

**Date of Report: 8/3/21****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: ROBERTSON DRAW FIRE****A. Fire Name: Robertson Draw****B. Fire Number: MT-CGF-210148****C. State: MT****D. County: Carbon****E. Region: 1****F. Forest: Custer Gallatin NF****G. District: Beartooth RD****H. Fire Incident Job Code: P1N2S5 0111****I. Date Fire Started: 6/13/2021****J. Date Fire Contained: TBD****K. Suppression Cost: \$10,300,000 as of 7/9/21****L. Fire Suppression Damages Repaired with Suppression Funds (estimates):**

1. Fireline repaired (miles): To date: Handline: 2.43 miles on NFS land.
2. Other (identify): Chipper line: To date: 1.5 miles on NFS land.

**M. Watershed Numbers:***Table 1: Acres Burned by Watershed*

HUC #	Watershed Name	Total Acres	Acres Burned	% of Watershed Burned
100700060607	Bear Creek	28,441	1,409	5
100700060605	Dillworth Cr – Clarks Fk Yellowstone River	39,543	11,250	28
100700060606	Grove Creek	16,700	12,600	75
100700060510	Line Creek	24,881	986	4
100700060905	Snow Cr – Rock Cr	26,122	84	0.3
100700060610	Wolf Cr – Clarks Fk Yellowstone River	36,493	4,107	11

**N. Total Acres Burned:***Table 2: Total Acres Burned by Ownership*

OWNERSHIP	ACRES
NFS	6,848
BLM	10,597
STATE	1,439
PRIVATE	11,552
TOTAL	30,436

**O. Vegetation Types:** Douglas-fir, Juniper, Lodgepole, Grassland, Sage/Grass Range, Aspen, Riparian

**P. Dominant Soils:** Lithic Calciborolls, Typic Calciborolls, Typic Cryoboralfs, Typic Cryoborolls, Calic Cryoborolls

**Q. Geologic Types:** Gneiss, Limestone, Interbedded Sandstone and Shale, Landslide Deposits, Alluvium, Pediment, Conglomerate

**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	9.7
INTERMITTENT	
EPHEMERAL	
OTHER (DEFINE)	

**S. Transportation System:**

**Trails:** National Forest (miles): 11.24

Other (miles):

**Roads:** National Forest (miles): O&M: 7.8

Other (miles): Decommissioned: 0

**PART II - BURNED-AREA DESCRIPTION: CROOKED CREEK FIRE****A. Fire Name: Crooked Creek****B. Fire Number: BID-210154****C. State: MT****D. County: Carbon****E. Region: 1****F. Forest: Custer Gallatin NF****G. District: Beartooth RD****H. Fire Incident Job Code: PDN2ZN (1522)****I. Date Fire Started: 7/15/2021****J. Date Fire Contained: TBA****K. Suppression Cost: \$4,000,000 as of 7/22/21****L. Fire Suppression Damages Repaired with Suppression Funds (estimates):**

1. Fireline repaired (miles): To Date: Handline: 2.8mi on NFS land
2. Other (identify): To date: Clipper line: 1.1mi on NFS land
3. Other (identify): To date: two track road bladed to serve as fire break: 1.35mi on NFS land

**M. Watershed Numbers:***Table 4: Acres Burned by Watershed*

HUC #	Watershed Name	Total Acres	Acres Burned	% of Watershed Burned
100800100701	Upper Dry Head Creek	22,736	4,180	18

**N. Total Acres Burned:***Table 5: Total Acres Burned by Ownership*

OWNERSHIP	ACRES
NFS	3,995
PRIVATE	154
CROW NATION	31
TOTAL	4,180

**T. Vegetation Types:** Douglas fir, Juniper, Lodgepole, Grassland, Sage/Grass Range, Aspen, Riparian**U. Dominant Soils:** Calcic Cryoborolls, Typic Cryoboralfs, Lithic Calciborolls, Typic Calciborolls**V. Geologic Types:** Limestone, Dolomite, Sandstone, Shale, Landslide Deposits**W. Miles of Stream Channels by Order or Class:***Table 6: Miles of Stream Channels by Order or Class*

STREAM TYPE	MILES OF STREAM
PERENNIAL	3.3
INTERMITTENT	
EPHEMERAL	
OTHER (DEFINE)	

**X. Transportation System:****Trails:** National Forest (miles): 0

Other (miles):

**Roads:** National Forest (miles): O&M: 0      Other (miles): Decommissioned: 0

### **PART III - WATERSHED CONDITION: ROBERTSON DRAW FIRE**

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

*Table 7: Burn Severity Acres by Ownership*

<b>SOIL BURN SEVERITY</b>	<b>NFS</b>	<b>BLM</b>	<b>STATE</b>	<b>PRIVATE</b>	<b>TOTAL</b>	<b>% WITH FIRE PERIMETER</b>
<b>UNBURNED</b>	396	1,306	147	1,820	3,669	12
<b>LOW</b>	2,344	6,581	843	6,842	16,610	55
<b>MODERATE</b>	3,795	2,469	439	2,618	9,321	30
<b>HIGH</b>	313	241	10	271	835	3
<b>TOTAL</b>	6,848	10,597	1,439	11,551	30,435	

**B. Water-Repellent Soil (acres):** 10,156 acres within entire fire perimeter. 4,108 acres on FS lands (all area burned under moderate and high severity were observed to express moderate water repellency).

**C. Soil Erosion Hazard Rating:** Within entire fire perimeter: 20,279 (acres low+unburned), 9,321 acres moderate, 835 acres high.

On FS lands: 2,740 (acres low+unburned), 3,795 acres moderate, 313 acres high.

**D. Erosion Potential:** 1.2 ton/ac/yr average annual delivery estimate from WEPP cloud for example drainage within burn perimeter on FS land.

Nineteen point-samples were taken using the Robertson Draw BAER Survey123 Form to validate and adjust the BARC image. Difficult access to forested portions of the fire and FS lands limited sampling on the western portion of the fire. Sampling in these areas took place in the headwaters of Bear Creek, Gold Creek, and Grove Creek.

High and moderate Soil Burn Severity (SBS) was common in the western portion of the fire, where the landscape was predominantly forested with interspersed grasslands/meadows. A large portion of high SBS was found on north facing forested hillslopes with dense timber stands, while adjacent south facing slopes with less dense pre-fire vegetation showed moderate SBS. SBS and Burn Intensity showed similar patterns to pre-fire NDVI, which indicated the fire behavior and SBS were likely driven by pre-fire vegetation patterns.

#### **E. Sediment Potential**

1.2 ton/ac/yr sediment discharge average annual delivery estimate from WEPP cloud for a representative drainage within burn perimeter on FS land. The modelling was run specifically to assess post-fire sediment delivery concerns associated with the community of Bear Creek's municipal water intakes. Based on the model output, sediment yield for 20% probability (i.e. 5 yr RI) event is approximately 1.9 tons/ac.

**F. Estimated Vegetative Recovery Period (years):** 2-5 years (grasslands and forest understory)

**G. Estimated Hydrologic Response (brief description):** The Robertson Draw Fire ignited as a result of a human-caused motor vehicle accident on June 13, 2021 in Robertson Draw. Situated in the southeast corner of the Beartooth District of the Custer Gallatin National Forest (CGNF). The majority of the burning occurred on June 15<sup>th</sup> when strong winds and a record high Energy Release Component (ERC) combined to drive the fire front northeast across BLM, State, and private rangelands. In addition, the fire burned against the wind up the steep eastern slopes of the Beartooth Front. The ERC that day was not

merely a record high for June 15<sup>th</sup> over the period of record of ERC monitoring, it was a record high for any date of the year.

The area burned on BLM, State, and private lands was primarily sage/grass rangeland with some riparian areas and aspen groves. Soil burn severity in these areas was primarily low, with some areas of moderate (Figure 1). A portion of the BLM land area that burned, and nearly all of the Forest Service area that burned, were a mix of timber, open grassland areas, aspen groves, and riparian. Burn intensities were moderate or high in most of the timbered areas.

Post-fire peak flow calculation was only carried out in the headwaters of Bear Creek drainage in the northeast portion of the Forest Service owned burned area. This headwater area is the source water catchment for drinking water used by the community of Bear Creek. The 10% probability flow at the bottom of this catchment was estimated at 220 cfs.

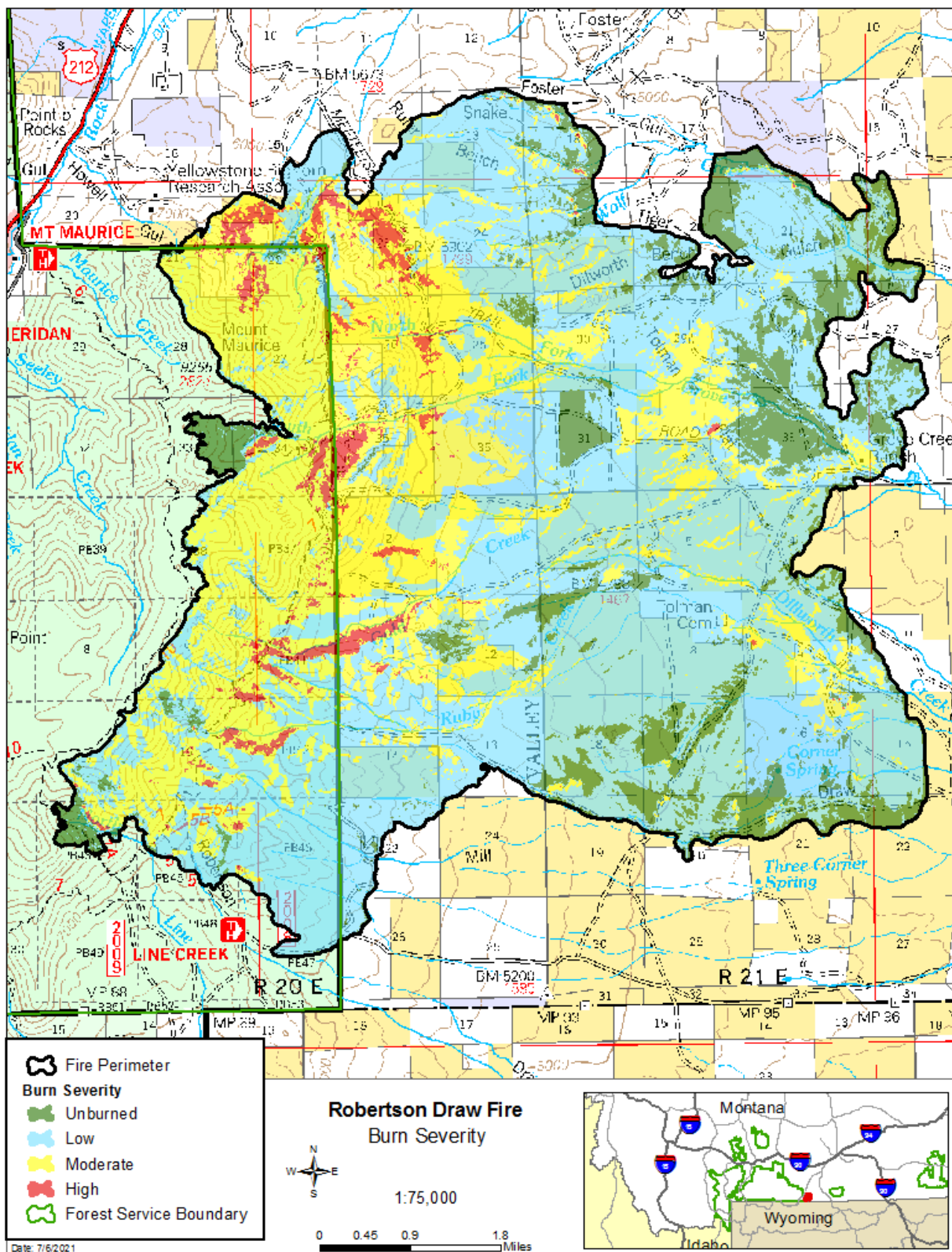


Figure 2: Soil Burn Severity Map for Robertson Draw Fire

**PART III - WATERSHED CONDITION: CROOKED CREEK FIRE****F. Burn Severity (acres):***Table 8: Burn Severity Acres by Ownership*

SOIL BURN SEVERITY	NFS	CROW NATION	PRIVATE	TOTAL	% WITH FIRE PERIMETER
UNBURNED	442	5	52	499	12
LOW	505	19	34	558	13
MODERATE	693	7	37	737	18
HIGH	2,356	0	31	2,387	57
TOTAL	3,995	31	154	4,180	

**G. Water-Repellent Soil (acres):** 3,124 acres within entire fire perimeter. 3,049 acres on FS lands (all area burned under moderate and high severity were observed to express moderate water repellency).

**H. Soil Erosion Hazard Rating:** Within entire fire perimeter: 1,057 (acres low+unburned), 737 acres moderate, 2,387 acres high.

On FS lands: 947 (acres low+unburned), 693 acres moderate, 2,356 acres high.

**I. Erosion Potential:** 0.88 tons/ac/yr average annual delivery estimate from WEPP cloud for example drainage within burn perimeter. The representative watershed used for hillslope erosion modeling was 410 acres. The watershed was 2.4% Unburned/Low, 3.0% Low Severity, 14.2% Moderate Severity, and 79.4% High Severity.

**J. Sediment Potential:** 0.92 tons/ac/yr sediment discharge average annual delivery estimate from WEPP cloud for example drainage within burn perimeter. Sediment yield for 20% probability (i.e. 5 yr RI) event is approximately 0.67 tons/ac.

**F. Estimated Vegetative Recovery Period (years):** 2-5 years (grasslands and forest understory)

**G. Estimated Hydrologic Response (brief description):** The Crooked Creek Fire ignited as a result of an unknown cause on approximately June 15, 2021 in the northeast portion of the Pryor Mountain Unit, Beartooth District, Custer Gallatin National Forest (CGNF). The fire is located in rugged timbered canyons to the north of the Dry Head Overlook. As of July 24, 2021 the fire perimeter encompassed approximately 4,180 acres, the majority involving Forest Service administered lands. Less than 200 acres are located on the Crow Reservation to the north and on private property to the east.

The majority of the area burned was north-facing timber, with open grassland areas, aspen groves, and riparian areas making up the rest of the burn areas. Burn intensities were moderate or high in most of the timbered areas.

A BARC Map was produced by GTAC. Due to very few critical values being associated with this fire, and visual field verification that BARC image accurately reflected soil burn severity, the BARC map was adopted as Soil Burn Severity Map without any alterations. This should be taken into account if the Soil Burn Severity Map is used for land management decisions.

High and moderate burn severity areas on relatively steep slopes with shallow soils make up 57% of the total fire area. It is expected that post-fire storm runoff, peak flows, and sediment yields will be significantly higher than under pre-fire conditions.

Due to the very few critical values identified on this fire, post-fire peak flow modelling was not deemed necessary nor carried out.





## **PART V - SUMMARY OF ANALYSIS**

### **Introduction/Background**

#### **A. Describe Critical Values/Resources and Threats**

*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 (Robertson Draw Fire)**

*Risk Assessment: Human Life and Safety*

*Probability of Damage or Loss: Possible*

*Magnitude of Consequence: Major*

*Risk Level: High*

Human life and safety of Forest visitors and employees traveling on NFS roads and trails, in the burn scar is threatened due to the potential for injury or loss of life from hazard tree strikes, falling rocks, flash floods, debris flows, and other burned area hazards. One of the highest risks is along Trail 7 where falling trees could strike Forest visitors and trail crew performing drainage work.

#### **2. Property (P):**

##### **Property: Trail Stabilization of Forest Service Trail #7 (Robertson Draw Fire)**

*Risk Assessment: Trail Infrastructure*

*Probability of Damage or Loss: Very Likely*

*Magnitude of Consequence: Moderate*

*Risk Level: Very High*

Trail #7 starts at a trailhead at the northeast corner of Forest Service land ownership and traverses the Beartooth Front for 11.24 miles to Robertson Draw. Field reconnaissance documented that nearly the entire 11.24 miles of trail had been burned over and approximately 7.0 miles of the trail has been damaged by the fire and will be at risk of further damage in the post fire period. This future damage is likely to occur through the following mechanisms.

- Direct erosion of trail prisms due to loss of drainage structures and deposition from upslope.
- Direct erosion of tread due to loss of adjacent and upslope vegetation

- Fillslope failure and/or trail tread destabilization due to direct loss of forested vegetation, organic soil components, and root systems. This potential failure mechanism is likely to occur on steep hillslopes with moderate and high burn severity.

**Property: Forest Service Road #2008 at Culvert crossing (Robertson Draw Fire)**

*Risk Assessment: Road Infrastructure*

*Probability of Damage or Loss: Likely*

*Magnitude of Consequence: Moderate*

*Risk Level: High*

To protect aquatic resources from elevated sediment inputs and prevent severing of the road do to crossing washout, armor road surface and downstream face of road prism on Road #2008. This road is maintained as a level #2 road and provides access to the Robertson Draw Trailhead. Hydraulic analysis of the existing crossing indicates that stream flow would overtop the existing culvert/road prism at 115 cfs. The estimated post-fire 10% recurrence interval peak flow for this site is 220 cfs. Thus, overtopping of the road is likely during the post-fire hydrologic recovery period.

**Property: Forest Service Road #2144 (Crooked Creek Fire)**

*Risk Assessment: Road Infrastructure*

*Probability of Damage or Loss: Possible*

*Magnitude of Consequence: Major (rated "major" because damage or loss of road would eliminate the sole route by which the permittee accesses the Wells Grazing Allotment).*

*Risk Level: High*

Road #2144, which is maintained as a level 2 road, passes through an ephemeral drainage from a steep catchment, approximately 75% of which experienced high burn severity. The road provides the sole permittee and FS personnel access to the Wells Grazing Allotment. Elevated post-fire peak flow runoff from the steep, severely burned catchment threatens to damage the road and thus sever permittee access to the Wells Allotment.

### **3. Natural Resources (NR):**

**Natural Resources: Native Plant communities (Robertson Draw & Crooked Creek)**

*Noxious weeds are within and adjacent to the burned area. These populations are substantial in size and have the potential with the available seed bed to spread into burned areas.*

*Risk Assessment – Threats to native plant communities (including Species of Conservation Concern)*

*Probability of Damage or Loss: Very Likely - Based on burn severity and proximity to existing weed infestations.*

*Magnitude of Consequence: Moderate – Loss of native plant communities and spread of noxious weeds.*

*Risk Level: Very High – Invasive species treatment is needed for areas adjacent to documented infestations. Additional invasive species monitoring next year will determine if weed spread is occurring*

*further into the burned area.*

The Robertson Draw fire perimeter contains approximately 74 acres of scattered known noxious weed infestations on NFS lands, primarily spotted knapweed and Canada thistle, with very minor amounts of bull thistle, leafy spurge, and oxeye daisy. In addition there are large populations of invasive species (spotted knapweed and Canada thistle) located outside the fire perimeter but within and adjacent to the contingency line fuel break (clipper line). There is further risk from weed propagules that may spread into the fire area from Trail #7 that contours through the fire area.

The Crooked Creek has no known noxious weed infestations within the fire perimeter, but there are several areas (approximately 8 scattered acres) adjacent to the fire perimeter with known infestations of spotted knapweed and Canada thistle. While not currently mapped immediately adjacent to the fire, yellow toadflax is known to the west along routes traveled for suppression and open to the public and is a concern if it were to become established in disturbed areas. The district will monitor for establishment of toadflax outside of BAER funds in future years due to the invasive nature of this species.

Though not a BAER critical value, Beartooth goldenweed that occurs in the Robertson Draw area is a Species of Conservation Concern. Risk of losing native plant communities impacts this Species of Conservation Concern. Similarly, the degrading of native plant communities on the Crooked Creek Fire would threaten key endemic plant populations near the contingency line.

**B. Emergency Treatment Objectives:** As noted above, threats to life, property, and natural resources could result from post-fire conditions in the burned area. For these reasons the primary treatment objectives are:

- Prevent injury or loss of human life that is possible in the next 12 months
- Prevent additional loss of trail infrastructure that is very likely to occur in the next 12 months
- Prevent additional loss of road infrastructure that is possible in the next 12 months
- Minimize the establishment and spread of noxious weed infestations that is very likely to occur in the next 12 months.

**C. Probability of Completing Treatment Prior to Damaging Storm or Event:**

**Land:** 50

**Channel:** NA

**Roads/Trails:** 50 (Roads) 50 (Trail)

**Protection/Safety:** 100

**D. Probability of Treatment Success**

*Table 10: Probability of Treatment Success*

	Years after Treatment		
	1	3	5
<b>Land</b>			
Noxious weed treatment	80	85	85
<b>Channel NA</b>			
<b>Roads/Trails</b>			
Trail Stabilization	85	90	95
Replace Culvert	90	90	95
Storm Proofing	90	80	80

Protection/Safety			
Hazard Tree Felling	95	85	80

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

The loss of trail drainage controls (waterbars) and trail tread is very likely to increase repair costs over time, if BAER trail stabilization treatments are not implemented as soon as possible. The current estimate is \$35,000 to treat 7 miles of trail. If the treatments are not implemented, and assuming the at-risk trail segment requires full tread rebuilding with waterbars, the cost would be 7 miles x \$15,000 cost/mile for a total of about \$105,000.

The loss of the existing culvert and road embankment on Road #2008 at Robertson Draw would sever the road prism, damage/destroy the culvert, and subject the stream and its aquatic resources to the input of sediment from the road prism material (sediment). The estimated cost to armor the stream crossing is \$9,000. If the crossing hardening is not implemented and the crossing washes out, the estimated cost of repair would be \$23,000 plus an estimated \$4,000 for disposal of the ruined culvert and furnishing fill material to rebuild the road prism, for a total of \$27,000. Thus the estimated loss would be \$14,000.

On the Crooked Creek Fire, armoring of Road #2144 is estimated to cost \$6,000. If the road were to wash out due to post-fire runoff the repair would likely cost approximately \$9,000 and the loss would be \$3,000.

Adding both trail and road infrastructure costs equates to a potential loss of \$122,000.

The value of protecting the ecological integrity of native plant communities and soil productivity of the burned area from noxious weed infestation exceeds the cost of treatment and monitoring. The continued spread would impact treatment costs in the future. As a coarse estimate, the weeds may spread largely into high and moderate burn areas at 14% per year. For Robertson Draw, using the base estimate treatment area 112 acres and assuming horse/mule spraying team, this could be upwards \$36,400 which is 30% higher than the proposed \$28,000 treatment. Similarly, the Crooked Creek fire would have a projected cost of \$5,328 at three years if not treated immediately.

Altogether, the cost would be \$163,728 if no treatment for these critical values.

- F. **Cost of Selected Alternative (Including Loss):** There remains an estimated 20 percent chance that the proposed treatments for this work either may not be completed prior to damaging storms or fail. As a gross estimate, the cost is the treatment estimate (\$89,075) plus the loss (0.2 x \$89,075) which equals \$106,890.

#### G. Skills Represented on Burned-Area Survey Team:

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

##### Team Leader:

Email: dale.white@usda.gov

Phone(s) 406-551-0874

##### Forest BAER Coordinator:

Email: dale.white@usda.gov

Phone(s) 406-551-0874

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

Skill	Team Member Name
Team Lead(s)	Dale White

<b>Skill</b>	<b>Team Member Name</b>
<i>Soils</i>	Erik Anderson
<i>Hydrology</i>	Dale White, Andy Efta
<i>Engineering</i>	Parks Frady
<i>GIS</i>	Bryce Hancock
<i>Archaeology</i>	Mike Bergstrom
<i>Weeds</i>	Beth Bischoff
<i>Recreation</i>	Allie Wood
<i>Other</i>	

## H. Treatment Narrative:

### Land Treatments:

#### *Robertson Draw and Crooked Creek Fires*

##### P1a. Invasives EDRR

The objective is to implement an Early Detection Rapid Response (EDRR) strategy which would be to detect and suppress new weed infestations in the burned area. Left unchecked, it is likely that existing weed infestations will increase post-fire, particularly in moderate to high soil burn severity areas, due to conditions favorable to accelerated growth and reproduction and release from competition with native plant communities. In addition, the unintentional introduction and dispersal of invasive weeds into areas disturbed by fire suppression and rehabilitation has the potential to establish persistent weed populations. It is expected that most native vegetation will recover if weed invasions are minimized.

##### Methods

The strategy on the Robertson Draw fire would use EDRR to contain noxious weed along the trail corridor and search for potential weed spread from known populations in the vicinity of the trail where the fire burned with moderate and high severity. Table 10 outlines the treatment cost.

Crooked Creek work would primarily search along the fringe of the fire near handline and the perimeter where weeds most likely to take hold (Table 11).

##### P1b. Invasives EDRR – Suppression Repair

EDRR would concentrate on the fuel break areas within and adjacent as contingency line that were 1.5 miles for Robertson Draw and 2.5 miles for Crooked Creek. Similarly EDRR would be done as fire suppression repair on handline for 2.4 miles in Robertson Draw and 2.8 miles in Crooked Creek.

*Table 10. Robertson Draw EDRR*

<b>EDRR TREATMENT</b>	<b>UNITS (ACRES)</b>	<b>COST/UNIT</b>	<b>TOTAL</b>
<b>FIRE SUPPRESSION REPAIR (FUEL BREAK-CHIPPER LINES) - 1.5 MILES</b>	3	\$50	\$150
<b>FIRE SUPPRESSION REPAIR (HANDLINE) - 2.4 MILES</b>	1	\$250	\$250
<b>NATIVE GRASSLAND RANGE EDDR</b>	112	\$250	\$28,000
<b>NATIVE GRASSLAND RANGE SEARCH</b>	289	\$25	\$7,225
<b>TOTAL</b>			<b>\$35,625</b>

*Table 11. Crooked Creek EDRR*



EDRR TREATMENT	UNITS (ACRES)	COST/UNIT	TOTAL
EDDR FIRE SUPPRESSION REPAIR (FUEL BREAK/IMPROVED ROAD) - 2.5 MILES	17	\$50	\$850
EDDR FIRE SUPPRESSION REPAIR (HANDLINE) - 2.8 MILES	1	\$100	\$100
NATIVE GRASSLAND RANGE SEARCH	164	\$25	\$4,100
TOTAL			\$5,050

### Channel Treatments NA

### Roads and Trail Treatments

#### ***Trail Stabilization (Robertson Draw Fire)***

T1. Trail Drainage Stabilization. Approximately 7.0 miles of Trail #7 located on steep slopes with high/moderate burn severity are expected to be at risk of deterioration from additional runoff, and sediment from post-fire conditions. The threats are from runoff severely eroding the trail and depositing sediment from upslope areas onto the trail.

High and Moderate-severity burn along Trail #7 has created many standing dead and fire-weakened trees in this wind-prone area which threaten the safety of trail crew members implementing trail stabilization measures.

#### Methods

The method for reducing these risks is primarily trail tread repair and installation of water bars, which would be used to direct and divert flow off the trail. These treatments would reduce the risk of the trail washing out, becoming hazardous to trail users, and transporting sediment to streams. Implementation will be accomplished by CGNF Trails Crew.

Burned trees would be assessed by a fire fighting crew and those with high hazard ratings and the potential to fall into the trail work area would be marked. Treatment targets hazard trees within 1 1/2 tree lengths of the planned working areas. Trees posing high risk and impeding drainage work would be addressed.

T3. Other Trail Treatments. Human life and safety of Forest visitors and employees traveling on NFS trails within the burn scar is threatened due to the potential for injury or loss of life from falling trees, falling rocks, flash floods, debris flows, and other burned area hazards.

#### Methods

The method for reducing these risks is to install signs to educate visitors and NFS employees of the dangers associated with travel within the burn scar. Signs would be installed at the Robertson Draw Trailhead, the trailhead at the north end of Trail #7 on the Meeteetse Road, and at the NFS boundary on the North Fork Grove Creek Trail.

#### ***Protection/Safety Treatments:***

The trail treatments (T1 & T3 above) would reduce the safety risk of hazard trees and other post-fire hazards to Forest visitors and employees. With time the hazard associated with falling trees would diminish in time as remaining dead trees finally fall and the watershed stabilizes.

#### ***Stream Crossing Protection (Robertson Draw Fire)***

R12. Fill-Slope Stabilization: Hydraulic analysis of the existing 4 ft diameter stream culvert indicates that a stream discharge of 115 cfs would result in stream flow topping and flowing across the road prism. The estimated 10% probability post-fire peak flow is 220 cfs. Therefore the existing culvert and road embankment has a relatively high potential to fail during the post fire period. The purpose of this work is to decrease the risk of this stream crossing failing, which would result in moderate to severe road damage to the road prism and add a large volume of sediment to downstream water bodies.

Methods:

Install riprap to armor the road surface and downstream face of road prism on Road #2008. This treatment will significantly reduce the likelihood of failure of the road crossing during the post-fire period.

***Stream crossing Protection (Crooked Creek Fire)***

R12. Fill-Slope Stabilization: Road #2144 passes through a vegetated swale which drains a steep catchment, approximately 75% of which experienced high burn severity. This road provides the sole permittee and administrative access to the Wells Grazing Allotment. Elevated post-fire peak flow runoff from the steep, severely burned catchment threatens to damage the road and thus sever permittee access to the Wells Allotment. The objective of this treatment would be to protect the road surface and low prism from damage during post-fire storm runoff from the severely burned catchment.

Methods:

To protect the road surface and low prism from damage during storm runoff the road surface would be armored a 9" thick layer of 6" minus riprap. The armored surface would be 10 feet wide and would be installed on a 100 ft long segment of the existing road within the swale. Pit run (3" minus) or other suitable material would be installed on top of the riprap to provide a relatively smooth driving surface.

**I. Monitoring Narrative: NA**



**PART VI – EMERGENCY STABILIZATION TREATMENTS AND SOURCE OF FUNDS**

Line Items	Units	Unit Cost	NFS Lands		Other \$		Other Lands		Non Fed \$	All Total \$
			# of Units	BAER \$			# of units	Fed \$	# of Units	
<b>A. Land Treatments</b>										
P1a. EDRR Native plant communities (R.Draw)	Acres	250	112	\$28,000						
P1a. EDRR Native plant communities (R.Draw)	Acres	25	289	\$7,225						
P1b. EDRR suppression-clipper (R.Draw)	Acres	50	3	\$150						
P1a. EDDR suppression- handline (R.Draw)	Acres	250	1	\$250						
P1a. EDDR Native plant communities (Crooked Cree	Acres	25	164	\$4,100						
P1b. EDDR suppression-clipper (Crooked Crk)	Acres	50	17	\$850						
P1b. EDDR suppression-handline (Crooked Crk)	Acres	100	1	\$100						
<i>Subtotal Land Treatments</i>				\$40,675						
<b>B. Channel Treatments</b>										
None										
<b>C. Road and Trails</b>										
T1. Trail Stabilization (Robertson Draw)	Miles	5,000	7.0	\$35,000						
T.3 Other Trail Treatments: Warning Signs	Each	3	300.0	\$900						
R12. Stream Crossing Armor (Robertson Draw)	Each	9,000	1.0	\$9,000						
R12. Road surface amoring (Crooked Creek)	Each	6,000	1	\$6,000						
<i>Subtotal Road and Trails</i>				\$50,900						
<b>D. Protection/Safety</b>										
<i>Subtotal Protection/Safety</i>				\$0						
<b>E. BAER Evaluation</b>										
Initial Assessment	Lump	\$32,400	1	\$32,400						
<i>Subtotal Evaluation</i>				\$32,400						
<b>F. Monitoring</b>										
<i>Subtotal Monitoring</i>				\$0						
<b>G. Totals</b>				\$91,575						
Previously approved										
Total for this request				<b>\$91,575</b>						

**PART VII - APPROVALS**

1. \_\_\_\_\_ 8/4/2021  
Acting Forest Supervisor Date