Date of Report: 10/5/2021

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: Morgan Creek

B. Fire Number: WY-MRF-260

C. State: CO

D. County: Routt

E. Region: 02

F. Forest: Medicine Bow-Routt NFs

G. District: Hahns Peak-Bears Ears

H. Fire Incident Job Code: P2N5FC (0206)

I. Date Fire Started: 07/09/2021

J. Date Fire Contained: Estimated 10/31/21

K. Suppression Cost: 12.4 million as of 9/27/2021

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

1. **Fireline repaired (miles):** 8.4 miles
2. **Other (identify):**

M. Watershed Numbers:

Table 1: Acres Burned by Watershed (HUC 6)

HUC #	Watershed Name	Total Acres	Acres Burned	% of Watershed Burned
140500010208	Reed Creek - Elk River	8986.5	2370	26.4%
140500010205	Hinman Creek-Elk River	14196.6	382	2.7%
140500010204	South Fork Elk River	23360.6	3566	15.3%

N. Total Acres Burned:

Table 1: Total Acres Burned by Ownership

OWNERSHIP	ACRES[1]
NFS	7582
OTHER FEDERAL (LIST AGENCY AND ACRES)	
STATE	
PRIVATE	4
TOTAL	

O. Vegetation Types: Mixed conifer including spruce-fir and lodgepole as well as some aspen stands in the uplands. Beetle kill has resulted in pockets of heavy dead and down. Riparian areas are bordered by willows with some alder and sedges.

P. Dominant Soils: Soils within the burn area reflect a wide range of lithologies. Soils in the Elve series are very deep, and formed in alluvium, colluvium or till derived from igneous rocks. These soils are on mountain slopes, hills, moraines, or alluvial fans. Another dominant soil type is the Gateway series which consists of moderately deep, well drained soils that formed in loamy slope alluvium over clayey residuum derived from mudstone or shale. Other soils derived from various sedimentary and metamorphic deposits are also present including expressions of the Leighcan, Macfarlane and Pineisle series.

Pre-fire conditions likely exhibited robust O horizons especially in stands characterized by mixed conifer. In areas where soil development was favored, clay percentages approach 50% in the Gateway series., and percentages over 20% are common in the others. Much of the area contains evidence of prolonged soil creep and mass movement, especially the areas around Floyd peak and Burn Ridge. Many soil types in the area are derived from poorly consolidated glacial till, and while they usually are well drained, saturation events combined with the steep topography lend to movement of the slopes over time.

Q. Geologic Types: The footprint of the Morgan Creek Fire lies in the Park Range of Northwestern Colorado. The Park Range owes its topography and relief to tectonic uplift of Precambrian crystalline rocks, mainly metavolcanic and metasedimentary deposits intruded by quartz monzonites and granites. The metamorphic rocks have been extensively folded and faulted during many episodes of deformation. In the central part of the area the intrusive rocks form an exposed pluton 7 miles wide and more than 17 miles long - the Mt. Ethel pluton. The crystalline rocks are overlain by Paleozoic, extensive Mesozoic, and scattered Cenozoic continental and marine sediments, as well as by Pleistocene tills and outwash deposits. All the bedrock units have been broken by faults. Pleistocene glaciers of the Bull Lake and Pinedale glacial periods carved much of the present-day landscape. The Pinedale glaciation was the last of the major ice ages to appear in the Rocky Mountains and lasted from approximately 30,000 to 10,000 years ago. Many of the soils types in the area are representative of this most recent glacial period.

R. Miles of Stream Channels by Order or Class:

Table 2: Miles of Stream Channels by Order or Class

STREAM TYPE	MILES OF STREAM
PERRENIAL	17.7
INTERMITTENT	14.6
EPHEMERAL	19.2
OTHER (DEFINE)	

S. Transportation System:
Trails: *National Forest (miles):* 4.5 miles *Other (miles):*
Roads: *National Forest (miles):* 6.9 miles *Other (miles):*

[1] There is a slight discrepancy between the soil burn severity and fire perimeter total acres. The fire has been managed by Type 3 and 4 incident management teams that are not staffed with GIS specialists. Minor fire growth occurred since the last mapped fire perimeter resulting in slightly higher SBS acres that reflects this growth.

PART III - WATERSHED CONDITION

A. Burn Severity (acres):

Table 3: Burn Severity Acres by Ownership

Soil Burn Severity	NFS	Other Federal (List Agency)	State	Private	Total	% within the Fire Perimeter
Unburned	1282					
Low	2194					
Moderate	3842					
High	385					
Total	7703					

B. Water-Repellent Soil (acres): 385 (high severity acres)

C. Soil **Erosion Hazard Rating:** The ratings in this interpretation indicate the hazard of soil loss from off-road and off-trail areas after disturbance activities that expose the soil surface. The ratings are based on slope, soil erosion factor K, and an index of rainfall erosivity (R).

Erosion Hazard Rating	Acres
Not Rated	16
Slight	844
Moderate	2434
Severe	4410

D. **Erosion Potential:** Up to 0.5 tons/acre/year for erosive hillslopes with high burn severity. Generally, under 0.25 tons/acre/year (Derived from WEPP-runs)

E. **Sediment Potential:** 126 lbs/acre/year (derived from WEPP runs)

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.

G. Estimated Hydrologic Response (brief description): Estimated Hydrologic Response: The fire has reduced or eliminated canopy and ground cover, as well as altered soil structure with varying degrees of hydrophobicity within the fire perimeter. These changes will lead to reduced precipitation interception and 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, sediment-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. The most probable damaging storm events are high intensity-short duration thunderstorms that most commonly occur during the July/August monsoon.

Pre and post-fire rainfall-runoff and snowmelt-runoff peak flow estimates were modeled across the burn area (Tables XX and XX). While the estimated quantity of peak flow is difficult to predict, the modeling provides some scale for the magnitude of runoff and the relative percent increase from pre-fire to post-fire peak flows for different watersheds affected by the fire. This information is used during a rapid post-fire assessment to indicate where downstream critical values may be at risk to sediment-laden flows or flash flooding from damaging thunderstorms.

Table 5. Thunderstorm Runoff Peak Flows for the first year following the fire (Wildcat5 Model)

Pour Pt	Pourshed Name	Area [ac]	Pre-Fire Bankfull Peak Flow (2 Year Recurrence Interval) [cfs]	% Low SBS	% Mod SBS	% High SBS	10 Year - 1 Hour Thunderstorm Event			
							Pre-Fire Peak Flow [cfs]	Post-Fire Peak Flow [cfs]	% Increase	Time to Peak Flow [hr]
RC1	Reed Creek Abv NFSR 440 Crossing	3375	100	22	42	6	62.3	331	431%	1.27
RC2	Reed Cr Above Wapiti Ranch (Private In-Holding)	1778	67	29	48	8	55.5	296	434%	0.98

The hydrology report contains additional information on expected increases to spring snowmelt runoff from the Morgan Creek fire in concert with the 2002 fires in the same watershed.

PART V - SUMMARY OF ANALYSIS

Introduction/Background: The lightning caused Morgan Creek Fire was reported on July 9 on the Routt National Forest 15 miles north of Steamboat Springs, Colorado. The fire started south of the Hinman Campground south of the Seedhouse corridor which is one of the most heavily visited areas on the Hahns Peak-Bears Ears Ranger District. The fire burned through beetle killed lodgepole pine and mixed conifer.

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

Table 6: Critical Value Matrix

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

1. **Human Life and Safety (HLS):** Human life and safety of Forest visitors and employees traveling on NFS roads, the South Fork and Burn Ridge Trails, winter sports (snowmobiliing and cross-country skiing) and hunting in the burnscar is threatened due to the potential for injury or loss of life from falling hazard trees, flash floods, debris flows, and other burned area hazards. The probability of damage or loss is **Possible** as the area is popular with recreationists on roads and trails as well as off trails/roads for winter recreation and hunting throughout the burn scar. The hazard tree threat is

particularly concerning as much of the burned area had standing, beetle killed trees before the fire that are now further weakened. The magnitude of consequence is **major** since an overhead hazard strike, entrapment in a flood or debris flow, or motorized vehicle collision with downed trees could result in serious injury or loss of life. The risk level is **High**. Warning signs are recommended; see treatments P1a, P1b.

2. **Property (P):**NFSR 440.1 (Reed Cr) is a double lane ML3 with ditches, cross drain culverts, and larger conduits at major stream crossings. The road provides access to various forest related assets including recreation (trails, camping, etc.), range, and timber resources. Additionally, NFSR 440.1 provides the only access to the Wapiti Ranch which includes a private residence that is typically inhabited year-round. Reed Creek crosses NFSR 440.1 at MP 6.4 through a 96”x77” CMP poses a risk to the road from the increased runoff of the associated watershed due to the extent of high and moderate soil burn severity upstream of the culvert crossing (see hydrological report). Loss of Forest Service road infrastructure from post-fire watershed response (e.g., flooding, debris flows, etc.) is possible, and the magnitude of consequances **high** due to costs to repair a ML3 road; in addition this is the only access to a year round private inholding. The BAER risk is **High** and BAER treatments are recommended; see treatments RT11 and RT4.
   b. The South Fork and Burn Ridge trails within the burn scar are threatened due to increased post-fire runoff that may result in accelerated erosion of the trail prism downslope of areas of moderate and high SBS. While limited in extent, the portions on steep slopes or below steep slopes have the potential to intercept overland flow from upslope burned areas resulting in damage to the trail tread. The probability of damage or loss is **likely** because erosion rates are high on the steeper slopes with high or moderate SBS, and the vulnerable portion of trail has steep grades and drainage features unable to withstand the expected increases in post-fire runoff. The magnitude of consequence is **moderate** due to the cost of rebuilding the trails including access; the BAER risk level is **High**. Treatments are recommended; see treatment RT13.
      a.
3. **Natural Resources (NR):**Water on NFS lands within and downstream of the burn scar that is used for municipal and agriculture supply is threatened due to potential water quality impacts from increased sediment and nutrient loading following runoff producing events. The probability of damage or loss is **possible** because hillslope erosion and deposition of sediment, ash, and nutrients in downslope water bodies is expected to occur following high intensity short duration storm events. The magnitude of consequence is **minor** because the impacts will be of short duration following summer thunderstorms, but these effects to water quality are expected to persist for the next 3 to 5 years until canopy cover, ground cover, and soil water repellency return to pre-fire conditions. The risk rating is **intermediate,** and treatments are not warranted. While the natural processes and associated impacts may impact downstream water quality, the BAER team did not determine a BAER risk rating for these non-USFS values as they are outside of BAER authority.

   b. Soil productivity in areas of high SBS is threatened by post-fire erosion and loss of soil horizons. The probability of damage or loss is **possible** as the soil loss values are within the tolerable limits except on areas of high soil burn severity because there is a short-term potential for large increases in hillslope erosion. The magnitude of consequence is **minor** as only isolated areas are would be affected with soil productivity being maintained in the majority of the burned area. The risk rating is **low**; treatments are not warranted.

   c. Hydrologic function in areas of moderate and high SBS is threatened due to the presence of hydrophobic soils, loss of ground cover, and reduced infiltration. The probability of damage or loss is **likely** given the amount of moderate and high SBS that is present within the burn scar. The magnitude of consequence is **moderate** because the expected increases in runoff and erosion will cause channel adjustments. The risk rating is **high**. However, there are not cost-effective treatments that would reduce the threat to acceptable; therefore, treatments to reduce the risk are not recommended.

d. Suitable occupied Lynx habitat is threatened by the loss of vegetative cover across all burn severities and the loss of soil productivity in high SBS areas that could inhibit recovery of the habitat. The probability of damage or loss **very likely** where vegetative cover has been consumed by the fire. The magnitude of consequence for both threats is **minor** because any loss of vegetative cover is expected to be temporary and extensive suitable lynx habitat remains on the landscape. The risk rating for both threats is **low**; treatments are not warranted.

e. The disturbance created by fire and fire suppression methods such as dozer lines, handlines, road expansion and helicopter landing locations can quickly alter the native plant community and provide the opportunity for the expansion or establishment of invasive and noxious weeds. Yellow Toadflax *(Linaria vulgaris)* is documented to occur near the perimeter of the Morgan Creek Fire boundary and along the access routes and handlines created during the fire suppression efforts. Yellow toadflax is an aggressive perennial noxious weed that out competes native species plant communities. It reproduces by seed and vigorous, spreading rhizomes with high potential to displace native vegetation and alter wildlife and grazing habitat and native plant communities. Yellow toadflax is a Colorado List B noxious weed that requires managers to contain and prevent their spread. The probability of damage/loss is **likely** due to presence adjacent to areas of suppression disturbance and the magnitude is **moderate** due to loss of native plant communities which would be difficult to restore. The BAER risk is **high**; treatments are recommended.

4. **Cultural and Heritage Resources:**A file search was conducted using the best available spatial data for cultural resource locations managed by the MBRTB. No eligible historic sites were identified within the burn area. It is possible that not all known cultural resources (and subsequently identification of all potential high cultural values at risk) within the Morgan Creek Fire boundaries were located during this assessment. Based on existing information the probability of damage or loss is **unlikely**, although the consequences would be **major** as cultural sites are irreplaceable. The BAER risk rating is **intermediate**.

B. **Emergency Treatment Objectives:** Raise awareness of post-fire hazards throughout the burned area, minimize post-fire damage to Forest Service roads and trails, and prevent loss of native plant communities due to the spread of yellow toadflax.
   a. Minimize threats to life/safety to the extent possible through signing on roads at entry points, high use recreation areas, and at trailheads.
   b. Storm proof and stabilize vulnerable portions of NFSR 440 as well as the South Fork and Burn Ridge trails to protect historic Forest Service property.
   c. Promote revegetation and soil stabilization by native plant communities through early detection/rapid response surveys to minimize the spread of yellow toadflax, a Colorado State listed noxious weed.

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 7: 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	95
Protection/Safety	80	85	90

E. Cost of No-Action (Including Loss): $96,000 for reconstruction of road-stream crossing and high-risk trail segments; this does not include loss of egress from private land inholding or injury/loss of human life

F. Cost of Selected Alternative (Including Loss): $17,260

G. Skills Represented on Burned-Area Survey Team:

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

Team Leader: Liz Schnackenberg
Email: liz.schnackenberg@usda.gov **Phone(s)** 970.819.2900

Forest BAER Coordinator: Liz Schnackenberg
Email: liz.schnackenberg@usda.gov **Phone(s):** 970.819.2900

Team Members: *Table 4: BAER Team Members by Skill*

Skill	Team Member Name
Team Lead(s)	Liz Schnackenberg
Soils	Ryan Adans/Mike Kasten (T)
Hydrology	Tyler Carleton/Tanner Timm (T)
Engineering	Loren Reimer/Kris Skinner (T)
GIS	Nick Bencke
Archaeology	Jason Strahl
Weeds	Kristina Wood (T)
Recreation	Brendan Kelly
Other	Melissa Dressen (WL)

H. Treatment Narrative:

Land Treatments: Early detection/rapid response (EDRR) surveys will focus on areas disturbed by suppression activities adjacent to known yellow toadflax populations. Heavy equipment used for suppression activities travelled through areas of known weed populations to unaffected areas, substantially increasing the risk of noxious weed spread in these disturbed areas. If new weed populations are found, they would be promptly treated to minimize the potential to spread that could result in modification of native plant communities. Surveys will begin as soon as possible starting in the summer of 2022 when species presence become detectable. Current known locations of weed species mapped came from the Hahns Peak-Bears Ears District weed inventory layer. Data will be collected and reported in accordance with Region 2's Direction for the Approach to Mapping and Recording Inventory and Treatment Data.

Treatments would likely be implemented through contracts or agreements but may also use Force account. This funding request is based on limiting expansion of known weed populations.

Treatment	Units	Unit Cost	# of Units	Total Cost
L1b –EDRR Suppression	Acres	$130	5	**$650**
Total				**$650**

Channel Treatments: NA

Roads and Trail Treatments: Treatments will reduce the risk of damage from elevated post-fire runoff on NFSR 440 and the South Fork and Burn Ridge trails by storm proofing an at-risk road-stream

crossing and improving the number and efficiency of drainage features along segments within and below areas of moderate and high SBS.

RT4 Armored Dip:

Objective: Provide overflow channel for existing culverts at live stream crossings where post-fire flows and debris are likely to overwhelm culvert capacity and overtop roadway. Control flow to prevent flood flows from diverting and running longitudinally down the road prism causing mass erosion and loss of road prism for hundreds of feet downstream from crossing. Prevent loss of road prism at overflow point by armoring dip fill slopes.
Description: Excavate rolling dip in road prism directly downslope from live stream crossing where water would enter roadway if culvert was overwhelmed or plugged. Place riprap armoring on roadway fill slopes at rolling dip outflow and/or inflow as specified by assessment team. Dip is typically constructed by a dozer with riprap keyed into the slope with backhoe or excavator. Can be performed either under public works contract or by FS heavy equipment force account crew.
Location/Suitable Sites: NFSR 440/Reed Creek road-stream crossing.

RT 4 Armored Dip	Units	Unit Cost	# Units	Total Cost
Install armored dip	each	$ 3,100	1	$ 3,100
Treatment Total				**$ 3,100**

RT11: Stream crossing protection- brushing/clearing culvert inlet. The inlet of the existing culvert at the NFSR 440/Reed Creek road-stream crossing is overgrown with mature willows and alders which are further reducing culvert capacity. This treatment would clear debris from the culvert inlet to improve capacity since the hydrologic modelling indicates the culvert is likely to be overwhelmed in a ten-year storm event, and this road provides the only access to a private inholding that is inhabited year-round.

RT 11 Stream Crossing Protection	Units	Unit Cost	# Units	Total Cost
Culvert inlet clearing	each	$ 1,200	1	$ 1,200
Treatment Total				**$ 1,200**

RT13 Trail Drainage/Tread Stabilization: The existing trail system drainage features are insufficient to handle the anticipated increase in post-fire runoff from areas burned at moderate to high severity on approximately 1.75 miles of the South Fork and Burn Ridge trails which are both Class 3. Predicted increased runoff due to water repellant soils and lack of effective ground cover will be intercepted and captured, leading to severe trail tread erosion that will render the trail unusable and/or dangerous to use. Implementing this treatment will decrease the risk of unacceptable loss of trail prism, providing for continued recreation opportunities with reduced risk to human life and safety. Both affected trails are popular for hiking, mountain biking, and hunting access.

RT13 Trail Drainage	Units	Unit Cost	# of Units	Total Cost
Trail drainage/storm proofing- Class 3	mile	$5,600	1.75	$9,800
TOTAL				**$9,800**

RT16. Implementation COR: Implementation COR/CO for road treatments.

RT16 Road Implementation	Units	Unit Cost	# of Units	Total Cost
Road COR	Day	$400	1	$400
Road CO	Day	$450	1	$450

TOTAL				**$850**

Protection/Safety Treatments: P1a and P1b Burned Area Warning Signs: The purpose of the Burned Area Warning signs is to reduce risks to human life and safety, to inform forest visitors of potential dangers and/or hazards when entering burned areas on NFS lands. Entering burned areas presents a high risk to human and life and safety, with increased threats from post-fire effects such as falling trees, rolling rocks, flash floods, and debris flows. It is necessary to inform the public of burned-area hazards that are a direct result of wildfire; hazards which are substantially different compared to unburned forest setting and with which many forest visitors may be unfamiliar. Burned area warning signs will be installed to inform the public of the possible dangers associated with a burned area at trailheads and entry points into the burned area, and high use areas along the Elk River.

P1 Warning Signs	Units	Unit Cost	# of Units	Total Cost
P1a Road Warning Signs (materials and seasonal labor)	sign	$450	4	$1,800
P1b Trail Warning Signs (materials and seasonal labor)	sign	$170	3	$510
TOTAL	**Sign**			**$2,310**

I. Monitoring Narrative: No monitoring beyond that identified in specific treatments is recommended at this time.

PART VI – EMERGENCY STABILIZATION TREATMENTS AND SOURCE OF FUNDS

Line Items	Units	Unit Cost	# of Units	BAER $	Other $	# of units	Fed $	# of Units	Non Fed $	Total $
A. Land Treatments										
L1b-EDRR Suppression	acre	130	5	$650	$0		$0		$0	$650
				$0	$0		$0		$0	$0
Insert new items above this line!				$0	$0		$0		$0	$0
Subtotal Land Treatments				$650	$0		$0		$0	$650
B. Channel Treatments										
				$0	$0		$0		$0	$0
				$0	$0		$0		$0	$0
Insert new items above this line!				$0	$0		$0		$0	$0
Subtotal Channel Treatments				$0	$0		$0		$0	$0
C. Road and Trails										
RT4-Armoured Dip	each	3,100	1	$3,100	$0		$0		$0	$3,100
RT11- crossing protection	each	1,200	1	$1,200						$1,200
RT13- Trail drainage	mile	5,600	2	$9,800						$9,800
RT16- rd COR	day	425	2	$850	$0		$0		$0	$850
Insert new items above this line!				$0	$0		$0		$0	$0
Subtotal Road and Trails				$14,950	$0		$0		$0	$14,950
D. Protection/Safety										
P1a- road warning sign	each	450	4	$1,800	$0		$0		$0	$1,800
P1b- trail warning sign	each	170	3	$510	$0		$0		$0	$510
Insert new items above this line!				$0	$0		$0		$0	$0
Subtotal Protection/Safety				$2,310	$0		$0		$0	$2,310
E. BAER Evaluation										
Initial Assessment	Report	$9,530	1	---	$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				$17,910	$0		**$0**		**$0**	**$17,910**
Previously approved										

PART VII - APPROVALS

1. LESLIE CROSSLAND Digitally signed by LESLIE CROSSLAND Date: 2021.10.14 11:48:48 -06'00'

Forest Supervisor Date