Date of Report: 9/23/2021

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: Muckamuck

B. Fire Number: WA-COF-002290

C. State: Washington

D. County: Okanogan

E. Region: 6 Pacific Northwest

F. Forest: Colville

G. District: Tonasket

H. Fire Incident Job Code: P6N75D (0621)

I. Date Fire Started: 8/3/2021

J. Date Fire Contained: estimated 10/31/2021

K. Suppression Cost: ~13 million dollars

L. Fire Suppression Damages Repaired with Suppression Funds (estimates): 2 million dollars

1. **Fireline repaired (miles): 10 miles**
2. **Other (identify):**

M. Watershed Numbers:

Table 1: Acres Burned by Watershed

Muckamuck				**Soil Burn Severity**							
Subwatershed Name	**Total Subwatershed**		**Subwatershed Outside the Fire**	**Unburned or Very Low**		**Low**		**Moderate**		**High**	
	Acres	% Burned	Acres	Acres	%	Acres	%	Acres	%	Acres	%
Coulee Creek 170200062103	19,714	2.5%	19,214	129	0.7%	159	0.8%	210	1.1%	2	0.0%
North Fork Salmon Creek 170200062003	34,504	31.3%	23,720	995	2.9%	3,548	10.3%	5,715	16.6%	527	1.5%

West Fork Salmon Creek 170200062002	27,281	9.0%	24,812	434	1.6%	1,260	4.6%	767	2.8%	9	0.0%
Grand Total	**81,499**	**16.9%**	**67,746**	**1,558**	**1.9%**	**4,966**	**6.1%**	**6,691**	**8.2%**	**538**	**0.7%**

N. Total Acres Burned:

Table 2: Total Acres Burned by Ownership

Soil Burn Severity	BLM	Private	State	Bureau of Reclamation	US Forest Service	Grand Total	Soil Burn Severity
High	51	15	35	0	438	538	3.9%
Moderate	703	1,849	548	23	3,568	6,691	48.7%
Low	608	1,210	236	154	2,757	4,966	36.1%
Unburned	18	166	41	9	1,323	1,558	11.3%
Grand Total	**1,380**	**3,240**	**860**	**186**	**8,086**	**13,753**	
Ownership %	10.0%	23.6%	6.3%	1.4%	58.8%		

O. Vegetation Types:
Pre-fire vegetation consisted largely of a higher elevation Subalpine-fir zone dominated by Lodgepole Pine, Subalpine fir, and Engelman Spruce. The lower elevations were dominated by Douglas-fir with some Ponderosa Pine. The highest elevations were larger rock scree and high elevation herbs and shrubs. Understories were dominated by alder, ceanothus, and service berry.

P. Dominant Soils: Wynhoff Series, Myerscreek Series, Manly Series, Nevine Series, Oxerine Series

Q. Geologic Types:
Granite, quartz monzonite, quartz diorite, granodiorite, and trondhjemite. Includes diorite in southeastern Washington; diorite and gabbro near Concunully in Okanogan County; gneiss, schist, and migmatites in areas of Chelan, Colville, and Okanogan batholiths. Includes high-grade metamorphic rocks of Precambrian age in Spokane area. Includes significant portions, primarily orthogneiss, of the Kettle Metamorphic Core Complex and the Okanogan Metamorphic Core Complex, as well as orthogneiss in the Okanogan Batholith area. Metamorphic rocks near Spokane include quartzite and possibly meta-argillite and hornfels of Belt Supergroup. Colville batholith; Kaniksu Batholith (including Spirit pluton); Loon Lake granite; Mount Stuart granodiorite; Osoyoos granodiorite; Similkameen batholith; Whisky Mountain granodiorite; Cooper Mtn Batholith; Okanogan Batholith

R. Miles of Stream Channels by Order or Class:

Table 3: Miles of Stream Channels by Order or Class

Muckamuck	
Type	**Miles**
Intermittent Stream	55
Perennial Stream	13
Grand Total	**69**

S. **Transportation System:**
Trails:

Muckamuck	
Trail Class	**Miles**
3 - Highly Developed	2.6

Roads:

Muckamuck	
Operational Maintenance Level	**Miles**
1 - BASIC CUSTODIAL CARE (CLOSED)	9
2 - HIGH CLEARANCE VEHICLES	10
3 - SUITABLE FOR PASSENGER CARS	9
4 - MODERATE DEGREE OF USER COMFORT	3
Non-FS Roads	2
Grand Total	**34**

PART III - WATERSHED CONDITION

A. Burn Severity (acres):

Table 4: Burn Severity Acres by Ownership

Soil Burn Severity	BLM	Private	State	Bureau of Reclamation	US Forest Service	Grand Total	Soil Burn Severity
High	51	15	35	0	438	538	3.9%
Moderate	703	1,849	548	23	3,568	6,691	48.7%
Low	608	1,210	236	154	2,757	4,966	36.1%
Unburned	18	166	41	9	1,323	1,558	11.3%
Grand Total	**1,380**	**3,240**	**860**	**186**	**8,086**	**13,753**	
Ownership %	10.0%	23.6%	6.3%	1.4%	58.8%		

B. Water-Repellent Soil (acres): 2,229 acres

C. Soil Erosion Hazard Rating:

Muckamuck		
Erosion Hazard	**Erosion Hazard (acres)**	**Erosion Hazard (%)**
Low	1,661	12%
Moderate	5,863	43%
High	5,725	42%
Very High	504	4%
Grand Total	**13,753**	**100%**

D. Erosion Potential: 34 tons/acre

E. Sediment Potential: 5,251 cubic yards/square mile

Erosion and sediment potential are average estimates from model runs and are generally considered higher than expected. In the event of a high intensity rain event or a rain on snow event then we would expect to see a watershed response like the higher numbers displayed above.

F. Estimated Vegetative Recovery Period (years): 3-5 years

G. Estimated Hydrologic Response (brief description): Hydrologic response following wildfire in the Muckamuck Fire burned area will include reduced interception and infiltration of precipitation, increased runoff and erosion, higher stream flow volumes for a given precipitation or snowmelt input, and a more rapid rise of stream and river levels compared with those of unburned conditions. Additionally, the probability of severe erosion, debris flows, and hillslope failure is substantially higher, and will remain so for at least the next few years.

Drainage	Area	Peak Flow[1]			Sediment Delivery[2]		
		Pre-Fire Q_p	Post-Fire Q_p	Percent Increase	Pre-Fire Sediment Delivery	Post-Fire Sediment Delivery	Percent Increase
	(ac)	(cfs)	(cfs)	(%)	(tons/acre)	(tons/acre)	(%)
Center Creek	703	10	492	4771%	0.00	4.0	404%
Dunn Creek	1,877	26	669	2453%	0.00	5.0	503%
Ray Creek	1,047	16	514	3053%	0.00	5.9	585%
W. Trib N. Fork Salmon Creek	728	13	475	3554%	0.00	10.2	1021%
[1] Pre-fire peak flows estimated using USGS Stream Stats; post-fire peak flows estimated using USDA ERMiT and Peak Flow Calculator.							
[2] Sediment delivery estimated using USDA WEPP-PEP and ERMiT.							

PART V - SUMMARY OF ANALYSIS

Introduction/Background

The Muckamuck fire was caused by lightning on August 3, 2021. Hot, dry weather, low humidity and drought conditions increased fire behavior causing it to quickly move into the Conconully, WA area towards private, State and BLM lands. At its peak there were multiple Type 1 Teams from several locations across the western US supporting the fire suppression efforts. Please see Appendix A for soil burn severity, soil erosion hazard, and treatment maps.

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):

- Protect human life and safety of forest visitors through raising awareness of the risks present in a post-fire forested mountain setting by installing informational and warning signs at trail

and road portals in and adacent to the burned area.
- Protect human life and safety from post-fire hazards at selected trails and campgrounds through closure treatments, CXT pumping/sanitizing, and road gate installation
- Facilitate partner agency efforts to install temporary systems on NFS land to provide early warning for precipitation and runoff events that could threaten off-NFS values.
- Monitor the effectiveness of road and trail treatments and facilitate any needed maintenance of treatments during the first year following the fire.

Value	Probability	Consequence	Rating	Threat
Trails and Roads	Possible	Major	High	Some trails and roads go through moderate and high intensity burn areas and are prone to fire killed standing and down trees
Cottonwood Campground	Likely	Major	Very High	Hazard trees are present in Cottonwood Campground that pose an immediate threat to workers and the public.
CXT pumping at campsites	Possible	Major	High	Campgrounds are in the floodplain of North Fork Salmon Creek and sewage discharge is a concern at spring run-off.

2. Property (P):
- Reduce risk of trail infrastructure damage from elevated post-fire hillslope runoff and flood flows
- Reduce erosion and transport of fine sediment into area streams, and thus reduce impacts of road and trail network to water quality and aquatic habitat.

Value	Probability	Consequence	Rating	Treat
Tunnel and Muckamuck Trails	Likely	Major	Very High	Some portions of these trails go through moderate and high intensity burn areas and need drainage features to keep the trail in place and reduce erosion.

3. Natural Resources (NR):
- Foster the recovery of native plant communities, including sensitive species, in the burned area by minimizing the proliferation of noxious weed populations

Value	Probability	Consequence	Rating	Treat
Native and Natural Plant Communities	Very Likely	Moderate	Very High	Localized noxious and invasive weed populations exist immediately adjacent to the burned area and area disturbed by suppression. Plants will compete aggressively with native species for space and nutrients.

4. Cultural and Heritage Resources:
- No Cultural Resources were impacted by the Muckamuck fire that would warrant treatment.

B. Emergency Treatment Objectives:

The objectives of the emergency treatments proposed in this document are to manage identified unacceptable risks from “imminent post-wildfire threats to human life and safety, property, and critical natural resources on National Forest System lands” (FSM 2523.02). The timely application of the proposed treatments is expected to substantially reduce the probability of damage to the BAER critical values identified in the section A, above.

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

Land: 95%
Channel: None proposed
Roads/Trails: 80%
Protection/Safety: 95%

D. Probability of Treatment Success

Table 6: Probability of Treatment Success

	1 year after treatment	3 years after treatment	5 years after treatment
Land	80%	75%	70%
Channel	No treatments proposed in channel		
Roads/Trails	70%	80%	90%
Protection/Safety	85%	90%	95%

E. Cost of No-Action (Including Loss): The cost benefit ratio is less than 1 (0.0) due to most treatments addressing non-market values (human life and stafety) and native/naturalized communities where market values can't be prescribed.

F. Cost of Selected Alternative (Including Loss): The cost benefit ratio is less than 1 (0.0) due to most treatments addressing non-market values (human life and stafety) and native/naturalized communities where market values can't be prescribed.

G. Skills Represented on Burned-Area Survey Team:

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

Team Leader: Luke Cerise
Email: luke.cerise@usda.gov **Phone(s)** (509) 486-5108

Forest BAER Coordinator: Luke Cerise
Email: luke.cerise@usda.gov **Phone(s):** (509) 486-5108

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

Skill	Team Member Name
Team Lead(s)	Luke Cerise
Soils	Jason Jimenez, Colville NF Soil Crew
Hydrology	Andrea Traeumer, Mike Malon
Engineering	Lucy Reeves, Nate Peck
GIS	Chris Strobl, Abby Gettinger
Archaeology	Stu Chilvers, April Miller
Weeds	Brandon Weinmann
Recreation	Betsy Peterson
Other	

H. Treatment Narrative:

Land Treatments:

L1a. Invasives EDRR - BAER: Early Detection and Rapid Response (EDRR) treatments are proposed for sensitive habitats and roadside areas (55 acres) within 200 feet of documented high priority weed infestations where the fire burned with moderate to high soil burn severity. These areas have a high probability of being invaded by non-native invasive plants.

L1b. Invasives EDRR - Suppression: Above and beyond the Incident Suppression Repair efforts, BAER EDRR treatments are proposed for dozerlines, drop points and other ground disturbing areas caused by

fire suppression activities (20 acres) and will be essential to protect native and naturalized communities. The likelihood that heavy equipment working on the fire brought in propagules from outside the fire perimeter is high. Early detection and treatment will help prevent new invasive species from getting established in these disturbed areas. EDRR for suppression is proposed on 1.3% of the NFS acres within the fire perimeter. Most of the EDRR work is expected to go into an existing agreement with the Okanogan County Weed Board.

Muckamuck	
Common Name	**Acres w/in fire**
butter and eggs	0.2
Canada thistle	10.0
common St. Johnswort	62.6
diffuse knapweed	136.6
gypsyflower	13.0
stinking willie	0.4
sulphur cinquefoil	11.2
whitetop	0.4
Grand Total	**234.4**

Item	Unit	Unit Cost	# Units	Total
EDRR Invasives BAER	Acres	$120/acre	55	$6,600
EDRR Invasives Suppression	Acres	$120/acre	20	$2,400
	Total Land Treatment Cost			**$9,000**

Channel Treatments:
No Channel Treatments are proposed.

Roads and Trail Treatments:
There are approximately 2.5 miles of trail within the Muckamuck Fire on the Tonasket Ranger District. Of those miles 1 received high and moderate soil burn severity and 1 mile of low soil burn severity or unburned conditions.

Site	Units	Cost	# of Units	Total Cost
Muckamuck #346	Miles	$2580	1	$2580
			Grand Total	**$2,580**

BAER team members assessed the first 0.5 miles of Tunnel and Muckamuck trails. Multiple burned snags and stump holes exist along these trails. Trail surveys found that soil burn severity levels and relative steepness were reasonable predictors of erosion potential. Fire burn severity is used to determine trail stabilization treatments. Storm patrol funding is requested to assess storm damage on BAER Critical Values. Analysis of high and moderate burn severities of the trail corridors and adjacent areas, a total of 1 mile are at unacceptable postfire risk to loss or damage.

Protection and Safety		cost	units	total

road warning signs	each	$750	3	$2,250
Trail and campground warning signs/installation	each	$1350	6	$8,100
CXT pumping/sanitize	each	$550	8	$4,400
Temporary gates (materials and labor)	each	$3,000	3	$9,000
Trailhead and campground hazard tree falling (2 campgrounds and trailheads with large diameter snags, complex falling)	days	$605	5	$3,025
Storm patrol (10 days @400/day)	each	$400	10	$4,000
Subtotal Protection and Safety				$30,775

Drainage work needs to be completed within one year. About one mile of trail burned with high and moderate severity as is given priority based on burn severity areas, potential for capturing or intercepting increased post-fire flood runoff, main access trails to wilderness, near fish populations and locations adjacent to stream channels and crossings. No road treatments are being proposed.

Muckamuck Trails	3 - Highly Developed
Soil Burn Severity	**Miles**
High	0.2
Moderate	0.6
Low	1.2
Unburned	0.4
Grand Total	**2.5**

Recreational Facilities (developed campgrounds)

- Camp sites at Cottonwood, Oriole, and Kerr sit in the floodplain of North Fork Salmon Creek. A high risk exists for flooding at these camp sites and should have seasonal closure to ensure public safety (details in Critical Values table above). See hydrology and soils report for watershed response.
- CXT facilities at the three campsites listed above need to be pumped and sanitized prior to winter.
- There is an increased risk from flooding and debris flows for backcountry camps that are located near streams or in flood plain areas and located below burned areas. Hazard trees pose an increased risk to those who may camp or travel through the burned areas and need further assessment.

Protection/Safety Treatments:
Access to most trails and backcountry campsites affected by the fires is not suggested at this time due to hazard tree and other dangers. Warning signs are needed at two trailheads and three campsites in the fire perimeter. Notifications should be sent to outfitter guide special use permit holders of the conditions of burned area. Road gate installation is suggested to help facilitate seasonal road closures due to elevated risk of flooding and debris flows in the Spring. Please see the treatment map for gate locations.

In the future when trail stabilization work takes place, it may still be necessary to keep some trails closed. Each trail will need to be further evaluated and signs posted on those trails that will remain closed until funds can be secured to reconstruct the trails. Hazard tree felling for each trailhead and campground locations will be needed to ensure public and employee safety. Administration of closure orders will be needed to help ensure public safety.

The National Weather Service, Okanogan Conservation District, WA Department of Ecology, WA NRCS, and Conconully Public Works Manager are discussing a strategy to place RAWS Stations around the town of Conconully, WA. This BAER Team provided all requesting Agencies with soil burn severity data and watershed response modeling to help guide their decision-making process. If a location is deemed suitable on Forest Service land the cooperating Agencies will contact the Tonasket Ranger District.

I. Monitoring Narrative:

The effectiveness of the protection and safety treatments is highly dependent on monitoring and adaptive management. Monitoring will be done by District Staff as time and funding allow. The Forest may pursue the development of Forest-wide BAER monitoring plan.

Appendix A: Maps


Muckamuck_BAER_Soil_Burn_Severity_Ma


Muckamuck_BAER_ErosionHazard_Mapcom


Muckamuck_BAER_Treatment_Mapcompres

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 BAER	acre	120	55	$6,600	$0			$0		$0	$6,600
EDRR Suppression	acre	120	20	$2,400	$0			$0		$0	$2,400
Insert new items above this line!				$0	$0			$0		$0	$0
Subtotal Land Treatments				$9,000	$0			$0		$0	$9,000
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											
Trail stabilization	mile	2,580	1	$2,580	$0			$0		$0	$2,580
Storm Patrol	days	400	10	$4,000	$0			$0		$0	$4,000
Insert new items above this line!				$0	$0			$0		$0	$0
Subtotal Road and Trails				$6,580	$0			$0		$0	$6,580
D. Protection/Safety											
CXT Pump/Sanatize	each	550	8	$4,400							
Road gates	each	3,000	3	$9,000							
Trailhead/campsite HZT	day	605	5	$3,025							
Road warning signs	each	750	3	$2,250	$0			$0		$0	$2,250
Trail warning signs	each	1,350	6	$8,100	$0			$0		$0	$8,100
Insert new items above this line!				$0	$0			$0		$0	$0
Subtotal Protection/Safety	each			$26,775	$0			$0		$0	$10,350
E. BAER Evaluation											
								$0		$0	$0
Initial Assessment	Report	$55,000	1	$55,000	$0			$0		$0	$0
Insert new items above this line!				---	$0			$0		$0	$0
Subtotal Evaluation				$55,000	$0			$0		$0	$0
F. Monitoring											
				$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				$42,355	$0			**$0**		**$0**	**$97,355**
Previously approved											
Total for this request				**$42,355**							

PART VII - APPROVALS

1. Rodney D. Smoldon Digitally signed by Rodney D. Smoldon Date: 2021.09.27 13:47:38 -07'00'

Forest Supervisor Date