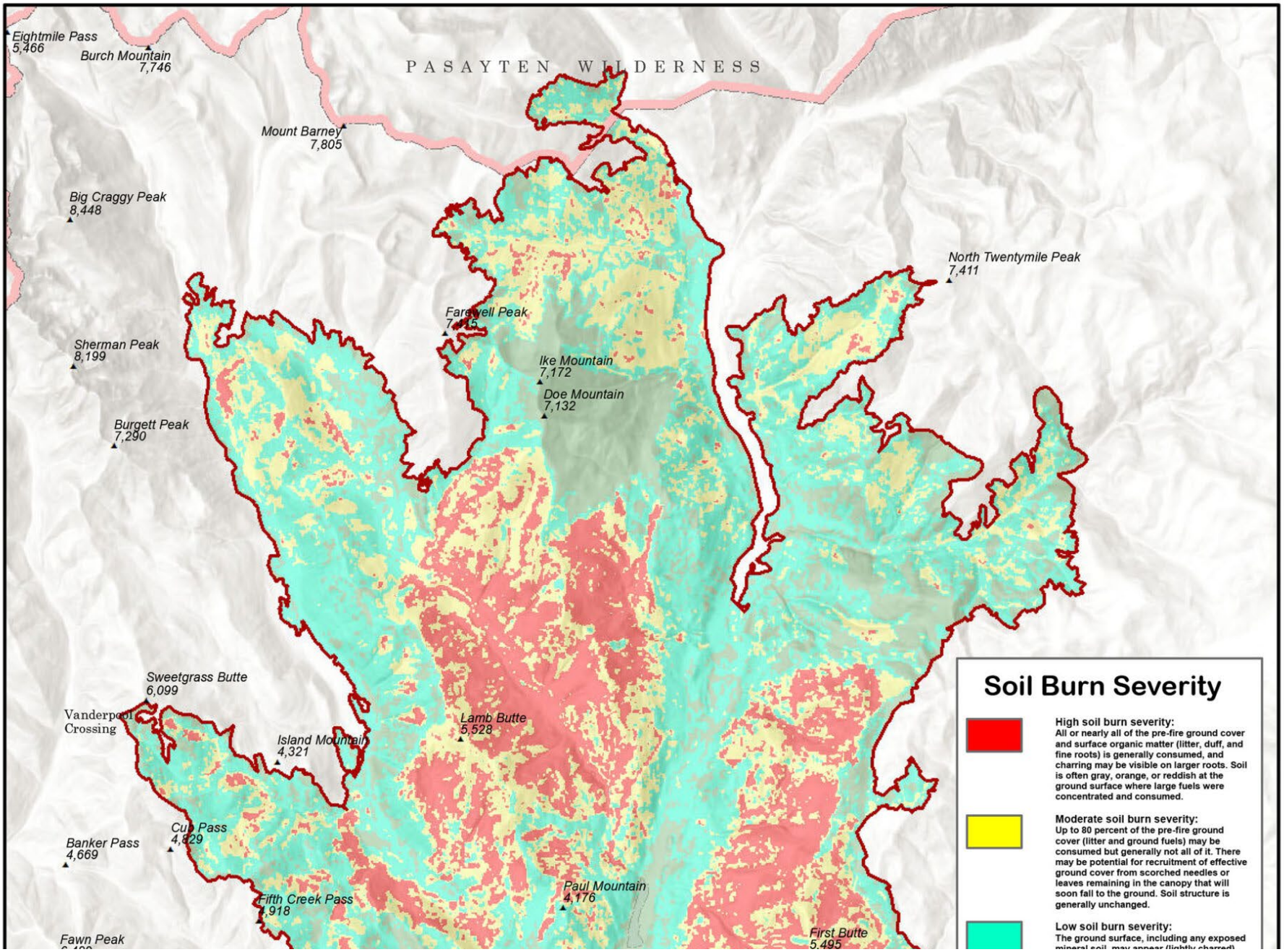
Date: 8/31/2021

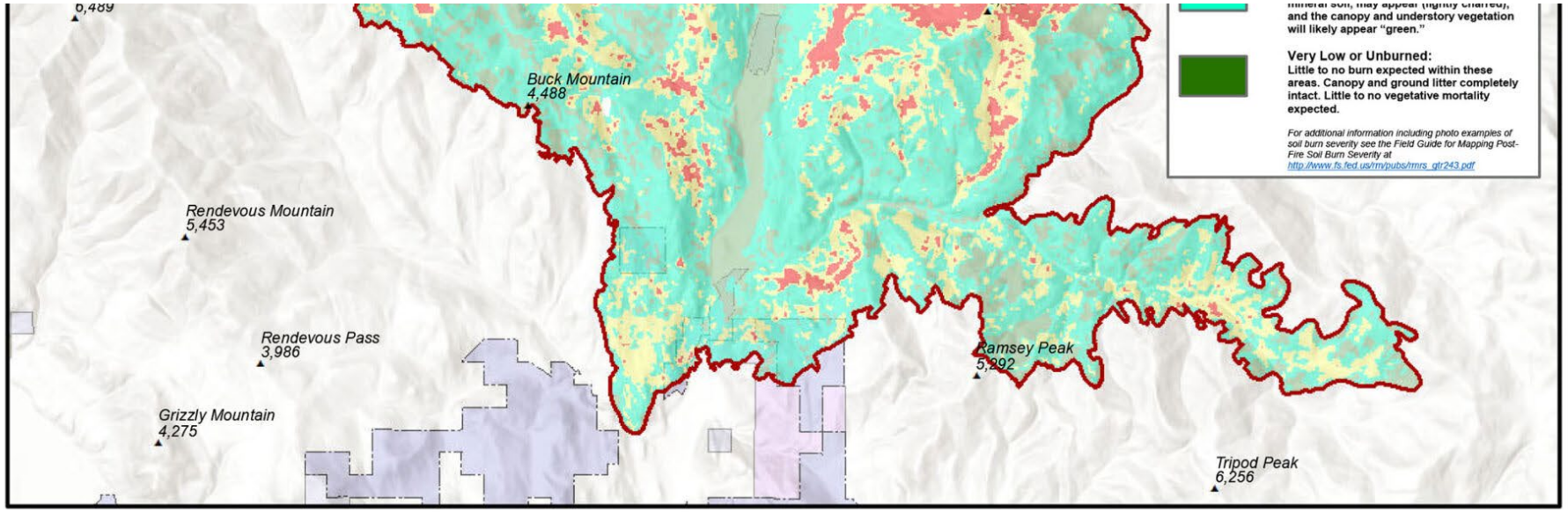


USDA Forest Service
U.S. DEPARTMENT OF AGRICULTURE

Soil Burn Severity Map - Cub Creek 2 Fire

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





0 1 2 4 Miles

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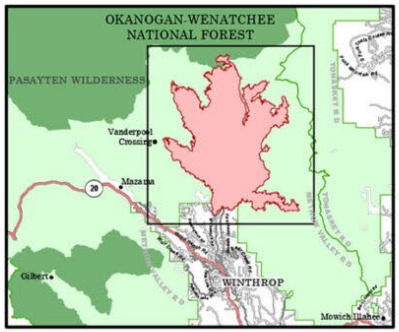

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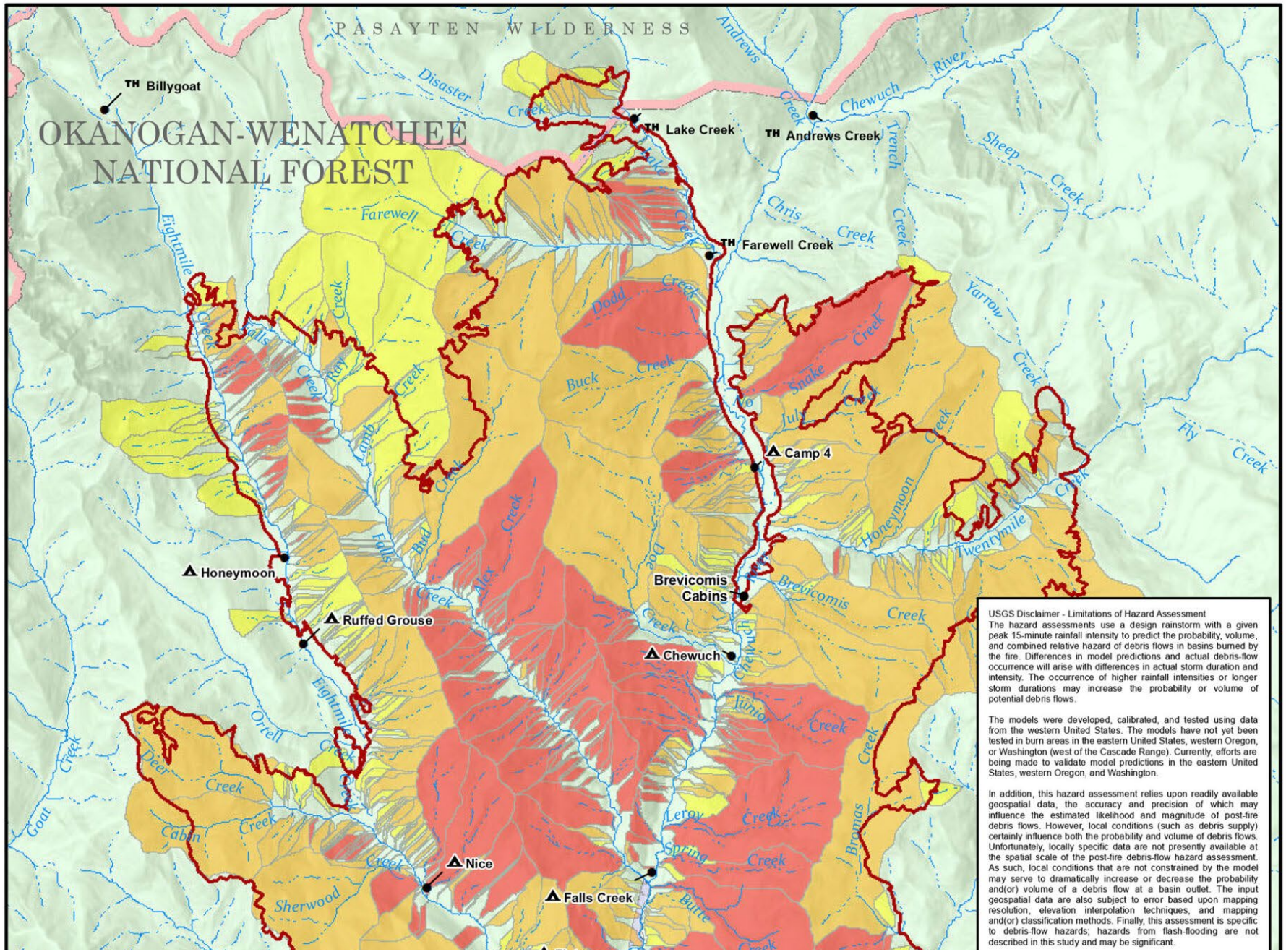
U.S. DEPARTMENT OF AGRICULTURE

Okanogan-Wenatchee National Forest | September 2021

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

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

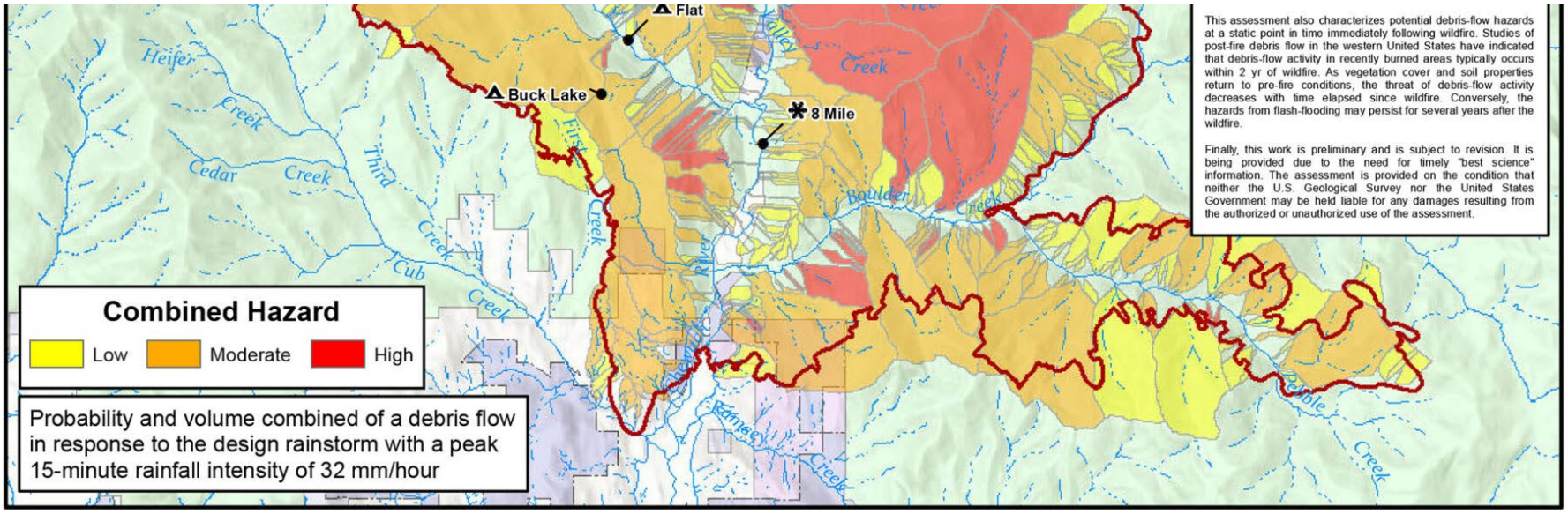


USGS Disclaimer - Limitations of Hazard Assessment

The hazard assessments use a design rainstorm with a given peak 15-minute rainfall intensity to predict the probability, volume, and combined relative 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.



0 1 2 4 Miles

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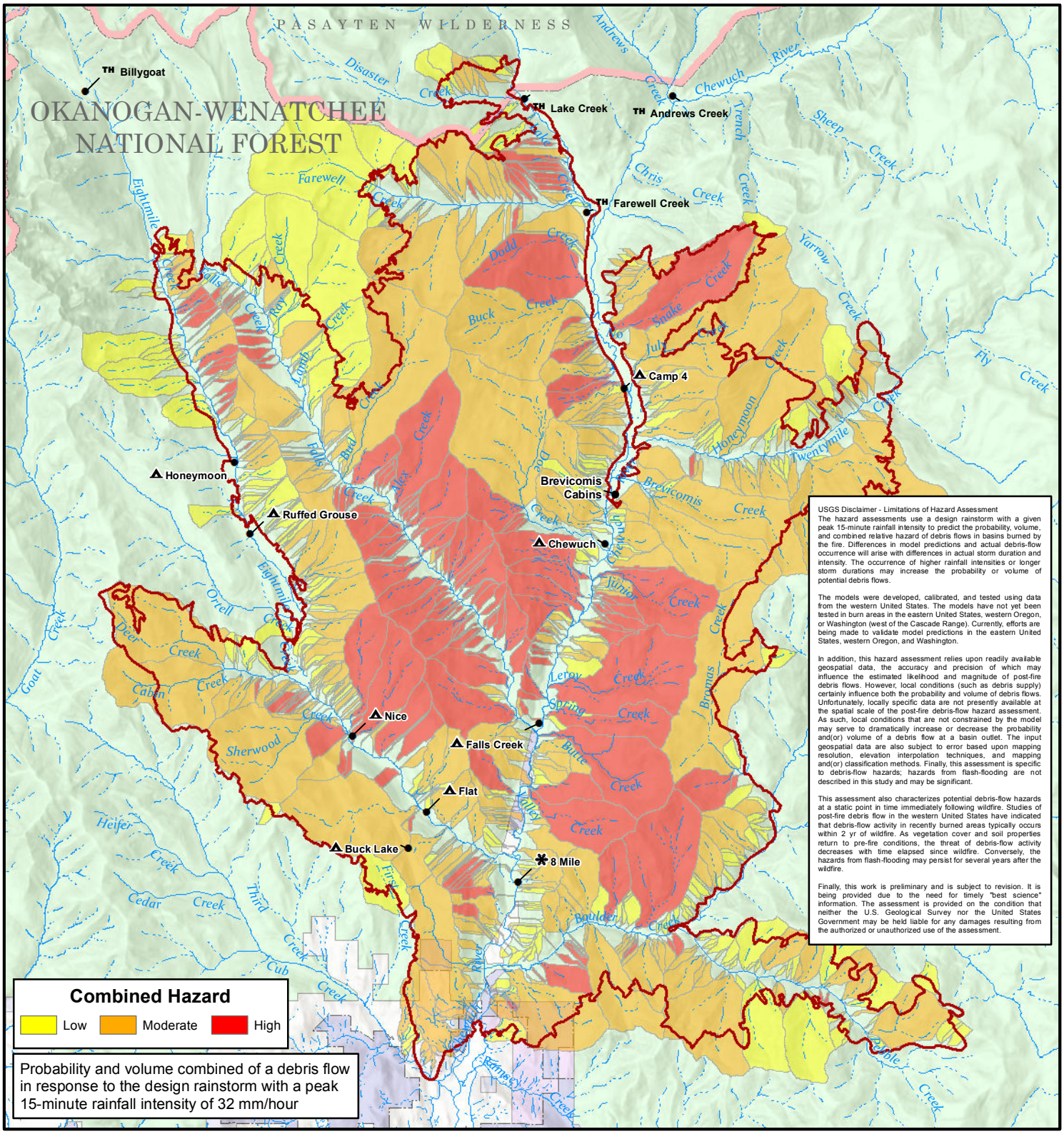
Cub Creek 2 Fire

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

Date: 9/7/2021

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

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



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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.

0 1 2 4 Miles

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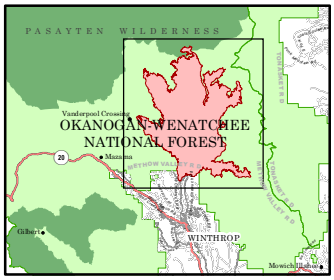
Cub Creek 2 Fire

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

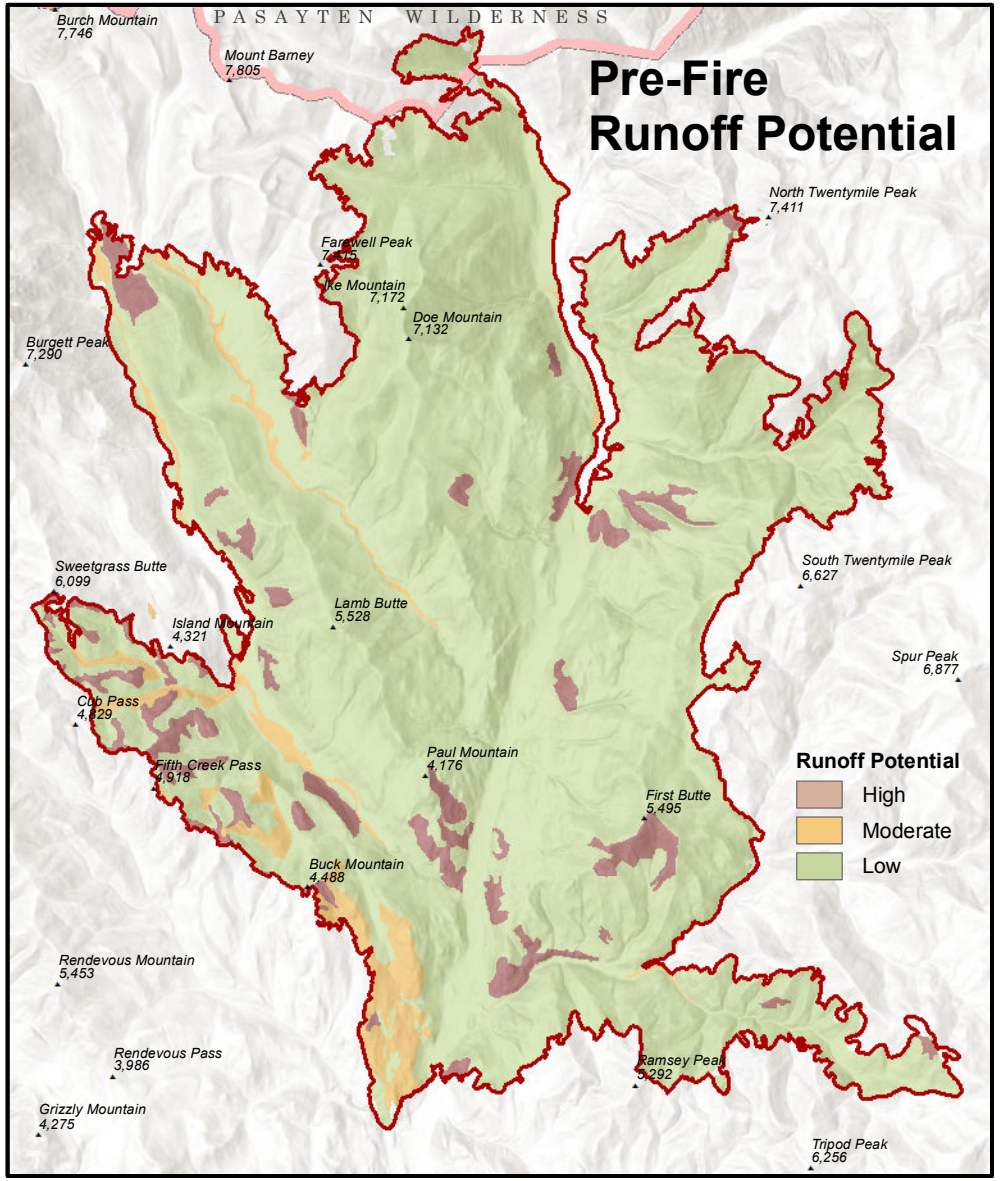
WASHINGTON
Okanogan County

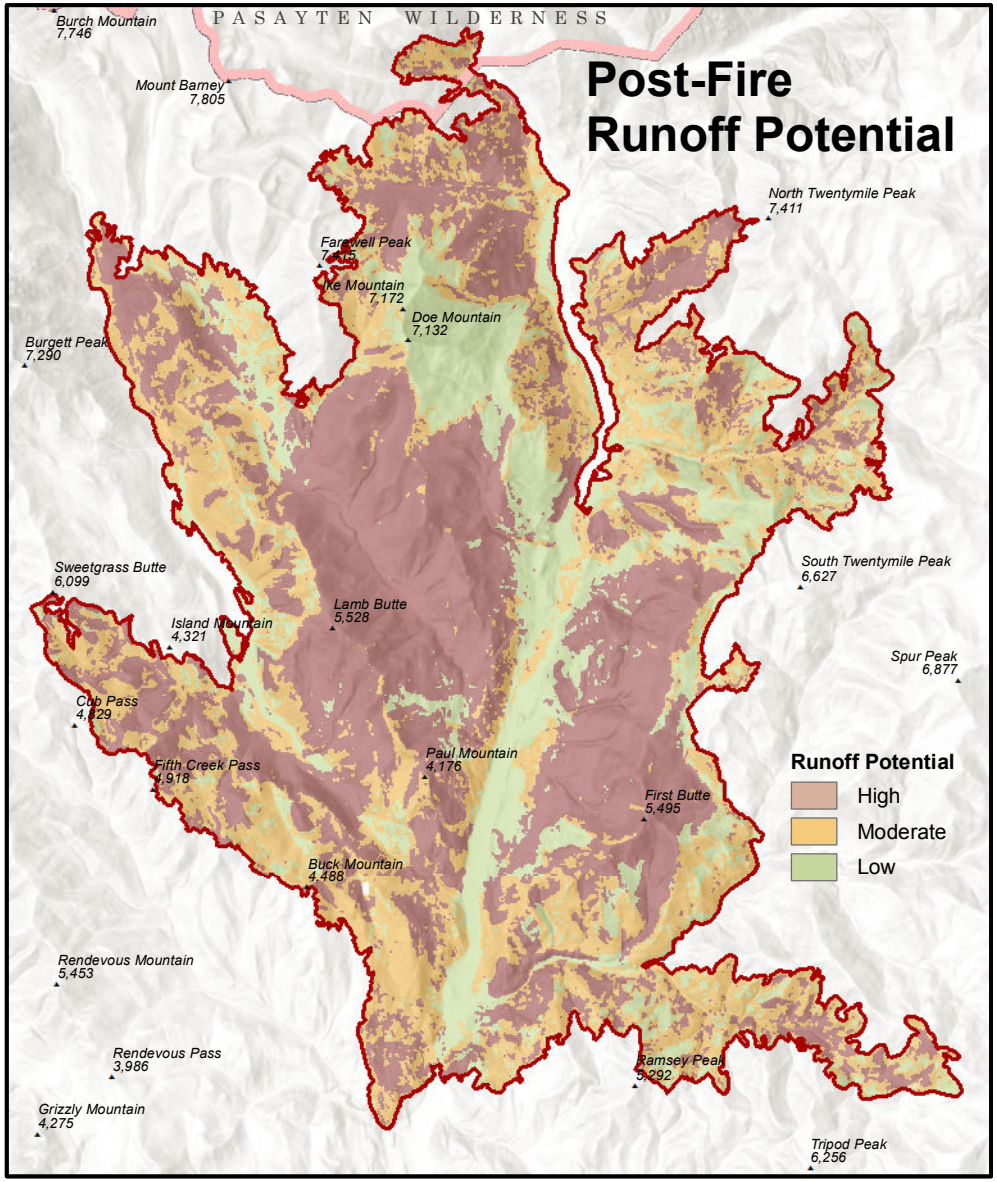


Date: 9/7/2021

Runoff Potential Map - Pre & Post Fire - Cub Creek 2 Fire

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





0 5 10 Miles

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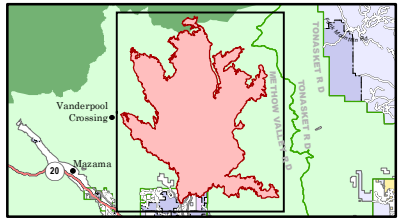
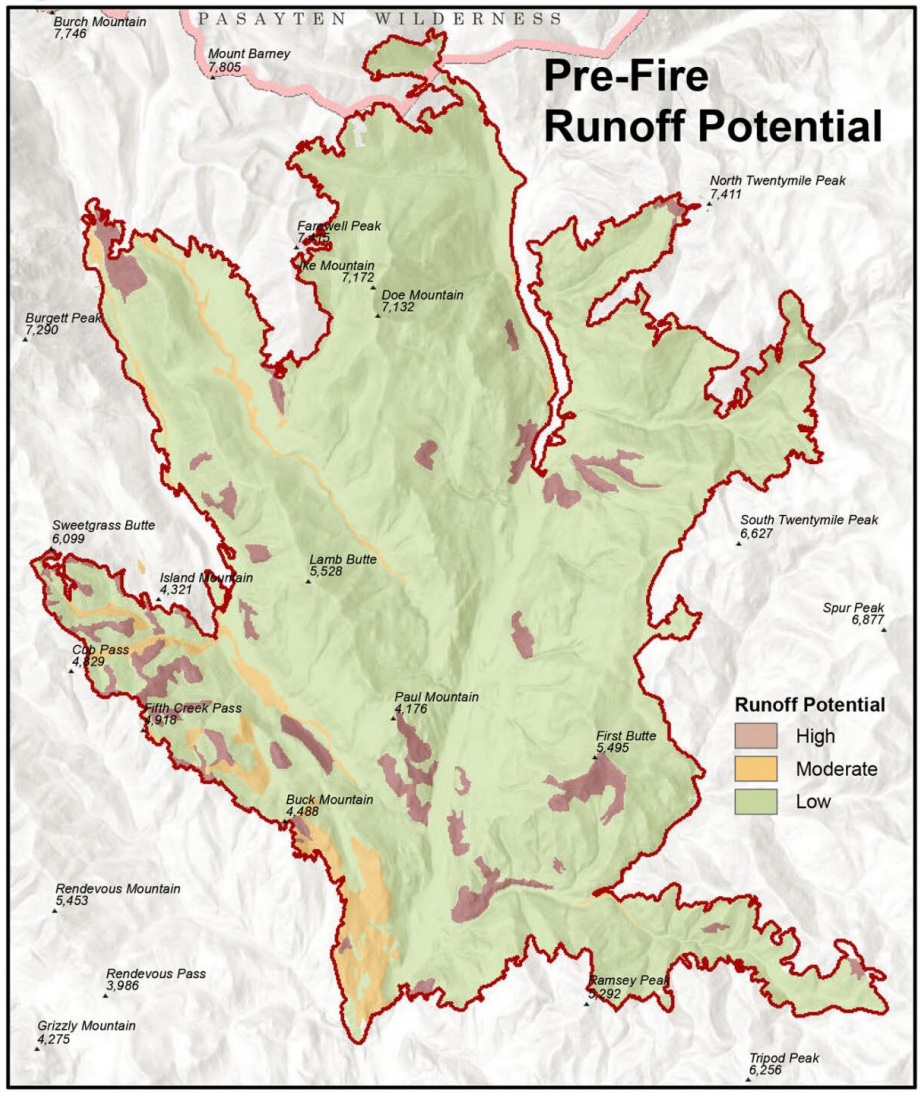
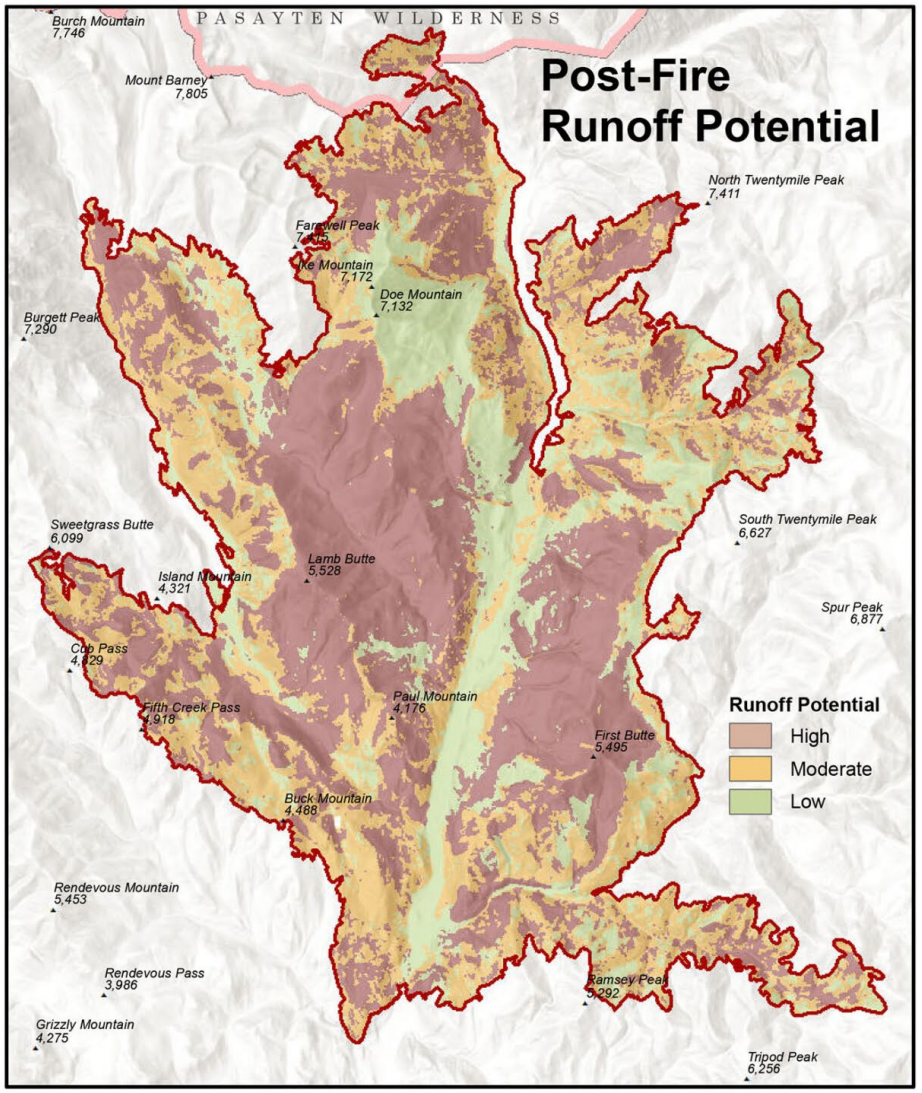
Date: 9/3/2021



Runoff Potential Map - Pre & Post Fire - Cub Creek 2 Fire

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





0 5 10 Miles

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Date: 9/3/2021