Date of Report and Type: Interim 11/15/2017

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 # 1
  - ☒ 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: Park Creek

B. Fire Number: MT-HLF-0001460115

C. State: Montana

D. County: Lewis and Clark, Powell

E. Region: 01 - Northern

F. Forest: 15 - Helena-Lewis and Clark

G. District: Lincoln

H. Fire Incident Job Code:

I. Date Fire Started: 07/14/2017

J. Date Fire Contained: 10/09/2017

K. Suppression Cost: $20,050,123

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

1. **Dozer Fireline repaired** (miles): 9.1 (NFS) and 3.5 (private land)
2. **Excavator Fireline repaired** (miles): 6.9
3. **Other** (identify):1.2 miles of feller buncher line; 0.5 miles of handline

M. Watershed Numbers:

Table 1: Acres Burned by Watershed

HUC #	Watershed Name	Total Acres	Acres Burned	% of Watershed Burned
170102030309	Arrastra Creek	15,089	3,276	22%
170102030303	Beaver Creek	11,621	5,232	45%
170102030103	Copper Creek	26,016	478	2%
170102030304	Keep Cool Creek	22,843	8,270	36%
170102030601	Meadow Creek	11,881	493	4%
170102030703	Rock Creek	25,419	226	1%

N. Total Acres Burned:

Table 2: Total Acres Burned by Ownership

OWNERSHIP	ACRES
NFS	17,862
OTHER FEDERAL (LIST AGENCY AND ACRES)	0
STATE	74
PRIVATE	39
TOTAL	17,976

O. Vegetation Types: The upper elevation areas of the fire are dominated by subalpine habitat types. Intermixed subalpine fir-whitebark pine types occur in a small percentage of the high elevation areas. Douglas-fir habitat types dominate at mid to lower elevations. Within the fire area species such as lodgepole pine, ponderosa pine, quaking aspen, western larch and whitebark pine occur as seral species. The rest of the area is covered by rock, grass, meadows and a small component of headwater riparian areas.

P. Dominant Soils: Soils are relatively uniform with rocky, fine textured loams occuring across the burn area. These soils are formed primarily from metasedimentary residuum and glacial till, and often have volcanic ash influence in the upper 6 inches. Dominant families are Typic Cryoboralfs and Andic Cryochrepts, which together compose more than 80 percent of the burned area. While soils within the burned area share geologic, textural, and pedogenic characteristics, their hydrologic characteristic and erosion hazards vary greatly due to topographic condition and rock content.

Q. Geologic Types: Geology across the Park Creek Fire consists of argillites, siltites, and quartzites (54% of the burned area) with areas of glacial till derived from basalt or metasedimentary rock (46% of the burned area). Landforms are primarily mountain ridges and slopes with moraines, cirque basins and ridges at the higher elevations. Slopes range from 40-60 percent.

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	23.5
INTERMITTENT	21.5

S. Transportation System:

Trails: *National Forest (miles):* 16.4 *Other (miles):* 0.0

Roads: *National Forest (miles):* 19.4 *Other (miles):* 0.7

PART III - WATERSHED CONDITION

A. Burn Severity (acres):

Table 4: Burn Severity Acres by Ownership

Soil Burn Severity	NFS	State of Montana	Private	Total	% within the Fire Perimeter
Low	6908	50	11	6969	38.8
Moderate	3988	3	2	3993	22.2
High	1392	0	0	1392	7.7
Unburned	5575	32	26	5633	31.3
Total	17,863	74	39	17976	100.0

B. Water-Repellent Soil (acres): 5385 (sum of moderate and high severity)

C. Soil Erosion Hazard Rating: Very severe: 3,764 ac (21%)

Severe: 8158 ac (46%)
Moderate: 2347 ac (13%)
Not rated: 3613 (20%)

D. **Erosion Potential** (tons/acre): 4.0 (24-month post-fire average)

E. **Sediment Potential** (cubic yards/square mile): 688 (24-month post-fire average)

PART IV - HYDROLOGIC DESIGN FACTORS

A. **Estimated Vegetative Recovery Period** (years): 1-3 grass, 20-50 shrubs, 20-50 conifers

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

C. **Equivalent Design Recurrence Interval** (years): 25

D. **Design Storm Duration** (hours): 6 hr and 24 hr*

E. **Design Storm Magnitude** (inches): 1.6 in and 2.5 in

F. **Design Flow** (cubic feet / second/ square mile): 125**

G. **Estimated Reduction in Infiltration** (percent): 28**

H. **Adjusted Design Flow** (cfs per square mile): 310†

* Actual model input was an SCS Type II rainfall distribution, which captures shorter duration events.
** Mean estimated pre-fire normalized flow for all drainages modeled for interim report.
*** All acres burned under moderate and high severity were assumed to have sustained at least a partial reduction in infiltration.
† Mean estimated post-fire normalized flow for all drainages modeled for interim report.

PART V - SUMMARY OF ANALYSIS

Introduction/Background

The Park Creek Fire started as two independent fires, the Arrastra Creek Fire and Park Creek Fire. Around the weekend of August 19th-20th, the two fires burned together and assumed one name. The fire(s) burned- and continue to burn- through steep rugged terrain in large dead fuels. The western edge of the fire continues to expand west of Arrastra Creek to the northwest. Roughly 30 percent of the area experienced moderate to high severity burn. Even where low-severity burn occurred, fast-moving fire runs often consumed nearly all existing vegetation, despite limited soil heat penetration. Though there are extensive areas of low soil burn severity, these areas are still at risk of elevated runoff response due to reduced ground cover, native hydrophobicity, and steep slopes.

With high incidence of post-fire water repellancy and fine soil textures, hillslopes are anticipated to be highly susceptible to post-fire runoff and reduced infiltration. Because much of the burned area is on steep slopes with large rock fragment amounts and shallow depths to bedrock, a robust post-fire runoff response and elevated erosion response can be expected if a strong rain event were to occur over the next 3-5 years. In short, high soil rock content results in elevated but tolerable post-fire soil erosion except where flow is concentrated along roads and trails lacking proper drainage, but steep slopes, surface hydrophobity, and reduced vegetative cover and transpiration will likely result in substantially increased post-fire runoff and elevated stream flows.This landscape context informed the evaluation of critical values at risk within and adjacent to the burn perimeter.

The primary values at risk resulting from the Park Creek Fire are transportation infrastructure (roads, trails and culverts), water quality, native fisheries (Bull trout and Westslope Cutthroat trout), native vegetation and heritage sites. Several crossings affected by the Park Creek fire have been recently upgraded in association with South West Crown of the Continent (SWCC) treatment and represent significant government investment in both Forest Service infrastructure and aquatic habitat improvement for bull trout and westlope cutthroat trout.

While the Park Creek fire perimeter abuts the 2015 Sucker Creek fire and shares portions of the same road system, the affected drainages and associated crossings do not overlap with those affected by the Sucker Creek fire.

Following initial assessment, the Park Creek fire grew by 4,278 acres. This growth was primarily to the west in the Arrastra Creek subwatershed, and to a lesser extent in the Meadow and Rock Creek subwatersheds and in the upper headwaters of Stonewall Creek. Particularly in the Arrastra drainages, the burn occurred at a higher proportion of high and moderate severity relative to the rest of the fire. The primary values at risk in the additional burn area are similar to those assessed previously, although specific locations and the risk posed to them have changed and are detailed in the sections below.

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

At the time of initial assessment, the fire was active in the interior, limiting access to certain roads, trails, and other critical values. The interim BAER assessment team re-convened after containment to identify values in those locations as well as within and downslope of the additional burn area. For the most part, values that could be immediately identified as low risk were not carried through to the next stage of analysis and are not presented here.

Following guidance in Interim Directive 2520-2013-1, the team evaluated this list of values through more detailed field assessment and subsequent modeling and analysis to identify the critical values (FSM 2523.1 – Exhibit 01) that may be treated under the BAER program. The critical values were then assigned a level of risk defined by the probability of damage or loss coupled with the magnitude of consequences using the risk assessment matrix (FSM 2523.1 – Exhibit 02). The critical values with unacceptable risks signify a burned-area emergency exists.

For reference and comparison, the full initial Critical Values narrative is included in Appendix A to this report.

Table 5: Critical Value Matrix

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

1. Human Life and Safety (HLS):

a. **Very high** risk to travelers along routes (roads and trails) within and downstream of the burn scar due to an increased threat of *flooding and debris flows* from contiguous areas of high and moderate burn severity in watershed source areas. The probability of damage or loss is **likely** and the magnitude of consequences is **major**. Requested treatments include those described below for roads, trails, and stream crossings, as well as installation of hazard warning signs.

b. **Very high** risk to travelers along routes (roads and trails) within and downslope from hillslopes burned at a moderate to high severity due to an increased threat of *falling trees, rocks, and other debris*. The probability of damage or loss is **likely** and the magnitude of consequences is **major**. Requested treatment is the installation of hazard warning signs.

2. Property (P):

a. *Road 607:* This is a Maintenance Level 3 road. Portions of this road are located below moderate and high burn severity areas. The probability of damage as a result of increased surface water overwhelming existing drainage features and eroding the road prism is **very likely**, and the magnitude of consequence is **moderate**, resulting in a **very high** assessed risk to the infrastructure. Requested treatments include road template reshaping, ditch

cleaning, and culvert cleaning along the entire length of road to ensure functional drainage and maximum conveyance capacity of existing features.

Individual crossings were identified and assessed, and two culverts were recommended for replacement in locations that were assessed a **very high** level of risk (probability of property damage or loss was **very likely** based on damaging event prediction and magnitude of consequence was **moderate**).

Of these replacements, one is a cross-drain (FR#607 MP 0.53) that was identified for cleaning during the initial drainage maintenance efforts. Further review indicated maintenance was unsuccessful and due to a buried outlet it is not capable of passing increased post-fire runoff. It was therefore identified for replacement in kind under this interim request. The other is a crossing (FR# 607 MP 1.79) for an ephemeral draw below a severely burned hillslope to be upsized to 36" diameter to accommodate anticipated increase in flow.

b. *Road 607-H1:* This is a Maintenance Level 2 road and accesses State land to the south. The beginning of the road parallels FS Road 607 and runs immediately below the outlet of two cross drains (one existing, one to be installed with initial assessment approved funds). A small drain dip is recommended to control increased surface flow expected to be conveyed by the culverts from the burned area above. The probability of damage or loss is **likely** and magnitude of consequence is **moderate**, resulting in a **high** level of risk to the infrastructure.

c. *Road 607-F1:* This is a Maintenance Level 2 road that is primarily outsloped with minimal drainage features. It accesses a private inholding not known to be a permanent residence. A majority of this road is located below slopes with very low to low burn severity. Treatments are not requested due to an acceptable level of risk (**low to intermediate**) to the infrastructure.

d. *Road 607-F2:* This is a Maintenance Level 1 (stored) road, closed to motorized use year-round. This road travels through a steep draw of moderate to high burn severity, and includes an intermittent stream crossing in an area of high burn severity, immediately upslope of Road 607. The probability of damage or loss is **very likely** and magnitude of consequence is **moderate**, resulting in a **very high** level of risk to the infrastructure. The recommended treatment is to remove the culvert and stabilize the channel; however the site is not eligible for BAER funding due to the lower maintenance level of the road and its distance from higher maintenance level roads. It is recommended that storm patrols pay particular attention to areas downslope of this site, and that if possible, non-BAER funds be considered for culvert removal.

e. *Road 607-C1:* This road was converted to non-motorized trail 607-T1 under the Blackfoot Travel Plan, but still has an existing road template. A majority of this route, including the perennial Theodore Creek stream crossing is located in/below very low to low burn severity areas. BAER treatments are not recommended due to an acceptable level of risk (**low to intermediate**) to the infrastructure.

f. *Road 607-D1:* The first half of this road is Maintenance Level 2, and accesses a Forest Service aggregate/riprap pit. The remainder of the road is Maintenance Level 1 (stored) road, closed to motorized use year-round. A majority of this road is located in very low to low burn severity areas. BAER treatments are not recommended due to an acceptable level of risk (**low to intermediate**) to the infrastructure.

g. *Road 4106-C1:* This is a Maintenance Level 1 (stored) road, closed to wheeled motorized use year-round and in an area open to snowmobile use seasonally. A majority of this road is located in very low to low burn severity areas, and road treatments are not recommended due to an acceptable level of risk (low to intermediate) to the infrastructure. Two perennial

stream crossings were identified: Yukon Creek is the upper crossing, which was found to have already been restored to its natural streamcourse. The road was found to have been obliterated beyond that point as well. The lower crossing (tributary to Yukon Creek) is in a wide valley bottom with gentle slopes and minimal road fill. This is considered to be an acceptable level of risk (**low to intermediate**), and no BAER treatments are requested.

h. *Road 1804:* This is a Maintenance Level 1 (stored) road, closed to wheeled motorized use year-round and in an area open to snowmobile use seasonally. A majority of the road travels through very low to low burn severity areas, and road treatments are not requested due to an acceptable level of risk (**low to intermediate**) to the infrastructure.

Three perennial stream crossings on Road 1804 were identified, the second of which is an unnamed tributary to Beaver Creek. This is considered the highest priority of the three, as it is immediately upstream of a culvert previously approved for replacement (initial assessment) and has potential to detrimentally impact Road 4106 in the event of failure due to its close proximity. The probability of damage or loss is **very likely** and the magnitude of risk is **major**, resulting in a **very high** level of risk.

The first culvert is the next priority; probability of loss or damage is **possible** and magnitude of consequence is **moderate**, resulting in an **intermediate** level of risk. The requested treatment is to remove the culvert, stabilize the channel, and lay back the fill slopes to an acceptable angle that will minimize both erosion and risk to snowmobilers.

Flow modeling suggests probability of damage or loss to the third culvert is **unlikely**. This is considered to be an acceptable level of risk (**low**), and no BAER treatments are requested.

i. *Road 1804-A1:* This is a Maintenance Level 1 (stored) road, closed to wheeled motorized use year-round and in an area open to snowmobile use seasonally. A majority of the road travels through low to moderate burn severity areas. Road treatments are not requested due to an acceptable level of risk (**low to intermediate**) to the infrastructure.

Two crossings were identified on this road, one intermittent and one perennial. For the intermittent crossing, the probability of damage or loss is **possible** and magnitude of consequence is **moderate**, resulting in an **intermediate** level of risk to the infrastructure.

For the perennial crossing, the probability of damage or loss is **likely** and magnitude of consequence is **moderate**, resulting in a **high** level of risk. The treatment requested for both sites is to remove the culverts and stabilize each channel as necessary to protect against erosion, while allowing for safe snowmobile access.

j. *Road 4043:* This road travels through an unburned area, and while no treatments are recommended on the road itself, there is concern with a perennial stream crossing (Beaver Creek) just past its junction with FS Road #4106. This crossing is downstream of the confluences with Yukon Creek, Theodore Creek, and Klondike Creek, all of which are expected to experience elevated post-fire flows. Modeling suggests the existing structure has sufficient capacity to carry expected post-fire design flows, but it is a timber bridge with timber wall abutments, and little to no armoring is present. The requested treatment is to armor the bridge abutments with riprap to protect against scour and undermining that could result from increased flows, velocities, and debris loads. The probability of damage or loss is **possible** and magnitude of consequence is **major**, resulting in a **high** level of risk.

k. *Road 4106:* This is a Maintenance Level 3 road that serves as a primary access road. Portions of this road are located below moderate and high burn severity. The probability of damage as a result increased surface water overwhelming existing drainage features and eroding the road prism is **likely**, and the magnitude of consequence is **major**, resulting in a **very high** assessed risk to the infrastructure. Requested treatments include road template

reshaping, ditch cleaning, and culvert cleaning along the length of road within the fire perimeter to ensure functional drainage and maximum conveyance capacity of existing features. Individual crossings were identified and assessed, and four crossings are identified for treatments listed in priority below.

The highest priority crossings are major perennial streams Arrastra Creek and North Fork Arrastra Creek. Both drainages experienced substantial areas of moderate to high severity burn. These crossings are assessed as **very high** risk, not only to the infrastructure but also to Human Life and Safety, and Natural Resources (fisheries). Requested treatment is to mitigate for overtopping by armoring the fill slopes and roadway surface with aggregate and riprap. For additional protection, critical armored drain dips (riprap and aggregate armoring) are requested to convey overflows. The Arrastra Creek culvert had a fallen tree down across its inlet, which will be removed immediately to prevent other debris from accumulating. These sites were identified as top priorities for storm patrol and response.

Mid-priority priority crossings identified and recommended for treatment included replacement of one culvert (upsize), and installation of one culvert to drain an existing ditch/spring. Both of these locations have contributing drainages that experienced low to moderate burn severity. Probability of damage or loss is **possible** and magnitude of consequence is **moderate to major** (considering standard of road and large fills susceptible to erosion), resulting in an **intermediate to high** level of risk.

Lower priority crossings were identified, such as crossings that had been upsized in recent years, or those in which contributing areas experienced low burn severity. BAER treatments are not recommended due to an acceptable level of risk (**low**) to the infrastructure.

l. *Road 1800:* This is a Maintenance Level 3 road that serves as a primary access road. Portions of this road are located below moderate and high burn severity. The probability of damage as a result of increased surface water overwhelming existing drainage features and eroding the road prism is **likely**, and the magnitude of consequence is **major**, resulting in a **very high** assessed risk to the infrastructure. Requested treatments include road template reshaping, ditch cleaning, and culvert cleaning along the length of road within the fire perimeter to ensure functional drainage and maximum conveyance capacity of existing features.

m. A handful of Maintenance Level 1 roads were not surveyed due to time constraints or inaccessibility (i.e. 4106-A1, 607-C1, 607-G1). They include year-round closures to all motorized use, snowmobile routes, and those scheduled for decommissioning. There were few possible stream crossings identified, and most are located in areas of very low to low severity burn areas. These factors informed the consideration of such roads as low priority, and a **low** level of risk was assessed to them. BAER treatments are not requested.

n. Two additional trails, the Porcupine Basin trail (FS Trail #488) and Theodore Creek trail (FS trail #607-T1) are located in the additional burn area. The total miles of trail affected by the burn more than doubled to a final total of 16.4 miles. These trails include motorized and non-motorized use, including important and popular pack access routes into the Scapegoat wilderness, and administrative access to the manned Stonewall lookout and communications sites and infrastructure. Stumps and organic material helped provide stability on extensive areas of these steep side-slope trails; much of this support was consumed in the fire, and trails are in need of additional drainage structure installation in addition to spot and extended tread repair in order to prevent substantial loss of trail infrastructure and exacerbated hillslope erosion. The probability of damage or loss is **likely** and the magnitude of consequences is **major**; therefore risk level is **high**. Treatments requested include drainage structure repair, replacement, and reconstruction along with spot retread and hazard tree removal in the immediate work vicinity.

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

a. *Water quality and stream crossings:* Due to fire effects, watersheds within the Park Creek Fire burn perimeter are likely to generate higher stormflows in the first few years following the fire. Larger flow events in part are a function of increased surface runoff from bare hillslopes. Furthermore, burned and exposed soils are more susceptible to erosion, entrainment and transport to stream channels. This combination of increased runoff and greater susceptibility to erosion threatens transportation infrastructure. Fourteen crossings were initially evaluated for flow capacity in order to determine their adequacy to convey post-fire design storm flow events; an additional thirteen were evaluated for the interim assessment. Under post-fire conditions, model outputs suggest that virtually every one of these drainages may see an increase in post-fire runoff, which in some cases may overwhelm crossing capacity and overtop roads, leading to washout and delivery of road sediment to streams. Probability of damage or loss is therefore **likely**, with magnitude of consequences being **major**, and the risk level **high**.

b. *Fisheries:* Streams affected by the fire are within six 6th code HUCs: Beaver Creek, Keep Cool Creek, Arrastra Creek, Meadow Creek, Rock Creek and Copper Creek. In addition, the Blackfoot River, which is designated bull trout critical FMO (foraging, migration and overwintering) habitat, has the potential to be affected in a downstream 6th code HUC (Humbug Creek), even though it is located outside of the fire perimeter boundary.

Fish-bearing streams in the Beaver Creek 6th code HUC within the fire perimeter include Beaver, Yukon, Klondike, and Theodore creeks. This HUC is considered to be functioning at unacceptable risk and the fisheries composition on forest includes bull trout (ESA threatened species), brook trout, and westslope cutthroat trout (MIS species). Westslope cutthroat trout are the most widely distributed salmonid in this 6th code HUC within the fire perimeter, followed by bull trout and then non-native brook trout. The sediment levels in spawning gravels for streams in this HUC tend to be near reference conditions or slightly elevated above reference levels. The streams in the Beaver Creek 6th code HUC within the fire perimeter known to be occupied by bull trout in low densities include Beaver Creek and the lower reaches of Theodore and Klondike Creek. Connectivity for bull trout in these waters with other local populations in the Blackfoot Core population is also low, which places this population at risk of extirpation from natural or man caused disturbances because of their requirements for clean cold water and sensitivity to increased sediment levels.

Streams in Keep Cool Creek 6th code HUC within the fire perimeter from west to east include Stonewall, Park, Liverpool, and Sucker creeks. This HUC is also considered to be functioning at unacceptable risk. The only salmonid present on forest in these streams is westslope cutthroat trout (MIS species), although brook trout are present downstream off forest lands. Wetslope cutthroat occupy approximately 4.6 miles of stream in this 6th code HUC within the fire perimeter. The sediment levels in spawning gravels for streams in this HUC are near reference conditions in Stonewall Creek but substantially elevated above regional reference levels in other streams for which data is available, which would suggest reduced survival of incubating eggs and fry in spawning areas of these streams under pre-fire conditions.

In the Arrastra Creek 6th Code HUC, westslope cutthroat trout occupy the greatest area (1.13 miles) and bull trout occupy only a small stream reach within the burn perimeter. However, downstream of the burn perimeter, bull trout occupy 0.12 miles of the North Fork Arrastra Creek and 9.8 miles of main Arrastra Creek. This HUC is considered to be functioning at risk and comprises the greatest aquatic resource put at risk by the Park Creek Fire. Both resident and fluvial life history forms of bull trout (ESA threatened species) are thought to utilize main Arrastra Creek while the lower portion of the North Fork Arrastra Creek is occupied by resident bull trout. The sediment levels for spawning gravels in this HUC are near reference conditions or slightly elevated above reference levels. Based on

survey information in summer 2017, connectivity for bull trout to the Blackfoot Core population extends at least to private land just below the Forest boundary.

The most sensitive aquatic natural resource value at risk associated with the Park Creek fire would be maintaining existing bull trout habitat quality in the Beaver and Arrastra Creek subwatersheds. The Arrastra Creek drainage comprises the highest aquatic value at risk because of both a resident population and the fluvial life history form displaying connectivity with the Blackfoot Core population. Given the level of burn severity, concentration of higher severity levels in riparian and headwater areas, and the likeihood of sediment mobilization in the Arrastra Creek drainage, the risk or probablility of damage to known occupied bull trout habitat in the watershed both on and off Forest is **Likely** and the magnitude of consequences would be **Major**, resulting in a Risk Value of **Very High**. Sediment mobilization combined with debris flows are a major concern at road crossing structures that require mitigation if hydrologic modeling indicates upsizing of structures is warranted to prevent road failure as a result of the fire's effects.

c. *Native Vegetation:* Native vegetation communities and soil productivity are at risk from rapid expansion of noxious weeds from existing populations in the burned area. Recent weed inventories conducted within and around the Park Creek fire perimeter identified 270 acres of weed infestations. Inventories have found spotted knapweed, Canada thistle, musk thistle, bull thistle, common mullen, black henbane, oxeye daisy, and houndstongue within the burned area. During the BAER team evaluation, noxious weed populations were found infesting direct roadsides on 84.5 miles of forest roads, 2.5 miles of trail, and 0.6 miles of dozer line associated with suppression activities.

The fire area and dozer lines adjacent to the fire have the following habitats; Idaho fescue/Bluebunch wheatgrass, Douglas fir/pine grass, Douglas fir/snowberry, Big Sagebrush/Idaho fescue, and limber pine/elk sedge. These habitats are all highly susceptible to weed invasion. In addition wetter habitats, such as the drainage bottoms, that have greatly reduced tree canopies as a result of disturbance are also much more susceptible to invasive weeds. High and moderate fire severity can cause an area to be susceptible to weed invasion. The acres of moderate to high severity in these habitat types are estimated to be 3,812 acres. In addition, multiple drop points (DP) have been created throughout the Park Creek incident. DP's 3, 7, 9, 10, 20, and 21 intersect with pre-existing weed infestations. These drop points are highly susceptible locations for the expansion of already established weed infestations. There are approximately 10 acres of noxious weeds within the listed drop points.

No additional inventoried weed populations were identified in the additional burn area by the interim assessment. Within the fire perimeter, an additional 13 acres were identified adjacent to road and dozer lines as highly susceptible to weed invasion. The probability of loss of native vegetation due to invasion is **Likely** and would have **Major** consequences; thus the risk level is **Very High**.

d. *Soils:* Soils are generally moderately to very rocky loams to silt loams with a layer of wind deposited volcanic ash in the upper portion of the soil profile. Volcanic ash's chemical properties contribute greatly to soil water and nutrient holding capacity, but due to its fine texture, it is also most susceptible to erosion and compaction when exposed to weather. Thus, a modest loss of topsoil may result in disproportionate reductions in soil productivity.

The final burn severity assessment indicates that moderate to high severity fire occurred on approximately 30% of the burned area. In several cases, high and moderate burn severities are concentrated along riparian areas or stream headwaters, with some slopes having almost complete consumption of organic surface cover along the entire hillslope length. Overall, 21% of modeled hillslopes exceeded the tolerable 1-2 tons of eroded sediment per acre threshold (FSM 2500 - R-1 Supplement No. 2500-99-1). Due to the dispersed,

widespread number of hillslopes exceeding tolerable soil loss, reductions in soil productivity throughout the burned area are **Likely** and substantial sediment mobilization may occur, with **Moderate** consequences to the resource, leading to a **High** risk level.

Natural recovery is the recommended treatment to address concerns to soil productivity and hydrologic function. Because erodible slopes are dispersed throughout the burned area, hillslope treatments targeting specific areas are unlikely to result in significant reductions in eroded sediment. The hillslopes generating the greatest amounts of erosion do not produce enough sediment on their own to generate emergency conditions or warrant treatment. Treatments which reduce eroded sediment interception and avoid concentrated flow, particularly along trails that bisect large areas of high and moderate severity burn on steep slopes, are strongly recommended.

4. Cultural and Heritage Resources:

No known heritage sites are within or near the expanded fire boundary, so the list of sites addressed in the initial assessment remains the same.

a. Four sites (24LC2306, 24LC2309, 24LC2310, and 24LC2314) are within the burn area or immediately adjacent to it and may be at very high risk. These four sites need to be visited by a heritage designee see if any erosion control measures are necessary, and if so, to monitor the implementation of those measures. One prehistoric site (24LC0425) may be at intermediate risk from post fire erosion as it is in the downstream floodplain of Beaver Creek. The site needs to be visited by a heritage designee in conjunction with a hydrologist to see if any erosion control measures are necessary, and if so, to monitor the implementation of those measures. Any future treatment and monitoring fund request will be included in an Interim BAER Report.

The interim assessment team determined that these five sites are at **Low** risk from post-fire erosion and no BAER treatments are requested.

b. Portions of the Lincoln Ditch (24LC0244/24PW0062) overlap into the burn area and are in a downstream floodplain that has a risk of flooding. This ditch needs to be visited by a heritage designee to see if any repairs or erosion control measures are necessary, and if so, to monitor the implementation of those repairs and measures.

A 30-foot damaged segment of the Lincoln Ditch was repaired during fire suppression repair. The interim assessment team observed that the repaired ditch berm had softened up and needed some erosion control protection measure in order to prevent it from washing away. Post-fire erosion damaging the site is **Likely**, posing **Major** consequences to the repaired ditch segment of the Lincoln Ditch. This is an emergency situation necessitating timely erosion control treatment measures; thus the risk level is **Very High**.

5. Other non-BAER Values:

a. There are numerous NFS values that are not BAER Critical Values in addition to non-NFS values potentially at risk from post-fire threats originating primarily on NFS lands. Treatments for these other values have not been identified. Activities to address the non-BAER Critical Values on NFS lands can be considered for discretionary program funding. It is recommended the non-NFS values potentially threatened by post-fire conditions be communicated to the appropriate parties through interagency coordination.

B. Emergency Treatment Objectives:

Critical values having a "Very High" or "High" risk rating will be treated with emergency stabilization actions proven to mitigate potential threats or minimize expected damage. Intermediate risk areas will be treated with a more moderate approach appropriate to the lower risk level. Additionally, critical warning signs are

recommended in some areas with an intermediate risk. Treatments are paired with storm inspection and response, focused in particular on sites with the highest risk levels. No treatments were identified for values when the analysis resulted in a low or very low risk rating.

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

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

D. Probability of Treatment Success

Table 6: Probability of Treatment Success

	1 year after treatment	*3 years after treatment*	*5 years after treatment*
Land	85	85	90
Channel	N/A	N/A	N/A
Roads/Trails	80	90	90
Protection/Safety	90	80	70
Cultural/Heritage	80	90	90

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

Initial: $900,000
The potential cost of no action includes the failure of culverts/stream crossings on major roads in the burned area, severe erosion damage on several public roads needed for FS and public access, entrainment and deposition of road sediment in important fishery streams, and erosion damage and failure of trails. The cost of repairing roads, trails, and stream crossings would likely exceed the cost of the treatment. The value of critical habitat for one ESA-listed fish species, as well as other species of concern, cannot easily be quantified, but would likely far exceed the cost of sediment-mitigation measures proposed here. The value of protecting the ecological integrity and soil productivity of the burned area from noxious weed infestation likely exceeds the cost of weed treatment and monitoring, although this too was not quantified.

Interim: $302,500*
(Replacement cost of Roads = $40,000*5.5 miles) + (Replacement cost of trails = $15,000*3.5 miles)

*To avoid duplication, the interim no-action cost estimate does not include road miles previously identified in the initial assessment. However, some additional treatments are requested for those segments to reduce risk to an acceptable level. When those segments are considered, the full potential cost of no-action is higher. Furthermore, damage or loss to cultural or ecological resources such as heritage features and native plant communities, and threats to human life and safety, cannot be quantified and are not included here.

F. Cost of Selected Alternative (Including Loss):

Initial: $134,785

In accordance with the revised Forest Service manual, the risk matrix below, Exhibit 2 of Interim Directive No.: 2520-2012-1, was used to evaluate the Risk Level for each value identified during the Sheep fire BAER assessment. Only treatments that had a risk of Intermediate or above are recommended for BAER authorized treatments.

Interim: $156,931

(Roads treatment = $73,592) + (Roads loss = .20*$73,592) + (Trails treatment = $11,658) + (Trails loss = .3*$11,658) + (Weeds additional acres and treatment cost = $4,843) + (Storm patrol, hazard tree removal, and safety signs = $26,086) + (Cultural resource protection and effectiveness monitoring= $1,686) + (Implementation coordination/consultation = $20,850)

F. Skills Represented on Burned-Area Survey Team:

☒ Archaeology	☐ Botany	☐ Ecology	☒ Economist	☒ Engineering
☒ Fisheries	☐ Forestry	☒ GIS	☒ Hydrology	☒ Range
☒ Recreation	☒ Soils	☒ Team Lead	☐ Wildlife	☐
☐	☐	☐	☐	☐

Initial Team Leaders: **Marci Nielsen-Gerhardt**, marcibaer1@gmail.com; **Megan McGinnis**, meganlmcginnis@fs.fed.us, 406-791-7729

Interim Team Leaders: **Kate Condon**, kcondon@fs.fed.us, 406-495-3724

Forest BAER Coordinator: **Wayne Green**, wgreen@fs.fed.us, 406-791-7740

Core Team Members:

Table 7: BAER Team Members by Skill

Skill	Initial	Interim
Team Lead(s)	Marci Nielsen-Gerhardt, Megan McGinnis	Megan McGinnis, Kate Condon
Archaeology	Mark Bodily	Mark Bodily
Economist	Tessa Donahue	Tessa Donahue
Engineering	Jacob Noland	Mary Smith
Fisheries	George Liknes	George Liknes
GIS	Laura Burns	Laura Burns
Hydrology	Andy Efta, Kate Condon	Kate Condon
Range	Luke Shimer	Megan Dawson
Recreation	Josh Lattin	Josh Lattin
Soils	Jonathan LeBlanc	Megan McGinnis

H. Treatment Narrative:

(Describe the emergency treatments, where and how they will be applied, and what they are intended to do. This information helps to determine qualifying treatments for the appropriate funding authorities. For seeding treatments, include species, application rates and species selection rationale.)

Land Treatments:

Noxious Weeds

Noxious weed control with herbicides is recommended for new populations of current and new invader weed species within the Park Creek Fire. Noxious Weed management will include representatives from the following cooperators: private land owners, the State of Montana, the Lewis and Clark County Weed Coordinator, Montana State Department of Highways, Natural Resource Conservation Service, and the U.S. Forest Service. A management plan will be developed to treat known noxious weed infestations.

Only existing weed populations will utilize Early Detection, Rapid Response (EDRR) treatments. If subsequent monitoring identifies weeds populations not effectively removed with initial treatment, additional treatment will be planned, and funds requested in a subsequent interim request. Other funding sources will be sought in out-years to treat any expansions of noxious weeds identified in subsequent monitoring. All of this work will be accomplished using ground-based equipment.

Requested treatments are as followed, with interim changes or additions highlighted in blue. Personnel costs for EDRR treatment have been added for the interim funding request.

- Mix of backpack (110 acres), UTV, or truck herbicide spray (160 acres) and hand-pulling, as appropriate, in fall 2017 and spring/early summer 2018 before weeds begin to seed.
- EDRR for 1 year from fire containment (including personnel costs for one GS07 crew lead and four GS05 technicians to accomplish monitoring and treatment).
- Using approved herbicides and application techniques based on weed species, topography and environmental factors, in compliance with Helena-Lewis and Clark forest plan standards. Treatments will be concentrated along the southern perimeter of the fire, where existing weed infestation areas and along key vector corridors occur. Total treatment area comprises 283 acres.

Original calculations were a low estimate of crew time to conduct treatments. Revised estimates incorporate costs for administrative costs that were not previously accounted for. New estimates use per acre costs that reflect more appropriate administrative costs.

Table 8: Weeds EDRR Treatment Types and Cost

TREATMENT DESCRIPTION	METHOD	ESTIMATED ACRES	COST PER ACRE	COST
EDRR	Backpack spraying	110	200	$22,000
EDRR	Truck/UTV	160	55	$8,800
EDRR	Truck/UTV	13	55	$715
TOTAL				$31,515
INITIALLY FUNDED				$26,672
INTERIM				**$4,843**

Cultural Resource Erosion Protection

Treatment objectives are to reduce the risk of post-fire erosion to segments of the Lincoln Ditch. Treatment will be to install certified weed-free erosion control mats over the repaired ditch segment and berm to prevent continued erosion, as soon as is possible. Effectiveness of this treatment will be monitored.

Table 9: Cultural Resource Protection Cost Estimate

TREATMENT	UNIT	UNIT COST	# OF UNIT	TOTAL COST
GS-12 ARCHAEOLOGIST FIELD/OFFICE WORK	Day	454	2	$908
GS-09 ARCHAEOLOGIST FIELD WORK	Day	260	1	$260
EROSION CONTROL MAT	Each	$68	1	$68

Channel Treatments: None proposed.

Roads and Trail Treatments:

Road treatments will be targeted at effectively draining anticipated increased runoff in the first several years following the fire. The risk is to road and associated infrastructure with substantial damage expected where flooding, debris flows, and erosion is imminent. Of the fourteen crossings initially assessed for risk of failure post-fire, five structures had sufficient capacity to pass post-fire design events. Two bridges were not BAER Values at Risk by virtue of being privately owned. The other initially assessed seven crossings were deemed appropriate to treat under BAER authority (See Appendix A and B [of initial report] for details).

The highest risk is associated with roads 4106 and 607. Initial recommended treatments to reduce the risk of catastrophic failure due to high flow post-fire storm events include: upgrading 3 culverts to meet anticipated post-fire flows (two along road 4106, one along 607); armored critical drain dip, aggregate surfacing, and armored fill slope treatments at three stream crossings where conditions preclude culvert upgrades (all 3 occurring along road 607); and riprap to armor bridge footings (road 607). Recommended treatments to improve safety include installing warning signage and implementing storm patrol monitoring to ensure treatments are functioning as intended. Treatments would protect existing road infrastructure, address safety concerns associated with public road use, and mitigate the potential for bull trout habitat impairment resulting sediment inundation from crossing failure.

For the interim request, additional road and trail segments and treatments are detailed in the Critical Values section above and are presented on the Interim BAER Treatment Map. Summaries of each treatment approach, specifications, and costs are presented here:

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 consists of rip rap is placed where runoff could possibly cause erosion to the road surface and fillslope. Additional aggregate armoring of the roadway may be specified in critical locations.

Road Drainage 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. Catchment basins will be constructed as necessary, and culvert inlets/outlets will be armored with riprap to prevent erosion. Road surface and approaches may be armored with aggregate to prevent erosion due to runoff or overtopping, or when road is aggregate surface originally.

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.

Overflow Protection – Overflow protection will be installed at two crossings on FSR 4106, the North Fork Arrastra Creek (MP 10.90) and the mainstem Arrastra Creek culvert (MP 10.67). This treatment was selected to provide short-term emergency protection to the culverts, which are both currently undersized for existing conditions and are at very high risk of overtopping during post-fire storm events. Full replacement of the two crossings was considered but would involve upgrading to bridge structures, requiring a more extensive design, a longer timeline for installation which would not address the immediate risk to the structures in the first year post-fire, and expenses in excess of the BAER cost-benefit guidelines. Overtopping protection was selected instead as an acceptable short-term emergency mitigation to reduce risk from surface and fillslope erosion and downcutting of the road infrastructure. The road over the culverts will be outsloped, rip rap will be placed on fill slopes to protect from erosion, and the roadway will be armored with 4" lift of aggregate. Critical dips will also be installed at these locations to control

and direct flow over and across the road surface. These treatments in particular will be closely monitored for effectiveness.

Replacing Non-Functioning Ditch Relief Culverts (in-kind) – Culverts with compromised inlets or outlets will not function well enough to pass increased run-off and debris caused by post-fire conditions. Replacement assumes that the issue is substantial enough that there is no option to cut off damaged sections of pipe and band on new sections to restore hydraulic function. By replacing with functioning pipes, the risk of plugging and 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.

Armoring Bridge Abutments – Unprotected bridge abutments in streams that are anticipated to experience increased peak flows and velocities need to be armored with riprap. This prevents undermining and scouring of the abutments.

Culvert Removal – This treatment is for the removal of existing culverts at stream crossings on Forest Roads. The culvert crossings were identified as being undersized due to the anticipated increase in flows from the burned watersheds above the crossings. These culverts will be removed and have the road fill pulled back to match the surrounding stream banks in order to pass the increased flows that are anticipated from future storm events. The stream channel will be reconstructed with stream simulation material, thereby reducing the potential for head cutting and scour through the new channel. The treatment is primarily for undersized pipe crossings primarily located on maintenance level 1 roads, which are closed to all wheeled motorized traffic.

Stream Culvert Replacement – The treatment is for the replacement of existing culverts at stream crossings on Forest Roads. Following post-fire streamflow analysis, the pipe crossings were identified as being undersized due to the anticipated increase in flows from the burned watersheds above the crossings and pose an unacceptable risk to the road infrastructure and other critical values. These culverts will be removed and upsized in order to pass the increased flows that are anticipated from future storm events. In locations where culvert upgrade size is limited (i.e. lack of sufficient cover), riprap armoring around the inlet and adjacent fill slope to protect the roadway in the event of overtopping.

Table 10: Stream Crossings Selected for Treatment

LOCATION	EXISTING	TREATMENT	FLOW REGIME	DRAINAGE AREA (AC)	% BURNED MOD+HIGH	POST-FIRE DAMAGING EVENT OF EXISTING STRUCTURE
FR #607 MP 1.79	18" CMP	Replace with 36"x52' CMP	Ephemeral	23	73	Q2
FR #607 MP 0.53	18" CMP	Initial: clean Interim: replace in-kind	Ephemeral	97	20	Q10
FR #4043 MP 0.1	Bridge	Armor abutments	Perennial (Beaver Ck)	5137	17	Q10 – Q25
FR #4106 MP 10.67	72" CMP	Overflow protection (outslope, surface road, riprap fill slopes, armored critical dip)	Perennial (mainstem Arrastra Ck)	1,998	43	Q5
FR #4106 MP 10.90	60" CMP	Overflow protection (see above)	Perennial (North Fork Arrastra Ck)	1,379	36	Q5
FR #1804 MP 0.07	18" CMP	Remove and stabilize slopes	Perennial (unnamed tributary to Beaver Ck)	42	11	Q10
FR # 1804 MP 0.15	24" CMP	Remove and stabilize slopes	Perennial (unnamed tributary to Beaver Ck)	345	27	Q2

Table 11: Culvert Replacement Cost Estimate

TREATMENT	UNIT	UNIT COST	# OF UNIT	TOTAL COST
COR PER DIEM	Day	164	3	$492
COR FLEET	Mile	5.47/day + 0.22/mile	900	$215
36" CMP CULVERT INSTALLED	Lineal Foot	100	52	$5,200
RIPRAP ARMORING INLETS/FILL SLOPES	CY	125	15	$1,875

Table 12: Culvert Removal Cost Estimate

TREATMENT	UNIT	UNIT COST	# OF UNIT	TOTAL COST
COR PER DIEM	Day	164	3	$492
COR FLEET	Mile	5.47/day + 0.22/mile	480	$122
EXCAVATOR + OPERATOR	Hour	175	24	$4,200
DUMP TRUCK (10-12 CY) + OPERATOR	Hour	125	24	$3,000
EROSION CONTROL	Site	2	$300	$600

Table 13: Road Drainage Maintenance Treatment Cost Estimate

TREATMENT	UNIT	UNIT COST	# OF UNIT	TOTAL COST
COR PER DIEM	Day	164	16	$2,624
COR FLEET	Mile	5.47/day + 0.22/mile	2000	$527
CULVERT CLEANING	Each	95	26	$2,470
ROAD TEMPLATE RESHAPING/DITCH CLEANING	Miles	800	9	$7,200
SMALL UNARMORED DRAIN DIP	Each	300	1	$300

TREATMENT	UNIT	UNIT COST	# OF UNIT	TOTAL COST
CRITICAL ARMORED DRAIN DIPS	Each	4,000	2	$8,000
CULVERT INSTALL WITH RIPRAP AND SURFACING	Each	4,800	1	$4,800
CULVERT REPLACEMENT WITH DISPOSAL AND RIPRAP ARMORING	Each	5,100	1	$5,100
ARMORING BRIDGE ABUTMENTS	Each	4,500	1	$4,500
OVERFLOW PROTECTION (NF ARRASTRA AND ARRASTRA CK)	Each	10,000	2	$20,000
OVERFLOW PROTECTION (4106 MP 8.76)	CY	125	15	$1,875

Trail work will treat the trail segments within the burned area that is at high risk of damage from elevated post-fire runoff and erosion, mostly associated with moderate and high burn severity. Trail treatments include: restoration of existing drainage structures, replacement of damaged drainage structures, installation of new drainage structures where post-fire conditions result in high risk of erosion, spot tread repair where burned-out root and stump holes undermine trail drainage and stability, extended tread drainage improvement on high-risk segments, crib wall reconstruction where cribs were damaged, hazard tree and downed tree removal, and posting visitor warning signs at access points.

The previous BAER funding request accounted for 7.97 miles of affected trails. This interim assessment found that by containment, the affected trail mileage had increased to 16.4 miles. Approximately 3.5 of these miles of trail are at high risk of damage associated with moderate and high burn severity.

Table 14: Trail Drainage Restoration Cost Estimate

TREATMENT	UNIT	UNIT COST	# OF UNIT	TOTAL COST
SPOT RETREAT/ SLUMPS/ FILLING HOLES	Miles	825	3.5	$2,888
RESTORATION OF DRAINAGE STRUCTURES	Each	30	90	$2,700
REPLACE DAMANGED DRAINAGE STRUCTURES	Each	75	15	$1,125
INSTALL ADDITIONAL DRAINAGE STRUCTURES	Each	115	43	$4,945

Protection/Safety Treatments:

Storm Inspection and Response

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. 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. 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. 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.

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 road patrols shall bring in heavy equipment necessary to mechanically remove any obstructions from the roads and culvert inlets and catch basins where necessary. 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 15: Storm Inspection and Response Cost Estimate

TREATMENT	UNIT	UNIT COST	# OF UNIT	TOTAL COST
GS-11 ENGINEER	Day	350	6	$2,100
GS-9 HYDROLOGIST	Day	300	3	$900
BACKHOE	Day	880	5	$4,400
EXCAVATOR	Day	1200	5	$7,000
DUMP TRUCK	Day	920	1	$5,000

Safety Signs

This treatment is for the installation of traffic signs warning the public of possible dangers associated with burned area, such as falling rocks and debris.

Burned area signs warn the public identifying of the possible dangers associated with a burned area on major entry points into the burned area and developed recreation sites. It shall contain language specifying items to be aware of when entering a burn area such as falling trees and limbs, rolling rocks, and flash floods.

Table 16: Warning Signs Cost Estimate

TREATMENT	UNIT	UNIT COST	# OF UNIT	TOTAL COST
GS-09 (FOR SIGN INVENTORY/DESIGN)	Days	300	1	$300
GS-11 (FOR PROJECT REVIEW AND INSPECTION)	Days	350	1	$350
2-GS-04 OR 05 (SIGN INSTALLATION) CREW	Days	300	3	$900
FALLEN ROCKS/ DEBRIS WARNING SIGNS	Each	150	5	$750
MILEAGE PLAQUES	Each	75	5	$375
POSTS AND HARDWARE	Each	50	5	$250
FLEET VEHICLE (SERVICE TRUCK)	Miles	7/day + 0.3/mile	100	$58
FLEET VEHICLE (MINI-EXCAVATOR)	Hours	5/day + 20/hour	8	$175
FLEET VEHICLE (INSPECTION)	Miles	5.47/day + 0.22/mile	100	$28

Trail Hazard Tree Removal

Trail hazard tree removal will be conducted for the safety of trail crews working to restore trail drainage in moderate and severe burn severity areas.

TREATMENT	UNIT	UNIT COST	# OF UNIT	TOTAL COST
TRAIL HAZARD TREE REMOVAL	Miles	1000	1	$1000

BAER Evaluation

Associated activities obligated under ID-FSM2520-2017-1 need to be considered in the BAER funding request when emergency response actions are authorized. These are accumulated tasks above the normal program of work and generally not accounted for in out-year program planning. Because implementation of approved BAER response actions trigger these required tasks and the unit's allocated budget does not account for these obligations, BAER funding is the appropriate authorization to ensure this coordination and consultation is completed. These costs were not previously accounted for in the initial request.

Table 97: Coordination and Consultation

ACTIVITY	PERSONNEL	UNIT	UNIT COST	# OF UNIT	TOTAL COST
INTERAGENCY COORDINATION	Forest BAER Coordinator (GS-12)	Days	450	3	$1,350
INTERAGENCY COORDINATION	Watershed Specialist (GS-11)	Days	350	3	$1,050
IMPLEMENTATION TRACKING & REPORTING	Forest BAER Coordinator (GS-12)	Days	450	3	$1,350
IMPLEMENTATION COORDINATION	Watershed Specialist (GS-11)	Days	350	15	$5,250
IMPLEMENTATION CONTRACT PREP & ADMINISTRATION	BAER Engineer (GS-11)	Days	350	30	$10,500
EMERGENCY CONSULTATION	Forest Fish Biologist (GS-12)	Days	450	2	$900
SITE REPORTING	Forest Archaeologist (GS-12)	Day	450	1	$450
EFFECTIVENESS MONITORING	Forest Archaeologist (GS-12)	Day	450	1	$450

I. Monitoring Narrative:

(Describe the monitoring needs, what treatments will be monitored, how they will be monitored, and when monitoring will occur. A detailed monitoring plan must be submitted as a separate document to the Regional BAER coordinator.)

Early Detection Rapid Response: Treatment sites will be evaluated annually for the next three years to ensure control methods are meeting resource objectives and to inventory for new invaders. Weed specialist/technicians will visit chemically treated sites after treatment; this is especially important for weed populations that are sprayed to ensure efficacy of herbicide application. Initiate follow-up treatments if additional non-native species or new infestations are discovered. Control will be considered successful upon determination that all noxious weeds have been controlled have not spread beyond their pre-fire locations.

Road Drainage Maintenance: Road drainage maintenance treatment effectiveness will be monitored during storm patrol activities.

Culvert Replacements: Monitoring will be conducted by district personnel and/or members of the Forest Engineering staff. Monitoring will consist of visiting the site after high intensity thunderstorms and/or after spring run off to ensure the replacements culverts are functioning as designed. In addition, photos will be taken during the site visits and a photo log will be established.

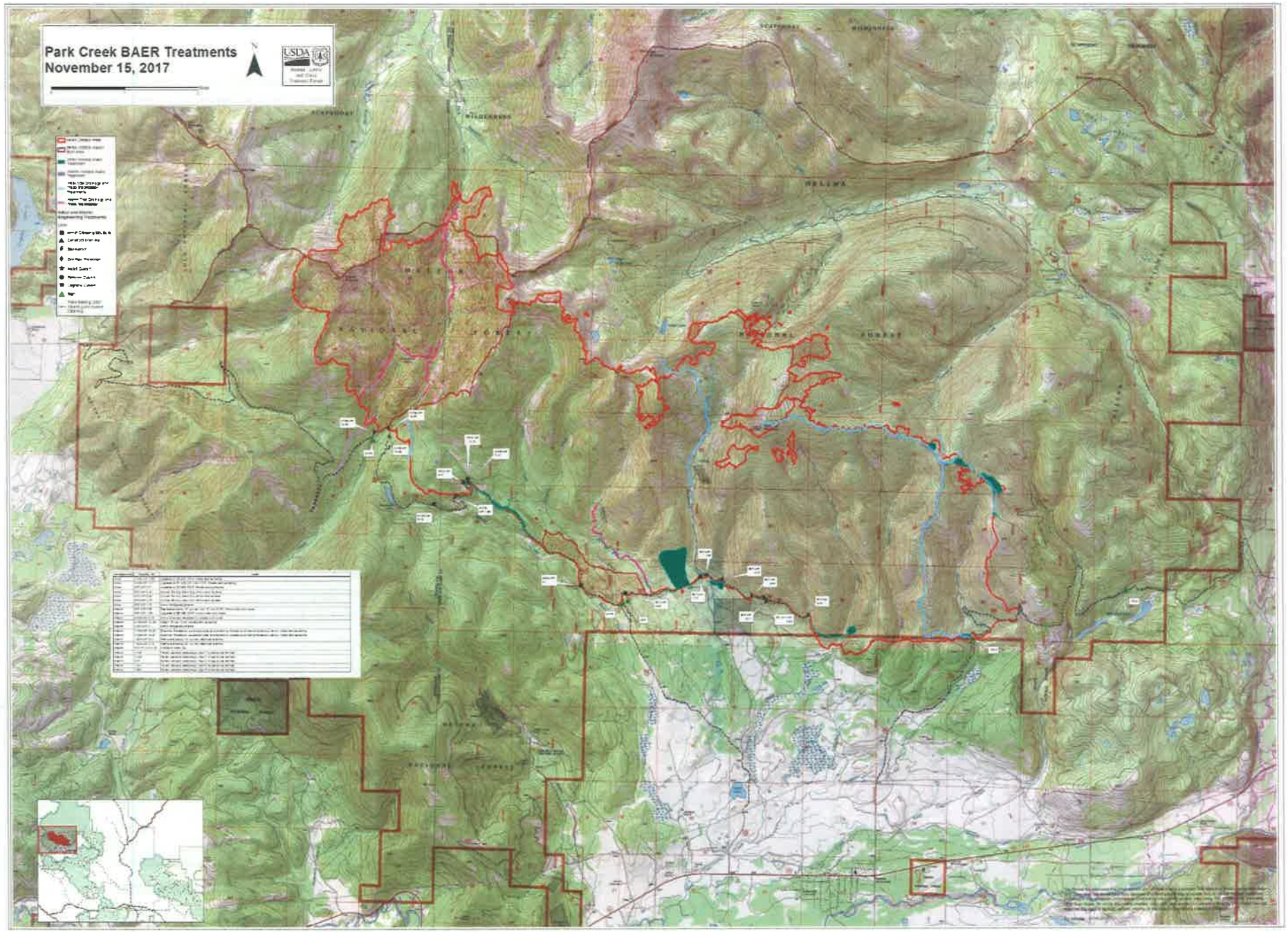
Trail Drainage Reconstruction: The drainage improvements will be inspected throughout the year after implementation to monitor the effectiveness of water run-off and the trail drainage condition.

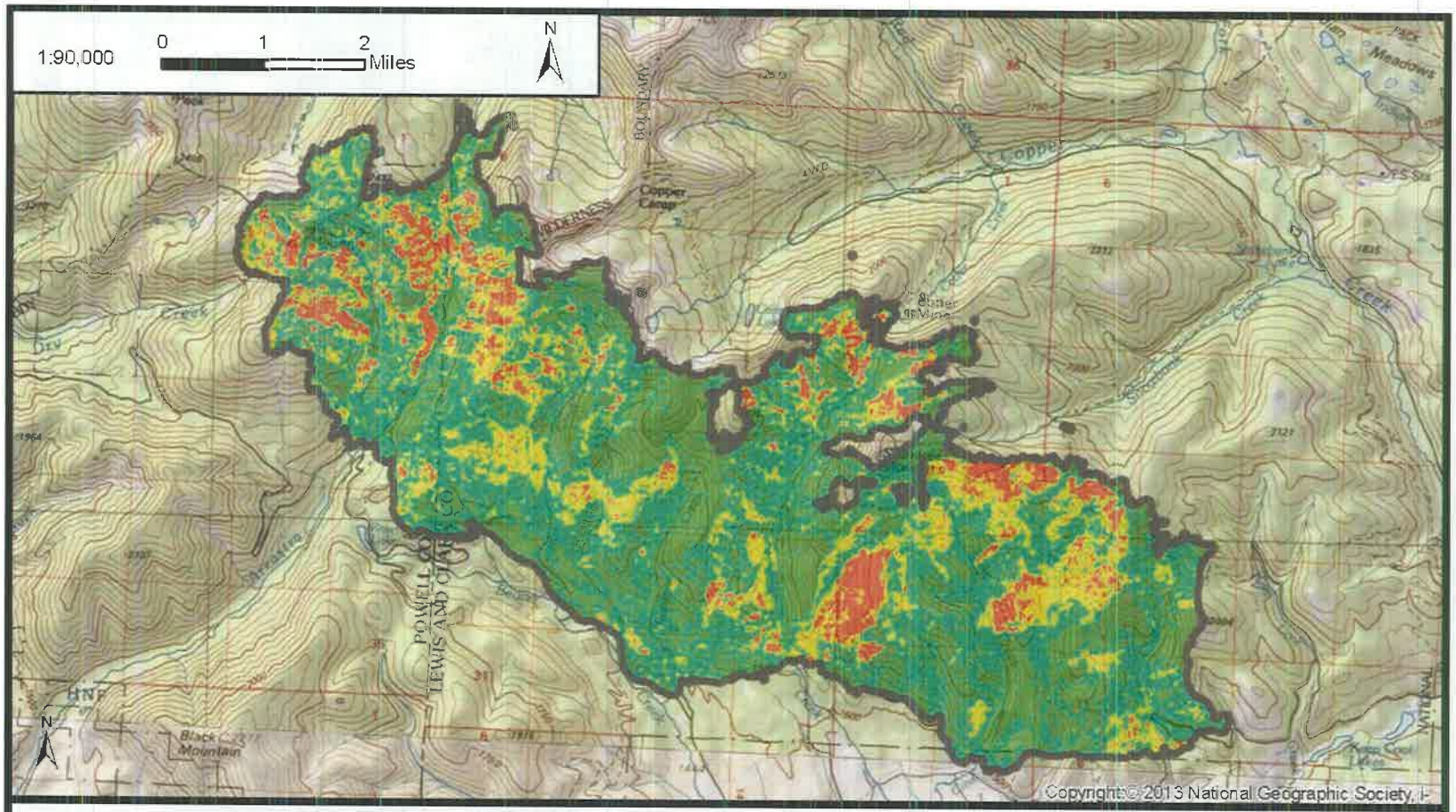
Warning Signs: District and SO personnel will monitor or check signs after events to ensure that they will be effective for the future.

Cultural Resource Protection: At least two times during the following field season, sites need to be monitored by an archaeologist to determine treatment effectiveness and document any change in site condition. Monitoring will also be used to determine if additional management action is required to protect these sites.

Storm Inspection and Response: Monitor the storm-patrol response time to ensure objectives are being met. Identify the type of storm event that mobilizes material.

Implementation Coordination: Forest BAER Coordinator will file annual accomplishment report.


Park Creek BAER Treatments
November 15, 2017
USDA



SOIL BURN SEVERITY

2017 PARK CREEK FIRE

BURNED AREA EMERGENCY RESPONSE (BAER)

Helena-Lewis and Clark National Forest

SOIL BURN SEVERITY ACRES				
High	Moderate	Low	Unburned-Very Low	Total
1,392	3,993	6,969	5,622	17,975

BAER USDA

PART VI – EMERGENCY STABILIZATION TREATMENTS AND SOURCE OF FUNDS

			NFS Lands			Other Lands				All
Line Items	Units	Unit Cost	# of Units	BAER $	Other $	# of units	Fed $	# of Units	Non Fed $	Total $
A. Land Treatments										
Weed treatment & assessment	*acre*	*99*	*270*	*$26,627*						$26,627
Weeds treatment - new acres	*acre*	*55*	*13*	*$715*						$715
Weeds treatment - adjusted costs	*acre*	*15*	*270*	*$4,128*						$4,128
Heritage site erosion control	*site*	*1236*	*1*	*$1,236*						$1,236
Subtotal Land Treatments				*$32,706*	$0		$0		$0	*$32,706*
B. Channel Treatments				*$0*						
Subtotal Channel Treat.				*$0*	$0		$0		$0	$0
C. Road and Trails										
Culvert upgrade along road 4106	*each*	*12,560*	*1*	*$12,560*						$12,560
Culvert upgrade along road 4106	*each*	*9,780*	*1*	*$9,780*						$9,780
Culvert upgrade along road 607	*each*	*10,760*	*1*	*$10,760*						$10,760
Design, contract prep. and admin.	*each*	*2,983*	*3*	*$8,950*						$8,950
Armored Critical Dip for culverts along road 607	*each*	*4,000*	*3*	*$12,000*						$12,000
Riprap to armor bridge along road 607	*each*	*150*	*40*	*$6,000*						$6,000
Spot treatment of trail drainage features and improve surface erosion control	*mile*	*825*	*9.1*	*$7,508*						$7,508
Restore non functioning drain structures	*each*	*68*	*129*	*$8,772*						$8,772
Replace damaged trail drainge structures	*each*	*112*	*65*	*$7,280*						$7,280
Additional drain structures and crib repair	*each*	*166*	*71*	*$11,786*						$11,786
Extended trail surface erosion control improvement	*mile*	*5,200*	*0.46*	*$2,392*						$2,392
Culvert replacement	*each*	*7,782*	*1*	*$7,782*						$7,782
Culvert removals	*each*	*4,207*	*2*	*$8,414*						$8,414
Road drainage reconstruction (includes bridge armoring and culvert overflow protection)	*miles*	*6,377*	*9*	*$57,396*						$57,396
Trail drainage restoration	*miles*	*3,331*	*3.5*	*$11,658*						$11,658
Subtotal Road & Trails				$183,037	$0		$0		$0	$183,037
D. Protection/Safety										
Hazard tree removal roads and trails	*mile*	*1,000*	*7*	*$7,000*						$7,000
Road Warning Signs	*each*	*100*	*6*	*$600*						$600
Road Warning/Safety Signs	*each*	*318*	*5*	*$3,186*						$3,186
Trail hazard tree removal	*miles*	*1,000*	*1*	*$1,000*						$1,000
Storm inspection and response	*days*	*3,880*	*5*	*$14,320*						$14,320
Subtotal Structures				$26,106	$0		$0		$0	$26,106
E. BAER Evaluation										
Initial Assessment	lump				$18,000		$0		$0	$0
Interim Assessment	lump				$15,000					
Implementation Coordination and Consultation	*lump*			*$21,300*						$21,300
Subtotal Evaluation				$21,300	$33,000		$0		$0	$21,300
F. Monitoring										
Trail treatment effectiveness	*day*	*250*	*2*	*$500*						$500
Road treatment effectiveness	*day*	*385*	*2*	*$770*						$770
Weed monitoring one year		*300*	*5*	*$1,500*						$1,500
Heritage treatment effectiveness	*day*	*450*	*1*	*$450*						$450
Subtotal Monitoring				$3,220	$0		$0		$0	$3,220
G. Totals				$266,370	$33,000		**$0**		**$0**	**$266,370**
Previously approved				$134,785						
Total for this request				**$131,585**						

Total approved in Initial Request: $134,785

Total requested in Interim #1 Request: $131,585

PART VII – APPROVALS

1. _____ 11/17/2017 /2017
Forest Supervisor Date

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

APPENDIX A. INITIAL PARK CREEK BAER REPORT: CRITICAL VALUES AT RISK NARRATIVE

Road and Stream Crossing Infrastructure:
Reduced canopy interception and transpiration, increased extent and magnitude of soil water repellency, and lack of ground cover are anticipated to increase runoff and erosion compared to pre-fire conditions. Streams in and downstream of the burned area are likely to generate higher stormflows in the first few years following the fire, potentially exacerbated by debris bulking. This combination of increased runoff and greater susceptibility to erosion threatens transportation infrastructure, including roads and stream crossings. The greatest threat is from summer thunderstorms that may occur.

Transportation infrastructure was assessed within and adjacent to the fire perimeter by BAER personnel to determine the probability of damage or loss and associated magnitude of consequences. Road drainage was assessed both through field reconnaissance in tandem with anticipated soil erosion (in part informed by ERMiT and hydrologic modeling).

Following is a brief description resulting from on the ground surveys of the system roads with resource condition resulting from the fire:

a. Road 4106: This maintenance level (ML) 4 road is the main access to the Arrastra Creek trailhead and is a key segment providing connectivity to other arterial Forest System roads. Portions of this road are located below hillslopes burned at moderate and high burn severity, and there are several culverts that have some risk of failure due to increased flows.

b. Road 607: This ML 3 road provides access to the Stonewall road and Stonewall trailhead, and has experienced recent treatment associated with SWCC. While the majority of its length does not provide connectivity to the larger forest system, it is a key route for administrative access and is the only FS road that provides direct access to the Park Creek drainage. Portions of this road are located below moderate burn severity, and there are several culverts that have some risk of failing due to increased flow in a water-quality limited watershed.

Risk Assessment – Threats to Forest Service roads and associated structures
Probablity of Damage or Loss: Likely – High potential of failure of road drainage due to post-fire flows.
Magnitude of Consequence: Moderate– Loss of FS infastructure
Risk Level: High

Trails:
Four Forest Service system trails have fall within the Park Creek and Arrastra Creek Fire perimeter on the Lincoln Ranger District. These include both motorized and non-motorized access trails. Trail use ranges from light to heavy, and typically occurs between May and mid to late November. Trails are already susceptible to erosion due to thin soils, exposed ridgeline or sideslope position, and steep slopes; however the erosion potential becomes severe when coupled with the effects of wildland fire. Pre-fire trail conditions within the fire perimeter ranged from fair to excellent, with annual maintenance occurring on most trails, and recent significant improvements on some. Post-fire conditions resulted in partially consumed crib walls, burn-out beneath trail tread from stump and root holes, and damaged drainage structures. Trail incision and complete loss of trail tread could occur resulting in loss of infrastructure possibly leading to significant repairs and costs to restore sections of trail. Loss of trail drainage may lead to off-trail slope erosion and gully formation.

Risk Assessment – Threats to Forest Service trails and associated structures
Probablity of Damage or Loss: Likely – High potential for erosion of surface tread and sediment delivery to streams. Soil deposition on trail surfaces from adjacent hillslopes may also occur.
Magnitude of Consequence: Major – Portions of Trail #418 are located on a hillslope that has experienced high severity burn and has a high likelihood of trail tread damage.
Risk Level: High

Water quality and stream crossings:

Due to fire effects, watersheds within the Park Creek Fire burn perimeter are likely to generate higher stormflows in the first few years following the fire. Larger flow events in part are a function of increased surface runoff from bare hillslopes. Furthermore, burned and exposed soils are more susceptible to erosion, entrainment and transport to stream channels. This combination of increased runoff and greater susceptibility to erosion threatens transportation infrastructure. Fourteen crossings were evaluated for flow capacity in order to determine their adequacy to convey post-fire design storm flow events. Under post-fire conditions, model outputs suggest that virtually every one of these drainages may see an increase in post-fire runoff, which in some cases may overwhelm crossing capacity and overtop roads, leading to washout. Runoff estimates are included in Appendix C for reference.

Risk Assessment – Threats to water quality and stream crossings
Probablity of Damage or Loss: Likely – projected post-fire design flows exceed capacity for many crossings
Magnitude of Consequence: Major – Road washout in the event of high flows would eliminate the functionality and safety of the stream crossing and contribute to downstream sediment loads
Risk Level: High

Fisheries:
The Park Creek Fire encompasses two 6th code HUCs: Beaver Creek and Keep Cool Creek. Small portions of the Arrastra Creek and Copper Creek HUCs are also within the fire perimeter. Additionally, the Blackfood River, which is designated as critical bull trout habitat, has the potential to be affected in the downstream Hambug Creek HUC even though it is outside the fire perimeter boundary. The 18 miles of perennial stream and 19.8 miles of intermittent stream within the fire perimeter support (in order of largest distribution to smallest): Westslope cutthroat trout (Management indicator species), Bull trout (ESA listed species), and non-native Brook trout.

Beaver Creek is currently functioning at risk. Sediment levels in spawning gravels for streams in this HUC tend to be near reference conditions or slightly elevated above reference levels. Streams within the Beaver Creek watershed is known occupied Bull trout habitat, with low densities in the lower reaches of Theodore and Klondike Creek. Connectivity between these reaches, and within the broader Blackfoot core population, is low, placing these populations of Bull trout at risk of extirpation due to natural or man caused disturbances that increase temperatures and sediment levels.

Streams in the Keep Cool Creek watershed are also considered functioning at risk. The only salmonid supported by this HUC within the fire perimeter is Westslope cutthroat trout. Brook troute are present downstream of forest lands. Sediment levels in spawning gravels are near reference conditions in Stonewall Creek, but are substantially elevated above regional reference levels in other streams. There is high likelihood of reduced survival of incubating eggs and fry even under pre-fire conditions, making them vulnerable to increased mortality post fire.

Elevated potential for road/stream crossing failur, overwhelmed transporation system drainage, and exacerbated hillslope erosion potential may all contribute to elevated in-channel sediment loads. Crossing upgrades associated with infrastructure protection will provide additional benefit to fisheries through reduced sediment delivery to streams. No further treatments are recommended at this time.

Risk Assessment – Threats to ESA and MIS fish communities due post-fire erosion events.
Probability of Damage or Loss: Very Likely - The probability of increased fine sediment or post fire debris flows reaching fish bearing streams and adversely affecting habitat or directly impacting native fish is likely
Magnitude of Consequence: Major – Damage to critical ESA fisheries resources resulting in considerable or long term effects.
Risk Level: Very High

Native vegetation:
Native vegetation communities and soil productivity are at risk from rapid expansion of noxious weeds from existing populations in the burned area. Recent weed inventories conducted within and around the Park Creek fire perimeter identified 270 acres of weed infestations. Inventories have found spotted knapweed, Canada thistle, musk thistle, bull thistle, common mullen, black henbane, oxeye daisy, and houndstongue

within the burned area. During the BAER team evaluation, noxious weed populations were found infesting direct roadsides on 84.5 miles of forest roads, 2.5 miles of trail, and 0.6 miles of dozer line associated with suppression activities.

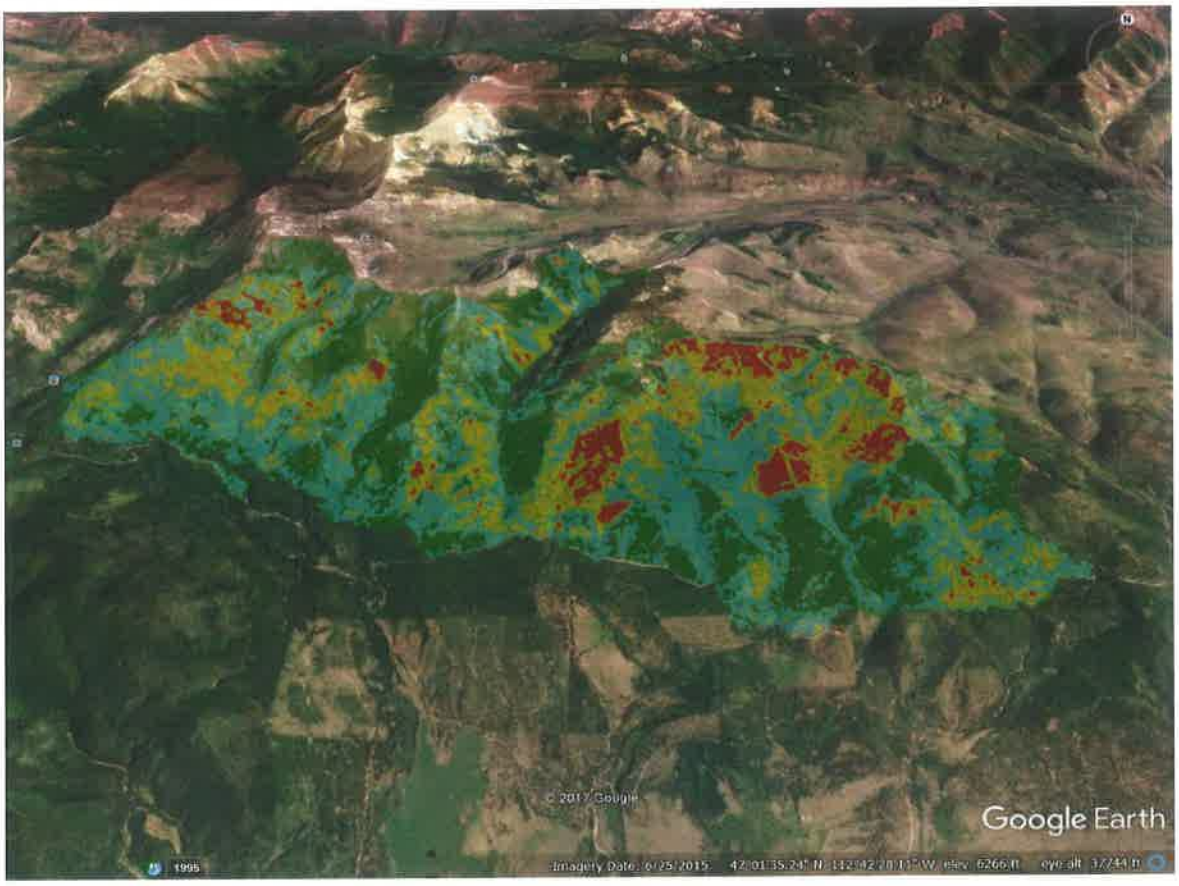
The fire area and dozer lines adjacent to the fire have the following habitats; Idaho fescue/Bluebunch wheatgrass, Douglas fir/pine grass, Douglas fir/snowberry, Big Sagebrush/Idaho fescue, and limber pine /elk sedge. These habitats are all highly susceptible to weed invasion. In addition wetter habitats, such as the drainage bottoms, that have greatly reduced tree canopies as a result of disturbance are also much more susceptible to invasive weeds. High and moderate fire severity can cause an area to be susceptible to weed invasion. The acres of moderate to high severity in these habitat types are estimated to be 3,812 acres. In addition, multiple drop points (DP) have been created throughout the Park Creek incident. DP's 3, 7, 9, 10, 20, and 21 intersect with pre-existing weed infestations. These drop points are highly susceptible locations for the expansion of already established weed infestations. There are approximately 10 acres of noxious weeds within the listed drop points.

Risk Assessment – Threats to native plant communities due to the establishment or spread of noxious weeds.
Probability of Damage or Loss: Likely - Based on moderate and high burn severity, proximity to known weed infestations, and main vector corridors
Magnitude of Consequence: Major – Loss of native plant communities and spread of noxious weeds.
Risk Level: High

Soils:
Soils in the Park Creek fire area are characterized by extremely gravelly silt loam, extremely channery loam, and very cobbly lay loam soil textures. Soils are derived from metasedimentary rock and glacial till. The estimates of soil burn severity across the Park Creek fire in acres are: 653 high (5 %), 3153 moderate (24 %), 5108 low (40 %), and 3936 unburned (31 %).

Burned Area Reflectance Classification imagery was field verified and combined with soil erosion rating hazards to determine post-fire erosion risk for the fire. The following map shows the post-fire soil burn severity across the burn perimeter.

Areas of high Soil Burn Severity (SBS) were infrequent. Areas of moderate SBS were characterized based on the following properties: Heat-altered soil structure, non-viable roots, ash present where soil litter was present pre-fire) and strong/deep hydrophobicity being common. Areas of low SBS were characterized by: intact native soil structure; flexible, viable roots; litter only being charred or partially consumed; and heterogeneous patches of moderate hydrophobicity at the soil surface.



Risk Assessment – Threats to loss of site productivity through post-fire erosion, weed invasion,and altered soil community structure.
Probability of Damage or Loss: Likely – Thirty percent of the area is impacted by moderate severity fire.
Magnitude of Consequence: Moderate – Loss of soil productivity in the Park Fire area.
Risk Level: High

Heritage:
Heritage designees were unable to conduct field visits to sites in time for the initial assessment. File and map searches were conducted to identify known heritage sites and culturally sensitive areas within or near the burn area on NFS system lands, and are discussed here to represent potential heritage concerns. Subsequent field assessment will as a part of an interim report to determine risk to individual sites and assess treatment options.

Four sites (24LC2306, 24LC2309, 24LC2310, and 24LC2314) are within the burn area or immediately adjacent to it and may be at very high risk. These four sites need to be visited by a heritage designee see if any erosion control measures are necessary, and if so, to monitor the implementation of those measures.

Portions of the Lincoln Ditch (24LC0244/24PW0062) overlap into the burn area and are in a downstream floodplain that has a risk of flooding. This ditch needs to be visited by a heritage designee to see if any repairs or erosion control measures are necessary, and if so, to monitor the implementation of those repairs and measures.

One prehistoric site (24LC0425) may be at intermediate risk from post fire erosion as it is in the downstream floodplain of Beaver Creek. The site needs to be visited by a heritage designee in conjunction with a hydrologist to see if any erosion control measures are necessary, and if so, to monitor the implementation of those measures. Any future treatment and monitoring fund request will be included in an Interim BAER Report.

Risk Assessment – Threats to historical and cultural resources within the fire area.

Probability of Damage or Loss: To be determined - Based on moderate and high burn severity and proximity to known the burn area and threats from erosion or deposition, initial assessment suggest damage to some sites is very likely.
Magnitude of Consequence: – Major-Portions of the sites and artifacts would be lost
Risk Level: Very High (pending field assessment)

Summary Risk Matrix Table

Probability of Damage or Loss	Magnitude of Consequences		
	Major	Moderate	Minor
	RISK		
Very Likely	Very High **Heritage (to be verified)**	Very High **Fisheries**	Low
Likely	Very High **Trails, Weeds, Road/Stream Crossings**	High **Roads (independent of stream crossings), Soil Productivity**	Low
Possible	High	Intermediate	Low
Unlikely	Intermediate	Low	Very Low