RESOURCES

WILDFIRE-ASSOCIATED LANDSLIDE EMERGENCY RESPONSE TEAM REPORT

NATURAL

2025 Wildcat Fire

Yakima County, Washington

by Emilie Richard, Isabella Bennett, Bill Medwedeff, and Mitch Allen

WASHINGTON GEOLOGICAL SURVEY
WALERT Report
December 2025

WASHINGTON STATE DEPARTMENT OF NATURAL RESOURCES
WASHINGTON GEOLOGICAL SURVEY

WILDFIRE-ASSOCIATED LANDSLIDE EMERGENCY RESPONSE TEAM REPORT

2025 Wildcat Fire

Yakima County, Washington

by Emilie Richard, Isabella Bennett, Bill Medwedeff, and Mitch Allen

WASHINGTON
GEOLOGICAL SURVEY
WALERT Report
December 2025

WASHINGTON STATE DEPARTMENT OF
NATURAL RESOURCES
WASHINGTON GEOLOGICAL SURVEY

DISCLAIMER

Disclaimer of Warranties
No express or implied warranty of any kind is made regarding the information contained herein, including, but not limited to, the warranty of merchantability, warranty of fitness for a particular purpose, or warranties of content, completeness, accuracy, reliability, usefulness, or that use would not infringe on privately-owned rights.

Use at Your Own Risk
The information presented here is intended for use as a general screening tool in community planning or for creating awareness and understanding of geologic information and is neither intended to constitute advice nor is it to be used as a substitute for site-specific advice from a licensed professional. You use this information at your own risk and should not act (or refrain from acting) based upon the information without independently verifying the information and, as appropriate, obtaining professional advice regarding your particular facts and circumstances.

Limitation on Liability
User agrees there shall not be liability on the State of Washington, Washington Department of Natural Resources, or their officers, agents, representatives, or employees for any damages allegedly resulting from any use of or reliance on this information. Under this limitation, there shall be no liability for any damages whatsoever, including but not limited to any damages in contract or tort for compensatory, consequential, punitive, direct, indirect, or special damages such as personal injuries, property damage, loss of profits, or any other losses or expenses.

No Endorsement
Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not constitute or imply its endorsement, recommendation, or favoring. Further, the views and opinions of authors expressed herein do not necessarily state or reflect those of the State of Washington or any agency thereof.

WASHINGTON GEOLOGICAL SURVEY

Mailing Address:	*Street Address:*
MS 47007	Natural Resources Bldg., Rm 148
Olympia, WA 98504-7007	1111 Washington St SE
	Olympia, WA 98501

Phone: 360-902-1450; Fax: 360-902-1785
E-mail: geology@dnr.wa.gov
Website: http://www.dnr.wa.gov/geology

Publications List:
https://www.dnr.wa.gov/programs-and-services/geology/publications-and-data/publications-and-maps#publications-list

Washington Geology Library Catalog:
https://www.dnr.wa.gov/programs-and-services/geology/washington-geology-library#search-the-library-catalog

Washington State Geologic Information Portal: https://www.dnr.wa.gov/geologyportal

Contents

Key Points 1
Introduction 1
Wildfire Overview 1
Soil Burn Severity 2
U.S. Geological Survey (USGS) Post-Fire Debris Flow Hazard Modeling 2
Observations and Interpretations 2
  Site-Specific Summaries 3
Summary and Recommendations 5
Acknowledgments 6
References 6
  Limitations 7
Appendix A: Geological background 8
  Hillslope processes 8
  Flash floods and debris flows 8
    Flash floods 8
    Debris flows 8
  Alluvial fans 8

PLATES

(Plates are located at the end of this document)

Plate 1. Highlighted locations mentioned in this report for the Wildcat Fire

Plate 2. USGS post-fire debris flow hazard modeling for 24 mm/hr rainfall rate for hydrologic basins impacted by the Wildcat Fire

Wildfire-Associated Landslide Emergency Response Team Report for the 2025 Wildcat Fire

by Emilie Richard, Isabella Bennett, Bill Medwedeff, and Mitch Allen

Washington Geological Survey
MS 47007
Olympia, WA 98504-7007

KEY POINTS

- Many structures, roads (Bumping Lake Road and Bumping River Road), and trail networks are situated on fans that could be impacted by flooding and debris flows.
- The northern shore of Bumping Lake is lined by fans below hydrologic basins that are modeled as mostly moderate and high combined debris flow hazard.
- Potential increased flux of sediment and debris into the lake from burned areas could impact the reservoir spillway, water quality, aquatic environment, or wildlife within the lake.

INTRODUCTION

A Wildfire-Associated Landslide Emergency Response Team (WALERT) assessment was conducted to evaluate the potential risk posed by flash floods and debris flows from the Wildcat Fire in Yakima County, Washington. Wildfires can significantly change the hydrologic response of a watershed so that even modest amounts of rainfall can produce dangerous flash floods and debris flows. Increased runoff, flash floods, and debris flow hazards may remain elevated for several years after the fire.

WALERT assessed the wildfire burn scar and the areas downslope to determine whether debris flows or flooding could impact infrastructure, structures, and other areas where public safety is a concern. Definitions and background information about these hazards are provided in Appendix A. In addition, WALERT looked for historical evidence of debris flows using field reconnaissance, interpretation of lidar elevation data, and aerial orthoimagery. We also used lidar data to map alluvial fans, which are cone-shaped sediment deposits that form where streams flow onto wide, flat surfaces. Alluvial fan mapping from lidar elevation data can identify the potential runout zones of stream runoff, flooding, and debris flows.

This report is primarily a qualitative assessment of post-wildfire landslide hazards based on our professional judgment and experience. The report is further supported by field-validated satellite data and debris flow modeling. The assessment was performed as part of emergency response with the intent to produce a rapid report for decision-makers, land managers, landowners, and other interested parties.

WILDFIRE OVERVIEW

The Wildcat Fire was ignited by lightning on August 25, 2025 and burned 15,592 acres between the northern shore of Bumping Lake and State Route 410, approximately 20 miles east of Mount Rainier (InciWeb, 2025). Most of the burned area is within the Okanogan-Wenatchee National Forest and William O. Douglas Wilderness, which are both managed by the U.S. Forest Service (USFS), with smaller parts of the burned area within land owned and managed by U.S. Bureau of Reclamation and private owners. According to members of the Naches Ranger Station, the only structure lost to the fire was an outhouse. The fire primarily burned in timber, brush, and closed timber litter (InciWeb, 2025).

Portions of the Wildcat burn area also burned in previous fires, including the 2010 Boulder Creek Fire (10,100 acres), which burned slopes along Bumping Lake, the 2017 American Fire (3,855 acres), which burned over American Ridge above Goose Prairie, and the 2021 Shneider Springs Fire (107,336 acres), which burned slopes along Fifes Creek on the northeastern edge of the Wildcat burn area (Washington State Department of Natural Resources, 2023).

The burned area of the Wildcat Fire is characterized by steep, mountainous terrain, with elevations ranging from approximately 3,400 ft at Bumping Lake to 6,827 ft at the summit of American Ridge along the northern fire boundary (Plate 1). The valley containing Bumping Lake and Bumping River is a glacially eroded valley with steep side slopes that exceed 30 degrees in places, and a relatively wide and flat valley bottom. Numerous tributary streams cut drainages into these steep side slopes before flowing onto alluvial fans where the drainages intersect the valley.

SOIL BURN SEVERITY

We use a soil burn severity (SBS) map, generated by the USFS Burned Area Emergency Response (BAER) Team, that incorporates pre- and post-fire satellite data and field observations of post-fire soils to map the spatial variation in soil burn severity within the fire perimeter. The USFS BAER team generated the SBS for a limited portion of the burned area (west of Goose Prairie). The fire grew significantly after they completed their original SBS mapping. Clouds and smoke obscured all post-fire satellite images needed to generate an SBS map for the full burn area. To provide useful data for the newly burned portions of the fire a separate Burned Area Reflectance Classification (BARC) map was generated by the USGS following the USFS BAER assessment. This BARC map was not field verified for correlation with soil burn severity needed to generate a SBS map.

The resulting SBS and BARC mapping suggests that the majority of the Wildcat burned area experienced low to moderate soil burn severity, with smaller portions experiencing high soil burn severity, experiencing very low burn severity, or remaining unburned. The high burn severity areas are concentrated in steep, south-facing slopes in the westernmost sections of the burned area above Bumping Lake.

These soil burn severity maps can be helpful for landowners and land managers to quickly assess the area to focus vegetation and forestry recovery efforts. If you need assistance accessing or analyzing the SBS data, please contact us and we can provide some support.

U.S. GEOLOGICAL SURVEY (USGS) POST-FIRE DEBRIS FLOW HAZARD MODELING

The USGS provided two separate post-fire debris flow modeling assessments for the Wildcat Fire that incorporated topographic variables, SBS data from the USFS BAER team, and subsequent BARC data. The first model only incorporates the SBS data from the portion of the fire assessed by the USFS. To model debris flow hazard for the remaining area the USGS generated a composite BARC map to use as a proxy for the burn severity of the northwest section of the burn scar. The results of the two separate models are very similar, but differences do exist. For this report we present the results with the highest modeled hazard between the two assessments (Plate 2). The modeling data are typically available on the USGS Post-Fire Debris Flow Hazard Assessment Viewer within a few weeks of being generated (https://usgs.maps.arcgis.com/apps/dashboards/c09fa874362e48a9afe79432f2efe6fe). Be aware that when viewing the modeling results on this platform, the default display shows the likelihood results for hydrologic basins, not the combined hazard rating used in this assessment.

The USGS post-fire debris flow model estimates post-fire debris flow volume, likelihood, and a combined hazard rating that incorporates both likelihood and volume. The modeling is generated for both individual hydrologic drainage basins and stream channel segments, for a range of rainfall intensity values. Here we will discuss the model results for the Wildcat Fire in terms of combined debris flow hazard for hydrologic basins, given a design rainfall intensity of 24 mm/hour sustained over a 15-minute period (approximately one quarter inch in 15 minutes). The model output provides three different combined hazard ratings: low, moderate, and high. It is important to note that the USGS model does not consider the effect of rain-on-snow events in recently burned areas. Debris flows and flash floods may occur during rain-on-snow events that may not meet predicted rainfall thresholds.

We focus our assessment on locations where public safety or infrastructure could be at risk. Most of the burned area is modeled as low and moderate combined hazard for debris flows, with several high hazard basins above Bumping Lake.

OBSERVATIONS AND INTERPRETATIONS

WALERT conducted a field assessment on November 3–4, 2025. Pre-field remote review of available lidar and aerial imagery included mapping alluvial fans within and downstream of the burned area, searching for evidence of historical debris flow events, and locating any potential structures or infrastructure at risk. This remote evaluation identified 111 alluvial fans (Plate 1). The extent of our field review was limited to areas along the southeastern flank of the fire, due to lack of road access. We specifically focused on areas where wildfire effects on watershed hydrology could put life and infrastructure at risk. In the field we observed the slopes and fans along Bumping Lake Road and Bumping River Road, as well as several of the fans at Goose Prairie, where Camp Fife and several private residences are located (Plate 1).

Aerial imagery taken before and after the 2010 Boulder Creek Fire was inspected for evidence of previous flooding, erosion, and debris flow activity following past wildfires in the same area as the Wildcat Fire. While minimal change in vegetation was observed following the 2010 fire, apparent channel scour and sediment from a potential debris flow are visible in 2011 aerial imagery on one of the alluvial fans on the north shore of Bumping Lake (Point 1, Plate 1). No other evidence of flooding or debris flows could be definitively identified from imagery anywhere in the burn area following the 2010 fire. During remote review of aerial imagery, we also observed apparent loss of vegetation on the upper surface of another Bumping Lake fan (see *Point 2* below) likely from a debris flow between 1959 and 1970. During review of lidar imagery, we observed several landslides within stream channels upslope of fans. While landslides are typically outside of the scope of WALERT assessments, the presence of landslide deposits within channel above fans may increase the likelihood of debris flow activity on downslope fans, as the unconsolidated landslide deposits may be a source of relatively erodible material.

The ground surfaces of many fans within, or downslope of, the Wildcat Fire contain multiple incised channels, debris lobes, and apparent debris levees based on interpretation of lidar and our limited field observations. The well-defined appearance of these features suggests flooding or debris flows have occurred on many of these fans in the past, and that they have occurred recently enough to not have been obscured by erosion. Additionally, the uppermost portions, or apexes, of many of these fans are not deeply incised. Shallow incision depths are relatively conducive to channel avulsions that could redirect flows to any portion of the downslope fan should the channel be filled or plugged by debris.

There are several trail networks partially or fully within the Wildcat Fire perimeter that we could not assess during field review. Broadly, potential debris flow and (or) flood hazards on these trails may be greatest during or following a high intensity precipitation event, particularly where trails cross fan surfaces or confined stream valleys, within or below the burned area. Users should also be aware of hazards associated with partially burned trees, snags, and root holes. For trail-specific information, users should access the appropriate U.S. Forest Service website, such as the Naches Ranger District (https://www.fs.usda.gov/r06/okanogan-wenatchee/recreation/naches-ranger-district).

On many fans visited in the field we observed pipes of varying size and material apparently collecting water from streams near fan apexes and transporting this surface water to residential structures downslope. These pipes were primarily unburied, and many were discontinuous, potentially damaged during the fire. Any functioning pipes may be at risk of destruction in the event of a debris flow or flood event.

Site-Specific Summaries

The following sections highlight sites within and downslope of the Wildcat Fire where post-wildfire debris flows or flash flooding may impact infrastructure and public safety. Site numbers refer to numbered locations on Plates 1 and 2.

BUMPING LAKE

Bumping Lake is a water storage reservoir for the Yakima River basin and a popular fishing, camping, and recreation destination. The reservoir dam was initially built in 1910, and several modifications, including the concrete spillway immediately downslope of the burn area, were added in the mid-1990s (U.S. Bureau of Reclamation, n.d.). Nearly all the northern shoreline of Bumping Lake is mapped as alluvial fans (Plate 1). Most of the hydrologic basins upslope of these fans are modeled with a moderate combined debris flow hazard, with a few high-hazard basins and one low-hazard basin (Plate 2). Potential impacts to the lake associated with the Wildcat Fire include possible increased transportation of sediment and debris into the lake from within the burned areas during or after an intense precipitation event. Debris like floating logs could impact the spillway, while sediment could impact water quality, the aquatic environment, or wildlife within the lake.

The Bumping Lake spillway is located at the base of the burned area between two adjacent fans. The fan immediately east of the spillway is mapped at the mouth of a steep confined stream channel associated with a hydrologic basin modeled with a moderate debris flow hazard (Plate 2). The spillway is located adjacent to the western extent of this fan, downslope of low-lying topographic barriers that appear to have deflected past stream flow and sediment away from the spillway. The fan to the west of the spillway is downslope of several smaller hydrologic basins modeled with a moderate debris flow hazard. None of these hydrologic basins, nor the mapped fan, are associated with a confined stream channel that are likely to direct future flooding or debris flows to the mapped fan based on remote observation of lidar. In the field we observed shallow standing water just upslope of an incised channel that conveys overland flow into Bumping River downstream of the spillway. Our observations suggest that the more likely risk to the spillway may be impacts from floating debris entering the lake at other locations, accumulating in front of the spillway, and creating a woody debris jam that would obstruct flow.

BUMPING LAKE ROAD AND TRAIL

Bumping Lake Road (NF-394) provides access to numerous residential structures and recreational sites including Bumping Lake Trail #971. In many locations, the Wildcat Fire burned to the edge of Bumping Lake Road (Plate 1). This road traverses six fans downslope of basins modeled as moderate combined debris flow hazard, and terminates on a fan below a high combined debris flow hazard basin (Plate 2). Two of these fans are described in more detail below in subsections Point 2 and Point 3. There are several 1.5–3-ft-diameter culverts installed under Bumping Lake Road, some of which appear to be damaged on the upstream side of the road. Blocked culverts can cause flood water and sediment to damage the road surface, and potentially re-route stream flow to new locations. Impacts to Bumping Lake Road may prohibit road access to emergency responders, residents, or maintenance crews.

Bumping Lake Trail (Plate 1) crosses ten mapped fans between the trailhead at Bumping Lake Road and the junction with Swamp Lake Trail. The basins above seven of these ten fans are modeled as moderate and (or) high combined hazard, and the remaining three are not modeled (Plate 2). The fans along the western edge of the lake are modeled as predominantly moderate and high burn severity. Based on this modeling and our remote review, there is likely an elevated risk of post-fire debris flow and (or) flood impacts to this trail as a result of the Wildcat Fire, especially near active or abandoned channels on fan surfaces. Hazard impacts may include trail surface erosion, debris deposition, and (or) the potential for trail user danger should a debris flow or flood occur.

Point 2

We evaluated the fan surface near the apex and along active and abandoned channels to assess potential hazards to the residential structures located on this fan surface (Plate 1). The fan is characterized by a hummocky surface that is well vegetated with a mixture of tree species of varying ages. The active stream channel flows roughly southward down the fan surface, and under Bumping Lake Road in a 3-ft-wide culvert. There are two, slightly less incised, abandoned channels on this fan that lack vegetation, suggesting somewhat recent flow. Near the fan's apex and upstream of Bumping Lake Road, we observed that the active channel was incised roughly 5 ft deep and composed of primarily angular to sub-rounded cobbles and small boulders. Midway up the fan along the active channel, we observed a recent avulsion where a fallen tree partially redirected flow out of the channel. In remote review, we observed debris flow activity as a swath of bare soils at the apex of this fan that likely occurred between collection of 1959 and 1970 aerial imagery. The swath of bare soil (apparent in 1975 and 1985 aerial imagery) coincides with an area of distinctly younger trees than the mature conifer trees growing on immediately adjacent slopes.

Future events have potential to reactivate much of the fan's surface based on a shallowly incised stream channel at the uppermost portion of the fan that could be filled or plugged by debris, initiating channel avulsions. Structures built within or adjacent to the active channel, abandoned channels, and (or) swales where water and (or) hyperconcentrated flows may become channelized, may be at elevated risk. The basin above this fan is modeled as high combined hazard, suggesting that it is at elevated risk of debris flows following the Wildcat Fire (Plate 2).

Point 3

We observed three potential flow paths on this fan surface. At the time of our visit on Nov. 3 there was no flow in the main channel (along the western edge of the fan). However, we observed fine sediments in the channel that appeared to have been deposited by recent stream flow. We observed 1 ft boulders, large woody debris in the active channel, and debris lobes along channel margins. Boulders up to 5 feet wide, and abundant mature conifer trees were observed on other parts of the fan's surface. There is an 18–24 in. culvert beneath Bumping Lake Road associated with this channel. Downslope of Bumping Lake Road, the active channel opens into a swale terminating at the lake shore, where a significant amount of large woody debris (logs, felled trees, and branches) are situated within the swale between the road and lake. Should a large flux of water or material come through this system, much of this debris may be delivered into Bumping Lake.

Based on our remote and field assessment of this fan, structures may be at elevated risk of flooding or debris flows. Future events have potential to reactivate much of the fan's surface based on a shallowly incised stream channel at the uppermost portion of the fan that could be filled or plugged by debris, initiating channel avulsions. The hydrologic basin above this fan is modeled with a moderate combined debris flow hazard (Plate 2). As such, structures built within or adjacent to the active channel, abandoned channels, and (or) swales where water and (or) hyperconcentrated flows may become channelized, may be at elevated risk of debris flows following the Wildcat Fire (Plate 2).

GOOSE PRAIRIE

The community of Goose Prairie is located on several alluvial fans that drain from hydrologic basins modeled with moderate and low combined debris flow hazard (Plate 2). The Goose Prairie community consists of Camp Fife and several residential structures on the eastern half of the prairie. During our field assessment, we traversed three of the fans that underlie the Goose Prairie community (points 4–6). We observed flowing water in channels on all three fans, as well as alternate stream flow pathways on the fan surfaces from past avulsion and channel migration. There are four other alluvial fans in Goose Prairie that we did not visit in the field. Remote review reveals similar morphological features and surface textures in lidar for two of the fans (south of point 4). These fans have larger contributing basins and more incised stream channels, but no recorded structures on the fan surfaces. On the southernmost fan in Goose Prairie, multiple channels coalesce into one main stem before crossing Bumping River Road at the fan's distal edge. This fan has a moderate debris flow combined hazard rating according to the USGS modeling. At the north end of Goose Prairie, there is one structure on a smaller fan that has a smooth surface texture, no discernable channel in the lidar, and for which the modeling indicates a moderate debris flow hazard for the small, contributing basin (Plate 2).

On the fan near Camp Fife (point 4) we observed a stream channel incised 4–5 ft into the fan surface with subrounded cobbles on the channel bed. On the surface of the fan's apex, we observed angular boulders up to 4 ft diameter. Abundant angular boulders, hummocky slopes, and apparent avulsion channels on the fan's surface is indicative of past debris flow activity. Unmarked walking trails traverse steeper sections of the fan near the apex, driveways and structures occupy the flatter mid-fan sections, and Bumping River Road crosses over the very distal edge. The debris flow modeling indicates low combined hazard for this fan.

On the fan at point 5 (Plate 1), we observed 1–2 ft angular boulders near the apex. Two distinct channels drain in different directions away from the fan apex, with pebble to cobble sized sediment on the channel beds. Multiple channels and angular boulders suggest past flooding or debris flow processes on the fan. The fan at Point 6 showed similar evidence of past debris flow activity in the form of hummocky surfaces and clusters of 1–3 ft boulders near the apex. However, the channel on this fan appears to be much less incised and only a small trickle of flow was observed in the shallow channel. The stream channel associated with this fan appears to flow through landside deposits roughly 500 ft above the fan apex. Material disturbed by this apparent landslide may be relatively easy to erode during high flows or floods. The cabins and structures on these fans are exposed to increased risk of flooding and debris flows during intense rain, rapid snowmelt, or rain-on-snow until vegetation recovers to pre-fire conditions. The basins above Goose Prairie (Points 4–6) have low and moderate debris flow hazard according to the USGS modeling (Plate 2).

South of the community, the Goose Prairie Trail crosses drainages of several burned basins with moderate debris flow hazard and could experience washouts if flooding or debris flows occur.

BUMPING RIVER ROAD (NF-1800)

Bumping River Road is the only access road to Goose Prairie and Bumping Lake. The road runs along several alluvial fans between the base of the southeast facing slopes in the burned area and Bumping River. We observed road cut excavations and stream channels at culverts on several of these fans.

Sunrise Creek Fan

The Sunrise Creek fan has developed several inset fan surfaces over time in response to erosion of its lower slopes by the Bumping River. The modern fan surfaces have multiple incised channels with varying depths, and the portions we visited in the field are vegetated with abundant, mature conifers. Where Sunrise Creek crosses Bumping River Road (Point 7) there is a ~3-ft-diameter concrete culvert. We observed some pooling of water in the channel downstream of the road. Upslope of the fan, Sunrise Creek traverses several landslide deposits apparent in remote review of the lidar. Landslide deposits can be more erodible than in-place bedrock during high flows or floods. The USGS modeling indicates a moderate debris flow hazard for the Sunrise Creek basin (Plate 2).

Goat Creek Fan and Trailhead

Goat Creek has incised roughly 6 ft into the fan surface just upstream of the culvert beneath Bumping Lake Road and has a bedload of mixed fines, subrounded cobbles, and some 1–1.5 ft boulders. Where Goat Creek crosses Bumping River Road (Point 8) there is a ~3-ft-diameter concrete culvert. The culvert and adjacent roadside ditches appear to have been recently cleared of debris. In lidar there are several fan surfaces that appear to have been incised into older fan deposits within the mapped extent of the fan. The incised nature of the mapped fan suggests a history of repeated erosion and fan building. This road crossing and the nearby Goat Creek Trailhead (NF Trail 959) parking area could be at increased risk of flooding during intense rain, rapid snowmelt, or rain-on-snow until vegetation recovers to pre-fire conditions. The USGS modeling indicates a moderate debris flow hazard for the Goat Creek basin (Plate 2).

Unnamed Creek

Where the road bisects this fan (Point 9), we observed a dry channel with a 3-ft-diameter concrete culvert at the road crossing. There were recently felled trees and woody debris in the channel, and the culvert entrance appeared recently cleared. Downstream of the culvert, we observed a younger and more recently active alluvial fan surface with abundant angular gravels and cobbles burying the bases of younger conifers. These deposits show multiple avulsion pathways and levees. Based on field observations and remote assessment, this crossing could be at increased risk of flooding and debris flows during intense rain, rapid snowmelt, or rain-on-snow until vegetation recovers to pre-fire conditions. The basin associated with this fan shows a moderate debris flow hazard according to the USGS modeling (Plate 2).

SUMMARY AND RECOMMENDATIONS

This WALERT assessment suggests that there is an elevated risk of flooding and debris flows that could impact public safety and infrastructure for several years following the Wildcat Fire. Based on this elevated risk, we make the following recommendations:

- Add signage to trailheads and public recreation sites regarding post-fire hazards that could occur following intense precipitation, rapid snowmelt, or rain-on-snow events.
- Inform residents of Goose Prairie and residents along Bumping Lake Road that potential elevated flooding and debris flow hazards will persist until the landscape recovers to pre-fire conditions.
- Keep culverts clear to limit impacts to Bumping River Road and Bumping Lake Road, where flooding or debris flows could restrict access for residents, visitors, reservoir managers or emergency services.

- Monitor the lakeshore for signs of flooding or debris flow activity which would contribute sediment and debris to the lake, impacting Bumping Lake reservoir and spillway.

Visitors to Bumping Lake should be aware of the increased risk of post-fire flash flooding and debris flows following the Wildcat Fire, particularly in areas highlighted above at Points 1–9. Posting signs and educational material at park entrances, parking lots, information centers, and trailheads may help promote awareness of these hazards and provide valuable information for visitors to make decisions about their personal safety. Temporary closures or restrictions in these areas could also be considered by land managers.

Residents of homes on fans and (or) adjacent to streams flowing from burned areas could be informed about potential post-fire flash flooding and debris flows, particularly those areas highlighted above at Points 2–6. Concerned residents could seek appropriate professional consulting services for site-specific evaluations of the potential threats to their life, safety, and property. Furthermore, residents could consider establishing evacuation preparedness plans to increase resilience to these hazards. For information on what to do if you live in a recently burned area where debris flows are possible, download the National Weather Service Debris-Flow Survival Guide[1]. For more information on how to stay safe when at risk from debris flows, please consult our Floods After Fire pamphlet and the USGS's fact sheet with safety tips relating to post-fire debris flows (links in Appendix A below). Landowners needing advice and assistance with recovery and or reforestation can connect with resources at the After the Fire Washington website: https://afterthefirewa.org/.

Landowners and land managers may choose to take action to prevent excessive soil erosion, reduce flooding, and promote revegetation to meet their management and economic goals. Utilizing the soil burn severity map as a tool to find areas of elevated burn severity can assist in this evaluation. We are willing to help direct users to this map product, or to provide the data in various formats as needed.

Managers of transportation networks and private landowners should be aware of the increased likelihood of sediment transport, sediment deposition, and (or) erosion impacts to roads following wildfires, as well as potential issues with blocked drainage ditches and (or) culverts. We further recommend inspecting culverts, including those discussed in this report, within channels draining areas impacted by the fire both before and after storm events. Blocked culverts can cause additional flooding and damage, which could otherwise be minimized by proactively clearing these culverts. Road blockages could limit access for emergency responders.

Bumping Lake Dam management may be able to limit potential impacts to the dam and spillway with monitoring and mitigation of large woody debris in the lake. The USGS debris flow modeling does not consider woody debris when modeling estimated debris flow volumes. However, the soil burn severity mapping could potentially shed light on tree mortality on the slopes above the lake. Areas mapped with higher burn severity may have more dead trees available for transport into the lake via flooding or debris flows. Removing large woody debris from streambeds, swales, and fan surfaces may limit the flux of these materials into the lake.

It is important to know that post-fire conditions change over time. Ongoing monitoring of post-fire conditions and potentially impacted new and existing infrastructure may be necessary to regularly recognize changes of risks to public safety.

ACKNOWLEDGMENTS

We wish to thank our partners at the United States Forest Service (USFS) and U.S. Geological Survey (USGS) for providing BARC and SBS data, as well as debris flow modeling that informed this assessment. We thank the USFS Naches Ranger District for access and information pertaining to the burned area, and the Boy Scouts of America Camp Fife leadership for providing access to key areas discussed in this report. Special thanks to Joel Gombiner, our editor, for his editing contributions and map plates for this report.

REFERENCES

Washington State Department of Natural Resources, 2023, Washington Large Fires 1973-2023 [GIS data]: Washington State Department of Natural Resources. [accessed Sept. 23, 2025 at https://geo.wa.gov/datasets/wadnr::washington-large-fires-1973-2023/explore?location=47.213099%2C120.438127%2C8.14]

WatchDuty, 2025, Wildcat Fire [webpage]: Watch Duty. [accessed Sept. 23, 2025 at https://app.watchduty.org/i/61614]

InciWeb, 2025, Wildcat Fire [webpage]: InciWeb. [accessed Nov. 12, 2025 at https://inciweb.wildfire.gov/incident-information/waowf-wildcat-fire]

[1] National Weather Service Debris-Flow Survival Guide https://www.weather.gov/media/lox/DebrisFlowSurvivalGuide.pdf

Limitations

WALERT aims to quickly identify and assess geologic hazards associated with wildfires to inform decision making and help focus the efforts of local officials and residents who may be impacted by post-wildfire hazards. All observations and interpretations are based on empirical evidence and local knowledge. Not all areas or hazards were evaluated. We encourage landowners, land managers, and those potentially at risk from post-wildfire hazards to consult qualified professionals for site-specific analysis of geological hazards and flood risk and prepare accordingly.

APPENDIX A: GEOLOGICAL BACKGROUND

Hillslope processes

A variety of factors contribute to the probability of debris flows occurring in burned areas. These include hillslope gradient, channel convergence, availability of fine sediments, severity of hydrophobic (water repellant) soil conditions, burn severity, and the removal of a protective canopy and diminished root strength caused by fire.

Hydrophobic soil conditions in burned areas can increase water runoff potential on hillslopes during a storm by preventing water from infiltrating into the subsurface. Overland flow can result in rills and gullies that further channel water downhill.

When effective ground cover has been denuded after intense fire, soils are also exposed to erosive forces such as raindrop impact and wind. The steepest slopes are most prone to erosion, particularly where soils are shallow or where there is a restrictive subsurface layer such as bedrock. Soils that have developed in volcanic ash and glacial till are easily detachable, having low cohesion and structure, and contain relatively low amounts of organics, resulting in moderately thin topsoil horizons.

Flash floods and debris flows

Debris flows have a specific geologic definition that is often misused by the media, the public, and scientists. Most observed “debris flows” are actually sediment-laden flash floods known as hyperconcentrated flows (HCFs). In the following sections, we explain the differences between these two types of flows.

FLASH FLOODS

Flash floods, especially those that originate from recently burned areas, are often described as “debris flows” due to the sediment-laden water transporting woody and vegetative debris, trash, gravel, cobbles, and occasionally boulders. Though “debris flow” may be an observer’s description of the event, a true debris flow has specific properties, behaviors, and characteristics that differentiate it from a flash flood. An HCF is the transition between a flash flood and a debris flow. One way geologists differentiate the three is by the percent of sediment (by volume) carried by the flowing water. A flood contains less than 5 percent sediment by volume, an HCF carries around 5 to 60 percent sediment by volume, and a debris flow exceeds 50 percent sediment by volume.

DEBRIS FLOWS

Debris flows are often described as having the appearance of flowing, wet concrete. These flows travel quickly in steep, convergent channels. A moving debris flow can be very loud because it can buoy cobbles, boulders, and debris to the front and sides of the flow. The sound is often compared to that of a freight train and may cause the ground to vibrate. In a post-fire situation, a debris flow may start as a flash flood surge that picks up sufficient sediment to transform into an HCF and, if soil and slope conditions are suitable, can transform into a debris flow.

Debris flow deposits tend to be distinct and include channel-adjacent levees of gravel, cobbles, and boulders. Channel-adjacent trees display upslope damage such as scarring on bark from rock or debris impact. Mud and gravel may be splashed onto trees and other channel-adjacent objects. Because of the ability of a debris flow to buoy these materials to the front of the moving mass, debris flows are extremely dangerous to public safety and infrastructure.

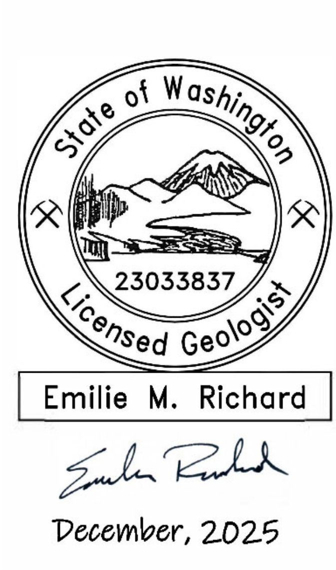
Alluvial fans

Alluvial fans are low-gradient, cone-shaped deposits that consist of sediment and debris. These features often accumulate immediately below a significant change in channel gradient and (or) valley confinement. This might occur at the mouth of a canyon or steep channel that drains from mountainous terrain and emerges onto a low gradient area such as a flood plain. Sediment on the alluvial fan is deposited by streams, floods, HCFs, and (or) debris flows and is typically sourced from a single channel.

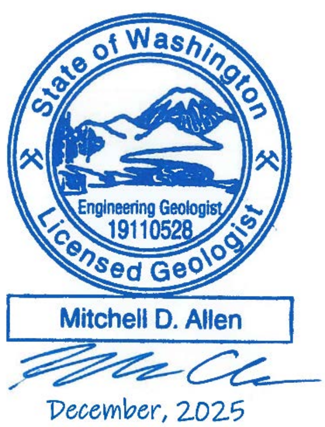
Alluvial fans are attractive locations to build cabins and homes due to the slight elevation above the flood plain. However, alluvial fans are active depositional areas that accumulate sediment over time. The sediment can be deposited both slowly, such as during a spring melt when high streamflow transports and deposits fine sediment on the fan, or quickly, when a flash flood, HCF, or debris flow transports sediment and debris to the fan.

Information flyers about alluvial fan hazards are available on our website in both English and Spanish

- https://www.dnr.wa.gov/publications/ger_fs_alluvial_fans.pdf
- https://www.dnr.wa.gov/publications/ger_fs_alluvial_fans_esp.pdf
- The USGS’s fact sheet on post-fire debris flows safety: *https://pubs.usgs.gov/fs/2022/3078/fs20223078.pdf*

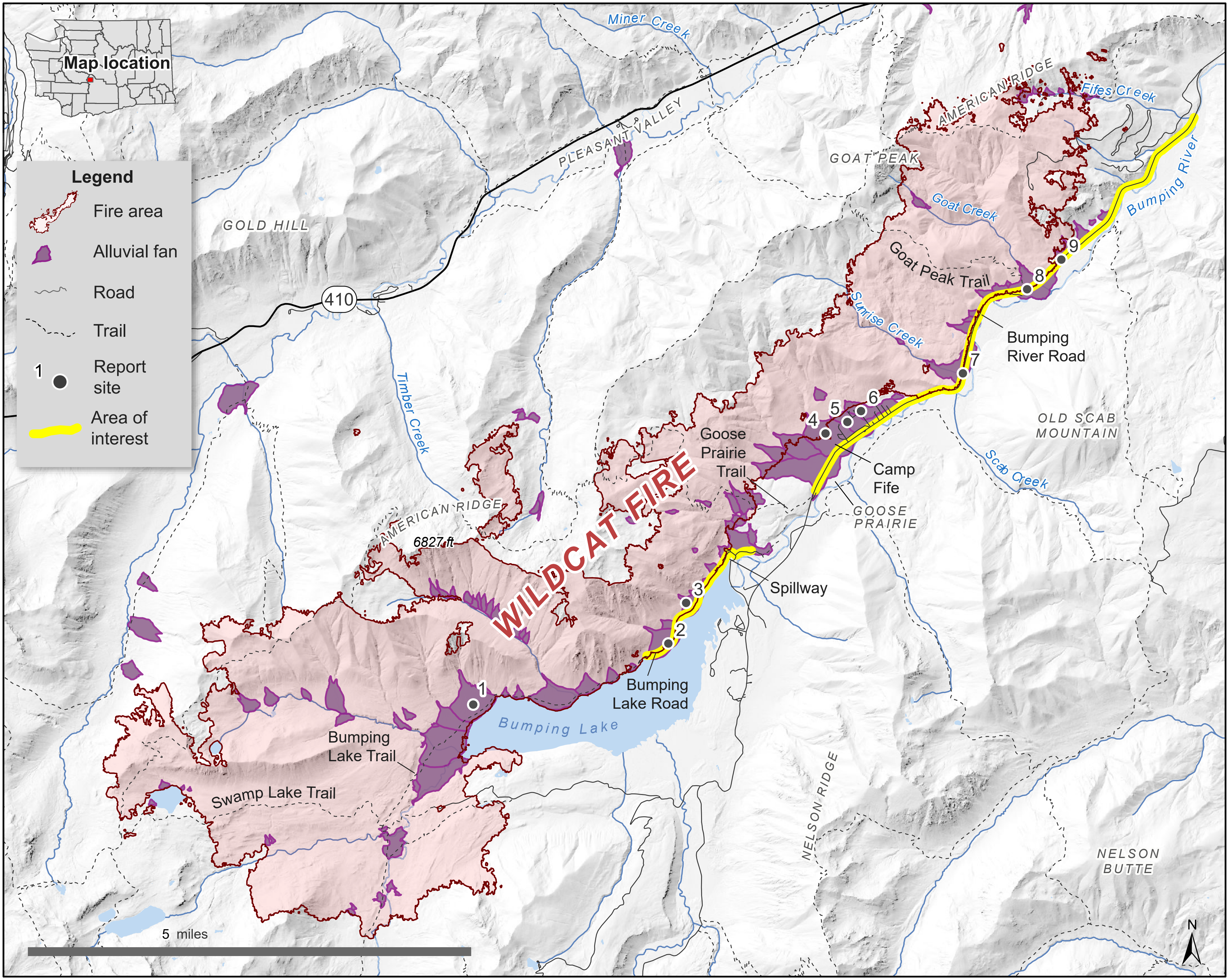


Emilie Richard
Licensed Geologist #23033837
Washington Geological Survey
Washington State Dept. of Natural Resources
Olympia, WA
Cell: 360-529-7984
Email: emilie.richard@dnr.wa.gov



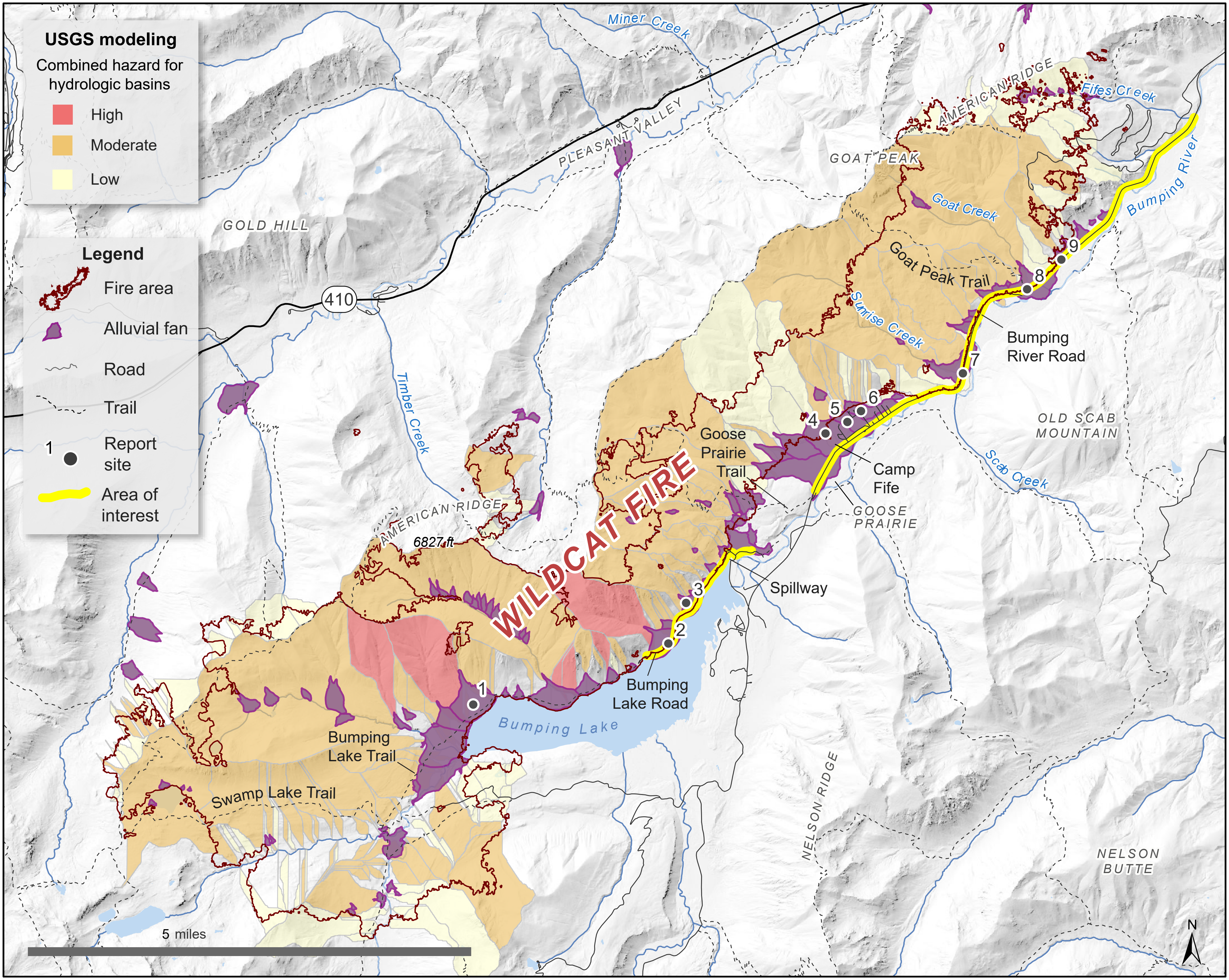
Mitchell D. Allen
Licensed Engineering Geologist #19110528
Washington Geological Survey
Washington State Dept. of Natural Resources
Olympia, WA
Cell: 360-819-0436
Email: mitchell.allen@dnr.wa.gov

Plate 1



Map location
Legend
Fire area
Alluvial fan
Road
Trail
1 Report site
Area of interest
410
Miner Creek
PLEASANT VALLEY
AMERICAN RIDGE
Fifes Creek
GOAT PEAK
Goat Creek
Bumping River
GOLD HILL
Goat Peak Trail
Sunrise Creek
Bumping River Road
Timber Creek
Goose Prairie Trail
Camp Fife
OLD SCAB MOUNTAIN
Scab Creek
GOOSE PRAIRIE
WILDCAT FIRE
AMERICAN RIDGE
6827 ft
Spillway
Bumping Lake Road
Bumping Lake
Bumping Lake Trail
Swamp Lake Trail
NELSON RIDGE
NELSON BUTTE
5 miles
N
1
2
3
4
5
6
7
8
9

Plate 2


USGS modeling
Combined hazard for hydrologic basins
High
Moderate
Low
Legend
Fire area
Alluvial fan
Road
Trail
1 Report site
Area of interest
Miner Creek
PLEASANT VALLEY
AMERICAN RIDGE
Fifes Creek
GOAT PEAK
GOLD HILL
Goat Creek
Bumping River
Goat Peak Trail
Sunrise Creek
410
Bumping River Road
Timber Creek
OLD SCAB MOUNTAIN
Goose Prairie Trail
Camp Fife
Scab Creek
GOOSE PRAIRIE
AMERICAN RIDGE
6827 ft
WILDCAT FIRE
Spillway
Bumping Lake Road
Bumping Lake
Bumping Lake Trail
Swamp Lake Trail
NELSON RIDGE
NELSON BUTTE
5 miles
N
1
2
3
4
5
6
7
8
9