Date of Report: 9/22/2021

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: Woods Creek Fire

B. Fire Number: MT-HLF-000258

C. State: Montana

D. County: Broadwater and Meagher

E. Region: Northern

F. Forest: Helena-Lewis & Clark

G. District: Townsend

H. Fire Incident Job Code: P1N5JY

I. Date Fire Started: 7/10/2021

J. Date Fire Contained: first good snow

K. Suppression Cost: $23,900,000

L. Fire Suppression Damages Repaired with Suppression Funds (estimates):
1. **Fireline repaired (miles):**
2. **Other (identify):**

M. Watershed Numbers:

Table 1: Acres Burned by Watershed

HUC #	HUC 12 Subwatershed Name	Total Acres	Acres Burned	% of Subwatershed Burned
100301010801	Upper Deep Creek	19,882	97	0.5%
100301011005	Gurnett Creek	14,040	987	7%
100301011101	Duck Creek	20,792	1,209	6%
100301011103	Confederate Gulch	38,097	15,408	40%
100301030207	Woods Gulch Creek	18,978	1,977	10%
100301030208	Little Birch Creek	9,847	5,506	56%
100301030209	Big Birch Creek	19,690	7,230	37%
100301030303	Thompson Gulch	13,642	1,715	13%
100301030306	Rock Springs Creek-Smith River	31,052	90	0.3%
100301030501	Upper Camas Creek	21,624	16,826	78%

100301030502	Lower Camas Creek	17,855	5,427	30%
	Grand Total	**225,499**	**56,471**	**25%**

N. Total Acres Burned:

Table 2: Total Acres Burned by Ownership

Ownership	Acres
US Forest Service	37,572
Bureau of Land Management	79
State	1,175
Other Lands including Private	17,646
Grand Total	**56,471**

O. **Vegetation Types:** On the north and west flanks of the fire, sage and juniper dominated shrubland quickly transitions into mixed conifer forests dominated by Douglas fir and lodgepole pine. High elevations within the burn consist of high mountain meadows, rock outcrops, and exposed limestone ridges that host white bark pine and subalpine fir. On the eastern flank of the fire, upper elevations are dominated by mixed conifer forest but transition into rolling, flatter expanses of grassland with aspen in drainage bottoms and forest fringes.

P. **Dominant Soils:** Dominant soils are predominantly young Typic Cryochrepts derived from colluvium and glacial till; these soils comprise approximately 35% of the burn area and are found on mountain side slopes in mixed conifer forest. Argic Cryoborolls formed from mudstone residuum comprise 20% of the burned area and support upland meadows and grasslands. Other soil components consist of Ustochrepts, Cryoboralfs, and shallow complexes of glacial till and rock outcrops. Soils are primarily skeletal loams and sandy loams with high rock content.

Q. **Geologic Types:** Precambrian Belt Supergroup metasedimentary argillites, siltites, and quartzites are the dominant formation and comprise over 50% of the burned area. Mafic intrusives and granitic materials are the secondary geology with 30% cover within the burned area. Remaining geologic parent materials consist of glacial till, limestone, and alluvial deposits along valley bottoms. Moderately steep mountain slopes are the dominant landform, with glaciated ridges and moraines at the high elevations and rolling slopes and terraces along the foothills and eastern flanks of the burned area.

R. Miles of Stream Channels by Order or Class:

Table 3: Miles of Stream Channels by Order or Class

STREAM TYPE	MILES OF STREAM
Intermittent	64
Perennial	81
Other (Artificial Path)	3
Other (Canal/Ditch)	2
Grand Total	**150**

S. **Transportation System:**

Road Operational Maintenance Level	Miles
1 - BASIC CUSTODIAL CARE (CLOSED)	42
2 - HIGH CLEARANCE VEHICLES	21
3 - SUITABLE FOR PASSENGER CARS	17
4 - MODERATE DEGREE OF USER COMFORT	1
Total Forest Service Roads	**81**
Non-FS Roads	**113**
Total Roads	**194**

FS Trails	Miles
Motorized	7.21
Non-Motorized	29.59
Grand Total	**36.79**

PART III - WATERSHED CONDITION

A. **Burn Severity (acres):**

Table 4: Burn Severity Acres by Ownership

Soil Burn Severity	US Forest Service	Bureau of Land Management	State	Other Lands including Private	Total	% within Fire Perimeter
Unburned/ Underburned	10,658	7	240	4,543	15,448	27%
Low	12,074	31	798	9,743	22,646	40%
Moderate	11,229	32	134	2,736	14,131	25%
High	3,611	9	3	623	4,246	8%
Total	**37,572**	**79**	**1,175**	**17,646**	**56,471**	**100%**

B. **Water-Repellent Soil (acres):** Weak, discontinuous hydrophobicity is present along the surfaces of native soils throughout the area and was estimated to affect 70% of acres in unburned conditions. No alterations to this native hydrophobicity were observed in low burn severity. An estimated 26,666 acres have weak, discontinuous surface hydrophobicity within the burned area. Fire-induced hydrophobicity was observed in both moderate and high soil burn severity. In moderate burn severity, hydrophobicity was continuously present at surfaces and persisted up to 2 cm deep, with estimated coverage up to 80% of moderately burned areas. High burn severity was associated with strong, continuous hydrophobicity that persisted from the surface to 4 cm deep and was estimated to affect 90% of severely burned soils. In total, strong, persistent, and continuous hydrophobicity is estimated to exist on 15,126 acres of moderate and high severity. This fire-induced hydrophobicity is expected to decrease over time with each wetting event.

A. **Soil Erosion Hazard Rating:** Only Forest Service lands had soil landtype inventory that provided soil erosion hazard ratings; all reported totals are for inventoried lands only. A total of 76% of the burned area has high and moderate soil erosion hazard within federally managed portions of the burned area. Slight

erosion hazard exists on 23% of the burned area, dominantly on ridges, terraces and toe slopes. Bedrock, which is not rated for soil erosion hazard and therefore not included in the table, was present on 324 acres which comprised the remaining 1% of burned inventoried lands.

Erosion Hazard Rating	Acres	Percentage
Slight	10,523	23
Moderate	24,433	54
High	10,146	22

B. **Erosion Potential:** Modeled post-fire erosion rate increases for individual hillslopes ranged from a minimum 0.0 tons per acre, up to a maximum of 30.3 tons per acre, with an average rate increase of 1.3 tons per acre across the burn.

C. **Sediment Potential:** Total post-fire increases in delivered sediment across the burned area is estimated to be approximately 35,000 tons, based on a 10% exceedance probability model. Natural erosion estimates for the area are around 1,500 tons per year. Drainages with the highest predicted sediment production were Upper Camas Creek and some headwater drainages to Confederate Gulch; together these two sub-watersheds were predicted to produce 66% of the total sediment delivered out of the burned area.

D. **Estimated Vegetative Recovery Period (years):** Grasses are expected to recover in one to three years, with some forbs already showing regrowth particularly in areas of lower burn severity and in riparian areas. Overstory mortality was extensive in both uplands and some riparian areas, although the root systems of riparian shrubs are likely to have survived. Riparian shrubs are expected to recover within three to five years, and sooner in the scattered areas where mortality was low. Upland shrubs and conifers are expected to recover in twenty to fifty years. In some areas where conifer encroachment was occurring, conifer stands may revert to shrubland, as happened after the nearby Maudlow fire of 2000.

E. **Estimated Hydrologic Response (brief description):** The fire has reduced or eliminated canopy and ground cover, and has altered soil structure with varying degrees of hydrophobicity across extensive areas within the fire perimeter. These changes will lead to reduced precipitation interception, soil infiltration capacity, and surface roughness. This will result in elevated erosion, runoff, and sediment transport relative to pre-fire conditions.

Watershed response to rain and snowmelt will include an initial flush of ash, rill and gully erosion in headwater drainages and on steep slopes within the burned area, debris-laden flash floods or debris flows in response to high-intensity rain events, and elevated snowmelt peak flows. Water quality will be diminished during seasonal peak runoff, as well as during and after high-intensity summer rains due to elevated ash, fine sediment, and nutrient loading. Elevated post-fire response will gradually diminish over time as vegetation and groundcover become re-established over the next several years, although some impacts are likely to persist for a decade or longer.

Portions of 11 sixth-field hydrologic unit code (HUC12) subwatersheds were affected by the fire. Four of these subwatersheds flow toward the Missouri River, and seven flow to the Smith River. Most of the mainstem streams flowing off of the fire are heavily appropriated and rarely contribute much surface flow to either river. Within these subwatersheds, 13 drainages were delineated at road crossings to evaluate the potential post-fire threat to specific critical values. Another 8 drainages were delineated at the USFS boundary to assess the watershed response across the remainder of the burned area.

Smaller drainages were modeled using the Wildcat5 rainfall-runoff tool to run curve number equations for the pre- and post-fire condition. Two design storms were selected to simulate the high-intensity summer storms of greatest concern, using one-hour duration and precipitation intensities of 20% and 50% annual exceedance probability (i.e. the two-year and five-year events). Small, steep draws showed the greatest increase in runoff response; unburned conditions generated little to no runoff, while post-fire runoff from the same storm generated large, flashy responses. Refer to the hydrology report for specific values, and also to the debris flow potential discussion that follows.

Larger drainages (>5000 acres) were modeled using the WEPP-Cloud Disturbed online interface, with regional regression equations used as a comparison. These values represent annual peak flow estimates, rather than a specific high-intensity design storm. The larger drainages also show substantial increases in post-fire runoff, with the two-year peak flows ranging from little change to as much as doubling the two-year peak flows. The hydrology report provides model outputs by drainage.

Debris Flow Potential

The USGS provides estimates of debris-flow probability, approximate volume, and combined hazard for several storms with a range of 15-minute peak intensities. The peak 15-minute intensity of 40 mm/hr was used to evaluate risk to critical values in this BAER assessment. This rainfall intensity corresponds roughly to a 50% probability (two-year return interval) rain event.

Additional information on the USGS debris flow model used for the Cub Creek 2 Fire is available at: https://www.usgs.gov/natural-hazards/landslide-hazards/science/scientific-background?qt-science_center_objects=0#qt-science_center_objects

The model outputs are posted on the USGS public-facing webpage: https://landslides.usgs.gov/hazards/postfire_debrisflow/ which has an interactive map and downloadable geospatial data. The interactive map on the USGS website only allows the display of the 24 mmh^{-1} peak 15-minute rainfall intensity rain event.

Summary of Observations:

- A storm event with a 15-minute peak intensity of 40 mm/h was predicted to have greater than 80% probability of debris flows in several drainages, including the uppermost headwaters of Slough, Elk, Pickfoot, Camas, Little Camas, and Little Birch Creek in the Smith River watershed, and Clear Creek in the Missouri River watershed.
- Although the USGS model predicted roughly a 30% probability of debris flows from the 40 mm/h storm in the uppermost headwaters of Duck Creek, small debris flows occurred in two small, steep drainages on August 21, impacting culverts and roads in the burned area.
- Larger, more intense rainstorms with lower probability of occurrence will increase the risk of debris flows throughout the burned area.
- There is little development in the headwater basins with the highest probability of debris flows, although their impacts could potentially spread downstream to FS roads, dispersed campsites, and ultimately onto private land.
- Non-FS values within and downstream of the burned area may also be threatened by inundation from flooding and debris flows, including but not limited to diversions, ditches, and other water-handling infrastructure, as well as people, homes, and ranch outbuildings in some locations below the fire.
- Debris flows from relatively common rain events (e.g. the 50% probability event described above) are unlikely to extend onto private land due to decreasing downstream channel and valley slopes as well as extensive intact riparian areas that help to slow flows and trap debris and rock. Larger, less-common storms could trigger debris flows that extend down onto private land.
- People and infrastructure near headwater channels with higher probability of debris flow occurrence are at risk of injury or damage from direct impact of debris and flood flows, as well as loss of egress from damaged roads.
- The increased probability of debris flow activity will likely subside within 3-5 years following fire containment, as conditions within the burned watershed recover and hillslopes stabilize.

PART V - SUMMARY OF ANALYSIS

Introduction/Background

The Woods Creek Fire began as a lightning strike on July 10, 2021. As of the date of this report the Woods Creek fire perimeter includes roughly 56,000 acres primarily on the Helena – Lewis & Clark National Forest. The fire left a mosaic of fire severity on USFS land, and included some large, contiguous headwater areas that burned with moderate to high soil burn severity. Large areas of private land also burned in the Woods Creek

Fire. Most of the private acreage was in grassy foothills that generally burned with low soil burn severity. The fire has burned mostly within the Smith River watershed, but also in several Missouri River tributaries. The BAER assessment was initiated on September 12, 2021.

Critical BAER values were assessed for post-fire threats to identify where an emergency exists that warrants treatment, and to identify the most cost effective treatments to minimize or mitigate post-fire threats. The critical value spreadsheet in the project file summarizes the values assessed and the level of post-fire risk assigned to those values.

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):

Human life and safety on NFS lands is at risk from threats associated with burned trees, rock fall, debris flows, flooding, and loss of egress/access throughout the burned area.

Probability of post-fire threats to life and safety were determined for several trails, roads and developed recreational facilities within the burned area. Due to the threat of hazard trees and flooding/debris flows, the BAER risk ratings for the roads, trails and facilities generally ranged from *possible* to *likely*. In all cases, the magnitude of consequences was considered to be *major*, resulting in a *high* or *very high* risk rating.

Roads with *high* or *very high* BAER risk ratings for human life and safety due to the threat of direct injury or death or loss of egress from falling hazard trees and rocks as well as flash flooding and debris flows include all road segments within or immediately downslope of the burned area.

Trails with *high* or *very high* BAER risk ratings for human life and safety due to the threat of direct injury or death or loss of egress from falling hazard trees and rocks as well as flash flooding and debris flows include all trail segments within or immediately adjacent to or downslope from areas of moderate or high soil burn severity.

The Gipsy Lake Campground was rated at a *high* BAER risk level for human life and safety due to the threat of falling hazard trees, as well as the potential for loss of road egress due to potential flood damage to the access road. The magnitude of consequences for potential impacts on life and safety was considered to be *major*.

2. Property (P):

Loss of road and trail prisms and drainage system function could occur from increased runoff, erosion, flooding, and debris flows for road and trail sections within and downstream of areas of moderate and high soil burn severity. Risk ratings were determined for trails, roads and developed recreational facilities within the burned area. The probability of damage or loss was determined based on the likelihood and magnitude of damage from increased hillslope runoff to the road or trail drainage system as well as elevated flooding and debris flows leading to failure of stream-crossing structures. The magnitude of consequences was based on the degree and extent of potential property damage. Several road segments were judged to be at *high* or *very high* risk of damage or loss due to post-fire conditions, and treatments have been recommended to reduce those risks. Similarly, several heavily used trails in good pre-fire condition in the burned area were judged to be at *high* risk of damage or loss due to post-fire conditions based on their susceptibility to elevated runoff from moderate and high SBS terrain. Details on the trails, roads and road infrastructure risk assessment are in the BAER engineering and trails reports.

3. Natural Resources (NR):

Soil Productivity and Hydrologic Function: While post-fire erosion will have a negative effect on soil productivity and vegetative recovery, burned-area soils will likely support the recovery of native vegetation, provided noxious invasive weeds do proliferate in the burned area. Hydrologic function will initially be impaired, particularly in areas of moderate to high soil burn severity. However, hydrophobicity will substantially diminish during spring snowmelt in the first year following the fire, and conditions affecting movement and storage of water will gradually recover in the coming years.

The probability of loss of soil productivity was estimated to be *very likely*, the magnitude of consequences was estimated to be *major*, and the risk *very high*. Nonetheless, BAER treatments are not recommended for soil productivity as landscape treatments across much of the burned area were determined not to be feasible or cost-effective. Treatments to maintain native plant communities will however contribute towards addressing post-fire impacts on soil productivity. The probability of loss of hydrologic function was estimated to be *very likely*, the magnitude of consequences was estimated to be *minor*, and the risk *low.*

Water Quality: Soil erosion and subsequent sedimentation increases are predicted throughout and downstream from the burned area. The cumulative effect of increased peak flows and sediment-laden runoff from the burned area increases the risk of degraded water quality within and downstream from the burned area. Beneficial uses of water include aquatic habitat as well as irrigation and other agricultural uses on private land, among others. The probability of loss of water quality was estimated to be *very likely*, the magnitude of consequences was estimated to be *moderate,* and the risk *high.* Given the risk rating, a variety of erosion/sedimentation control treatments were considered. However, no BAER treatments were recommended, as the low probability that such treatments would successfully reduce the risk to an acceptable level did not support treatment. Forest Service personnel will collaborate with partners to share information about burned area conditions to aid in informing local agencies and water managers about potential water quality degradation.

Native or Naturalized Plant Communities: Invasive plant infestations have been documented in some locations within the burned area prior to the fire. Noxious weeds, present along road and trail corridors, may potentially spread on disturbed soils throughout the burned area. The potential for spread of invasive plants is highest in areas disturbed by suppression activities, and in areas with moderate to high soil burn severity near existing weed populations. These areas are highest priority for treatment. The goal of treatments is to limit the expansion of existing invasive plants into unaffected native plant communities within the fire perimeter.

The spread of noxious weeds would adversely affect multiple resources including native plant communities, the degradation of which in turn affects threatened and endangered species habitat for wildlife (grizzly bears and lynx), as well as soil productivity and hydrologic function. Forest Service policy mandates the Forest to minimize the establishment of non-native invasive species to prevent unacceptable degradation of the burned area. The probability of loss of native plant communities was estimated to be *very likely* and the magnitude of consequence was estimated to be *moderate*; the BAER risk rating is *very high*.

Wildlife: Critical TES Habitat or Suitable Occupied Habitat

An assessment of post-fire threats to wildlife critical TES habitat identified habitat for grizzly bears and Canadian lynx. A BAER risk assessment identified opportunities to restore effectiveness of existing barriers on some closed roads in the Atlanta Creek area that were opened up during the fire. Expanded access to motor vehicles could threaten grizzly bear security in these areas. A treatment to restore these closures is recommended but will be deferred to the Minor Infrastructure restoration pilot program. The probability of loss of grizzly bear security was estimated to be *likely* and the magnitude of consequence was estimated to be *moderate*; the BAER risk rating is *high.*

4. Cultural and Heritage Resources:

Several historic and pre-contact sites exist within the burned area. Some lithic scatter sites may be vulnerable to looting after the fire removed vegetation and groundcover, and the historic Porcupine mine site is also potentially vulnerable to erosion and sediment deposition. The probability of loss of cultural and historic resources was estimated to be *possible* and the magnitude of consequence was estimated to be *major* as these are not renewable resources; the BAER risk rating is *high*.

B. Emergency Treatment Objectives:

a. Reduce the post-fire risks to life and safety through administrative and physical closures roads and a campground, warning signs, and monitoring.
b. Storm-proof and stabilize roads and trails where feasible to protect the property investment and maintain access for administration and the public. Patrol roads during and immediately after rain events to clear debris from drainage structures to reduce risk of road failure.
c. Promote revegetation of native plant communities and soil stabilization through early detection/rapid response surveys and treatment to minimize the spread of State-listed noxious weeds.
d. Protect cultural and heritage sites from looting and erosion damage.

C. Probability of Completing Treatment Prior to Damaging Storm or Event:
Land: 90%
Channel: NA
Roads/Trails: 75%
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	80	75	70
Channel	-	-	-
Roads/Trails	70	80	90
Protection/Safety	85	90	95

E. Cost of No-Action (Including Loss): The cost of no action for roads treatments was calculated at $762,000. The cost to rebuild a mile of erosion-damaged trail would cost between $15-20,000—if half of the miles of trail at high risk were to be damaged due to inadequate drainage, the cost of no-action would be $90-120,000, well above the amount requested for trail stabilization. It is difficult to quantify the cost of no action to human life and safety, native plant communities, TES habitat, or cultural and historic resources, although the value of each is certainly far in excess of the funds requested.

F. Cost of Selected Alternative (Including Loss): $248,801

G. Skills Represented on Burned-Area Survey Team:

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

Team Leader: Kate Condon, Dave Callery
Email: katherine.condon@usda.gov, david.callery@usda.gov **Phone(s)** 406-495-3724

Forest BAER Coordinator: Scott Nagel
Email: scott.nagel@usda.gov **Phone(s):** 406-465-3064

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

Skill	**Team Member Name**
Team Lead(s)	Kate Condon, Dave Callery

Skill	Team Member Name
Soils	Megan McGinnis (BLM), Kelsey Martin
Hydrology	Deb Entwistle, Mariana Dobre
Engineering	Nick Childs, Gabe Witham
GIS	Dolores Weisbaum, Lori Wollan
Archaeology	Josh Uecker, Marley Chynoweth
Weeds	Tracy Schilling, Tony Smith
Recreation	Roy Barkley
Other	Chiara Cipriano (PIO)

H. Treatment Narrative:

Land Treatments:

P1a-b. Early detection/rapid response (EDRR): EDRR surveys will focus on areas of unimpaired native plant communities that burned at high or moderate soil burn severity and are adjacent to known state-listed noxious weeds, as well as areas disturbed by suppression activities. EDRR will be used to minimize the potential for new noxious weed infestations and ensure the natural recovery of native perennial grasses and forbs. Heavy equipment used for suppression activities travelled through areas of known weed populations to unaffected areas, which has substantially increased the risk of noxious weed spread in these disturbed areas. If new weed populations are found they would be promptly treated to minimize the potential to spread and resulting degradation of native plant communities. Chemical treatment of new and existing noxious weed infestations will reduce the likelihood of spread to disturbed areas and help re-establish high-quality wildlife and habitat within the burn.

Treatment	Units	Unit Cost	# of Units	Total Cost
P1a - Invasives EDRR – crew-based	Acres	$132	308	$40,656
P1b - Invasives EDRR-Suppression – UTV-based	Acres	$29	47	$1,363
P1b- Invasives EDRR-Suppression – crew-based	Acres	$132	48	$6,336
P1a-b – Invasives EDRR - herbicide	Acres	$29	403	$11,687
TOTAL				$60,042

H1. Heritage and Cultural Resource Protection: Several historic and pre-historic sites eligible for NHPA listing lie within the burned area on NFS land. Proposed treatments would disguise two sites through lopping and scattering available woody material to reduce the risk of removal of artifacts, and would install 600 linear feet of straw wattle above a historic mine site threatened by post-fire erosion.

Treatment	Units	Unit Cost	# of Units	Total Cost
H1 – Site disguise to prevent loss of artifacts	Site	$504	2	$1,008
H1 – Erosion control at historic mine site	Site	$2,252	1	$2,252
TOTAL				$3,260

Channel Treatments: None

Roads and Trail Treatments: Treatments will reduce the risk of damage from elevated post-fire runoff on trails and roads by improving the number and efficiency of drainage features along segments within and below areas of moderate and high SBS. Stream crossings where there is a high probability of failure due to debris and sediment-laden flood flows will be modified to reduce the risk of damage to roads in the post-fire environment.

R1. Road Drainage (storm-proofing existing drainage features): Road storm-proofing involves cleaning or armoring of drainage structures to remove accumulated sediment and expand existing features to ensure drainage capacity prior to runoff events.

Treatment	Units	Unit Cost	# of Units	Total Cost
Road Drainage – Storm-proofing	mile	$560	17.5	$9,800

R2a. New Drainage Dip: Work will include the construction of drainage dips where gravel or native-surface roads were judged to be vulnerable to erosion due to inadequate drainage features.

Treatment	Units	Unit Cost	# of Units	Total Cost
Drainage Dip	each	$850	18	$15,300

R2b. New Cross-Drain Culvert: Work will include the replacement of a fire-damaged ditch-relief culvert where elevated post-fire flows are expected to challenge the existing drainage infrastructure.

Treatment	Units	Unit Cost	# of Units	Total Cost
Cross-drain culvert	each	$2,500	1	$2,500

R3: Storm Inspection and Response: Storm Inspection and Response will keep culverts and drainage features functional by clearing sediment and debris between storms to retain the effectiveness of these features.

Treatment	Units	Unit Cost	# of Units	Total Cost
Storm Inspection and Response (Light equipment)	mile	$300	31	$9,300

R5. Critical (Armored) Dip: Work will include the addition of armored relief dips where culverts at stream crossings were judged to be vulnerable to plugging and failure. The dips will direct overflow across the road with minimal damage to the road surface and prism.

Treatment	Units	Unit Cost	# of Units	Total Cost
Armored Critical Dip	site	$4,615	13	$59,995

R14. Other Road Treatment: About 1.6 miles of the west face of Duck Creek Road traverses very steep hillslopes that burned with moderate to high SBS. A hydromulcher owned by the Forest will apply mulch with native seed to the steep road cuts and slopes above to assist in stabilization of these slopes, reducing erosion and sediment delivery to the road surface.

Treatment	Units	Unit Cost	# of Units	Total Cost
Hydromulch	mile	$23,000	1.6	$36,800

T1. Trail Drainage Stabilization: Trail storm-proofing involves cleaning or armoring existing drainage structures to remove accumulated sediment and adding drainage structures to provide capacity for elevated post-fire runoff.

Treatment	Units	Unit Cost	# of Units	Total Cost
Trail drainage stabilization	mile	$3,742	12.0	$44,904

Protection/Safety Treatments:

S1a. Road Hazard Signs: This treatment will install burned area warning signs at key road entry points to caution forest users of burned area hazards and/or closures.

Treatment	Units	Unit Cost	# of Units	Total Cost
Burned Area Hazard signs, posts, hardware and installation	sign	$350	10	$3,500

S1b: Trail/Recreation Hazard Signs: This treatment will install burned-area warning signs at trailheads, boat ramps, and on trails intersecting the fire perimeter.

Treatment	Units	Unit Cost	# of Units	Total Cost
Signs for campgrounds and trailheads	sign	$200	15	$3,000
Signs for dispersed sites	sign	$200	5	$1,000
Total				**$4,000**

S2. Road Closure Devices (gate, berm, boulders, etc.): This treatment will install a chain and padlock on an existing wire gate to prevent the public from traveling onto FSR 383-D3 which is currently lined with hazard trees and unsafe for use.

Treatment	Units	Unit Cost	# of Units	Total Cost
Chain and combination padlock, installation	each	$100	1	$100

S3. Hazard Tree Falling: This treatment will cover the removal of fire-killed trees at risk of falling and damaging Gipsy Lake campground infrastructure.

Treatment	Units	Unit Cost	# of Units	Total Cost
Hazard tree falling at Gipsy Lake Campground	site	$1,800	1	$1,800

I. Monitoring Narrative: Treatment monitoring will occur as part of the treatments for weeds, roads, and trails. No additional funding is requested for monitoring.

PART VI – EMERGENCY STABILIZATION TREATMENTS AND SOURCE OF FUNDS

Line Items	Units	Unit Cost	# of Units	BAER $
A. Land Treatments				
L1a-Invasives EDRR crew	ac	132	308	$40,656
L1b-EDRR-Suppression UTV	ac	29	47	$1,363
L1b-EDRR-Suppression crew	ac	132	48	$6,336
L1a-b-EDRR herbicide	ac	29	403	$11,687
H1-Cultural site disguise	site	504	2	$1,008
H1-Heritage site erosion contr	site	2,252	1	$2,252
Insert new items above this line!				
Subtotal Land Treatments				$63,302
B. Channel Treatments				
Insert new items above this line!				
Subtotal Channel Treatments				$0
C. Road and Trails				
R1-Road Drainage	miles	560	17.5	$9,800
R2a-Drainage Dip	each	850	18	$15,300
R2b-Ditch-relief Culvert	each	2,500	1	$2,500
R3-Storm Insp/Resp, light	miles	300	31	$9,300
R5 Armored Critical Dip	each	4,615	13	$59,995
R14 Cutslope stabilization hyd	miles	23,000	1.6	$36,800
T1-Trail drainage stabilization	miles	3,742	12	$44,904
Insert new items above this line!				
Subtotal Road and Trails				$178,599
D. Protection/Safety				
S1a-Road Hazard Signs	sign	350	10	$3,500
S1b-Trail/CG Hazard Signs	sign	200	20	$4,000
S2-Road Closure Gate lock	each	100	1	$100
S3-Hazard Tree Falling	site	1,800	1	$1,800
Insert new items above this line!				
Subtotal Protection/Safety				$9,400
E. BAER Evaluation				
Initial Assessment		$68,000	1	$68,000
Insert new items above this line!				---
Subtotal Evaluation				$68,000
F. Monitoring				
Insert new items above this line!				$0
Subtotal Monitoring				$0
G. Totals				$251,301
Previously approved				
Total for this request				**$251,301**

PART VII - APPROVALS

1. _____ 9/23/21
Forest Supervisor Date