Date of Report: 10/13/2017

BURNED-AREA REPORT
(Reference FSH 2509.13)

PART I - TYPE OF REQUEST

A. Type of Report

[x] 1. Funding request for estimated emergency stabilization funds
[ ] 2. Accomplishment Report
[ ] 3. No Treatment Recommendation

B. Type of Action

[x] 1. Initial Request (Best estimate of funds needed to complete eligible stabilization measures)

[ ] 2. Interim Report #____.
[ ] Updating the initial funding request based on more accurate site data or design analysis
[ ] Status of accomplishments to date

[ ] 3. Final Report (Following completion of work)

PART II - BURNED-AREA DESCRIPTION

A. Fire Name: Big Red

B. Fire Number: CO-RTF-402

C. State: CO

D. County: Routt

E. Region: 02

F. Forest: Medicine Bow-Routt NF

G. District: Hahns Peak-Bears Ears

H. Fire Incident Job Code: P2LA0417

I. Date Fire Started: 8/1/17

J. Date Fire Contained: 10/3/17

K. Suppression Cost: Approximately $1,500,000

L. Fire Suppression Damages Repaired with Suppression Funds
1. **Fireline waterbarred (miles):** 0.33 miles
2. **Fireline seeded (miles):** 0
3. **Other (identify):**

M. Watershed Number: 140500030101 (Little Snake River-Whiskey Creek).

N. Total Acres Burned: 2940 acres
[2,940] NFS Acres [0] Other Federal [0] State [0] Private

O. Vegetation Types: The National Forest Service (NFS) lands burned in the Big Red fire were primarily composed of mixed confier of lodgepole pine forest, much of which experienced high mortality during the mountain pine beetle epidemic. Engelmann spruce/

subalpine fir, and aspen were also found in the area with small patches of non-forested vegetation. Tree density and understory composition and cover varied with aspect and slope. Common understory plants in forested areas include dwarf huckleberry, Ross' sedge, elk sedge, common juniper and forbs. Some areas within the fire perimeter were previously logged and were composed of more sparsely vegetated stands of young lodgepole pine. Open, non-forested areas on NFS lands were primarily sage brush and larger riparian areas composed of a combination of sedge meadows and willow carrs, and sparsely treed wetlands. Disturbed areas along Forest Service roads 500, 500.1a/b/c, and 511 and connecting NFS roads within the fire perimeter contain a combination of native vegetation and invasive species such as Canada thistle.

P. Dominant Soils: Dominant soil types within the fire perimeter include the Leighcan, Trude, and Targhee series. Smaller components include the Elve and Comad series. These soils are mostly well-drained and moderately erosive, with the exception of the Leighcan and Trude series which are rated as highly erosive. They are typically characterized by gravelly loam to sandy loam surface textures and many soils in the area have large amounts of rocks and coarse fragments in the profiles. Soil structure and fine roots were found to be largely in tact within the moderate burn areas. High severity burn areas began to show signs of structure degradation. Loss of the litter/duff layer and compromised structural integrity will exacerbate post fire erosion and will inhibit recovery in areas were these effects were most pronounced, mostly areas of high soil burn severity. Areas that remained unburned and those that experienced low burn severities were found to have a more natural structure (generally granular) with more organic matter and fine roots. Partial consumption of heavy fuels was far more common than complete consumption of heavy fuels. Consumption of heavy surface fuels can detrimentally affect soil productivity over small areas but, overall, it is not believed that long term soil productivity will be an impediment to the continued recovery of plants during successive growing seasons. Debris flows and high rates of erosion are possible but not expected within the fire perimeter. Areas that experienced high soil burn severity are most suceptible, especially in steep drainages where ground cover consumption was high.

Q. Geologic Types: The Park Range of Colorado borders the western side of North Park and represents a long north-south trending range extending from the Wyoming Border down toward the center of Colorado through Jackson and Routt counties. The range also marks the path of the continental divide, separating the Platte River drainage to the east from the upper basin of the Colorado River to the west. Continuing north, the range extends into Wyoming where it is known as the Sierra Madre Range. The Park Range is a large linear anticline bounded by faults. Most of the mountains in the area are the result of highly localized movements of the crust as the Rocky Mountains were thrust upward. These movements broke deep massive igneous basement rocks and bent the more flexible rocks above until they arched upward. As these mountains rose, the forces of erosion stripped away many of the sedimentary layers and exposed the Precambrian basement rocks that now make up many of the peaks in the area. The landscape today is representative of glaciation events experienced in Colorado. The most recent of these events is known as the Pinedale glaciation, preceded by the more extensive Bull-Lake glaciation.The Big Red fire is situated on the West side of the Park Range along the Continental divide and close to the Wyoming border. Geology within these landforms is highly diverse and surficial geologic deposits can be characterized as metamorphic and sedimentary formations of Quaternary and Tertiary age.

R. Miles of Stream Channels by Order or Class: 6.6 miles perennial; 4.5 miles intermittent

S. Transportation System

Trails 2.1 **miles** **Roads:** 8.6 **miles**

PART III - WATERSHED CONDITION

A. Burn Severity (acres): 651 **(22% Unburned)** 1080 **(37% low)** 1157 **(39% moderate)** 52 **(2% high)**

The BAER team utilized a Burn Area Reflectance Classification (BARC) map to produce an accurate soil burn severity map in a short timeframe (see Map 1). The Burned Area Emergency Response (BAER) team acquired BARC images which covered most of the burned area. Following field review, minor systematic adjustments to the classification were made and the BARC map was adjusted to reflect field observations in the burn area.

B. Water-Repellent Soil (acres): Field observations indicated moderate repellency within a 1 inch of the surface over moderate severities. Areas with high burn severities, and/or thick ash layers commonly had strong water repellency at depths of greater than ½ an inch. The pattern of water repellent soils is likely to be patchy and mosaic much like the fire itself. The extent of sites that experienced moderate to high burn severities totaled 42% of the fire, and these areas are most likely to exhibit pronounced hydrohbicity.

Increased runoff due to hydrophobic conditions is reflected in the peak flow analysis contained in the Hydrology Report. Increased overland flow due to the hydrophobic conditions may increase hill-slope rill and sheet erosion. Hydrophobic layers will usually take six months to two years to break down. Plant root development, soil microbial activity, and freeze-thaw cycling all contribute to the degradation of hydrophobic conditions.

C. Soil Erosion Hazard Rating (acres): 147 **(slight)** 1460 **(moderate)** 1333 **(severe)**

A rating of "slight" indicates that erosion is unlikely under ordinary climatic conditions; "moderate" indicates that some erosion is likely and that erosion-control measures may be needed; "severe" indicates that erosion is very likely and that erosion-control measures, including revegetation of bare areas, are advised, but , overall, it is not believed that long term soil productivity has been impacted and natural revegetation of the area is expected.

D. Erosion Potential: Erosion response is heavily influenced by soil burn severity and hill slope. Before the fire, most of the forested areas had protective ground cover in the form of litter, duff, or ground vegetation. Before the fire, minimal soil erosion occurred on forested hill-slopes within the burned area. Following the fire, the rates of erosion are expected to increase significantly because the burn affected soil aggregate stability, canopy cover, ground cover, and infiltration rates. Given the identified values at risk and the low potential for detrimental levels of erosion and soil loss, it is not recommended that any treatments like mulching take place.

E. Sediment Potential: Modeling results indicate that rates of erosion are very low (generally close to zero) in unburned densely forested areas. Rate of erosion will increase significantly to over 2.5 tons/acre on steep (45% slope) forested hillslopes that were mapped at moderate or high soil burn severity. Extensive removal of forest floor ground cover occurred

in these areas. The results also show that natural recovery of these areas is likely to occur within 3-5 years following the burn. In high and moderate soil burn severity areas, it is highly likely that increased rates of soil erosion and sediment delivery to stream channels will occur, in the first and second year following the fire, particularly on steep slopes.

PART IV - HYDROLOGIC DESIGN FACTORS

The following contains the hydrologic factors used in the analysis and a comparison of pre to post-fire flow projections for the modeled precipitation events by watershed.

A. **Estimated Vegetative Recovery Period, (years):** 3-5 years

B. **Design Chance of Success, (percent):** 80

C. **Equivalent Design Recurrence Interval, (years):** 10

D. **Design Storm Duration, (hours):** 1

E. **Design Storm Magnitude, (inches):** 1.03

F. **Design Flow, (cubic feet / second/ square mile):** 0.4 cfs/mi^2

G. **Estimated Reduction in Infiltration, (percent):** 22%

H. **Adjusted Design Flow, (cfs per square mile):** 26 cfs/mi^2

Modeling of burned catchments associated with values at risk of the Big Red Fire was conducted to predict the increased flooding risk of a late summer convective storm. Modeling focused on a catchment with the greatest values at risk. The modeled catchment was a tributary to the Middle Fork Little Snake River. The 10-year 1-hour storm was modelled to represent a high intensity thunderstorm storm expected to occur in late summer and early fall. Additionally, increased flooding risk associated with snowmelt events were considered.

Fire Affected 6th Field Watersheds

Watershed Name	HUC	Total Area (ac)	Burned Area (ac)	Unburned / Very Low (ac)	Low (ac)	Mod (ac)	High (ac)	% Burned
Little Snake River-Whiskey Cr	140500030101	33924	2930	640	1080	1150	60	9

Soil burn severity area by catchment modeled.

Catchment Name	Total Watershed Area (ac)	Unburned/ Very Low Severity Burn Area	Low Severity Burn Area (ac / %)	Moderate Severity Burn Area (ac / %)	High Severity Burn Area (ac / %)

		(Acres / %)			
Middle Fork Little Snake River Tributary	170	13 / 8	71 / 42	37 / 22	0 / 0

The results of the pre- and post-fire hydrologic modeling for the 10-year, 1-hour rain event are shown in the tables below. Additionally, the 2-yr snowmelt flow is listed as a comparison. This flow estimates the bankfull flow and provides a comparison to peak flows from rainfall response.

Modeled 2-yr snowmelt peak flow and 10-year, 1-hour modeled thunderstorm rain event

Catchment Name	Area (sq. mi)	2-yr Snow-melt Peak Flow (cfs)	10-yr Design Flow (cfs/mi²)	10-yr Adjusted Design Flow (cfs/mi²)	10-yr Pre-fire flow from Design Storm (cfs)	10-yr Post-fire flow from Design Storm (cfs)	Relative % increase
Middle Fork Little Snake River Tributary	0.27	8.4	0.4	26	0.1	7	7000

A significant increase in flows due to post-fire rainfall response is expected in the modeled catchment. However, in the modeled catchment, the rainfall response is still expected to be less than bankfull flows from snowmelt runoff. Increases in snowmelt peak flows are expected to be minor due to the mosaic of moderate and high soil burn severity and the large percentage of ground cover intact throughout the burn area. These results should be interpreted with caution as numerous assumptions and simplifications of physical processes are embodied in the output. While absolute flow magnitudes may contain considerable uncertainty, relative increases in peak flow provide a more useful guide for understanding the general extent of alteration of a catchment's soil hydrologic function.

PART V - SUMMARY OF ANALYSIS

A. Describe Critical Values/Resources and Threats (narrative):
A BAER Risk Assessment (FSM 2523.1 Ex 2) was completed for ***Critical Values*** in and downstream of the Big Red burn area the table below summarizes where the level or risk warrants recommended treatments:

Value At Risk	Probability of Damage or Loss	Magnitude of Consequence	Risk Level	Treatment Recommended
Human Life and Safety				
Public Safety	Possible	Major	Very High	Yes
Property				
Roads	Possible	Moderate	Intermediate	Yes
Trails	Unlikely	Moderate	Low	No
Natural Resources				

Native Plant Communities/ Noxious weeds	Very Likely	Moderate	High	Yes
Soil productivity, water quality, TE species	Unlikely	Moderate	Low	No
Cultural Resources				
Heritage Sites	Unlikely	Moderate	Low	No

The following provides information to support the emergency determinations in the above table.

Human Life and Safety

Hazard trees: Threats to life and safety are highest on infrastructure used by the public and agency personnel such as roads located within moderate or high soil burn severity. Hazard tree safety concerns existed prior to the fire due to the beetle-kill timber, and these hazards have been further exacerbated by the fire. Burned trees, especially those previously impacted by beetle, are a high risk hazard due to the risk of injury or death from falling trees. Additionally there is increased hazard for forest users beyond this infrastructure such as hunters and others occupying the burned areas. There is a high liklihood of hazard trees falling in the vicinity of Forest users. BAER information/outreach treatments are recommended to reduce the human safety risk.

Emergency Determination: **Increased threats to human life and safety from hazard trees are likely, and the magnitude is Major resulting in a Very High risk rating and therefore a burned-area emergency exists.**

Property

Roads: Roads and road/stream crossings within the burned area are at risk from impacts from increased water, sediment, and/or debris. Impacts include damage to the road and/or loss of access due to severe erosion of the road surface, or deposition of sediment or debris. Roads within the burned area could exacerbate the risk of flooding and erosion by collecting surface water, concentrating it and delivering it to hillslopes or stream channels. Field assessment identified several relief culverts that might need some cleaning if we get high flows that allow debris from the fire to back up at the inlets. While the assessment did not feel that the cleaning constitued an emergency at this time, storm patrol is recommended since this hazard exists to prevent road damage and failure.

Trails: Trails within the burned area have sufficient drainage to accommodate increased flood flows.

Emergency Determination: The probability of loss or damage to roads is Possible and the magnitude of consequence is Moderate, therefore, the BAER risk is Intermediate and so the potential for a burned-area emergency exists. No emergency was identified for trails.

Natural Resources

Native Plant Communities/Noxious Weeds: There are no known occurrences of Threatened or Endangered plant species within the fire perimeter.

The integrity of native plant communities are at risk from non-native plant (weed) invasion following the Big Red fire. Forest Service policy mandates the Forest to minimize the establishment of non-native invasive species to prevent unacceptable degradation of the burned area. Plant communities most at risk include areas with the highest soil burn severity, those closest to roads and other seed transportation corridors, those closest to known populations of weeds, and those in recent areas of timber harvest. Native plant communities are a critical resource for maintaining the ecological integrity of Forest Service lands and providing habitat for a large variety of wildlife species. BAER Early Detection and Rapid Response weed treatments are recommended to minimize the damage to the native plant communities.

Water Quality: Large sediment increases are not expected due to the mosaic nature of the burn.

Soil Productivity: Effects to soil productivity are expected to be minimal due to the mosaic nature of the burn and effective needle cast already occurring over much of the area.

TE species: There are no TE terrestrial or aquatic species within or immediately downstream of the burned area.

Emergency Determination: **Invasive species establishment and expansion resulting in loss or damage of native plant communities is Very Likely and the consequences are Moderate, therefore the BAER risk is High and a burned-area emergency exists.**

There are no TE species within or downstream of the fire. Significant impacts to water quality and soil productivity are unlikely, therefore no BAER burned-area emergency exists for these resources.

Cultural and Heritage Resources:

Cultural Resources: Post-fire threats to cultural resources are limited to historic roads and trails. Of the two historic trails of initial concern, neither were in areas where high runoff, erosion, flooding, or debris flow could pose a potential threat. In addition, the burn intensity was moderate to very low/unburned in the resource locations. The moderate burn areas within the Ellis Trail are in locations on the NFSR 500 and did not adversely impact the site's integrity. Historic trails also have a low likelihood of looting and vandalism associated with them. Due to the mosaic nature of the burn and expected minimal increases in erosion and flooding, the probability of damage to historic roads and trails is unlikely and no BAER treatments were identified.

Emergency Determination: The probability of loss or damage to cultural on historic roads and trails is Unlikely and the magnitude of consequence is Moderate, therefore, the BAER risk is Low and no burned-area emergency exists.

B. Emergency Treatment Objectives (narrative):

Human Life and Safety: Reduce the risk of loss of life or injury to humans from burned trees falling.

Property: Ensure adequate functioning drainage structures and road-stream crosssings to prevent road damage or failure.

Natural Resources: Minimize introduction and expansion of invasive species into native plant communities.

Cultural and Heritage Resources: No treatments are recommended for cultural or heritage resources.

C. Probability of Completing Treatment Prior to Damaging Storm or Event:
Land n/a% **Channel** n/a **Roads/Trails** n/a **Protection/Safety** 90%

D. Probability of Treatment Success

	Years after Treatment		
	1	3	5
Land (weeds)	80%	n/a	n/a
Channel	n/a	n/a	n/a
Roads/Trails	80%	n/a	n/a
Protection/Safety	80%	90%	95%

E. Cost of No-Action (Including Loss): Monetary costs cannot be assigned to human life and safety or native plant communities. No implementation treatments were identified for property. Storm patrol for roads will help to prevent loss of property.

F. Cost of Selected Alternative (Including Loss): $4339

G. Skills Represented on Burned-Area Survey Team:

[x] Hydrology	[x] Soils	[ ] Geology	[x] Range
[ ] Forestry	[ ] Wildlife	[ ] Fire Mgmt.	[x] Engineering
[ ] Contracting	[ ] Ecology	[x] Botany	[ ] Archaeology
[ ] Fisheries	[ ] Research	[ ] Landscape Arch	[x] GIS

Team Leader: Liz Schnackenberg

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BAER Team Members

Soils	Ryan Adams
Hydrology	Tyler Carleton
Vegetation/Botany/GIS	Marti Aitken
Invasive Weeds/Range	Randell Andersen
Engineering	Jacob Brown
Wildlife	Melissa Dressen (consulation only)
Fisheries	Rick Henderson (consultation only)
Cultural Resources	Brittany Milway (consultation only)
Recreation/trails	Ben Lindsley (consultation only)

H. Treatment Narrative:

The proposed treatments on NFS lands can help to reduce the impacts to critical values at risk, but treatments cannot fully mitigate the potential effects. The treatments listed below are those that are considered to be the most effective to protect identified values at risk NFS lands.

Land Treatments:

Invasive Weeds: Early Detection Rapid Response surveys: This treatment is to reduce the potential for impaired vegetative recovery and loss of native plant communities due to the spread of invasive weeds by conducting detection surveys and rapid response eradication efforts in the areas identified as being at the highest risk. High risk areas are those burn areas that contain know weed populations, or suppression disturbances (ie hand line etc) adjacent to known weed population, and where vectors exist such as roads and trails.

EDRR monitoring will begin in 2018 during the detection periods of noxious weed species. Crews will simultaneously monitor for and treat noxious weeds. Treatment methods may include boom spraying operations, backpack spraying, changes to grazing methods, cultivation, hand pulling or biological control. As encountered, weed populations will be documented, mapped, and spot treated with appropriate methods.

Channel Treatments: None recommended.

Roads and Trail Treatments: While the assessment did not feel that threates of increased erosion, flooding and debris transport potential to affect the road system and drainage features constituted an emergency at this time, storm patrol is recommended as NFSR 500 connects Colorado and Wyoming and is important for recreationists and there are concerns about culvert function at some locations.

Protection/Safety Treatments and Interagency Coordination:

Treatments to address life and safety concerns include posting of hazard warning signs at key portal entrances and the start of roads notifying the public of post-fire hazards. This signing will address the threats of hazard trees as well as flood potential.

NHPA 106 Compliance for Other Treatments

BAER treatments are subject to Section 106 of the National Historic Preservation Act and 36 CFR 800.2(0). Prior to the implementation of any other proposed BAER treatment, consultation with the MBRTB Heritage Staff is required. If cultural resources are present within the proposed BAER treatment area, the proposed treatments will require Section 106 compliance.

I. Monitoring Narrative: Implementation monitoring will be accomplished during implementation of BAER treatments and is included in treatment cost estimates. Monitoring includes effectiveness of weeds treatements during the first year, and that hazard tree signing is being effectively maintained at identified locations. If storm patrol identifies the need for road treatments, these treatments would be monitored for effectiveness.

Part VI – Emergency Rehabilitation Treatments and Source of Funds by Land Ownership

			NFS Lands				Other Lands			All
		Unit	# of	WFSU	Other	# of	Fed	# of	Non Fed	Total
Line Items	Units	Cost	Units	SULT $	$	units	$	Units	$	$
A. Land Treatments										
EDRR (weeds)	ac	62.59	17	$1,064	$0		$0		$0	$1,064
				$0	$0		$0		$0	$0
				$0	$0		$0		$0	$0
Insert new items above this line!				$0	$0		$0		$0	$0
Subtotal Land Treatments				$1,064	$0		$0		$0	$1,064
B. Channel Treatments										
				$0	$0		$0		$0	$0
				$0	$0		$0		$0	$0
				$0	$0		$0		$0	$0
Insert new items above this line!				$0	$0		$0		$0	$0
Subtotal Channel Treat.				$0	$0		$0		$0	$0
C. Road and Trails										
Storm Patrol	Days	375	5	$1,875	$0		$0		$0	$1,875
				$0	$0		$0		$0	$0
				$0	$0		$0		$0	$0
Insert new items above this line!				$0	$0		$0		$0	$0
Subtotal Road & Trails				$1,875	$0		$0		$0	$1,875
D. Structures										
Safety/warning signs	Ea	200	2	$400	$0		$0		$0	$400
Sign installation	Days	500	1	$500	$0		$0		$0	$500
Sign Maintenance	Days	500	1	$500	$0		$0		$0	$500
Insert new items above this line!				$0	$0		$0		$0	$0
Subtotal Structures				$1,400	$0		$0		$0	$1,400
E. BAER Evaluation										
Assessment team	ea	3006	1	$3,006	$0		$0		$0	$3,006
				$0	$0		$0		$0	$0
Insert new items above this line!				$0	$0		$0		$0	$0
Subtotal Evaluation				$3,006	$0		$0		$0	$3,006
F. Monitoring										
				$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				$7,345	$0		$0		$0	$7,345

PART VII - APPROVALS

1. _____ 10/19/2017
For CHUCK OLIVER acting Forest Supervisor — Date

2. _____ 11/3/2017
for Regional Forester (signature) — Date

Map 1: Big Red Final Soil Burn Severity and EDRR focus areas.