Date of Report: 12/21/2021

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: Haystack Fire

B. Fire Number: MT-BDF-006341

C. State: Montana

D. County: Jefferson

E. Region: R1

F. Forest: Beaverhead-Deerlodge NF

G. District: Butte RD

H. Fire Incident Job Code: P1N8KN 0102

I. Date Fire Started: 07/30/2021

J. Date Fire Contained: 11/01/2021

K. Suppression Cost: $10,400,000

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

1. **Fireline repaired (miles): 4.9 miles of dozer line, 6.7 miles of hand line**
2. **Other (identify): 0.6 miles of fuel breaks, 1.3 miles of road access for improvements, 40.8 miles of road modification as line.**

M. Watershed Numbers:

Table 1: Acres Burned by Watershed

HUC #	Watershed Name	Total Acres	Acres Burned	% of Watershed Burned
100200060402	Little Boulder River	25,536	16,314	63.9
100200060401	NF Little Boulder River	11,904	2,886	24.2
100200050301	Upper Little Whitetail Creek	26,413	4,293	16.3
100200060201	Upper Bison Creek	22,515	647	2.9
100200050401	Whitetail Reservoir	12,458	128	1.0
100200060202	Lower Bison Creek	27,235	58	0.2

N. Total Acres Burned:

Table 2: Total Acres Burned by Ownership

OWNERSHIP	ACRES
NFS	23,953
BLM	35
PRIVATE	338
TOTAL	24,326

O. Vegetation Types: The fire consists of primarily lodgepole Pine in the interior of the burn, with approximately 70-80% standing dead and down timber from beetle kill and other natural conditions; Douglas-fir is found primarily along the perimeter of the fire. Small mountain meadows, large boulders and rough mountainous terrain are found throughout the fire area.

P. Dominant Soils: Soils are generally coarse or gravelly sandy loams formed from residuum weathered from granite or colluvium derived from granite. The Windyridge series (Sandy-skeletal, mixed, shallow, Typic Cyrorthents) and Goldflint series (Sandy-skeletal, mixed Lithic Cryorthents) are representative of the soils in the fire area.

Table 3. Dominant Soils within the fire area.

Soil Map Unit	Landform	Geology	Percent of Fire Area
75GA3, 75GB4, 75GC3, 75GD4, 75GA2, 75GAF, 75GB2, 75GD2, 75GH2, 75GD1	Rolling uplands, low relief	Granite	85
71GD4	Dissected mountain slopes, high relief	Granite	6
51GE3	Mountain slopes and ridges	Granite	4
75VB3, 75VAF, 75VH2	Rolling uplands, low relief	Volcanics	3
64GJ1	Stream terraces	Granite	1

Q. Geologic Types: Cretaceous granodioritic rock is the dominant geology type covering just over 90% of the fire area. Approximately 6% of the fire area, west of Moose Creek, is dominated by surficial sedimentary deposits. Minor amounts (<3%) of cretaceous Elkhorn volcanics are located east of Bigfoot Creek and west of Little Whitetail Creek.

R. Miles of Stream Channels by Order or Class:

Table 4: Miles of Stream Channels by Order or Class

STREAM TYPE	MILES OF STREAM
PERENNIAL	35.1
INTERMITTENT	35.5

S. **Transportation System:**
Trails: *National Forest (miles):* 3.5 *Other (miles):* 0.0
Roads: *National Forest (miles):* 31.0 *Other (miles):* 19.7

PART III - WATERSHED CONDITION

A. Burn Severity (acres):

Table 5: Burn Severity Acres by Ownership

Soil Burn Severity	NFS	BLM	Private	Total	% within the Fire Perimeter
Unburned	5,083	12	84	5,179	21.3
Low	12,148	23	179	12,350	50.8
Moderate	2,948	--	49	2,997	12.3
High	3,774	--	26	3,800	15.6
Total	23,953	35	338	24,326	100.0

B. Water-Repellent Soil (acres): Approximately 6,700 acres exhibited surface hydrophobicity. High and moderate burn severity areas exhibited persistent and continuous fire-induced hydrophobicity.

C. **Soil Erosion Hazard Rating:** Most of the fire area is considered to have high-moderate erosion risk (Table 6). Only Forest Service ownership was considered.

Table 6. Soil Erosion Risk

Erosion Risk	Acres	Percent
Moderate	2,255	9
High-Moderate	15,313	63
High	6,535	27

D. Erosion Potential: WEPPcloud – Disturbed was run for unburned and scenarios for the North Fork Little Boulder River (results: burned, unburned) and the Little Boulder River above the confluence of the North Fork (results: burned, unburned) as described in the hydrology report. Modeled results of average annual delivery for the 100-year simulation period are summarized in Table 7 for the North Fork Little Boulder River and Table 8 for the Little Boulder River. An order of magnitude increase in both sediment and stream discharge is expected for both drainages. Post-fire effects are likely to be greater for the Little Boulder River drainage above the North Fork Little Boulder River confluence than the North Fork Little Boulder River itself; magnitude of effects varies between sub-drainages of the Little Boulder River. Much of the change relates directly to the proportion of high and moderate burned severity. The average soil erosion in the Little Boulder is three times more than the North Fork due to proportionally greater burn extent. Observations in the burn area this fall confirmed erosion hazard. The granitics that dominate the area lead to higher erosive for soils than others where soils derive from other parent materials.

Table 7. WEPPcloud - Disturbed model results for North Fork Little Boulder River.

North Fork Little Boulder River	per unit area watershed		at model outlet	
	Unburned	Burned	Unburned	Burned
Precipitation	21 in/yr	21 in/yr	8.7 x 10^8 ft^3/yr	8.7 x 10^8 ft^3/yr
Stream discharge	2.6 in/yr	2.87 in/yr	1.1 x 10^8 ft^3/yr	1.2 x 10^8 ft^3/yr
2-yr Peak discharge	--	--	62 ft^3/s	170 ft^3/s
Total hillslope loss	0.54 lb/ac/yr	2.8 lb/ac/yr	3.1 ton/yr	16 ton/yr
Total channel soil loss	44 lb/ac/yr	48 lb/ac/yr	250 ton/yr	280 ton/yr
Sediment discharge	43 lb/ac/yr	49 lb/ac/yr	240 ton/yr	280 ton/yr

Table 8. WEPPcloud - Disturbed model results for Little Boulder River.

Little Boulder River	per unit area watershed		at model outlet	
	Unburned	Burned	Unburned	Burned
Precipitation	21.1 in/yr	21.1 in/yr	1.4 x 10^9 ft^3/yr	1.4 x 10^9 ft^3/yr
Stream discharge	0.894 in/yr	3.05 in/yr	5.9 x 10^7 ft^3/yr	2 x 10^8 ft^3/yr
2-yr Peak discharge	--	--	56 ft^3/s	760 ft^3/s

Total hillslope loss	0.05 lb/ac/yr	11 lb/ac/yr	0.44 ton/yr	100 ton/yr
Total channel soil loss	15 lb/ac/yr	59 lb/ac/yr	130 ton/yr	530 ton/yr
Sediment discharge	14 lb/ac/yr	65 lb/ac/yr	130 ton/yr	590 ton/yr

E. Sediment Potential: Model results indicate an increase of more than four times in the Little Boulder River drainage.

F. Estimated Vegetative Recovery Period (years): 1-3 yrs grass/forbs, 10-15 yrs shrubs, 20-50 yrs conifers

G. Estimated Hydrologic Response (brief description): The WEPPcloud – disturbed models (see Table 7 and Table 8) suggest that the hydrologic response post-fire will include significantly increased stream discharge for the Little Boulder River and, likely to a lesser extent, increased stream discharge in the North Fork Little Boulder River which confluences with the Little Boulder River just upstream of the NFS ownership boundary along NFSR 86. An increase in sediment load is also to be expected. Short-duration, high intensity thunderstorms are likely to be the most damaging precipitation events, however hillslope erosion in high/moderate SBS areas was observed on steeper slopes in October 2021 prior to any significant precipitation or snowmelt events. Intact riparian areas along the mainstem drainages will provide energy dissipation and opportunity for sediment catchment with the highest potential for this occurring downstream of the fire perimeter and NFS lands as the valley becomes less confined. The other three HUC-12 watersheds affected by the fire may see minor increases in steam and sediment discharge; significant post-fire effects in these watersheds are not anticipated.

PART V - SUMMARY OF ANALYSIS

Introduction/Background

The Haystack fire is located in the Boulder Mountains about 4 air miles southwest of Boulder, MT. Elevations range from 8,000 ft along ridgetops to 5,000 ft near the confluence of the North Fork Little Boulder and Little Boulder Rivers. The Gatlin Gulch Fire was caused by lightning on July 30, 2021. The Haystack Fire, also lightning caused, was detected on August 2, 2021 and engulfed the Gatlin Gulch Fire during a wind driven event that resulted in an 8,000+ acre growth and accounted for much of the high and moderate soil burn severity.

Post-fire effects have the potential to directly and/or indirectly impact the natural and cultural landscape, road/trail infrastructure, weed infestations, and stream courses with the fire perimeter. These resource impacts will be evaluated based on the critical value matrix outlined in Table 9.

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

Table 9: 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):

Post-Fire Hazards
Probability of Damage or Loss: Possible
Magnitude of Consequence: Major
Risk Level: **High**

Closures are not being considered for the fire area nor for trails or roads within the fire area. Therefore, public use of burned NFS lands susceptible to post-fire effects is anticipated. The possible risk to public safety and potential for injury or loss of life warrants installation of signs through BAER to warn users of potential hazards asociated with burn areas, allowing them to make informed deicsions as to using NFS lands in the vicinity of the fire. Recommended treatment: hazard notification.

2. Property (P):
Stream Crossings on Wilson Creek and Jerry Smith Creek at NFSR 86
Probability of Damage or Loss: Likely
Magnitude of Consequence: Major
Risk Level: **Very High**

Additional stream crossings exist within and downstream of the fire area. Initial field assessment suggested that the Wilson Creek and Jerry Smith Creek crossings, just before the channels confluence with the Little Boulder River, were the only culverts that warranted further analysis for potential failure. Several other crossings along NFSR 86 were replaced and/or upsized during suppression activities.

The entire Wilson Creek drainage burned; 52.3% is mapped as High SBS and another 10.2% as Moderate SBS. The existing culvert is too short for the width of the road prism and is showing initial signs of failure, likely from piping around the structure. The next drainage upstream from Wilson Creek is Jerry Smith Creek. The entirety of this drainage also burned; 67.5% is mapped as High SBS with another 22.7% as Moderate SBS.

At both crossings, an expected increase in post-fire stream and sediment discharge will likely overwhelm the current drainage structures leading to road failure. Road failure will increase the amount of sediment, especially fine sediment, delivered to the Little Boulder River and remove access to the rest of the watershed above the Wilson Creek crossing. NFSR 86 serves as ingress/egress to several private inholdings with seasonal residences above Wilson Creek. Access via this route is also required for NFS management activities further up the Little Boulder River, including range allotments and implementation of other post-fire treatments. Culvert replacement/upsizing was considered for the Wilson Creek crossing; rationale and proposed replacement structure dimensions are described in the hydrology report. However, removing the existing culvert and installing an armored dip at Wilson Creek was determined to be acceptable as the minimum effective treatment. At Jerry Smith Creek the stream slope is more gradual at the road crossing, with more distance between the hillslope toe and the start of the road prism than at Wilson Creek; pulling the existing culvert and installing an armored dip to allow for water and sediment conveyance is recommended. Recommended treatment: armored dip (RT-4) at both sites.

Road Prism – NFSR 86
Probability of Damage or Loss: Very Likely
Magnitude of Consequence: Moderate
Risk Level: **Very High**

NFSR 86, also known as the Little Boulder Road, runs generally east-west along the Little Boulder River and is a native surface maintenance level 3 route. It frequently lies adjacent to the creek and is almost exclusively within the floodplain due to the confined valley. The road prism is very likely to be damaged by the increased flows and sedimentation expected post-fire both from the mainstem of the Little Boulder River and several sub-drainages. Soils upslope of the road are primarily grantic; hillslope erosion and deposition of fine materials is expected to significantly impact the drivability of the road and frequently contribute to the very likely overwhelming of existing catchment basins. Evidence of post-fire deposition was observed in October, prior to any significant precipitation events occurring in the fire area. NFSR 86 is 12.2 miles total length; all 9.6 miles above the NFS ownership boundary are NFS

maintenance jurisdiction within and or directly downslope of burned area. Recommended treatment: 9.6 miles of storm inspection/response (RT2) and 9.6 miles of storm proofing (RT1a), given the density of existing drainage features.

Road Prism – NFSR 638
Probability of Damage or Loss: Possible
Magnitude of Consequence: Moderate
Risk Level: **Intermediate**

NFSR 638, also known as the North Fork Road, runs generally north-south along the west side of the North Fork Little Boulder River for approximately 3.4 miles upstream from the confluence with the Little Boulder River before it leaves the mainstem stream corridor. In the vicinity of the fire, it is a native surface maintenance level 3 route. Hillslopes along the east side of the road. across the river, burned; the road/stream corridor were used as a control feature during burning operations resulting in primarily low soil burn severities. Hillslope soil erosion was observed along these hillslopes in October. Stream discharge of the North Fork Little Boulder River system is anticipated to increase by an order of magnitude post-fire. However, intact riparian systems with active beaver populations along the mainstem will provide hydraulic roughness and sediment catchment opportunities which should mostly protect the road prism from damage. Recommended treatment: none.

Road Prism – NFSR 5132, 5133, and 8463
Probability of Damage or Loss: Likely
Magnitude of Consequence: Moderate
Risk Level: **High**

Segments of NFSR 5132, 5133, and 8463 account for 13.3 miles of the 31 miles of NFS roads mapped within the fire perimeter. These three roads are native surface maintenance level 2 routes (except 5133 is maintence level 1) and have a total of 8.4 miles that intersect high and moderate soil burn severity. Soils within the fire perimeter are primarily granitic; WEPPcloud model results suggest that hillslopes above these three road segments have some of the highest potential for sediment deposition. Evidence of post-fire deposition starting to overwhelm existing drainage features on these road segments was observed in October, prior to any significant precipitation event. Recommended treatment: 8.4 miles of storm inspection/response (RT2) and 8.4 miles of storm proofing (RT1a), given the density of existing drainage features.

Trail Prism – 7122
Probability of Damage or Loss: Likely
Magnitude of Consequence: Moderate
Risk Level: **High**

Trail 7122 can be accessed from NFSR 86, from the road it runs along the Wilson Creek drainage before heading upslope towards the ridge between Wilson Creek and Jerry Smith Creek. Both of these drainages burned in their entirety. Approximately 2.7 miles of Trail 7122 is within the fire perimeter, with 1.8 miles traversing areas of High/Moderate SBS. A significant increase in stream and sediment discharge, including significantly increased hillslope erosion, is expected in the vicinity of the trail. Recommended treatment: 1.8 miles of trail drainage (RT13).

3. Natural Resources (NR):
Spread of Invasive Species
Probability of Damage or Loss: Very Likely
Magnitude of Consequence: Major

Risk Level: **Very High**

There is risk of losing native plant communities and spread of noxious weeds. Primary risk comes from the potential expansion of existing infestations within and adjacent to burned area, particularly in areas of moderate and high burn severity, along with potential introduction of noxious weed seed from fire suppression activities which included off-road travel, digging line, and road improvement.
Recommended treatment: 455 acres of Early Detection Rapid Response Treatment (P1a & P1b).

Hydrologic Function on NFS Lands
Probability of Damage or Loss: Likely
Magnitude of Consequence: Minor
Risk Level: **Intermediate**

Natural resource damage on NFS lands is likely, particularly within and downslope/downstream of the higher severity burn areas of the Little Boulder River watershed. Post-fire effects such as ash transport, prolonged increase in sediment delivery from hillslopes, increase in sediment delivery from channel banks and adjacent road prisms, increased runoff, and potential debris flows contribute to the potential loss of soil productivity and hydrologic function. Mulching, with either straw or wood, was considered as a treatment option to mitigate the damage by increasing ground cover in areas of high soil burn severity. However, consideration of treatment cost-benefit and likelihood of implementation before a damaging precipitation event led to the determination that risk level was not considered unacceptable.
Recommended treatment: none.

4. Cultural and Heritage Resources: None

B. Emergency Treatment Objectives:

- Reduce risk to forest visitors by informing them of post-fire conditions through sign placement on routes accessing the fire area.
- Reduce risk of infrastructure damage to due to increased streamflow, sediment load in channels, and hillslope erosion.
- Reduce risk of new weed infestations and the further spread of known infestations to promote recovery of desired native vegetation communities.

C. Probability of Completing Treatment Prior to Damaging Storm or Event:
Land: N/A
Channel: N/A
Roads/Trails: 75%
Protection/Safety: 80%

D. Probability of Treatment Success

Table 10: Probability of Treatment Success

	1 year after treatment	***3 years after treatment***	***5 years after treatment***
Land	80	80	80
Channel	--	--	--
Roads/Trails	75	75	75
Protection/Safety	75	75	75

E. Cost of No-Action (Including Loss): It is difficult to quantify the cost of no action to human life and safety, native plan communities, TES habitat or cultural and historic resources. However, no-action is expected to cause loss of road and trail infrastructure as well as resource damage from increased noxious weed infestations in disturbed areas. There are a high number of private inholdings and placer claims leading to an increased probability of stranding the public in remote locations.

F. Cost of Selected Alternative (Including Loss):

G. Skills Represented on Burned-Area Survey Team:

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

Team Leader: Sara Rouse
Email: sara.rouse@usda.gov **Phone(s)**: 406-859-8231

Forest BAER Coordinator: Kevin Weinner
Email: kevin.weinner@usda.gov **Phone(s):** 406-683-3857

Team Members: *Table 11: BAER Team Members by Skill*

Skill	Team Member Name
Team Lead(s)	
Soils	Sara Rouse
Hydrology	Erin Ryan
Engineering	Jeremiah Sperry
GIS	
Archaeology	
Weeds	Lucas Philips / Randie Adams
Recreation	
Other	

H. Treatment Narrative:

Land Treatments:

The risk to native plant communities will be reduced by use of **P1a-b. Early Detection/Rapid Response (EDRR)** protocols. Weed treatment will focus on limiting introduction and spread of known, existing populations due to ground disturbance from both fire suppression activities and from the fire itself. Weed technicians will patrol the area within and adjacent to high/moderate soil burn severity, including major travel corridors. The proposed treatment is expected to cover up to 455 acres of weed spraying. Standard herbicides for the Beaverhead-Deerlodge National Forest, Butte Ranger District will be used and typical surfactant/adjuvant and dye added to the tank mix.

Channel Treatments:

No channel treatments are being requested.

Roads and Trail Treatments:

The risk to NFS road and trail infrastructure from increased stream and sediment discharge will be addressed using four types of road and trail treatments. **RT2. Storm Inspection and Response** is being requested for a total of 18 miles worth of road segments within the fire perimeter and parallel to the Little Boulder River out of the roughly 50 miles worth of road mapped within the fire area; mileage request is based on a prioritization of route segments through areas of High and Moderate SBS and/or immediately downslope of hillslopes with the highest sediment loss potential based on burned condition model results. An additional 18 miles worth of **RT1a. Road Drainage** is being requested to storm proof existing drainage features. The high density of intermittent/perennial drainages crossing NFSR 86 before their confluence with the Little Boulder River and the density of cross-drain (e.g. ditch relief) structures along interior road segments requires a similar mileage of storm proofing as the storm inspection and response treatment. Two stream crossings along NFSR 86 were identified to have an

unacceptable risk of failure post-fire; **RT-4. Armored Dip** is being requested for both the Wilson Creek and Jerry Smith Creek crossings.

Approximately 3.5 miles of NFS trail segments are mapped within the fire perimeter. **RT13. Trail Drainage** is being requested to address 1.8 miles of the 7122 trail that runs through High and Moderate SBS in the Wilson Creek and Jerry Smith Creek drainages.

Protection/Safety Treatments:

The risk to human life and safety will be addressed with **hazard notification** using signs to warn the public of potential post-fire hazards. The signs will be installed along routes that access the Haystack Fire area.

I. Monitoring Narrative: NA

PART VI – EMERGENCY STABILIZATION TREATMENTS AND SOURCE OF FUNDS

A. Land Treatments										
PL1a. Invasives	acres	106	103	$10,918	$0		$0		$0	$10,918
PL1b. Invasives Fire Sup.	acres	64	352	$22,528	$0		$0		$0	$22,528
				$0	$0		$0		$0	$0
Insert new items above this line!				$0	$0		$0		$0	$0
Subtotal Land Treatments				$33,446	$0		$0		$0	$33,446
B. Channel Treatments										
				$0	$0		$0		$0	$0
Insert new items above this line!				$0	$0		$0		$0	$0
Subtotal Channel Treatments				$0	$0		$0		$0	$0
C. Road and Trails										
RT1a. Road Drainage	miles	5,000	18	$90,000	$0		$0		$0	$90,000
RT2. Storm Inspection & Re	miles	1,000	18	$18,000	$0		$0		$0	$18,000
RT4. Armored Dip	site	3,500	2	$7,000	$0		$0		$0	$7,000
RT13. Trail Drainage	miles	1,000	2	$1,800	$0		$0		$0	$1,800
Insert new items above this line!				$0	$0		$0		$0	$0
Subtotal Road and Trails				$116,800	$0		$0		$0	$116,800
D. Protection/Safety										
Hazard Signs	sign	250	6	$1,500	$0		$0		$0	$1,500
				$0	$0		$0		$0	$0
Insert new items above this line!				$0	$0		$0		$0	$0
Subtotal Protection/Safety				$1,500	$0		$0		$0	$1,500
E. BAER Evaluation										
Initial Assessment	Report			---	$0		$0		$0	$0
				$0	$0		$0		$0	$0
Insert new items above this line!				---	$0		$0		$0	$0
Subtotal Evaluation				$0	$0		$0		$0	$0
F. Monitoring										
				$0	$0		$0		$0	$0
				$0	$0		$0		$0	$0
Insert new items above this line!				$0	$0		$0		$0	$0
Subtotal Monitoring				$0	$0		$0		$0	$0
G. Totals				$151,746	$0		**$0**		**$0**	**$151,746**
Previously approved										
Total for this request				**$151,746**						

PART VII - APPROVALS

1. CHERI FORD Digitally signed by CHERI FORD Date: 2021.12.22 13:36:57 -07'00'

Forest Supervisor Date