CEDAR CREEK FIRE

Reports

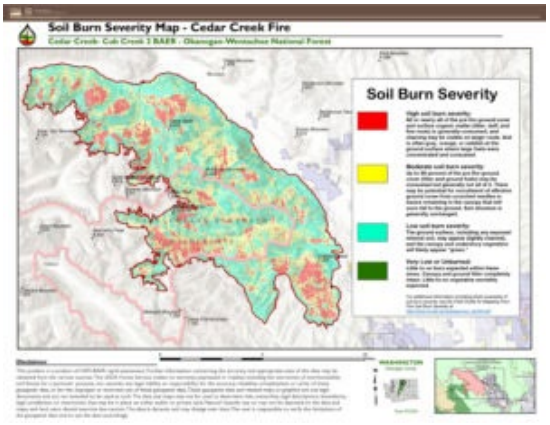
Cedar Creek Fire Burned Area Report
[10-page PDF]

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

Cedar Creek Fire Soil Burn Severity Map



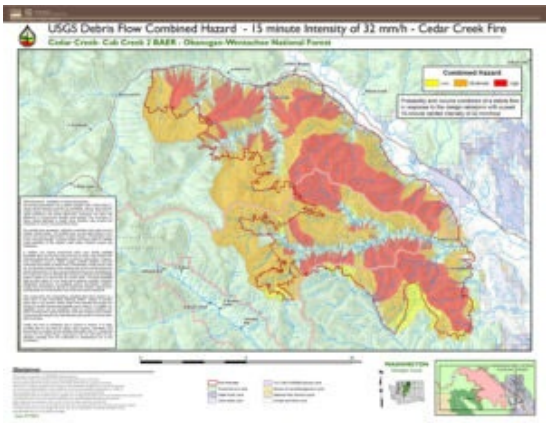
- **JPG** and **PDF** format
- A **KMZ** file will also available to view the map in greater detail in

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

Cedar Creek Debris Flow Hazard



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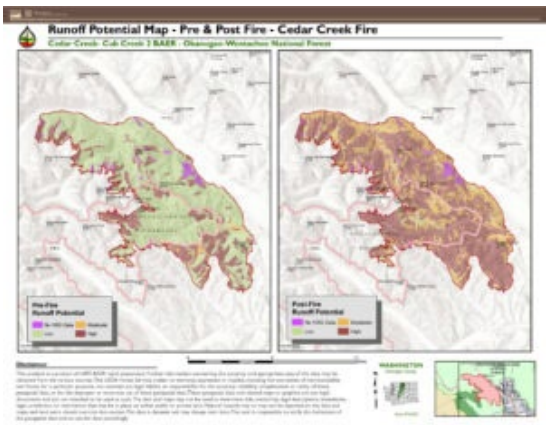
Cedar Creek Runoff Potential Ð Pre and Post Fire



JPG and PDF

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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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Cedar Creek Burned Area Summary

2500-8 Burned Area Report

Fire Background

The Cedar Creek Fire started from a lightning strike on July 8, 2021. The fire started approximately 3.2 miles west-southwest of the community of Mazama, merged with the Varden Fire, and was referred to as the Cedar Creek Fire (Figure 1). This ~55,000-acre fire caused evacuations and multiple temporary closures remain in place due to the fire effects. The fire burned within the Methow River drainage. Several headwater streams within the burned area have extensive fire impacts.

Figure 1 Cedar Creek Fire activity from Goat Creek Road.

The Forest Service assembled a Burned Area Emergency Response (BAER) team on August 25, 2021, to assess both the Cedar Creek and Cub Creek 2 Fires. 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 48% of the burned area within the Cedar Creek Fire exhibit high or moderate soil burn severity and may have developed water repellent soils as a result (see map on page 7). Like the Cub Creek 2 Fire, vegetation mortality in the moderate and high soil burn severity areas ranged from 80 – 100%.

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 Cedar Creek 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.

A storm event of 32 mm/h (about 0.3 inches in 15 minutes) was predicted to have greater than 80% probability of debris flows in several drainages, including but not limited to many of the tributaries to Wolf Creek, several tributaries to the Methow River, several tributaries to Early Winters Creek, and two tributaries to Little Bridge Creek in the Twisp River drainage.

The probability of debris flows is even higher in the Cedar Creek burned area in response to a 15-minute intensity of 40 mm/h (about 0.4 inches in 15 minutes), a rain event with roughly a 10-year recurrence interval.

Most of these watersheds are roughly estimated to produce more than 1,000 m^3 of debris, resulting in a high debris flow hazard.

Non-FS values within and downstream of the burned area may also be threatened by inundation from flooding and debris flows, including but not limited to homes on debris fans along the northeast face of the fire, homes on the Wolf Creek debris fan and on fans south of Wolf Creek, and State Highway 20 (see map on page 8). The Washington Geological Survey's full Wildfire-Associated Landslide Emergency Response Team Report (WALERT) can be found at https://www.dnr.wa.gov/publications/ger_hazards_landslide_walert_report_cedar_cub_2021.pdf. A map showing alluvial fans on the edge of the fire perimeter from their report is duplicated on page 10 of this summary.

Hydrology

Watershed response will likely include an initial flush of ash and fine sediment, rill and gully erosion in headwater drainages and in small, steeper drainages within the burned area, debris-laden flash floods (Figure 2) and debris flows in response to high-intensity rain events, as well as elevated snowmelt peak flows.

Preliminary hydrologic modeling indicates flow increases in many headwater channels of >100x the pre-fire flow rates for a given storm. Water quality will be diminished during seasonal peak runoff, as well as after high-intensity summer rains, due to elevated ash, fine sediment, and nutrient loading. Elevated post-fire response will gradually diminish over time as vegetation and groundcover levels recover over the next several years, although some impacts are likely to persist for a decade or longer (see map on page 9).

Figure 2 Debris in burned channels is easily mobilized by rain and increased flows.

Critical Values

Roads and Drainage Features

The watersheds burned in the Cedar Creek 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.

Forest system roads within the burn perimeter (61 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 Cedar Creek Fire and corresponding drainages.

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

Specific Forest Service roads and their associated drainage features at risk include:

4410	4410440
4410100	4415
4410200	4415040
4410400	5310100
4410415	5310145
4410500	5210200
4410522	

Also, all non-surveyed roads within or immediately adjacent to high or moderate soil burn severity are considered at risk and warrant an assessment as they become accessible.

The proposed treatments include signs warning travelers of the increased danger, construction of dips and armored dips to facilitate drainage, installation of drop inlets to ensure drainage functions remain intact with added debris, cut off damaged section of pipes to ensure free drainage, clean inlets, catch basins and outlets to restore functional drainage, and regular storm inspection and response.

While there are no known Forest Service owned or maintained bridges or large culverts at risk from the, there are other public and private at-risk bridges and culverts that should be evaluated for channel-way adequacy (often included in bridge inspection reports), abutment condition and exposure, vegetation content on banks upstream and downstream of the structure, adequacy of culvert inlet (basins, headwalls, bevel), existence of livestock stream-fencing, or any other factors that impact the hydraulic and debris-passing capacity of the structure.

Figure 3 Burned debris can quickly plug undersized culverts.

Recreation

Many recreation resources are located within or near the perimeter of the fire on NFS lands, including two campgrounds, three trailheads, numerous dispersed use sites, seven terra trails, one sno-park, groomed motorized and non-motorized trails, and the Lake Chelan-Sawtooth Wilderness area designation. Recreational use occurs throughout the year within this area and seasonal use occurs at each of the developed infrastructure assets.

Camping: Fire impacts to campgrounds were observed through site visits. Klipchuck and Early Winters campgrounds are both outside the fire perimeter and are not directly impacted by the fire. Both are located downstream from some moderate and high soil burn severity areas, but the threat of flooding or debris flows is unlikely due to their location and the fact that relatively little of the Early Winters watershed burned. No treatments are recommended.

Dispersed camping is a popular activity in this area as well. While no infrastructure is at risk in these areas, human life and safety is still a major concern at many of these sites, due to falling trees and flooding. Recommended treatment is for temporary site closures, warning, or closure signs to

be posted at sites along trails outside of wilderness (especially including the Cedar Creek area with a few sites in the Chickadee area), and hazard tree assessment to be completed. Sites with unacceptable risks should be closed until hazards are reduced through natural recovery of the area. For sites in the Lake Chelan-Sawtooth Wilderness, warning signs should be posted at the trailhead. Consistent with Forest Service wilderness policy, signs are typically not posted inside the wilderness and instead are located at trailhead bulletin boards. There is a higher expectation of risk while in wilderness with increased need for self-reliance by visitors. These factors result in the recommendation for warning signs, rather than closure, of established campsites inside the Lake Chelan-Sawtooth wilderness

Trailheads and Trails: The Wolf Creek trailhead was burned over resulting in loss of infrastructure and the presence of hazard trees. Because the trailhead is a location for congregation of the public and administrative personnel, there is a high risk to life and safety due to the threat of overhead hazards from hazard trees. The toilet (Figure 4) burned leaving an open vault containing human waste, resulting in high risk to life and safety. Recommended treatments include temporary closure of the trailhead and treating or pumping the toilet and sealing the open holes to prevent them from filling with water and snow.

Figure 4 All that remains of the Wolf Creek TH toilet is the metal roof.

The Cedar Creek trail (476 – Figure 5), Wolf Creek trail (527), and some trails in the Chickadee area, including Thompson Ridge trail, experienced moderate to high burn severity. These trails are high or medium use trails that were in good condition prior to the fire. Due to post fire threats, these trails have a very high level of risk for infrastructure damage or failure. These trails are recommended for treatment to stabilize, stormproof, or mitigate the anticipated impact of post-fire storm events.

Additional recommended treatment includes temporary closure of the Cedar Creek trail (476), Wolf Creek trail (527), and some trails in the Chickadee area, including portions of the Thompson Ridge trail. These are the highest use and most impacted trails.

Temporary closure of the Wolf Creek trail (527) will effectively also close the South Fork Wolf Creek trail (527.1), North Fork Wolf Creek trail (528), and the Milton Mountain trail (508) due to access to those trails being dependent upon travelling the Wolf Creek trail.

Figure 5 Cedar Creek Trail damage may get worse with eroding hillslopes.

One groomed winter motorized, and numerous groomed winter non-motorized trail routes are located within the fire perimeter, including in the Chickadee area. A high life and safety risk exists to users of these trails that are in moderate and high soil burn severity areas during the winter season due to the threat of hazard trees whether by direct impact from a falling tree, or by newly fallen trees causing accidents, or limiting egress. This is a very dense trail network with overlapping summer and winter trails. Some trails in the Chickadee area are only lightly affected and may remain open.

For snow trails that remain open, warning signs are recommended to be posted at the Eightmile sno-park, the Chickadee trailhead, and other access points alerting users to the increased risk of hazard trees especially due to winter storms during the season of use. The groomed snowmobile trail going up SR20 is at lower risk due to being in an area with mostly low burn severity. It is not recommended for closure, but a warning sign at the sno-park is recommended.

Trail conditions and hazards should be reassessed in the spring or summer of 2022, and thereafter as needed, to determine if risks have been reduced to an acceptable level to reopen closed trails.

Botany

The Cedar Creek 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 43 miles of dozer line and 8 miles of handline (Figure 6) 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. The Cedar Creek fire overlapped with five different fires that have occurred on USFS land within the past 35 years. It is expected that 109 acres of shrub steppe communities, and 23,215 acres of dry and hot forested plant communities that reburned within the past 35 years will face impacts given the invasion of cheatgrass, knapweed, dalmatian toadflax and whitetop that are changing the ecological response and fire resiliency of these ecosystems. It is also expected that the 10 acres of riparian communities that burned at moderate to high severity are vulnerable to establishment of noxious weeds from off forest wind dispersed species. 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 6 Newly dug firelines are good host locations 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 360 acres) and burned areas prone to new noxious weed infestations (120 acres), weed technicians will perform regular surveys and treat new infestations.

Cultural Resources

There are 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 Cedar Creek 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 Cedar Creek Fire.

Maps of soil burn severity, debris flow hazards, runoff potential, and alluvial fans adjacent to the burned area can be found on the following pages.

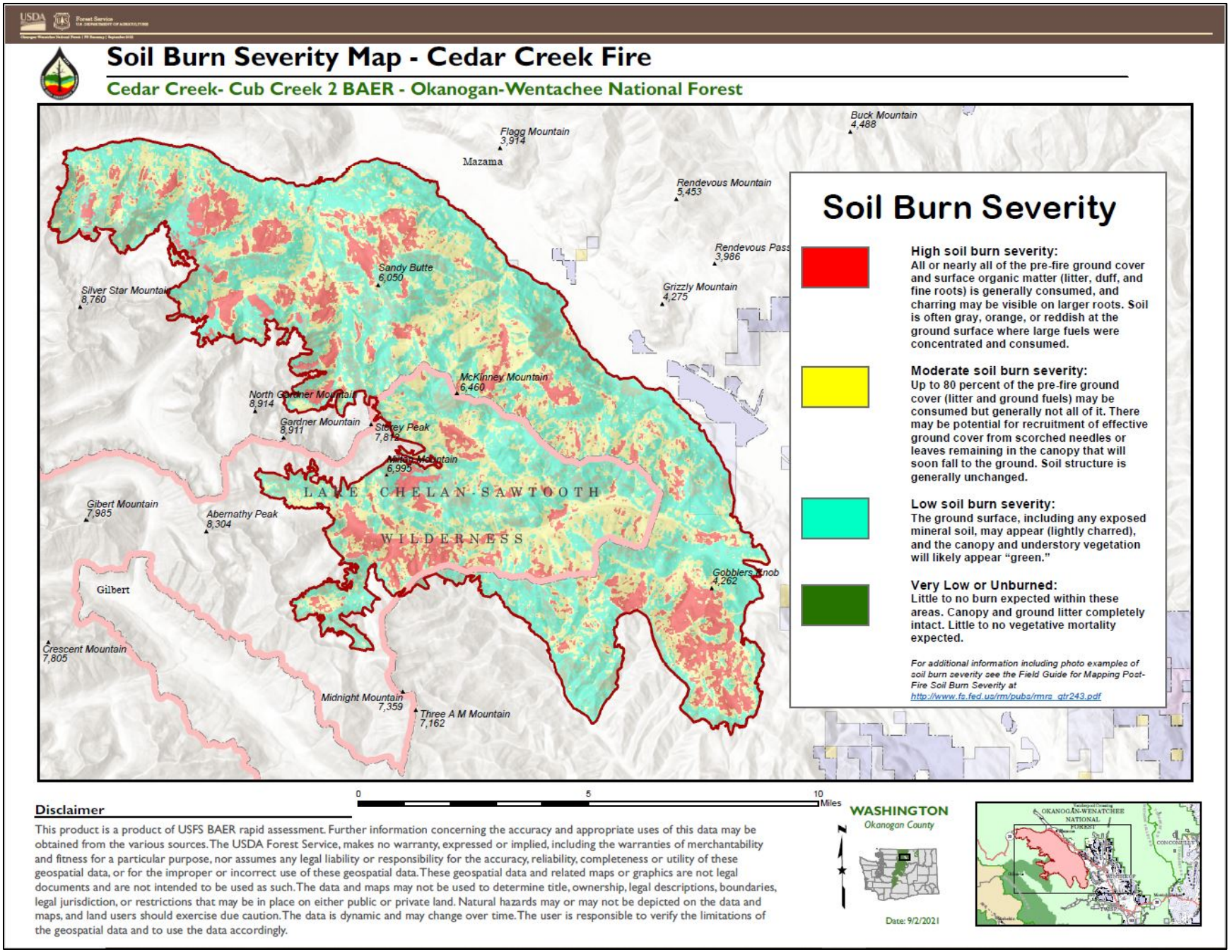

Figure 7 Soil burn severity map of the Cedar Creek Fire.

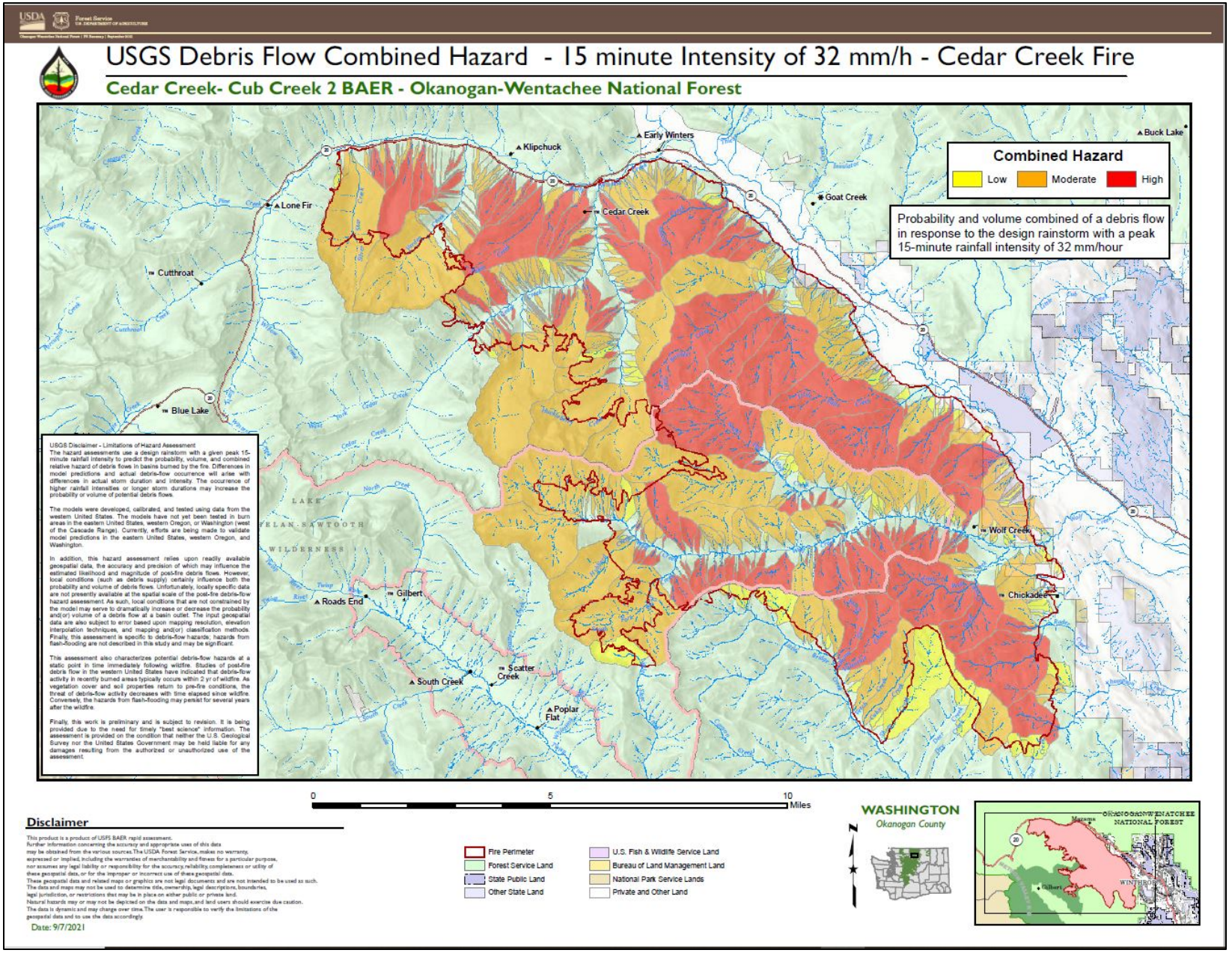

Figure 8 Debris flow hazards for the Cedar Creek Fire

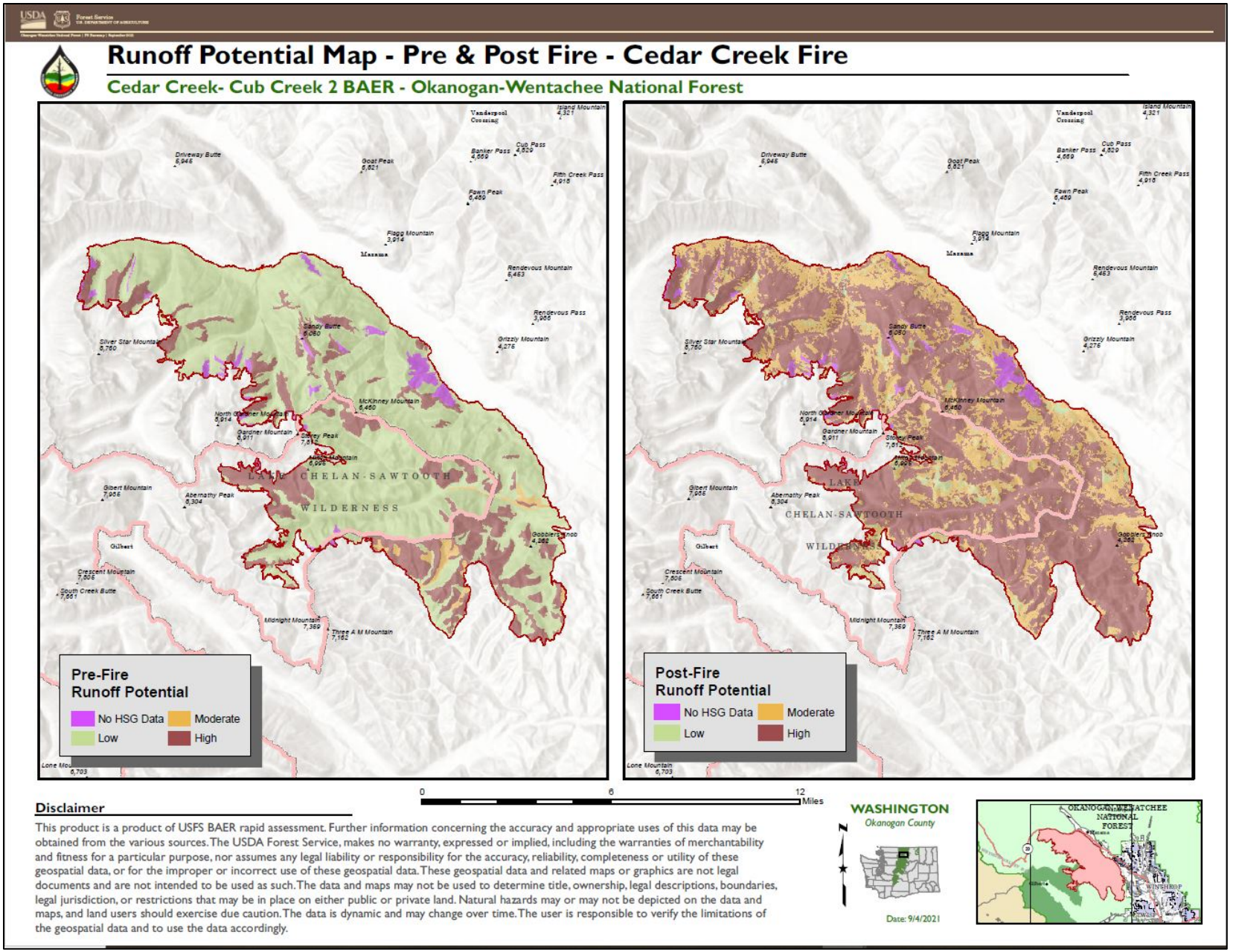

Figure 9 Maps showing pre- and post-fire modeled runoff potential.

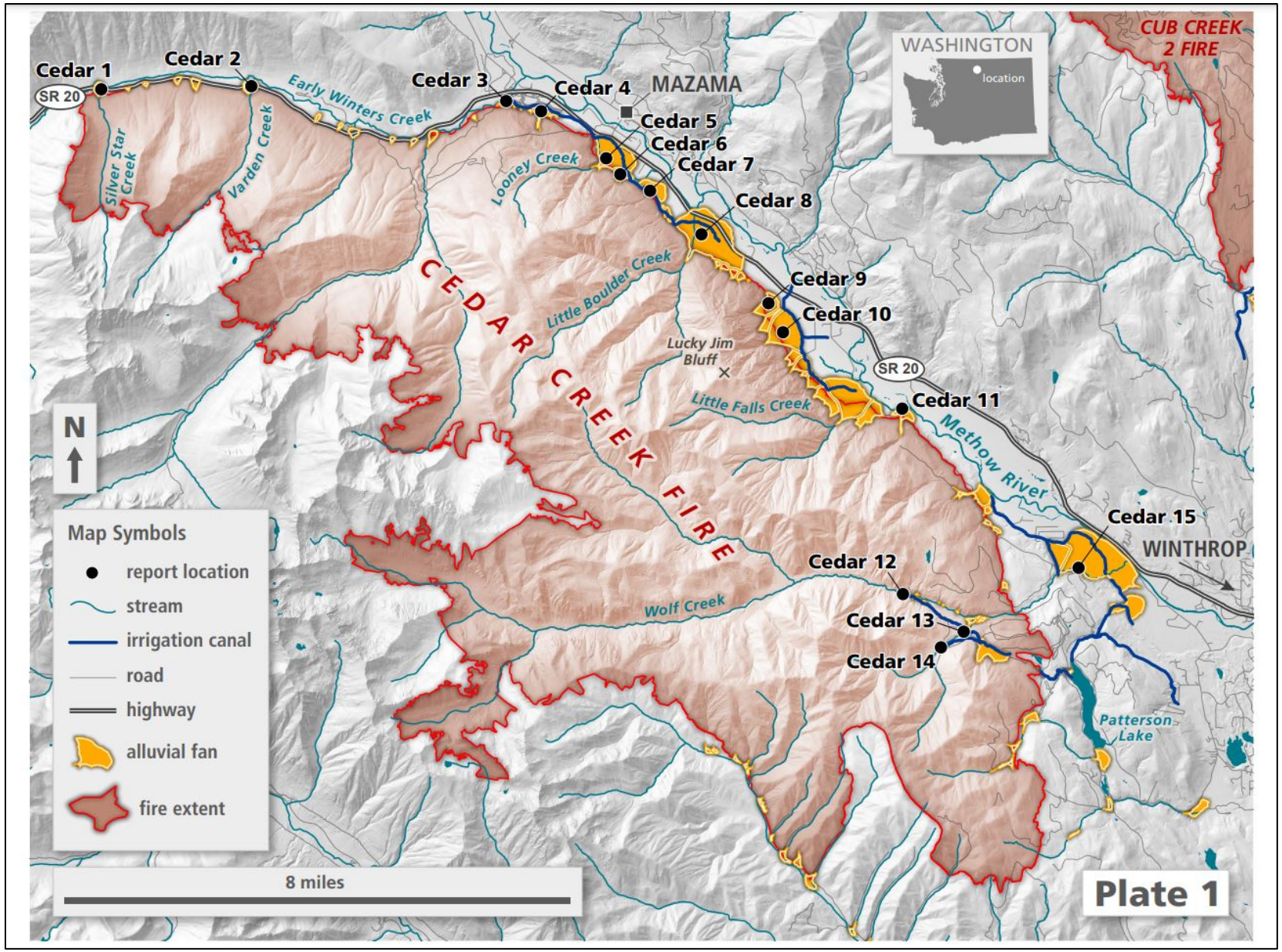

Figure 10 Map of alluvial fans in the vicinity of the Cedar Creek Fire.

Wildfire Associated Landslide Emergency Response Team (WALERT)

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WALERT Team Lead
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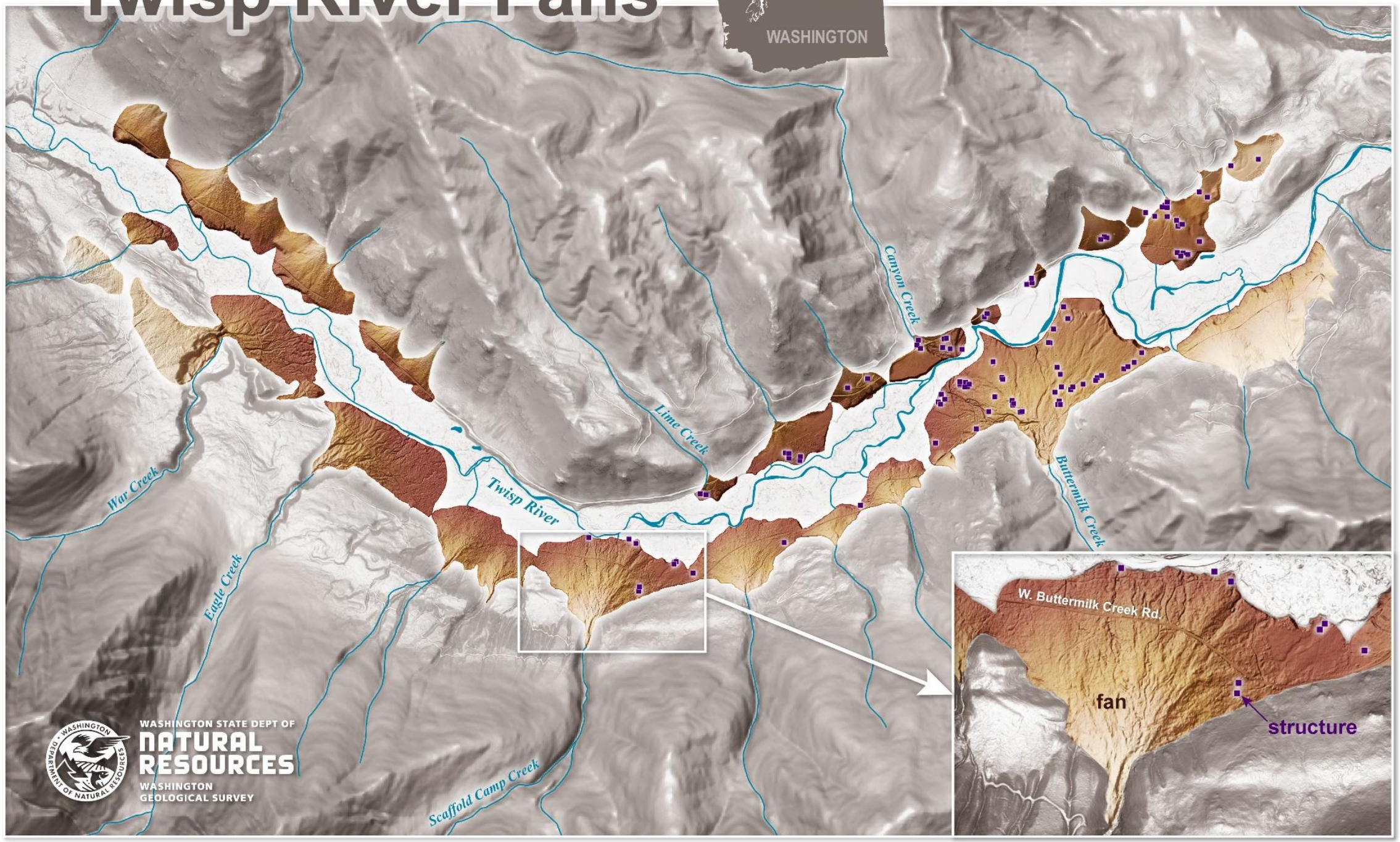
Twisp River Fans



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NATURAL RESOURCES

WILDFIRE-ASSOCIATED LANDSLIDE EMERGENCY RESPONSE TEAM REPORT

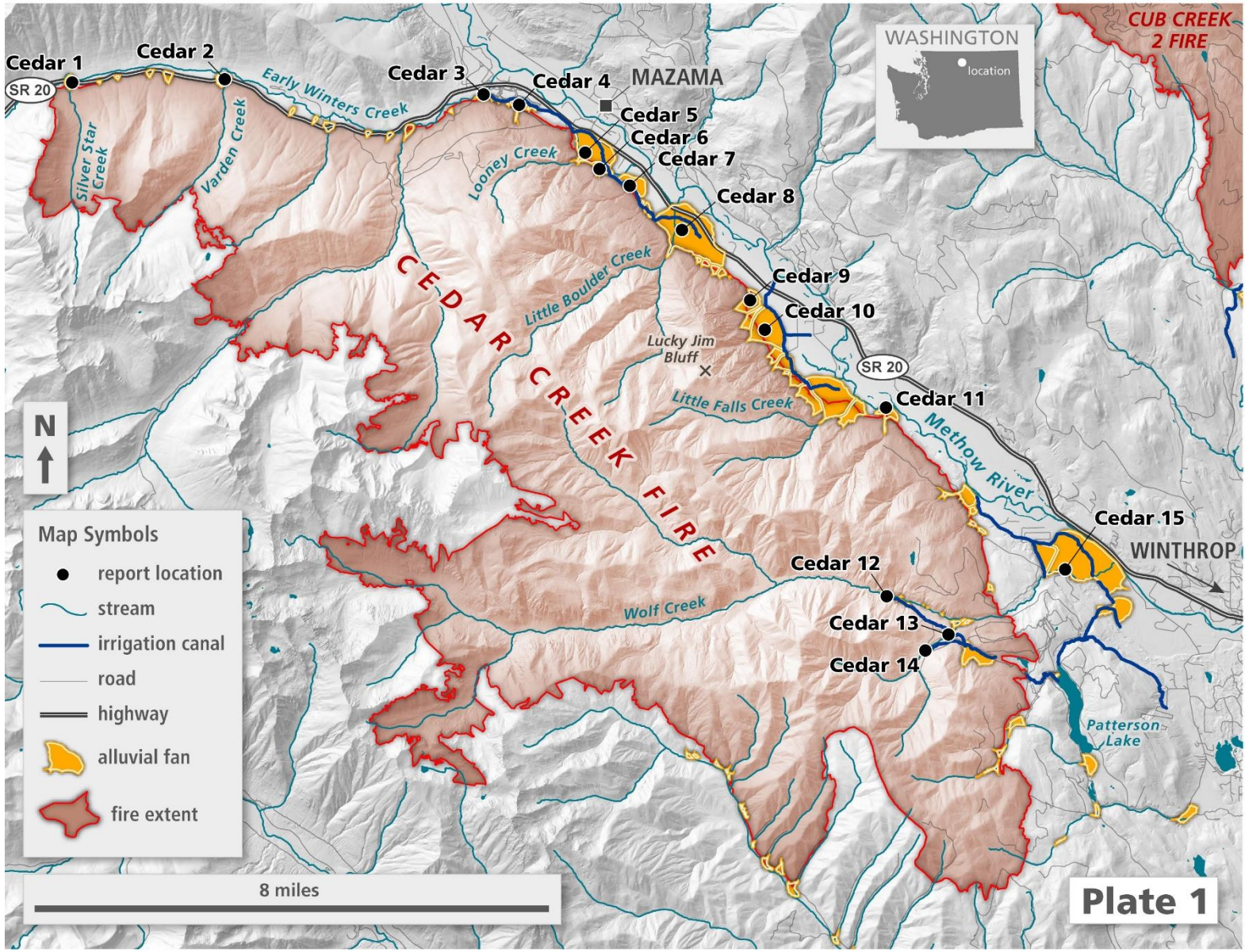
Cedar Creek and Cub Creek 2 Fires

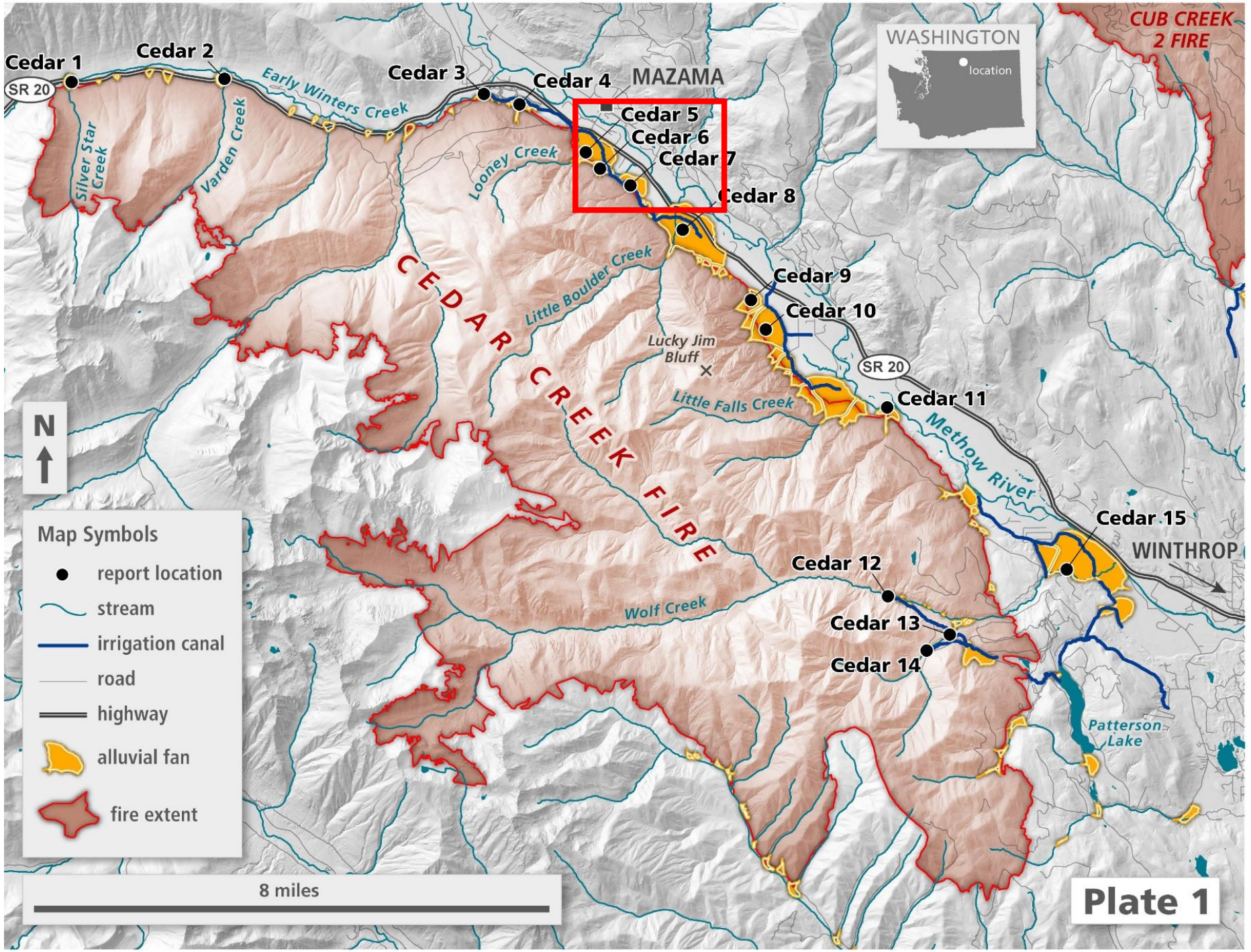
Okanogan County, Washington

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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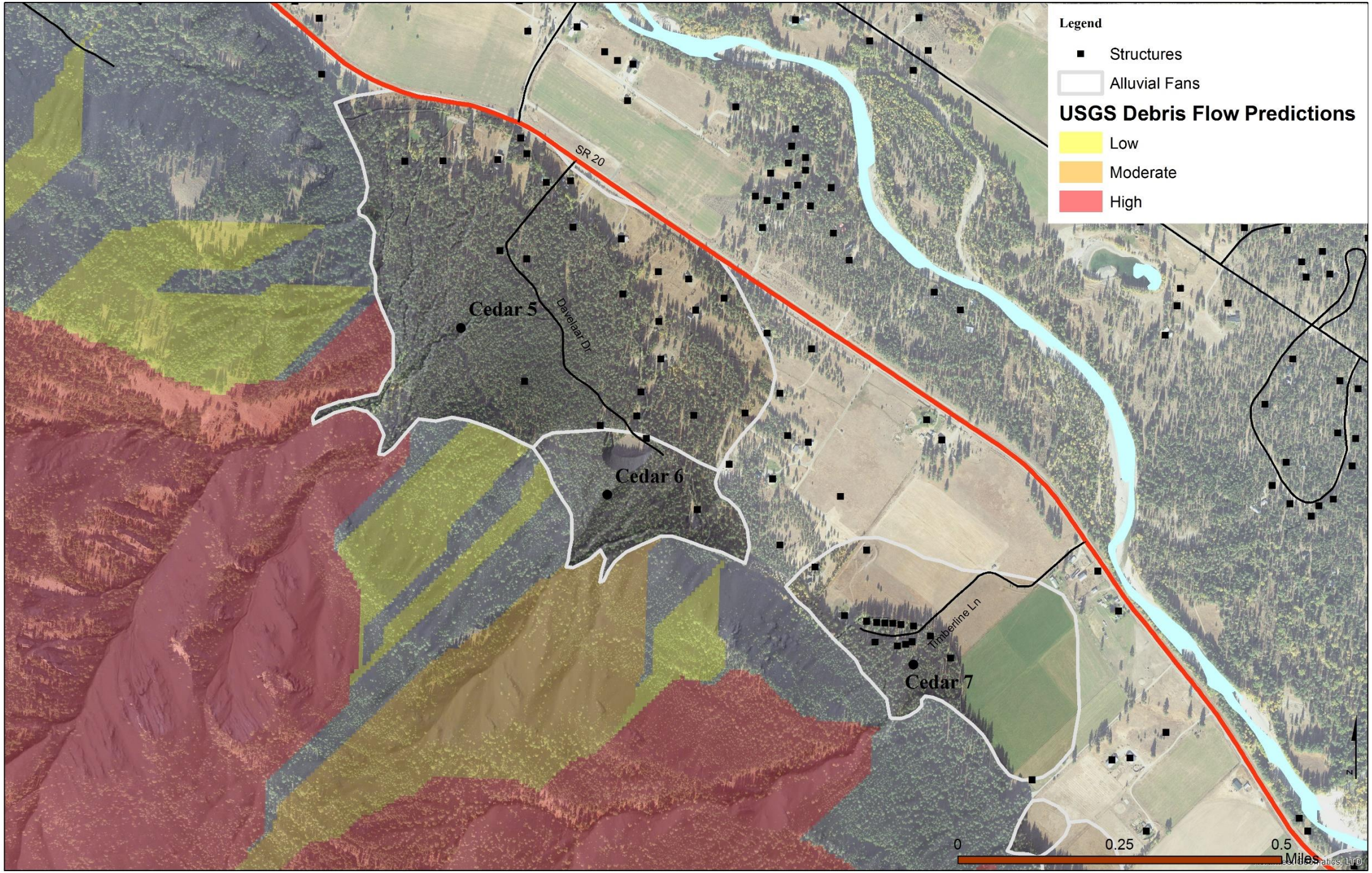
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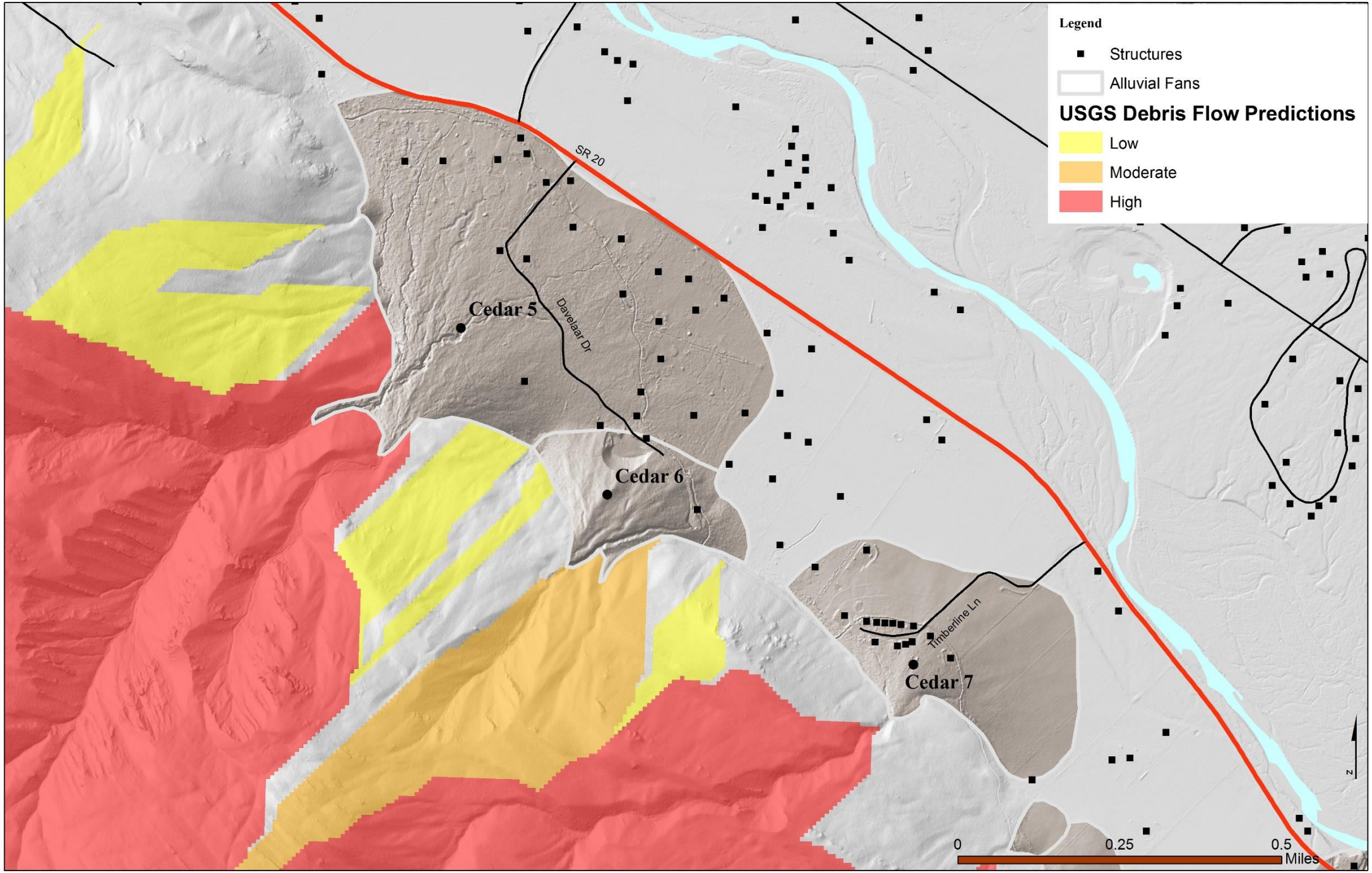
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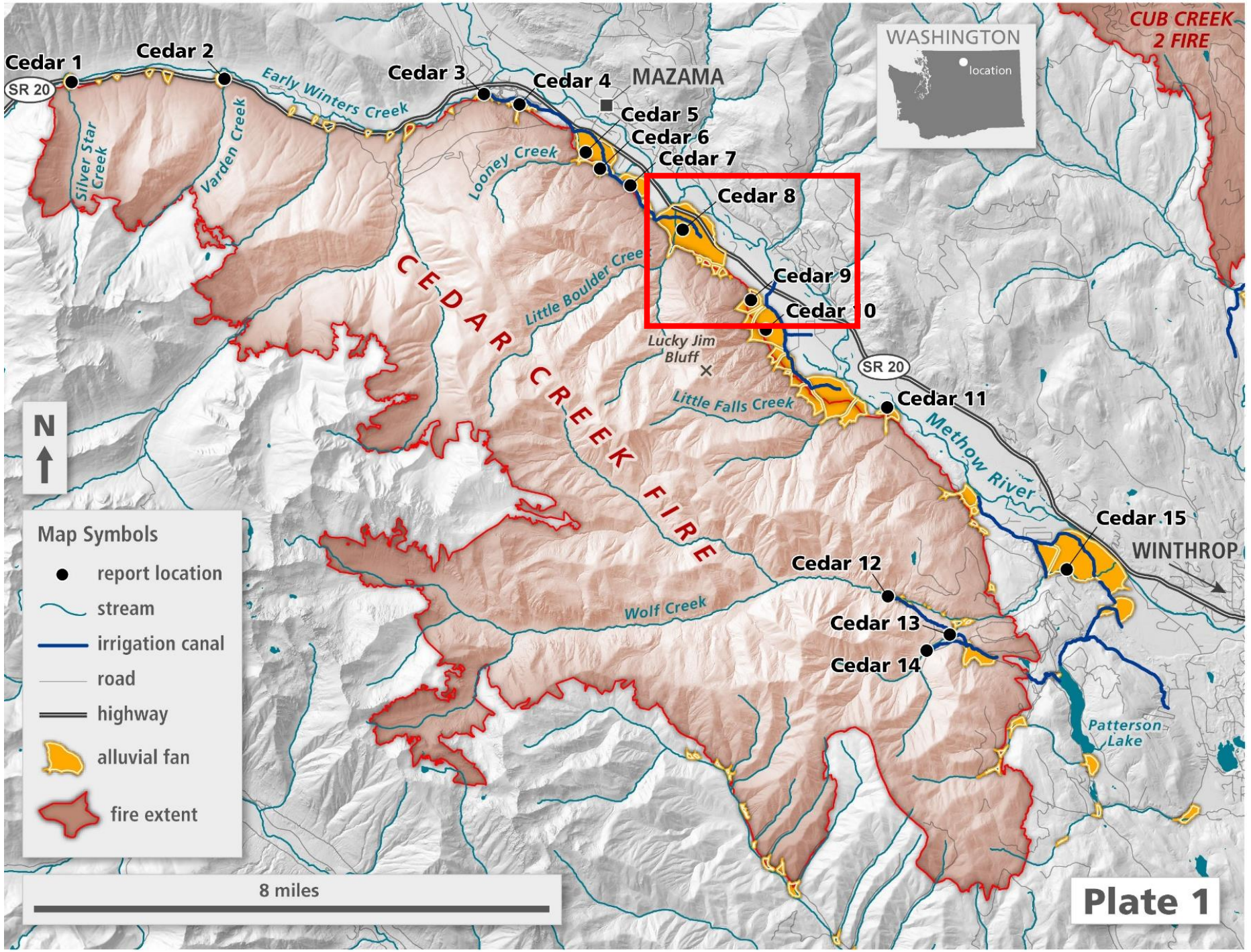
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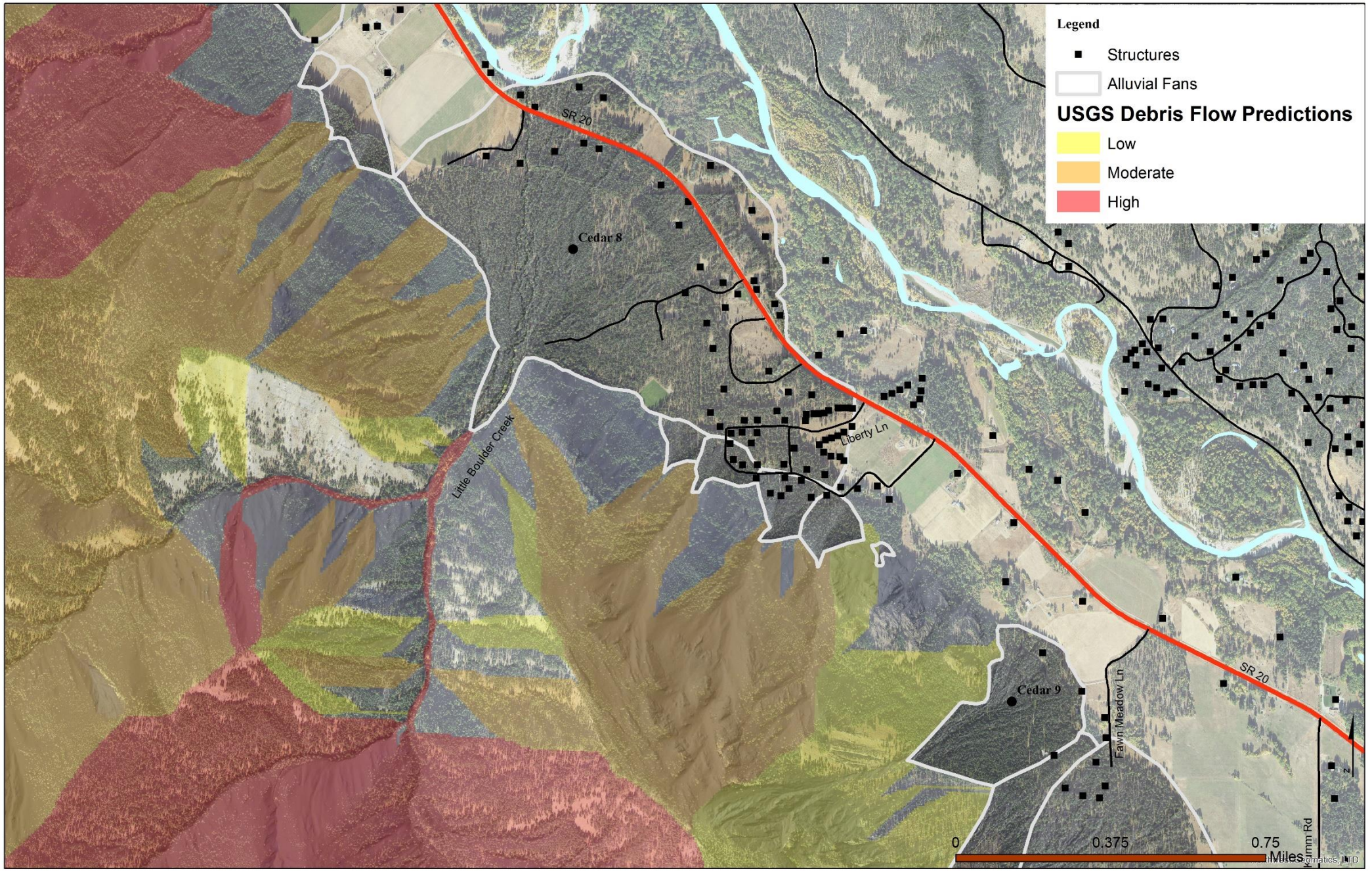
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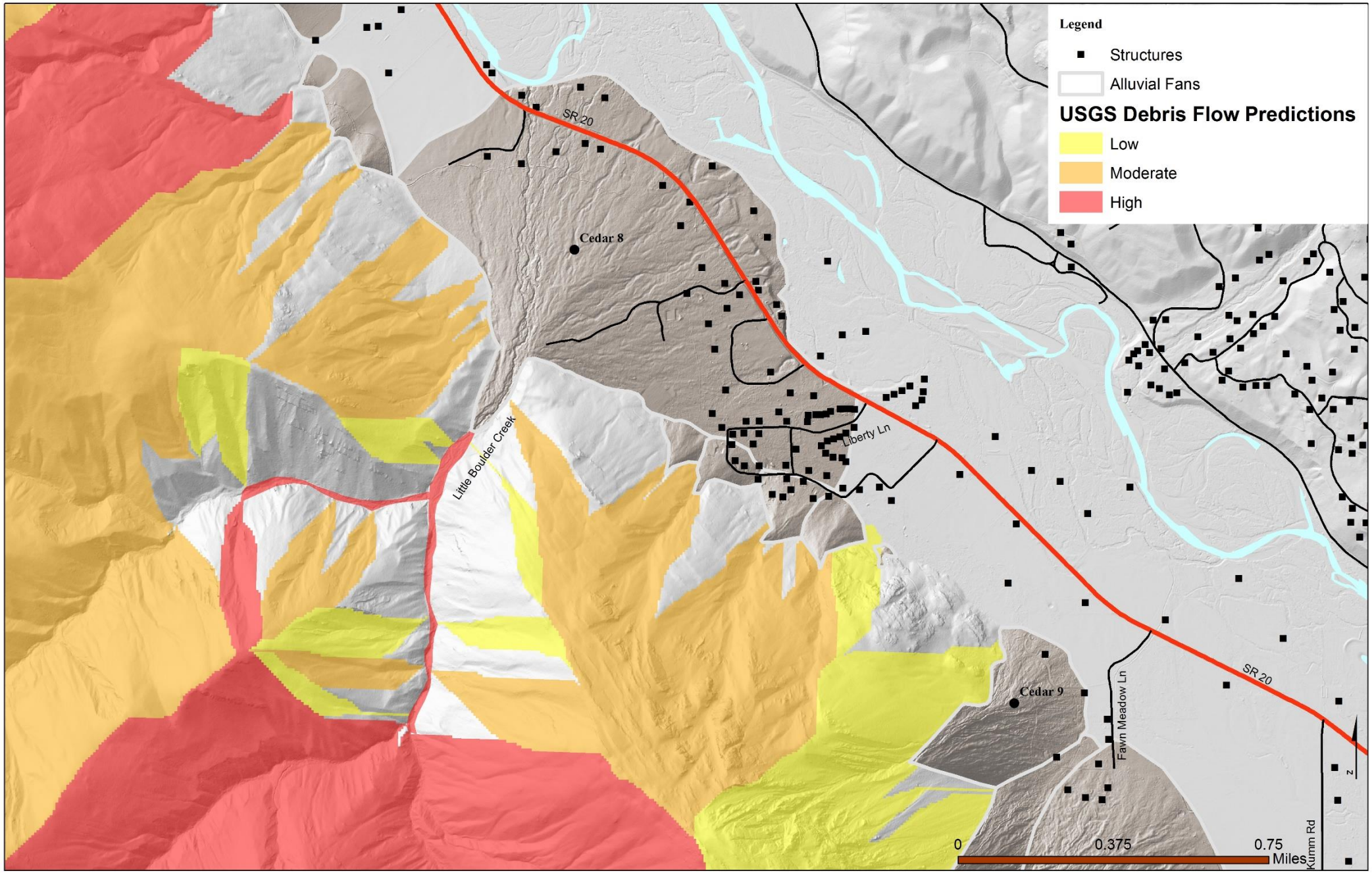
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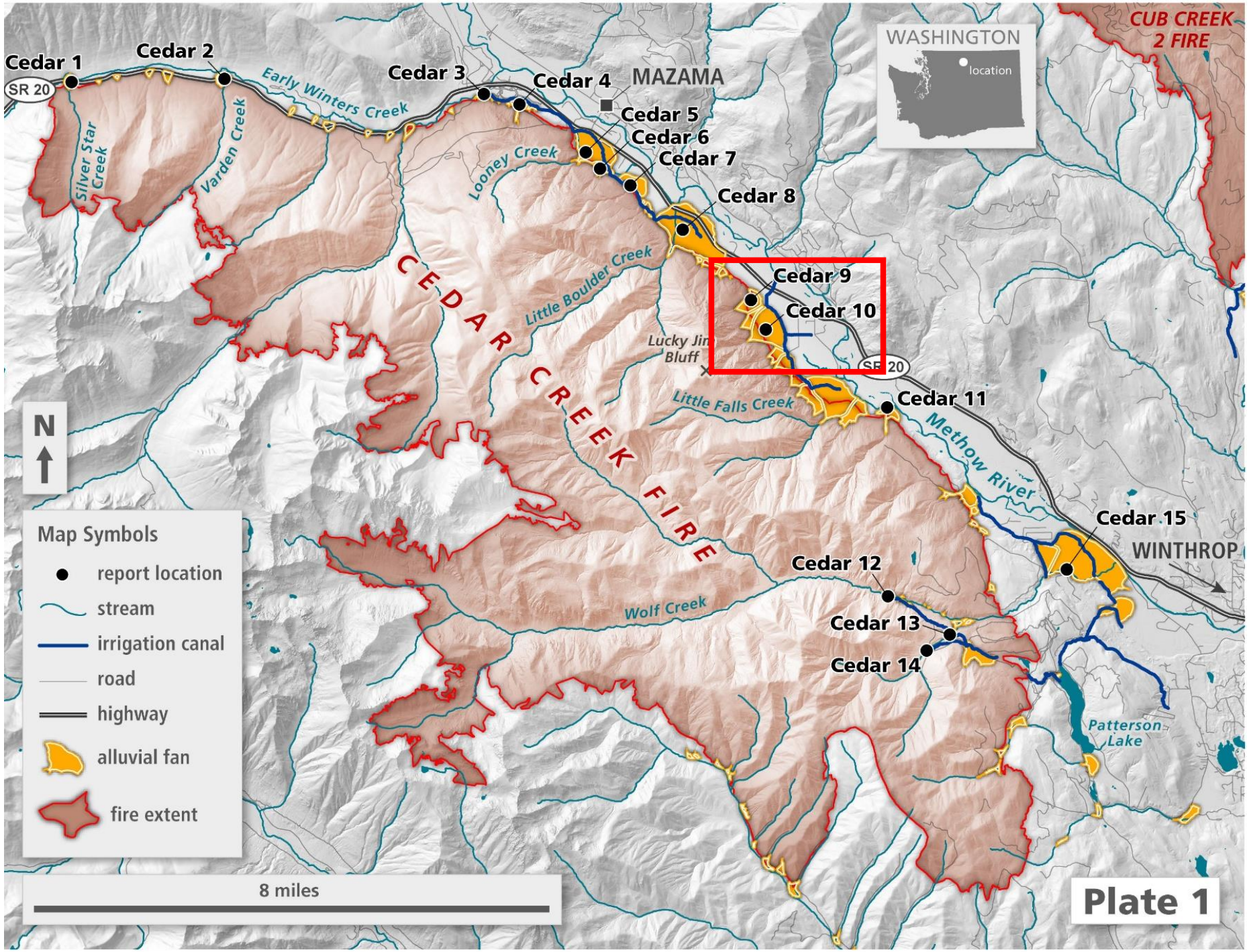
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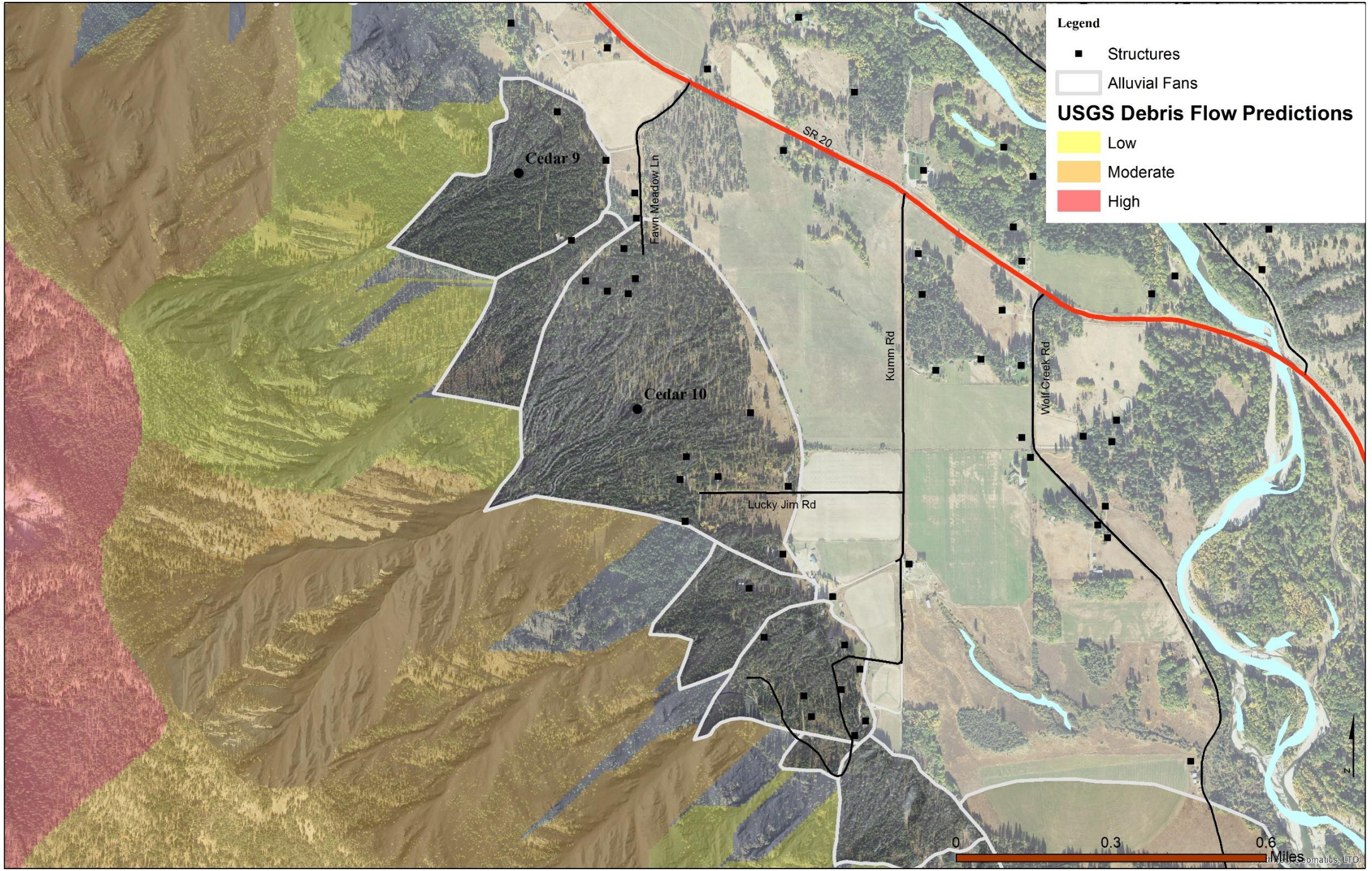
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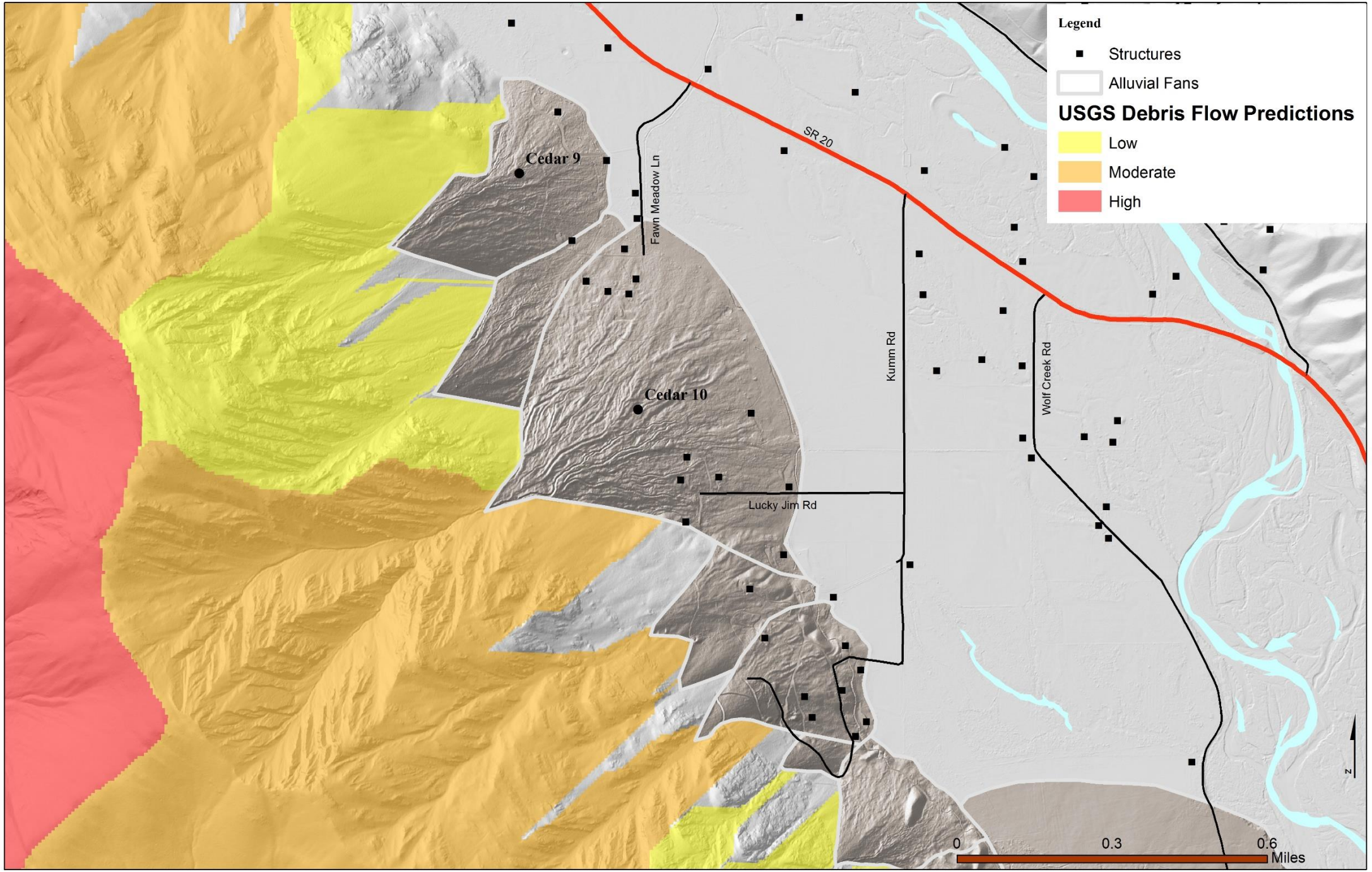
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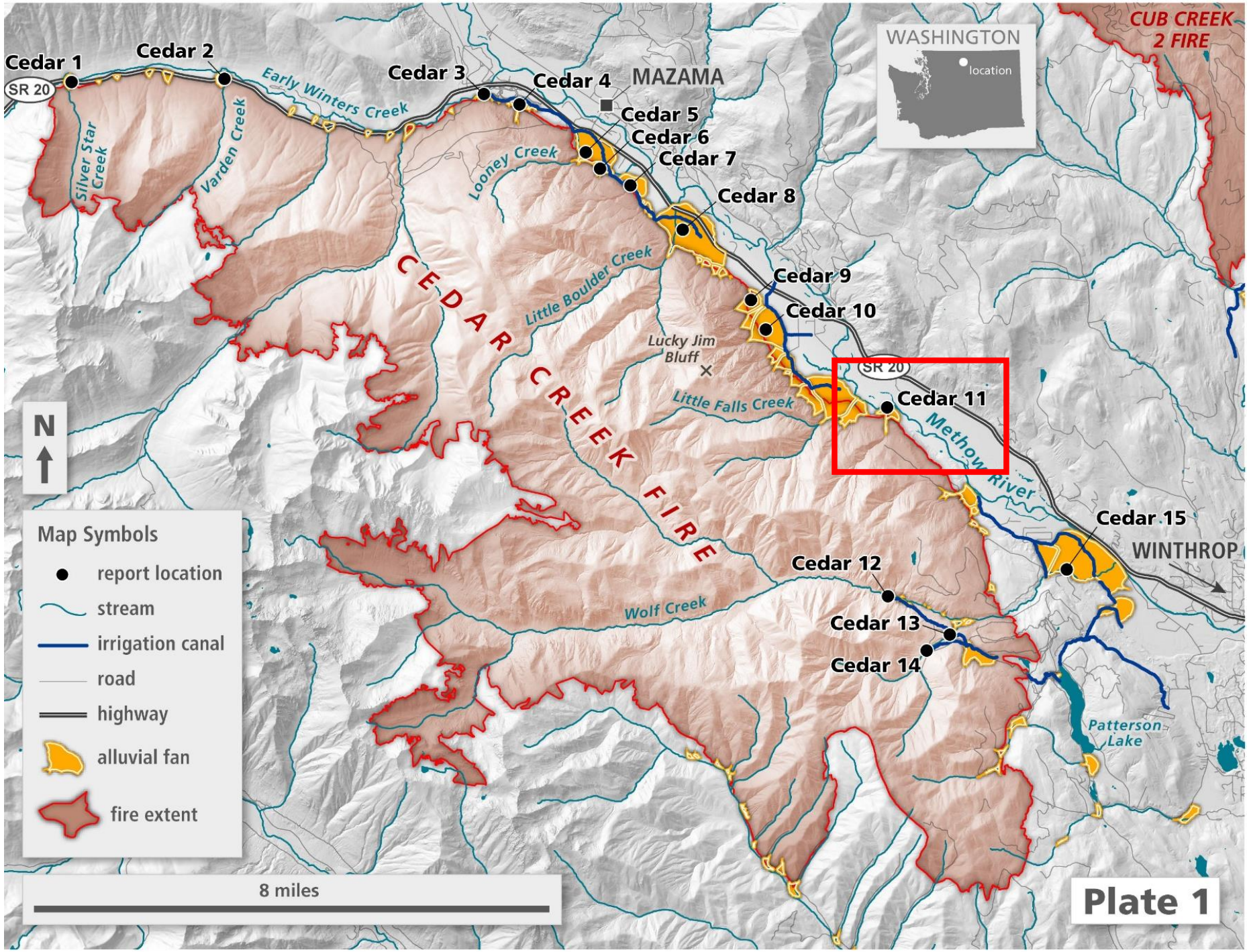
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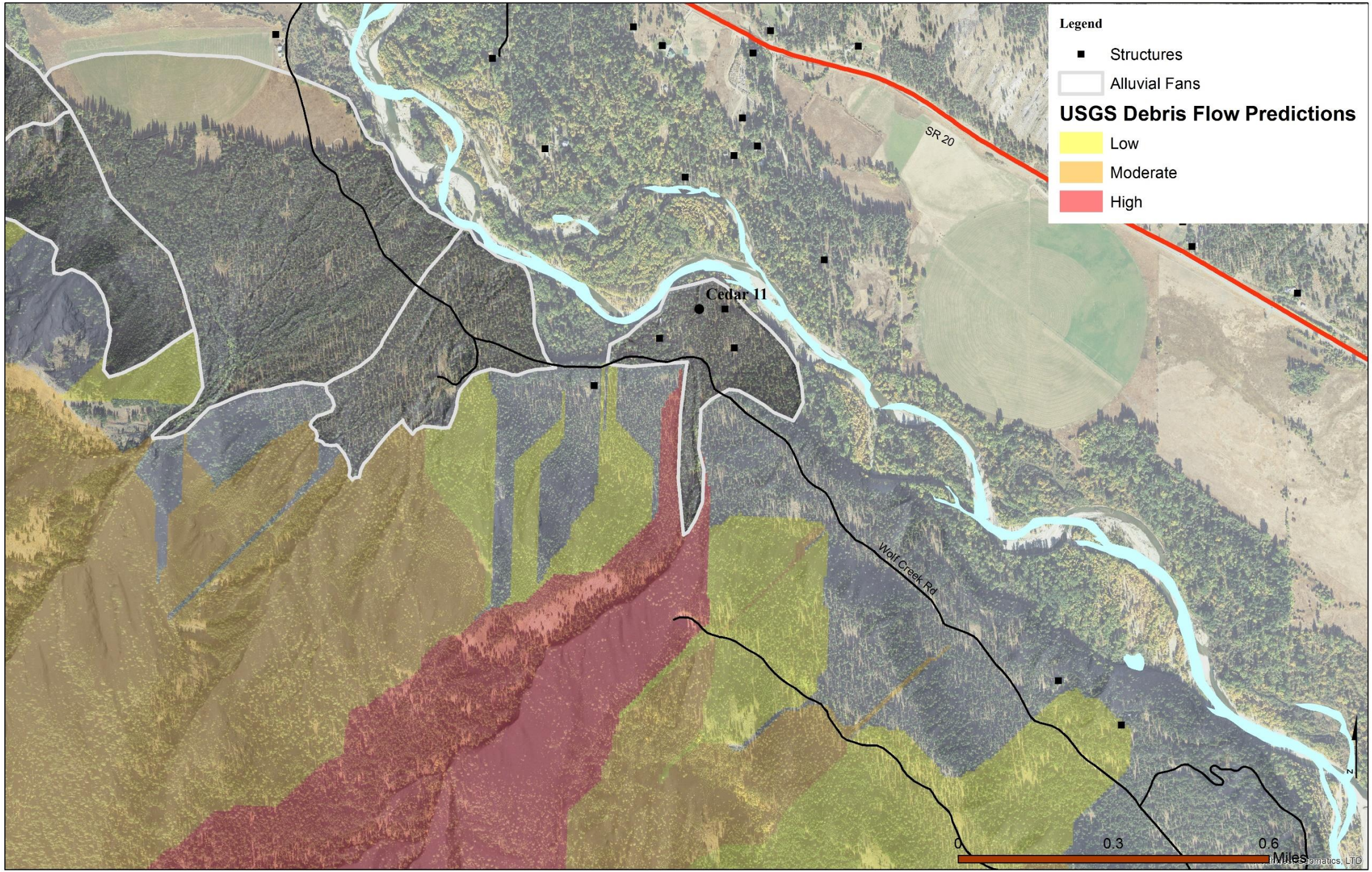
Cedar 3
Cedar 4
MAZAMA
Cedar 5
Cedar 6
Cedar 7
Cedar 8
Cedar 9
Cedar 10
Cedar 11
Cedar 12
Cedar 13
Cedar 14
Cedar 15
SR 20
Early Winters Creek
Silver Star Creek
Varden Creek
Looney Creek
Little Boulder Creek
Lucky Jim Bluff
Little Falls Creek
Methow River
CEDAR CREEK FIRE
CUB CREEK 2 FIRE
Wolf Creek
Patterson Lake
WINTHROP
WASHINGTON
location
N
Map Symbols
report location
stream
irrigation canal
road
highway
alluvial fan
fire extent
8 miles
Plate 1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Alluvial Fans
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Moderate
High
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Cedar 11
Wolf Creek Rd
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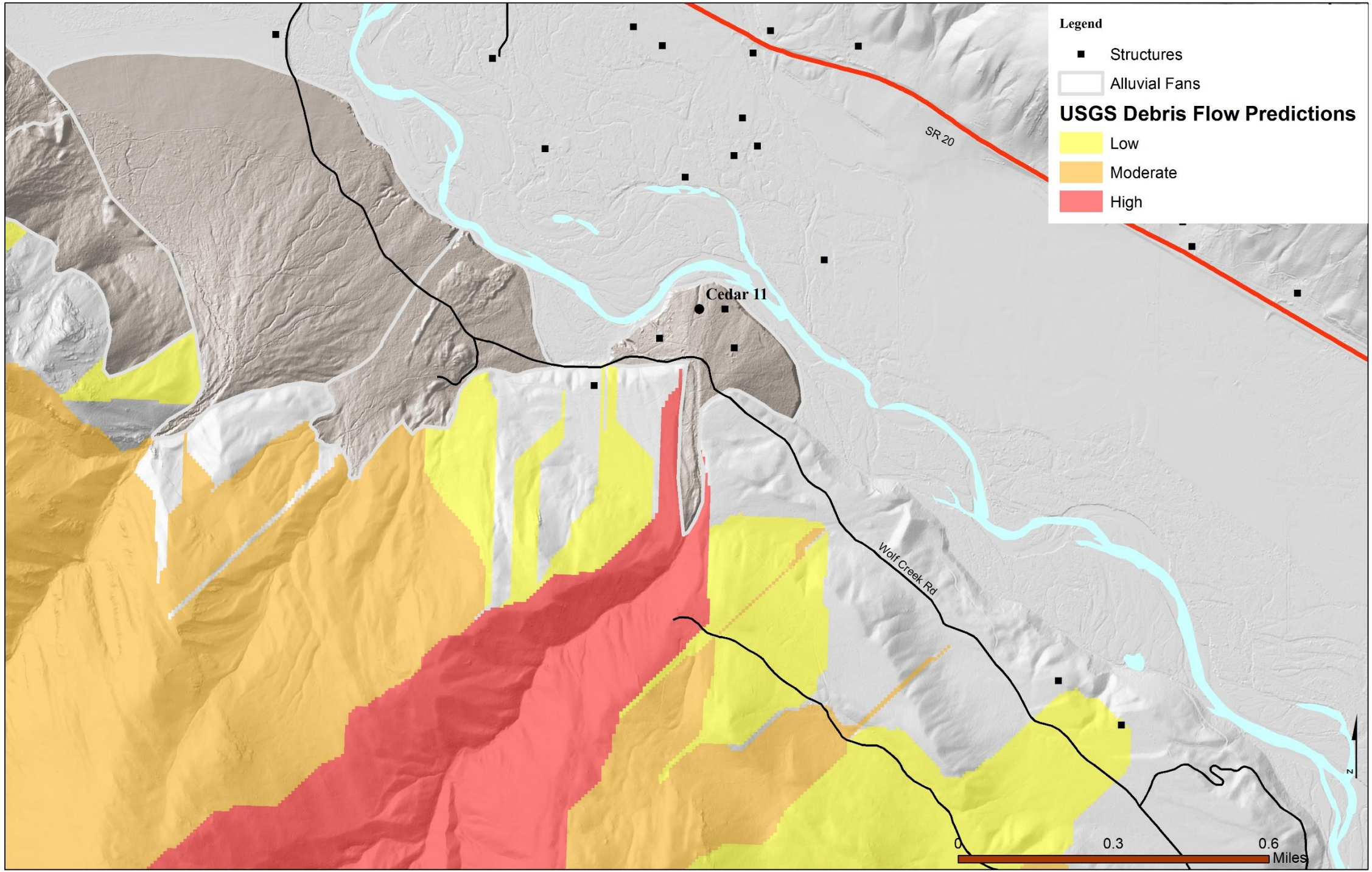
0.6
Miles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Alluvial Fans
USGS Debris Flow Predictions
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Cedar 11
Wolf Creek Rd
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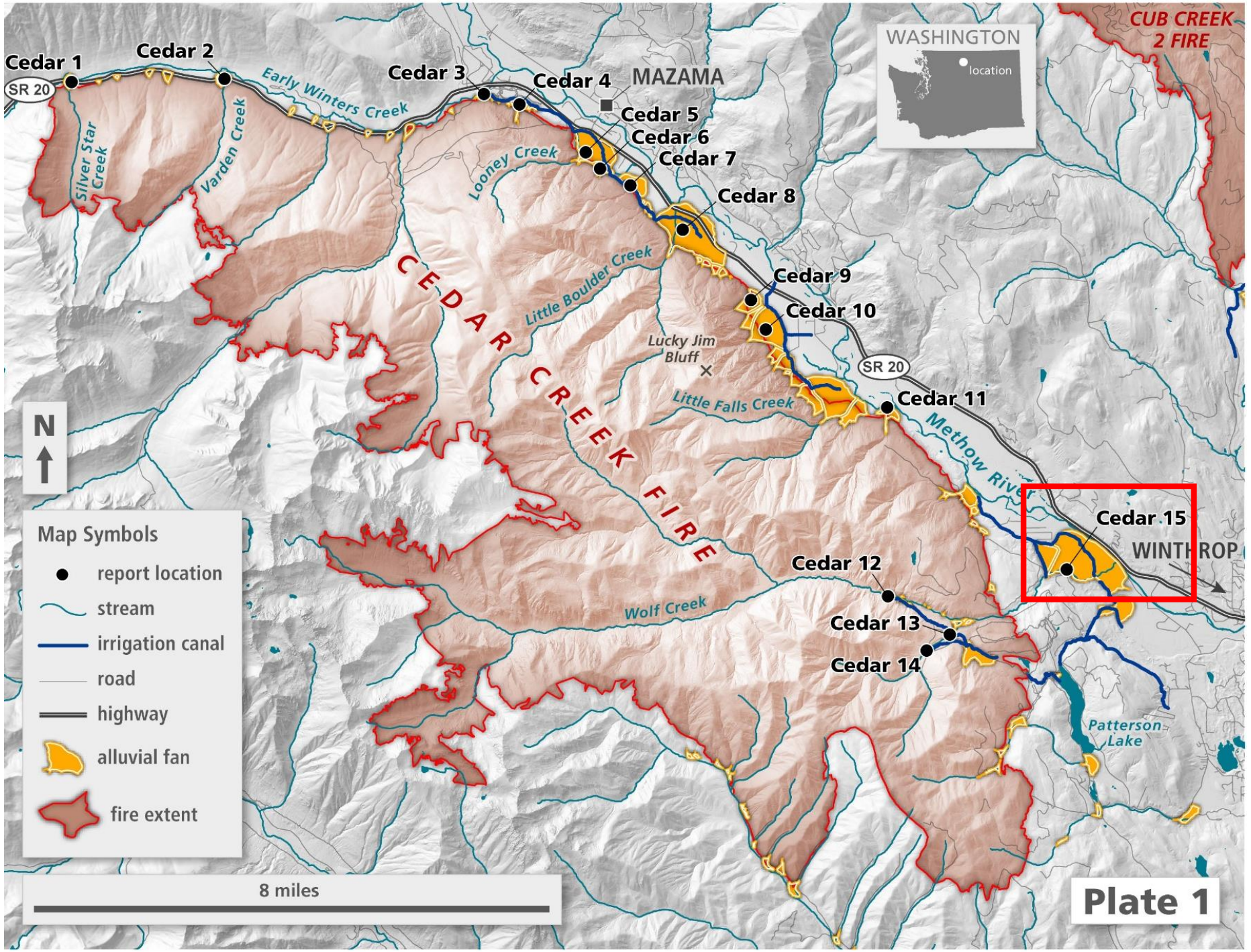
Miles


CEDAR CREEK FIRE
CUB CREEK 2 FIRE
WASHINGTON
location
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Cedar 2
Cedar 3
Cedar 4
Cedar 5
Cedar 6
Cedar 7
Cedar 8
Cedar 9
Cedar 10
Cedar 11
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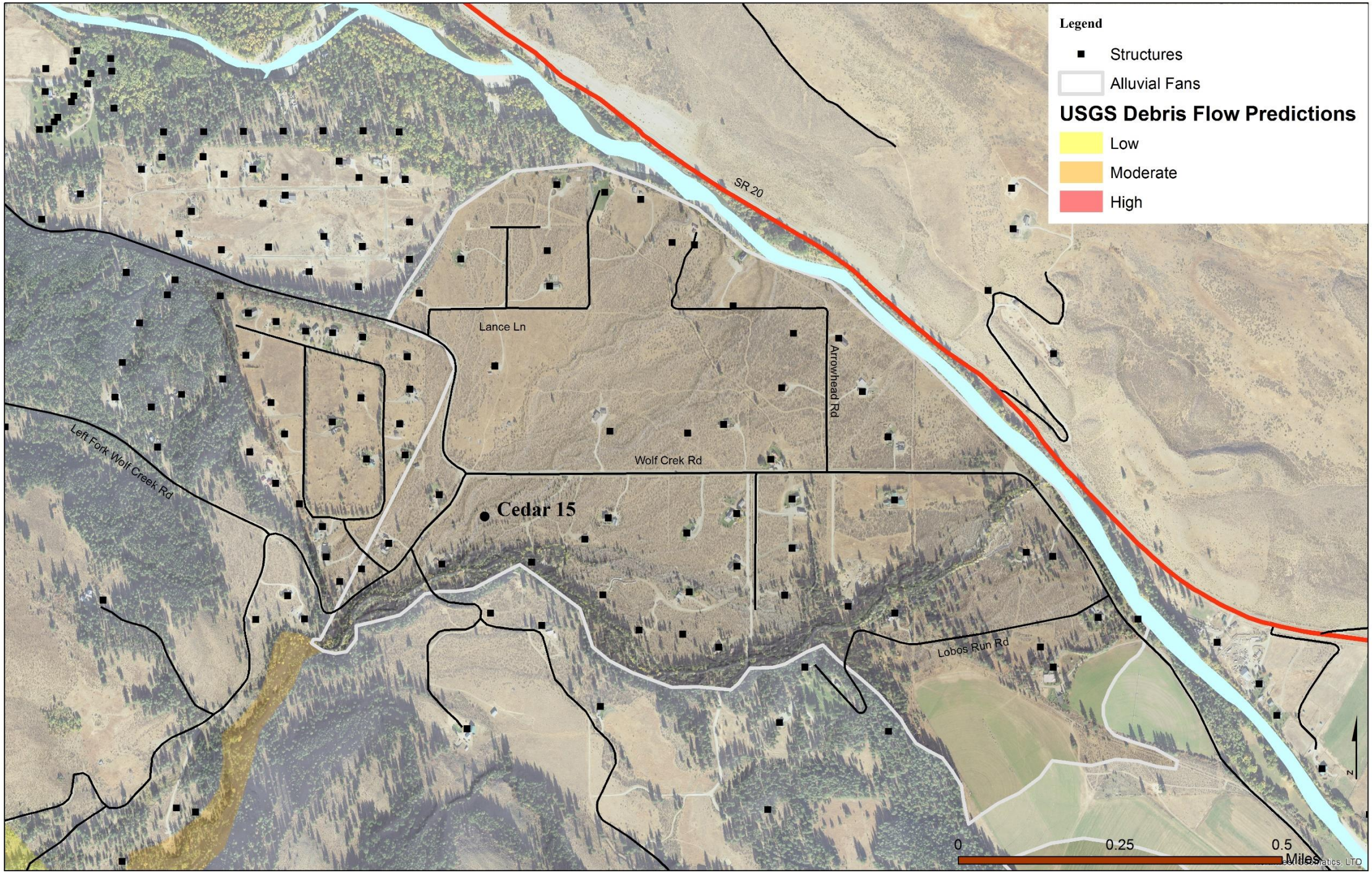
Patterson Lake
WINTHROP
N
Map Symbols
report location
stream
irrigation canal
road
highway
alluvial fan
fire extent
8 miles
Plate 1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Structures
Alluvial Fans
USGS Debris Flow Predictions
Low
Moderate
High
SR 20
Lance Ln
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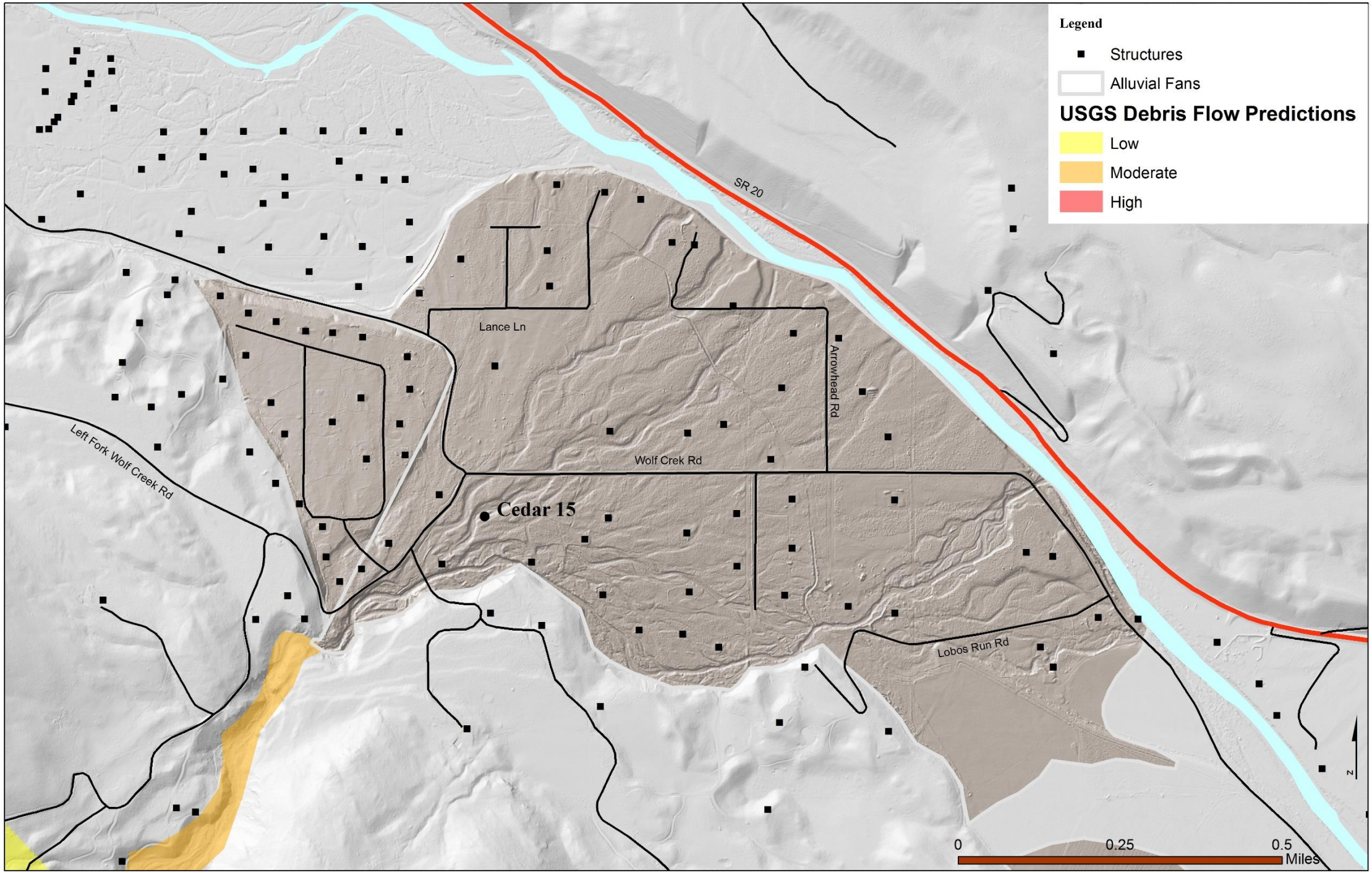
Wolf Crek Rd
Left Fork Wolf Creek Rd
Cedar 15
Lobos Run Rd
N
0
0.25
0.5
Miles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Low
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Cedar 15
Lobos Run Rd
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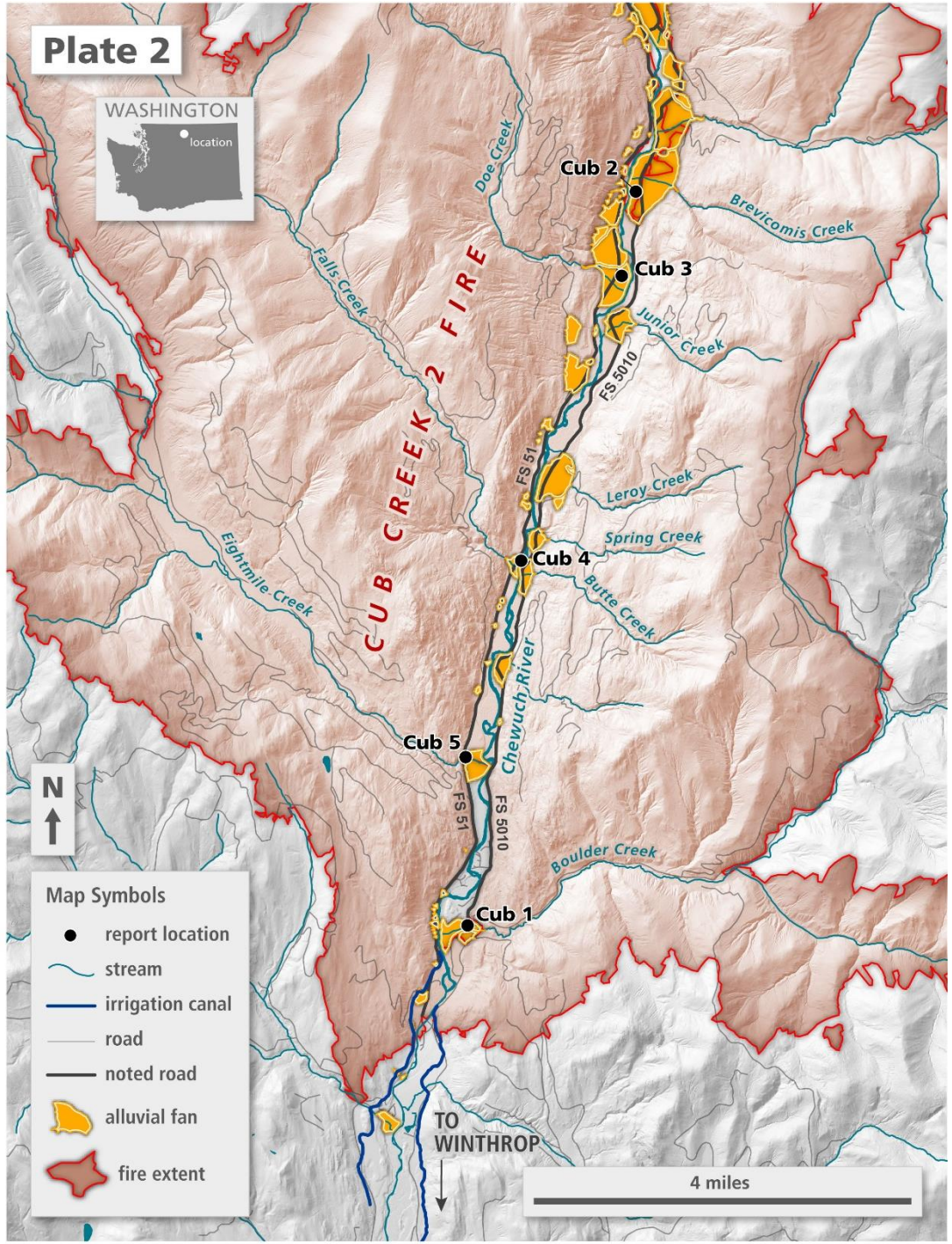
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WASHINGTON
location
CUB CREEK 2 FIRE
Doe Creek
Brevicomis Creek
Falls Creek
Junior Creek
FS 5010
FS 51
Leroy Creek
Spring Creek
Eightmile Creek
Butte Creek
Chewuch River
Boulder Creek
Cub 1
Cub 2
Cub 3
Cub 4
Cub 5
N
Map Symbols
report location
stream
irrigation canal
road
noted road
alluvial fan
fire extent
TO WINTHROP
4 miles

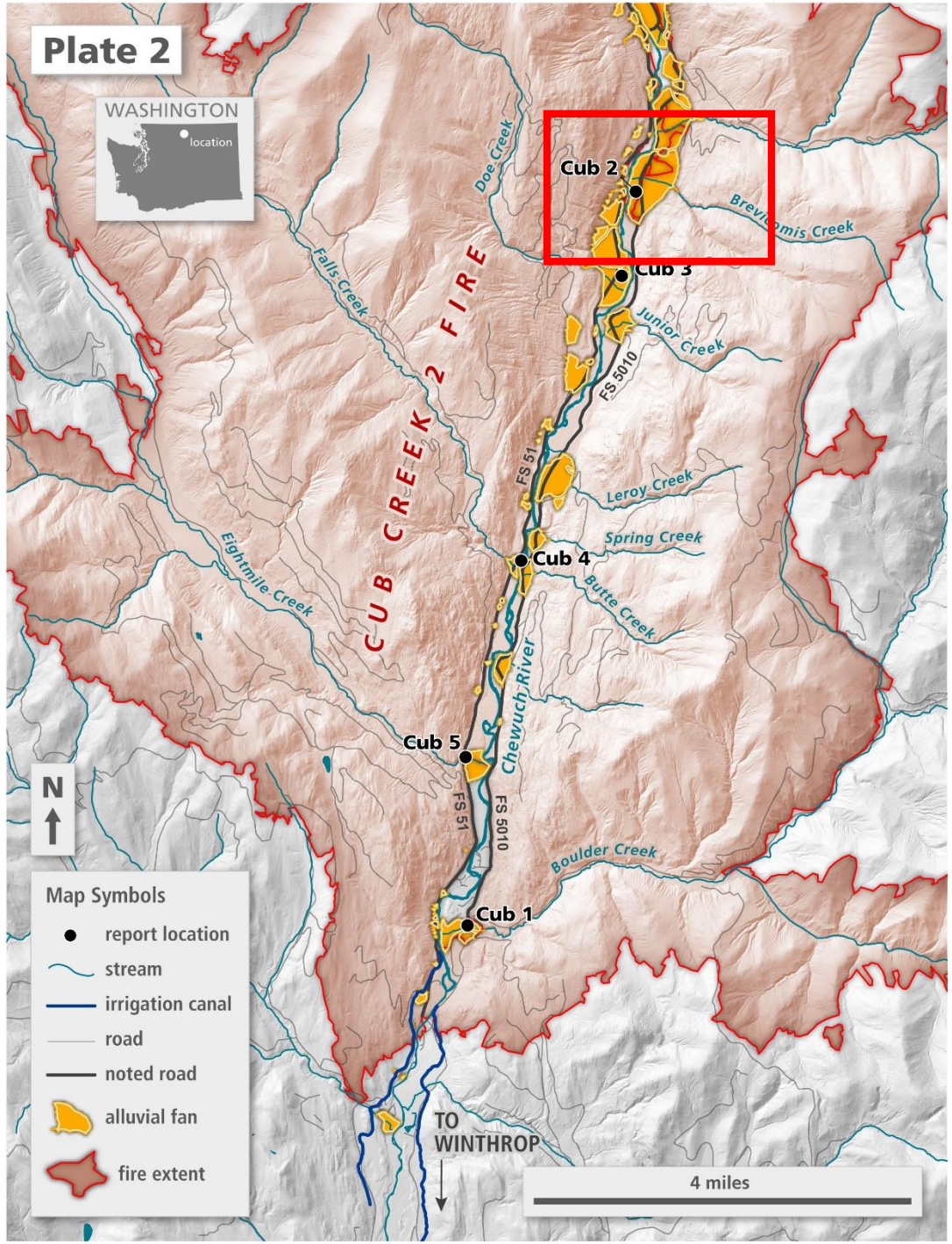
Plate 2
WASHINGTON
location
CUB CREEK 2 FIRE
Cub 2
Cub 3
Cub 4
Cub 5
Cub 1
Doe Creek
Brewis Creek
Falls Creek
Junior Creek
FS 5010
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Map Symbols
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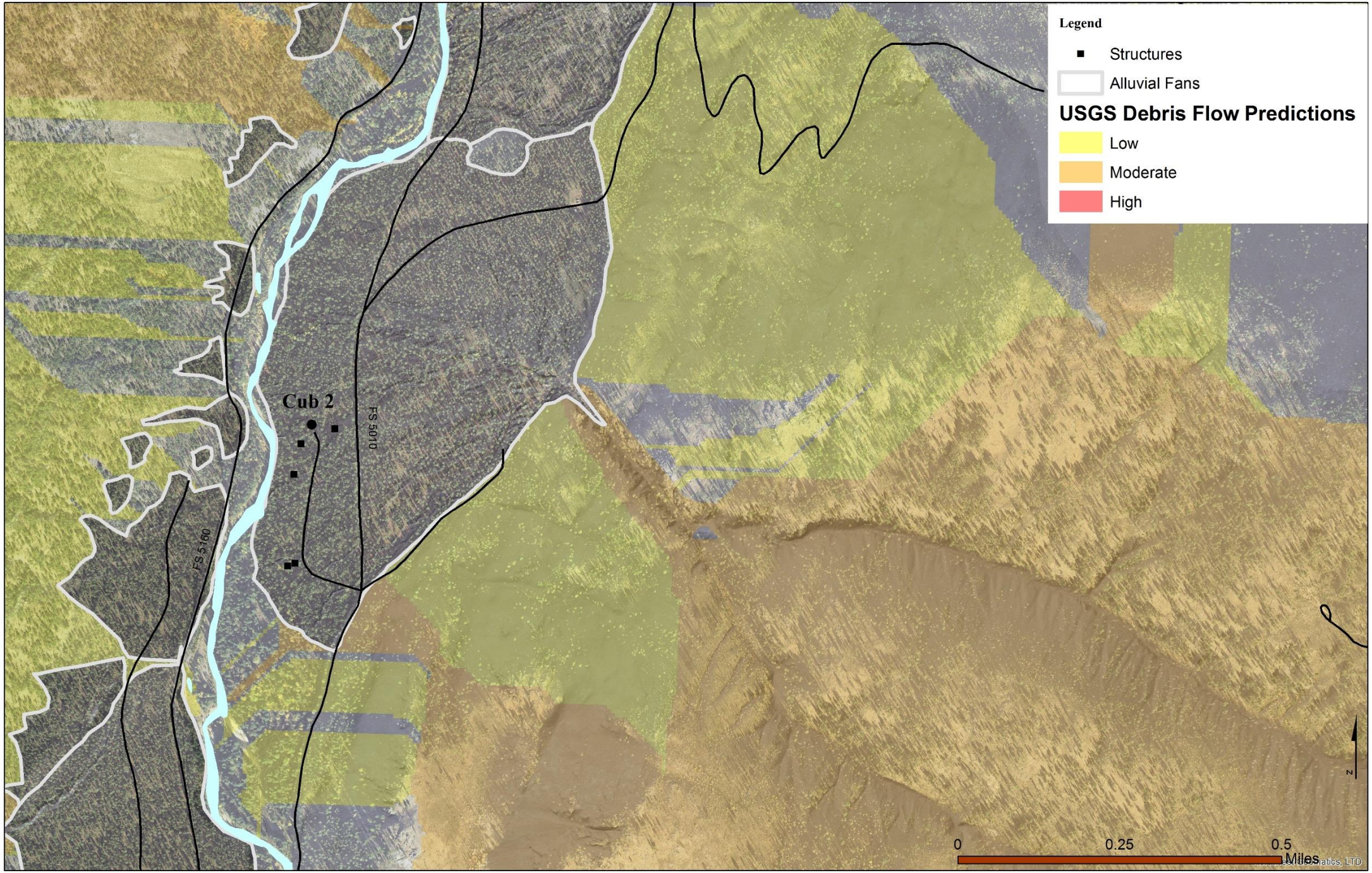
irrigation canal
road
noted road
alluvial fan
fire extent
TO WINTHROP
4 miles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Structures
Alluvial Fans
USGS Debris Flow Predictions
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High
Cub 2
FS 5010
FS 5160
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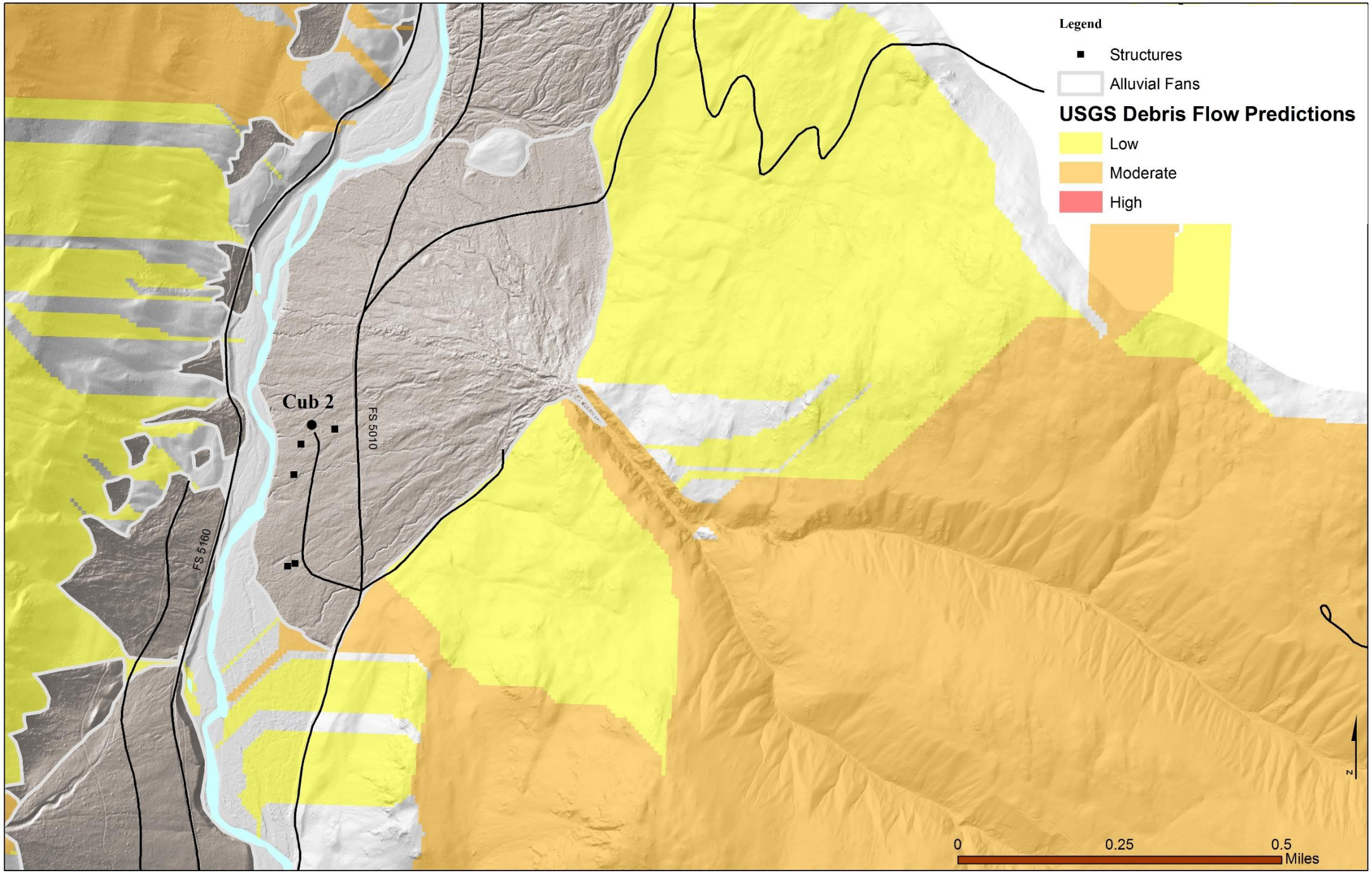
Miles


Legend
Structures
Alluvial Fans
USGS Debris Flow Predictions
Low
Moderate
High
Cub 2
FS 5010
FS 5160
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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.

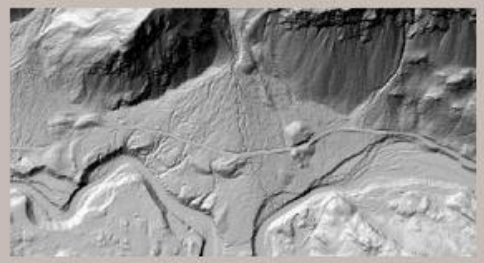
How do I know if I live or work on an alluvial fan?

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

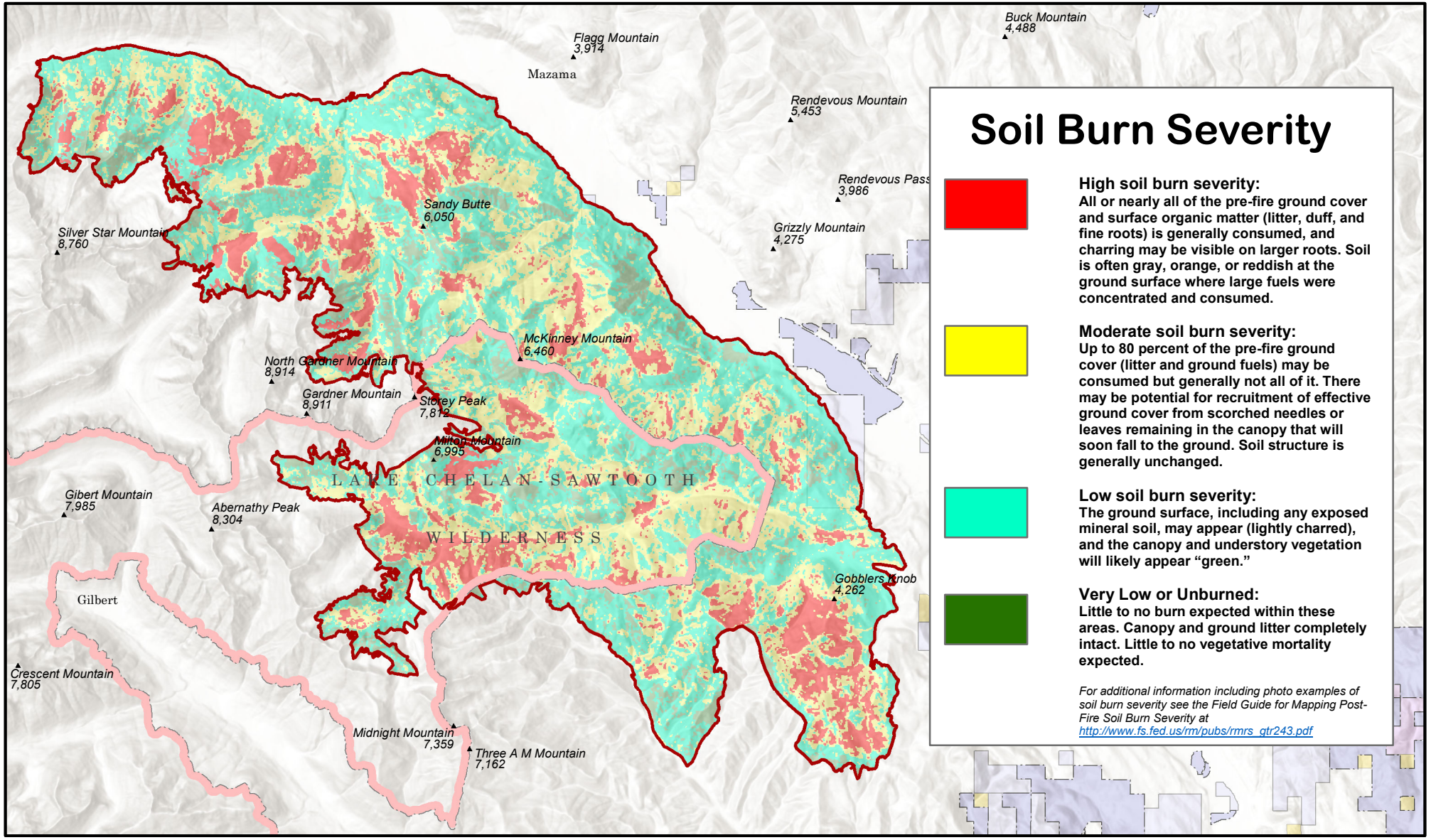
USGS Debris Flow Models:
Cedar Creek: https://landslides.usgs.gov/hazards/postfire_debrisflow/detail.php?objectid=374
Cub Creek 2: https://landslides.usgs.gov/hazards/postfire_debrisflow/detail.php?objectid=370

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 - Cedar Creek Fire

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



Soil Burn Severity

High soil burn severity:
All or nearly all of the pre-fire ground cover and surface organic matter (litter, duff, and fine roots) is generally consumed, and charring may be visible on larger roots. Soil is often gray, orange, or reddish at the ground surface where large fuels were concentrated and consumed.

Moderate soil burn severity:
Up to 80 percent of the pre-fire ground cover (litter and ground fuels) may be consumed but generally not all of it. There may be potential for recruitment of effective ground cover from scorched needles or leaves remaining in the canopy that will soon fall to the ground. Soil structure is generally unchanged.

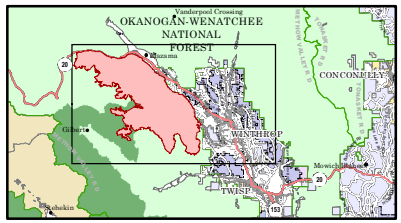
Low soil burn severity:
The ground surface, including any exposed mineral soil, may appear (lightly charred), and the canopy and understory vegetation will likely appear "green."

Very Low or Unburned:
Little to no burn expected within these areas. Canopy and ground litter completely intact. Little to no vegetative mortality expected.

For additional information including photo examples of soil burn severity see the Field Guide for Mapping Post-Fire Soil Burn Severity at
http://www.fs.fed.us/rm/pubs/rmrs_gtr243.pdf

0 5 10 Miles

WASHINGTON
Okanogan County



Date: 9/2/2021

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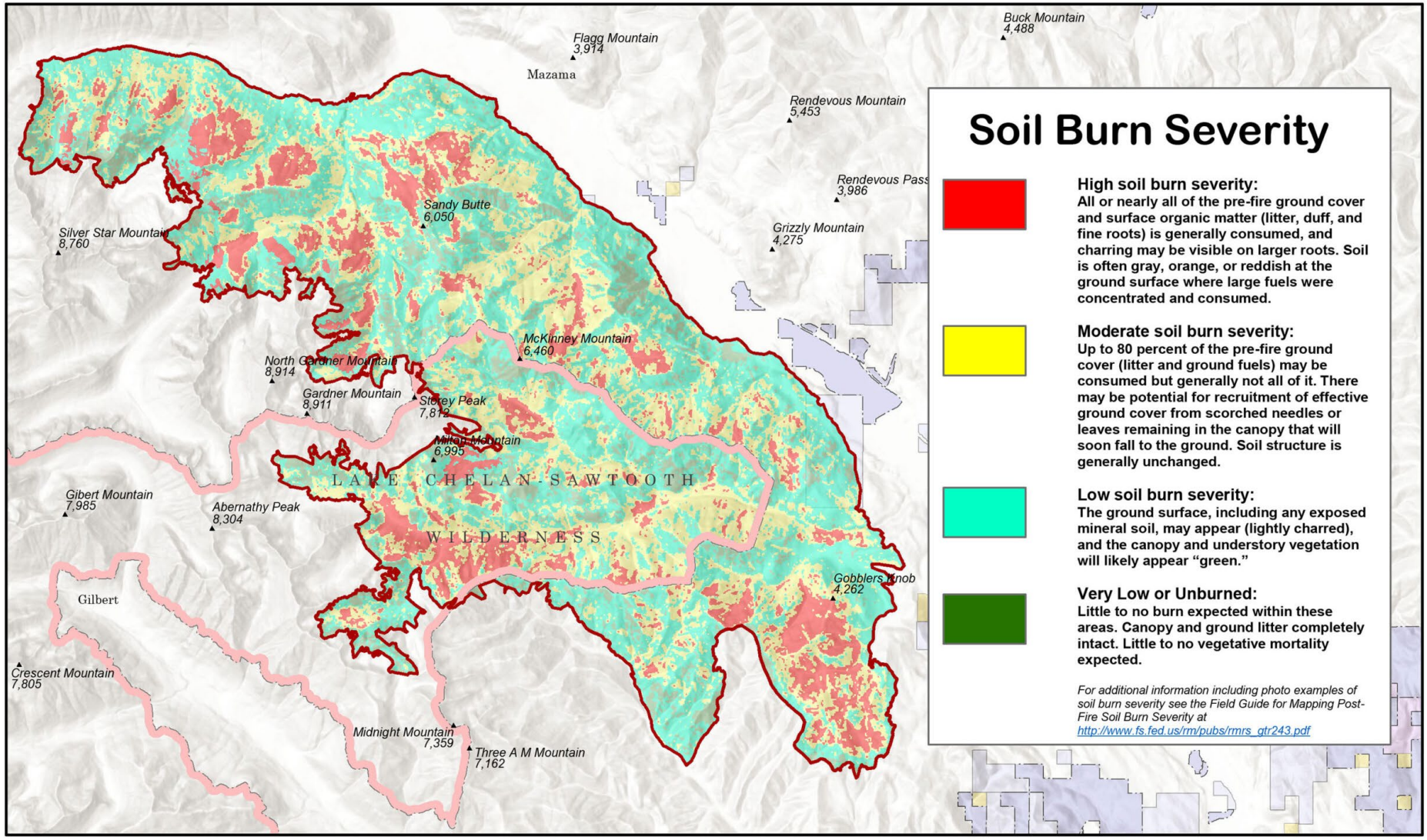
U.S. DEPARTMENT OF AGRICULTURE
Okanogan-Wenatchee National Forest | FS Incmap | September 2021

Soil Burn Severity Map - Cedar Creek Fire

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



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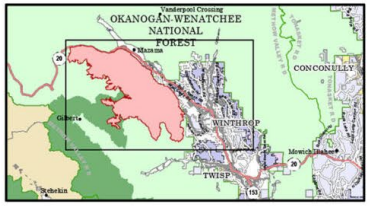
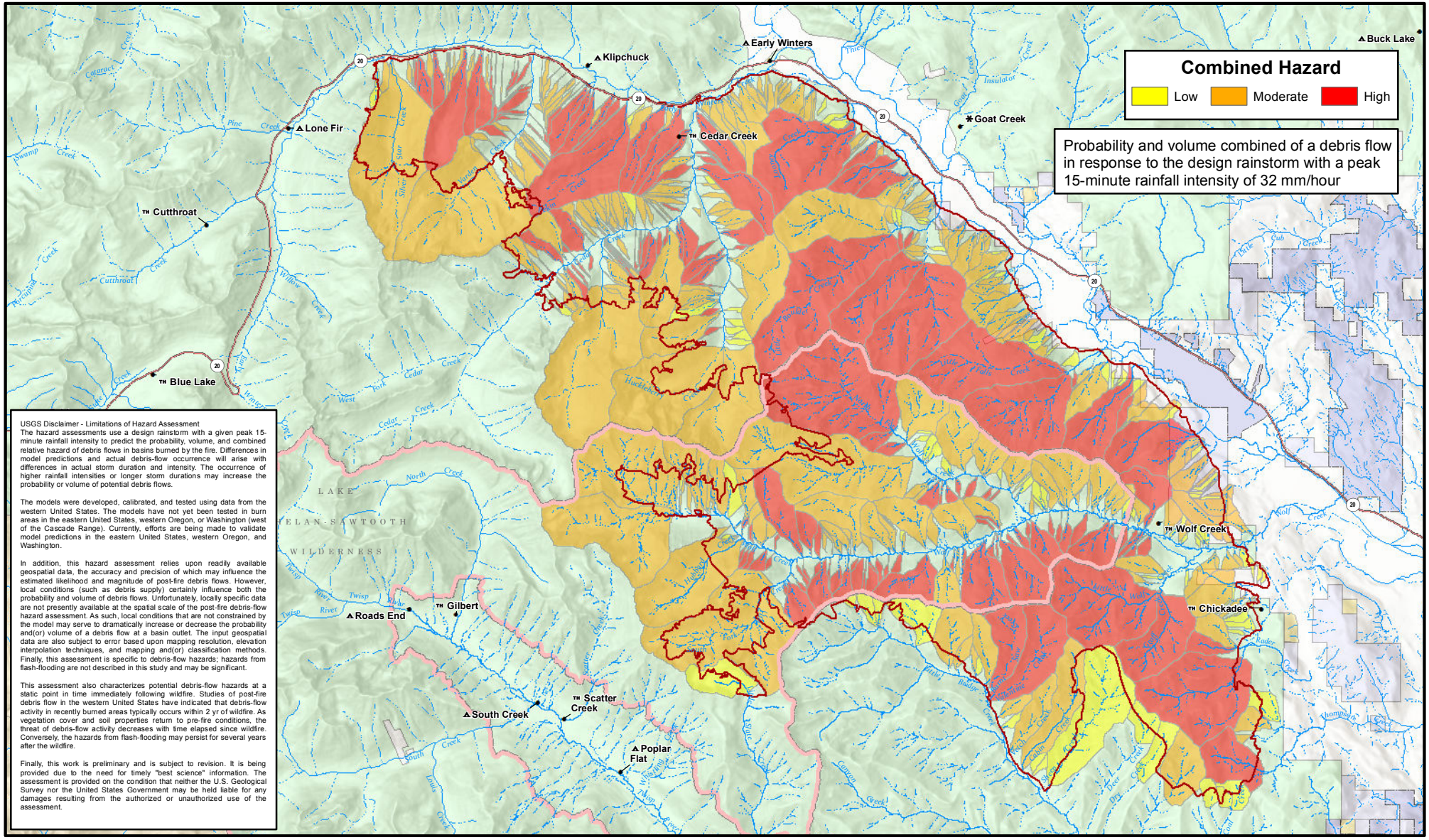


USGS Debris Flow Combined Hazard - 15 minute Intensity of 32 mm/h - Cedar Creek Fire

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



0 5 10 Miles

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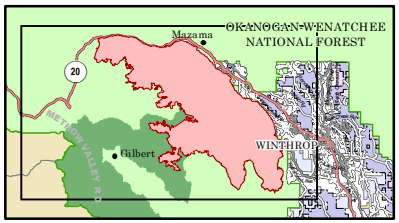
Okanogan County



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

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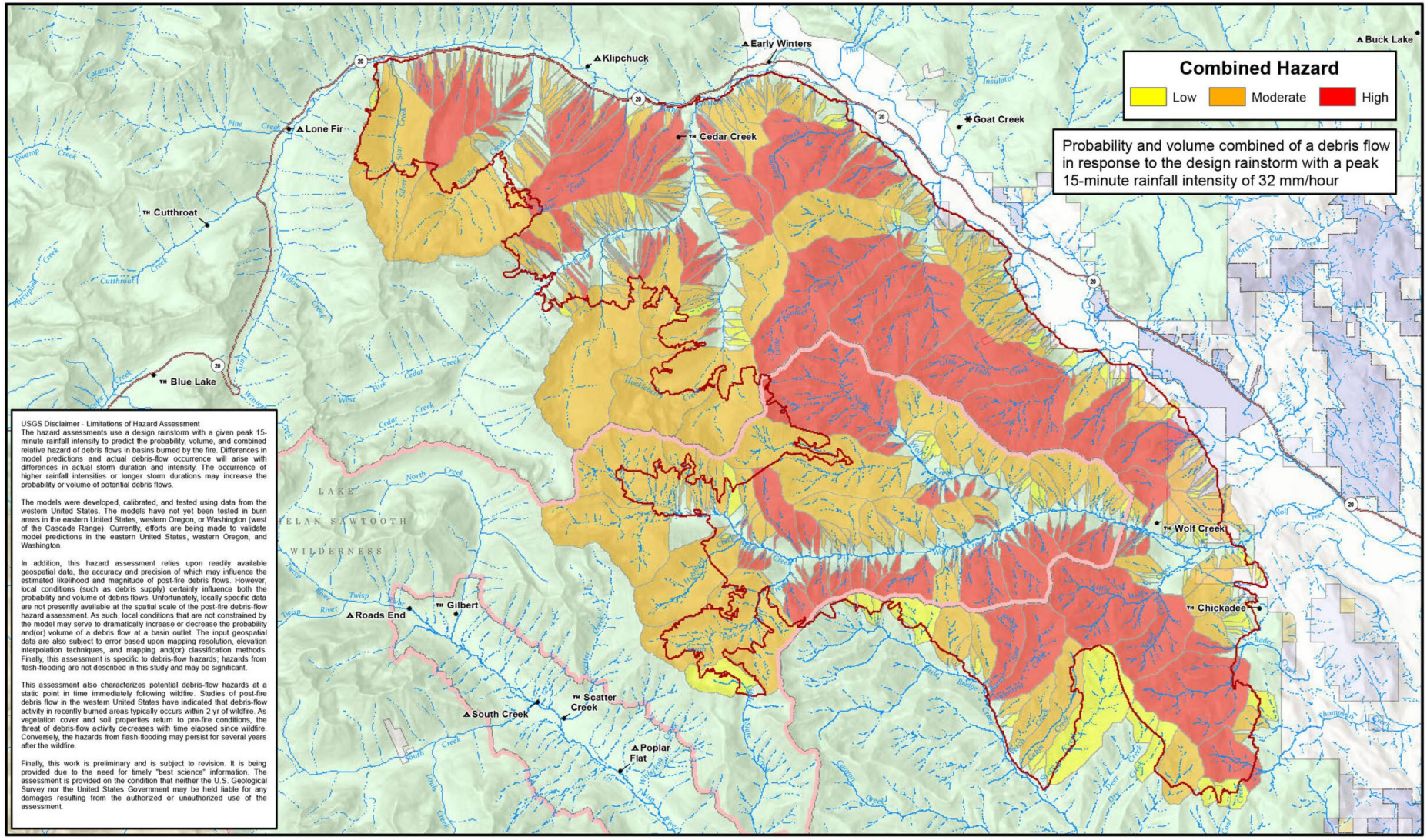
Date: 9/7/2021

USDA Forest Service
U.S. DEPARTMENT OF AGRICULTURE
Okanogan-Wenatchee National Forest | FS Shortcap | September 2021

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

Cedar Creek- Cub Creek 2 BAER - Okanogan-Wentachee 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.

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 5 10 Miles

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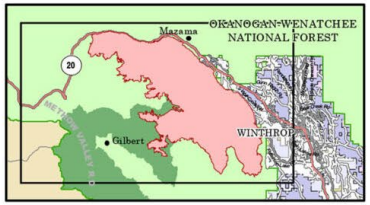
Date: 9/7/2021

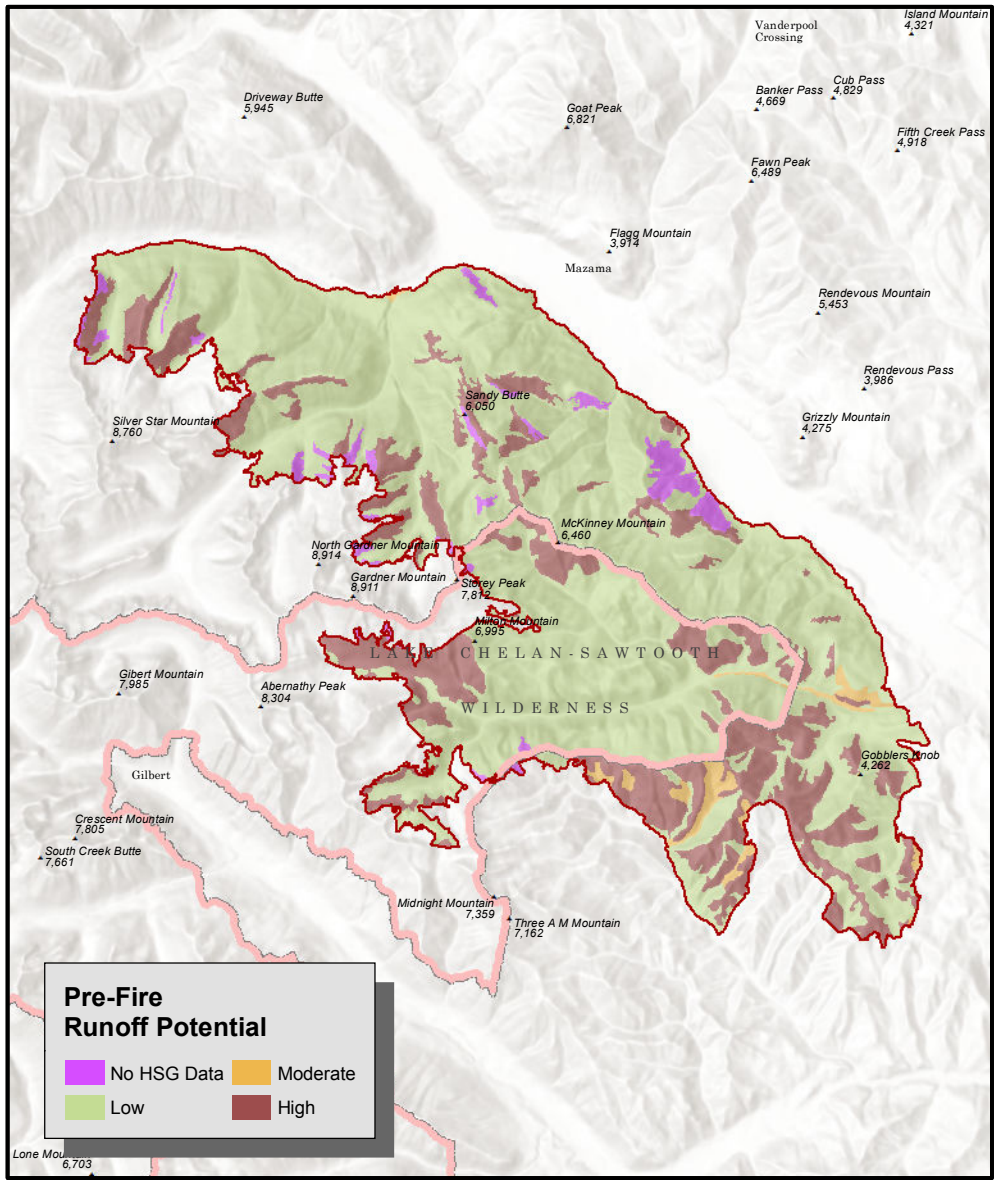
- Fire Perimeter
- Forest Service Land
- State Public Land
- Other State Land
- U.S. Fish & Wildlife Service Land
- Bureau of Land Management Land
- National Park Service Lands
- Private and Other Land

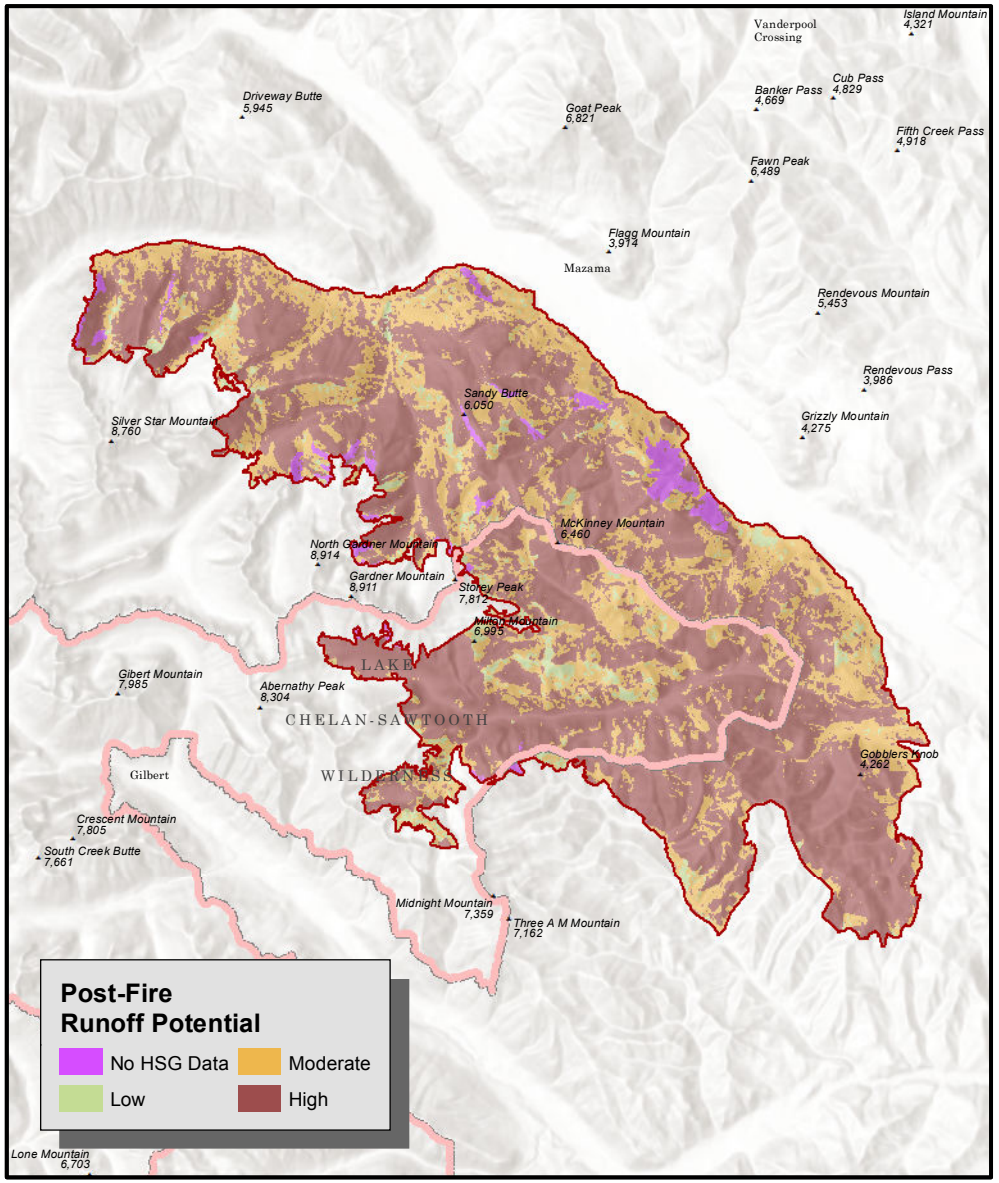
WASHINGTON
Okanogan County



Runoff Potential Map - Pre & Post Fire - Cedar Creek Fire

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





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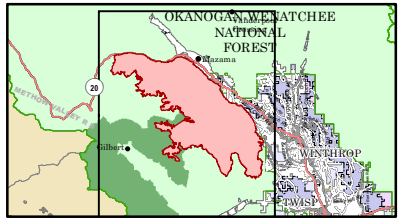

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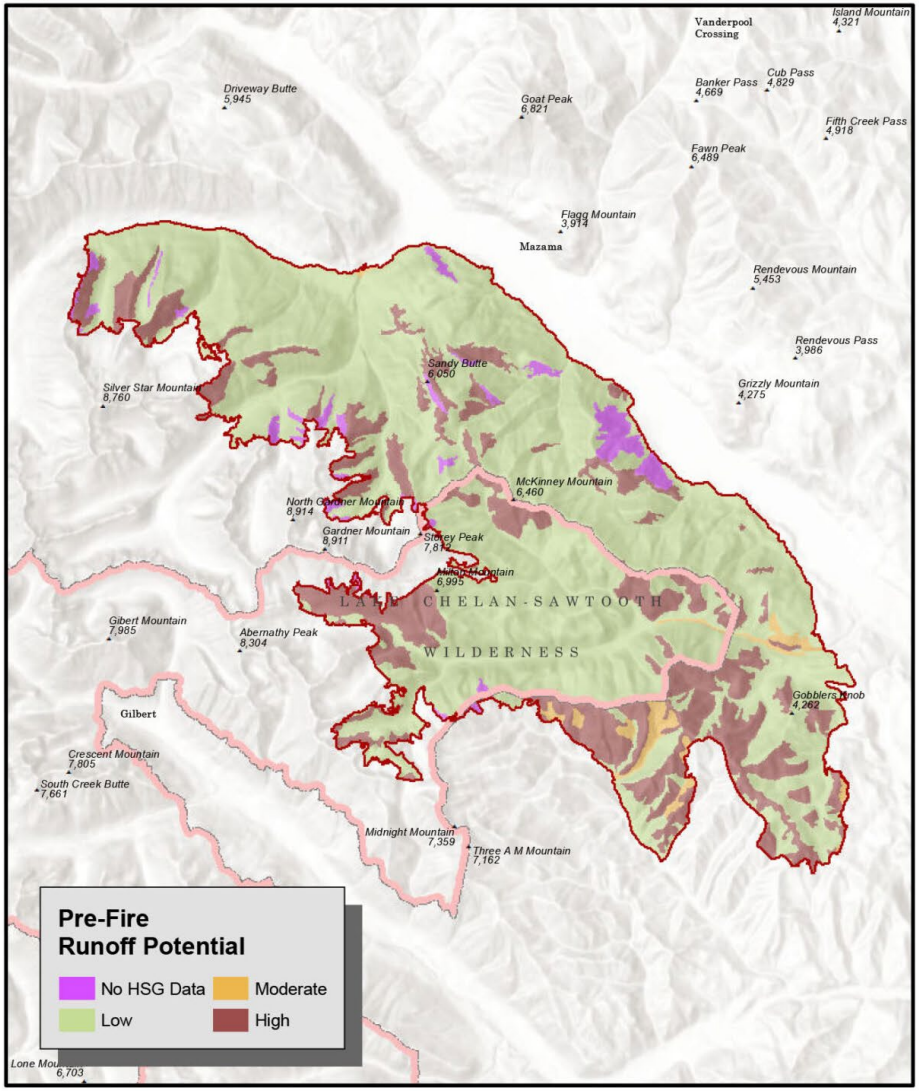
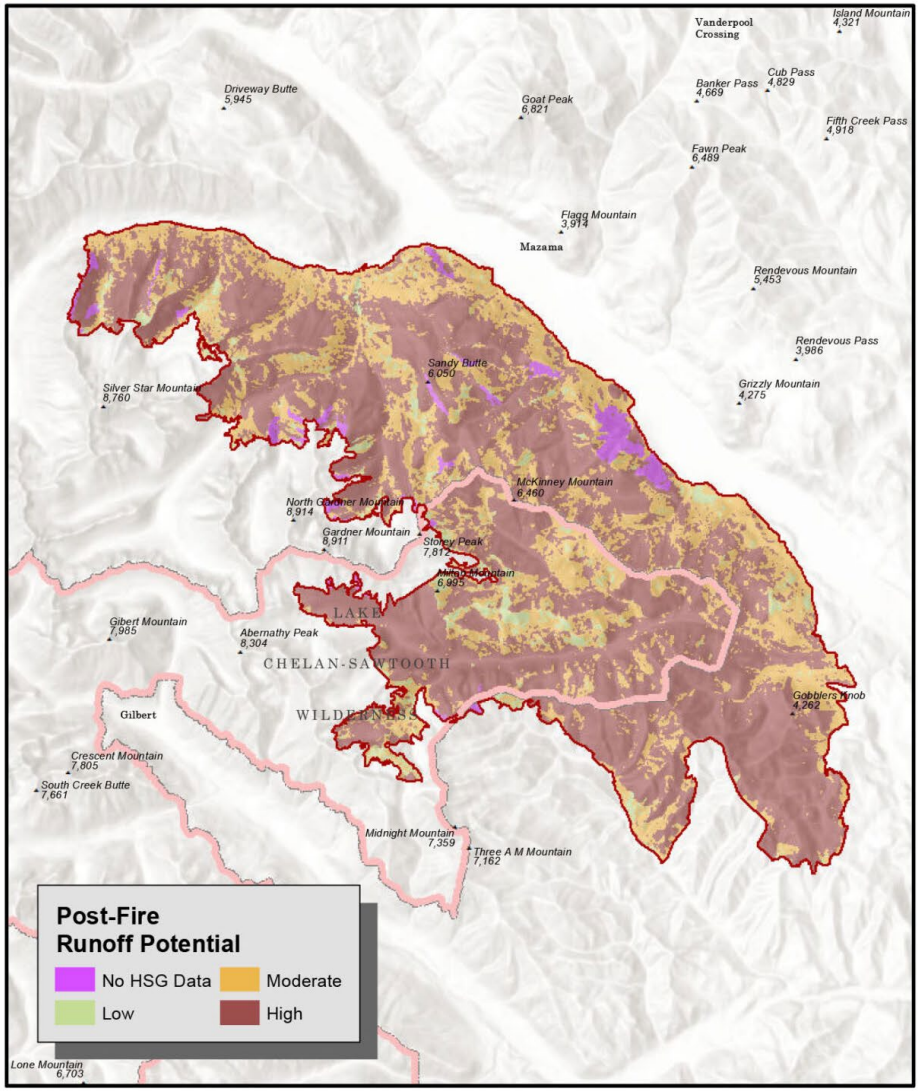
Okanogan-Wenatchee National Forest | FS Bureau | September 2021

Runoff Potential Map - Pre & Post Fire - Cedar Creek Fire

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





0 6 12 Miles

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