

Date of Report: 10/12/2022



Goat Rocks



Kalama

BURNED-AREA REPORT

Gifford-Pinchot National Forest

PART I - TYPE OF REQUEST**A. Type of Report**

- ☒ 1. Funding request for estimated emergency stabilization funds
- ☐ 2. No Treatment Recommendation

B. Type of Action

- ☒ 1. Initial Request (Best estimate of funds needed to complete eligible stabilization measures)
- ☐ 2. Interim Request #_____
- ☐ Updating the initial funding request based on more accurate site data or design analysis

PART II - BURNED-AREA DESCRIPTION

A. Fire Name: Goat Rocks
Kalama

B. Fire Number: WA-GPF-000743
WA-GPF-001028

C. State: Washington

D. County: Lewis
Cowlitz

E. Region: 06

F. Forest: Gifford Pinchot

G. District: Cowlitz Valley
Mount St Helens/Mt Adams

H. Fire Incident Job Code: P6P1U2
P6P1HY

I. Date Fire Started: 8/9/2022

J. Date Fire Contained: Estimated 10/31/2022
Estimated 10/31/2022

K. Suppression Cost: Goat Rocks ~\$15,000,000
Kalama ~\$5,000,000

L. Fire Suppression Damages Repaired with Suppression Funds (estimates):

- Fireline repaired (miles):** 0 miles repaired as of today
- Other (identify):** Road surface aggregate from fire suppression repair,.Place water bars and repair portions of multiple roads including cleaning ditches. Clean up supplies and garbage at drop points.

M. Watershed Numbers:

Table 1: Goat Rocks Acres Burned by Watershed as of 9/27

HUC #	Subwatershed Name	Total Acres	Acres Burned	Subwatershed Burned (%)
170800040104	Clear Fork Cowlitz River-Cowlitz River	38,792	1,666	4.3
170800040202	Coal Creek Cowlitz River	85,564	1,941	2.3

Table X : Kalama Acres Burned by Watershed as of 9/27.

HUC #	Subwatershed Name	Total Acres	Acres Burned	Subwatershed Burned (%)
170800030301	Headwaters Kalama River	24,723	432	1.8

N. Total Acres Burned:*Table 1: Total Acres Burned by Ownership.*

OWNERSHIP GIFFORD PINCHOT NFS	ACRES
GOAT ROCKS	4,029
KALAMA	432

- O. **Vegetation Types:** Goat Rocks: *Abies amabilis* (pacific silver fir) vegetation zone, and some of the lower elevation areas are within the *Tsuga heterophylla* (western hemlock) zone. The Goat Rocks Wilderness ranged from western hemlock zone in the lower areas, and Sister Rocks RNA and the higher elevations of the wilderness are dominated by pacific silver fir. Kalama; mixed conifer consisting of lodgepole pine in lower elevations to western hemlock and douglas fir in higher elevations.
- P. **Dominant Soils:** Goat Rocks and Kalama: Soils information derived from the Gifford Pinchot National Forest Soil Resource Inventory, GIS analysis, and Lidar analysis. Soils are derived from volcanic ash deposits and colluvial deposits from weathered bedrock of volcanic sediments, tuffs, and breccia. Steep hillslopes dominate the fire with over 90% of the burned area measuring greater than 30 percent slope. Potential for surface erosion is moderate when exposed to bare mineral soil except in the valley bottoms where erosion potential is slight.
- Q. **Geologic Types:** Goat Rocks and Kalama: Geologic history in the burned area (USGS Geologic Map i2005, 1993) is shown in volcanic flows of Tertiary andesites, basalts, and pyroclastic flows. More recent events are shown in Quaternary flows of andesite and basalt.

R. Miles of Stream Channels by Order or Class:*Table 2: Goat Rocks Miles of Stream Channels by Order or Class within fire perimeter*

STREAM TYPE	MILES OF STREAM
PERENNIAL	7
INTERMITTENT	12

Table 3: Kalama Miles of Stream Channels by Order or Class within fire perimeter

STREAM TYPE	MILES OF STREAM
PERENNIAL	0
INTERMITTENT	2

S. Transportation System:

Trails (within fire perimeter): *National Forest (miles):* Goat Rocks 4 Kalama: 1.0
Roads (within fire perimeter): *National Forest (miles):* Goat Rocks 7 Kalama 2

PART III - WATERSHED CONDITION**A. Burn Severity (acres):**

Table 4: Burn Severity Acres by Ownership. Acres were calculated based on 9/24 fire perimeter and BARC image. Both fires increased in size after analysis.

Soil Burn Severity	GPNF Goat Rocks	GPNF Kalama	State	Private
Unburned/ Very Low	617	105	0	0
Low	2,127	169	0	0
Moderate	719	25	0	0
High	144	2	0	0
Total	3,608	352	0	0

Figure 1. Soil Burn Severity of Goat Rocks Fire

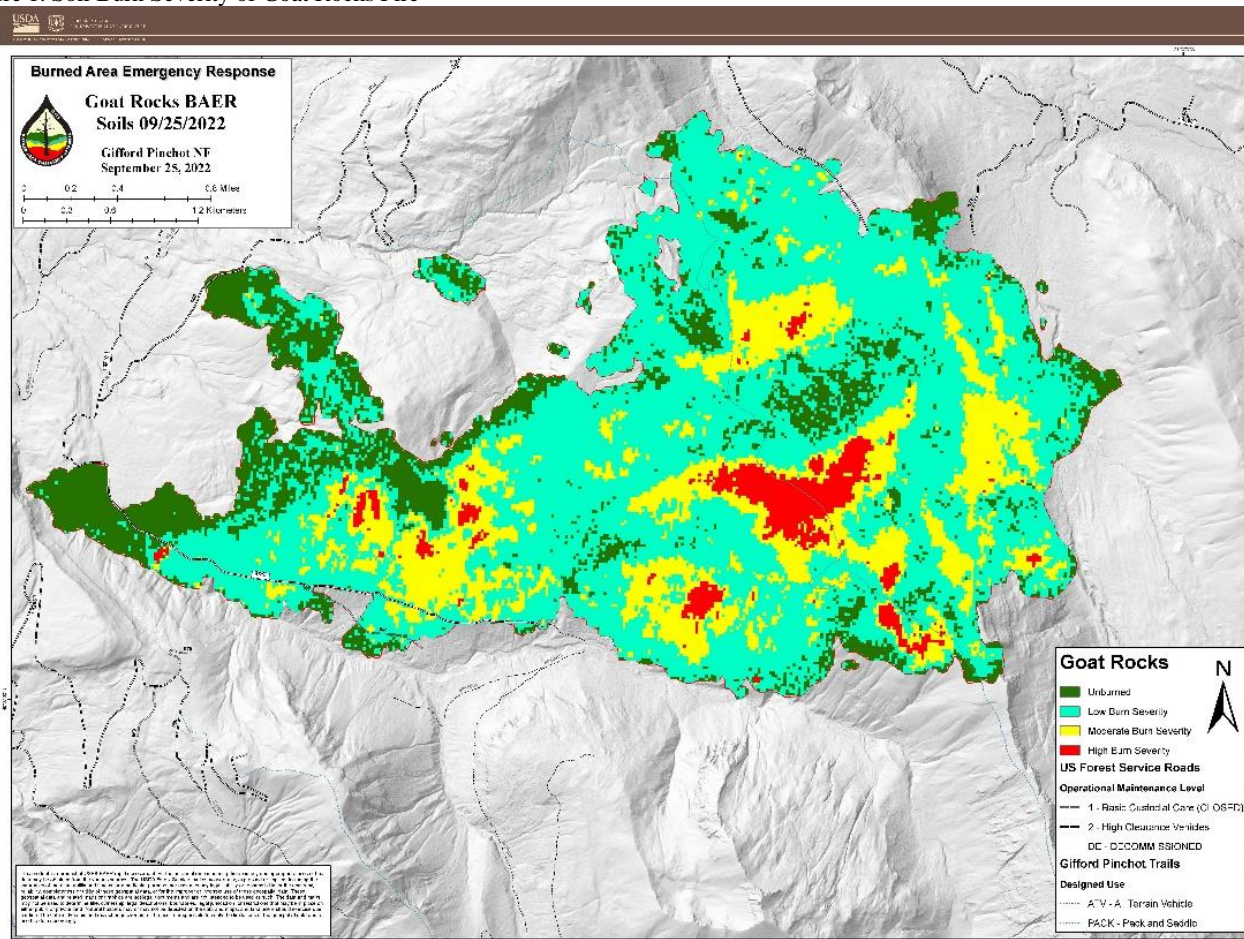
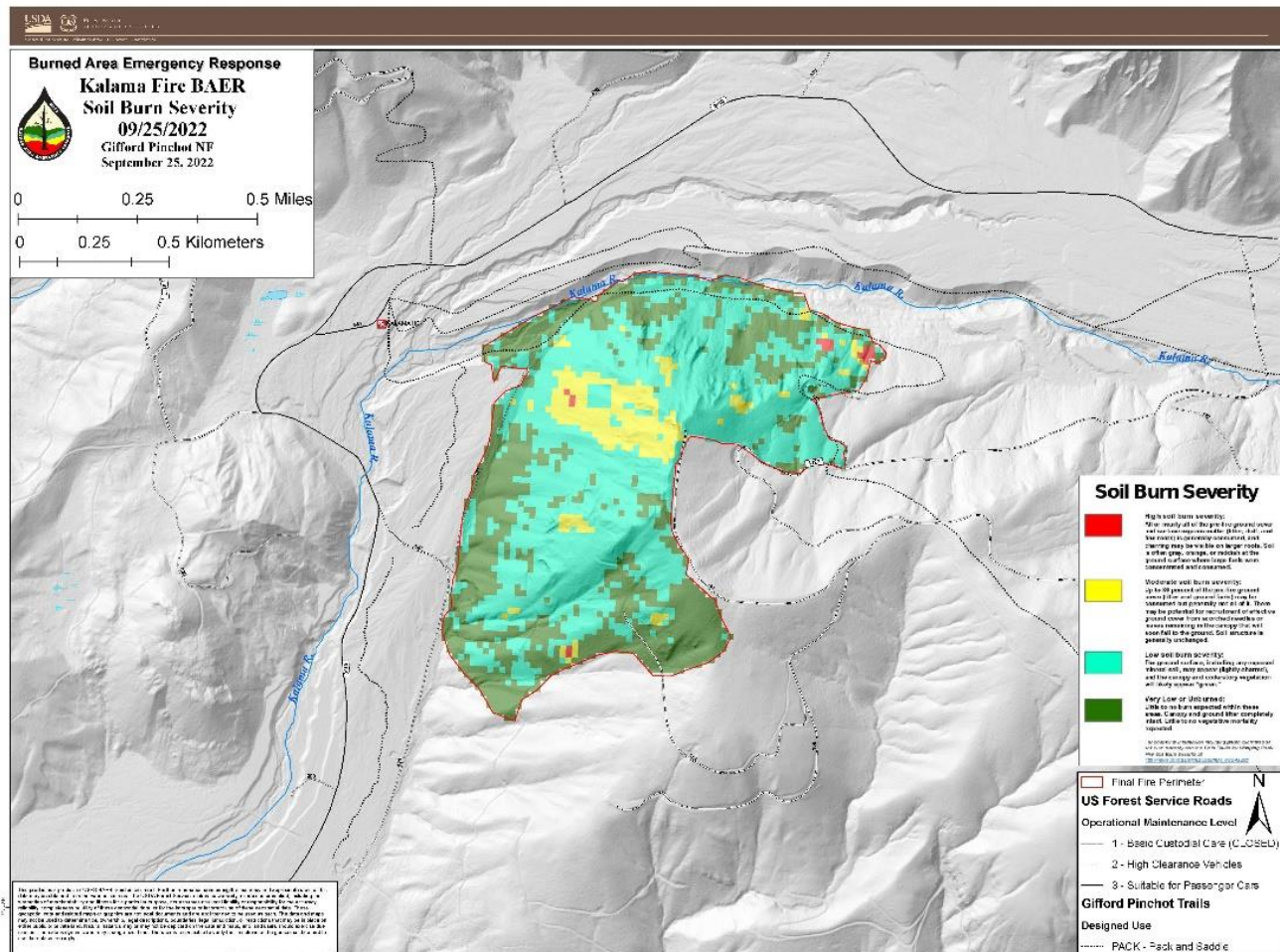


Figure 2. Soils Burn Severity of Kalama Fire



B. Water-Repellent Soil (acres): assuming on high SBS had water-repellent soils

Goat Rocks: 39

Kalama: 2

C. **Soil Erosion Hazard Rating:** 90% of the soils Goat Rocks Burn area has Moderate Erosion Hazard Rating, the remaining 10% is slight. Kalama determined no rating needed.

D. **Erosion Potential:** Goat Rocks: 1.67 (tons/ac). Kalama: determined no modeling needed.

E. **Sediment Potential:** Goat Rocks: 106.88 yrd³/mi². Kalama: determined no modeling needed.

F. **Estimated Vegetative Recovery Period (years):** 5-10 years for both Goat Rocks and Kalama fires

G. **Estimated Hydrologic Response (brief description):**

Kalama: Determined no modeling was needed.

Goat Rocks:

The 5-year peak flow was selected as the design storm of interest (aka the Q₅). The design storm for the 5-year event was 24 hours with 5.5 inches of rain, based on NOAA Atlas 2. This storm represents a sustained precipitation event, with periods of high intensity, which can occur as a result of atmospheric river events.

The 5-year storm was selected for a variety of reasons 1) The probability of a 5-year storm event occurring in the first 3 years post-fire is approximately 48.8%. This makes it a 'Possible' event under the probability of occurrence in the risk assessment matrix; 2) local watershed experts expect a 2-5 year event to have heightened sensitivity to changes in the

post-fire landscape. In an area with naturally steep slopes and inherent instability, storm events with a 10-year recurrence interval (or greater) could pose risk to flood flows, debris flows, and impaired water quality even in the absence of a burned environment; 3) the 5-year storm was selected over the 2-year storm due to a higher likelihood of la Nina in the winter of 2022-2023. La Nina winters are associated with wetter winters and greater probability of atmospheric river events. This makes it a 'Likely' event under the probability of occurrence.

Six pour points were modeled to assess fire impacts on peak streamflows. All of the pour points except Coal at Lost and Coal unnamed tributary were modeled to assess potential impacts to infrastructure. Coal at Lost and Coal unnamed tributary were modeled to assess the high range of fire impacts on peak streamflows.

Figure 3. Proportional increases in peak streamflow

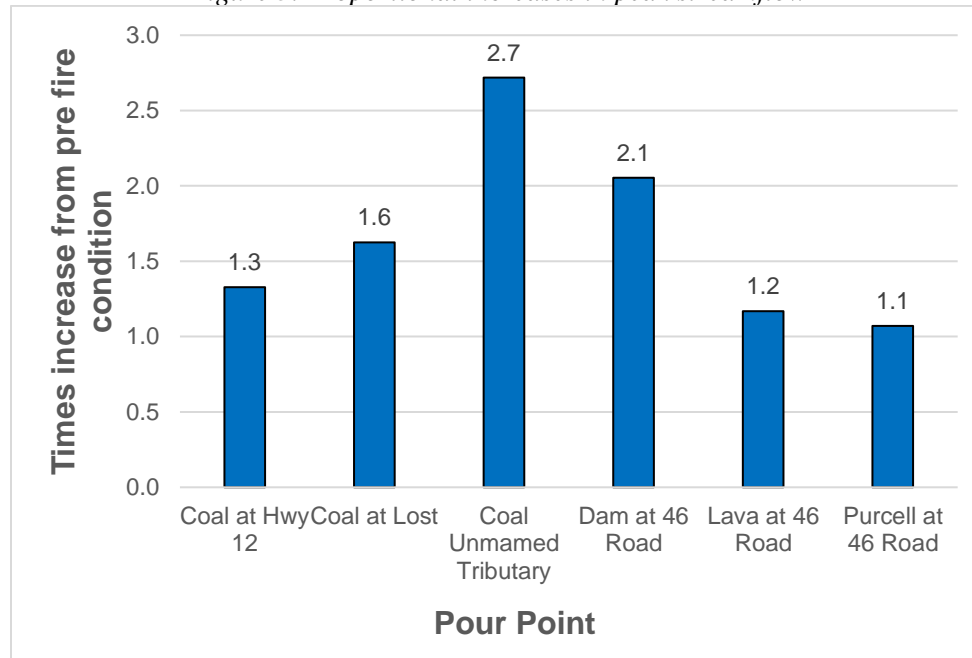


Table 6. Peak streamflow estimates from Wildcat5

Pour Point	Acres	Pre-Fire Discharge (cfs)	Post-Fire Discharge (cfs)	Times Increase
Coal at Hwy 12	6,593	755	1002	1.3
Coal at Lost	3,008	368	599	1.6
Coal Unnamed Tributary	784	103	279	2.7
Dam at 46	1,454	181	372	2.1
Lava at 46	2,291	278	325	1.2
Purcell at 46	1,354	170	182	1.1

PART V - SUMMARY OF ANALYSIS

Introduction/Background

A. Describe Critical Values/Resources and Threats (narrative):

A comprehensive list of potential values at risk within or directly downstream of the Goat Rocks and Kalama burned areas were compiled through consultation with local management and resource specialists and through BAER Team on the ground assessment. Following guidance in Interim Directive 2520- 2020-1, the BAER assessment team evaluated this list of values through field assessment and subsequent analysis to identify the critical values (FSM 2523.1 – Exhibit 01) that may be treated under the BAER program (See project file for BAER Critical Values). The critical values were then assigned a level of risk defined by the probability of damage or loss coupled with the magnitude of consequences

using the risk assessment matrix (FSM 2523.1 – Exhibit 02). The critical values with unacceptable risks signify a burned-area emergency exists. The characterization of the probability of damage or loss is based on the watershed response analysis completed by the BAER Assessment. Critical values having a “Very High” or “High” risk rating include recommended emergency stabilization actions known to mitigate potential threats or minimize expected damage, which are described below. “Intermediate” risk areas were identified and discussed with the recommended treatment consisting of coordination with local, state, and other federal cooperators. Additionally critical warning signs are recommended in some areas with an intermediate risk. Treatments with an intermediate risk focus on life and safety. No treatments were identified for values when the analysis resulted in a “low” or “very low” risk rating.

Table 7: Critical Value Matrix

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

Table 8. Goat Rocks BAER Critical Values and Recommended Treatment

Life/ Property/ Resources	Critical Value	Threat to Value	Probability of Damage or Loss	Magnitude of Consequence	Rationale	Risk	Treatment Options Considered	Recommended Treatment
Property - Roads	4600000	Increased flow causing road prism and drainage structure failures	Likely	Major	MP 4.9 Dam Cr Culvert. Large portion of Dam Creek drainage Low to High burn severity, evidence of previous overtopping, deposition, existing culvert damage, culvert inlet skewed to stream, deep 30ft-fill on Dam Creek, and lots of debris readily moving through the system.	High	R3. Storm Inspection and Response, R4.Culvert Removal R5. Critical Dip, R6.Culvert Modification- (NewRiser + Crushed inlet repair), R7.Relief Culvert, R9.Debris Rack, R10. Channel Clearing(wood). R13.Fill-Slope Stabilization	R3. Storm Inspection and Response, R6.Culvert Modification- (NewRiser + Crushed inlet repair), R7.Relief Culvert R13.Fill-Slope Stabilization
Property - Roads	4610000	Increased flow causing road prism and drainage structure failures	Likely	Moderate	Previous Washouts, flashy steep cross slopes, moderate to high burn severity, If road failure or diversion occurred at high risk stream crossings, the loss of property would be considered moderate	High	R1. Stormproofing R3. Storm Inspection and Response R5. Critical Dip	R1. Stormproofing R3. Storm Inspection and Response R5. Critical Dip
Property - Roads	4612000	Increased flow causing road prism and drainage structure failures	Unlikely	Minor	Road is hydrostabilized	Very Low	None	No Treatment

Property - Roads	D4610018	Increased flow causing road prism and drainage structure failures	Possible	Minor	Road was opened during suppression but will be hydrostabilized during suppression repair	Low	None	No Treatment
Life and Safety	Public Safety on 4610 and to Bluff Lake Trailhead	Falling Trees, Rocks, Increased Flood potential, stump holes, unstable ground, road prism failures	Possible	Major	Numerous hazards exist especially in the first year following the fire. Moderate to high burn severity exists on both roads and trails	High	S1a. Road Hazard/closure Signs S2. Physical Closure Devices	S1a. Road Hazard sign at NFSR 4610 near 4612
Life and Safety	Bluff Lake TH, Loss of life or injury to humans	Hazard trees falling across parking lot	Unlikely	Major	Failure involves trees > 6" dbh, with direct impacts to designated recreation area with high concentrations of stationary use (humans in the parking lot). No trees were identified as burnt next to TH parking lot.	Intermediate	S2. Site closure to ensure public safety; Immediate hazard tree mitigation - identify and fell hazard trees- S1B. Sign area to hazards	S1B. Sign area to hazards
Life and Safety	Three Peaks TH - Loss of life or injury to humans	Hazard trees falling across parking lot	Unlikely	Major	Failure involves trees > 6" dbh, with direct impacts to designated recreation area with high concentrations of stationary use (humans in the parking lot)	Intermediate	S1B. Sign area to hazards	S1B. Sign area to hazards
Property - Other	Bluff Lake TH, Three Peaks TH	Hazard trees falling on signage	Possible	Minor	Failure involves trees > 6" dbh, with direct impacts to designated recreation area with a concentrations of stationary use (vehicles parked at trailhead, information board, site sign)	Low	None	None

Life and Safety	Bluff Lake Trail #65, Three Peaks Trail #6- Loss of life or injury to humans	Hazard trees falling on humans	Possible	Major	Failure involves trees > 6" dbh, with direct impacts to designated recreation area with high concentrations of stationary use (humans/stock animals along trail)	Very High	S2. Close trail to ensure public safety. S1B Sign area to hazards	S1B. Sign area to hazards.
Property - Trails	Bluff Lake Trail #65, Three Peaks Trail #69 - Damage to trail prism on SBS H and M and steep locations	Water and erosion	Possible	Moderate	moderate property damage (loss of trail tread)	Intermediate	No treatment	No Treatment
Life and Safety	Dispersed campsites around Bluff Lake and recreationists along lake shore	Hazard Tree falling across sites	Possible	Major	Failure involves trees > 6" dbh, with direct impacts to dispersed recreation area with high concentrations of stationary use (humans/stock animals along shore)	High	S3. Immediate hazard tree mitigation - identify and fell hazard trees S2. Site closure to ensure public safety; implement hazard tree mitigation. S1B Sign area to hazards	S1B. Sign area to hazards. On ends of trail not at campsites themselves.
Property - Water System	Slow sand filter water system for La Wis Wis Campground	Increased sedimentation from debris in Purcell Creek watershed	Unlikely	Moderate	Potential failure of filter if sedimentation overwhelms system	Low	None	None
Cultural Resources	Historic and cultural sites within fire perimeter	Vandalism to cultural sites	Possible	Minor	Ethnographic information does not show there is known locations within fire perimeter. If fire burned over sites and now are visible by trails vandalism is possible	Low	None	None

Natural Resources - T&E habitat	Columbia Chinook, Coho, Steelhead	Loss of soils that reduces vegetation recovery and increases sediment inputs into perennial waters with Endangered Species.	Likely	Minor	Potential to effect individuals but not entire ESU	Low	None	No BAER Treatment - However storm inspection and response will benefit
Natural Resources - Native Plants	Native and Naturalized Plant Communities - Fire suppression disturbance areas	Native Plants- Invasive plant colonization of areas disturbed by suppression. 3 knapweed species, Himalayan blackberry, scotch broom, bull thistle, tansy ragwort-high risk of expansion and impact to native communities	Likely	Major	High priority noxious weed populations occur patchily along the road systems developed as primary and contingency line for the Goat Rocks fire. These plants were in full seed at the time of mechanical treatment along these road systems and the disturbance created by the large equipment spread seed as well as opened areas for invasion to high priority noxious weeds. Firefighter equipment and gear likely carried seed from other locations, including known populations. Current low degree of infestation is likely to increase to chronic unacceptable levels without detection and treatment in suppression-disturbed areas.	Very High	P1b. Invasives EDRR - Suppression Repair P2. Preventative Seeding for Invasive Species	P1b. Invasives EDRR - Suppression Repair
Natural Resources - Native Plants	Native and Naturalized Plant Communities - Invasives within Burned Area	Native Plants- Invasive plant colonization of undisturbed (weed-free) areas within the burned,area	Likely	Moderate	Areas of high and moderate vegetation mortality (estimated here by soil burn severity) are highly susceptible to invasion by high priority noxious weed species. Road and Trail system in fire perimeter has	High	P1a. Invasives EDRR - BAER	P1a. Invasives EDRR - BAER – areas of high and moderate burn severity and adjacent to FS system roads and trails in 2023.

					periodic, infestations of high priority weed species which provide seed sources into newly fire disturbed areas. Judged moderate because prior information about invasive species within the burned area is lacking, but noxious weed presence is believed to be minimal away from system roads. Precautions should be taken in case there were undetected infestations of invasive species that could expand following fire-generated disturbance.			
Resources - Hydraulic Function	Loss of hydrologic function in high to moderate soil burn severity.	Loss of hydraulic function in high to moderate SBS	Likely	Minor	Low magnitude	Low	No Treatment	No Treatment
Resources - Soil Productivity	Loss of soil productivity in high to moderate soil burn severity.	Loss of soil productivity in high to moderate soil burn severity.	Likely	Moderate	Moderate change of loss of soil in Moderate and High SBS	High	Small area of moderate and high SBS, No Treatment	No Treatment

Figure 4. Goat Rocks Fire BAER Treatments for Engineering and Recreation.

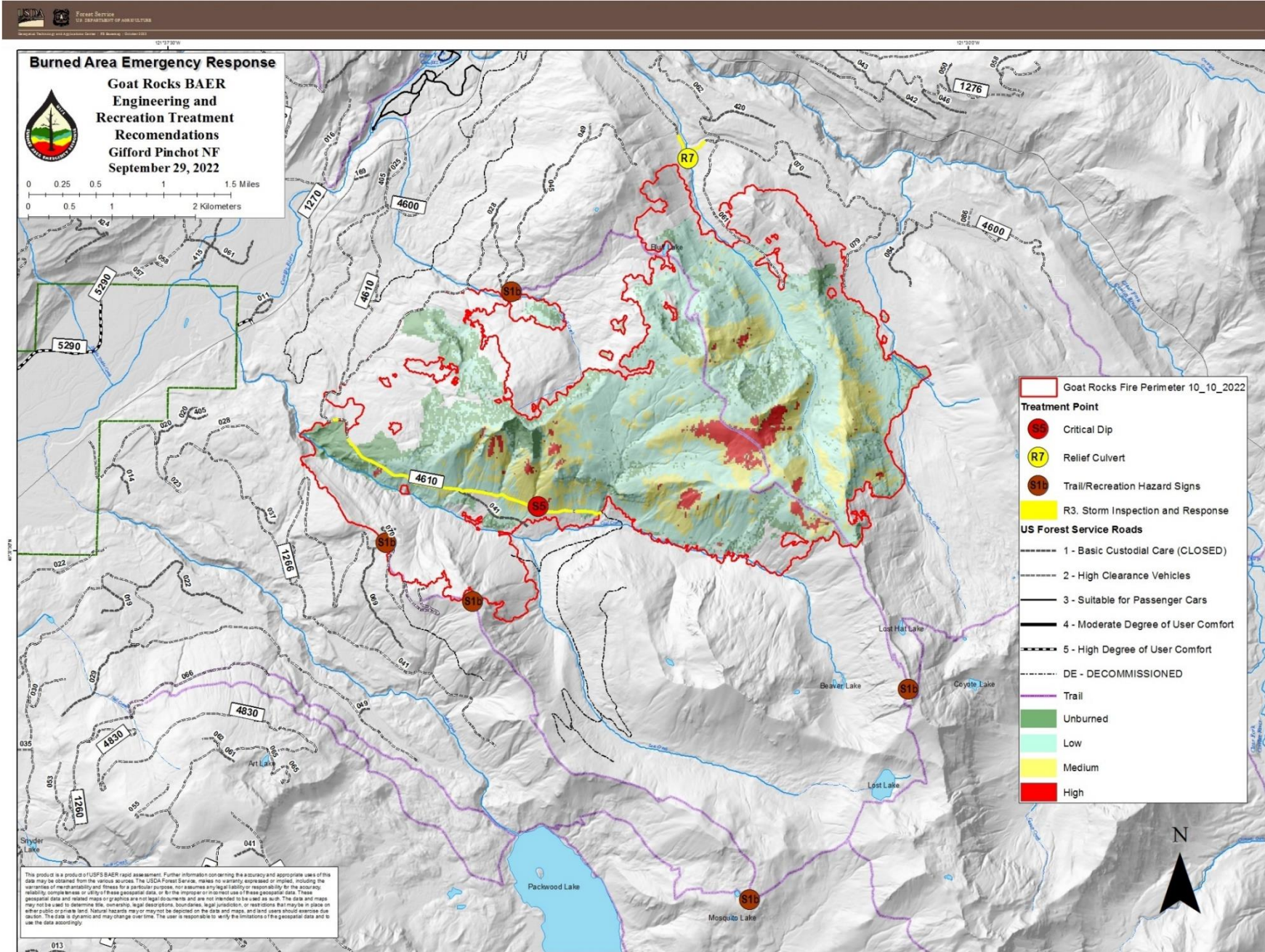


Figure 5. Goat Rocks Fire BAER Treatments for Invasive Weeds.

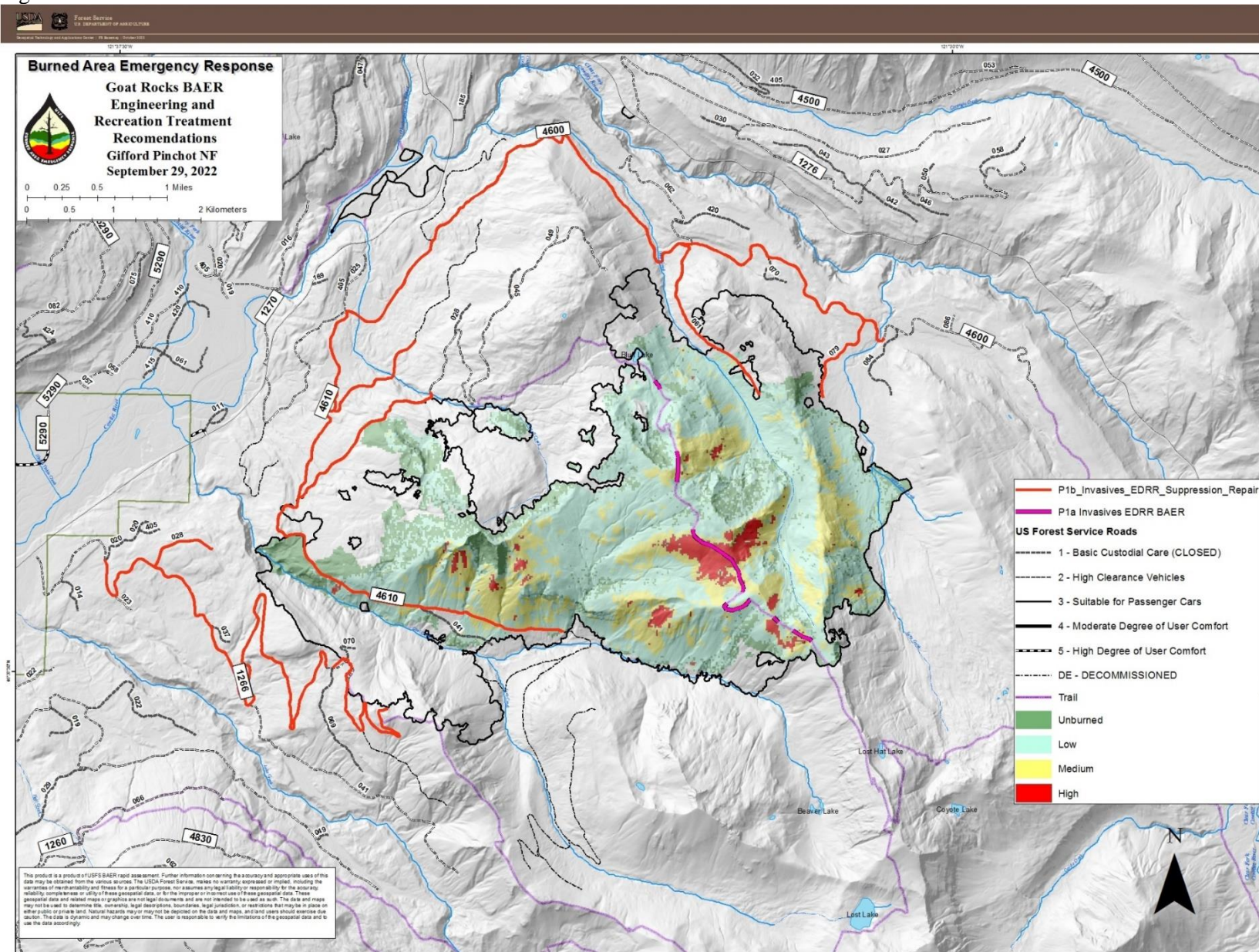
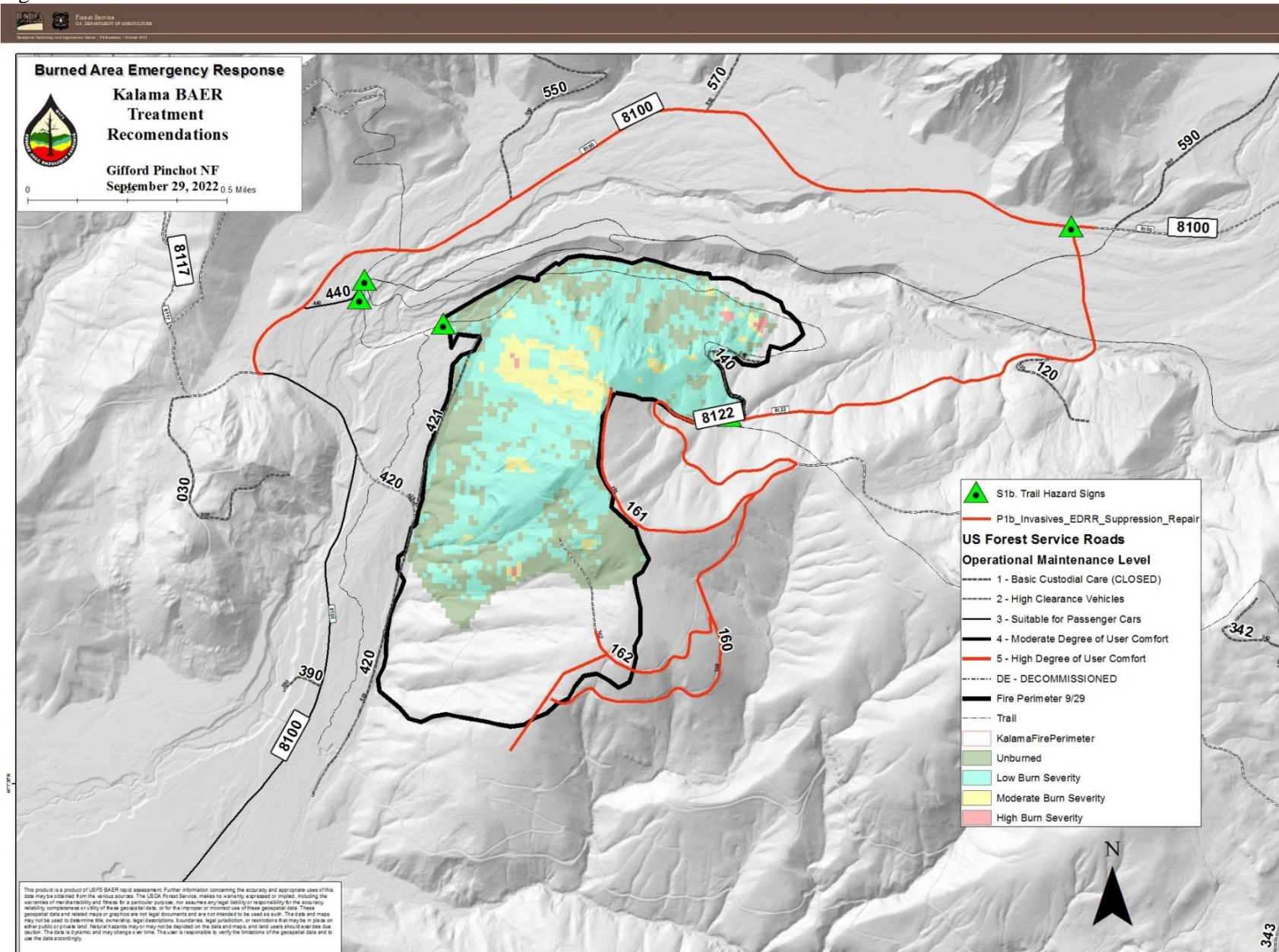


Table 7. Kalama BAER Critical Values and Treatments.

Life/ Property/ Resources	Critical Value	Threat to Value	Probability of Damage or Loss	Magnitude of Consequence	Rationale for Magnitude	Risk	Treatment Options Considered	Recommended Treatment
Life and Safety	Cinnamon Trail #204 - Loss of life or injury to humans	Hazard trees falling across trail	Possible	Major	Failure involves trees > 6" dbh, with direct impacts to designated recreation area with high concentrations of transitional use (humans/stock animals along trail)	High	S2. Close trail to ensure public safety. S1b Sign area to Hazards	S1b Sign area to Hazards
Life and Safety	FR 8122	Hazard trees falling across road and hitting people	Possible	Major	Failure involves trees > 6" dbh, with direct impacts to road with transitional use (humans/car/stock animals)	High	S2. Close trail to ensure public safety. S1b Sign area to Hazards	S1b Sign area to Hazards
Life and Safety	Cinnamon Trail #204 - Damage to trail prism on SBS H and M and steep locations	Water and erosion	Unlikely	Moderate	moderate property damage (loss of trail tread)	Low	None	None.
Natural Resources - Native Plants	Native plant communities along the 81, 8122, The 8100421, 8122161, 8100162, and the 8122140 roads roads and along the Horse Trail	Canada thistle, Diffuse knapweed, Spotted knapweed, Scotch broom, and Tansy ragwort -high risk of expansion and impact to native communities	Possible	Minor	Major: Invasive weeds already present are likely to cause major disruption of native plant communities. degradation of Wilderness character/values	Low	None	None
Natural Resources - Native Plants	Native plant communities: adjacent habitat to roadside or fire-line openings created by soil disturbing equipment	Spread of invasive plants into native habitats – adjacent to fire- lines openings and burning.	Likely	Moderate	Major: Presence of invasive species in or near fire line openings, and spread of seed by suppression efforts, cause increased vectors for invasive spread into burned area.	High	P1b. Invasives EDRR - Suppression Repair P2. Preventative Seeding for Invasive Species	P1b. Invasives EDRR- Suppression Repair

Figure 6. Kalama Fire Recreation and Invasive Weed BAER Treatments.



B. Emergency Treatment Objectives:

The primary objective of this Burned Area Emergency Response Report is to recommend prompt actions deemed reasonable and necessary to effectively protect, reduce or minimize significant threats to human life and safety, property, and unacceptable degradation to natural resources and cultural resources. The application of these BAER treatments are expected to minimize on-site and downstream damages to the identified critical values previously mentioned. The emergency treatments being recommended by the Goat Rocks and Kalama BAER Team are specifically designed to achieve the following Results:

Proposed Land Treatments:

1. Promote and protect native and naturalized vegetative plant communities by reducing the spread of noxious weeds (P1b. Invasives EDRR- Suppression Repair)

Proposed Channel Treatments:

There are no proposed channel treatments.

Proposed Road and Trail Treatments:

1. No trail treatments recommended.
2. Protect road investments from becoming damaged due to increased post-fire runoff . R3. Storm Inspection and Response, R6. Clean and Repair Culvert Inlet, R7. Relief Culvert 48" CMP, R13. Fill Slope Stabilization (Riprap)

Proposed Protective/Safety Treatments

1. Protect human life and safety by raising awareness through posting hazard warning signs at recreation sites, trailheads, trails (S1a – Road Hazard Signs, S1b – Trail/Recreation Hazard signs).
2. Protect human life and safety by temporarily closing Road 4610 (S2. Physical Closure Devices (gate, berm, boulders, etc.)

C. Probability of Completing Treatment Prior to Damaging Storm or Event:

Land: 90% **Channel:** N/A **Roads/Trails:** 85% **Protection/Safety:** 95%

D. Probability of Treatment Success

Table 5: Probability of Treatment Success

	<i>1 year after treatment</i>	<i>3 years after treatment</i>	<i>5 years after treatment</i>
<i>Land</i>	70	75	80
<i>Channel</i>	N/A	N/A	N/A
<i>Roads/Trails</i>	85	90	95
<i>Protection/Safety</i>	95	95	95

E. Cost of No-Action (Including Loss): Critical values identified in Section A would be damaged or lost. Cost of the no action is estimated to be \$438,000

F. Cost of Selected Alternative (Including Loss): Total cost of the action alternative (including loss) is \$84,905.

G. Skills Represented on Burned-Area Survey Team:

- | | | | | |
|---|--|---|---|---|
| <input checked="" type="checkbox"/> Soils | <input checked="" type="checkbox"/> Hydrology | <input checked="" type="checkbox"/> Engineering | <input checked="" type="checkbox"/> GIS | <input checked="" type="checkbox"/> Archaeology |
| <input checked="" type="checkbox"/> Weeds | <input checked="" type="checkbox"/> Recreation | <input checked="" type="checkbox"/> Fisheries | <input type="checkbox"/> Wildlife | |
| <input type="checkbox"/> Other: | | | | |

Team Leader and Forest BAER Coordinator: J.D. Jones

Email: joshua.d.jones@usda.gov

Phone(s) 541-219-0782

Team Members: *Table 6: BAER Team Members by Skill*

Skill	Team Member Name
<i>Team Lead(s)</i>	J.D. Jones
<i>Soils</i>	David Watson
<i>Hydrology</i>	Todd Parker
<i>Engineering</i>	Hailu Gabriel and
<i>GIS</i>	Kim Viera, Charles Brockway
<i>Archaeology</i>	Matthew Mawhirter
<i>Weeds</i>	Brad Kriekhaus
<i>Recreation</i>	Kacy Smith

H. Treatment Narrative:**Land Treatments:****Goat Rocks: P1a./ P1b. Invasives EDRR and Invasives EDRR - Suppression:**

Early detection and rapid response (EDRR) treatment of invasive plants is critical to prevent them from becoming established. Treatment is most effective when infestations are small and before they can produce seed. Three EDRR survey and treatments of areas adjacent to known infestations will be needed in the 2023 growing season.

The Goat Rocks Wilderness is currently one of the most weed free areas of the Gifford Pinchot NF. Numerous invasive species occur a short distance from areas burned by the Goat Rocks fire – some of them are highly invasive and detrimental to native plant communities. There are 3.3 miles of the Huff Lake Trail within the fire perimeter, all within the Goat Rocks Wilderness. 1.5 miles experienced moderate or high soil burn severity. This trail has known infestations of diffuse knapweed, and oxeye daisy near the trailhead. It is estimated that the first 25 feet on each side of the trail through the burned area is most likely to be invaded by invasive plants based on dispersal mechanisms of the weeds of concern. A total of 9 acres were identified for EDRR. Treatments may be with backpack spraying with herbicide or hand pulling. At least three and four visits are required - weed survey/mapping and treatment. Gifford Pinchot uses several partners for survey and treatment for noxious weeds. The Lewis County Crew of 2 costs about \$600 per day. The Wash. Conservation Corps crew of 6 people cost about \$1300 per day.

EDRR treatment is also proposed for Forest Service roadsides disturbed by road reopening and used for fire suppression activities (direct access roads), where reopening those roads for suppression caused ground disturbance, bare soils, and created new openings facilitating the establishment and spread of invasive plant propagules. For over a month a weed wash station was not put into place. Portions of the 1266, 4610, 4610018, 4610041, 4612, 4600061, 4600079 roads were burned, or opened up for Suppression. They experienced mechanical ground disturbance by either masticator, grader, and/or dozer. Multiple roads were used as shaded fuel breaks, where trees were pulled 15' off the road, and then were skidded down road corridor through the ditch and the roadside to log decks. Considering the noxious weeds known to occur including diffuse knapweed, meadow knapweed, spotted knapweed, cut leaf and Himalayan blackberry, oxeye daisy, scotch broom, bull and Canada thistle, and tansy ragwort; Roads are major vectors for the introduction and spread of invasives, and early detection and treatment will help prevent new infestations from invading newly burned ground. EDRR for suppression is recommended

Washington Conservation Corps crew, 8 days treating invasive species along suppression lines and disturbed areas. – with an estimated 68 acres of survey and 32 acres of treatment: \$16,500.

Goat Rocks BAER (non-suppression) botany treatments P1a.

Line items	units	Unit cost	# of units	Total \$
Native plant community adjacent to high priority roads EDRR				
Weed Surveys along trails and adjacent burned areas with moderate and high burn severity. Cost is a bit higher do to the hike needed to get into Huff Lake Trail in the Goat Rocks Wilderness.	Acres	\$50	9	\$450
Weed Treatments (est. based on nearby infestations pre-fire)	Acres	\$350	9	\$3,150
Total (non-suppression)				\$3,600

Goat Rocks Invasives EDRR - Suppression P1b. (treatments for suppression-related impacts only)

Line items	units	Unit cost	# of units	Total \$
Dozer lines, staging areas, drop points, roads as containment, danger tree removal areas				
Weed surveys (dozer line, fuel break, reopened road as line, repair sites, skidder roads etc – 23 miles; 10 staging areas, drop points and helispots are along survey roads)	acre	\$25	68	\$1,700
Treatments along roads (est. based on proximity of existing infestations)	acre	\$350	32	\$11,200
Total (suppression)				\$12,900
Grand Total				\$16,500

Kalama: P1b. –Suppression repair EDRR.

Weed species found on roads include Canada thistle, Diffuse knapweed, Spotted knapweed, Scotch broom, and Tansy ragwort. Portions of the 81, 8122, 8122160, 8122161 and 8122162 roads and a dozer line roads were used for suppression experienced mechanical ground disturbance by either masticator, grader, and/or dozer. 81 road was used as a shaded fuel breaks where trees were pulled 25' off the road, and then were skidded down the ditch and the roadside to log decks.

Kalama Invasives EDRR - Suppression P1b. (treatments for suppression-related impacts only)

Line items	units	Unit cost	# of units	Total \$
Dozer lines, staging areas, drop points, roads as containment, danger tree removal areas				
Weed surveys (dozer line, fuel break, reopened road as line, repair sites, skidder roads etc – 4 miles; 5 staging areas, drop points and helispots are along survey roads)	acre	\$25	12	\$300
Treatments along roads (est. based on proximity of existing infestations)	acre	\$350	2	\$700
Total (suppression)				\$1,000
Grand Total				\$1,000

Channel Treatments: None proposed.

Roads and Trail Treatments:

The reconnaissance of the roads during the field investigations found mostly minimal issues pertaining to road stabilization and public safety especially based on soil burn severity. Issues associated with road system included issues pertaining to road stabilization and road drainage problems, partially plugged culverts, filled in catchment basins and ditches, etc. Most of these issues are typical of what is found on roads within the fire perimeters. The road templates are typical, which are crowned, outsloped, and insloped. The combination of runoff and debris has the risk of plugging and blocking engineered drainage structures and destroying them. With the landscape now burned, the runoff flows will be greater in intensity and more debris is available for transport above these crossings, increasing the risk for engineering drainage structure failure.

R1 – Storm Proofing (stormproofing existing drainage features):

The objective of stormproofing is to establish resiliency in the road drainage system by minimizing concentration of water flow. Establish proper road drainage (either in-sloped or out-sloped) to maximize the departure of storm flows from the road and thus minimize damage to the road and sediment to the watershed.

Stormproofing involves heavy maintenance to establish or restore ideal transverse grades of the road surface and eliminate any concentration of flows other than in the ditch where applicable. Expansion or restoration of ditch is performed where applicable. Stormproofing is planned to be accomplished by exist road maintenance or construction contracts. Total request is for \$5,250.

Locations and Timing:

In the Goat Rocks Fire the only stormproofing recommended is for 1.5mile segment of Road 4612. Stormproofing will occur as soon as possible Fall of 2022 after funds are received.

R3 – Storm Inspection and Response:

Immediately upon receiving heavy rain and spring snowmelt the FS will send out patrols to identify roads that may be in impacted by high flows, and debris. Observations of rocks and sediment plugged culverts are identified and corrected before they worsen or jeopardize motor vehicle users and/or road tread. The road patrol personnel bring heavy equipment necessary to mechanically remove any obstructions from the roads and culvert inlets and catch basins where necessary. All excess material and debris removed from the drainage system shall adhere to the sidecasting as reviewed by the archeologist and hydrologist.

Roads within the Goat Rocks Fire contain drainage structures that cross streams located in watersheds having areas of high to moderate soil burn severity. These flood source areas have a greater potential for increased runoff and debris flows. These increases in flows pose a threat to the existing crossings which may result in plugging culverts or exceeding their maximum flow capacity. If these flows plug drainage structures the result could be unacceptable erosion and debris torrents further down the drainage from the failure of the fill slope of the road.

Engineering personnel will survey the roads below moderate and high soil burn severity within the fire perimeter after high-intensity winter storms in 2022 before they are snowed out of the area. Survey will inspect road, surface condition, ditch erosion, and culverts/inlet basins for capacity to accommodate runoff flows. Storm inspection/response will keep culvert and drainage features and functions by cleaning sediment and debris from in and around features between or during storms. This work will be accomplished through Forest Service Road Crew, equipment rental, and general labor. This request also includes felling danger trees along the portion of road to be worked on to mitigate safety concerns. Total request is for \$5,400.

Locations and Timing:

Check locations on 2.0 miles of road where SBS was H and/or M above FSR –4610000, 460000
It is expected that storm inspection and response will be needed an estimated 3 days in fall 2022.

R6 – Culvert Modification (Clean and Repair CMP inlet):

The objective of this treatment is to restore ideal flow capacity to existing culvert. This is not a modification upgrade proposed.

Treatment will involving removal of material deposition blocking inlet and repair of partially crushed culvert inlet that are reducing water and debris flow capacity through culvert. Culvert cleaning and repair is planned to be

accomplished by exist road maintenance or construction contracts. Total request is for \$1,000.

Locations and Timing:

In the Goat Rocks Fire the only treatment is the stream culvert on Rd46 at Dam Creek.

Culvert cleaning and repair will occur as soon as possible Fall of 2022 after funds are received.

R7 – Relief Culvert:

The objective of the relief culvert is to establish resiliency and redundancy to undersized existing culverts. This will protect road infrastructure loss, and reduce safety risk of a washed out/overtopping road to the public. Having an overflow culvert will also allow access for excavator to successfully complete response when bottom culvert plugs. The relief culvert will also prevent road fill from going into stream and heading downstream to threatened and endangered fish habitat.

This treatment includes installation of an overflow culvert in deep roadfills above the existing stream culvert to pass water when existing culvert becomes clogged or unable to pass post-fire flows. Relief culvert selection was made to be readily available material/size to expedite implementation. Relief culvert installation is planned to be accomplished by exist road maintenance or construction contracts. Total request is for \$13,500.

Locations and Timing:

In the Goat Rocks Fire the only treatment is a 48inch diameter relief culvert on Rd 46 at Dam Creek.

Relief culvert installation will occur as soon as possible Fall of 2022 or Spring after funds are received.

R13 – Fill Slope Stabilization:

The objective of the fillslope stabilization is to armor the relief culvert outlet back down to the streambed to minimize erosion. This treatment protects both the existing culvert outlet and the roadfill.

This treatment includes installation of riprap which is a well-graded mix of angular stable rock. Fillslope stabilization is planned to be accomplished by existing road maintenance or construction contracts. Total request is for \$3,600.

Locations and Timing:

In the Goat Rocks Fire the only treatment is at 48inch diameter relief culvert outlet on Rd 46 at Dam Creek.

Fill Slope Stabilization will occur as soon as possible Fall of 2022. The 4610 road doesn't need fill slope stabilization

R5 – Critical Dip (stream crossing):

The objective of a critical dip is to establish resiliency in the road drainage system by rerouting of water flow from a culvert or stream crossing down the roadway.

Installation of an armored low point in roadway discourages water and debris from rerouting down roadway and initiating cascading failures. This is often needed at long climbing road grades to prevent rilling, channeling, and washout of roadway. Critical Dip installation is planned to be accomplished by exist road maintenance or construction contracts. Total request is for \$1,750.

Locations and Timing:

In the Goat Rocks Fire the only critical dip recommended is at a stream culvert on Rd 4610 MP 3.1.

Stormproofing will occur as soon as possible Fall of 2022 after funds are received.

Dam Creek Road 46 Crossing (R6 – Culvert Modification/clean/repair, R7 – Relief Culvert, R13 Fill slope stabilization, R3 storm inspection and response).

Multiple onsite observations indicated high risks at site that are now elevated more due to the Goat Rocks fire: culvert inlet makes sharp turn relative to stream channel, a couple feet of rocky deposition blocking culvert invert, partially crushed west side of culvert inlet, recent woody deposition over 8 feet above culvert crown, ground water “fountaining” multiple locations inside of culvert, recent erosion of fillslope and material adjacent to culvert on downstream left side, outlet rust line over 1/3 diameter, and outlet plunge pool width 7-10x Culvert

diameter. Additionally a few hundred feet above the culvert where the culvert influence depositional area appeared to end, the minimum stream bankfull width was 19ft.

The purpose and need for treatment of the Dam Creek site is to protect road infrastructure loss while reduce risk of sediment delivery, and reduce safety risk of a washed out/overtopping road to the public.

The initial recommendation was to remove the Dam Creek culvert and fill. However after conversations with local zone engineer Sarah Rockey indicated significant concern with restricting vehicular access, additional options were revisited.

The second option considered was installation of a critical dip with partial removal of the fill but leaving the culvert in place. This would have created a vented hardened ford with energy dissipation armoring. Two issues with this option were the providing access for design vehicle and the amount of material/cost/time to be moved. While it is recognized that the purpose of BAER is not to maintain existing access standards, both maintaining and restricting access are considerations in determining the minimum treatments needed to provide an acceptable risk to critical values. In order for this option to be effective it would need to be low enough to allow safe excavator access for clearing existing culvert inlet when plugged. Based on site conditions this is estimated to be about 10ft above the culvert crown(top) and would require approximately 740 CY of roadfill to be removed on the climbing roadway. The second option considered would require the following interventions to be effective: critical dip w/ partial fill removal \$11,100, 50CY riprap armoring for energy dissipation full width of dip outfall \$6,000, closure gate to allow closing off for when water overtops roadway \$3,000, existing culvert repair \$1,000, and storm inspection and response for reopening culvert after clogging \$5,400. The total cost BAER treatments of the second option considered for the Dam Cr site at FR 46 MP4.9 was \$26,500.

A third option is what resulted in the final recommendation to install overflow relief culvert. There are two big concerns with simply planning for storm inspection and response on a deep fill like this. One is the difficulty in safely cleaning out a deep inlet that is buried in water, rocks, and debris beyond the reach of an excavator. The second is that high stream flow is likely occurring during this time so live water has to be managed concurrently while cleaning operations are occurring. The recommended third option of cleaning/repairing inlet and installing a relief culvert with energy dissipation addresses risk of road crossing overtopping erosion failure and allows safer storm inspection and response. The 48inch diameter relief culvert initially seems to be oversized but was sized to pass onsite debris likely to float above clogged culvert, pass enough of fully clogged culvert flow to have high probability of success, is still a readily available size, can be transported on one truck, and most of the cost will be due to the emergency timeframe and fill removal not whether it is a 36inch or 48inch pipe, Experience shows culvert failures most frequently initiate by a single stick spanning the inlet initiating a blockage and additional deposition. The recommended option would require the following interventions to be effective: **R7 relief culvert-** 48inch diameter x 60ft long relief culvert installation \$13,500, **R13 Fill slope stabilization-** 30CY riprap armoring for energy dissipation \$3,600, **R6 Culvert Repair-** existing culvert repair \$1,000, and **R3 storm inspection and response-** for reopening culvert after clogging. Compared to critical dip alternative it would not require a gate due to very low probability of live water over roadway and it would require half of the energy dissipation armoring. The total cost BAER treatments of the recommended third option for the Dam Cr site at FR 46 MP 4.9 is \$23,500.

Engineering Treatment Schedule (Property and Safety)				
Treatment	Quantity	Unit	Cost	Total
R1. Storm Proofing	1.5	Mile	\$ 3,500.00	\$ 5,250.00
R6. Clean and Repair Culvert Inlet	1.0	Each	\$ 1,500.00	\$ 1,500.00
R3. Storm Inspection and Response	3.0	Days	\$ 2,000.00	\$ 6,000.00
R7. 48" CMP	60	LF	\$ 225.00	\$ 13,500.00
R5. Armored Relief/Critical/Drain Dip (10 CY Riprap)	1	Each	\$ 2,500.00	\$ 2,500.00
R13. Fill Slope Stabilization (Riprap)	30	CY	\$ 120.00	\$ 3,600.00
Treatments Total				\$ 32,350.00

Protection/Safety Treatments:

This treatment will design and install burned area warning signs to caution forest visitors recreating and administrative users about the potential hazards that exist within the burned area. It is consistent with the language provided in the BAER warning and hazard sign guides. The warning signs will identify the types of hazards to watch for roads, and trails. This treatment will place hazard warning signs and information signs at key entry points or trail junctions, and numerous recreation trailheads. It will inform users of the dangers associated with entering/recreating within a burned area as well as inform them of closures to help ensure that users are able to access available routes in a safe manner.

The purchase and installation of signs at each of the identified locations consistent with Forest Engineering Standards at these locations. A Forest Service employee will inspect the signs for visibility, damage, or loss and replace as needed

S1a - Road Hazard Signs: Signs will inform users of the dangers associated with entering and recreating within the burned area. One sign will be at the 4610 road and one on the 8122 road for the Kalama Fire. Total request is for \$2,000.

Warning Sign Location: Road 8122 and Road 4610

Table 7. Recommended road hazard signs

Treatment	Units	Unit Cost	# of Units	Total Cost
S1a - Installation of warning/closure sign 30x48	Sign/Post	\$1000	2	\$2,000

S1b- Trail Hazard Signs: In addition to the initial installation, there will be a need to monitor and reinstall signage as it becomes worn or is otherwise damaged. Cost includes supplies and labor to install.

Locations: Kalama Fire: Kalama Horse Camp/ Cinnamon Trail #204 Trailhead; the junction of Cinnamon Trail #204 and Toutle Trail #238; Cinnamon Trail #204 on the fire perimeter boundary; and at the junction of Cinnamon Trail #204, FR8122, and the southern fire perimeter.

Goat Rocks Fire: Three Peaks Trail Head; Bluff Lake Trail #65 at southern fire perimeter junction; Three Peaks Trail #69 at southern fire perimeter junction; the junction of Packwood Lake Trail #78 and Three Peaks Trail #69; the junction of Packwood Lake Trail #78, and Coyote Lake Trail #76.

Table 8. Recommended treatment for trail hazard signs.

Kalama Fire Treatment	Units	Unit Cost	# of Units	Total Cost
Trail Hazard Signs	Sign/Post	\$360	4	\$1,440
Goat Rocks Fire Treatment	Units	Unit Cost	# of Units	Total Cost
Trail Hazard Signs	Sign/Post	\$360	5	\$1,800

I. Monitoring Narrative:

No monitoring needed.

PART VI – EMERGENCY STABILIZATION TREATMENTS AND SOURCE OF FUNDS**Goat Rocks Fire**

			NFS Lands				Other Lands			All	
		Unit	# of		Other		# of	Fed	# of	Non Fed	Total
Line Items	Units	Cost	Units	BAER \$	\$		units	\$	Units	\$	\$
A. Land Treatments											
P1a. EDRR BAER Survey	acres	50	9	\$450	\$0			\$0		\$0	\$450
P1a. EDRR BAER Treatment	acres	350	9	\$3,150	\$0			\$0		\$0	\$3,150
P1b. Suppression EDRR Survey	acres	25	68	\$1,700	\$0			\$0		\$0	\$1,700
P1b. Suppression EDRR Treatment	acres	350	32	\$11,200	\$0			\$0		\$0	\$11,200
Insert new items above this line!				\$0	\$0			\$0		\$0	\$0
Subtotal Land Treatments				\$16,500	\$0			\$0		\$0	\$16,500
B. Channel Treatments											
No Treatments Recommended				\$0	\$0			\$0		\$0	\$0
Insert new items above this line!				\$0	\$0			\$0		\$0	\$0
Subtotal Channel Treatments				\$0	\$0			\$0		\$0	\$0
C. Road and Trails											
R1 Storm Proofing	Miles	3,500	1.5	\$5,250				\$0		\$0	\$5,250
R3 Storm Inspecton and Response	Days	2,000	3.0	\$6,000				\$0		\$0	\$6,000
R5 Armored Relief/Critical Dip	Each	2,500	1.0	\$2,500				\$0		\$0	\$2,500
R6 Clean and Repair Culvert	Each	1,500	1.0	\$1,500				\$0		\$0	\$1,500
R7 Relief Culvert 48" CMP	LF	225	60	\$13,500				\$0		\$0	\$13,500
R13 Fill Slope Stabilization	CY	120	30	\$3,600	\$0			\$0		\$0	\$3,600
Insert new items above this line!				\$0	\$0			\$0		\$0	\$0
Subtotal Road and Trails				\$32,350	\$0			\$0		\$0	\$32,350
D. Protection/Safety											
S1a - Road Hazard Signs	sign/post	1,000	1	\$1,000	\$0			\$0		\$0	\$1,000
S1b - Trail Hazard Signs	sign/post	360	5	\$1,800	\$0			\$0		\$0	\$1,800
Insert new items above this line!				\$0	\$0			\$0		\$0	\$0
Subtotal Protection/Safety				\$2,800	\$0			\$0		\$0	\$2,800
E. BAER Evaluation											
Initial Assessment	Report				\$29,393.00			\$0		\$0	\$29,393
Insert new items above this line!				---	\$0			\$0		\$0	\$0
Subtotal Evaluation								\$0		\$0	
F. Monitoring											
Insert new items above this line!											
Subtotal Monitoring				\$0	\$0			\$0		\$0	\$0
G. Totals											
				\$51,650	\$0			\$0		\$0	\$51,650
Previously approved											

Kalama Fire

		NFS Lands					Other Lands			All	
		Unit	# of		Other		# of	Fed	# of	Non Fed	Total
Line Items	Units	Cost	Units	BAER \$	\$		units	\$	Units	\$	\$
A. Land Treatments											
P1b. Suppression EDRR Suvey	acres	25	12	\$300	\$0			\$0		\$0	\$300
P1b. Suppression EDRR Treatment	acres	350	2	\$700							\$700
Insert new items above this line!				\$0	\$0			\$0		\$0	\$0
Subtotal Land Treatments				\$1,000	\$0			\$0		\$0	\$1,000
B. Channel Treatments											
No Treatments Recommended				\$0	\$0			\$0		\$0	\$0
				\$0	\$0			\$0		\$0	\$0
Insert new items above this line!				\$0	\$0			\$0		\$0	\$0
Subtotal Channel Treatments				\$0	\$0			\$0		\$0	\$0
C. Road and Trails											
Insert new items above this line!				\$0	\$0			\$0		\$0	\$0
Subtotal Road and Trails				\$0	\$0			\$0		\$0	\$0
D. Protection/Safety											
S1a - Road Hazard Signs	sign/post	1,000	1	\$1,000	\$0			\$0		\$0	\$1,000
S1b - Trail Hazard Signs	sign/post	360	4	\$1,440	\$0			\$0		\$0	\$1,440
Insert new items above this line!				\$0	\$0			\$0		\$0	\$0
Subtotal Protection/Safety				\$2,440	\$0			\$0		\$0	\$2,440
E. BAER Evaluation											
Initial Assessment	Report			\$25,393	\$29,393.00			\$0		\$0	\$29,393
Insert new items above this line!				---	\$0			\$0		\$0	\$0
Subtotal Evaluation								\$0		\$0	
F. Monitoring											
Insert new items above this line!				\$0				\$0		\$0	
Subtotal Monitoring				\$0	\$0			\$0		\$0	\$0
G. Totals											
Previously approved				\$3,440	\$0			\$0		\$0	\$3,440
Total for this request				\$3,440							

PART VII - APPROVALS

[Signature]
 Forest Supervisor

10/14/2012
 Date