Date of Report:
7/27/2021

BURNED-AREA REPORT

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: Lava

B. Fire Number: CA-SHF-949

C. State: CA

D. County: Shasta

E. Region: R5

F. Forest: Shasta-Trinity

G. District: Mt Shasta

H. Fire Incident Job Code: P5N3XW

A. Fire Name: Lava

B. Fire Number: CA-SHF-949

I. Date Fire Started: 6/25/2021

J. Date Fire Contained: 77%

K. Suppression Cost: 32 million

L. Fire Suppression Damages Repaired with Suppression Funds (estimates): 82 miles
1. **Fireline repaired (miles):** 72 miles
2. **Handline:** 10 miles

M. Watershed Numbers:

Table 1: Acres Burned by Watershed

HUC #	Watershed Name	Total Acres	Acres Burned	% of Watershed Burned
HUC #	Watershed Name	Total Acres	Acres Burned	% of Watershed Burned
180102070102	Boles Creek-Shasta River	23,771	1,365	6
6180102070103	Garrick Creek	13,696	4,049	30
180102070104	Lake Shastina-Shasta River	21,187	9,172	43
180102070402	North Gate	13,141	3,290	25
180102070403	The Whaleback-Sheep Rock	39,309	353	1
180102070405	Whitney Creek	13,511	5,722	42
180102070406	Juniper Flat	10,746	1,646	15

N. Total Acres Burned:

Table 2: Total Acres Burned by Ownership

OWNERSHIP	ACRES
NFS	20,699
OTHER FEDERAL (LIST AGENCY AND ACRES)	0
STATE	0
PRIVATE	4,897
TOTAL	25,596

O. Vegetation Types: The Lava fire burned through vegetative communities ranging in elevation from approximately 3,000 feet to over 8,200 feet. This dramatic elevation gradient spans many different habitat types. Low areas of the fire area are dominated by western juniper, ponderosa pine, with understories of sagebrush, bitterbrush and mountain mahogany. As elevation increases the habitat transitions from pine to mixed conifer forest of Douglas fir, white fir, and incense cedar, transitioning to Shasta red fir, western white pine, and hemlock forest and finally to the climax species before true alpine, whitebark pine.

P. Dominant Soils: The primary soil types within the burn scar are Delaney sandy loam, and rock outcrop. Delaney soils are soils with high sand content that formed primarily as alluvial and eolian deposits. Generally they have very high infiltration and are found on gentle to flat slopes. Because of the soil texture and the gentle slopes, these soil units do not have accelerated runoff or erosion regardless of water repellency. Because of the many basalt flows within the fire perimeter, rock outcrop are the primary soil units. These rock outcrops are fractured bedrock with a coarse fragment surface. Erosion and runoff are generally low in

these units even if the soil burn severity indicates a moderate soil burn severity. For high soil burn severity erosion rates are moderate.

Q. Geological Setting: The Lava fire burn area is on the north and northwest slopes of Mount Shasta, which is within the Cascades Physiographic Province. The Cascades Province is composed of large composite or stratovolcanoes consisting of lava and fragmental pyroclastic deposits. Mount Shasta being one of these stratovolcanoes has been building for the past 250,000 years in a series of four major eruptive episodes, the latest being less than 500 years ago.

Mount Shasta is composed of andesite and basalt flows covered by glacio-fluvial deposits, and fans of unconsolidated pyroclastic, debris flow, and fluvial deposits. These fans are thin in their lower reaches (a few meters) but in their upper reaches, may be 250 meters in thickness. Bolam and Whitney Creeks have incised these weak upper fan areas, forming Whitney and Bolam gorges. The deposits incised by Whitney Creek range from 12,000 to 9,400 years in age (de la Fuente, and Bachman, 1999). They are capped by a 9,300-year old andesite flow that filled in some of the previously developed drainages. This flow forms the western boundary of Whitney gorge in the area below Whitney falls.

Early Holocene debris flow and fluvial deposits are virtually absent in the lower parts of the Whitney fan, indicating that little erosion of the gorge area occurred at that time. A widespread pyroclastic layer was deposited in the lower fan about 1,800 years ago, and following this event, there was considerable deposition of debris flow and fluvial material. This relationship indicates that the bulk of the incision of Whitney gorge occurred in the past 1,800 years (Osterkamp et al., 1987).

R. Miles of Stream Channels by Order or Class:

Table 3: Miles of Stream Channels by Order or Class

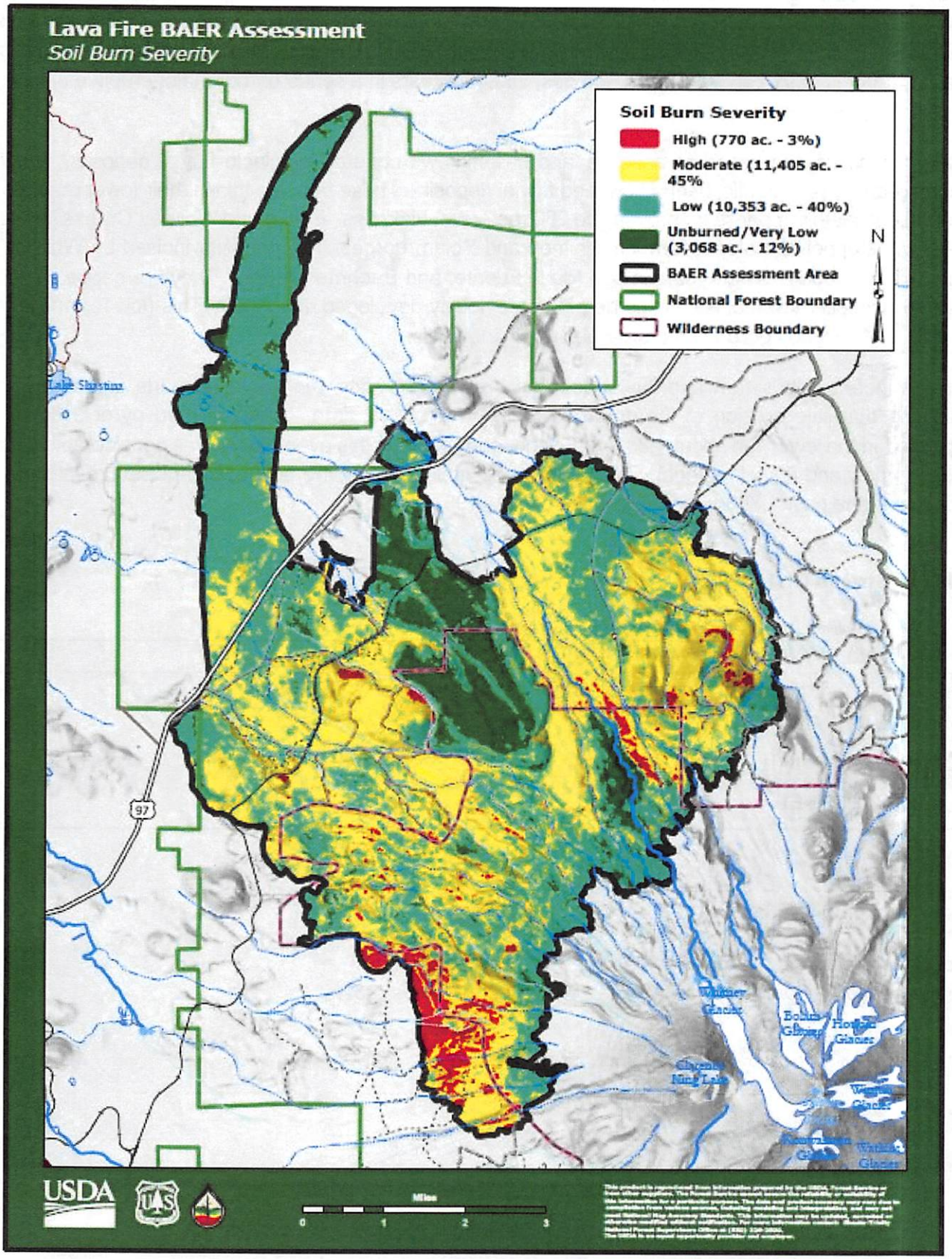
STREAM TYPE	MILES OF STREAM
PERENNIAL	3.7
INTERMITTENT	56.4
EPHEMERAL	16.2
OTHER (DEFINE)	0

S. Transportation System:

Trails: *National Forest (miles):* 5.9 *Other (miles):* 0
Roads: *National Forest (miles):* 48 *Other (miles):* 5.4

PART III - WATERSHED CONDITION

Figure 1 Soil Burn Severity Map:



A. Burn Severity (acres):

Table 4: Burn Severity Acres by Ownership

Soil Burn Severity	NFS	Other Federal	State	Private	Total	% within the Fire Perimeter
Unburned	2,153	0	0	915	3,068	12
Low	7,575	0	0	2,778	10,353	40
Moderate	10,213	0	0	1,192	11,405	45
High	759	0	0	11	770	3
Total	20,7	0	0	4,897	25,596	100

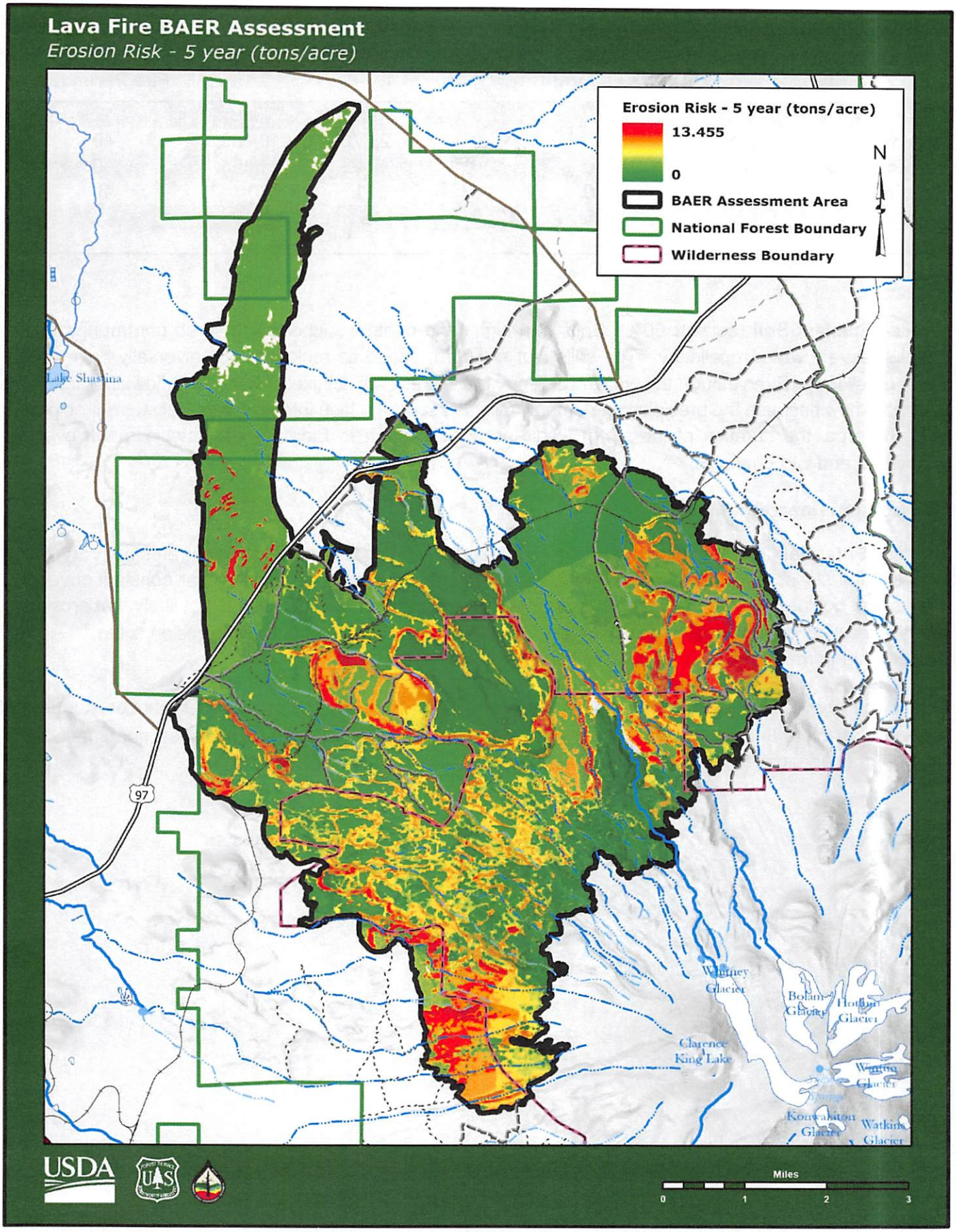
B. Water-Repellent Soil (acres): 60%: Soils with high sand content supporting a shrub community tend to develop severe water repellency. The soils that are not mapped as rock outcrop universally have severe water repellency. Even though the water repellency is severe, it will not likely change the flow characteristics of stream flow because the precipitation primarily falls as snow. If a high intensity summer storm precipitates over the area, the duration of the storm would not long enough to facilitate appreciable runoff over the watershed and into channels.

C. Soil Erosion Hazard Rating: n/a

D. Erosion Potential: 2-year event 1.0 tons/acre, 5-year event 2.0 tons/acreThe erosion rates are very low. Because the slopes that are not rock outcrops are gentle, the steep slopes have a near constant cover of stones and boulders, and a majority of the area is rock outcrop that didn't burn, it is not likely that erosion and the resulting sediment delivery will happen. Another factor that does not favor erosion is the precipitation primarily falling as snow which infiltrates as it melts.

Due to the above mentioned information only major erosion happens during summer thunder-storms and melting of glaciers that cause seasonal erosion events of riling and gullying of hillslopes and small debris flows in major drainages with most depositing on flatter slopes below (see map below).

Figure 2 Soil Erosion Rates:


Lava Fire BAER Assessment
Erosion Risk - 5 year (tons/acre)
Erosion Risk - 5 year (tons/acre)
13.455
0
BAER Assessment Area
National Forest Boundary
Wilderness Boundary
N
Lake Shastina
97
Whitney Glacier
Bolam Glacier
Hotlum Glacier
Clarence King Lake
Konwakiton Glacier
Watkins Glacier
USDA
Miles
0
1
2
3

E. Sediment Potential: low to moderate on steeper drainages

G. Estimated Vegetative Recovery Period (years): .). Vegetative recovery period is 5 years for brush and 30 years conifers.

H. Estimated Hydrologic Response: Modeling of a couple pour points indicated flows could double or triple from pre fire conditions. Due to the flows in this area being a result of glacial melting, it is not a typical stream hydrologic setting or response. Whitney creek flows only during the summer, when the glacier is melting, or during intense storms. Highest flows typically occur at night since glacial melting is greatest in the afternoon, and it takes several hours for the water to travel the 14 km from the headwaters down to Highway 97. Flows are likely to only be triggered by glacial melt or intense storms, not by the Lava Fire burned area. The flow we saw was likely caused by the sustained heat wave of temperatures above 100 degrees F, sustained for about 2 weeks. Stephen Bachmann, former Forest Service Hydrologist in Mt Shasta personal communication July 20, 2021. Union Pacific railroad may want to monitor Bolam Gulch and the railroad crossing. This site does not appear to have had any erosion issue in the past, and according to Mr. Bachmann, it should not have any post fire increases in flow that might result in water ponding up and/or eroding the fill slope. There is another railroad crossing with almost as much fill material and no culvert as the Bolam crossing site. This site is at the crossing of the railroad and 42N15 in Section 21. It is an unnamed tributary. Union Pacific Railroad may want to monitor this site. Like Bolam Gulch there is no culvert, but also no scour or indication of flow or erosion at the toe of the fill slope. There is a small approximately 30-inch culvert on Hwy 97. This culvert does not appear to have had any flow in in in a while. These is gravel and brush inside the culvert. This culvert is at approximately 41.479 by -122.346. Cal Trans should monitor this culvert. Like the two crossings with the railroad, there is no evidence of scour at the fill slope.

I. Estimated Geologic Response: Within the burned area of the Lava Fire, evidence of mass wasting as debris flows and rock fall are widespread. Based on our observations, it appears that numerous slopes and drainages in the burn area have large amounts of stored material, significant drainage areas, defined channels and steep gradients. Based on the steep slopes, the amounts of stored sediments in most drainages in this area, it is our estimate that as a result of high intensity summer storms, which might produce rain-on-snow events, the probabilities of debris flow initiations in drainages flowing down Mount Shasta are high. In addition, as conditions are changing due to climate change, glaciers on the mountain are melting faster. Under some specific conditions of hot spells, consisting of triple digit daytime temperature highs with poor overnight cooling, enhance glacial melt can trigger debris flow initiations.

That said, it is important to emphasize that these debris flow initiations could happened regardless of post-fire conditions. In this case, post-fire condition will not be the main reason for debris flow initiations, but will exacerbate the issue, since now as a result of the removal of vegetation by the fire, soils are exposed and have become weakened, hydrophobic conditions have changed and rocks on slopes have lost their supportive vegetation. These post-fire conditions in addition to ample supply of woody debris will exacerbate debris flow events occurring in this burn area.

Due to these post-fire conditions, some roads and trails in the burn area are at risk from rolling rocks, debris flows, and hyper-concentrated floods. Risks to human life, roads, and trails, is elevated in some areas in and downstream of the Lava Fire. Based on the above, special attention and caution is recommended in areas where people are traveling through, working, or recreating in or below the burned areas during and after storm events. To reduce the risk to life, it is our recommendation to coordinate warning notifications with the National Weather Service and post warning signs.

PART V - SUMMARY OF ANALYSIS

Introduction/Background

The Lava Fire started on 6/24/21 by lightning and is burning northeast of the community of Weed. Below average winter snowpack and very hot, dry windy conditions created burning conditions similar to those normally experienced in August. Diurnal winds and drought conditions are contributed to the northeast and eastern fire spread into upper rocky lava fields.

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

Table 5: 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**

1. **Human Life and Safety (HLS):**
   Threat exists at segments of roads near creeks and at major drainage crossings if the public is traveling on the road during a significant flood event or are traveling after un-observed damages have occurred and road failures are triggered. Additionally, hazard trees and rocks will persist for years and threaten travelers along burned alignments. High risk of falling trees and rocks on roads and intermediate risk of debris flows along HWY 97.
2. **Property (P):** Threat to roads and trails may occur in response to increased flows, sediment transport and debris that may cause failure of existing drainage features and erode road prisms near creeks and at major drainage crossings of impacted watersheds. Benched roads with significant burned areas above are also susceptible to mass wasting and debris flows in addition to the risks of fill failure.
3. **Natural Resources (NR):** It is likely that invasive species were spread into un-infested, native plant communities through: (1) the disturbance of known noxious weeds adjacent and within the burn area, and (2) the exposure of open, bare ground that is now vulnerable to invasion. The consequences are moderate because spread and introduction of noxious weeds would cause long-term damage to the critical natural resource values associated with native and endemic plant communities. Thus, the risk of invasion is high for noxious weeds in native plant communities. **Cultural and Heritage Resources:** High risk of exposed artifacts subject to vandalism

B. Emergency Treatment Objectives:

Evaluate the effects to the watershed from the fire intensity for downstream values at risk, FS infrastructure of roads and trails, archeologic sites, native plant populations and wildlife.

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

Land 90 %
Roads/Trails 90%

Channel -
Protection/Safety 90%

D. Probability of Treatment Success

Table 6: Probability of Treatment Success

	1 year after treatment	*3 years after treatment*	*5 years after treatment*
Land	95	85	80
Channel	-	-	-
Roads/Trails	95	90	85
Protection/Safety	95	85	80

E. Cost of No-Action (Including Loss): $543,000

F. Cost of Selected Alternative (Including Loss): 150,000**Skills Represented on Burned-Area Survey Team:**

☒ Soils ☒ Hydrology ☒ Engineering ☒ GIS ☒ Archaeology
☒ Weeds ☒ Recreation ☐ Fisheries ☐ Wildlife
☒ Range:

Team Leader: Brad Rust
Email: brad.rust@usda.gov **Phone(s)** 530 806 5406

Forest BAER Coordinator: Brad Rust
Email:brad.rust@usda.gov **Phone(s):**530 806 5406

Team Members:*Table 7: BAER Team Members by Skill*

Skill	Team Member Name
Team Lead(s)	Brad Rust, Luke Rutten, Jeff TenPas
Soils	Eric Nicita, Jeff TenPas
Hydrology	Luke Rutten, Bill Goodman, Jesse Merrifield
Engineering	Alvin Sarmiento, Larry Arrington, Ben Molitor, Molly Breitmun
GIS	Jonna DuShey, Matt House
Archaeology	Laird Nolan
Weeds	Erin Lonergan
Recreation	Nick Meyers (remote)
Range	Dani Balin

H. Treatment Narrative:

Land Treatments: Noxious weed detection and monitoring.

EDRR:

Early detection and rapid response are key principles in preventing noxious weed infestations from becoming unmanageable and are the primary strategy prescribed during BAER assessments.

Treatments to mitigate the noxious weed emergency include early detection surveys to document spread and concurrent rapid response treatments. Detection surveys will be conducted along completed dozer line, road improved as fire line, and within high severity burn areas adjacent to known infestations or near sensitive botanical resources. Existing infestation which had previously been controlled will be treated in order to limit fire-induced expansion. Treatment time frames are extended to account for plant phenology due to the large elevational gradient of the fire area.

COST ESTIMATE

The total cost estimate for prescribed treatment is $77,271. Cost estimates are based on AmeriCorps crew costs as outlined in Cost-Share agreements between the Shasta-Trinity National Forest and the Great Basin Institute. See below for a detailed account of estimates.

COST ESTIMATE LAVA BAER

Weed Assessment Area	Risk Rating			Cost		
	Probability of Damage or Loss	Magnitude of Consequences	Risk	Labor	Project Admin.*	Total
Suppression related	Likely	Moderate	High	$31,074	$9,580	$40,654
Burn area	Possible	High	High	$31,071	$5,546	$36,617
						$77,271

Estimated rates for FY22

Personnel	Cost	Days	Total
Three GBI Crew members	$570	90	$51,300
GBI Crew Lead	$241	45	$10,845
One GS-7	$270	15	$4,050

Materials and Equipment	Cost	Quantity	Total
Noxious weed flagging	$3	72 rolls	$216
Disposal bags	$20	3 boxes	$60
GBI 4X4 truck rental and fuel	$600 / week	18 weeks	$10,800

*Project administration includes: training, data entry, reporting, crew management, as well as materials and equipment needs

Archeology: no treatments necessary.

Channel Treatments: none

Roads and Trail Treatments: The outlined treatments were chosen to minimize or mitigate: 1. Threat to life and safety on vulnerable roads and incidental infrastructure; 2. Road property loss due to impact from up-gradient burn areas.

Lava Fire Assessment Area – Shasta- Trinity - USFS Treatment Schedule

Treatment	Quantity	Unit	Cost	Total

Burned Hole Repair	2	each	$ 1,000	$ 2,000
Install Warning Signs	7	each	$ 500	$ 3,500
Whitney Trail Repair	1	project	$ 5,000	$ 5,000
Total				**$10,500**

Protection/Safety Treatments: Large BAER warning signs at major roads into the fire. Four needed at major roads intersections. Cost for materials and installation are $1,000 per sign.

I. Monitoring Narrative:

Trail and road treatment effectiveness monitoring.

PART VI – EMERGENCY STABILIZATION TREATMENTS AND SOURCE OF FUNDS

			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										
EDRR	project	77,247	1	$77,247	$0		$0		$0	$77,247
Insert new items above this line!				$0	$0		$0		$0	$0
Subtotal Land Treatments				$77,247	$0		$0		$0	$77,247
B. Channel Treatments										
				$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										
Road treatments	project	5,500	1	$5,500	$0		$0		$0	$5,500
Trail Treatments	project	5,000	1	$5,000	$0		$0		$0	$5,000
Insert new items above this line!				$0	$0		$0		$0	$0
Subtotal Road and Trails				$10,500	$0		$0		$0	$10,500
D. Protection/Safety										
Warning signs	ea	1,000	4	$4,000	$0		$0		$0	$4,000
				$0	$0		$0		$0	$0
Insert new items above this line!				$0	$0		$0		$0	$0
Subtotal Protection/Safety				$4,000	$0		$0		$0	$4,000
E. BAER Evaluation										
Initial Assessment	Report			---	$76,475		$0		$0	$0
				$0	$0		$0		$0	$0
Insert new items above this line!				---	$0		$0		$0	$0
Subtotal Evaluation				$0	$76,475		$0		$0	$0
F. Monitoring										
Roads & Trails Monitoring	Project			$0	$0		$0		$0	$0
				$0	$0		$0		$0	$0
Insert new items above this line!				$0	$0		$0		$0	$0
Subtotal Monitoring				$0	$0		$0		$0	$0
G. Totals				$91,747	$76,475		**$0**		**$0**	**$91,747**
Previously approved										
Total for this request				**$91,747**						

PART VII - APPROVALS

1. Kari K Otto — 16 AUG 2021

Forest Supervisor — Date