Date of Report: 11/05/2020

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: Cinnabar Fire

B. Fire Number: MT-LNF-001896

C. State: Montana

D. County: Granite County

E. Region: 1

F. Forest: Lolo National Forest

G. District: Missoula Ranger District

H. Fire Incident Job Code: P1NG5P (0116)

I. Date Fire Started: 8/19/2020

J. Date Fire Contained: 10/25/2020

K. Suppression Cost: $4,376,000

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

1. Fireline repaired (miles):

Type of Suppression Line	Total Miles	Miles Repaired
Access or Improved Road	0.6	0.6
Completed Dozer Line	0.7	In Progress, 10/5/2020
Completed Hand Line	3.4	3.4
Fire Break Planned or Incomplete (Road as Completed Line)	1.9	1.9
Road as Completed Line with Masticated Shaded Fuel Break	19.4	19.4
Total Miles	**26.0**	**25.3**

2. Other (identify): All Repair Completed, 10/5/2020

Other Suppression Features	Number of Features
Spike Camp	1
Helicopter Dip Site	7

Other Suppression Features	Number of Features
Drop Point	12
Helibase	1
Helispot	9
Road Repair	1
Staging Area	1
Unimproved Landing Area	1

M. Watershed Numbers:

Table 1: Acres Burned by Watershed

HUC #	Watershed Name	Total Acres	Acres Burned	% of Watershed Burned
170102021302	**Welcome Creek**	12,340	**2,745**	22%
170102021303	**Cinnamon Bear Creek-Rock Creek**	30,254	**43**	0.1%
170102021305	**Gilbert Creek**	14,993	**95**	1%

N. Total Acres Burned:

Table 2: Total Acres Burned by Ownership

OWNERSHIP	ACRES
NFS	2,883
OTHER FEDERAL (LIST AGENCY AND ACRES)	0
STATE	0
PRIVATE	0
TOTAL	2,883

O. Vegetation Types: The Cinnabar Fire is burning in a high elevation (5,000 – 7,500 feet), cool mixed conifer forest types that are aspect, elevation, and slope dependent. The predominant vegetation type in the burned area is a single-storied lodgepole pine forest, with inclusions of grand fir and subalpine fir trees. Understory vegetation includes beargrass, huckleberry and false huckleberry, and grouse whortleberry. Fuel loading in the area was high due to dead and dying lodgepole.

P. Dominant Soils: Soils within the Cinnabar Fire area are derived from weakly weathered metasedimentary parent materials. Soil surveys were not completed due to timing restrictions and safety. Photos of the burned area show that profile rock content in the burned area was inherently high and soil development was generally weak, common to young Inceptisols with thin organic horizons. The dominant landforms in the burned area include moderate relief mountain slopes (35-55% slope), broadly convex mountain ridges, and stream breaklands (55% + slope).

Q. **Geologic Types:** The Cinnabar Fire occurred within the Sapphire Mountain Range on the eastern side of the Bitterroot Valley. The underlying geology is meta-sedimentary rock associated with the Belt Rock Supergroup (Precambrian era). The burned area also features granitic inclusions, predominantly on exposed ridgelines.

The Cinnabar Fire area includes a significant mining history, there are 3 historic, abandoned mines within the burned area, and dozens of mines located on the Bitterroot/Rock Creek Divide just to the west of the perimeter. In the burned area, there were gold and silver placer mining activities on Welcome and Carron Creeks.

R. Miles of Stream Channels by Order or Class:

Table 3: Miles of Stream Channels by Order or Class

Stream Type	Miles of Stream (within burned area)
Perrenial	4.9
Intermittent	0.3
Ephemeral	0

S. **Transportation System:**
Trails: *National Forest (miles):* 3.7 miles *Other (miles):*
Roads: *National Forest (miles):* 0 miles *Other (miles):*

PART III - WATERSHED CONDITION

A. Burn Severity (acres):

Table 4: Burn Severity Acres by Ownership

Soil Burn Severity	NFS	Other Federal (List Agency)	State	Private	Total	% within the Fire Perimeter
Unburned	**551**				**551**	19%
Low	**703**				**703**	24%
Moderate	**1152**				**1152**	40%
High	**477**				**477**	17%
Total	**2883**				**2883**	

B. Water-Repellent Soil (acres): 477 - It is assumed that based on soil conditions from previous BAER assessments in similar vegetation and soil types that all high severity burned areas have a moderate water repellency. Lack of vegetation in high burn severity areas will likely decrease water infiltration more than hydrophobicity from fire effects.

C. Soil Erosion Hazard Rating:

Soil Erosion Hazard Rating (acres)	Low	Moderate	High
Pre-Fire	537	2347	0
Post-Fire	463	1944	476

Soils were assigned erosion hazard potential based on surface erodibility potential under unburned conditions (Lolo LSI – Surface Erodibility Potential) and in burned areas based on the impacts of moderate and high soil burn severity, which exacerbate soil erosion potential through loss of vegetative cover and consumption of surface organic materials. For example, where the underburned soil erodibility was "Moderate" and soil burn severity was moderate or high for a portion of acres of that soil type, the soil erosion hazard was increased to "High", for those acres. Elevated soil erosion hazard is only applicable for the first few years following the fire until revegetation occurs to stabilize slopes.

D. **Erosion Potential:** 1.5 tons/acre (range from 0.5 to 2.6 tons/acre) averaged over the first 2-year period

The Stevensville, Montana weather station data was adjusted to climatic conditions of the Cinnabar fire perimeter with the climate interpolation program PRISM within ERMiT. The adjusted climate was determined based on the relatively higher elevation and precipitation of the burned area.

E. **Sediment Potential:** 348 yd^3/mi^2/year
Sediment potential was based on a probability of 60% of the eroded soil reaching streams within the burned areas. This estimate of sediment potential is conservative based on the high burn severity and likelihood of sediment reaching the stream within the Carron Creek and Welcome Creek drainages. In areas with lower burn severity, significantly less sediment is anticipated to reach stream channels.

F. Estimated Vegetative Recovery Period (years): Understory vegetation recovery will begin immediately, with grass and shrub species recovering within 1-3 years. Tree regeneration will take greater than 10 years.

G. Estimated Hydrologic Response (brief description):

For the Cinnabar Fire, one pore point and watershed was used to model hydrologic response. This pore point was located just below the fire perimeter, in the Welcome Creek drainage. This watershed encompasses most of the burned area. The table below shows the design storms used in the model (all 24-hour) to produce pre- and post-fire return interval flows.

Return Interval (years)	24-Hour Design Storm (inches)
2	1.9
5	2.2
10	2.7
25	3
50	3.4
100	3.8

Fire hydrology model outputs are given in the tables below. The 2 year return interval (50% probability of this occurring) shows a 4-fold increase in streamflow and associated runoff in the drainage. The remaining return intervals also show a 3 to 4-fold increase in runoff.

	RCN	area (ac)	%											
unburned	60	3090	59.6		acres:	5187								
low	70	582	11.2		slope:	40								
moderate	82	1041	20.1		mi2 :	8.1047			Post-fire RCN composite				68	
high	88	474	9.1		% hi/mod	29.2								
			100.0											
	peak flow (cfs)							cfs/mi2						
return period	**2**	**5**	**10**	**25**	**50**	**100**		**2**	**5**	**10**	**25**	**50**	**100**
pre-fire	16	37	88	146	261	430		2	5	11	18	32	53
post-fire	61	124	312	472	720	1004		8	15	39	58	89	124

Due to the steepness of terrain in the burned area, the amount of moderate and high burn severity (29% of the burned area), and the lack of vegetation and groundcover after the fire, high probability rainfall events will likely increase surface runoff and erosion. Elevated runoff response is expected to be greatest in the first year following the fire and become less prevalent as vegetation and groundcover become re-established over the next several years. Anticipated vegetative recovery is: 1-3 years grass (achieve % effective ground cover), 10-15 years shrubs, and 20-50 years conifers.

PART V - SUMMARY OF ANALYSIS

Introduction/Background

The Cinnabar Fire burned entirely within the boundary of the Welcome Creek Wilderness, which was federally designated in 1978 and encompases over 28,000 acres of pristine lands in the Rock Creek drainage of the Missoula Ranger District. This burned area is popular for its wilderness character; it is a sought after area by recreationists and hunters looking for high levels of solitude. The area has a rich human history – the area was heavily explored in the late 1800s after gold and silver were found in Welcome Creek, and three abandoned placer mines and associated historic features are located within the burned area. All of the watersheds which burned in the Cinnabar Fire feed into Rock Creek – a Blue Ribbon trout fishing stream - which is also highly popular area for outfitter-guide fishing and hunting, camping, hiking, and scenic value. To the immediate west of the burned area, the Sapphire Divide Road and Trail System is also a popular for hiking, hunting, and scenic driving that provides access to the south, running the length of the Sapphire Mountains.

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):**

   Potential threats to the recreating public and Forest Service employees include flooding with a potential for localized debris flows in steep canyons, hazard trees and rock fall, and loss of emergency ingress and egress. These threats exist along Forest Service System Trails, and to areas downstream or downslope of burned areas, particularly those with high or moderate soil burn severity.

- **Threats to Forest Employees and Visitors (Trails): Very High (likely, major)** risk to public and administrative personnel along the Welcome Creek, Solomon Ridge, and Welcome-Sawmill Saddle Trails due to the presence of hazard trees in areas of moderately concentrated use. Treatment recommendations are, removal of site specific imminent hazard trees to protect administrative personnel, and installation of hazard tree warning signage at trailheads to warn of potential threats.

2. **Property (P):**
   The Cinnabar Fire burned over and adjacent to approximately 4 miles of National Forest System Trail, accessing through-routes connecting Rock Creek to the Bitterroot/Rock Creek Divide. The Welcome Creek, Solomon Ridge, and Welcome-Sawmill Saddle Trails provide access into the Welcome Creek wilderness and are some of the only access points for the surrounding roadless areas that border the Welcome Creek Wilderness on three sides. In addition, these trails are planned for improvement utilizing GAOA funding. If damage occurs to trails from post fire erosion, requested funding for GAOA may not be able to be utilized for needed trail improvements. There is a **High risk (likely, moderate) to trail infrastructure** of a damaging event from post-fire watershed response.

3. **Natural Resources (NR):**
   Native Plant communities and ecological function: The Cinnabar Fire is mostly within the Welcome Creek Wilderness and is considered a pristine, intact ecosystem. Any potential increase in noxious weeds would degrade the current condition. The Welcome Creek Wilderness is a relatively small wilderness (28,250 acres); however, it is surrounded by inventoried roadless areas in all directions except the south, southwest where most of the suppression activity was able to occur. Currently, there are less than 30 acres of mapped and known infestations of noxious weeds in this wilderness. The Cinnabar Fire reduced or eliminated crown canopy, shrub and forb cover in high to moderate severity (vegetative) burned areas. And while 30 acres is a small percentage of the burned area and wilderness, the infestations are along trails and near moderate to high soil burn severity areas. These areas a susceptible and conducive to noxious weed spread and eventual establishment due to the lack of competition after a fire.

   Whitebark pine is a high-elevation, long-lived tree and is considered a sensitive species in the Northern Region. There are several whitebark pine trees in and around the burned area. Several of these trees have shown resistance to whitebark pine blister rust and have been used for cone collections. These trees are considered “plus trees” and were protected during suppression operations. Protection efforts included removing vegetation around the trees to decrease high intensity fire near the trees.

   Removal of vegetation also created conditions conducive to noxious weed spread by opening the canopy and increasing direct sunlight to the soil (drying) and removing competition. **High** risk of expansion of **noxious weed infestations** exists at known locations along roadsides, trails, logging

decks, dozerlines, landings, and within high soil burn severity areas. Treatment recommendations are to inventory, spot spray and monitor these locations per the Early Detection Rapid Response treatment protocol. This includes doing detection surveys, mapping any potential treatment sites, verification (if detection not completed by trained plant specialist), treatment, and monitoring for eradication.

4. **Cultural and Heritage Resources:**

   No cultural or heritage resources are at risk from post-fire damage within the burned area.

B. Emergency Treatment Objectives:

C. Probability of Completing Treatment Prior to Damaging Storm or Event:
Land: 70%
Channel: N/A
Roads/Trails: 70%
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	70%	80%	90%
Channel	NA	NA	NA
Roads/Trails	70%	80%	90%
Protection/Safety	90%	90%	90%

E. Cost of No-Action (Including Loss): Trail reconstruction will likely be needed in areas where drainage is not improved to support post fire effects from increased runoff. Trail reconstruction is variable, but would likely cost a minimum $12,500 per mile, a total of ~$25,000-50,000. Because the trail is located in a remote, wilderness area, time needed to repair trails and logistics of moving repair supplies would likely increase total cost. In addition, funding to improve these trails was requested through GAOA act. If portions of these trails in the fire area are damaged by post-fire runoff the funding to improve trails may be insufficient, and the investment to improve the trail system may be lost. Noxious weed spread without implementing EDRR treatments can result in a 14% growth rate if left untreated, resulting in costs that could increase twenty-fold. While these losses can be difficult to quantify, treatment following spread could cost up to $150,000 and effectiveness of treatments would be greatly reduced. Introduction of species such as rush skeletonweed into the wilderness area could be extremely difficult to reverse. Erosion associated with weed spread and loss of native vegetation, runoff from trail failures, and damage to trails also would have negative effects to the local tourism industry. This burned area is popular for its wilderness character; it is visited by recreationists and hunters looking for high levels of solitude. All of the watersheds which burned in the Cinnabar Fire feed into Rock Creek – a Blue Ribbon trout fishing stream - which is also highly popular area for outfitter-guide fishing and hunting, camping, hiking, and scenic value. In addition to trail damage that would limit access, erosion from trail failures has the potential to negatively affect trout fisheries and water quality in Rock Creek and its tributaries in the fire area.

F. Cost of Selected Alternative (Including Loss): $17,680

G. Skills Represented on Burned-Area Survey Team:

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

Team Leader: Ann Hadlow
Email: ann.hadlow@usda.gov **Phone(s)** 406-626-5402

Forest BAER Coordinator: Ann Hadlow
Email: **Phone(s):**

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

Skill	Team Member Name
Team Lead(s)	Ann Hadlow
Soils	Claire Campbell
Hydrology	Dustin Walters
Engineering	N/A
GIS	N/A
Archaeology	Syd Bacon
Noxious Weeds	Karen Stockmann
Recreation	Katie Knotek
Other	

H. Treatment Narrative:

Land Treatments:

L-01: Early Detection Rapid Response

The proposed weed treatment for the Cinnabar Fire is Early Detection, Rapid Response (EDRR). This approach will allow initial treatments along trails of known existing population as well as surveys in high and moderate severity burned area for new invader (specifically rush skeletonweed) and known weeds that may have spread. EDRR would occur on areas of moderate and high soil burn severities, trails, roadsides, suppression activity sites, and around whitebark pine plus trees. Typical EDRR detection and treatment protocol would be performed, however surveys would only be used to identify weeds around whitebark pine, treatment method around whitebark pine would utilize hand pulling or other acceptable control method. This includes doing detection surveys, mapping any potential treatment sites, verification (if detection not completed by trained plant specialist), treatment, and monitoring for eradication.

Early detection surveys would be completed by a trained botanist ($350/day) over a course of 10 days along trails and burned areas. Surveys would be completed throughout 2021 to ensure detection of multiple species during flowering times. Rapid response would be completed by seasonal applicators as soon as possible (contracts or agreements may be used too to ensure rapid response). An estimated 10 days of treatments with a two-person crew ($400/day) and herbicide for spot treatments.

Priority	Treatment	Estimated Acres	Target Weed Species	Prescription	Estimated Cost
1	Early Detection Surveys	1,629	All potential species and sensitive plants	Observational	$3,500.00
2	Rapid Response Ground Application (Spot, backpack) and surveys	30 + spot applications	Spotted knapweed, cheatgrass, and rush skeletonweed	7 oz/acre of Aminopyralid	$4,320.00
Total EDRR					$7,820.00

Channel Treatments: None Prescribed.

Roads and Trail Treatments:

T-01: Trail Tread Stabilization

The trails in the burned area are at high risk due to the burning of stabilizing brush, roots and logs. Current trail drainage features are not adequate to address the anticipated increased runoff. Trail features will be constructed to standard as defined by USFS Trails Handbook 2309.18. Installation should be designed to last no more than three years. Permanent structures are not part of this treatment. If safety risks (e.g. hazard trees) cannot be mitigated for work crews, work will be delayed until threat is reduced or stabilized. Install drainage feature depending on steepness of trail in areas of moderate or high severity or those areas directly below moderate or high soil burn severity. Focus on sections of trail that have continuous gradient for a length of greater than 50 feet and are either insloped (cupped) or show evidence of routing water (rills, gullies). Hazards within or along the trail route that restrict efficient and safe access to work sites will be mitigated (rocks, trees). This treatment is designed to stabilize trails for anticipated increases in runoff. The stabilization methods may vary by site but are designed to reduce trail erosion or damage.

Treatment prescriptions for trail drainage maintenance include:

- Clean existing drainage features
- Installation of rolling grade dips and non-structure water bars
- Berm removal, bank stabilization and the installation of non-structure stream crossing

TREATMENT	UNIT	UNIT COST	# OF UNIT	TOTAL COST
T-O1 TRAIL DRAINGAGE MAINTENANCE	Miles	$5,480	1.8	$9864

Protection/Safety Treatments:

P-01: Burned Area Hazard Warning Signs

Working, traveling, and recreating in burned areas poses an elevated risk to Human Life and Safety. The purpose of this treatment is to acknowledge and alert forest employees and visitors to the existing threats associated with traveling routes (roads and trails) within and downstream of burned areas.

“Entering Burned Area” signs are needed to alert the public to possible threats to life and safety. These signs are available on the Lolo from past fire areas where signs are no longer need. Signs will be re-used and funding for additional hazard warning signs will not be needed.

These warning signs should be posted in site-specific locations to alert travelers to upcoming dangers such as falling rocks, and “Flood Risk – No Parking or Standing”, etc. These signs will be located in strategic intersections to inform the traveler of their current location on the Forest Visitor Map. In most cases, these areas are located adjacent to the fire perimeter or at trail junctions.

P-02: Hazard Tree Mitigations

There is a very high risk to human life and safety associated with the implementation of BAER trail stabilization treatments, especially where Forest Service employees congregate during work activities. To mitigate this risk, hazard trees will be identified and felled within areas where crews will congregate for significant amounts of time (for trail retread work, at camp sites, and at trailheads). These treatments are only proposed in areas where extensive trail work will occur; treatments are proposed on 4 miles. Hazard tree mitigation work will occur in the Wilderness; this treatment will be conducted with a cross-cut saw.

Hazard Tree Mitigations Cost Estimate

TREATMENT	UNIT	UNIT COST	# OF UNIT	TOTAL COST
PS-02 HAZARD TREE MITIGATIONS	Miles	$800*	1.8	$1440

* Cross-cut saw implementation in the Welcome Creek Wilderness.

I. Monitoring Narrative:

No monitoring is proposed other than 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										
Early Detection Rapid Response	Lump	3,500	1	$3,500	$0		$0		$0	$3,500
Rapid Response Ground Application	acres	144	30	$4,320	$0		$0		$0	$4,320
Insert new items above this line!				$0	$0		$0		$0	$0
Subtotal Land Treatments				$7,820	$0		$0		$0	$7,820
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 Drainage Maintenance	Miles	5,480	2	$9,864	$0		$0		$0	$9,864
				$0	$0		$0		$0	$0
Insert new items above this line!				$0	$0		$0		$0	$0
Subtotal Road and Trails				$9,864	$0		$0		$0	$9,864
D. Protection/Safety										
Hazard Tree Mitigation	Miles	800	1.8	$1,440	$0		$0		$0	$1,440
				$0	$0		$0		$0	$0
Insert new items above this line!				$0	$0		$0		$0	$0
Subtotal Protection/Safety				$1,440	$0		$0		$0	$1,440
E. BAER Evaluation										
Initial Assessment	Report			$822	$0		$0		$0	$0
				$0	$0		$0		$0	$0
Insert new items above this line!				---	$0		$0		$0	$0
Subtotal Evaluation				$822	$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				$19,124	$0		**$0**		**$0**	**$19,124**
Previously approved										
Total for this request				**$19,124**						

PART VII - APPROVALS

1. CAROLYN UPTON Digitally signed by CAROLYN UPTON Date: 2021.01.07 16:20:13 -07'00'

Forest Supervisor Date