

Date of Report: May 14, 2014

BURNED-AREA REPORT

(Reference FSH 2509.13)

PART I - TYPE OF REQUEST

A. Type of Report

- ☒ 1. Funding request for estimated emergency stabilization funds
☐ 2. Accomplishment Report
☐ 3. No Treatment Recommendation

B. Type of Action

- ☒ 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: Rock Creek B. Fire Number: MT-LCF00367
C. State: Montana D. County: Lewis and Clark
E. Region: Northern (1) F. Forest: Lewis and Clark
G. District: Rocky Mountain H. Fire Incident Job Code: P1HRP6
I. Date Fire Started: 7/17/2013 J. Date Fire Contained: 9/26/2013
K. Suppression Cost: TOTAL: \$0
L. Fire Suppression Damages Repaired with Suppression Funds
 1. Fireline waterbarred (miles): Handline 0; Dozerline - 0
 2. Fireline seeded (miles): 0
 3. Other (identify): 0

M. Watershed Numbers:

HUC 6 Number	HUC6 names
100301040107	Rock Creek

N. Burned acres by Ownership

Ownership	Total Acres
Private	0
State	0
BLM	0
Forest Service	600
Other	0
Total Acres	600

O. Vegetation Types: Vegetation types within the perimeter of the Rock Creek Fire include Lodge Pole pine, Douglas fir and minor Subalpine fir and rocky scree slopes.

P. Dominant Soils: Soils form based on an integration of climate, geologic parent material, topography, living organisms, and time. Within relatively short distances, the combination of soil-forming factors can vary, resulting in soils with different physical and chemical characteristics. Soils within the Red Shale Fire perimeter are derived mainly from limestone on the ridges and ridge tops. Hillslopes are generally underlain by argillites and siltites and quartzites, drainage bottoms are mantled with colluvium and residuum deposited through glacial till. The dominant soils are classified at the family level as Typic /Lithic Cryoborolls/Cryochrepts with surface textures of cobbly/very gravelly silt loams/loams. Surface rock ranges in cover from 15 to 70 percent and in size from gravels to cobbles. Land Type Association units (LTA) and attributes used in the analysis are from the Holdorf et al, 1980 publication (Holdorf et al, 1980).

Table 1. General characteristics from the Land Type Association (LTA) unit analysis for the Rock Creek Fire

LT*	Landform	Slope Range	Parent Material	Soil Family	Soil Surface Texture
20	Forested break lands	60+	Mixed, Limestone	Typic & Andic Cryochrepts, Lithic Cryandepts	loam, silt loam
40	Peaks and alpine ridges	60+	Mixed	Lithics	stony, very gravelly loam
50	Steep slopes along drainageways	5 to 25	Mixed	Lithic Cryororthent	silty clay loam
60	Forested ridges, slopes, sparsely vegetated ridges	25 to 60	Mixed, limestone	Andic Cryochrepts	silt loams, loams
68	Benches, ridges, valley sideslopes	10 to 60	Soft sandstone/shale	Typic Cryoborolls and Cryoboralfs	loamy-skeletal loams and sandy loams

* Only LT that constituted greater than 5% of the burned area are included in this table.

Table 2. Soil erosion ratings based on Land Type Associations (LTA) units with associated acres within the fire perimeter

LT	Soil Material Erodibility	Hydrologic Soil Group	Percent of Burn Area*
20	Low	C	12.5%
40	Low	C	4.8%
50	Low	C	5.4%
60	Low	C	57.5%
68	Moderate	C	16.4%

*6 Landtype associations were omitted from the report totaling 3.4% of the burned area.

R. Miles of Stream Channels by flow regime:

FIRE	PERENNIAL	INTERMITTENT/EPHEMERAL	TOTAL
Rock Creek Fire	0	~0.84	~0.84

S. Transportation System (NFS only):

Open Road miles

	Sum of Miles
Other Public Roads	0
Roads Open to All Vehicles, Yearlong	0
Roads Open to Highway Legal Vehicles Only, Yearlong	0
State or US Highway	0
Total	0

Open Trail miles

	Sum of Miles
Trail Special Designation, Yearlong	1.1
Trails Open to Vehicles 50 inches or Less in Width, Yearlong	0
Total	1.1

Admin Use routes

	Sum of Miles
ADMIN	0
Total	0

PART III - WATERSHED CONDITION

A. Burn Severity (NFS acres ONLY):

Fire	Unclassified	Unburned	Low Severity (Forest and Non-Forest)	Moderate Severity	High Severity
Rock Creek			70	318	208

Burned NFS Acres by Vegetation Type

Vegetation Type	Fire Acres (%)		
Sparse Vegetation	16		
Grassland	11		
Shrub	<1		
Lodgepole	531		
Rock/other	41		
Total	599		

B. Water-Repellent Soil (acres): 208.

C. Soil Erosion Hazard Rating (acres)

(low) 557

(moderate) 114

(high) 1

D. Erosion Potential: 29.6 tons/acre (ERMiT results for moderate/High severity)

E. Sediment Potential: 7108 cubic yards / square mile (25% of surface erosion delivered)

PART IV - HYDROLOGIC DESIGN FACTORS

A. Estimated Vegetative Recovery Period, (years): 3-7

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

C. Equivalent Design Recurrence Interval, (years): 5

D. Design Storm Duration, (hours/minutes): 5/45

E. Design Storm Magnitude, (inches): 1.7/1.1

F. Design Flow, (cubic feet / second/ square mile): 26.5

G. Estimated Reduction in Infiltration, (percent): 56

H. Adjusted Design Flow, (cfs per square mile): 165 cfs/mi²

PART V - SUMMARY OF ANALYSIS

A Describe Critical Values/Resources and Threats:

Summary

The most recent acreage available for the Rock Creek Fire based on the latest incident report is 600 total acres within the burn perimeter. Actual burn acres based on BARC imagery is estimated at 696 acres.

The Rock Creek fire was started by lightning ignitions on July 17. The fire is located 25 miles west of Choteau, Montana entirely within the Bob Marshall Wilderness Area. The Rock Creek fire designated fire for resource benefit. The fire burned within 25 year old lodgepole pine and grassy meadows. The fire burned mainly on steep slopes and tops of peaks.

Summary of Watershed Response

The snowpack snow water equivalent (SWE) during the winter of 2012/13 was average to below average throughout the Rocky Mountain Ranger District with lower than average snow pack and without the typical June rains, resulting in dry fuel conditions. July and August, when much of the Rock Creek Fire occurred, was in a moderate to high burn condition (temperatures over 95 degrees, 20-30 mph winds, and relative humidity <10%).

Decision criteria included its location in the Bob Marshall Wilderness, limited access, safety concerns from snags, and the high expense of effective suppression. Much of it burned in a desired mosaic pattern with small pockets of high and moderate severity burn. However, there were several large areas of contiguous moderate severity with complete canopy consumption.

With the loss of ground cover from the areas with large contiguous moderate severity burning exhibited water repellent (hydrophobic) conditions as there is a risk of post-fire erosion from a short duration-high intensity rainstorm in the next several years

The data entered into the ERMiT model includes climate, soil texture, rock content of the soil profile, vegetation type (forest, range, or chaparral), hillslope gradient and horizontal length, and soil burn severity. The climatic data for the Rock Creek Fire was based on the information modified from the Gibson Dam station for elevation and precipitation to represent Spotted Bear Pass. Soil characteristics were determined from previous BAER reports completed in the area and landtype association descriptions in the Holdorf 1981 document. Slope characteristics and burn intensity were determined from GIS models and BARC Imagery. Below is a list of the input variables used for analysis:

High Intensity:

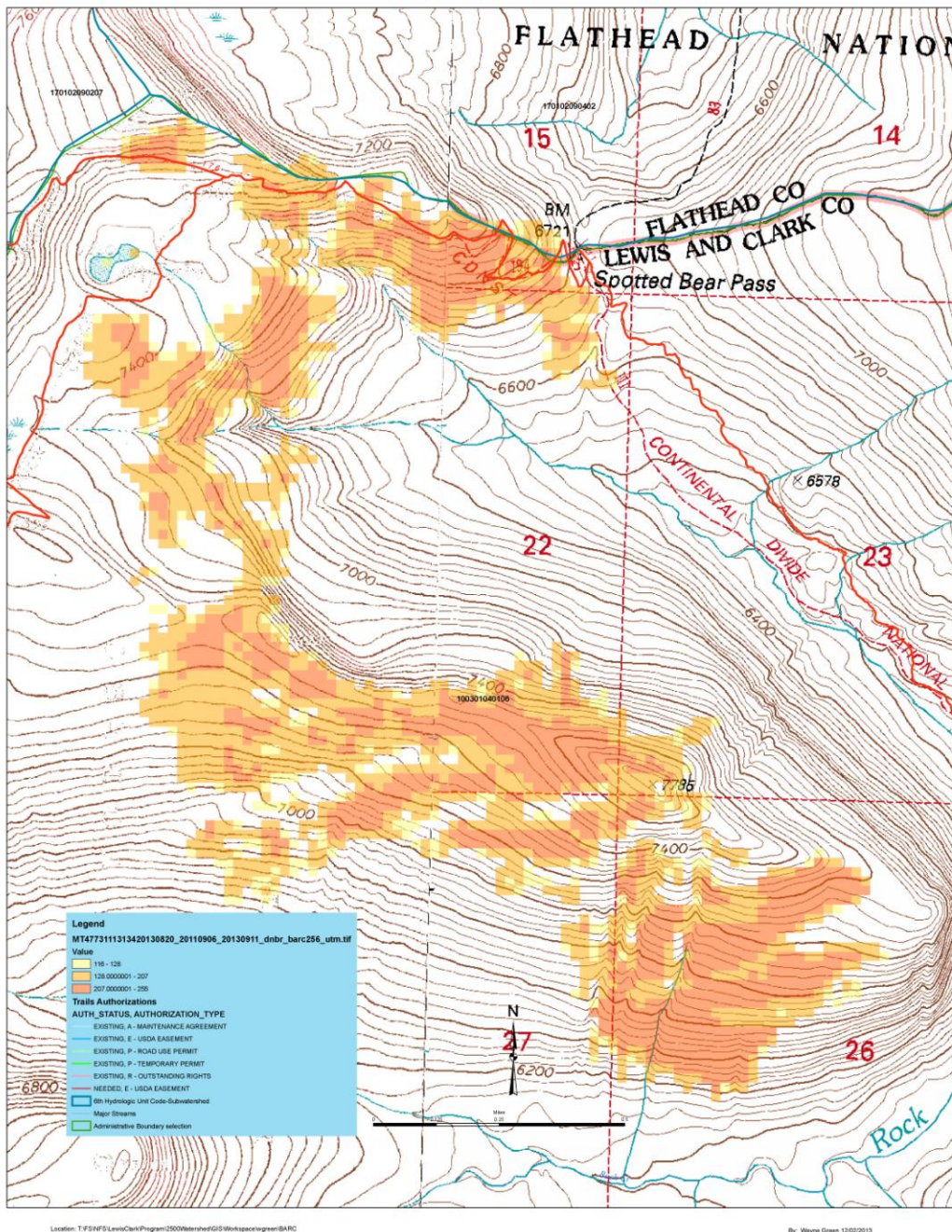
Slope Length: 1000ft
Surface Text: Silt Loam
Rock Content: 45%
Hillslope %: 10, 45, 10

Moderate Intensity:

Slope Length: 1000ft
Surface Tex: Silt Loam
Rock Content: 45%
Hillslope %: 10, 45, 10

Rock Creek Fire Burn Map

2013 Rock Creek Fire BAER
Burn Severity Map



The Rock Creek Fire burned exclusively with the Bob Marshall Wilderness area. Burn pattern was mosaic with large areas of moderate to low/non-burn throughout the interior of the fire. Low to moderate burns moist north facing slopes.

The results from the ERMiT runs were used to create erosion hazard potentials specific to the Rock Creek Fire. High erosion hazard was defined by slopes >30% that fall within high burn intensity/moderate to high burn severity areas. Low erosion hazard was defined by slopes <30% that fall within low burn intensity/low to moderate burn severity. The results of the ERMiT runs, separated by erosion hazard provide potential erosion (ton ac⁻¹) within the first two years following the fire (Table 6).

Table 6. Results of ERMiT modeling.

Burn Severity	Acres	Potential Erosion Hazard (ton/acre)	
		Year 1	Year 2
Low	70	NA	NA
Moderate	318	30.85	7.79
High	208	56.98	22.84



The Rock Creek fire. The soil burn severity in the fire perimeter was mosaic and was judged to be predominantly moderate with pockets of high severity. Steep trail segments (Trial 194) as seen in the photo within the fire perimeter within heavily burned areas comprise the majority of the Values at Risk – predominantly trail segments.



Aerial photograph illustrating the mosaic and steep nature of the Rock Creek Fire.

Values at Risk:

Risks were assigned based on Interim Directive No. **2520-2010-1**.

The BAER inter-disciplinary team identified issues that result from fire effects within the Rock Creek Fire. The primary watershed effects from the fires include a potential reduction in infiltration, due to water repellency, with the resulting increase in potential runoff. Increased runoff, especially where the vegetation and surface duff layer has been burned will result in increased potential for soil erosion and sedimentation. After examination of the fire area the BAER team, in consultation with other specialists, identified the following values at risk due either to increased runoff, increased soil erosion potential, or public safety hazards. These estimated post-fire effects and identified values at risk shaped the analysis and report:

Trails and Recreation: There are roughly 1.5 miles of trails within the fire perimeter. These trails are the only access into the area and are used by Forest personnel and the public. The trail system has been damaged by the fire and is now a hazard to travelers. The fire will likely result in trail damage through high intensity rain events and will likely result in sediment delivery to streams and waterways. Approximately 20 feet of puncheon bridges were burned in the fire. These bridges provide protection of sensitive wetlands and wet soils.

ANALYSIS METHODS:

1. The classified BARC was added to a generated slope raster classified by percent of slope in order to come up with six categories divided by percentage of slope (side slope) and burn intensity:
 - i. 0-15% Slope, Medium - High Intensity Burn
 - ii. 0-15% Slope, Low Intensity Burn
 - iii. 15-30% Slope, Medium - High Intensity Burn
 - iv. 15-30% Slope, Low Intensity Burn
 - v. >30% Slope, Medium - High Intensity Burn
 - vi. >30% Slope, Low Intensity Burn

2. This raster was converted to a polygon layer and then intersected with the Bob Marshall Wilderness Complex Trails layer, with a resulting output of “Trails within the burn, classified based on their side slope and the intensity of burn along those segments.” Miles of trail was then re-calculated on this resulting output (OUTPUT: TrailBarcSlopeIntersect). The summary is below, broken out by slope/burn intensity:

Rock Creek Slope-Intensity	Miles
0-15% Slope, Low Intensity Burn	0.03
0-15% Slope, Med - High Intensity Burn	0
15-30% Slope, Low Intensity Burn	0.04
15-30% Slope, Med - High Intensity Burn	0.15
>30% Slope, Low Intensity Burn	0.09
>30% Slope, Med - High Intensity Burn	0.8
Total Burned Miles	1.11
Total Burned Moderate and High Intensity	0.95

In some areas stabilization and drainage structures burned even in areas where low intensity fire was predominant. These structures are essential to protect trail integrity.

The attribute table was exported and brought into an Access database for querying and analysis. The following numbers were used to standardize, per mile, the general drainage system work needs based on side slope and burn intensity and their cost (Ian Bardwell, Trail Coordinator, Rocky Mountain Ranger District):

Slope-Intensity	Waterbars per mile @ \$65/per	Ditching Feet per Mile @ \$3/foot
0-15% Slope, Low Intensity Burn	5	500
0-15% Slope, Med-High Intensity Burn	10	500
15-30% Slope, Low Intensity Burn	10	300
15-30% Slope, Med - High Intensity Burn	25	300
>30% Slope, Low Intensity Burn	25	200
>30% Slope, Med - High Intensity Burn	50	200

In Access the Trail BARC Slope Intersect Table was queried together with the specific numbers and costs per structure type presented in item 3, above.

- **Trails and Heritage/Cultural Resources:** There are two previously recorded cultural sites located within the fire perimeter, Rock Creek Trail #111 and Larch Hill Trails #194/176. **Cultural stipulations will require the trails to be rehabbed to their original character and the puncheon bridges be replaced in-kind.** Two more previously recorded sites are located in close proximity of the burned area, My Lake and historic Rock Creek Guard station located downstream of the burned area. The site at My Lake (uphill from and proximate to the fire boundary) will need to be avoided by any post fire rehab activities. Rock Creek Guard Station is downstream from the burn area and may be susceptible to increased risk of erosion as a result of the fire. If increased erosion is noted at this site, the Forest Archaeologist will need to be notified.
- **Soil Productivity:** High intensity rainfall during the first two years following the fire will accelerate soil erosion. The loss of a major portion of the topsoil could significantly reduce soil productivity of those sites.
- **Water Quality:** Increased delivery of sediment and nutrient yields are anticipated from portions of watersheds that burned at moderate or greater intensity. Some populations of aquatic organisms may be impacted particularly in the North Fork Sun River and perennial tributaries from the fire.
- **Potential Loss of Native Vegetation and Ecological Integrity due to Weed Infestation and Spread:** No known populations of noxious weeds are located within the burn perimeter or the area of the fire, therefore weed spread is not anticipated as part of this burned area recovery.

Risk Matrix

In accordance with the revised Forest Service manual, the risk matrix below, Exhibit 2 of Interim Directive No.: 2520-2010-1, was used to evaluate the Risk Level for each value identified during the Rock Creek Fire BAER assessment. Only treatments that had a risk of High or above are recommended for BAER authorized treatments.

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

For the Rock Creek Fire, the risk levels by resource included Trails, soils, wetlands, and cultural resources. System trails had risk levels of very high and therefore are resources recommended for BAER funded treatments. Soils also rated very high, however wilderness designation of the location of the fire would preclude any treatment to stabilize soils.

Probability of Damage or Loss	Magnitude of Consequences		
	Major	Moderate	Minor
	RISK		
Very Likely	Very High Soil (Wetland)	High	Low
Likely	Very High Trails	High Cultural	Low

Possible	High	Intermediate	Low
Unlikely	Intermediate	Low	Very Low fisheries

Emergency Treatment Objectives:

System Trails: The trails in the fire perimeter are the only access within this area of the forest and located entirely within the Bob Marshall Wilderness Area. They are used extensively by the public for recreation and by the forest for administration. The objectives for the trails treatment will be to stabilize the system by providing drainage, wetland protection and erosion control to limit sediment delivery to waterways. Puncture bridges are located over sensitive wetland plants and soils. Some of these were damaged or destroyed during the fire. The bridges are important structures for the protection of wetlands resources including sensitive soils and plants. Also, trail crew safety during the trail treatments will need to be completed by removal of hazardous trees that present an eminent threat/hazard.

Probability of Completing Treatment Prior to Damaging Storm or Event:

Land NA % Channel NA % Roads/Trails 95 % Protection/Safety 95 %

Probability of Treatment Success

	Years after Treatment		
	1	3	5
Land (weeds)	NA	NA	NA
Land (site protection)	NA	NA	NA
Channel	NA	NA	NA
Roads/Trails	95	85	75
Protection/Safety	90	90	90

E. Cost of No-Action (Including Loss): \$2,000,000

F. Cost of Selected Alternative: \$13,043

G. Skills Represented on Burned-Area Survey Team:

<input checked="" type="checkbox"/> Hydrology	<input checked="" type="checkbox"/> Soils	<input type="checkbox"/> Geology	<input type="checkbox"/> Range
<input type="checkbox"/> Forestry	<input type="checkbox"/> Wildlife	<input type="checkbox"/> Fire Mgmt.	<input checked="" type="checkbox"/> Engineering
<input type="checkbox"/> Contracting	<input type="checkbox"/> Ecology	<input type="checkbox"/> Botany	<input checked="" type="checkbox"/> Archaeology
<input type="checkbox"/> Fisheries	<input type="checkbox"/> Research	<input type="checkbox"/> Landscape Arch	<input checked="" type="checkbox"/> GIS

Team Leader Wayne Green

Email: wgreen@fs.fed.us Phone: 406-791-7740

Core Team Members:

- Beth Anderson – Soil Scientist
- Wayne Green – Hydrologist/Geologist
- Ian Bardwell – Engineering/Trails
- Kelsey McCartney – GIS/Archaeology Specialist
- Tessa Donahue – Values at Risk
- Mark Bodily – Heritage
- Jason Oltrogee - Weeds

H. Treatment Narrative:

Land Treatments:

Weed Treatments: Monitor of known invasive weed sites will continue with forest accounts.

Trail and Cultural Treatments:

Trail stabilization work is proposed for trails #176 and #194 to protect 0.95 miles of trails. Both trails were previously recorded as historic linear sites, no additional mitigation will be required. **However, cultural stipulations will require the trails to be rehabbed to their original character and the puncheon bridges be replaced in-kind.**

This work is from 10 to 16 trail miles into the Bob Marshall Wilderness, all supplies will be carried on foot or on pack animals and BAER crews will camp near work areas. Though needed stabilization work will be relatively expensive due to logistics, failure to complete this work will result of loss of the infrastructure and far greater future costs. Within the fire perimeter, approximately 0.95 miles of NFS system trails have been burned over with a moderate to high intensity wildfire. The trails system is the only transportation system within this area of the Bob Marshall Wilderness area of the Rocky Mountain Ranger District. The trail system provides access for year around recreation opportunities, hunting opportunities, fire suppression, wildlife surveys, and are considered culturally significant sites.

Excessive surface flows down the routes located on steep slopes are likely and will likely result in significant surface erosion and failure in localized areas. Stabilization of trails #176 and #194 is necessary to protect them from further impacts from post fire runoff and debris torrents. Travel during wet periods is a significant safety issue due to the slippery nature of the soil. Without the treatments, overland flow, and soil erosion will damage both the trail as well as transfer additional sediment load into the aquatic system. It is likely that many of the routes will become impassible within the next year without treatment.

The treatment is to stabilize 0.95 miles of trails in order to minimize erosion and stream sedimentation from post-fire runoff and protect the trails as a historic heritage resource. Protection for crews trail work is facilitated by removing hazard trees that threaten the worksites of the crews. Long sections of the travel routes pass through riparian areas that are wet for most of the year and will require the reconstruction of puncheon bridges through these sensitive areas. Treatment also includes reconstruction of 20 feet of Puncheon Bridge to protect riparian wetland and soil resources.

METHODS: Use a mix of waterbar installation, ditching, out-sloping, and puncheon bridge reconstruction to direct water off the trail as quickly as possible while maintaining the overall trail integrity, in order protect wetland areas and prevent sediment from entering streams by minimizing trail erosion that is likely to occur due to fire effects. Work will be in accordance with EM-7720-102, Forest Service Standard Specifications for Construction of Trails and conform to wilderness standards based on a minimum tools analysis.

GIVENS: The impacted trails are all in the Bob Marshall Wilderness. They are designed and maintained as pack and saddle trails.

ASSUMPTIONS: Because of the nature of the terrain in the fire area and the pattern of burn along the trails, proposed treatment of the burned miles of trail should, in the majority of cases, be adequate to mitigate the impacts of any future runoff event causing sediment delivery into streams, soil stabilization of wet areas, and to protect the character and potential site eligibility of the historic Forest Service Trails system. Analysis of the fire-effected trails, therefore, will be limited to those areas actually burned, as shown on the BARC (as opposed to within the greater area of the fire perimeter). Note: There may be cases where some drainage work is needed outside the actual burn area to prevent increased sedimentation, such as areas where a steep segment of trail may itself be unburned but the slope above it is burned, but in general a visual overview of the burned area data did not reveal this to be a common occurrence, and therefore the analysis was run on only those mile of trail actually burned.

Approximately 20 feet of Puncheon Bridge were burned. These trail segments occur across wet soils and wetland areas. The bridges protect soils and wetland resources from impacts from users (i.e. hikers and horse traffic) and also Forest Service personal. A large fire event such as the Rock Creek fire makes the trails system susceptible to washouts, gullying, and rilling during the upcoming fall and spring runoff events. The increased erosion associated with the fire event will increase the risk to ecological health, stream sedimentation, and public safety within the fire area.

Trail treatments by method include:


Treatment type	Explanation: Provide explanation and rationale for each treatment
Safety:	Selective hazard tree removal where trail crew doing stabilization are at risk.
Trail Work:	
Puncheon Bridges	Rebuild to provide safe travel, protect soils, wetlands, and reduce erosion. The treatment will preserves the historic trails.
Trail	Stabilize trail through removal of berms and increase/improve drainage.
Weeds Treatment:	No treatment proposed.
Cultural Resources:	
Cultural Resource Monitoring	No monitoring or oversight needed.

I. Monitoring Narrative: Treatments and fire recovery will be completed during the 2014 summer field season and monitored for three consecutive years starting in the spring of 2015. Treatments will be surveyed for effectiveness of stability, erosion control and safety. The fire will be monitored for vegetation recovery.

Part VI (A) – Emergency Stabilization Treatments and Source of Funds Lewis and Clark National Forest.
(see below)

Part VI – Emergency Stabilization Treatments and Source of Funds

Interim #

	NFS Lands		Other Lands	All
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		Unit	# of		Other		# of	Fed	# of	Non Fed	Total
Line Items	Units	Cost	Units	BAER \$	\$		units	\$	Units	\$	\$
A. Land Treatments											
<i>Subtotal Land Treatments</i>				\$0	\$0			\$0		\$0	\$0
B. Channel Treatments											
<i>Subtotal Channel Treat.</i>				\$0	\$0			\$0		\$0	\$0
C. Road and Trails*											
Puncheon Bridges	Foot	100	20	\$2,000	\$0			\$0		\$0	\$2,000
Trail work\Water Bars	Foot	65	44	\$2,844	\$0			\$0		\$0	\$2,844
Trail work\Outslope	Foot	2.5	1426	\$3,564	\$0			\$0		\$0	\$3,564
Trail Work\Ditching	Foot	3	205	\$615	\$0			\$0		\$0	\$615
Heritage Oversight	Day	0	0	\$0	\$0			\$0		\$0	\$0
<i>Subtotal Road & Trails</i>				\$9,023	\$0			\$0		\$0	\$9,023
D. Protection/Safety											
Select haz tree removal**	Miles	1,020	1	\$1,020	\$0			\$0		\$0	\$1,020
				\$0	\$0			\$0		\$0	\$0
<i>Subtotal Structures</i>				\$1,020	\$0			\$0		\$0	\$1,020
E. BAER Evaluation											
<i>Subtotal Evaluation</i>				---	\$0			\$0		\$0	\$0
F. Monitoring											
Treatment and recovery		1000	3	\$3,000	\$0			\$0		\$0	\$3,000
<i>Subtotal Monitoring</i>				\$3,000	\$0			\$0		\$0	\$3,000
G. Totals				\$13,043	\$0			\$0		\$0	\$13,043
Previously approved			0								
Total for this request				\$13,043							

*This work is from 10 to 16 trail miles into the Bob Marshal Wilderness, all supplies will be carried on foot or on pack animals and BAER crews will camp near work areas.

**This is a rough estimate and interim request will be made if additional funds are required to protect employee safety.

PART VII - APPROVALS

1. /s/ Robin Strath DFS for William Avey May 14, 2014
Forest Supervisor (signature) Date

2. _____ Date
Regional Forester (signature)