

Date of Report and Type: 11/2/2017; Initial**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(s):** West Fork**B. Fire Number:** MT-KNF-000222**C. State:** Montana**D. County:** Lincoln**E. Region:** 01-Northern**F. Forest:** 01-14 Kootenai**G. District(s):** Libby**H. Fire Incident Job Code:** P1LBH6 (0114)**I. Date Fire(s) Started:** August 30, 2017**J. Date Fire Contained:** 10/1/2017 (estimated)**K. Suppression Cost:** \$7,500,000**L. Fire Suppression Damages Repaired with Suppression Funds (estimated):**

1. **Machine Fireline repaired (miles):** 10.4
2. **Other (Identify):** 40 miles of road; six acres of drop points, parking areas, and safety zones; and less than one acre of hand fireline.

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

HUC #	Watershed Name	Total Acres	Acres Burned	% of Watershed Burned
170101011402	Upper Pipe Creek	34,896.7	5,260.7	15%
170101011503	Bobtail Creek	13,982.2	8,796.6	63%
170101011504	Quartz Creek	22,937.5	5,986.9	26%
170101011505	Cedar Creek-Kootenai River	32,586.2	38.8	< 1%

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

OWNERSHIP	ACRES
NFS	16,584.4
OTHER FEDERAL	0
STATE	0
PRIVATE	3,487.7
TOTAL	20,072.1

- O. Vegetation Types:** The dominant vegetation types within the fire area are mixed conifer forests (Douglas fir and western larch) interspersed with minor inclusions of deciduous trees, shrublands, and grasslands.

P. Dominant Soils:

Soils within the West Fork burn perimeter are almost entirely silt loam Inceptisols derived from metasedimentary glacial till overlain by volcanic ash. Small components of Entisols derived from alluvial deposits, mid-slope forested Alfisols, and rock outcrop and talus slopes also exist. Over all, sixteen land types occur within the burned perimeter. Of these, over half (57%) have soil erosion hazard ratings of severe or very severe due to fine textures; moderate to steep slopes; and deep, gravelly, poorly-consolidated surface horizons. Variable till densities at times create hydrologic discontinuities which contribute to slope instability, especially along road cutslopes.

Q. Geologic Types:

The West Fork Fire occurs in the southernmost extent of the Purcell mountain range and is dominated by Belt Supergroup metasedimentary rocks overlain by Mount Mazama volcanic ash loess. Glacial till deposits, alluvial fans, and colluvium derived from metasedimentary siltite, quartzite, and argillite are the dominant parent materials. Landforms are dominantly glaciated, moderately steep mountain slopes and ridges interspersed with moraines and glacial outwash terraces.

R. Miles of Stream Channels by Order or Class:*Table 3: Miles of Stream Channels by Order or Class*

STREAM TYPE	MILES OF STREAM*
PERENNIAL	15.1
INTERMITTENT	44.1
EPHEMERAL	0
OTHER (DEFINE)	0

*miles calculated from National Hydrologic Dataset have not been field verified

S. Transportation System:

Trails: National Forest (miles): 11.5	Other (miles): 0
Winter Trails: National Forest (miles): 5.9	Other (miles): 0
Roads: National Forest (miles): 71.6	Other (miles): 39.8

PART III - WATERSHED CONDITION**A. Burn Severity (acres):***Table 4: Burn Severity Acres by Ownership*

Soil Burn Severity	NFS	Other Federal (List Agency)	State	Private	Total	% within Fire Perimeter
Low	7,683.3	0	0	1,196.2	8,879.5	44%
Moderate	3,579.4	0	0	1,077.5	4,656.9	23%
High	1,526.8	0	0	177.0	1,703.8	9%
Unburned	3,794.8	0	0	1,037.1	4,831.9	24%
No Data*	-	0	0	-	-	-
Total**	16,584.	0	0	3,487.7	20,072.1	

*Unverified BARC imagery contained 6,766 acres of no data values due to known sensor failure issues with Landsat 7. These no data areas were re-assigned amongst the four burn severity classes using a weighted average of the known values for the remainder of the fire area.

**Totals may not be precise due to rounding.

B. Water-Repellent Soil (acres): 3,572**C. Soil Erosion Hazard Ratings:***Table 5: Soil Erosion Hazard Ratings*

Soil Erosion Hazard	Acres	% Within Fire Perimeter
Slight	376.2	1.9%
Moderate	7861.5	39.2%
Severe	7596.1	37.8%
Very Severe	3888.9	19.4%
Not Rated	349.4	1.7%
Total	20072.1	1.9%

D. Erosion Potential (tons/acre):

0.35 tons/acre (Min = 0, Max = 9.98)

E. Sediment Potential (yards³/miles²):

165.93 yards³/miles²

PART IV – HYDROLOGIC DESIGN FACTORS

A. Estimated Vegetative Recovery Period (years): 1-3 years grass (achieve % effective ground cover), 2-5 years shrubs, 20-50 years conifers

B. Design Chance of Success (percent): 50-90%, depending on site and treatment

C. Equivalent Design Recurrence Interval (years): 100-year post-fire

D. Design Storm Duration (hours): 6-hour

E. Design Storm Magnitude (inches): 2.1 inches

F. Design Flow (cfs/mile²): 41 cfs/mi² averaged for catchments

G. Estimated Reduction in Infiltration (percent): 18% reduction

H. Adjusted Design Flow (cfs/mile²): 182 cfs/mi² averaged for catchments

PART V - SUMMARY OF ANALYSIS

Introduction/Background:

The 20,072 acre West Fork Fire was estimated to be contained on October 1, 2017. This lightning caused-fire is located seven miles northwest of Libby, Montana. Approximately 32% of the area within the fire perimeter burned at moderate and high soil burn severities.

The primary values at risk from post-fire effects due to the West Fork fire are: human life and safety, transportation infrastructure (roads and trails), bull trout habitat, and native vegetation communities. The primary threats caused by the fire include increased runoff, which is expected to intensify the first 2-3 years following the fire until the burned watersheds recover and accelerated hillslope erosion as a result of amplified runoff and decreased infiltration rates. However the precipitation regime for the fire areas will help mitigate the post-fire erosion with most of the annual precipitation falling as snow at high elevations with rain at lower elevations with few rain-on-snow event to influence spring melt and runoff dynamics. Additional threats originating from the destabilized hillslopes throughout the burned area include falling trees and rolling rocks.

A. Critical Values/Resources and Threats:

A comprehensive list of potential values at risk within or directly downstream of the Gibraltar Ridge and Caribou fires was compiled through consultation with local management and resource specialists and through BAER team field reconnaissance. Following guidance in interim directive 2520-2017-1, the BAER assessment team evaluated a list of values through field assessment and subsequent analysis to identify the critical values that may be treated under the BAER program. These critical values were then assigned a level of risk defined by the probability of damage or loss and the magnitude of consequences (Table 11). Presence of critical values with unacceptable risks signify a burned-area emergency exists. The characterization of the probability of damage or loss is based on the watershed response analysis completed during the BAER assessment. Critical values having a *Very High* or *High* risk rating are addressed through emergency stabilization actions known to effectively mitigate potential threats or minimize expected damage as described below. *Intermediate* risk areas are typically addressed through coordination with local, state, and other federal cooperators. Additionally, critical warning signs may be recommended in some areas with an *Intermediate* risk. No treatments are identified for values rated *Low* and *Very Low*.

Table 6: Critical Value Risk 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):

- a. **Very High** risk to **human life and safety** of recreationists and forest employees on the Quartz Creek road (NFSR 600) due to an increased threat of flooding, debris flows, hazard trees, and rockfalls. Treatment recommendation is installation of warning signs at major access points to the fire area and storm patrolling. Probability of damage or loss is likely, magnitude of consequences is major. (*Treatments: S01 and S02*)
- b. **High** risk to **human life and safety** of travelers along routes within and downslope from hillslopes burned at a moderate to high severity due to an increased threat of flooding, debris flows, hazard trees, and rockfalls. The highest identified risks are on NFS roads 4614, 6146, and 6407. Treatment recommendation is installation of warning signs at major access points to the fire area and maintenance of road closures along tributary spur roads. Probability of damage or loss is likely, magnitude of consequences is moderate. (*Treatment: S01*)
- c. **High** risk to **human life and safety** of travelers along trail routes within and downslope from hillslopes burned at a moderate to high severity due to an increased threat of flooding, debris flows, hazard trees, and rockfalls. The highest identified risks are along the Bobtail (#47), Bobtail Ridge (#375), Lindy Peak Spur (#375A), and Mount Tom (#406) trails.

Treatment recommendation is installation of warning signs at major access points to the fire area. Probability of damage or loss is possible, magnitude of consequences is major. (Treatment: S02)

- d. **High risk to human life and safety** of FS and contracted personnel implementing BAER treatments associated with emergency road treatments. Treatment recommendation is falling of hazard trees where work is being conducted. Probability of damage or loss is possible, magnitude of consequences is major. (Treatment: R01 and S02)
- e. **High risk to human life and safety** of FS and contracted personnel implementing BAER treatments associated with trail stabilization treatments. Treatment recommendation is falling of hazard trees where trail stabilization work is being conducted. Probability of damage or loss is possible, magnitude of consequences is major. (Treatment: T01)

3. Property (P):

- a. **High risk to FS property** from increased flows and slope destabilization. Undersized culverts on NFS collector roads within the fire area are likely to plug and severely damage road infrastructure with loss of NFS investment. Treatment recommendation is storm inspection. Probability of damage or loss is possible, magnitude of consequences is major. (Treatment: R01)
- b. **High risk to FS property** along the Bobtail (#47), Bobtail Ridge (#375), Lindy Peak Spur (#375A), and Mount Tom (#406) trails proximal to areas burned at a moderate to high severity due to an increased threat of erosion of trail tread. Treatments recommendation is trail stabilization. Probability of damage or loss is possible, magnitude of consequences is major. (Treatment: T01)

4. Natural Resources (NR):

- a. **High risk** for accelerated hillslope erosion and increased overland flows which may impact short-term **hydrologic function**. Emergency response is captured through road and trail treatments. Probability of damage or loss is likely, magnitude of consequences is moderate. (Treatments: R01, R02, and T01)
- b. **High risk** to native plant communities due to the threat from the spread of noxious weeds and invasive plant species. Known noxious weed and invasive plant populations (rush skeletonweed and blue weed) exist within and immediately adjacent to high and moderate soil burn areas. Other important noxious weed species include spotted knapweed and meadow hawkweed. Probability of damage or loss is likely, magnitude of consequences is moderate. (Treatment: L01)
- c. **Intermediate risk** of loss of **bull trout critical habitat** in Quartz Creek. The main threat to bull trout habitat or populations is from debris flows and eroded sediment delivery, but would result in recoverable and localized impacts. Probability of damage or loss is possible, magnitude of consequences is moderate. No treatment is recommended.
- d. **Low risk** of loss of **bull trout critical habitat** in the Kootenai River. While elevated erosion and sediment delivery is predicted in Bobtail drainage (which is not critical habitat), the likelihood of this sediment impacting bull trout habitat in the Kootenai river is low due to several miles of downstream unburned area which would likely retain and filter some of this sediment. Probability of damage or loss is possible, magnitude of consequences is minor. No treatment is recommended.
- e. **Low risk to soil productivity** across the entire burned area, with localized areas of **Intermediate risk** within the Bobtail drainage. Results from the erosion and sedimentation models indicate low levels of soil erosion and sedimentation and low magnitude of consequences. The mosaic nature of the fire and naturally occurring slope breaks will reduce the amount of soil transported out of the burn area, except in the Bobtail headwaters where moderate and high burn severity occurs near streambanks. The fire is expected to impact soil quality by eroding exposed soil and nutrient-rich ash off-site, as well as by increasing the potential for spread of noxious weeds and invasive plant species. Probability of damage or loss is unlikely, magnitude of consequences is minor. No treatment is recommended.

4. Cultural and Heritage Resources:

- a. **Very Low** risk to an historic lookout site. The tree in which the lookout is situated was undamaged by the fire and damage to the site due to post-fire conditions is unlikely and minor if it occurred. Probability of damage or loss is unlikely, magnitude of consequences is minor. No treatment is recommended.

Emergency Treatment Objectives: Mitigate and protect, to the extent possible, threats to personal injury or human life of forest visitors and Forest Service employees by raising awareness through posting hazard warning signs on roads, improving stream crossings, and communicating the hazards of flooding, debris flows, and rock fall. Provide safe access to the burned area for personnel implementing authorized BAER response actions and communicate threats to cooperating agencies and community groups. Consider temporary closures to protect public users of NFS lands and recreation facilities.

Protect or minimize damage to NFS investments in roads infrastructure by installing drainage features capable of withstanding potential increased stream flows, debris flows, and slope failure. Minimize damage to key NFS travel routes.

Protect or mitigate potential post-fire impacts to critical natural resources within the burned area including soil productivity and hydrologic function on NFS lands, and critical habitat for bull trout. Implement treatments that minimize threats to naturalized ecosystems by minimizing the potential for expansion of non-native invasive species (NNIS) into the burned area; minimize expected invasion of NNIS within and adjacent to the area where soils and vegetation was disturbed as a result of fire suppression activities.

Evaluate authorized BAER weed treatments and existing infrastructure to determine effectiveness in post-fire flow conditions.

Assist cooperators, and other local, State, and Federal agencies with the interpretation of the assessment findings to identify and address potential post-fire impacts to communities and residences, domestic water supplies, public utilities (including power lines, roads, and other infrastructure).

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

Land 70%
Roads/Trails 70%

Channel N/A
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%	80%	90%
Channel	N/A	N/A	N/A
Roads/Trails	70%	80%	90%
Protection/Safety	90%	90%	90%

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

Choosing to implement a No Action treatment of natural forest recovery comes with associated costs to forest infrastructure and the natural resources and their functions within the West Fork fire area. Road reconstruction following failure of culverts and drainage features costs approximately \$40,000 per mile while trail reconstruction is variable, but costs roughly \$12,500 per mile.

In the West Fork fire area, road failure is possible to likely on 14 miles. There are 10.3 miles of trail at risk from accelerated post-fire erosion. If one assumes 50% loss of structures/road/trail drainage within these areas, replacement costs would be roughly \$344,000. This value represents replacement costs only and does not account for damage/loss to ecosystem, economic and social values, which would substantially

exceed this number. Ecosystem functions within the fire areas include bull trout critical habitat, native plant communities, and soil and hydrologic function, which do not have a clear replacement cost.

F. Cost of Selected Alternative (Including Loss): \$139,839

G. Skills Represented on Burned-Area Survey Team:

<input checked="" type="checkbox"/> Archaeology	<input type="checkbox"/> Botany	<input type="checkbox"/> Ecology	<input type="checkbox"/> Economist	<input type="checkbox"/> Engineering
<input checked="" type="checkbox"/> Fisheries	<input type="checkbox"/> Forestry	<input checked="" type="checkbox"/> GIS	<input checked="" type="checkbox"/> Hydrology	<input type="checkbox"/> Range
<input checked="" type="checkbox"/> Recreation	<input checked="" type="checkbox"/> Soils	<input checked="" type="checkbox"/> Team Lead	<input checked="" type="checkbox"/> Weeds	<input type="checkbox"/> Wildlife

Team Leader:

Email: dmilner@fs.fed.us **Phone:** 406-758-5340 **FAX:** 406-758-3537

Forest BAER Coordinator:

Email: John Carlson **Phone:** 406-283-7634

Core Team Members:

Table 8: BAER Team Members by Skill

Skill	Team Member Name
Team Lead(s)	Derek Milner
Archaeology	Steve Armstrong
Engineering	Don Hammack
Fisheries	Tim Price
GIS	Jed Gregory
Hydrology	Becca Lloyd
Recreation	Daniel Ward
Soils	Megan McGinnis
Soils	Jori Johnson
Weeds	Perry Stebbins

H. Treatment Narrative:

Land Treatments:

L01: Early detection and Rapid Response

The emergency response strategy in the West Fork Fire area will include detection of rush skeletonweed and blueweed in high and moderate burned areas where these weeds could have spread. Treatment will include spot-spraying and broadcast-spraying of any new detections of these high priority invasive plants with aminopyralid. New detections of lower-priority noxious weeds, spotted knapweed and meadow hawkweed, will also be treated if found where risk of invasion into bared soil areas within the fire perimeter. The work will complement ongoing forest and county noxious weed treatment. Initial noxious weed treatment was performed on fire line and forest roads used by suppression as outlined in the West Fork suppression damage repair plan.

Table 9: Weeds EDRR Treatment Types Summary

TREATMENT DESCRIPTION	TARGET WEED SPECIES	PRESCRIPTION	ESTIMATED ACRES	COST PER ACRE	COST	TIMING
L01 – HIGH RISK SPREAD ONTO SITES WITHIN NATURAL COMMUNITIES	Rush skeletonweed and blueweed	Aminopyralid + Surfactant	20	\$175	\$3,500	Spring – Fall 2018

Channel Treatments: No channel treatments are proposed.

Roads and Trail Treatments:

T01: Trail stabilization

Many of the trails in the burned area are at *High* risk as current trail drainage features are not adequate to address the anticipated increased runoff. Trail stabilization treatments are needed to sustain the trails and to prevent off-site erosion.

The West Fork fire directly impacted 8.7 miles of National Forest System Trails on four NFS trails. The trail grades within the area vary from five to 20% and have side slopes of up to 70%. Trail tread in this area is commonly constructed from soils composed of glacial, metasedimentary, and volcanic ash parent material. Erosion potential on these trails becomes severe when coupled with the effects of wildland fire, putting these trails at *High* risk from impacts to Forest Service property and failure of hydrologic function. The four trails impacted and proposed for treatment are summarized below. Field reconnaissance of the West Fork fire showed that the trail system treatments would predominantly require trail stabilization (e.g. installing grade dips and erosion control structures).

Trail features will be constructed to standard as defined by USFS Trails Handbook 2309.18. Installation should be designed to last no more than 3 years. Permanent structures are not part of this treatment. If safety risks (e.g. hazard trees) cannot be mitigated for work crews, work will be delayed until threat is reduced or stabilized. Installed drainage features will vary depending on steepness of trail in areas proximate to moderate or high soil burn severity. Hazards within or along the trail route that restrict efficient and safe access to work sites will be mitigated (e.g. rocks and hazard trees).

Table 10: Miles of NF System Trails Impacted

TRAIL NAME	TRAIL NUMBER	MILES
BOBTAIL	47	2.3
BOBTAIL RIDGE	375	4.2
LINDY PEAK SPUR	375A	0.3
MOUNT TOM	406	3.5

Table 11 –Trail Treatment Types Summary

TREATMENT	UNIT	UNIT COST	# OF UNIT	TOTAL COST
TRAIL STABILIZATION	Miles	\$2,036	8.7	\$17,713
HAZARD TREE REMOVAL	Each	\$48	122	\$5,586
TOTAL				\$23,299

R01: Road Drainage Maintenance

In areas with high and moderate burn severity, runoff from burned hillslopes will increase the amount of water and debris in drainage structures. The roads identified for treatment were found to have issues with their drainage system due to the expected increase in post-fire watershed response to precipitation events. Road systems are necessary for administrative use, recreation, and other uses and represent a significant financial investment. Implementation of the treatments protects those investments and provides continued access for a variety of uses. The potential monetary cost to repair roads that would be damaged by post fire flows if left untreated significantly exceeds the cost of the treatments.

Treatments are proposed on the open National Forest roads within and directly below areas of moderate to high burn severity. The minimal treatments required to remedy these issues are:

Drain Dips (with or without armor) – Roadway dips modify the road drainage by altering the template and allowing surface flows to run off the road to prevent any excessive erosion of the surface. The armor consisting of rip rap is placed where runoff could possibly cause erosion to the road surface and fillslope.

Culvert Installation – New culverts will be installed in ditch lines on insloped roads that have insufficient relief culverts to prevent scouring of the ditch bottoms and resultant sediment delivery to streams during post fire runoff events. Catchment basins will be constructed as necessary, and culvert inlets/outlets will be armored in areas to prevent erosion. Road surface and approaches will be armored with aggregate to prevent erosion due to runoff or overtopping.

Culvert Cleaning – Culvert cleaning includes the cleanout of catchment basins, inlets and outlets. The cleanout of catchment-basins below the inlet of the culvert is done to capture the sediment transported from the channel or ditch. Capturing the sediment will help in preventing the culvert inlet from being partially plugged or completely buried. Culvert outlet cleanout is done to remove any material that would impede the flow of water through the outlet of the culvert.

Replacing Damaged Culvert Sections – Culverts with damaged inlets will not function well enough to pass increased run-off and debris caused by post-fire conditions. By cutting off damaged sections of pipe and banding on new sections the hydraulic function of the pipes will be restored and the risk of plugging or overtopping is greatly reduced.

Ditch Cleaning – The cleanout of drainage ditches is required to remove any debris that may deflect the flow out of the ditch and also to ensure the flow reaches the outflow structure.

Road Template Reshaping – Road surfaces that channel water down the roadway need to be reshaped to shed the increased flows quickly before additional road surface erosion occurs. This will be accomplished by a combination of insloping and removal of berm where water will drain off the road surface.

Hazard Tree Removal – Hazard tree removal includes the removal of any hazard trees in the immediate vicinity of specific work area in which workers are stationary for a period of time (i.e. culvert installation)

Location/Suitable Sites: Refer to BAER Treatment Map.

Design/Construction Specifications:

Drain Dips (with or without armor) – Construct rolling dips per Forest Service standards. Place rip rap across the roadway and on the fill slopes where potential runoff can occur if flow was to overtop the roadway from a plugged culvert or excessive runoff.

Culvert Installation – Install culverts in locations as directed by the Engineer. Culverts shall have sufficient slope to allow water to flow while keeping the velocities to a minimum. Catchment-basins shall be constructed as necessary at the inlets, and armored with riprap to prevent erosion of slopes. Roadway over the new culvert and on the approaches shall be armored with 4" lift of aggregate.

Culvert Cleaning – Remove any blockages from inlet, outlet and inside barrel. Straighten bent inlets. Catchment-basins shall have all existing silt and debris removed and either hauled away or spread out such that the material cannot reenter the drainage structure during a runoff event.

Replacing Damaged Culvert Sections – Cut pipe immediately beyond the damaged section and band on new pipe using either standard or dimple bands. Backfill and compact according to Forest Service specifications.

Ditch Cleaning – All drain ditches along the length of the roads shall have all existing silt and debris removed and either hauled away or spread out such that the material cannot reenter the drainage structure during a runoff event.

Corrugated Inlet Guard – Installation shall be completed in a manner that allows catchment basin to be cleaned by backhoe.

Template Reshape - Reshape the road surface to provide positive drainage to ditches and culverts. Remove berm where water will flow off roadbed, repair large ruts in the middle of the roadbed that channel water downgrade. Inslope and Outslope roadbed to provide drainage of surface water as directed by the Engineer.

Hazard trees shall be removed as directed by the Engineer, as to create a safe work environment at each work site.

R02: Engineering Support for Stream Crossing Review

During the rapid assessment time frame, an engineer was not available. Final structure and treatment recommendations have not yet been completed; further site review is necessary in order to complete structure design. Two weeks of engineering time is requested to complete final structure recommendations, finalize cost estimates, and coordinate installation with implementation crews.

Any proposed treatments at culverts determined to be undersized for the post-fire design storm (5-year) will be determined based on values at risk from failure of the culvert. Highest priority is given to those arterial roads on open maintenance level 2 and 3 roads. No treatment is authorized for maintenance level 1 roads due to the need to emphasize BAER treatment on arterial roads.

Table 12 - Road Treatment Types Summary – West Fork

TREATMENT	UNIT	UNIT COST	# OF UNIT	TOTAL COST
R01 ROAD DRAINAGE MAINTENANCE	Mile	\$4,400	14	\$61,600
HAZARD TREE REMOVAL	Mile	\$650	3	\$1,950
CONTRACT DESIGN AND ADMINISTRATION	Lump	\$10,500	1	\$10,500
R02 ENGINEERING SUPPORT FOR CULVERTS	Day	\$600	14	\$8,400
TOTAL				\$82,450

Protection/Safety Treatments:

S01: Road and Trail Hazard Warning Signs

Working, traveling, and recreating in burned areas poses an elevated risk to Human Life and Safety. The purpose of this treatment is to acknowledge and alert forest employees and visitors to the existing threats associated with traveling routes (roads and trails) within and downstream of burned areas.

“Entering Burned Area” signs are needed to alert the public to possible threats to life and safety. These signs should contain language addressing risks that warrant heightened awareness such as falling trees, rolling rocks, and flash floods.

These warning signs should be posted in site-specific locations to alert travelers to upcoming dangers such as falling rocks, hazard trees, etc. These signs will be located in strategic intersections to inform the traveler of their current location on the Forest Visitor Map and Motor Use Vehicle Map (MVUM). In most cases, these areas are located adjacent to the fire perimeter.

Detailed warning sign treatment costs can be found in the project record, specification sheets S01 Road Warning Signs and S02 Trail Warning Signs:

Table 13: Protection/Safety Treatment Type Summary

TREATMENT	UNIT	UNIT COST	# OF UNIT	TOTAL COST
ROAD HAZARD WARNING SIGNS	Each	\$350	10	\$3,500
TRAIL HAZARD WARNING SIGNS	Each	\$626	5	\$3,130
TOTAL				\$6,630

S02: Storm Inspection and Response

There is an immediate and future threat to travelers along these roads within the burned area due to the increased potential for rolling and falling rock from burned slopes and increased potential for falling trees, flash floods and mudflows. The post-fire flooding will threaten to interrupt access to visitors, local residents, and Forest Service personnel who are implementing treatments. With the loss of vegetation, normal storm frequencies and magnitudes can more easily initiate rill and gully erosion on the slopes and it is likely that this runoff will cover the roads or cause washouts. These events make for hazardous access along steep slopes and put the safety of Forest visitors and administrative personnel at risk.

The purpose of the monitoring is to evaluate the condition of routes for motorized access and to identify and implement additional work needed to maintain and/or repair damage to road surfaces and flow conveyance structures (culverts) across roads in order to provide safe access across FS lands. The patrols are used to identify those road problems such as plugged culverts and washed out roads and to clear, clean, and/or block those roads that have received damage.

Engineering and District personnel will survey the roads within the fire perimeter after spring snow-melt and high-intensity summer thunderstorms. Survey will inspect road surface condition, ditch erosion, and culverts/inlet basins for capacity to accommodate runoff flows. Early detection of damaging events reduces monetary loss and the threat to human life and safety. The cost of the treatment is reasonable considering that an average mile of road construction costs \$40,000 (14 miles in fire perimeter). In addition, the protection of human life is a critical value and the loss of even one life and/or injury is far more than the cost of the treatment.

Location/Suitable Sites: Treatment will focus on arterial and collector roads within the fire perimeter.

Design/Construction Specifications: FS personnel will direct the work.

Immediately upon receiving heavy rain and during significant spring snowmelt the FS will send out patrols to identify road hazard conditions – obstructions such as rocks, sediment, washouts, and plugged culverts, so the problems can be corrected before they worsen or jeopardize forest road users. The storm patrollers shall have access to at least a backhoe and dump truck that can be used when a drainage culvert is plugged or soon to be plugged, and to repair roads which are exhibiting severe surface erosion. All excess material and debris removed from the drainage system shall be placed outside of the bank-full stream channel where it cannot re-enter the stream.

Table 14: S02-Storm Inspections and Response Cost Estimate

TREATMENT	UNIT	UNIT COST	# OF UNIT	TOTAL COST
STORM INSPECTION	Day	\$1,650	12	\$19,800

BAER Evaluation:

Interagency Coordination and Consultation: BAER Implementation requires consultation with cooperating agencies including the State of Montana (Fish, Wildlife, and Parks), National Fish and Wildlife Service, as well as county and city agencies on resource issues regarding the proposed BAER treatments. Two days (each) are proposed for a GS-11 hydrologist and a GS-11 fish biologist.

Table 15: Coordination and Consultation Summary


TREATMENT	UNIT	UNIT COST	# OF UNIT	TOTAL COST
E01 – COORDINATION AND CONSULTATION	Each	\$390	4	\$1,560

I. **Monitoring Narrative:** No monitoring is proposed other than treatment effectiveness monitoring.

PART VI – EMERGENCY STABILIZATION TREATMENTS AND SOURCE OF FUNDS

Line Items	Units	Unit Cost	NFS Lands		Other \$	Other Lands			All
			# of Units	BAER \$		# of units	Fed \$	# of Units	Non Fed \$
A. Land Treatments									
L01 EDRR	ACRES	175	20	\$3,500	\$0		\$0		\$3,500
Insert new items above this line!				\$0	\$0		\$0		\$0
Subtotal Land Treatments				\$3,500	\$0		\$0		\$3,500
B. Channel Treatments									
Insert new items above this line!				\$0	\$0		\$0		\$0
Subtotal Channel Treatments				\$0	\$0		\$0		\$0
C. Road and Trails									
T01 Trail Stabilization	Lump	23,299	1	\$23,299	\$0		\$0		\$23,299
R01 Drainage Maintenance	Lump	63,550	1	\$63,550	\$0		\$0		\$63,550
R02 Engineering Support	Days	600	14	\$8,400	\$0		\$0		\$8,400
Contract Administration	Each	10,500	1	\$10,500					\$10,500
Insert new items above this line!				\$0	\$0		\$0		\$0
Subtotal Road and Trails				\$105,749	\$0		\$0		\$105,749
D. Protection/Safety									
S01 Hazard Signs	Lump	6,630	1	\$6,630	\$0		\$0		\$6,630
S02 Storm Inspection	Days	1,650	12	\$19,800	\$0		\$0		\$19,800
Insert new items above this line!				\$0	\$0		\$0		\$0
Subtotal Protection/Safety				\$26,430	\$0		\$0		\$26,430
E. BAER Evaluation									
Initial Assessment	Report			\$20,000	\$0		\$0		\$0
Coordination and Consultation	Each	\$390	4	\$1,560	\$0		\$0		\$1,560
BAER Implementation	Each	\$650	4	\$2,600			\$0		\$2,600
Insert new items above this line!					\$0		\$0		\$0
Subtotal Evaluation				\$4,160	\$0		\$0		\$4,160
F. Monitoring									
				\$0	\$0		\$0		\$0
				\$0	\$0		\$0		\$0
Insert new items above this line!				\$0	\$0		\$0		\$0
Subtotal Monitoring				\$0	\$0		\$0		\$0
G. Totals									
				\$139,839	\$0		\$0		\$139,839
Previously approved									
Total for this request				\$139,839					

PART VII - APPROVALS

1.  11/02/2017
Christopher S. Savage, Forest Supervisor Date

2.  11/3/2017
Leanne Marten, Region 1 Regional Forester Date

