



# Holiday Farm Fire

Erosion Threat Assessment/Reduction Team (ETART)  
Summary Report

December 2020



FEMA

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# Executive Summary

This report summarizes a rapid characterization of post-fire conditions resulting from the Holiday Farm Fire and identifies critical values potentially at risk from threats commonly associated with burned areas. In addition, the ETART assessment of drinking water threats from the Holiday Farm and other fires are captured in the ETART Water Quality/Drinking Water Supply Resource Report. The area of interest for this report consists of non-federal lands within and downstream of the Holiday Farm Fire perimeter. Critical values include human life and safety; improved properties/assets such as roads, bridges, buildings and water systems; important natural resources (soil productivity, water quality and municipal water sources, habitats for wildlife and fish); and cultural resources. Threats that exist or are recognized to amplify in a post-fire setting include accelerated soil erosion and hillslope water runoff that results in increased sediment transport, high stream flows, floods or debris flows; landslides and rock fall; hazard trees; mobilization of hazardous materials; and expansion of invasive or noxious plants.

The essential findings of this evaluation are: 1) to identify emergency conditions as defined by critical values at unacceptable risk from imminent post-fire threats; and 2) to recommend emergency response actions that reduce risk or minimize impacts to critical values. In addition to the emergency response actions, the data, analysis and conclusions supporting this report can be used to develop restoration opportunities leading to long-term recovery of the fire-damaged landscape. Multiple “Specialist Reports” encompassing soils, hydrology and water quality, engineering, fish and wildlife, botany and cultural resources were used to complete this assessment.

The 2020 fire season in Oregon State affected lands across all jurisdictions and ownerships: tribal, federal, state, local and private. Fires on federal and tribal lands are assessed through the U.S. Forest Service (USFS) Burned Area Emergency Response (BAER) or Department of Interior (DOI) Emergency Stabilization and Rehabilitation (ESR) programs. Given the size and severity of the fires’ impacts to state, local and private lands throughout Oregon, the State of Oregon requested the Federal Emergency Management Agency (FEMA) form a multi-jurisdiction assessment team to assess the state, local and private lands of several fires. FEMA coordinated with Oregon Emergency Management (OEM) and Department of Forestry (ODF), National Weather Service (NWS), U.S. Army Corps of Engineers (USACE) and the USFS to staff the Erosion Threat Assessment and Reduction Team (ETART) to evaluate the fire-affected state and private lands.

The team used the USFS BAER and DOI Emergency Stabilization & Rehabilitation (ESR) assessments for several fires, which established the foundation for the ETART and allowed for comprehensive evaluation of all lands burned within the fires.

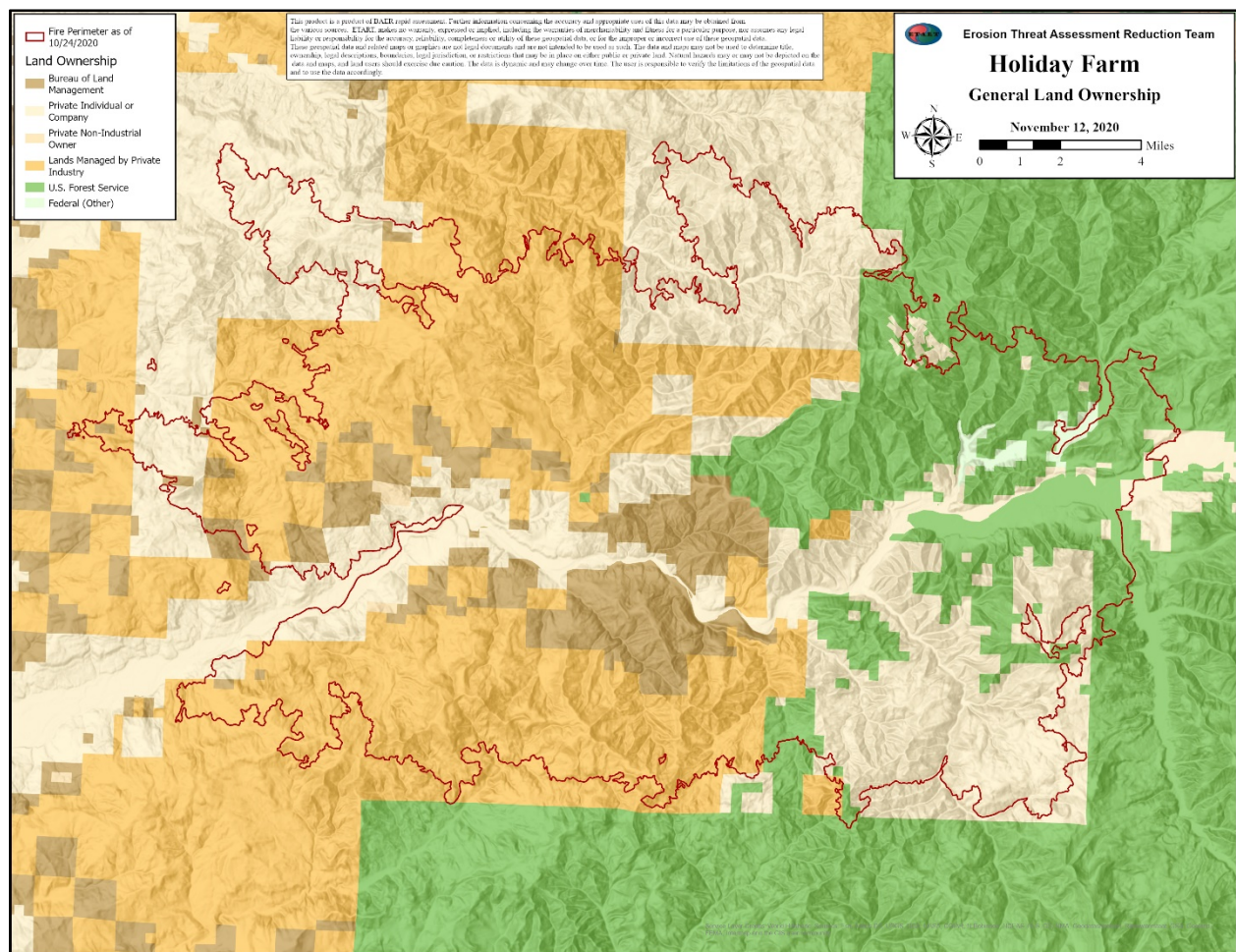
2020 Oregon ETART is comprised of personnel from Lane County, Linn County, OR Department of Environmental Quality (DEQ), OR Department of Fish & Wildlife (ODFW), ODF, OR Department of Geology and Mineral Industries (DOGAMI), OR Department of Transportation (ODOT), OR Water Resources Department (OWRD), Bureau of Land Management (BLM), Environmental Protection Agency (EPA), FEMA, USFS, U.S. Geological Survey (USGS), NWS and the Natural Resources Conservation Service (NRCS). These resource specialists completed the assessments while safely managing COVID-related protections, navigating interagency data sharing barriers, operating in a hazardous post-fire field environment and working across a broad geographic area. ETART members went above and beyond the demands of their normal duties to carry out critical emergency assessments in service of local communities.



# 1. Overview

## 1.1. Burned Area Characterization

- Fire Name: Holiday Farm
- State: Oregon
- Date Fire Started: September 7, 2020
- Date Fire Contained: October 29, 2020 (estimate, ICS-209 dated 10/25/2020)
- Suppression Cost: \$42,000,000 (estimate, ICS-209 dated 10/25/2020)
- Fire Number: OR-WIF-200430
- County: Lane and Linn



**Figure 1. Land Ownership - Holiday Farm Fire**

The Holiday Farm Fire began on September 7, 2020, about 3 miles west of McKenzie Bridge, OR during a strong east wind event that passed through the area. Pushed westward by strong winds, the fire grew from 37,000 acres on September 8<sup>th</sup> to over 100,000 acres in a 24-hour period. The fire burned through the communities of Blue River, Finn Rock, Nimrod, Vida and Leaburg, damaging and destroying homes, businesses and facilities. The fire burned an estimated 173,393 acres across multiple entities, including the Willamette National Forest, BLM, and commercial and private forest lands under authority of the State of Oregon Department of Forestry (ODF). (Figure 1, Table 1 and Table 2.)

**Table 1. Holiday Farm Fire Total Acres Burned – 173,393 (based on post-fire analysis perimeter)**

Ownership	Acres	Sq.Mi.	Percent
Private	121,467	190	70
State	-	-	-
Tribal	-	-	-
Federal	51,926	81	30
<b>Total</b>	<b>173,393</b>	<b>271</b>	

**Table 1. Holiday Farm Fire – Acres Burned by County**

Lane County	Acres	Sq.Mi.	Percent	Linn County	Acres	Sq.Mi.	Percent
Private	109,464	171	68%	Private	12,004	2	89%
State	-	-	-	State	-	-	-
Tribal	-	-	-	Tribal	-	-	-
Federal	50,453	79	32%	Federal	1,473	11	11%
<b>Total</b>	<b>159,917</b>	<b>250</b>		<b>Total</b>	<b>13,477</b>	<b>21</b>	

### 1.1.1. CLIMATE

The burned area is in a region that experiences wet winters and dry summers, with elevations less than 1,000 ft along the McKenzie River corridor to 4,500 ft atop Jimbo Mountain. Annual precipitation ranges from about 60 inches along valley bottoms to more than 90 inches at higher elevations, with most of the precipitation occurring from October through May. In the lower elevations (<2,000 feet), precipitation is dominated by rainfall. Precipitation for the higher elevations of the burned area, between 2,000 and 4,500 ft, is a mix of rain and snow. This rain-on-snow zone can produce very high peak flows during long-duration rainstorms falling on a shallow snowpack. The first wetting fall storms occur in late October into November and are generally characterized by lower



intensity, longer duration events. Wetting rains fell over the burned area from October 10-12, with some areas receiving nearly 3.5 inches (measured at several temporary RAWS set up for the fire). Field reconnaissance reported no observations of overland flow or apparent water quality concerns.

La Niña conditions are present in the tropical Pacific, with an approximately 85% chance of lasting through the winter. Forecasters currently predict this La Niña will be on the stronger side and peak in November–January, with higher precipitation and snowpack expected.

### **1.1.2. GEOLOGIC TYPES**

The bulk of the burned area falls within the Western Cascades geologic unit known as the Little Butte Volcanics, which is composed largely of Miocene and Oligocene igneous rocks, ranging in age from 30 to 40 million years. Rock types include lava flows, pyroclastic deposits such as ash-flow tuffs and lahars (volcanic mudflows) and volcaniclastic sedimentary rocks. An intrusive igneous body that is unusually large for the Cascades, known as the Nimrod Stock, occupies a central portion of the burned area. Younger Western Cascade volcanic rocks make up the remainder of the bedrock geology, with local ridge-capping lavas of the younger (Pliocene-Pleistocene) High Cascades present, and abundant Quaternary deposits, including glacial till and outwash fluvial deposits. Evidence of debris flows from steep and unstable hillslopes with linear drainages exists across much of the burned area. Historic and recent pre-fire landslide processes and deposits are present across much of the landscape.

### **1.1.3. DOMINANT SOILS**

Lands within the fire perimeter are largely in the Cirque Basin Mountain Landform Association. Soils are derived from glacial materials composed of tuffs, breccias and basalts. Slopes range from 0 to 70%, with an average of 35%. Soils are generally Inceptisols (Dystric Cryandepts) with loamy surface textures. Soil climate regimes are typically cryic. Soil depths range from 24 to 70 cm on mountain slopes to very deep in fluvial valleys. Pre-fire litter depth was typically 4 cm; soils were largely covered with mosses and bryophytes.

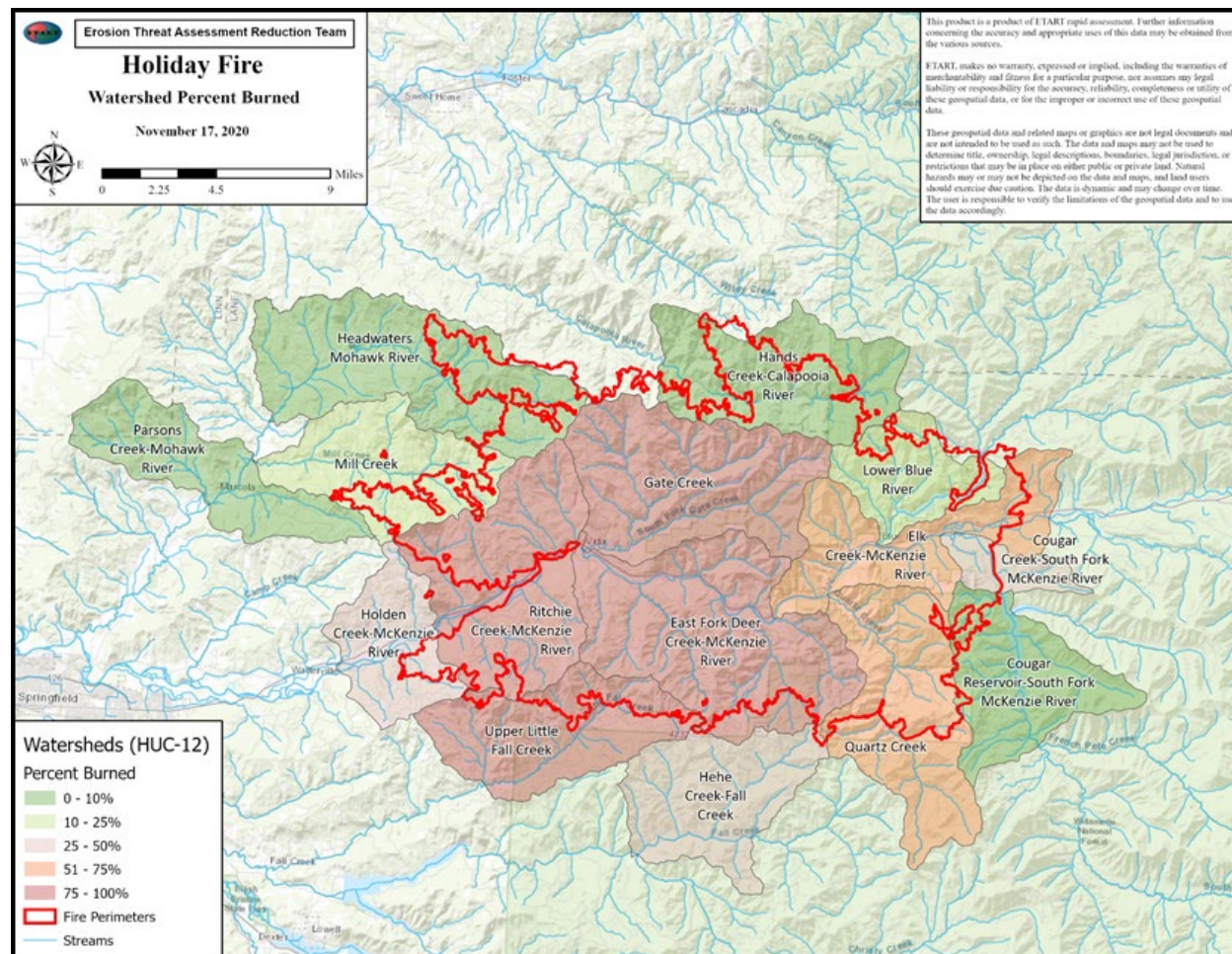
### **1.1.4. VEGETATION TYPES**

The vegetation types within the Holiday Farm Fire are comprised of Western hemlock (71%), mixed conifer (13%), non-forested (8%), Douglas-fir/mixed conifer (5%), true fir (1%) and mountain hemlock (0.1%). Understory composition is dominated by salal/Oregon grape/oceanspray/sword fern and Alaskan huckleberry. Many non-forested areas are considered unique and special habitats including wet, mesic and dry meadows, rock gardens, wetlands which support rare and sensitive plant populations within them.

### **1.1.5. WATERSHEDS (HYDROLOGIC UNITS)**

The fire perimeter occurs in eight 5th level hydrologic units (watersheds) and nineteen 6th level hydrologic units (subwatersheds). The percent area burned for the 6th Level subwatersheds are displayed in Figure 2 and summarized in Table 3. The primary drainages within or downstream of the

Holiday Farm Fire are the McKenzie River, Calapooia River and Mohawk River, with approximately 1,500 miles of intermittent and perennial streams (Table 4).



**Figure 2. Watersheds Percent Area Burned – Holiday Farm Fire**

Flow in the McKenzie River is controlled to varying degrees by several dams, reservoirs diversions (Carmen Diversion Dam, Smith River Reservoir, Trail Bridge Regulating Reservoir, Cougar Dam, Blue River Dam and Reservoir, Leaburg Dam and Diversion, Walterville Diversion). These facilities occur along a 60-mile stretch of river from Walterville upstream to near the headwaters at Clear Lake.

**Table 2. Affected Watersheds (5<sup>th</sup> and 6<sup>th</sup> Level Hydrologic Unit Name)**

5th Level Watershed	6th Level Subwatershed	Total Acres	Acres Burned	Percent Burned
Blue River	Lookout Creek	15,724	171	1%
	Lower Blue River	12,788	10,016	78%
	Upper Blue River	30,398	204	1%
Fall Creek	Hehe Creek-Fall Creek	20,925	161	1%

5th Level Watershed	6th Level Subwatershed	Total Acres	Acres Burned	Percent Burned
Little Fall Creek	Upper Little Fall Creek	22,318	4,716	21%
McKenzie River	East Fork Deer Creek-McKenzie River	38,897	35,260	91%
	Gate Creek	30,800	30,426	99%
	Holden Creek-McKenzie River	14,132	1,004	7%
	Ritchie Creek-McKenzie River	30,670	24,576	80%
	Headwaters Mohawk River	33,312	7,947	24%
	Mill Creek	20,813	4,526	22%
Quartz Creek-McKenzie River	Elk Creek-McKenzie River	20,828	16,427	79%
	Quartz Creek	26,923	14,152	53%
South Fork McKenzie River	Cougar Creek-SF McKenzie River	5,095	2,251	44%
	Cougar Reservoir-SF McKenzie River	19,499	1,610	8%
Upper Calapooia River	Bigs Creek-Calapooia River	15,594	1,174	8%
	Hands Creek-Calapooia River	24,448	10,595	43%
Wiley Creek	Jackson Creek-Wiley Creek	29,767	353	1%

**Table 3. Miles of Stream by Flow Regime and Soil Burn Severity<sup>a</sup>**

Flow Regime	High	Moderate	Low	Unburned	Total
Intermittent Stream	62	497	206	108	873
Perennial Stream	13	316	145	91	565
Perennial River	<1	14	26	21	61
<b>Grand Total</b>	<b>75</b>	<b>827</b>	<b>377</b>	<b>220</b>	<b>1,499</b>

a: Does not account for streams below the fire perimeter that may be a "Value" as domestic or municipal source water, or for aquatic habitat.

**Table 4. Road Miles by Ownership Designation within Fire Perimeter**

Owner Designation	Miles <sup>a</sup>
Bureau of Land Management	80.8
County Route	12.2
Forest Service	117.1
Private Route	731.2
State Highway	22.2
Unknown	151.2
<b>Total Miles</b>	<b>1,114.7</b>

a: Does not account for priority travel routes below the fire perimeter that may be a “Value” or threatened by flooding or debris flows.



## 1.2. Post-fire Watershed Condition

### 1.2.1. SOIL BURN SEVERITY (SBS):

The post-fire watershed conditions are mostly driven by fire behavior, which is largely a function of pre-fire fuel conditions (vegetation types, volumes, arrangement and moisture content) as influenced by weather and topography. Soil Burn Severity (SBS) is the fundamental post-fire factor for evaluating changes in soil processes and hydrologic function, which are used to evaluate watershed response, identify post-fire threats and assess the level of risk to critical values.

Prior to the ETART effort, the Forest Service produced a Soil Burn Severity (SBS) map as part of their Holiday Farm BAER Assessment. Field validation of the SBS was conducted across the burned area through coordination with ACOE and BLM. The initial Forest Service SBS mapping did not field-validate soil conditions on private or state lands. The ETART soils team completed soil burn severity validation on state and private lands with on-the-ground data collection and visual observations (Table 6, Figure 3).

**Table 6. Soil Burn Severity (SBS) Acres.**

Soil Burn Severity Class	All Lands		Federal Lands		Private Lands	
	Acres	Percent	Acres	Percent	Acres	Percent
High	16,116	9	4,621	3	11,496	6
Moderate	107,314	62	32,010	19	75,304	43
Low	42,265	25	13,952	8	28,313	17
Unburned	7,485	4	1,244	<1	6,240	4
<b>Total</b>	<b>173,180</b>		<b>51,827</b>		<b>123,353</b>	

The fire was fast moving and left high vegetation mortality and moderate soil burn severity across the burned area. Being a wind driven there are distinct differences from west to east due to pre-fire vegetation conditions (management disturbance, fuel loading and forest canopy cover). The most concentrated areas of high SBS are found in the Gate Creek, East Fork Deer Creek-McKenzie River, Lower Blue River and Elk Creek-McKenzie River watersheds.

### 1.2.2. WATER-REPELLENT SOIL (ACRES)

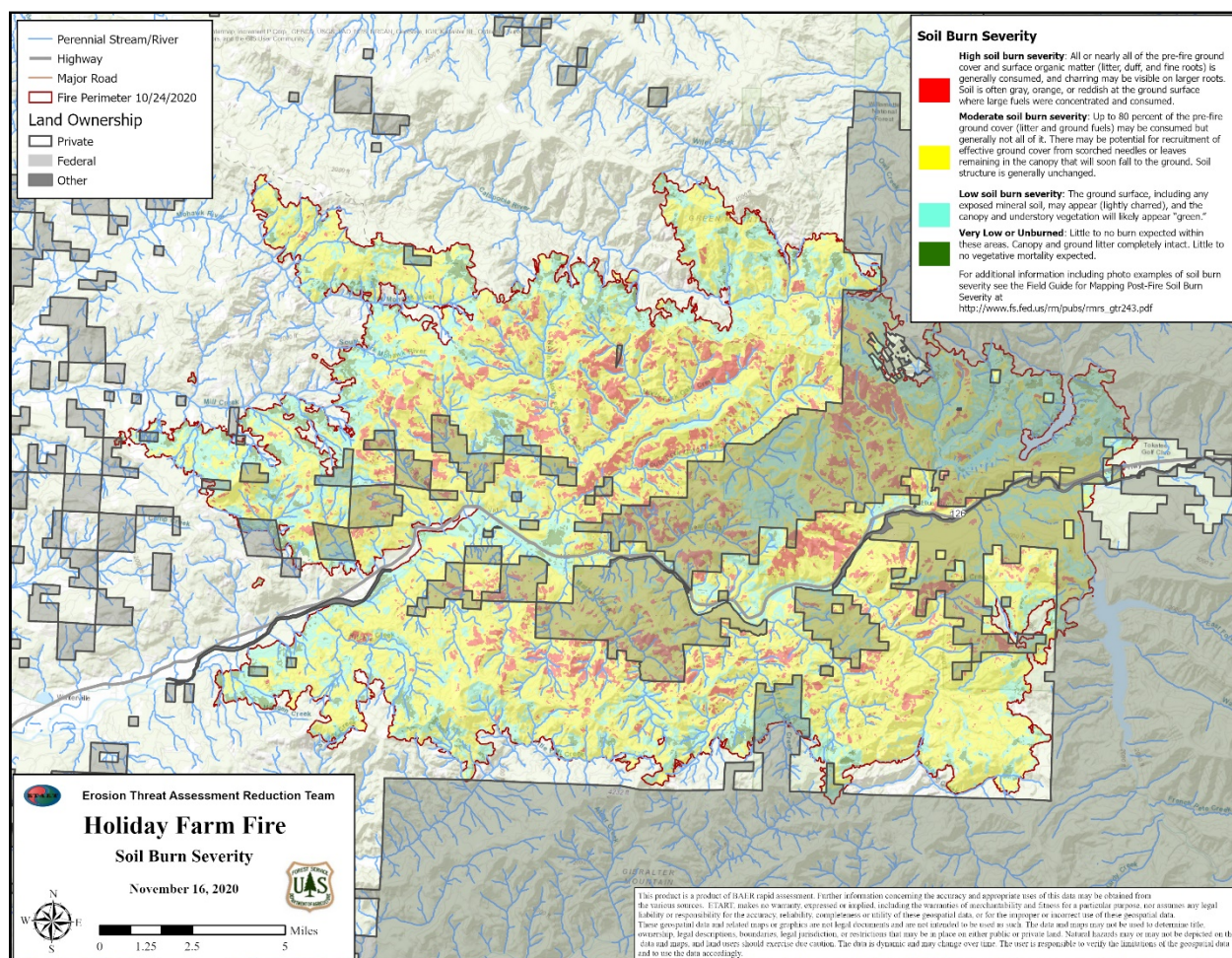
Natural water repellency is present on almost all soils in the fire perimeter and was found to be highly variable during field verification in unburned, low moderate burn severities. Fire-induced or altered hydrophobicity occurred only in pockets of high severity burned soils, which is less than 10 percent of the burned area.

### 1.2.3. SOIL EROSION INDEX:

The soil erosion index (SEI) describes the sensitivity for soil loss after disturbance removes the protective vegetation and litter cover. The SEI is primarily a function of hillslope soil processes and hydrologic function, as influenced by disturbance, such as fire, and slope. The SEI is described as “low”, “moderate”, “high” or “very high”. Low erosion index indicates soil erosion is unlikely.

Moderate erosion index indicates soil erosion is likely with a potential decrease in soil productivity.

High erosion index indicates soil erosion is very likely with likely decrease in soil productivity. Very high erosion index indicates a high probability for soil loss and decreased soil productivity, where erosion control measures are impractical and cost prohibitive.



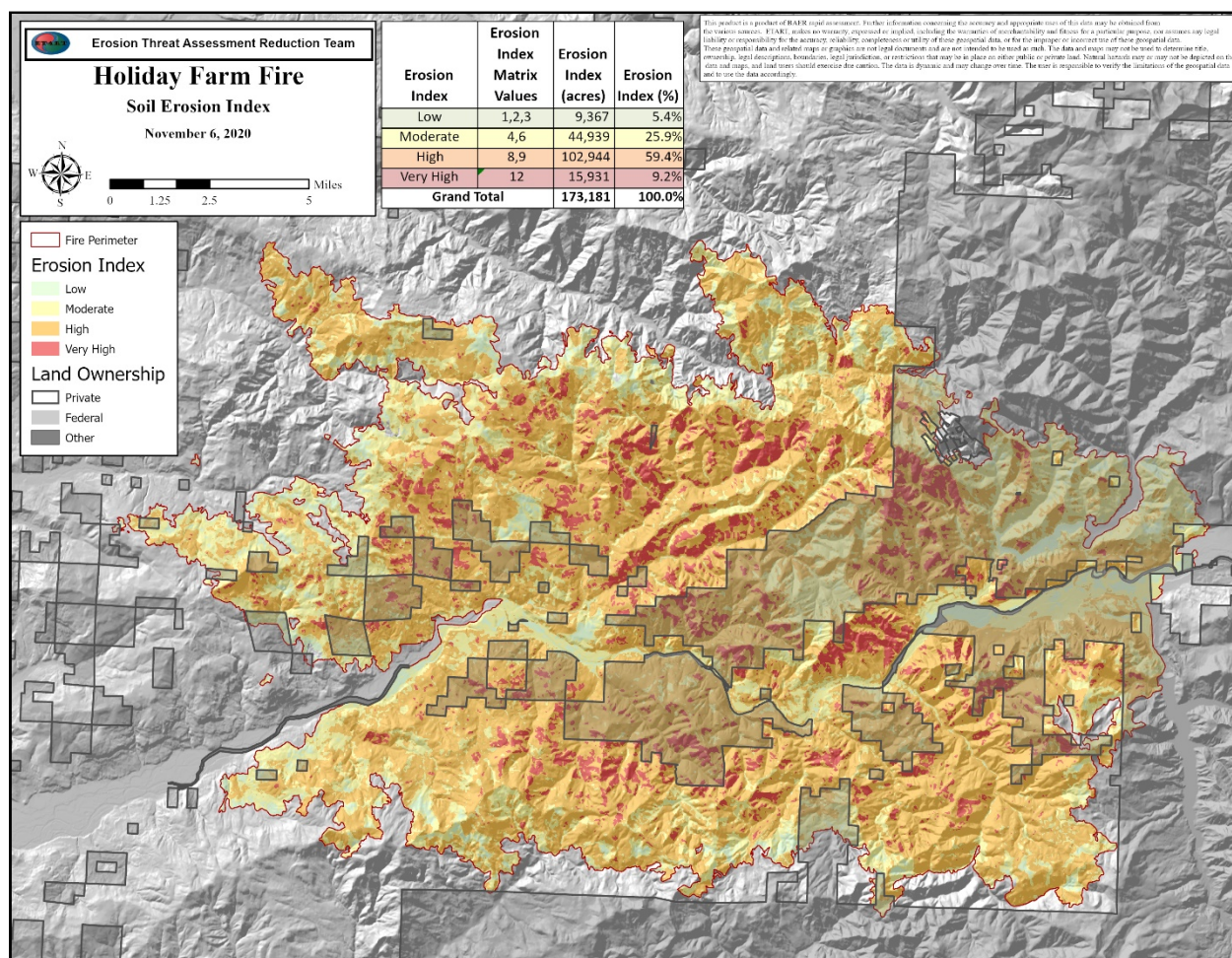
**Figure 2. Soil Burn Severity - Holiday Farm Fire**

Figure 4 displays the spatial distribution and acres by SEI for the area burned by Holiday Farm Fire. The matrix values in the map table represent combinations of inherent SEI with SBS. The analysis estimates 94% of the burned area has increased potential for accelerated soil erosion. The “very high” SEI is generally attributed to over-steepened slopes where SBS has minor influence to change soil erosion.



### 1.2.4. EROSION POTENTIAL

This analysis is used to identify hillslopes where post-fire accelerated erosion elevates the level of threat to downslope critical values. The potential for soil movement was estimated using the Water Erosion Prediction Project Cloud -Disturbed (WEPPCloud - Disturbed) Model (Robichaud and others 2019). This model uses NRCS Soil Survey data, land cover, land use climate data to predict the potential for soil movement. The model is run using pre-burn conditions, then using the burn severity map to estimate soil loss following the fire. The estimated soil loss per watershed unit area ranges from about 0.25 tons/acre up to 8 tons/acre the first year after the fire, averaging about 5 tons/acre across the burned watersheds of interest. On average this equates to roughly a 5-times increase in potential soil erosion post-fire over undisturbed conditions.



**Figure 3. Soil Erosion Index - Holiday Farm Fire**

### 1.2.5. ESTIMATED VEGETATIVE RECOVERY PERIOD (YEARS)

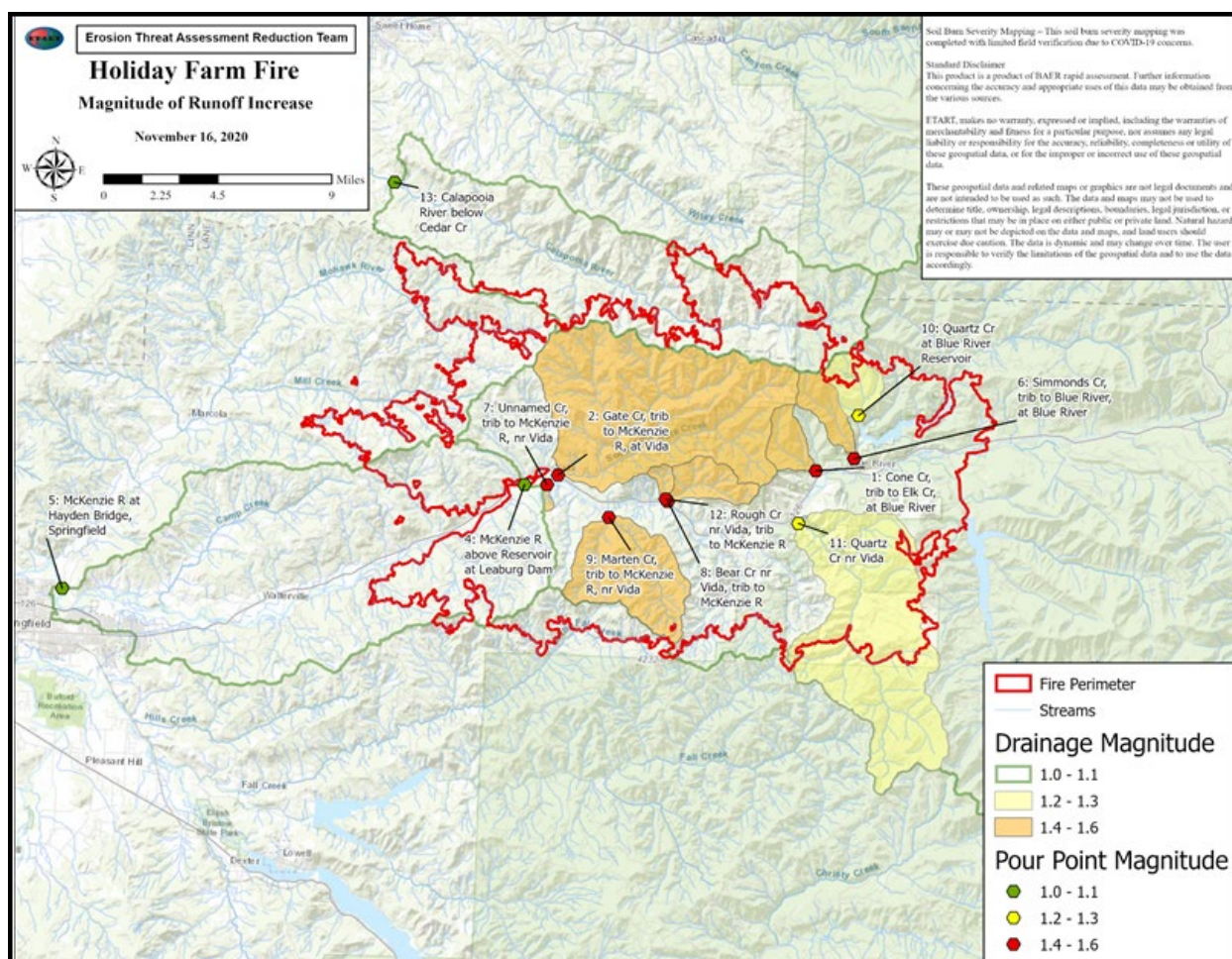
Vegetation recovery varies depending on plant association group, soil type, aspect soil burn severity. Areas that burned at low severity will generally recover within two years. Areas that burned with moderate soil severity may recover the understory and shrub layer in 3-5 years. For areas having high SBS, stand-replacement fire, and loss of overhead canopy from conifer tree species, ecosystem recovery will take up to 2-3 decades.



### 1.2.6. ESTIMATED HYDROLOGIC RESPONSE

Regional regression equations were used to estimate pre- and post-fire peak flows for several watersheds. The greatest increases in peak flows are estimated to be a magnitude 1.5 times over the 5-year recurrence interval (Figure 5). These elevated peak flow responses are predicted for the Simmonds Creek, Cone Creek and Rough Creek watersheds, where 85 to 100% of the source areas were burned at moderate to high SBS. Higher peak flows from these watersheds could lead to damage of road crossings that are unable to pass the additional water and debris. Also, homes along streams such as Gate Creek and Cone Creek maybe at increased risk of flooding.

The analysis of post-fire peak flows should only be used as a tool to better understand relative stream response levels for various drainages throughout the fire area. Post-fire stream response in smaller watersheds tends to be much greater than those in large watersheds because of the relative volume of water it takes to show an amplified increase from pre-fire flow and the spatial scale of continuous high-severity fire patches in relation to the extent of a storm event in the Cascades.



**Figure 4. Watershed Response in Runoff Magnitude Increase – Holiday Farm Fire**



## 2. Risk Assessment and Recommendations

The ETART resource groups identified several values having varying degrees and types of threats, which are listed in the ETART Holiday Farm Fire Values Table. The post-fire watershed conditions determined through field assessment and data analysis were used by the ETART to validate post-fire threats and, subsequently, using the Risk Assessment Matrix assign each value a level of risk defined by the probability of damage or loss coupled with the magnitude of consequences (Figure 6). A burned area emergency exists when a value has a rating of “very high” or “high” for all values and an “intermediate” risk for life and safety. These values are prioritized for emergency response or stabilization actions known to mitigate potential threats or minimize expected damage.

Probability of Damage or Loss	Magnitude of Consequences		
	Major	Moderate	Minor
Very Likely	Very High Risk	Very High Risk	Low Risk
Likely	Very High Risk	High Risk	Low Risk
Possible	High Risk	Intermediate Risk	Low Risk
Unlikely	Intermediate Risk	Low Risk	Very Low Risk

Figure 6. Risk Matrix

### 2.1. Human Life and Safety Summary

#### 2.1.1. HAZARD TREES

**Very High risk** to motorists along roadways, people near structures, and visitors and employees at **recreation areas** from falling of hazardous trees killed or damaged by fire. These locations have large numbers of dead and fire damaged trees (>75% basal area (BA) mortality). There is “Very High” risk (likely, major) in areas having 1-75% BA mortality, as well. Although there are generally lower numbers of dead and fire damaged trees, the threat will result in major consequences to human life and safety (and property). Specific locations needing hazard trees mitigated include Blue River Park, Forest Glenn Boat Landing, homes along Gate Creek, Goodpasture road, and Simmonds Creek and Old McKenzie Fish Hatchery and County Park. With respect to travel routes, of the roughly 1,213 of assessed miles on state, county and non-industrial private land (including unspecified private), an estimated 811 road miles have moderate to high levels of basal area mortality, where fire-killed or damaged trees are within falling distance to reach a road. There are roughly 800 acres of hazard trees within a 100-foot buffer surrounding 882 structures. There are 478 structures in areas that suffered 50% or greater basal area mortality. Another 404 structures are located in areas that suffered less than 50% basal area mortality.

Recommendation: Temporary road and sites closures until hazard trees are mitigated, minimize exposure to buildings, fell danger trees within striking distance of roadways and structures. Post hazard warning signs. Inform county emergency management, stakeholders and private landowners. Complete site-specific assessments for specific treatment recommendations.

### Available resources for on-the-ground assessment of danger/hazard trees

- OSU Fire Extension has recorded several post-fire webinars. Link to webinars and an extensive summary of available resources: <https://extension.oregonstate.edu/fire-program>.
- ODF post-fire resources, including information on locating stewardship foresters: (<https://www.oregon.gov/odf/fire/Pages/afterafire.aspx>).
- Field Guide for Danger Tree Identification and Response along Forest Roads and Work Sites in Oregon and Washington:
- [http://www.fs.usda.gov/Internet/FSE\\_DOCUMENTS/fseprd512960.pdf](http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fseprd512960.pdf)).
- Post-fire tree mortality assessment and marking guidelines: [https://www.fs.usda.gov/Internet/FSE\\_DOCUMENTS/fseprd814664.pdf](https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fseprd814664.pdf)).

To arrange for on-the-ground training contact ODF or OSU Extension Services. USFS State and Private Forestry also has experts on staff to help with post-fire trainings at the request of ODF.

### 2.1.2. DEBRIS FLOW, ROCK FALL, AND LANDSLIDES

**High risk** to life and safety at Lazy Dayz Mobile Home Park, Lucky Boy Road, McKenzie K-12 School in Blue River, Old Scout Road, OR-126, Rough Creek and Rail Creek, Shepard's Landing and McMullen's Landing, Simmons Creek - Blue River Bridge, Town of Blue River, Town of Nimrod, and Town of Vida from debris flows, rock fall or landslides. Portions of the communities and/or facilities are built on past debris flow fan deposits.

Recommendation: Further evaluation is needed to define site-specific threats to values and identify appropriate mitigations. Information sharing with County Emergency Management, communities, and property owners on needs for further evaluation or assessment. Facility closures, education, install hazard warning signs, utilize weather alert systems or monitoring.

**Intermediate risk** to life and safety at McKenzie Fire & Rescue Station 16-5 (Nimrod, Local Community) from debris flows, rock fall or landslides. Fire station located downslope of low debris flow hazard where the channel bends in the deposition zone. If debris flow is significant enough, it can avulse channel and deposit material at fire station.

Recommendation: Further evaluation is needed to define site-specific threats to values and identify appropriate mitigations. Information sharing with County Emergency Management, communities, and property owners on needs for further evaluation or assessment. Facility closures, education, install hazard warning signs, utilize weather alert systems or monitoring.

**Intermediate risk** to employees and visitors at Blue River Dam (USACE) from rock fall and accelerated erosion.

Recommendations: Repair and maintain current rock safety structure. Fence to catch falling rock from slopes above service road is damaged or at capacity in many places. Fencing above emergency spillway has failed in several spots.

**Low risk** to life and safety at Ben and Kay Doris State Park, H.J. Morton Memorial Park, Marten Rapids and Thomson Parks, Blue River Community Park, Forest Glen County Park, Gates Creek at Vida, McKenzie Fire & Rescue Station 16-4, School in Vida (K-12), Blue River Dam, Blue River Reservoir, Cougar Dam and Facilities, Cougar Dam Electric Transmission, Leaburg Hatchery, Leaburg Reservoir, Leaburg Dam, and Quartz Creek from debris flows, rock fall or landslides. Portions of the communities and/or facilities are built on past debris flow fan deposits.

Recommendation: Further evaluation is needed to define site-specific threats to values and identify appropriate mitigations. Information sharing with County Emergency Management, communities, and property owners on needs for further evaluation or assessment. Facility closures, education, install hazard warning signs, utilize weather alert systems or monitoring.

### 2.1.3. POST-FIRE FLOODING, FLOATING DEBRIS, AND OTHERS

**Very High risk** to boaters and swimmers in the McKenzie River for floating woody debris and additional “strainers” (woody slightly below the water surface). Debris is already observed in river and volumes are expected to increase.

Recommendations: Signage at boat put-ins, outreach and education, communication and coordination with Marine Safety Board.

**Very High risk** to visitors and employees at Blue River Park (picnic shelter, play structure, picnic tables, sports fields and hiking trails) from rock fall and soil erosion from steep hillslopes; open vertical 4 foot diameter culvert (south of ball field - no increased risk due to fire); ballfield backstop is damaged; increased danger of rock fall along walking trail that follows left bank of Blue River. Also, potential for increased erosion and unstable streambanks along Blue River, but with streamflow regulated by dam probably not a major concern.

Recommendations: Maintain closure, mitigate hazard trees, signage for rock fall along trail. Signage for unstable banks along Blue River. Fill or remove vertical culvert.

**Very High risk** to people at Forest Glen Boat Landing from an open vault of an outhouse burned by fire.

Recommendations: Ensure outhouse is secure from entry.

**High risk** to residents along Gate Creek, adjacent to creek from flooding, debris flow, and erosion. High potential for increased peak flows and flood/debris flow to result in injury or loss of life and impact homes. Two or three homes that survived the fire may be in danger of flooding. Expect increased sediment load to McKenzie River. Bridge looks OK for passing high flows and debris.

Recommendations: Inform county Emergency Management, signage.

**High risk** to occupants in unburned homes along Gate Creek, Goodpasture road, and Simmonds Creek from hazard trees upslope of occupied structures; from sediment bulked flows impacting riverbanks, erosion, and property boundaries along creek. Some unburned homes remain near the outlet of the confined Gate Creek drainage. Egress for people occupying unburned structures may be trapped by hazard trees during sediment or debris-laden flows during major storm events

Recommendations: Inform of property owner of threats elevating the risks.

## 2.2. Property Summary

**Very High risk** to Blue River Road and loss of access from bridge failure, specifically in Simmonds Creek vicinity. Bridge failure or damage will also impact life and safety of community. Increased



runoff, erosion and debris flows from high to moderate SBS flood source area and existing debris in channel is likely to damage bridge footings. Blue River Road, MP 0.45. See Appendix A for Road Treatment Cost Estimates.

Recommendations: Excavate floatable debris upgradient of bridge. Storm inspection and response.

**Very High risk** to stream crossing on Angels Flight Road from increased runoff, erosion, and debris flows, and pond holding back water upstream of culvert. Moderate SBS upstream of small dam ponding water upgradient of culvert. Debris dam could plug 18-inch culvert, washing out the road. Angels Flight Road: 44° 8'46.75" N; 122° 36'17.33" W. See Appendix A for Road Treatment Cost Estimates.

Recommendations: Remove the dam up-gradient of culvert and replace wooden dam retaining wall structure.

**Very High risk** to stream crossing on North Gate Creek Road from increased runoff, erosion and debris flows. Travel route is a rural minor collector for residents. Moderate SBS in flood source area upstream culvert, located at bottom of steep slope where debris dam could plug 18-inch culvert and wash out the road prism. North Gate Creek Road: 44° 8'56.18" N; 122° 32'51.96" W. See Appendix A for Road Treatment Cost Estimates.

Recommendations: Replace crossing using higher capacity culvert. Clean inlet and monitor during storm events.

- Storm Proofing. Clean/pull ditches, clean stream crossing culvert inlets/outlets and relief culverts, run out ditches and catchment basins of sediment, debris and rock. Out slope the road prism where appropriate. Replace or repair damaged culverts pending the need of primary maintainers. Slotted riser pipes or culvert end sections could be installed where feasible and appropriate to reduce the potential for sediment and debris plugging of existing culverts.
- Storm Inspection and Response. Monitor road drainage structures and debris flow treatment structures after significant storm events to ensure the maximum drainage capacity is maintained until the natural revegetation of the burned area has occurred. Maintain and/or repair any damage to road surfaces.

**Very High risk** to **42-inch culvert at stream crossing of Goodpasture Road** from increased runoff, erosion and debris flows. Travel route is a rural minor collector for residents. Moderate SBS in flood source area, culvert located at bottom of steep slope with large volume of existing debris in channel upstream of crossing. Goodpasture Road: 44° 7' 45.15" N; 122° 30' 17.25" W. See Appendix A for Road Treatment Cost Estimates.

Recommendations: Construct debris rack up-gradient of both culverts. Clean inlet and monitor during storm events.

**Very High risk** for damage to **McKenzie Highway near Finn Rock** from sediment and debris deposition into ditches and to road surfaces. Steep slopes and low post-fire ground cover increase potential for sediment mobilization, in possibly substantial amounts. Highway is a main access route with heavy traffic, and damage would likely be substantial and result in temporary loss of use. Without treatment, the highway would be impacted, increasing risk to human life and safety if the route is needed for emergency egress. See Appendix A for Road Treatment Cost Estimates.

Recommendations: Establish vegetation, erosion control matting to stabilize slope.

**High risk** to property and infrastructure at Lazy Dayz Mobile Home Park, Lucky Boy Road, McKenzie K-12 School in Blue River, Old Scout Road, OR-126, Rough Creek and Rail Creek, Shepard's Landing and McMullen's Landing, Simmons Creek - Blue River Bridge, Town of Blue River, Town of Nimrod, and Town of Vida from debris flows, rock fall or landslides. Portions of the communities and/or facilities are built on past debris flow fan deposits.

Recommendation: Further evaluation is needed to define site-specific threats to values and identify appropriate mitigations. Information sharing with County Emergency Management, communities, and property owners on needs for further evaluation or assessment. Facility closures, education, install hazard warning signs, utilize weather alert systems or monitoring.

**High risk** for damage to **road prism and stormwater management infrastructure on North Gate Creek Road, Blue River Drive, and Goodpasture Road** from increased runoff, erosion and debris flows. Travel route is a rural minor collector for residents. (North Gate Creek Road, MP 0.0 - 2.42; Blue River Drive, MP 0.0 - 1.55; Goodpasture Road MP 0.0 - 5.03) See Appendix A for Road Treatment Cost Estimates.

Recommendations: Clean ditches, remove debris from hazard tree mitigation work. Monitor during storm events.

**High risk** to **Simmonds Creek county bridge (and residential property)** from flooding and debris flows. Extensive burn of the watershed and expected increase in peak flow and delivery of debris. Bridge opening may not be adequate to pass large debris, potential temporary loss of access without complete loss of infrastructure. No structure burned but looks like drain field was being installed for a new house. Depending on where the future building is placed, it might be impacted by flooding. See Appendix A for Road Treatment Cost Estimates.

Recommendations: Channel clearing, storm patrol, information sharing with USACE and Lane County Emergency Management, and inform upstream residents.

**High risk** from flooding and debris over-whelming an **18-inch culvert on unnamed drainage on Leashore Drive near Vida (lat. 44.148812, long -122.557092)**. Culvert is already partially blocked by vegetation and burned debris. Low traffic volume but single access for homes farther up road. Undersized culvert may repeatedly clog with debris and form a small impoundment. Directly upstream of crossing is a residential property with an exposed bank that may erode and fail delivering material to culvert; streambank failure not likely to impact the physical integrity of the structure. Downstream of crossing is another residential property with similar streambank concerns. See [Appendix A](#) for Road Treatment Cost Estimates.

Recommendations: Clear culvert opening, and storm patrol as needed to clear debris and provide functionality of crossing. Information sharing with Lane County Emergency Management and inform upstream residents.

**High risk** to **Marten Creek bridge on Goodpasture road** from debris flows and accumulation of large woody debris. Bridge deck may not be high enough for passage of large woody debris. High percent of burned area in watershed upstream from crossing, estimated considerable peak flow increase and debris flow probability. Low traffic volume but single access to homes farther up road. See [Appendix A](#) for Road Treatment Cost Estimates.

Recommendations: Clear channel and storm patrol as needed to clear debris and provide functionality of crossing. Information sharing with Lane County Emergency Management and inform upstream residents.

## Resources for private landowners

The Natural Resources Conservation Service (NRCS) provides information about actions that can be taken on your private property. Please see [this list of fact sheets \(click here\)](#) for details of different treatment options that can be taken to combat erosion risks.

**High risk** to **private homes and access road/bridge along Gate Creek and tributaries** from flooding, debris flows and erosion. Analysis indicates considerable increases in post-fire peak flows with the potential for flooding or debris flows to impact two or three homes that survived the fire. Hazard trees are also a threat. Expect increased sediment and debris delivery to McKenzie River. Bridge appears to be located to sufficiently pass high flows and debris.

Recommendations: Inform private landowners. Install hazard warning signs communicating hazards. Hazard tree mitigation to remove downed wood (potentially mobilized debris).

**High risk** to **private homes along Goodpasture Road** from sediment bulked flows impacting riverbanks and erosion of property boundaries along creek. Some unburned homes remain near the outlet of the confined Gate Creek drainage. Unburned structures may be damaged by hazard trees or sediment and debris flows during major storm events.

Recommendations: Inform private landowners. Install hazard warning signs communicating hazards. Hazard tree mitigation to remove downed wood (potentially mobilized debris).

**High risk** to **private homes along Simmonds Creek** from sediment bulked flows impacting riverbanks and erosion of property boundaries along creek. Some unburned homes remain near the outlet of Simmonds Creek. Unburned structures may be damaged by hazard trees or sediment and debris flows during major storm events.

Recommendations: Inform private landowners. Install hazard warning signs communicating hazards. Hazard tree mitigation to remove downed wood (potentially mobilized debris).

**Intermediate risk** for damage to **road prism and stormwater management infrastructure on Blue River Road, Angels Flight Road, Elk Creek Road, North Gate Road, and Goodpasture Road** from increased runoff, erosion and debris flows. See [Appendix A](#) for Road Treatment Cost Estimates.



Recommendations: Clean ditches and culvert inlets, remove debris from hazard tree mitigation work. Storm inspection and response.

- Blue River Road, MP 0.0 - 1.64;
- Angels Flight Road, MP 0.0 - 1.79;
- Elk Creek Road: 12-inch culvert at 44°9'15.77" N; 122°21'48.43" W;
- North Gate Creek Road: 30-inch culvert at 44°8'56.95" N; 122°33'25.58" W;
- Goodpasture Road: 156-inch culvert at 44°8'2.66" N; 122°33'23.54" W

**Intermediate risk** for damage to **road prism on North Gate Road** from increased runoff, erosion and debris flows. Travel route is a rural minor collector for residents. Moderate SBS in flood source area can potentially impact 36-inch culvert. Goodpasture Road: 44°8'23.65" N; 122°34'45.52" W. See [Appendix A](#) for Road Treatment Cost Estimates.

Recommendations: Construct debris rack up-gradient of both culverts. Clean inlet and monitor during storm events.

**Intermediate risk** to **Highway 126 bridge at mouth of Bear Creek** from flooding, debris flows and erosion. The upstream watershed is extensively burned, has high tree mortality and there are expected increases in post-fire peak flow. Currently the bridge structure is not likely compromised from debris impacts. Upstream of the bridge, the channel has over-steepened banks that may slump into creek and incorporate additional debris. Bridge deck may not be high enough to pass large woody debris. All residential properties nearby are burned. Some home debris may wash into creek from flooding and/or overland flow. See [Appendix A](#) for Road Treatment Cost Estimates.

Recommendations: Clear channel and storm patrol as needed to clear debris and provide functionality of crossing. Information sharing with Lane County Emergency Management and inform upstream residents.

**Intermediate risk** to **property at McKenzie Fire & Rescue Station 16-5 (Nimrod, Local Community)** from debris flows, rock fall or landslides. Fire station located downslope of low debris flow hazard where the channel bends in the deposition zone. If debris flow is significant enough, it can avulse channel and deposit material at fire station.

Recommendation: Further evaluation is needed to define site-specific threats to values and identify appropriate mitigations. Information sharing with County Emergency Management, communities, and property owners on needs for further evaluation or assessment. Facility closures, education, install hazard warning signs, utilize weather alert systems or monitoring.

**Intermediate risk** to **roads at the mouth of Rough Creek, water diversion infrastructure and the Highway 126 bridge** from flooding, debris flow, and erosion. Very small contributing watershed with undersized box culvert may not pass flood flows and debris. High potential for nuisance flooding and sediment across road, no expected loss of crossing structure. Diversion headgate and a couple footbridges upstream were damaged by fire and may be further damaged by flooding. A residential property burned; some home debris may wash into creek due to flooding and/or overland flow. See [Appendix A](#) for Road Treatment Cost Estimates.

Recommendations: Clear channel and storm patrol as needed to clear debris and provide functionality of crossing. Information sharing with Lane County Emergency Management and inform upstream residents. For protection of water intakes, increase frequency of inspection and debris removal, and outreach to the public on water usage should the increased loading of sediment and debris require a temporary shutdown. For water intakes at Old McKenzie Fish Hatchery County Park and EWEB-Hayden bridge locations, monitor for damaged infrastructure and clear outlet prior to and after storms. Increased awareness by informing inform stakeholders and private landowners of potential threats and recommended mitigations.

**Intermediate risk** to **McKenzie Elementary School** from falling hazard trees and rolling debris striking the property. Hazard trees adjacent to the structures and on hillslopes would result in property damage. Elementary school is above adjacent stream floodplains, no threat from flooding.

Recommendations: Inform private landowners. Install hazard warning signs communicating post-fire threats. Remove standing dead trees, chip material and apply to soil as mulch. Re-establish native trees in immediate area and on surrounding hillslopes.

**Intermediate risk** to **residential property near the mouth of Cone Creek** from flooding and debris flows. Extensive burned area in upstream watershed with expected increased peak flows and high debris flow potential; evidence of prior debris flows. Residential property survived fire but may be in danger from flooding and debris flow. Owner remarked that flood insurance has been purchased.

Recommendations: Remove existing debris from channel likely to be mobilized by flooding.

**Low risk** for damage to **road prism and stormwater management infrastructure on Elk Creek Road, Leashore Drive, and Elk Rock Place** from increased runoff and erosion. See [Appendix A](#) for Road Treatment Cost Estimates.

Recommendations: Clean ditches of hazard tree removal debris and monitor during storm events.

- Elk Creek Road, MP 0.0 - 0.378.
- Leashore Drive, MP 0.0 - 0.44.
- Elk Rock Place, MP 0.0 - 0.25.

**Low risk** to **county access road to Blue River Dam** from increased potential for rock fall from extremely steep slopes (over 60% grade). Very low traffic volume, moving objects. See [Appendix A](#) for Road Treatment Cost Estimates.

Recommendations: General clearing of road, signage, road storm proofing and storm patrol.

**Low risk** to **Hatchery Creek water intake for Old McKenzie Fish Hatchery County Park** from hazard trees, flooding and debris flows. Water intake and piping delivers water to impoundments for fish rearing. Minor infrastructure damage expected from adjacent slopes having mixed low and unburned SBS. Access trail has hazard trees.

Recommendations: For protection of water intakes, increase frequency of inspection and debris removal, and outreach to the public on water usage should the increased loading of sediment and debris require a temporary shutdown. For water intakes at Old McKenzie Fish Hatchery County Park and EWEB-Hayden bridge locations, monitor for damaged infrastructure and clear outlet prior to and after storms. Increased awareness by informing inform stakeholders and private landowners of potential threats and recommended mitigations. Remove and cap intake prior to damaging storm. Mitigate hazard trees.

**Low risk** to **Blue River Dam at mouth of Quartz Creek** from increases in sediment and debris and rock fall and erosion. Analysis indicates erosion and sedimentation, but not expected to compromise sediment structure above Blue River Lake. Two bridges that cross the creek appear adequate to pass flood flows and debris. Adjacent slopes have existing rock fall (small rock and low volume). Fence to catch falling rock above service road is damaged or at capacity in many places. Fencing above emergency spillway has failed in several spots.

Recommendations: Information sharing with USACE on post-fire watershed conditions and sediment delivery. USACE is also concerned about sediment delivery to McKenzie River and potential impacts to Leaburg Dam. While there is potential for increased sediment delivery there are limited options for mitigation. Post hazard warning signs. Repair and maintain current rock safety structure.

**Low risk** to **McKenzie Schools at Blue River** from erosion off burned, steep slopes. Steep slopes on the north side of the school property may experience increased erosion, but minimal indications for rock fall.

Recommendations: Information sharing with County Emergency Management and school district. Green-up is already occurring. Storm-proofing and storm patrol to Elk Creek Road above the school and encourage natural recovery.

**Low risk** to property at Ben and Kay Doris State Park, H.J. Morton Memorial Park, Marten Rapids and Thomson Parks, Blue River Community Park, Forest Glen County Park, Gates Creek at Vida, McKenzie Fire & Rescue Station 16-4, School in Vida (K-12), Blue River Dam, Blue River Reservoir, Cougar Dam and Facilities, Cougar Dam Electric Transmission, Leaburg Hatchery, Leaburg Reservoir, Transmission Lines along Lucky Dog Road, Transmission Lines along OR126, Leaburg Dam, and Quartz Creek from debris flows, rock fall or landslides. Portions of the communities and/or facilities are built on past debris flow fan deposits.

Recommendation: Further evaluation is needed to define site-specific threats to values and identify appropriate mitigations. Information sharing with County Emergency Management, communities, and property owners on needs for further evaluation or assessment. Facility closures, education, install hazard warning signs, utilize weather alert systems or monitoring.

**Low risk** to **Old McKenzie Fish Hatchery** from erosion and sediment deposition onto the hatchery site. There is a terrace between the hatchery and upslope burned area that is expected to intercept eroded material. If sediment did reach the structure, it may result in property damage.

No treatment recommended.

**Very Low risk** to **Leaburg Hydropower Canal** from sedimentation. Cogswell Creek flows into the canal between Hwy 126 crossing and Leaburg Dam. Minor amount of watershed burned, there is potential

for some sediment and debris being washed into the canal. Otherwise, moderately steep slopes with low SBS adjacent to canal have residual vegetation to buffer overland flow and sediment delivery.

No treatment recommended.

**Very Low risk** for **damage to road prism and stormwater management infrastructure on Leaburg Dam Road** from increased runoff and erosion. Travel route is a local residential road. Low SBS in flood source area is unlikely to result in impacts to road ditches and all driveway culverts along entire length of road. Leaburg Dam Road, MP 0.0 - 0.82. See [Appendix A](#) for Road Treatment Cost Estimates.

Recommendations: Clean ditches of hazard tree removal debris and monitor during storm events.

**Very low risk** to **county roads along Upper Calapooia River** from flooding. Source area is relatively small with mix of low SBS and unburned land. Although considerable increases in post-fire peak flows are not expected, segments of the county road immediately adjacent to the river have an increased risk of damage from nuisance flooding. There is limited road infrastructure and low likelihood for total loss of access, all affected lands appear to be owned by Weyerhaeuser. See [Appendix A](#) for Road Treatment Cost Estimates.

Recommendations: Information sharing with Lane County Emergency Management and inform private landowners.

## 2.3. Soil and Water Summary

**High risk** to **soil productivity in the Deer Creek, Gate Creek, Trout Creek and Quartz Creek drainages** from accelerated erosion. High and moderate SBS on steep slopes increase potential for loss of topsoil. Ground cover in clear-cut areas may take longer than 2-5 years to establish and decrease longer term erosion.

Recommendations: Further evaluation is needed to define site-specific threats to values and identify appropriate mitigations. Apply mulch, preferably by chipping existing dead vegetation. Re-establish vegetation cover.



**Low risk** to **surface and ground water quality for domestic and municipal water supplies** from transport of burned debris or leaching of hazardous materials into source waters. Single structure (Indian Creek) likely for debris from burned home being transported downstream, debris field already extends down to the creek. Numerous wells and septic systems were burned over raising concerns for impacts to water quality in the immediate timeframe. Groundwater quality may be threatened burned debris and failed septic systems are not properly mitigated or decommissioned. McKenzie River is a municipal water supply for cities of Eugene, Springfield and other communities or properties along river. Increased concerns for water quality impacts from likely increases in sediment load cause by landslides, erosion and debris flows. EWEB has early warning water quality monitoring upstream of intakes. Assessment team visited EWEB intake at Hayden Bridge, noting the physical structure is unlikely to be impacted by increased flooding attributed to the fire.

Recommendations: Ongoing actions are mitigating the hazardous material threats. Information sharing with County Emergency Management, communities, and property owners. OWRD has a brochure on hazards associated with burned wells and how to address the potential effects.

## 2.4. Fish and Wildlife Habitat Summary

**Very High risk** to **T&E fisheries habitat** from water quality impairments (temperature). Loss of riparian shading leading to increased stream temperatures. A number of stream reaches experienced complete or partial loss of trees in riparian areas. This will result in increased solar radiation entering streams until vegetation regenerates. Temperature increases are likely to last multiple years (potentially 10+ years in high burn severity areas) thereby impacting several generations. In a number of locations, stream temperatures during summer were already close to the thermal tolerance limits for fish species. The actual magnitude will depend on future climatic conditions and pace of regeneration.

Recommendations: Work with partners to encourage natural regeneration and/or reforestation with mixed hardwood conifer.

**High risk** to **T&E fisheries habitat** from water quality impairments (contaminants) in McKenzie River near Mason Creek. Runoff incorporating hazardous wastes from burned buildings and vehicles poses risk to sensitive and aquatic species. A number of urban areas were subject to fire damage and are in proximity to waterways. Efforts to remove hazardous wastes are underway but in some instances surface runoff from rains has already occurred or will occur before wastes are removed. Environmentally persistent contaminants introduced to waterways may have multigenerational impacts. Other more transient chemicals will likely impact one to two generations within the area of exposure.

Recommendations: Work with partners to identify prioritize hazardous waste removal in proximity to waterways.

**Low risk to T&E fisheries habitat** from water quality impairments (turbidity). Runoff of ash and sediment represents a near-term threat to spawning success for salmonids and lamprey. A large portion of several watersheds containing spawning habitat for salmon, trout and lamprey was burned leaving significant ash deposits. Control measures will not be sufficient to prevent this from entering waterways during rain events. Some areas may experience increased redd failure, but likely there is sufficient alternate spawning habitat to sustain populations.

No treatment recommended.

**Low risk to T&E fisheries spawning, rearing and refugia habitat access** for ESA-listed species. Increased runoff resulting from lack of vegetative cover may result in higher peak flows leading to increased scour of redds and/or displacement of some species. Several watersheds experienced high levels of vegetative mortality at mid- to low elevations. Winter forecasts suggest a likelihood of wetter weather. This combination of conditions creates higher likelihood of significant rainstorm/runoff events with impacts are likely to be transient (affect 1-2 generations) and spatially heterogenous.

No treatment recommended.

#### **2.4.1. GENERAL FISH AND WILDLIFE RECOMMENDATIONS**

**Maintain or Restore Connectivity.** Work with partners to identify priorities and options for fish passage at stream crossing; implement aquatic organism passage options at culvert blockages or when replacing culverts. Given the scale of fires and the number of culverts on the landscape, it is likely some culverts were or will be impacted. Restoring passage allows fish to access suitable habitat or refugia if primary habitats are impacted by post-fire events.

**Large Woody Debris (LWD).** Work with partners to encourage salvage logging practices that retain LWD, to the extent practicable, for recruitment into stream channels. Locations are variable depending on extent of post-fire salvage logging within riparian zone. Many of the rivers and streams have historically low levels of LWD. Maintain standing or dead trees within riparian areas could potentially reset the system and provide substantial long-term benefits in terms of creating suitable habitat for aquatic and terrestrial species. As these trees enter streams and rivers, they create high quality habitat for salmonids.

**Riparian Shade.** Work with partners to identify artificial revegetation and/or natural regeneration practices that rapidly restore riparian shading. Locations are variable depending on burn severity and extent of active management. Many streams within the burn areas have summer temperatures close to thermal tolerance limits. Allowing a mix of hardwood/conifer in riparian areas promotes more rapid recovery of intermediate shading from hardwoods may be key to ensuring these streams remain suitable during summer in the near term.

**Keystone species.** Work with partners to identify alternative artificial revegetation and/or natural regeneration practices for long-term beaver habitat. Locations are variable depending on management goals. Promoting hardwood regeneration in riparian areas provides conditions for beaver to construct dams that benefit a range of aquatic species. Beaver are ecosystem engineers that create habitats for many aquatic species, including salmonids. To build dams, beavers require suitable plant materials (typically willow, alder etc.).

**Early Seral Habitat in East Lane Travel Management Area (TMA).** Work with partners on revegetation for forage and invasive plant management. Reseeding burned areas stabilize soil and decrease the likelihood for debris flows, provide valuable forage for deer and elk and reduce invasive plant species in areas of high vegetation mortality. ODFW is working with private landowners to reseed areas within the East Lane TMA to support soil stabilization and game forage. These areas are chosen because they had high vegetation mortality (91 - 100%) and are a high risk of debris flow.

## 2.5. Native Plant Communities Summary

**Very High risk** to **native plant communities and wildlife habitat** from expected invasive plant infestations in areas with 50-100% loss of basal area. There are expected widespread impacts to native plant communities across the fire without swift mitigation action. Immediately at risk are areas with exposed mineral soil and/or high vegetation mortality adjacent to established noxious weed infestations. Catastrophic, irreversible impacts to native plants communities are possible if ecosystem modifying weeds, such as false brome, aren't managed quickly near high SBS areas or travel corridors into such areas. False brome can expand 1,200% post-fire, and is currently very limited inside the burn area, often just as occasional roadside clumps (as observed in the Quartz Creek Road/Pond Road (NF-809) area). Areas with high vegetation mortality favor the introduction and expansion of harmful invasive plants as they are high in available nutrients and light penetration to forest floor. Weeds thrive in disturbed areas with little other vegetation present.

Recommendations: Early Detection, Rapid Response (EDRR) to survey and control priority invasive plant and noxious weed species, especially those along active forest roads and highways that could quickly spread quickly into severely burned areas. Quickly mitigate threat of priority weed species such as false brome and knapweed by surveying and treating all affected roadside populations, prioritizing those adjacent to high burn severity/veg mortality.

Mandate vehicle wash station to decontaminate equipment and prevent new introductions. Continue survey and monitoring 3-5 years to control target weed species.

**Very High risk** to **forestlands used for recreation and timber resources** from expected invasive plant infestations in areas with 50-100% loss of basal area. Forests are used extensively for recreation and timber harvesting. In areas with high vegetation mortality, introduction of invasive species is expected as trucks, vehicles, workers and recreation users access these areas. Irreversible impacts and alterations to forestlands are possible if ecosystem-modifying weeds such as false brome and spotted knapweed are not effectively treated. In addition to the threat of false brome, other species such as knapweed can also substantially alter the forest landscape. Spotted knapweed is known in the power corridor from Quartz Creek to NF-19 and could easily flourish in post-fire disturbance.

Recommendations: Early Detection Rapid Response (EDRR) to survey and control priority invasive plant and noxious weed species that could quickly spread into severely burned areas, especially along active roads and highways. Rapidly mitigate threats from priority weed species such as false brome and knapweed by surveying and treating all affected roadside populations. Mandate vehicle wash station to decontaminate equipment and prevent new introductions. Large populations of false brome exist beyond the eastward extent of burned area, hence the need for vehicle wash station. Continue survey and monitoring 3-5 years to control target weed species.

**Very High risk** to **H.J. Andrews Research Forest** from expansion of established nearby stand of false brome. The threat potential to the long-term ecological monitoring research forest is increased by fire suppression dozer lines and other suppression-related disturbances. While burn severity is low, disturbance from fire suppression operations is high as winds shifted to the east toward the research forest. HJA Research Forest is one of the original national Long-Term Ecological Research Stations managed cooperatively with OSU and Willamette National Forest. Introduction and spread of weeds could jeopardize continuation of 50-years of existing research.

Recommendations: Early Detection, Rapid Response (EDRR) to survey and control priority invasive plant and noxious weed species. Prevention (decontaminate equipment/personnel gear prior to entering site). Focus survey on suppression lines and known locations of false brome. Quickly contain any outbreaks. Survey and monitor for 5-10 years.

**Very High risk** to **sensitive plant populations, riparian habitats, floodplains, meadows, and botanical areas** from invasive plant populations and rare plant habitat displacement in areas with 50-100% loss of basal area. (See Botany Specialist Report for notes and maps identifying additional focus

locations.) Significant impacts are anticipated, especially when adjacent to known populations of noxious weeds, exposed mineral soil and increased light penetration to forest floor and riparian zones. Possible irreversible loss of natural habitat should invasive species displace rare plants and associated communities. Riparian habitats affected are particularly poised for threats from weeds as these areas often overlapped with not only high SBS, but also from residential development adjacent to the McKenzie River. Furthermore, segments of the McKenzie Highway closely abut these affected riparian habitats, exacerbating introduction and spread of noxious weeds. Knotweed was observed resprouting vigorously post-fire in an otherwise healthy floodplain near Vida.

Recommendations: Early Detection, Rapid Response (EDRR) to survey and control priority invasive plant and noxious weed species to protect sensitive habitats and T&E occurrences. Prevention (decontaminate equipment/personnel gear prior to entering site). Continue survey and monitoring 3-5 years and control target weeds. Focus should be on areas near sensitive plant populations, riparian habitats, floodplains, meadows and botanical areas in areas with 50-100% basal area loss with invasive plant populations nearby.

**Very High risk** to **native plant communities and wildlife habitat** from introductions of new invasive plants and/or spread of established local weed populations through fire suppression activities. Fire lines, vehicles and equipment were most certainly introducing and spreading new weeds as the fire spread quickly and vehicle wash protocols may have not been followed prior to fire management activities to protect life and property. Depending on the new weed species introduced, there could be substantial, permanent effects to native plant communities and dependent wildlife. Fire equipment from outside the region was brought in to fight unprecedented fires in Oregon. There is a very high likelihood of new weed introductions, including high priority species that may not previously been in the watershed prior to the fire.

Recommendations: Early Detection, Rapid Response (EDRR) to survey and control priority invasive plant and noxious weed species in areas of fire suppression activity. Survey fire suppression lines starting with the fire perimeter, especially where valued native plant communities warrant protection. Identify any new unfamiliar weeds and control as appropriate. Given variability in seed longevity, monitor for 3-5 years, if possible, but certainly in first two years.

**Very High risk** to **Blue River Conservation Easement (McKenzie River Trust)** from introduction and establishment of invasive plant species that threaten restoration efforts for native plant communities and instream salmonoid habitat. There has been considerable restoration investment in upper McKenzie Watershed, near the community of Blue River. A majority of the restoration site has 50-100% vegetation mortality. Invasive species are poised to significantly impact native plant and salmon recovery efforts with considerable, long-term effects. Adjacent road corridors, fire



suppression repair activities and known weed populations are all potential sources for weed introduction and spread.

Recommendations: Early Detection, Rapid Response (EDRR) to survey and control priority invasive plant and noxious weed species. Prevention (decontaminate equipment/personnel gear prior to entering site). Continue survey and monitoring 3-5 years to control target weed species.

**Very High risk** to **Finn Rock Reach (McKenzie River Trust)** from introduction and establishment of invasive plant species that threaten restoration efforts for native plant communities and instream salmonoid habitat. This location has significant restoration investment flanking both sides of the mainstem McKenzie River (South Fork). The area includes a public boat launch and is located adjacent to high voltage utility corridor infested with spotted knapweed. Quartz Creek bridge crosses the project area and serves as primary access point for private timberlands south of the McKenzie River. Adjacent forest roads have isolated patches of false brome that are well poised to rapidly spread into the heavily burned riparian restoration lands and associated floodplains.

Recommendations: Early Detection, Rapid Response (EDRR) to survey and control priority invasive plant and noxious weed species. Prevention (decontaminate equipment/personnel gear prior to entering site). Continue survey and monitoring 3-5 years to control target weed species.

**Very High risk** to **McKenzie School Restoration Site (McKenzie River Trust)** from introduction and establishment of invasive plant species that threaten restoration efforts for native plant communities and instream salmonoid habitat. There has been considerable restoration investment in upper McKenzie Watershed, downstream of Blue River Reservoir and near community of Blue River. A majority of the restoration site has 50-100% vegetation mortality. Invasive species are poised to significantly impact native plant and salmon recovery efforts with considerable, long-term effects. Adjacent road corridors, fire suppression repair activities and known weed populations are all potential sources for weed introduction and spread.

Recommendations: Early Detection, Rapid Response (EDRR) to survey and control priority invasive plant and noxious weed species. Prevention (decontaminate equipment/personnel gear prior to entering site). Continue survey and monitoring 3-5 years to control target weed species.

**Very High risk** to **forestland used for recreation and timber production** from new introductions and/or spread of established local weed populations through fire suppression activities. Fire lines, vehicles and equipment were most certainly introducing and spreading new weeds as the fire spread quickly and vehicle wash protocols may have not been followed prior to fire management activities to protect life and property. Fire equipment from outside the region was brought in to fight unprecedented fires in Oregon. There is a very high likelihood of new weed introductions, including high priority species that may not previously been in the watershed prior to the fire. Depending on the new weed introduced, there could be substantial effects to timber production and recreation uses in forestlands.

Recommendations: Early Detection, Rapid Response (EDRR) to survey and control priority invasive plant and noxious weed species in areas of fire suppression activity. Survey suppression lines starting with the fire perimeter, especially where they intersect valued forestlands. Identify new unfamiliar weeds and control as appropriate. Given variability in seed longevity, monitor for 3-5 years, if possible, but certainly in first two years.

**High risk** to **Pure Water Partnership (PWP) Sites, Lane County Parks and small private properties** from invasive plants. Sites are located along the McKenzie Corridor adjacent to known weed dispersal vectors. Invasive plant species threaten native plant restoration efforts on private properties replanted by PWP partnership. Replanting efforts are expected to have considerable long-term threats from invasive plant species. Properties are currently being assessed for enrollment. Replanting of 100 acres is expected the winter following fire. Prioritization process includes proximity to existing restoration, federal land or BAER sites with high erosion potential.

Recommendations: Early Detection, Rapid Response (EDRR) to survey and control priority invasive plant and noxious weed species. Prevention (decontaminate equipment/personnel gear prior to entering site). Continue survey and monitoring 3-5 years to control target weed species.

**High risk** to **native plant communities adjacent to roads** throughout fire from introductions and/or spread of established local weed populations through fire suppression activities (see Botany Specialist Report for notes and maps identifying additional focus locations). Fire lines, vehicles and equipment were most certainly introducing and spreading new weeds as the fire spread quickly and vehicle wash protocols may have not been followed prior to fire management activities to protect life and property. Weeds threaten sightlines, integrity, erosion, maintenance needs and longevity of forest roads. Quartz Creek and NF-809 are examples of roads that were used in fire suppression, located near known weed infestations (false brome and spotted knapweed) and service access to several miles of forest road corridor. Weed infestations from these locations are expected to spread easily via the road network to other susceptible locations.

Recommendations: Early Detection, Rapid Response (EDRR) to survey and control priority invasive plant and noxious weed species in areas that were used for fire suppression activity. Mandate vehicle wash stations to minimize weed transfer into and around road networks. Survey road networks, especially those that were used during fire suppression, as well as those near known populations of priority weeds.

**Intermediate risk to soil processes and hydrologic function** from increased weed pressure will negatively impact soil productivity and water quality (accelerated soil erosion and increased sediment delivery with impacts to water quality). There is expected increased weed presence post-fire, especially in moderate and greater SBS locations and riparian areas. Given severity of fire along the mainstem McKenzie River South Fork, soil & water quality resources will be impacted in the medium – to long term timeframes. Many weeds such as knotweed spread along waterways and exacerbate erosion, sedimentation and turbidity by offering few fibrous roots to support soil. These plants enter dormancy during high flow winter months when vegetation cover is most needed to intercept precipitation. Knotweed is known to occur in the mid to lower McKenzie River and can be transported during high water and flooding events.

Recommendations: Early Detection, Rapid Response (EDRR) to survey and control priority invasive plant and noxious weed species. Prevention (decontaminate equipment/personnel gear prior to entering site). Restore and revegetate valued areas where soil and water quality impacts from weeds are particularly concerning. Survey and monitoring 3-5 years to control target weed species.

**Intermediate risk to hiking trails and other trail routes** throughout burn area from invasive plant species. McKenzie River trails will likely receive increased visitor interest following fire, exacerbating current problem areas with plant seeds easily transported along them. Trails are considered areas of disturbance and are expected to be impacted by increased weed presence post-fire.

Recommendations: Early Detection, Rapid Response (EDRR) to survey and control priority invasive plant and noxious weed species. Prevention (decontaminate equipment/personnel gear prior to entering site). Install signage and boot brush stations. Continue survey and monitoring 3-5 years to control target weed species.

**Low risk to native plant communities and wildlife habitat** from new introductions and/or spread of established local weed populations through fire suppression activities. Fire lines, vehicles and equipment were most certainly introducing and spreading new weeds as the fire spread quickly and vehicle wash protocols may have not been followed prior to fire management activities to protect life

and property. Spotted knapweed is known in the power corridor from Quartz Creek to NF-19 and could easily flourish in post-fire disturbance. The burned area provides conditions for other opportunistic, quick growing weeds to establish, threatening safe conduction of electricity in high-power utility corridors.

Recommendations: Early Detection, Rapid Response (EDRR) to survey and control priority invasive plant and noxious weed species in areas that were used for fire suppression activity. Survey utility corridors where threats are expected from fire suppression activities or known weed populations.

## 2.6. Cultural Resources Summary

Cultural resources are non-renewable and can be adversely affected by post-fire erosion and related events, such as debris flows, tree falls, exposure of sites and artifacts to looting and displacement. In addition, proposed ETART treatments can also affect cultural resources and if federal funds are involved then S.106 consultation with Tribes and the Oregon SHPO must also be addressed. Under the ETART process, attempts were made to engage state and local cultural resource specialists to assist in determining critical values, risks and treatments, however no individuals were available to perform this work due to staffing and project workload factors in several state and federal agencies. In addition, the acquisition of GIS (feature data classes) from the Oregon SHPO for state and private lands in the fire area was not timely and thus fine-grained analysis of site locations as compared to moderate to high burn severity in the fire area could not be performed.

Given the lack of cultural resource personnel and completion of a critical values analysis, we recommend that FEMA, State and local agencies seek to acquire GIS data on archaeological and historic sites directly with Oregon SHPO and then apply the ETART process to determine the cultural resource critical values, perceived risks and propose treatments where the likelihood of success is greatest. What follows are some general guidelines for addressing values, risks and treatments.

Cultural resources reflect varying social, cultural, and scientific values to society at large and to specific cultural groups, such as area tribes. Cultural resources can be categorized into four broad types: pre-contact archaeological sites, historic archaeological sites, historic structures and traditional cultural properties/sacred sites. The fire area contains cultural resources spanning at least the last 10,000 years of time. These features include task-specific activity areas and camps such as sites of spiritual and cultural value to tribes, pre-contact lithic scatters, fishing stations, rock shelters, vision quest sites, historic trails, wagon roads and highways, historic mining and logging features and artifacts, historic structures, recreation and administrative sites.

In order to determine which cultural resources should be considered as “critical values” under ETART, a triage process is used to identify critical heritage values based on their listing or eligibility to the National Register of Historic Place, and scientific or cultural values. Not all cultural resource sites should be considered under the ETART process. Ideally a small group of specialists, including



representatives of interested tribes should prioritize the site inventory to reflect (in order of value) sites listed on the National Register of Historic Places (NHRP), sites determined as eligible to the (NRHP), and sites identified as having traditional cultural or spiritual values to tribes or other ethnic groups. Cultural resource sites that are designated as unevaluated are not automatically considered under ETART, unless their value is exceptional and would likely be easily determined eligible or listed on the NRHP.

Once the above critical values determination is made, a GIS analysis is used to identify their proximity to Moderate or High soil burn severity areas. The BAER risk matrix (Figure 6) is used to determine if stabilization treatments or other protection actions are warranted. Treatments range from point protection to prevent damage from erosion and/or debris flows, mulching or slash dispersal to cover exposed sites having a high likelihood of looting, directional felling of danger trees to prevent damage to archeological deposits or historic structures and treatment effectiveness monitoring. In addition, S.106 compliance is required for other recommended and federally funded ETART treatments that may affect cultural resources.

### **3. Monitoring and Management Recommendations**

Inform stakeholders of risks and advise on threat mitigation recommendations (e.g. engineering teams to inspect culverts and other road infrastructure) and storm alert systems. For hillslope stabilization there are multiple proven treatments effective against low degrees of hillslope erosion: mulching, slash spreading, erosion barriers, wattles, silt fences, debris deflectors, and protective fences.

#### **3.1. Watershed Response and Hydrologic Analysis - Monitoring Recommendations**

Modeling suggests that some watersheds affected by the Holiday Farm Fire will experience increased peak flows due to the extent and intensity of the fire. With this in mind, the team recommends installation of one or more near real-time (NRT) precipitation gages in or near the burn area. An NRT precipitation gage provides invaluable information about the localized intensity and amount of precipitation as it happens. Based on these data, the National Weather Service (NWS) can issue alerts to emergency managers, road crews and other partners to warn of increased potential for flooding and debris flows that could threaten lives or damage homes, roads other infrastructure. In addition to improving emergency response, expansion of the precipitation monitoring network would lead to a better understanding of how the amount and timing of runoff change due to fire in mountainous parts of the Pacific Northwest. At present, little information is available in this regard because large, intense fires have been relatively rare in this region.

Another recommendation is for additional stream gages be installed on watersheds within and adjacent to the burned areas. Gages currently exist on the Blue River, the McKenzie River and the South Fork of the McKenzie River, but the catchments measured by these gages were not

extensively burned. It would be beneficial to install new NRT stream gages on smaller, more extensively burned watersheds such as Gate Creek, Bear Creek and Simmonds Creek to provide the NWS and emergency managers with information about potential flooding and debris flows. Also, if gages on these watersheds can be paired with gages on nearby, less impacted watersheds, there's an opportunity to perform paired-watershed analyses to understand impacts of wildfires on hydrologic response. The paired-watershed method can be used to develop a runoff relationship between an experimental (burned) and a control (unburned) watershed. A better understanding of burned-watershed hydrology can assist with future evaluations of post-fire flood magnitude and hydrologic response in ungaged watersheds (Moody and Martin, 2001).

### **3.2. Geologic Hazards - Management Recommendations**

The finding in this report are from a rapid assessment of areas prone to geologic hazards. Most properties identified in this report were not fully assessed. A more complete assessment requires examining the on-the-ground characteristics of each property at risk. In some cases, this report points to high hazard areas that could benefit from "further evaluation", therefore, additional site-specific assessments are recommended. The results of a site-specific evaluation should address protecting homes from the impacts of large debris flows, which may necessitate additional design resources and consultation with engineers that is outside the scope of this evaluation. Engineered debris flow diverting structures were not evaluated by this report. These structures need to be surveyed and designed for specific areas based on site evaluation and criteria.

### **3.3. Roads and Travel Routes - Management Recommendations**

For locations where rock fall may occur, the recommendation is for signs to be posted and for thoroughfares to be cleared and maintained regularly. During storm inspection and response, channel clearing of debris that may be mobilized by flooding recommended at and immediately upstream of road crossings. If failure of a road crossing could result in residents being stranded, it's recommended that county emergency managers be made aware and that signs be posted to educate residents.

Storm Inspection and Response - Continue storm inspection and response until vegetation has reestablished in affected watersheds or for at least a total of two years.

### **3.4. Fish/Aquatic Habitat - Management Recommendations and Monitoring**

With respect to hazard tree mitigations, the primary objective is to ensure exclusion of employees and the public from these sites and to remove the hazard trees. Treatment of large wood is somewhat more complex because it is a beneficial, natural feature in streams. Add to this that many river reaches are difficult for heavy equipment (capable of removing the wood) to access. Thus, the treatment for wood in streams is a combination of good signage and education to warn boaters of the risks posed by large wood. Large wood in impoundments can more easily be treated by removing it, but signage is also important to warn boaters of the risks.

Near-term success in engaging partners can be monitored by number of projects on which engagement occurs. Over the mid- to longer-terms, success can be measured by habitat variables and populations metrics, such as LWD recruitment into stream channels and escapement of salmonids or population counts of terrestrial wildlife.

## 4. Holiday Farm ETART Members

### Holiday Farm ETART

Team Member	Resource	Agency
Michelle Delepine	Botany (Weeds)	West Multnomah Soil & Water Conservation District
Glenn Miller	Botany (Weeds)	Oregon Department of Agriculture
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Brandon Overstreet	Geologic Hazards	USDI Geological Survey
Rich Marvin	Hydrology	Oregon Water Resources Department
Ryan Andrews	Hydrology	Oregon Water Resources Department
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**ETART Resource Leads**

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Mary Young	Soils	USDA Forest Service
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Spencer Higginson	Hydrology	National Weather Service
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Kipp Klein	Engineering	USDA Forest Service
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**ETART Coordination Team**

Team Member	Agency
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Kelsey Madsen	FEMA
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Cara Farr	USDA Forest Service
Dave Callery	USDA Forest Service
Terry Hardy	USDA Forest Service

# Appendix A – Road Treatment Cost Estimates

**Storm Inspection and Response.** Following significant rainfall events, implement appropriate storm response to ensure the drainage infrastructure (bridges, culverts, ditches and cross-drains) are properly functioning to minimize road damage until the natural revegetation of the burned area has occurred. Deploy personnel with equipment to inspect and react as appropriate to: maintain and/or repair any damage to road surfaces; remove hazard trees or woody debris from roadside ditches and culvert inlet basins along affected length of priority roads; and monitor the movement of large woody debris, make a determination to remove material before it contacts bridge piers, abutments or culverts.

Determination of a significant rainfall event triggering storm response is in development with National Weather Service hydrologists. Storm predictions and watershed response parameters will provide guidance to cooperators on what level of event(s) are considered significant for flooding or to mobilize debris. This triggering event will likely adjust over time with post-storm event response to address road maintenance needs and monitoring of emerging concerns.

**Priority roads for Storm Response.** Blue River Road, Blue River Drive, Elk Creek Road, Eagle Rock Road & Eagle Rock Place, North Gate Creek Road, Goodpasture Road, Leashore Drive, Angels Flight Road and Leaburg Dam Road.

**Priority bridge & culverts for Storm Response.** Stream crossing treatments should be high priority because of high-value structures and potential loss of emergency access should the crossing fail.

## Blue River Road, Simmonds Creek Bridge (MP 0.45)

- Stage larger excavator to pull debris from channel as there is increased potential for damage to abutments and footings.

## North Gate Creek Road, 18-inch CMP cross-drain culvert (MP 1.65)

- It is highly advised the inlet basin for this crossing be cleaned frequently. A treatment alternative is to upsize the 18-inch culvert to a 24 or 36-inch culvert to handle the expected increases in water flow, sediment and debris.

**Goodpasture Road, 36-inch concrete culvert (MP 0.75) and 42-inch corrugated steel culvert (MP 5.00)**

- Both culverts have high risk for failure from increased flow and mobilized debris, with high consequences. A treatment alternative to construct a debris rack on the up-gradient side of both culverts should be considered.

**Leashore Drive, culvert (MP 0.42)**

- High risk for failure from increased flow and mobilized debris, with high consequences. It is advised the inlet basin for this crossing be monitored frequently and cleaned as needed.

**Angels Flight Road, 18-inch HDPE cross drain culvert (MP 0.49)**

- High risk for failure from increased flow and mobilized debris, with high consequences. It is recommended to remove the dam up-gradient of the culvert or to replace the wooden dam retaining wall. Investigation of ownership of the dam may be necessary prior to treatment.

**Cost Summary.** Lane County maintenance activities are not assessed in this cost estimate. Only proposed remediations such as culvert replacements are listed in the cost summary. If there is a culvert failure due to the fire impacts on a Lane County road, the cost estimates in Table 7 would be a similar cost of replacing any other culverts.

**Table 7. Road Treatments Cost Estimates – Holiday Farm Fire**

<b>North Gate Creek Road - Upsize Culvert (MP 1.65) Cost Summary</b>				
<b>Item</b>	<b>Unit</b>	<b>QTY</b>	<b>Unit Price</b>	<b>Total</b>
Mobilization	LS	1	\$1,683	\$2,000
Traffic Control	LS	1	\$6,300	\$6,300
Erosion Control	LS	1	\$500	\$500
General Excavation	CY	75	\$20	\$1,500
Embankment-In-Place	CY	55	\$25	\$1,375
36-inch Storm Sewer Pipe, 5 feet deep	FT	25	\$100	\$2,500
Aggregate Base	TON	20	\$15	\$300

Level 3, ½ Inch Dense ACP	TON	10	\$75	\$750
6-Inch Asphalt Concrete Pavement Repair	SY	30	\$10	\$300
Sub-Total				\$15,525
50% Contingency				\$7,763
Total				\$23,290

#### Goodpasture Rd – Debris Rack 36-in Culvert (MP 0.75) Cost Summary

Item	Unit	QTY	Unit Price	Total
Mobilization	LS	1	\$800	\$800
Traffic Control	LS	1	\$1,500	\$1,500
Erosion Control	LS	1	\$500	\$500
Heavy Trash Guard for 36-in Culvert	LS	1	\$1,320	\$1,320
Sub-Total				\$4,120
50% Contingency				\$2,060
Total				\$6,180

#### Goodpasture Rd – Debris Rack 42-in Culvert (MP 5.0) Cost Summary

Item	Unit	QTY	Unit Price	Total
Mobilization	LS	1	\$800	\$800
Traffic Control	LS	1	\$1,500	\$1,500
Erosion Control	LS	1	\$500	\$500
Heavy Trash Guard for 42-in Culvert	LS	1	\$1,800	\$1,800
Sub-Total				\$4,600
50% Contingency				\$2,300
Total				\$6,900

#### Angels Flight Rd – Dam Removal (MP 0.49) Cost Summary



Item	Unit	QTY	Unit Price	Total
Mobilization	LS	1	\$500	\$500
Traffic Control	LS	1	\$1,500	\$1,500
Erosion Control	LS	1	\$500	\$500
Excavation + operator	Hr	8	\$150	\$1,200
Sub-Total				\$4,000
50% Contingency				\$2,000
Total				\$6,000

## Appendix B – Supporting Botany Information

The analysis in the 2020 ETART Holiday Farm Botany report should serve as a starting place for addressing weed threats. Weed detection surveys and treatments should begin Spring 2021 and continue over the next 3-5 years, if resources are available. Surveys along roads should begin immediately where source populations and/or vector movement are a concern (i.e. arterial forest road networks). All roads used as fire lines should be surveyed at least once by August 2021 and repeated, if possible, for 3-5 years. If more resources become available, additional areas should also be identified for weed presence surveys and prioritized in the context of spatial relationship to critical resource values.

The Early Detection Rapid Response (EDRR) treatments are designed to protect sensitive native plant communities and supplement remaining native seed banks that promote native plant community recovery. The EDRR survey and treatment actions take into account known weed infestations, sensitive natural habitat types, rare plants, fire suppression lines and existing riparian restoration investments. This assessment identifies response actions to protect native plant communities by reducing the threat of weeds from fire disturbance, fire suppression operations and during post-fire recovery efforts. Cost estimates for implementing these treatments are in Table 8. It is critical to perform EDRR actions in the spring and fall of 2021 to prevent invasive plants from establishing in weed-free burned areas. Refer to the 2020 ETART Holiday Farm Botany Specialist Report for additional details on the invasive plant species and noxious weed threat analysis and treatments.

### ETART EDRR

Priority sites for initial survey and detection work are those within at least 50% basal area loss in proximity to the identified sensitive habitat types of concern and/or documented weed infestations. A total of 433 acres were flagged that met those parameters. These areas should be prioritized for survey efforts, ideally in both the spring and fall (at least the first year) and revisited annually during the mitigation period (3-5 years) as resources allow.

**Table 8. Cost Estimates for Invasive Plant and Noxious Weed Treatments - Holiday Farm Fire**

Treatment or Response Action	Units	Number	Estimated Unit Cost	Description of Cost
ETART EDRR (natural vegetation protection areas)	Acres	433	\$360/acre Spring Comb Spray  \$280/acre Fall Spot Spray  \$62/hr = Surveying and Monitoring	Spring 2021 and Fall 2021 EDRR surveys and treatment in natural vegetation protection areas that experienced moderate to high SBS and are adjacent to known weed populations.
ETART EDRR (roads and trails)	Miles	87	\$360/acre Spring Comb Spray  \$280/acre Fall Spot Spray  \$62/hr = Surveying and Monitoring	Spring 2021 and Fall 2021 Early detection rapid response surveys and treatment along roadsides and trails that experienced Mod/High severity burning and are adjacent to known weed populations.
ETART Suppression EDRR (suppression lines)	Miles (Acres)	56	\$360/acre Spring Comb Spray  \$280/acre Fall Spot Spray  \$62/hr = Surveying and Monitoring	Spring 2021 and Fall 2021 Early detection rapid response surveys and treatment on the dozer line, hand line and road completed line.

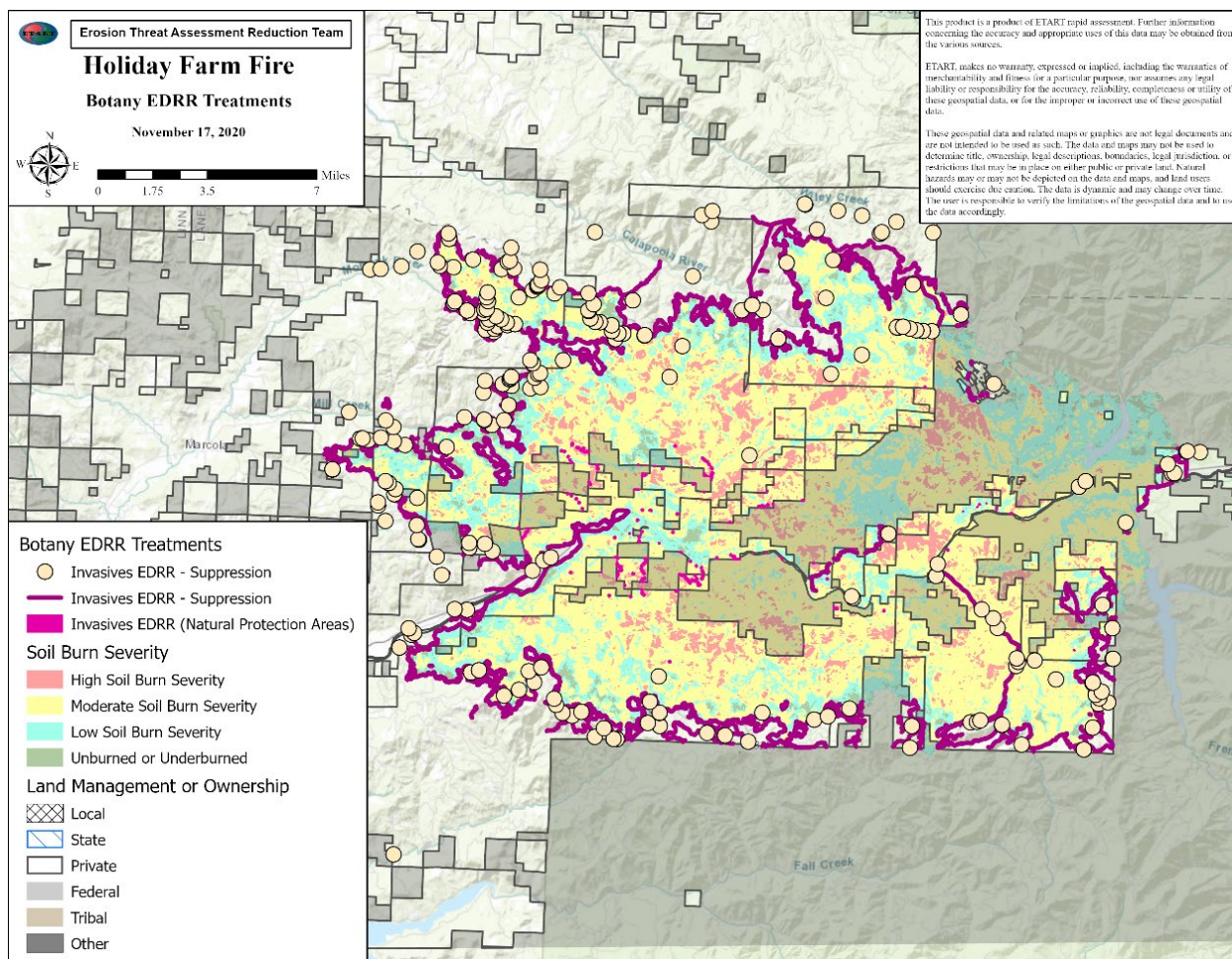
Treatment or Response Action	Units	Number	Estimated Unit Cost	Description of Cost
ETART Suppression EDRR (drop points)	Each	12	\$360/acre Spring Comb Spray  \$280/acre Fall Spot Spray  \$62/hr = Surveying and Monitoring	Spring 2021 and Fall 2021 Early detection rapid response surveys and treatment of drop points/staging areas. Acres unknown.
Weed Wash Stations for Equipment	Each	2	\$3,200/Station (recycled water)	Locate west and east on McKenzie River Highway prior to entering fire.
Weed Survey and Control Coordination	Month	6	\$62,477	ODA Noxious Weed Staff employee or local coordinator resource to direct and implement survey detection and evaluation.
Native Seed for suppression lines and drop points	Acre	70	\$140/acre	Blue Wildrye native seed (broadcast seeding at 14 lbs./acre).
Educational Signs	Each	10	\$500	Place in parks, at boat ramps and trailheads.
Boot Brushes	Each	20	\$300	Boot brush supplies and installation
Bare Root Plants	Each		\$1.00	As needed for future plantings.
Native Seed	Pound		\$10.00	As needed for future plantings.

## ETART Fire Suppression EDRR

All fire suppression lines should be assumed to be potential sources of new weed introductions and spread. Weeds thrive in disturbed areas with increased light availability such as fire lines. Equipment and personnel used for suppression efforts were mobilized from across a broad geography and due to the quick progression of the historic fire it should be inferred that many new weed seeds will be brought into these areas. The highest priorities are dozer lines along the fire perimeter, followed by affected roads (Table 9). In addition to suppression lines, activity points such as incident camps, equipment and personnel staging areas, helipads and safety zones should be surveyed for the presence of new weed introductions (Figure 8).

**Table 9. ETART EDRR Fire Suppression Treatments for Invasive Plant Species & Noxious Weeds – Holiday Farm Fire**

Fire Suppression Feature	Holiday Farm Fire (non-Federal Lands)		
	Private Industry Lands (miles)	Private Individual or Company (miles)	Total Miles
Completed Dozer Line	23	34	57
Completed Hand Line	10	22	32
Road as Completed Line	48	39	87
Road Repair	<1	2	2
Total Miles	82	97	178

**Figure 8. ETART Fire Suppression Treatments – Holiday Farm Fire**



**Prevent Spread of Existing Weed Infestations.** Numerous vectors capable of spreading existing weed infestations exist within the burned area of the Holiday Farm Fire. Both the McKenzie Highway (OR-126) and the McKenzie River run the length of the burned area from east to west. Several other well-known pathways also exist within the fire area, including public and private forest roads, trails and drainages. Furthermore, the widespread use of straw and seed in post-fire recovery efforts can easily lead to the unintended introduction of new weeds.

Recommendations include: mandate the use of vehicle wash stations for vehicles travelling into burned areas along forest roads; implement and enforce clean equipment, footwear and gear policies; ensure straw and seed mixes used in post-fire recovery come from reputable sources (use certified weed-free straw to the maximum extent possible); and only use seed that has documented weed analysis with values less than 0.5%.

**Control Known Noxious Weeds.** Both established and new introductions of weeds have potential for rapid expansion into moderate and severe SBS areas. Species such as false brome, herb Robert, spotted knapweed and knotweed are known within the burned area in limited distribution, but are well-poised to rapidly spread with increased soil nutrient and light availability, fire disturbance and increased vehicle traffic/vector potential. Additional, not yet detected species may be of even greater concern. Common species such as scotch broom, blackberry, ivy, herb Robert, foxglove, reed canarygrass, and several others also threaten the numerous Critical Values identified in this assessment.

Recommendations include control known populations of priority perennial or biennial noxious weeds such as false brome and herb Robert within the burn area as soon as temperatures start to warm to 50F in the early spring while many natives are either dormant or have yet to resprout from viable roots. Focus first on high traffic corridors such as boat ramps, trailheads and arterial forest roads. Timely attention should also be given to any new or threatening infestations near sensitive natural habitat protection areas such as oak, meadow, wetlands and T&E habitat as soon as possible once they have been observed.

**Survey High Risk Areas.** The newly burned areas are highly vulnerable to rapid establishment of noxious weeds and invasive, non-native plants. Add to the presence of fire suppression disturbances, it is clear that without prompt action, the potential for an explosion of invasive weeds on high and moderately SBS area is extremely high. This is especially a concern in locations near rare natural habitats and known weed presence.

Recommendations include rapid implementation of EDRR priority locations identified by GIS modelling and analysis. These areas have been prioritized due to their proximity to known weed locations (50 m buffer), potential to impact adjacent sensitive habitat types (i.e. “Natural Vegetation Protection Areas”) and presence within severe burn areas.

**Develop Public Awareness.** Resources do not exist to effectively monitor all potential areas for priority weed establishment. Fire and invasive plants do not adhere to property boundaries. Overlooked new infestations are likely to occur outside even the most comprehensive monitoring

strategy, especially when so many properties are held in different ownership. As these infestations grow, they threaten critical resource values elsewhere in the fire.

Recommendations include installing signage at popular informational community gathering hubs alerting and educating the public about the threats from invasive species. Posting threat awareness to local forums such as social media and newsletters (e.g. River Reflections). If funds are available, consider posting roadside signs at west and east entrances to burn area. Install boot brushes and invasive species signage at boat ramps and trailheads. Encourage reports be made to [OregonInvasivesHotline.org](https://OregonInvasivesHotline.org) and assign local weed management contacts to receive alerts when a community report is made.

**Revegetate to Promote Resiliency.** Restore and revegetate valued areas where soil and water quality impacts from weeds are particularly concerning. The post-fire landscape will continue to be favor the establishment of weeds for years following fire.

Successes with emergency mitigation efforts will be more effective in the long-term if susceptible areas with high vegetation mortality are revegetated quickly with suitable, competitive native plant material. Restoration will also improve soil and water quality. Given the rapid-fire progression it is likely that many understory plants will resprout from the roots, therefore account for the possibility of passive revegetation. Monitor, evaluate and perform maintenance as needed for desirable native vegetation to become established.

**Continue Survey and Monitoring Efforts.** For 3-5 years conduct follow-up monitoring of the survey and treatment programs to control target weeds. Evaluate efficiency, identify any gaps in the approach, modify and adapt management methods appropriately for desired outcomes and protection of critical resource values.