

Date of Report: 11/20/2020**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 # 1
 - ☐ Updating the initial funding request based on more accurate site data or design analysis

PART II - BURNED-AREA DESCRIPTION**A. Fire Name:** Cameron Peak**B. Fire Number:** CO-ARF-000636**C. State:** CO**D. County:** Larimer**E. Region:** 2**F. Forest:** Arapaho and Roosevelt NF**G. District:** Canyon Lakes Ranger District**H. Fire Incident Job Code:** P2NE4T (0210)**I. Date Fire Started:** August 13, 2020**J. Date Fire Contained:** November 22, 2020
(estimated containment on 11/18/20)**K. Suppression Cost:** \$132.0 M as of 11/18/2020**L. Fire Suppression Damages Repaired with Suppression Funds (estimates):**

- 1. Fireline repaired (miles):** Of approximately 114 miles of dozer line on the fire, repair has been completed on 25 miles as of 11/15/2020. Of roughly 23 miles of hand line, about 10 miles have been repaired as of the same date.
- 2. Other:** Repairs of NFS roads are occurring concurrently with dozer line repair.

M. Watershed Numbers:

Table 1: Acres Burned by Watershed

Sub-Watershed (HUC 12) Name	Total Subwatershed		
	Total Acres	Acres burned	% Burned
Beaver Creek	14,136	5,873	41.5
Bennett Creek	9,210	6,406	69.5
Big Thompson Canyon-Big Thompson River	17,695	0	0.0
Black Hollow-Cache la Poudre River	37,738	28,915	76.6
Cedar Creek	12,100	4,923	40.7
Elkhorn Creek	22,259	6,862	30.8
Hague Creek	8,685	3,567	41.1
Headwaters Cache la Poudre River	12,709	568	4.5
Headwaters North Fork Big Thompson River	16,418	1,872	11.4
Headwaters South Fork Cache la Poudre River	11,094	594	5.4
Joe Wright Creek	24,469	7,502	30.7
La Poudre Pass Creek	14,066	980	7.0
Little Beaver Creek	11,563	9,968	86.2
Lower Buckhorn Creek	19,953	5,424	27.2
Middle Buckhorn Creek	25,359	14,583	57.5
Miller Fork	8,933	7,093	79.4
Nunn Creek	19,035	6	0.0
Outlet North Fork Big Thompson River	13,344	2,759	20.7
Pendergrass Creek-South Fork Cache la Poudre River	18,637	7,182	38.5
Pennock Creek	11,068	1,820	16.4
Rawah Creek-Laramie River	36,970	5,018	13.6
Redstone Creek	19,832	1,780	9.0
Roaring Creek	9,938	3,824	38.5
Sevenmile Creek-Cache la Poudre River	18,640	4,713	25.3
Sheep Creek	13,966	9,674	69.3
South Fork Lone Pine Creek	16,306	1,562	9.6
Upper Buckhorn Creek	27,370	16,121	58.9
Willow Creek-Cache la Poudre River	21,936	7,622	34.7
Grand Total	493,429	167,213	

N. Total Acres Burned:

Table 2: Total Acres Burned by Ownership

OWNERSHIP	ACRES
LOCAL	1,031
NFS	173,318
NATIONAL PARK SERVICE	7,494
STATE	1,837
PRIVATE	25,080
TOTAL	208,760

- O. Vegetation Types:** The fire occurred within an elevation range of about 11,000 feet near timberline in the Rawah Wilderness down to about 7,200 feet near Rustic, CO along Highway 14 and the Poudre River. Because of the large area and wide elevation range contained within the fire perimeter, a broad range of vegetation types were present. Mixed Engelmann spruce/subalpine fir and lodgepole pine types were present in the higher elevation subalpine zone. Lodgepole pine, montane mixed conifer, Douglas-fir, and ponderosa pine types were present in the montane zone. At lower elevations and on south aspects, grasslands/shrublands, including Rocky Mountain juniper, were present. Additionally, dry and wet meadows and riparian vegetation types along stream/river courses were scattered throughout the fire area. Forest areas within the fire were impacted by mountain pine beetle and spruce beetle mortality from approximately 2007 through 2013. Consequently, beetle-killed trees were present at varying levels from approximately 10-20% up to 70-80% within stands.
- P. Dominant Soils:** Soils of the area are formed on mountain slopes derived of residuum and colluvium of igneous and metaigneous rocks. Dominant texture within the fire perimeter is very stony fine sandy loam, with coarse fragment content ranging from 35 to 60% by volume. Due to these rocky, coarse textures, soils have a drainage class of somewhat excessively drained to excessively drained.
- Q. Geologic Types:** Geology within the Cameron Peak fire perimeter is comprised of granite and metaigneous gneiss. The gneiss was likely composed of interlayered sedimentary and volcanic rocks that were metamorphosed approximately 1,710 Ma in the early Proterozoic Era. Over the following 50 to 310 million years (still in the Proterozoic Epoch), an igneous intrusion would result in patches of gneissic granite and granite material. Water and ice have transformed portions of the landscape, resulting in glacial deposits as well as alluvium of these materials being eroded, reworked, and deposited in and along streams (Shaver et al, 1988). [The southern half of the fire perimeter is primarily composed of metasedimentary rocks, primarily micaceous schist. The schist was interlayered and metamorphosed approximately 1,710 Ma in the early Proterozoic Era, with several igneous intrusions occurring approximately 1,400 to 1600 Ma.](#)

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	268
INTERMITTENT	454
EPHEMERAL	417
DITCH/PIPELINE/ETC	53

S. Transportation System:

Trails: National Forest (miles): 122

Snow Trails (miles): 19

Roads: National Forest (miles): 242

State/county/private (miles): 105

PART III - WATERSHED CONDITION

A. Burn Severity (acres):

Table 4: Burn Severity Acres by Ownership

Soil Burn Severity	Colorado State Forest	Local (includes SWAs)	Private	Rocky Mountain NP	USDA Forest Service	Grand Total	Area within fire perimeter (%)
High	4	11	138	1,104	10,944	12,200	6
Moderate	433	144	2,775	3,241	57,276	63,869	30
Low	1,049	706	17,239	1,994	70,155	91,143	44
Unburned	351	171	4,927	1,154	34,943	41,547	20
Grand Total	1,837	1,031	25,080	7,493	173,318	208,760	
Ownership%	0.9	0.5	12.0	3.6	83.0	100	

- B. Water-Repellent Soil (acres):** Hydrophobicity within the fire perimeter is highly variable. Within the small dataset of field observations collected during soil burn severity mapping, hydrophobicity did not correlate with soil burn severity class, nor was the presence of hydrophobicity consistent within any one soil burn severity class. The dataset collected during field work is realistically not rigorous enough to systematically draw conclusions as to the presence of hydrophobicity across the fire. The following numbers are provided as a rough estimate, to get an idea of what conditions may be present on the ground.

Table 5: Cameron Peak Water-Repellant Soil Observations

Hydrophobicity	Data points observed	%	Acres w/in perimeter
None	6	30	62,630
Weak	3	15	13,670
Mod	5	25	52,190
Strong	6	30	62,630

For the sake of this report, moderate and strong hydrophobicity would be interpreted as water-repellant. Therefore, approximately 55% of the fire (114,820 acres) may have water-repellant properties. Where present, hydrophobicity effects were primarily observed between one to six centimeters in depth.

- C. Soil Erosion Hazard Rating:** Soil Erosion Hazard Ratings (EHR) are derived from Arapaho Roosevelt National Forest TEU data. Approximately 11,960 acres within the fire perimeter are not covered by this soil mapping effort. These areas are located on private land to the southeast of Peterson Lake Reservoir, and the southeastern tip of the burned area.

Table 6: Erosion Hazard Ratings within the Cameron Peak Fire Perimeter

Erosion Hazard Rating	Acres	Percent within fire perimeter
Slight	14,190	7%
Moderate	98,555	47%
Severe	82,952	39%
Very Severe	1,103	1%
No Data	11,960	6%

- D. Erosion Potential:** Erosion potential post-fire is contingent on a variety of site characteristics including soil texture, rock fragment content, slope, soil burn severity and the distribution of soil burn severity. Due to the size of the fire and the variation amongst drainages, soil loss due to erosion was assessed in seventeen sub-watersheds using the Watershed Erosion Prediction Project: Post-Fire Erosion Prediction tool (WEPP PEP). Sub-watersheds were prioritized for modelling efforts based on elevated concerns for water quality. [Eight additional drainages were evaluated in the second \(interim\) assessment.](#)

Table 7 depicts the estimated soil loss due to post-fire conditions (at the watershed scale and per acre), as well as the dominant T factor rating within each watershed. T factor is an interpretation included in the on-forest TEU soil survey and depicts the soil loss tolerance for that map component in tons per acre. Essentially, this rating communicates the maximum amount of wind or water erosion that may occur on a site beyond which soil productivity is not maintained. Soil loss estimated due to post-fire conditions should be considered in context of the T factor rating. The watersheds analyzed contained multiple map unit components with differences in T factor ratings, as such multiple T factor ratings are reported in some watersheds.

Table 7: Estimated soil loss via post-fire erosion for the Cameron Peak fire

Pour Point	Erosion (WEPP PEP)		T Factor (TEU)
	Estimated Soil Loss post-fire		Acceptable soil loss
	(ton/watershed)	(ton/ac/year)	(ton/acre)
Barnes Meadow Res	120	0.24	5 and 2
Bennett Creek lower	4,200	0.7	2 and 4
Black Hollow Fish Barrier	1,400	0.35	2 and 4
Crown Point Gulch	1,400	1.4	2 and 4
E Sheep Cr at Poudre	2,200	1.25	2 and 4
Fall Creek-Chambers Lk	880	0.285	5
Laramie River Tunnel CG	2,300	0.38	5
Mineral Springs Gulch	1,500	1.2	2 and 4
NF Joe Wright Cr Hwy 14	350	0.165	5
Peterson Lake Trib	150	0.2	5
Trap Creek-Chambers Lk	NA	NA	2 and 5
Trib 1-Chambers Lk	140	0.55	5
Trib 1-Laramie River	48	0.6	5
Trib 2-Chambers Lk	30	0.475	5
Trib3 to Poudre River	1,200	0.5	2 and 5
Trib1 to Poudre River	310	0.65	2 and 5
Trib2 to Poudre River	190	0.15	2 and 5
Tunnel Cr at Hwy 14	250	0.155	2 and 5
Bear Gulch-Buckhorn Creek	1,200	0.42	2
Cascade Creek FSR 129	1,300	0.68	2
Dry Creek-Poudre River	620	0.87	4
Elkhorn Creek CR 69	210	0.08	5
FSR 344B	570	1.04	2
Lakey Canyon	210	0.25	2
Peterson Creek-Poudre River	170	0.13	2 and 5
Sevenmile Creek CR 69	2,300	0.50	2 and 5

- E. Sediment Potential:** Sediment delivery potential is contingent on a variety of site characteristics including soil texture, rock fragment content, slope, soil burn severity and the distribution of soil burn severity. Due to the size of the fire and the variation amongst drainages, sediment delivery potential was assessed at the hillslope scale in eighteen sub-watersheds using the Erosion Risk Management Tool (ERMiT). Sub-watersheds were prioritized for modelling efforts based on elevated concerns for water quality. [Eight additional drainages were evaluated in the second \(interim\) assessment.](#)

Table 8. Sediment Delivery - Erosion Risk Management Tool (ERMiT).

Subwatershed Name	Sediment Delivery (ton/ac)	
	Year 1	Year 2
Barnes Meadow Res	0	0
Bennett Creek lower	2.16	1.27
Black Hollow Fish Barrier	0	0
Crown Point Gulch	3.11	2
E Sheep Cr at Poudre	3.21	2.31
Fall Creek-Chambers Lk	0	0
Laramie River Tunnel CG	0	0
Mineral Springs Gulch	2.88	1.81
NF Joe Wright Cr Hwy 14	0	0
Peterson Lake Trib	0	0
Trap Creek-Chambers Lk	0	0
Trib 1-Chambers Lk	0	0
Trib 1-Laramie River	0	0
Trib 2-Chambers Lk	0	0
Trib3 to Poudre River	0.86	0.25
Trib1 to Poudre River	0.23	0.02
Trib2 to Poudre River	0.36	0.05
Tunnel Cr at Hwy 14	0	0
Bear Gulch-Buckhorn Creek	1.10	0.92
Cascade Creek FSR 129	2.28	2.26
Dry Creek-Poudre River	2.20	2.07
Elkhorn Creek CR 69	1.02	0.84
FSR 344B	1.89	1.77
Lakey Canyon	1.07	0.90
Peterson Creek-Poudre River	1.37	1.14
Sevenmile Creek CR 69	2.79	2.35
Beaver Creek FSR 145	3.16	1.62
Buckhorn Creek 44H	2.93	2.58
Buckhorn Creek FSR 129-Lower	2.93	2.58
Comanche Reservoir	3.16	1.62
Fish Creek-Buckhorn Creek	2.51	1.89
Miller Fork Big Thompson River	0.68	0.51
Sheep Creek FSR 132	2.93	2.58

Debris Flow Potential

The USGS provides estimates of debris-flow likelihood, volume, and combined hazard for several design storms with a range of peak 15-minute intensities. Peak 15 minute intensities range from 12 mm/h to 40 mmh⁻¹ in 4 mmh⁻¹ increments. Estimates that can be used to guide the initial establishment of rainfall intensity-duration thresholds for storm peak intensities of 15-, 30-, and 60-minute durations are also provided. A peak 15-minute intensity of 28 mm/hr and 36 mm/hr were used in this BAER assessment.

Debris flow estimates are calculated at two scales: the stream segment scale (segment of stream with a maximum length of 200m) and for drainage basins. The maximum drainage area size for calculation the predictions is 8 square kilometers, the largest basin area we have identified as producing a debris flow in our empirical database. Flooding is far more of a concern in drainage basins exceeding 8 square kilometers in contributing area. Streams that exceed an upslope area of 8 square kilometers, yet are still susceptible to flood and possibly debris-flow hazards, are included as "watch streams."

The USGS debris flow model uses the same data used to create the BARC map, including areas that had inaccurate reflectance readings due to the snow cover. This may result in greater uncertainty in the model estimates in those sections of the burn area, specifically in the southeastern portion of the fire.

Additional information on the debris flow model 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/ with an interactive map and the downloadable geospatial data, referenced above. The interactive map on the USGS website only allows the display of the peak 15-minute rainfall intensity of 24 mmh⁻¹ design storm.

Summary of Observations:

- A storm event of 28 mm/h (sub-annual recurrence interval) of rainfall show greater than 60% probability of debris flows in several drainages, including but not limited to those surrounding Chambers Lake, the Poudre Canyon Highway (Hwy 14), and Crown Point Road.
- The probability of debris flows are imminent in the Cameron Peak Burned Area in response to a 15 minute intensity of 36 mm/h rainfall event, a storm event with a 1 year expected return interval. With the increase in rainfall from a 28 mmh⁻¹ rain event, the extent of debris flows increases considerably within the burn perimeter.
- Many watersheds are estimated to produce more than 1,000 m³ of debris, resulting in a high debris flow hazard.
- Most watersheds are estimated to produce between 1,000 – 100,000 m³ resulting in overall low to moderate combined debris-hazard throughout the burn area.
- As reflected by the “Watch stream” layer provided by the USGS and the hydrologic response model results summarized in this report, elevated debris laden and sediment bulked flows are likely to occur in main stem stream channels within the burned area. In larger, lower gradient streams and rivers, it is likely suspended, dissolved and or floatable materials will be carried significantly further downstream.
- The increased probability of debris flow activity will likely subside within 3-5 years following fire containment.

F. Estimated Vegetative Recovery Period (years): Based on applicable local research and observations of vegetative recovery on past wildfires, estimated recovery of vegetation (sufficient to provide effective ground cover to significantly reduce hill-slope runoff and erosion to levels closer to pre-fire conditions) is 3-5 years. Natural recovery of trees takes a lot longer.

G. Estimated Hydrologic Response (brief description): The fire has reduced or eliminated canopy and ground cover, as well as altered soil structure with varying degrees of hydrophobicity across extensive areas within the fire perimeter. These changes will lead to reduced precipitation interception and soil infiltration capacity, as well as elevated runoff compared to pre-fire conditions.

Watershed response will likely 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 in response to high-intensity rain events, elevated snowmelt peak flows, and potentially debris flows. Water quality will be diminished during seasonal peak runoff, as well as 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 levels recover over the next several years, although some impacts are likely to persist for a decade or longer.

Portions of 26 sixth-field hydrologic unit code (HUC12) subwatersheds were affected by the fire. All of these subwatersheds flow into the Cache la Poudre River, except the Rawah Creek-Laramie River subwatershed, which includes the headwaters of the Laramie River. However, there is an inter-basin diversion just downstream of the fire perimeter that diverts water from the Laramie River over to the Cache La Poudre River via a tunnel through the mountain. Within these subwatersheds, 52 drainages under 6,000 acres were delineated to evaluate the potential post-fire threat to specific critical values.

The WEPP *Post-fire Erosion Prediction* (PEP) distributed model was used to estimate increases in peak flows resulting from the fire for drainages under 6,000 acres. The 5-year-recurrence-interval, one-hour design storm was used in this analysis to represent a relatively common high-intensity rain event that may occur over the area. Modelling results are summarized in Table 9.

Table 9. Pre and post-fire estimated streamflow for the 5-year RI, one-hour storm.

Watershed	Pre-fire (cfs)	Post-fire (cfs)	Percent change
Barnes Meadow Reservoir	7	42	496%
Barnes Meadow Res South	13	72	445%
Bennett Creek Dispersed Site 1	5	79	1572%
Bennett Creek Dispersed Site 2	2	31	1809%
Bennett Creek Dispersed Site 3	2	40	2100%
Bennett Creek Dispersed Site 4	8	101	1229%
Bennett Creek FSR 139	7	30	315%
Bennett Creek middle	25	103	316%
Black Hollow Fish Barrier	54	540	894%
Crown Point Gulch	13	145	999%
E Sheep Creek at Poudre River	24	295	1157%
East Fork Roaring Creek	48	260	445%
Fall Creek-Chambers Lake	41	161	294%
Fish Creek at SF Poudre River	53	247	362%
Mineral Springs Gulch	17	167	877%
Monument Gulch	3	44	1455%
NF Joe Wright Creek Hwy 14	28	161	470%
NFSR 350 Crossing	4	86	2013%
Peterson Lake Tributary	10	51	411%
Peterson Lake Tributary SE	2	9	360%
Trap Creek-Chambers Lake	51	92	79%
Tributary 1-Chambers Lake	3	57	1618%
Tributary 2-Chambers Lake	1	21	2383%
Tributary 1-Laramie River	1	23	2116%
Tributary 1 to Poudre River	7	130	1863%
Tributary 2 to Poudre River	17	192	1057%
Tributary 3 to Poudre River	31	420	1262%
Tunnel Creek at Hwy 14	21	124	489%
Two and One Half Creek	14	148	961%
Bear Gulch-Buckhorn Creek	34	207.7	509%
Cascade Creek FSR 129	21	370.8	1638%
Cedar Creek FSR 299	70	99.2	42%
Dry Creek-Poudre River	9	33.3	283%
Elkhorn Creek CR 69	26	75.9	187%
Manhattan Creek CR 68C	27	86.2	224%
North Fork Trail	4	12.6	236%
Peterson Creek-Poudre River	13	33.5	152%
Sevenmile Creek CR 69	57	222.1	288%

Sheep Creek FSR 132	61	471.8	668%
Stringtown Gulch-Buckhorn Creek	36	333.0	834%
Swamp Creek CR 69	14	62.9	343%
Trib 1 Big Thompson River	12	60.6	394%
Trib 2 Big Thompson River	9	30.9	236%
Trib 4 Poudre River	6	60.0	866%
Bear Gulch FSR 153	7	43.1	539%
Buckhorn Creek FSR 154	15	63.2	331%
Elkhorn Creek FSR 198	12	131.4	960%
FSR 344B	6	58.6	817%
Lakey Canyon	10	24.7	144%
Trib to Buckhorn Creek	4	6.4	70%
Miller Fork at FS Boundary	66	483.8	637%
Buckhorn Creek FSR 129-Upper	10	17.0	75%

Post-fire response in [seventeen](#) drainages over 6,000 acres was estimated by calculating pre-fire annual peak flows using USGS regression equations (Cooper 2005) in the StreamStats web interface, and adjusting those values for post-fire conditions using a simple modifier. The modifier was based on the proportion of the drainage with moderate and high soil burn severity effects. These annual peak flows are associated with snowmelt runoff in this area and are less responsive to burned area influences than are smaller burned drainages in response to short-duration, high-intensity rainfall events. The same intense rainstorms that can cause a rapid flow response in smaller drainages typically are more limited in scale, and thus generally do not produce rainfall simultaneously across the larger watersheds.

Table 10. Estimated pre and post-fire snowmelt peak flows for drainages larger than 6,000 acres (two-year recurrence interval—50% probability in first year following fire)

Watershed	Area (ac)	Soil Burn Severity (acres)				High-mod SBS (%)	Pre-fire peak flow (cfs)	Post-fire peak flow (cfs)
		High	Mod	Low	Unburned			
Poudre River at Big South*	57,408	1,648	5,573	4,261	46,009	13%	1230	1385
Lower Poudre River Fish Barrier*	36,032	823	2,607	1,246	31,243	10%	971	1063
Joe Wright Creek at Big South*	24,576	1,960	2,346	3,223	17,058	18%	763	897
W Sheep Creek at Poudre River	14,016	841	5,338	3,432	4,380	44%	181	261
Joe Wright Creek-Chambers Lake*	11,712	689	633	1,069	9,389	11%	496	552
Little Beaver Creek at CR63E	11,520	1,933	5,904	2,063	1,578	68%	113	190
Hague Creek Fish Barrier	8,704	766	1,929	875	5,103	31%	291	382
Bennett Creek lower	6,528	350	2,620	2,314	1,208	46%	62.8	91
Laramie River Tunnel CG	6,150	1,476	1,838	1,624	1,422	52%	150	228
WF Roaring Creek	6,106	220	1,086	372	4,475	21%	131	159
Beaver Creek FSR 145	13,230	138	2329	2686	8077	19%	171	203
Buckhorn Creek 44H	17,377	28	3632	7444	6273	21%	211	255
Buckhorn Creek FSR 129-Lower	9,427	25	2396	3984	3022	26%	135	170

Comanche Reservoir	7,434	133	1609	1208	4484	23%	124	153
Fish Creek-Buckhorn Creek	10,262	26	2206	6039	1991	22%	173	211
Miller Fork Big Thompson River	8,933	181	3249	3663	1840	38%	136	188
South Fork Poudre River	9,815	1	44	193	9,577	<1%	172	173

*regulated stream (upstream impoundment[s])

PART V - SUMMARY OF ANALYSIS

Introduction/Background

The Cameron Peak Fire started August 13, 2020 near Chambers Lake approximately 25 miles east of Walden and 15 miles southwest of Red Feather Lakes near Cameron Pass Colorado. The fire burned primarily in the Roosevelt National Forest, although it also affected areas of Rocky Mountain National Park and some private lands. Extreme fire behavior caused rapid expansion of the fire. The BAER assessment was initiated on September 21, 2020 and utilized a BARC imagery from September 13, 2020 which covered approximately 99,205 acres. Since that time the fire has continued to grow during periods of high fire activity and is now over 125,000 acres; a follow up BAER assessment to address the additional acres will be conducted later this fall. *The second assessment (interim #1) evaluated a burned area of 208,760 acres, which is likely to be the final burned area as snow has largely curtailed fire progress at the time of the interim assessment.*

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 associated risk. The most probable damaging storm events are high intensity-short duration thunderstorms that most commonly occur during the July/August monsoon season.

A. Describe Critical Values/Resources and Threats

Table 11: Critical Value Matrix

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

Probability of Damage or Loss: The following descriptions provide a framework to estimate the relative probability that damage or loss would occur within 1 to 3 years (depending on the resource):

- Very likely. Nearly certain occurrence (90% - 100%)
- Likely. Likely occurrence (50% - 89%)
- Possible. Possible occurrence (10% - 49%)
- Unlikely. Unlikely occurrence (0% - 9%)

Magnitude of Consequences:

- Major. Loss of life or injury to humans; substantial property damage; irreversible damage to critical natural or cultural resources.
- Moderate. Injury or illness to humans; moderate property damage; damage to critical natural or cultural resources resulting in considerable or long-term effects.
- Minor. Property damage is limited in economic value and/or to few investments; damage to critical natural or cultural resources resulting in minimal, recoverable or localized effects.

1. **Critical Value: Human life and safety**

Human life and safety is potentially at risk from threats associated with hazardous burned trees, debris flows, increased flooding, and loss of egress/access throughout the burned area.

Probability ratings to determine where life or safety could be impacted were determined for several trails, roads and developed recreational facilities within the burned area. Separate ratings were determined for hazard trees and flooding/debris flows to better inform closure treatment recommendations and future decisions about re-opening the closed roads, trails and facilities. For both hazard trees and flooding/debris flows, the BAER risk ratings for the roads, trails and facilities listed below 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 based on hazard trees and/or flooding/debris flow: 126.A, [129](#), [132](#), 135.0, 139.0, 139.0, 139 A-N, 142.0, 142 A-G, 144.0, 144.A, 152.0, 152.1, 152.1A-B, 152.2, 152.2A, 152.D-G, [153](#), [154](#), [154-1C](#), 177.0, 177.C, 177.B, D, E-F, 191.0, 191.A-B, 259.0, 259.A, 268.0, 268.A-B, D, [344](#), [345](#), 350.0, 350.A-B, 520.0 and D139.A.

Trails with high or very high BAER risk ratings for human life and safety based on hazard trees and/or flooding/debris flow: Upper and Lower Dadd Gulch, Flowers, Zimmerman, Browns Lake, Big South, Little Beaver, Little Fish, Roaring Creek, Chambers Lake, Blue Lake, Blue Lake Spur, Jacks Gulch CG Loop Trail, Fish Creek, Blue Lake, [North Fork](#), [Emmaline Lake](#), [Beaver Creek](#), and [Comanche Lake](#).

Developed Recreational Facilities: BAER risk ratings for human life and safety based on hazardous trees and/or flooding/debris flow. The probability that flooding would occur at developed campsites was considered to be intermediate and was applicable to selected streams adjacent low lying sites within the campgrounds. For all developed risk facilities, especially campgrounds, longer residence times (longer exposure) within these areas was considered in the risk determinations for life and safety. In all cases the magnitude of consequences for potential impacts on life and safety was considered to be major.

Table 12. Developed Recreation Facility Risk Ratings

Facility	Threat - Life-Safety Risk Rating
Aspen Glen Campground	Flooding – Intermediate Risk*
Ansel Watrous Campground	Flooding – Intermediate Risk*
Bennett Creek Picnic Site	Flooding – Low Risk
Big Bend Campground	Flooding – Intermediate Risk*
Big South Campground	Flooding – Intermediate Risk*
Big South Trailhead	Life -Safety Concerns Not Identified
Blue Lake Trailhead	Life -Safety Concerns Not Identified
Browns Lake Trailhead	Life -Safety Concerns Not Identified
Chambers Lake Boating Site	Life -Safety Concerns Not Identified
Chambers Lake Campground	Flooding – Intermediate Risk to access road at culvert crossing Trap Creek (no flooding risk to CG itself). Hazard Trees – Very High
Chambers Lake Picnic Site	Life -Safety Concerns Not Identified
Dutch George Campground	Flooding – Intermediate*
Fish Creek Trailhead	Life -Safety Concerns Not Identified
Fish Creek Picnic Site	Life -Safety Concerns Not Identified
Green Ridge/Lost Lake Trailhead	Life -Safety Concerns Not Identified
Jacks Gulch Group Campground	Hazard Trees – Very High Risk, burned latrines – intermediate risk
Jacks Gulch Trailhead	Hazard Trees – Very High Risk

Jacks Gulch Campground	Hazard Trees – Very High Risk, burned latrines –intermediate risk
Kelly Flats Campground	Flooding – Intermediate Risk*
Long Draw Snowpark	Life -Safety Concerns Not Identified
Sleeping Elephant Campground	Rock Fall – High Risk**
Stove Prairie Campground	Flooding – Intermediate Risk*
Tunnel Picnic Site	Flooding – Low Risk
Tunnel Campground	Flooding – Intermediate Risk at four sites adjacent to Laramie River (bridge not evaluated by hydrology)
Zimmerman Trailhead	Life -Safety Concerns Not Identified
Tom Bennett Campground	Hazard trees – very high risk (at a few sites—not extensive)
Beaver Creek Trail Head	Hazard trees – very high risk
Corral Creek Trail Head	Hazard trees – very high risk
Dunraven Trail Head	Hazard trees – very high risk
Green Ridge/Lost Lake Trail Head	Hazard trees – very high risk, burned latrine – intermediate risk
Bellaire Lake Campground	Hazard trees – very high risk
Donner Pass –Ballard Road Trail Head	Hazard trees – very high risk
Emmaline Lake Trail Head	Hazard trees – very high risk
Home Moraine Geological Site	
Comanche Peak Wilderness	Hazard trees – high risk, rock fall at designated campsites – high risk

*Campgrounds along the Cache La Poudre River within and downstream from the burned area have some river adjacent sites that may be subject to flooding. The probability that flooding would occur and/or impact public safety is unlikely.

**Sleeping Elephant Campground has many sites that are directly adjacent to the steep burned hill-slope. Although it appears unlikely that the fire significantly exacerbated risk in this location, monitoring of rock fall is recommended through Spring freeze thaw cycles and after rainfall events.

Dispersed Camping: BAER risk ratings for human life and safety based on hazardous trees and/or flooding/debris flow. The probability that campers at dispersed sites along the 139 road near Bennett Creek and in other locations could be impacted by flooding and/or hazard trees. The BAER risk rating is high. Risk ratings have not been completed for all dispersed camping locations within or immediately downstream from the burned area.

Emergency Determination: An emergency was determined for life/safety and BAER response actions, described in the treatments section of this report, are recommended.

2. Critical Value: Property

Loss of road and trail prisms and function could occur from increased erosion, flooding, and debris flows for road and trail sections within and downstream of areas of moderate and high soil burn severity.

Risk ratings to determine if property could be impacted 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, stream flooding and debris flows. The magnitude of consequences was based on the degree and extent of potential property damage.

Roads with high or very high BAER risk ratings for property: There are roughly 358 miles of Forest Service roads within the fire perimeter. This includes approximately 14 ML 1 miles, 250 ML 2 miles, 60 ML3 miles and 7 ML 4 miles. High or very high BAER risk ratings were determined for approximately 52 road miles. Roads or road segments that received high or very high-risk ratings are NFSR 139 and Adjacent 139 Collectors, NFSR 350, 191, 129, 132, 153, 154, 344, 345.

Trails with high or very high BAER risk ratings for property: There are roughly 122 miles of trails within the burned area. High or very high BAER risk ratings were determined for 40.24 miles of trail, based on terrain, trail slope and moderate-to-high SBS surrounding or immediately upslope of the trail. Trails or trail segments that received high or very high risk ratings are: Upper and Lower Dadd Gulch, Flowers, Zimmerman, Browns Lake, Big South, Little Beaver, Little Fish, Roaring Creek, Chambers Lake, Blue Lake, Blue Lake Spur, Jacks Gulch CG Loop Trail, Fish Creek, Blue Lake, North Fork, Emmaline Lake, Beaver Creek, and Comanche Lake. With the exception of approximately 2.6 miles of class 3 trails (developed), all are trail class 2 (moderately developed). All BAER treatments would occur on class two trails.

Trail standards for class 2 trails are outlined in this trail matrix document.

https://www.fs.fed.us/recreation/programs/trail-management/documents/trailfundamentals/01_TrailMatrixHandout_Sec508_01-24-17_150dpi.pdf.

Relevant standards to inform the BAER trail storm-proofing treatment include:

- Structures of limited size, scale, and quantity; typically constructed of native materials
- Structures adequate to protect trail infrastructure and resources
- Natural fords

Trail Bridges with high or very high BAER risk ratings for property: Blue Creek (2 bridges), Chambers Lake, Roaring Creek, North Fork (4 bridges), Emmaline Lake, Beaver Creek, and Comanche Lake Trails. The probability that these bridges would be impacted by post-fire flooding or debris flows is likely and the magnitude of consequences is moderate. The BAER risk rating is high, based on likelihood of debris-laden flood flows in representative drainages above bridges.

Emergency Determination: An emergency was determined for property and BAER response actions, described below, are recommended.

3. Critical Value: Natural Resources

Soil Productivity and Hydrologic Function: While post-fire erosion will have a negative effect on soil productivity and vegetative recovery, it is expected that burned area soils will support the recovery of native vegetation, provided noxious weeds do not become established in the burned area.

Emergency Determination: The probability of loss is possible, and the magnitude of consequence is moderate; the risk is intermediate. With an intermediate risk rating, BAER treatments are not recommended for soil productivity. Treatments to maintain native plant communities will however, also contribute towards addressing post-fire impacts on soil productivity.

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, public drinking water supply, and water for irrigation, among other uses. BAER and other Forest Service personnel have provided information about burned area conditions to aid in informing local agencies and water managers about potential water quality degradation.

- Probability: Very likely (90-100%) that water quality would be impacted by post-fire ash and sediment-laden runoff, nutrient loading, and potential debris flows within the first few years following the fire.
- Magnitude of Consequences: While the natural processes and associated impacts (described above) will undoubtedly impact water storage, conveyance and treatment infrastructure and processes owned and managed by water managers and providers, the BAER team did not determine a BAER risk ratings for these non-USFS values as they are outside of BAER authority and USFS responsibility. The magnitude of consequences for water quality as a BAER critical value was rated moderate.
- Based on the preceding probability and consequences determinations, the BAER risk rating is very 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. This included the analysis and assessment of large-scale mulch treatments to reduce risks to water quality.

Native or Naturalized Plant Communities: Invasive plant infestations have been documented throughout the burned area prior to the fire. Noxious weeds, present throughout the road and trail corridors, may potentially spread throughout the burned area. The potential for spread of invasive plants is highest in areas disturbed by suppression activities areas and with moderate to high burn severity. These areas are highest priority for treatment. This BAER risk assessment/treatment proposal of 480 acres is based on known weed infestations within moderate and high soil burn severity. This area is 15% of known infested areas and 0.5% of the entire burned area. Treatments are to limit the expansion of existing invasive plants within the fire perimeter.

Invasive plants within the burned area include *Cardaria draba*, *Carduus nutans*, *Centaurea diffusa*, *Centaurea maculosa*, *Cirsium arvense*, *Cirsium vulgare*, *Cynoglossum officinale*, *Euphorbia esula*, *Leucanthemum vulgare*, *Linaria dalmatica*, *Linaria vulgaris*, *Potentilla recta*, *Tanacetum vulgare* and *Verbascum thapsus*.

The spread of noxious weeds would adversely affect multiple resources including native plant communities which in turn affects threatened and endangered species habitat for wildlife and fisheries, as well as soil productivity. Forest Service policy mandates the Forest to minimize the establishment of non-native invasive species to prevent unacceptable degradation of the burned area.

Emergency Determination: The probability of loss of native plant communities is very likely and the magnitude of consequence is moderate; the BAER risk is very high.

Areas of native vegetation communities were determined to be threatened by expansion of noxious weeds into burned areas not evaluated in the initial assessment. However, a more detailed analysis of the critical values, threats, and risks was not completed in time to be included in this interim request. An additional interim request may be filed early in 2021 to assist in reducing the post-fire threats to these plant communities.

Wildlife: Critical TES Habitat or Suitable Occupied Habitat

Canada Lynx

In total, approximately 73,330 acres of lynx habitat is mapped within the fire area. Potential lynx habitat (lodgepole pine and mixed spruce/fir/lodgepole forest above 9,000' elevation) within the fire perimeter was primarily burned by crown fire, as observed by field observation and from BARC (high and moderate). Approximately 52,770 acres (72%) of suitable lynx habitat incurred crown fire that largely removed lynx habitat. Consequently, these acres won't provide potential lynx habitat for several decades until regenerating conifer trees grow tall enough to provide snowshoe hare and lynx cover.

In the long term, burned areas are expected to re-vegetate and re-forest over time through natural recovery. Crown fire in this type of ecosystem is a natural disturbance process that ultimately provides different age classes of forest for lynx habitat.

Preble's Mouse

Field observations of Preble's habitat were made in accessible areas along Bennet Creek just off the Pingree Park road and from Highway 14 along the Poudre River. Other potential habitat areas were not accessible behind private property. Generally, it appears that the riparian zone within Preble's critical habitat along Bennett Creek and other suitable habitat reaches were either unburned or lightly burned.

Risk Assessments: These risk assessments are based on the potential for post fire impacts, such as debris flows and flooding, to adversely impact lynx or Preble's habitat. The probability of damage/loss for lynx habitat is rated as Unlikely and the magnitude of consequences is rated as Minor, resulting in a risk rating of Very Low. For Preble's mouse critical and other suitable habitat stream reaches, the probability of damage/loss is rated as Unlikely and the magnitude of consequences is rated as Minor, resulting in a risk

rating of Very Low. No emergency was determined for either Preble's mouse or lynx habitat. [The same conclusion applies to the burned area evaluated in the interim assessment.](#)

Fisheries: Critical TES Habitat or Suitable Occupied Habitat

Table 13. Streams with occupied or suitable habitat for the Federally-Threatened greenback cutthroat trout within Cameron Peak burned areas on NFS lands.

Stream Name	Date of Discovery (D) or Reintroduction (R)	Species, Genetic Origin	Conservation Status	BAER Critical Value
East Fork Roaring Creek	2020 (R)	GBCT, South Platte	ESA Threatened; occupied GBCT habitat	Yes
Roaring Creek	1962 (D) ¹	CRCT, Yampa River	R2 Sensitive; suitable GBCT habitat	No
East Fork Sheep Creek	1982 (R) ¹	CRCT, Yampa River	R2 Sensitive; suitable GBCT habitat	No
West Fork Sheep Creek	1982 (R) ¹	CRCT, Yampa River	R2 Sensitive; suitable GBCT habitat	No
Williams Gulch	1996 (R) ¹	CRCT, Yampa River	R2 Sensitive; suitable GBCT habitat	No
Black Hollow	1963 (D) ¹ , 1969 (R) ¹ , 1982 (R) ¹	CRCT, Yampa River + Colorado River	R2 Sensitive; suitable GBCT habitat	Yes, on basis of property

Despite the high and very high risk ratings for these BAER Critical Values, available BAER treatments are unlikely to prevent or effectively reduce impacts from occurring in East Fork Roaring Creek or Black Hollow subwatersheds within the first few years of the fire. BAER treatments will not prevent the severe post-fire hydrologic responses in these stream channels from occurring. In addition, the state of the fish barrier in Black Hollow prior to the fire was functional, but in need of maintenance or replacement as the age of the wooden structure was approaching 40 years, well beyond the intended design life. Structural damage to the timbers of the barrier caused by the fire accelerated the deterioration of the barrier. Given the expected change in peak flow runoff and potential for debris flows within Black Hollow, BAER treatments are unlikely to prevent further damage or destruction of the structure. In addition, the current location of the Black Hollow fish barrier restricts the available habitat to less than 1.4 miles, which is less habitat than the minimum 1.7 mile habitat patch recommended in the Recovery Outline for greenback cutthroat trout (USFWS 2019). [The same conclusion applies to the burned area evaluated in the interim assessment.](#)

4. Critical Value: Cultural Resources

There are seven historic properties within the burned area. The BAER risk ratings for these critical values are low to intermediate. No BAER treatments are proposed. However, coordination and consultation to ensure BAER roads treatments do not impact cultural resources is recommended. [The same conclusions apply to the burned area evaluated in the interim assessment.](#)

Table 14. Summary of BAER Risk Assessments

Critical values	CV category: <i>life-safety, property, natural resource, cultural resource</i>	Risk rating
Roads	Property, life/safety	High, Very High
Trail	Property, life/safety	High, Very High
Native plant communities	Natural Resources	Very High
Critical habitat for GBCT	Natural Resources	High, Very High
Water quality	Natural Resources	Very High

Soil Productivity	Natural Resources	Low
Critical habitat for wildlife– Lynx, Preble's Mouse	Natural Resources	Low
Pre-historic site (eligible) (7 sites)	Cultural	Low

B. Emergency Treatment Objectives:

- Minimize post-fire risks to life and safety to the extent possible through administrative and physical closures, signing, and monitoring.
- Storm-proof and stabilize roads and trails to reduce risk to this USFS property. These treatments would also help minimize road/trail adjacent erosion and associated impacts on water quality.
- Promote revegetation and soil stabilization by native plant communities through early detection/rapid response surveys to minimize the spread of Colorado State-listed noxious weeds.

C. Probability of Completing Treatment Prior to Damaging Storm or Event:**Land:** 90**Channel:** NA**Roads/Trails:** 80**Protection/Safety:** 90**D. Probability of Treatment Success**

Table 15: Probability of Treatment Success

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

E. Cost of No-Action (Including Loss):

NFS Trails and Trail Bridges:

- \$300,000 (initial), \$545,400 (interim) value
- \$170,600 (initial), \$276,508 (interim) treatment cost
- \$130,000 (initial), \$268,900 (interim) expected benefit of treatment

NFS Roads:

- \$205,570 (initial), \$366,186 (interim) value
- \$58,878 (initial), \$161,700 (interim) treatment cost
- \$123,342 (initial), \$204,486 (interim) expected benefit of treatment

F. Cost of Selected Alternative (Including Loss): See expected benefit of treatments (above)**G. Skills Represented on Burned-Area Survey Team:**

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

Team Leader: Dave Callery, Tom Matthews**Email:** david.callery@usda.gov; thomas.matthews@usda.gov **Phone(s)** 406.439.5932; 970.903.3204**Forest BAER Coordinator:** Tom Matthews**Email:** thomas.matthews@usda.gov **Phone(s):** 970.903.3204**Team Members:** Table 8: BAER Team Members by Skill

Skill	Team Member Name
Team Lead(s)	Dave Callery, Tom Matthews
Soils	Jori Johnson, Leah Shipstead
Hydrology	Jamie Krezelok
Engineering	Steve Wood/Kipp Klein
GIS	Janice Naylor/Dolores Weisbaum
Archaeology	Larry Fullenkamp
Weeds	Tom Bates
Recreation	Matt Cowan, Matt Henry
Fisheries	Matt Fairchild
Wildlife	Dale Oberlag
PAO	Reghan Cloudman

H. Treatment Narrative:

Land Treatments: Early detection/rapid response (EDRR) surveys will focus on areas of high and moderate soil burn severity adjacent to known Colorado State listed noxious weeds, as well as areas disturbed by suppression activities. Heavy equipment used for suppression activities travelled through areas of known weed populations to unaffected areas which substantially increased the risk of noxious weed spread in these disturbed areas. Treatment would occur through existing county agreements. If new weed populations are found, they would be promptly treated to minimize the potential to spread and lead to the modification of native plant communities. Treatments would likely be implemented through contracts or agreements, but may also use force account, if necessary. Several locations include multiple weed species which may require treatment at different times and/or with different herbicides. This funding request is based on limiting expansion of known weed populations and does not, at this time, include suppression EDRR.

Areas of native vegetation communities were determined to be threatened by expansion of noxious, invasive weeds into burned areas not evaluated in the initial assessment. However, a more detailed analysis of the critical values, threats, and risks was not completed in time to be included in this interim request. An additional interim request may be filed early in 2021 to assist in reducing the post-fire threats to these plant communities.

Treatment	Units	Unit Cost	# of Units	Total Cost
L1a - Invasives EDRR – Initial	Acres	\$130	480	\$62,400
Treatment Total				\$62,400

Channel Treatments: N/A

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 greatly reduce the risk of damage to roads in the post-fire environment.

Roads Mobilization	Units	Unit Cost	# of Units	Total Cost
Initial	1	\$ 5,000	Lump Sum	\$ 5,000
Interim 1	1	\$ 5,000	Lump Sum	\$ 5,000
Treatment Total				\$ 10,000

RT1a. Road drainage and storm proofing (storm proofing existing drainage features): Storm-proof drainage features where identified to protect the road investment. Activity will include cleaning culverts inlets, road ditches, and ensuring water does not concentrate on the road.

RT1a Road Drainage (storm proofing)	Units	Unit Cost	# Units	Total Cost
Clean and Pull Ditches (NFSR 139 + spurs)	miles	\$ 350	5.15	\$1,803
Clean Culvert Inlet and Outlet (NFSR 139+spurs)	each	\$150	41	\$6,150
Road Reconditioning–Type 1 (NFSR 350)	mile	\$ 2,400	2.7	\$6,480
Road Reconditioning–Type 1 (NFSR 129)	mile	\$2,400	5.33	\$12,792
Road Reconditioning–Type 1 (NFSR 344)	mile	\$2,400	1.8	\$4,320
Road Reconditioning–Type 1 (NFSR 154+spurs)	mile	\$2,400	6.14	\$14,736
Road Reconditioning–Type 1 (NFSR 153)	mile	\$2,400	2.39	\$5,736
Road Reconditioning–Type 1 (NFSR 345)	mile	\$2,400	7.97	\$23,928
Treatment Total				\$75,945

RT1b. Road drainage (new drainage feature): Install new drainage features where identified to protect the road investment. Activity will include installing new rolling dips to move runoff off the roadway, preventing concentrated runoff and erosion of the road surface.

RT1b New Drainage Feature	Units	Unit Cost	# Units	Total Cost
Construct Critical Dip (NFSR 139 + spurs)	each	\$ 325	45	\$14,625
Treatment Total				\$14,625

RT2: Storm Inspection and Response (roads and Trails): 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. Costs reflect equipment and personnel time for roads and personnel time for trails.

Treatment	Units	Unit Cost	# of Units	Total Cost
Storm Inspection and Response (Roads) – Initial	Mile	\$1682	10	\$16,820
Storm Inspection and Response (Roads) – Interim 1	Mile	\$1682	10	\$16,820
Storm Inspection and Response (Trails) – Initial	Mile	\$250	28	\$7,000
Treatment Total				\$40,640

RT3 Culvert Removal: Remove culvert and grade road-stream crossing to ensure efficient passage of streamflow and debris, protecting roadway from plugging and failure due to post-fire flooding and debris.

RT 3 Culvert Removal	Units	Unit Cost	# Units	Total Cost
Culvert Removal and Grading (NFSR 191)	each	\$ 2,500	1	\$ 2,500
Treatment Total				\$ 2,500

RT6 Relief Culvert: Install a new relief culvert at NFSR 132 and NFSR 344 road-stream crossings where elevated post-fire flows are anticipated to damage the existing roadway, and no culvert currently exists. Both roads provide access to private residences on inholdings.

RT 6 Relief Culvert	Units	Unit Cost	# Units	Total Cost
Install 36" culvert (NFSR 132 & NFSR 344)	each	\$ 5,025	2	\$ 10,050
Treatment Total				\$ 10,050

RT7 Low-Water Crossing: Install hardened, driveable crossing structure at road-stream crossing where elevated post-fire flows are anticipated to damage the existing roadway.

RT 7 Low-Water Crossing	Units	Unit Cost	# Units	Total Cost
--------------------------------	--------------	------------------	----------------	-------------------

Rock Crossing (NFSR 350)	each	\$ 4,200	1	\$ 4,200
Treatment Total				\$ 4,200

RT 12 and 13: Trail Stabilization and Drainage: This treatment will improve surface drainage on the trail tread to limit erosion and to ensure safe use and travel on the trail for BAER treatment crews. Clearing and improving undamaged drainage structures will ensure capacity to accommodate increased runoff (water bars, rolling dips). Trail will also be out-sloped where appropriate and feasible. Work will include cutting hazard trees as appropriate for worker safety. All BAER treatments would occur on class two trails.

Relevant standards to inform the BAER trail storm-proofing treatments include:

- Structures of limited size, scale, and quantity; typically constructed of native materials
- Structures adequate to protect trail infrastructure and resources
- Natural fords

Treatment	Units	Unit Cost	# of Units	Total Cost
Trail Drainage – Initial	Mile	\$5,700	28	\$159,600
Trail Drainage – Interim 1	Mile	\$5,700	12.24	\$69,768
Treatment Total				\$229,368

RT14 Trail Infrastructure Protection: This treatment will temporarily move bridges from the drainage way in order to avoid damage/loss from post-fire flooding and debris flows.

Treatment	Units	Unit Cost	# of Units	Total Cost
Temporary trail bridge removal – Initial	each	\$1000	4	\$4,000
Temporary trail bridge removal – Interim 1	each	\$1000	7	\$7,000
Treatment Total				\$11,000

Protection/Safety Treatments: Road Hazard Warning Signs and Gates

P1a. Road Hazard Signs: This treatment will install burned area warning signs at key road entry points to caution forest users. Cost includes signs, posts, hardware, and installation.

Treatment	Units	Unit Cost	# of Units	Total Cost
Burned area hazard signage – Initial	sign	\$350	13	\$4,550
Burned area hazard signage – Interim	sign	350	4	\$1,400
Treatment Total				\$5,950

P1b: Trail/Recreation Hazard Signs: This treatment will install burned area warning signs at trailheads and on trails intersecting the fire perimeter. Cost includes signs, posts, hardware, and installation.

Treatment	Units	Unit Cost	# of Units	Total Cost
Signs for trails and dispersed camping sites – Initial	sign	\$158	45	\$7,110
Signs for trails and dispersed camping sites – Interim	sign	\$158	35	\$5,530
Treatment Total				\$12,640

P2. Road Closure Devices (gate, berm, boulders, etc.): This treatment will install temporary closure gates and barricades with required signage to control access to high-risk areas in the years immediately following the fire, or until the hazards can be mitigated and areas reopened to use.

Treatment	Units	Unit Cost	# of Units	Total Cost
Temporary closure gates, posts, hardware, reflective signs and installation – Initial	gate	\$1,377	10	\$13,770
Temporary closure gates, posts, hardware, reflective signs and installation – Interim	gate	\$1,377	9	\$12,393
Type III road barricades – Interim	each	\$450	40	\$18,000
Treatment Total				\$44,163

P3a. Hazard Tree (developed sites): This treatment will remove burned hazard trees that are a threat to trailhead users who are often stationary for longer time periods during preparation to use the trails.

Treatment	Units	Unit Cost	# of Units	Total Cost
Hazard tree mitigation – Initial	site	\$500	6	\$3,000
Hazard tree mitigation – Interim	site	\$500	3	\$1,500
Treatment Total				\$4,500

P5. Hazardous Materials: This treatment will provide for pumping open/exposed toilet vaults and installation of simple covers to minimize exposure to hazardous materials.

Treatment	Units	Unit Cost	# of Units	Total Cost
Pumping and sealing of open pit toilet vaults – Initial	4	\$1,450	4	\$5,800
Pumping and sealing of open pit toilet vaults – Interim	1	\$1,450	1	\$1,450
Treatment Total				\$7,250

Monitoring/Coordination: M1. Level I Closure Treatment Effectiveness: This treatment would install game cameras at the trail closure gates to determine if the closure is working and whether additional treatment or patrol is necessary.

Treatment	Units	Unit Cost	# of Units	Total Cost
Game camera installation and monitoring – Initial	each	\$1,850	5	\$9,250
Treatment Total				\$9,250

M3. Specialist: An archaeologist is necessary to survey BAER treatment locations on roads and trails that may impact cultural resources.

Treatment	Units	Unit Cost	# of Units	Total Cost
GS-11 Archaeologist – Initial	day	\$325	4	\$1,300
Treatment Total				\$1,300

M4. BAER Implementation Coordination: The BAER implementation coordinator would ensure the treatments are completed in a timely manner and in coordination with roads, trails, and heritage staff.

Treatment	Units	Unit Cost	# of Units	Total Cost
GS-11 Implementation Team Lead – Initial	day	\$400	25	\$10,000
GS-11 Implementation Team Lead – Interim 1	day	\$400	15	\$6,000
Treatment Total				\$16,000

M5. Agency Coordination: There is a need to continue interagency coordination initiated during the BAER assessment. This involves communication and coordination with other federal, state and local agencies with jurisdiction over lands where life and property are at risk from post-fire conditions.

Treatment	Units	Unit Cost	# of Units	Total Cost
GS-11 Interagency Coordinator – Initial	day	\$400	7	\$2, 800
Treatment Total				\$2,800

PART VI – EMERGENCY STABILIZATION TREATMENTS AND SOURCE OF FUNDS

			NFS Lands				
		Unit	Units		Cost		Total
Line Items	Units	Cost	initial	interim1	initial	interim1	BAER \$
A. Land Treatments							
L1a invasives EDRR	acres	\$130	480	0	\$62,400	\$0	\$62,400
<i>Insert new items above this line!</i>							\$0
<i>Subtotal Land Treatments</i>					\$62,400	\$0	\$62,400
B. Channel Treatments							
None							\$0
<i>Insert new items above this line!</i>							\$0
<i>Subtotal Channel Treatments</i>							\$0
C. Road and Trails							
RT1a road drainage (storm proofing)	miles	\$2,400	6.01	25.63	\$14,432	\$61,512	\$75,944
RT1b road drainage (new drainage feature)	each	\$325	45	0	\$14,625	\$0	\$14,625
RT2 storm inspection and response - road	miles	\$1,682	10	10	\$16,820	\$16,820	\$33,640
RT2 storm inspection and response - trail	days	\$500	14	0	\$7,000	\$0	\$7,000
RT3 culvert removal	each	\$2,500	1	0	\$2,500	\$0	\$2,500
RT6 relief culvert	each	\$5,025	0	2	\$0	\$10,050	\$10,050
RT7 low-water crossing	each	\$4,200	1	0	\$4,200	\$0	\$4,200
RT13 trail drainage	miles	\$5,700	28	12.24	\$159,600	\$69,768	\$229,368
RT14 trail infrastructure protection - bridge removal	each	\$1,000	4	7	\$4,000	\$7,000	\$11,000
RT15 roads - mobilization	lump	\$5,000	1	1	\$5,000	\$5,000	\$10,000
<i>Insert new items above this line!</i>							\$0
<i>Subtotal Road and Trails</i>					\$228,177	\$170,150	\$398,327
D. Protection/Safety							
P1a. Road Hazard Signs	each	\$350	13	4	\$4,550	\$1,400	\$5,950
P1b (trail/rec hazard signs/ closure)	each	\$158	45	35	\$7,110	\$5,530	\$12,640
P2 road closure devices (gate)	each	\$1,377	10	9	\$13,770	\$12,393	\$26,163
P2 road closure device (type III barricade)	each	\$450	0	40	\$0	\$18,000	\$18,000
P3a (hazard tree rec sites)	each	\$500	6	3	\$3,000	\$1,500	\$4,500
P5 (hazardous materials, vault toilets)	each	\$1,450	4	1	\$5,800	\$1,450	\$7,250
<i>Insert new items above this line!</i>							\$0
<i>Subtotal Protection/Safety</i>					\$34,230	\$40,273	\$74,503
E. BAER Evaluation							
Initial Assessment	Report				\$90,278	\$60,000	\$150,278
<i>Insert new items above this line!</i>							---
<i>Subtotal Evaluation</i>							\$150,278
F. Monitoring/Coordination							
M1 trail closures-game camera install/monitor	each	\$1,850	5	0	\$9,250	\$0	\$9,250
M3 Heritage (Roads)	days	\$325	4	0	\$1,300	\$0	\$1,300
M4 BAER Implementation Team Leader	days	\$400	25	15	\$10,000	\$6,000	\$16,000
M5 BAER Interagency Coordinator	days	\$400	7	0	\$2,800	\$0	\$2,800
<i>Insert new items above this line!</i>							\$0
<i>Subtotal Monitoring</i>					\$23,350	\$6,000	\$29,350
					initial	interim1	
G. Totals					\$348,157	\$216,423	\$564,580
Previously approved							\$338,907
Total for this request							\$225,673

PART VII - APPROVALS

1. _____
Forest Supervisor Date