Date of Report: 09/22/2020

BURNED-AREA REPORT

PART I - TYPE OF REQUEST

A. Type of Report

- ☐ 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: Grizzly Creek Fire **B. Fire Number:** CO-WRF-000348

C. State: CO D. County: Garfield and Eagle

G. District: Eagle-Holy Cross, Aspen-Sopris, Rifle **H. Fire Incident Job Code**: P2NEF1 (0215)

I. Date Fire Started: August 10, 2020 J. Date Fire Contained: September 30, 2020

(estimated)

K. Suppression Cost: ~\$34,000,000 (9/16/2020)

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

- 1. Fireline repaired (miles): 53 miles (complete), 38 miles (still need repair)
- 2. Other (identify): 36 miles (no repair needed), 23 miles (unknown)

M. Watershed Numbers:

Table 1: Acres Burned by Watershed

HUC #	Watershed Name	Total Acres	Acres Burned	% of Watershed Burned
140100011603	No Name Creek	22,238	1,085	5%
140100011602	Grizzly Creek	41,913	3,156	8%
140100011604	Glenwood Canyon	73,599	27,162	40%

N. Total Acres Burned:

Table 2: Total Acres Burned by Ownership

OWNERSHIP	ACRES
NFS	28,051
BLM	2,421
STATE	NA
PRIVATE	1,893
TOTAL	32,365

- **O. Vegetation Types:** The dominate vegetation types include riparian/wetlands, Pinyon-Juniper Woodlands, Montane Forest and Shrublands, Aspen and Subalpine Spruce-Fir Forests.
- **P. Dominant Soils:** Dominant soils types within the fire perimeter include the Cochetopa, Adel, Owen Creek, Rock-outcrop and Rubble-lands soil series.
- Q. Geologic Types: The canyons and tributaries surrounding the Colorado River are narrow and steep, with high walls formed in horizontally stratified sandstones of Sawatch quartzite, Manitou dolomite, Chaffee formation conglomerate, Leadville limestone, and Belden shale. There is an extensive karst topography that included sinkholes, caverns, and limestone towers on the top of the Leadville Limestone. Cenozoic (Late Tertiary to Quaternary) unconsolidated deposits overlie the Paleozoic marine sediments and include alluvial and mass-wasting deposits in drainages and along high cliff faces. Till and glacio-fluvio deposits underlie the moraines along the northern edge of the fire perimeter in the vicinity of East and West Dead Horse Creeks. Talus and colluvium deposits dominate the lower slopes of the canyons and often reach the valley floors, while landslide and debris-flow deposits are common in loosely the fractured overlying Eagle Valley evaporite, Chaffee Group and Belden shale formations.

R. Miles of Stream Channels by Order or Class:

Table 3: Miles of Stream Channels by Order or Class

STREAM TYPE	MILES OF STREAM
PERRENIAL	38
INTERMITTENT	106
EPHEMERAL	74
PIPELINE/DITCH	3

S. Transportation System:

Trails: National Forest (miles): 11.1 Other (miles): Roads: National Forest (miles): 29 Other (miles): 33

PART III - WATERSHED CONDITION

A. Burn Severity (acres):

Table 4: Burn Severity Acres by Ownership

Soil Burn Severity	NFS	BLM	Private	Total	% within the Fire Perimeter
Unburned	3,477	286	222	3,985	12%
Low	9,315	739	634	10,688	33%
Moderate	11,803	1,284	788	13,876	43%
High	3,457	112	248	3,817	12%
Total	28,052	2,421	1,893	32,366	100%

B. Water-Repellent Soil (acres): Approximately 8,000 acres in the high and moderate SBS areas exhibited strong water repellency.

C. Soil Erosion Hazard Rating:

	Soil Burn Severity Acres								
Soil Stability	High	High Moderate Low Unburned Total							
High	245	505	544	99	1,093				
Moderately High	416	2858	3337	1226	7,837				
Moderately Low	539	975	548	198	2,260				
Low	2310	7645	5103	2055	5,450				
Unknown Non-FS	306	1903	1156	407	3,773				
Total	3,817	13,876	10,688	3,985	32,365				

D. Erosion Potential: 9.2 tons/acre for high SBS, 3.4 tons/acre for moderate SBS, average 6.3 tons/acre for high and moderate SBS

E. Sediment Potential:

Soil Burn Severity	Sediment Delivery (tons/acre)	Sediment Delivery (yds³/ mi²)
Moderate	3.4	979
High	9.2	4,320

- F. Estimated Vegetative Recovery Period (years): 3-5 years for effective ground cover to establish
- **G. Estimated Hydrologic Response (brief description):** Both first-year snowmelt and common thunderstorm peak flows were considered. Design storms of 2-year 15 minute, 2-year 60 minute, 5-year 15-minute, and 5-year 60 minute were evaluated in the analysis. These events most closely approximate common convective thunderstorms that could cause sediment-laden high flows, debris flows, or flash flooding in the burn area. Experience with other fires indicates that storms of 0.5 inch or greater and hour will cause erosion and elevated floods and sediment loads in areas with a high percentage of moderate and high soil burn severity. See hydrology report for details.

PART V - SUMMARY OF ANALYSIS

Introduction/Background

The Grizzly Creek Fire started on August 10, 2020 in Glenwood Canyon approximately 1 mile east of Glenwood Springs on the White River National Forest. The fire primarily burned NFS lands on the White River National Forest, with some burned area on BLM-managed and private lands. As of September 15, 2020 the fire is 32,431 acres and is 91% contained with an estimated containment date of September 30, 2020. The BAER assessement started on September 8, 2020 utilizing the August 27, 2020 fire perimeter of 32,365 acres with the final report completed on September 21, 2020. The Critical Values spreadsheet in the project file summarizes ciritcal values evaluated and the risk assessment to identify where a BAER emergency exists that warrants treatment. Risk assessment focused on the most probable damaging storm events, which are high intensity short duration thunderstorms during the July/August monsoon season.

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

Table 5: Critical Value Matrix

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

1. Human Life and Safety (HLS):

- a. Human life/safety is at risk on NFS land from threats associated with hazard trees, rock fall, increased flooding and debris flows, and loss of egress/access throughout the burned area, but particularly on roads and trails. The trails within the burned area are mainly within the bottom of steep canyons that burned at high and moderate soil burn severity.
- b. Float boaters on the Colorado River also are at risk from threats from unexpected debris flows and flooding emanating from burned tributaries. Debris laden flood flows can fill the channel with suspended sediment, wood, and other debris that would create hazards to float boaters in an area that is currently class II-III raftng at lower flows and reaches class IV over 6000 cfs.
- c. Users of the Glenwood Canyon Trail, the popular paved trail connecting Glenwood Springs to Dotsero. The section of the trail that passes through the burned area is approximately 11 miles in length. A thunderstorm in one or more drainages above the trail could cause flash-flooding or a debris flow that users are not expecting.
- 2. Property (P):Damage to or loss of sections of road and trail could occur from increased runoff, erosion, flooding, and potentially debris flows within and downslope or downstream of areas of moderate and high soil burn severity. Roads on both side of Glenwood Canyon are at risk of damage from post-fire watershed response. Roads on the south side of the canyon provide access to private as well as NFS land. Affected roads are FSR 408.1 and 408.3; trails include 1847, 1850, 1850.1, 2065, and 2064.1, 2064.2.
- 3. Natural Resources (NR): The primary municipal water sources for the City of Glenwood are Grizzly and No Name Creeks. While the areas draining to the diversions on both streams are largely unburned, hillslopes above the stream and relatively close to the diversions did burn and have the potential to produce ash and sediment-laden flows during high-intensity rain events. Additionally, the burned areas above the diversions will likely be a chronic source of elevated nutrients and dissolved organic carbon for the next few years, until conditions stabilize.
 - b. Hanging Lake was designated as a National Natural Landmark by the National Park Service in 2011. It supports one of the best examples of a hanging garden plant community in the Southern Rocky Mountain biophysiographic province and is also one of the larger and least altered travertine systems in the province. The lake is dependent on unimpeded hydrologic function of a complex karst system on the East Fork of Deadman's Creek. The hydrologic function of this system is threatened by potential sediment-laden flood flows or debris flows.
 - c. Native plant communities are at risk of invasion by known populations of Colorado State listed noxious weeds adjacent to areas of high and moderate SBS, and areas disturbed by suppression activities. Noxious weed infestations pose a serious threat to the composition, structure, and function of native plant communities. Crown canopy was highly reduced to eliminated (moderate to high intensity burned areas); as was shrub and forb cover in the understory. These disturbed areas are now highly vulnerable to noxious weed spread from existing infestations or adjacent sources. In noxious weed ecology, any reduction in competition for available nutrients, space, or light is considered an advantage to noxious weeds growth and establishment.
 - d. The Colorado Pikeminnow, razorback sucker, humpback chub and Bonytail are native fish listed under the Endangered Species Act that reside in the Colorado River approximately 30 miles below the burned area. These fish are adapted to more turbid waters during spring runoff, but may be more vulnerable to high sediment and ash loading during summer low-

flow periods, when thunderstorm-triggered flash floods or debris flows could carry sediment from the burned area into the river.

4. Cultural and Heritage Resources: The Hanging Lake CCC shelter is a designated historic landmark. The shelter is located in the bottom of the Dead Horse Creek drainage along NFST 1850. It is located below a steep canyon wall with areas of high and moderate SBS. Rockfall along this trail has occurred in the past and will likely increase in frequency in the next few years following the wildfire.

B. Emergency Treatment Objectives:

- a. Reduce the post-fire risks to life and safety through administrative and physical closures of trails and roads, signing, and monitoring.
- b. Storm-proof and stabilize roads and trails to protect the property investment and maintain access for administration and the public; this would also protect municipal water quality.
- c. 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 6: Probability of Treatment Success

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

- **E. Cost of No-Action (Including Loss):** Approximately \$444,500 based on trail and road reconstruction as well as expanded weed treatment costs. Cost of injuries to public and personnel were not quantified.
- F. Cost of Selected Alternative (Including Loss): \$242,600
- G. Skills Represented on Burned-Area Survey Team:

oximes Soils oximes Hydrology oximes Engineering oximes GIS oximes Archaeology

oximes Weeds oximes Recreation oximes Fisheries oximes Wildlife

⊠ Geology

Team Leader: Dave Callery, Jamie Krezelok (trainee)

Email: David.Callery@usda.gov, Jamie.Krezelok@usda.gov Phone(s): 406-439-5932, 719-269-8542

Forest BAER Coordinator: Liz Roberts

Email: elizabeth.roberts@usda.gov **Phone(s):** 970-618-2708

Team Members: Table 7: BAER Team Members by Skill

Team Member Name
Dave Callery/Jamie Krezelok (t)
Beth Anderson/Ryan Sparhawk (t)
Tyler Carleton
Kipp Klein
Dorothy Thomas/Jane Frambach (t)
Rebekah Sease
Liz Roberts/Jessica Pettee (t)

Skill	Team Member Name
Recreation	Kay Hopkins/Paula Peterson (t)
Geology	Amy Titterington
Fish/Wildlife	Liz Roberts/Jen Prusse (t)/Melvin Woody (t)
PAO	Dave Boyd

H. Treatment Narrative:

Land Treatments: Early detection/rapid response (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 Colorado 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 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. 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 habitat within the burn.

Treatment	Units	Unit Cost	# of Units	Total Cost
L1a - Invasives EDRR	Acres	\$130	267	\$34,710
L1b- Invasives EDRR-Suppression	Acres	\$130	149	\$19,370

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

Mobilization	Units	Unit Cost	# of Units	Total Cost
Mobilization (Total for all road treatments)	Lump sum	\$3,500	1	\$3,500

RT1a. Road Drainage (stormproofing existing drainage features): Road stormproofing involves cleaning or armoring of drainage structures to remove accumulated sediment, and expand existing features to ensure drainage capacity prior to seasonal storms, reducing the risk to the transportation infrastructure.

Treatment	Units	Unit Cost	# of Units	Total Cost
Road Drainage	mile	\$3,450	4	\$13,800

RT2: 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 (Roads)	mile	\$1,575	4	\$6,300
Storm Inspection and Response (Trails)	mile	\$1,370	7	\$9,590
TOTAL				\$15,890

RT3. Culvert Removal: Work will include removal of existing culverts and laying back the banks to more closely approximate natural channel dimensions. This increases channel capacity and greatly reduces the likelihood that elevated post-fire flows will damage the road at the crossing.

Treatment	Units	Unit Cost	# of Units	Total Cost
Removal of existing pipe	site	\$1,030	3	\$3,090

RT4. Armored Dip: Work will include the addition of an armored dip where one of the culverts detailed in RT3 was removed at an ephemeral crossing. The dip will serve to direct high flows across the road with minimal damage to the road surface and prism.

Treatment	Units	Unit Cost	# of Units	Total Cost
Armored Critical Dip	site	\$3,900	1	\$3,900

RT7. Low Water Crossing: Work will consist of armoring crossings with rock where the two culverts described above are removed, allowing continued administrative and public access on these routes.

Treatment	Units	Unit Cost	# of Units	Total Cost
Construct Low Water Crossing	site	\$4,200	2	\$8,400

RT9. Channel Clearing (wood): This treatment will involve the removal by hand of large, mobile debris upstream of the bridges and boardwalk along the Hanging Lake Trail.

Treatment	Units	Unit Cost	# of Units	Total Cost
Clearing wood from channel	site	\$1,000	7	\$7,000

RT12. Fill-Slope Stabilization: This treatment will consist of bolstering vulnerable fillslopes and existing rock retaining structures along Grizzly Creek Trail, and reinforcement of rock retaining walls on Hanging Lake Trail.

Treatment	Units	Unit Cost	# of Units	Total Cost
Hanging Lake Trail	sites	\$1200	8	\$9,600
Grizzly Creek Trail	sites	\$1200	20	\$24,000
TOTAL				\$33,600

RT13: Trail 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 outsloped where appropriate and feasible. Work will include cutting hazard trees as appropriate for worker safety.

Treatment	Units	Unit Cost	# of Units	Total Cost
Jessie Weaver Trail	mile	\$5,814	0.8	\$4,651
Grizzly Creek Trail	mile	\$5,814	3.7	\$21,512
Hanging Lake Trail	mile	\$5,814	1.2	\$6,977
Spouting Rock Trail	mile	\$5,814	0.04	\$233
Cutover Trail	mile	\$5,814	1.2	\$6,977
TOTAL			6.94	\$40,349

RT14. Trail Infrastructure Protection: This treatment will involve the removal of large fire-killed trees on the fillslope of the Grizzly Creek Trail to prevent windthrow of these trees from damaging or destroying the trail prism.

Treatment	Units	Unit Cost	# of Units	Total Cost
Grizzly Creek Trail	site	\$250	15	\$3,750

RT15. Other: 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
Monitoring of trail closure effectiveness	site	\$1,805	4	\$7,220

Protection/Safety Treatments:

P1a. 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	\$407	10	\$4,070

P1b: 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 trails	sign	\$308	68	\$20,944
Signs for boat ramps	sign	\$250	10	\$2,500
Total				\$23,444

P2. Road Closure Devices (gate, berm, boulders, etc.): This treatment will install temporary closure gates with required signage to implement access restrictions to high risk areas in the period immediately following the fire. The White River NF will determine the appropriate time to life these closures, in an effort to balance public access with safety.

Treatment	Units	Unit Cost	# of Units	Total Cost
Temporary closure gates, posts, hardware, reflective signs and installation	gate	\$1,105	4	\$4,420

P9. Rockfall Mitigation: This treatment will fund the inspection of the rock fence above Hanging Lake to ensure it is adequate to protect visitors from the expected increase in rockfall at this location, once the trail is reopened to the public.

Treatment	Units	Unit Cost	# of Units	Total Cost
Inspection of Rockfall Fence	site	\$1,500	1	\$1,500

P10. Other: This treatment will install temporary closure gates on trails to implement access restrictions to high risk areas in the period immediately following the fire. The White River NF will determine the appropriate time to lift these closures, in an effort to balance public access with safety.

Treatment	Units	Unit Cost	# of Units	Total Cost
Trail Hazard signs, posts, hardware, and installation	unit	\$1,650	4	\$6,600

I. Monitoring/Coordination:

M4. BAER Implementation Coordination: The BAER coordinator would ensure the treatments are completed within the 1-year time period and coordinate with roads/engineering/trails/archeology staff.

Treatment	Units	Unit Cost	# of Units	Total Cost
BAER Implementation Coordinator	day	\$400	15	\$6,000

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	day	\$400	5	\$2,000

PART VI – EMERGENCY STABILIZATION TREATMENTS AND SOURCE OF FUNDS

			NFS Lan	ds				Other La	ands		All
		Unit	# of		Other		# of	Fed	# of	Non Fed	Total
Line Items	Units	Cost	Units	BAER\$	\$		units	\$	Units	\$	\$
						8				ĺ	
A. Land Treatments						*					
L1a-Invasives EDRR	ac	130	267	\$34,710	\$0	*		\$0		\$0	\$34,710
L1b-EDRR-Suppression	ac	130	149	\$19,370	\$0	××		\$0		\$0	\$19,370
Insert new items above the	is line!			\$0	\$0			\$0		\$0	\$0
Subtotal Land Treatments				\$54,080	\$0			\$0		\$0	\$54,080
B. Channel Treatments	;			, ,							. ,
Insert new items above the	is line!			\$0	\$0			\$0		\$0	\$0
Subtotal Channel Treatme	ents			\$0	\$0			\$0		\$0	\$0
C. Road and Trails					·	*					
Mobilization	lumpsum	3,500	1	\$3,500	\$0			\$0		\$0	\$3,500
RT1a-Road Drainage	miles	3,450	4	\$13,800	\$0	22		\$0		\$0	\$13,800
RT2-Storm Inspection (Roa	mies	1,575	4	\$6,300	\$0	200		\$0		\$0	\$6,300
RT2-Storm Inspection (Tra		1,370	7	\$9,590	\$0			\$0		\$0	\$9,590
RT3/4/7-Culvert Removal a		5,130	3	\$15,390	\$0			\$0		\$0	\$15,390
RT9-Channel Clearing (wo		1,000	7	\$7,000	\$0	▓		\$0		\$0	\$7,000
RT12-Fill Slope Stablization		1,200	28	\$33,600	\$0			\$0		\$0	\$33,600
RT13-Trail Drainage	miles	5,814	7	\$40,349	\$0			\$0		\$0	\$40,349
RT14-Trail Infrastructure P		250	15	\$3,750	\$0	8		\$0		\$0	\$3,750
RT15-Camera Installation	site	1,805	4	\$7,220	\$0			\$0		\$0	\$7,220
Insert new items above the		.,500		\$0	\$0			\$0		\$0	\$0
Subtotal Road and Trails				\$140,499	\$0	8		\$0		\$0	\$140,499
D. Protection/Safety				+	+0	8		+0		+5	Ţ ,
P1a-Road Hazard Signs	sign	407	10	\$4,070	\$0			\$0		\$0	\$4,070
P1b-Trail Hazard Signs	sign	308	68	\$20,944	\$0	~~		\$0		\$0	\$20,944
P1b-Boat Ramp Warning S		250	10	\$2,500	\$0	H		\$0		\$0	\$2,500
P2-Road Closure Gates	gate	1,105	4	\$4,420	\$0	*		\$0		\$0	\$4,420
P9-Rockfall fence inspection	Ŭ	1,500	1	\$1,500	\$0			\$0		\$0	\$1,500
P10-Trail Closure Gates	gate	1,650	4	\$6,600	\$0			\$0		\$0	\$6,600
Insert new items above the		,		\$0	\$0			\$0		\$0	\$0
Subtotal Protection/Safety				\$40,034	\$0			\$0		\$0	\$40,034
E. BAER Evaluation				, .,	+ -			+-		7-	, ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
Initial Assessment					\$0			\$0		\$0	\$0
		\$1	75576	\$75,576	\$0			\$0		\$0	\$0
Insert new items above the	is line!	·			\$0			\$0		\$0	\$0
Subtotal Evaluation				\$75,576	\$0	-		\$0		\$0	\$0
F. Monitoring/Coordina	tion			, ,,,	,	▓		, ,		, -	
Interagency Coordinator	days	\$400	5	\$2,000	\$0			\$0		\$0	\$2,000
Implementation Coordinator		\$400	15	\$6,000	\$0	-		\$0		\$0	\$6,000
Insert new items above the				\$0	\$0	-		\$0		\$0	\$0
Subtotal Monitoring	-			\$8,000	\$0	200		\$0		\$0	\$8,000
				, -, - 30	+-			7.0		+3	+-,
G. Totals				\$242,613	\$0			\$0		\$0	\$242,613
Previously approved				, _,-,0	+ •			, ,		+ -	, –,
Total for this request				\$242,613							
				. ,		W/					

PART VII - APPROVALS

Forest Supervisor	Date