

Date of Report: 10/03/2016

Interim Report: 10/14/2016

**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: Copper King

B. Fire Number: MT-LNF-005092

C. State: MT

D. County: Sanders

E. Region: Northern (01)

F. Forest: Lolo (16)

G. District: Plains (05)

H. Fire Incident Job Code: P1KJ37 (0116)

I. Date Fire Started: July 31, 2016

J. Date Fire Contained: 80 % (as of 10/14/2016)

K. Suppression Cost: \$27,500,000

L. Fire Suppression Damages Repaired with Suppression Funds (as of 10/03/2016)

- 1. Handline rehabbed: 8 miles (of 8 miles constructed)
- 2. Dozer line rehabbed: 24 miles (of 24 miles constructed)
- 3. Opened Roads and Dozerline seeded: 72 miles (25 FS ownership, 47 DNRC ownership)

M. Watershed Numbers: 170102130406, 170102130305, 170102130304, 170102130508, 170102130512, 170102130407

N. Total Acres Burned: 28,511 (As of 9/26/2016)

NFS Acres 18,715(63%) State 1,360 (5%) Private 9,569 (32%)

O. VegetationTypes: Ridges primarily consist of mixed conifer including lodgepole, subalpine fir, and spruce, with occasional whitebark pine and are dominated by subalpine fir/beargrass (ABLA/XETE) and Douglas-fir/huckleberry-beargrass (PSME/VAGL-XETE) habitat types. North and east aspect hillslopes support primarily Douglas-fir, larch, lodgepole, and grand fir (ABGR/CLUN), and ponderosa pine/ Douglas fir with larch inclusions (PSME/PHMA). South facing slopes consist of open grown ponderosa pine and Douglas-fir with a primary habitat type of Douglas-fir/rough fescue (PSME/FESC). Valley bottoms support grand fir and western red cedar with a habitat type of western red cedar/queencup beadlily (THPL/CLUN).

P, Q. Dominant Soils and Geologic Type (Lolo National Forest Land Systems Inventory, 1988):

Landform	Slope Range (%)	Parent Material Group	Soil Family	Soil Surface Texture	Drainage
Stream Bottoms	1-10	Alluvium	Orthents/ Aquepts	Sandy loam	Well drained
Terraces	1-45	Alluvium	Ustochrepts	Silt loam	Well drained
Toeslopes/ Alluvial Fans	5-35	Valley fill deposits	Eutroboralfs	Silt loam to Sandy loam	Well drained
Rolling foothills	4-45	Alluvium	Xerothents/Udrothents	Sandy loam to Silt Loam	Well drained
Flood scoured footslopes	20-45	Weakly weathered metasedimentary rock	Udorthents/Ustochrepts	Silt loam to gravelly loam	Well drained
Stream breaklands	55-100	Undifferentiated metasedimentary rock	Ochrepts	Silty with ash over boulders	Excessively well drained
Moderate relief mountain slopes	35-55	Weakly weathered metasedimentary rock	Eutrochrepts	Silt to sandy loam	Well drained
Broadly convex ridges	10-35	Weakly weathered metasedimentary rock	Cryochrepts/Eutrochrepts	Silt loam to Sandy loam	Well drained
Glacial cirque headwalls	55-85	Metasedimentary rock	Cryandepts	<i>Mostly rock,</i> silt loam	Well-drained
Steep subalpine ridges	50-100	Metasedimentary rock	Cryochrepts/Cryanchrepts	Silt loam	Excessively drained
Glacial cirque bottoms	10-30	Metasedimentary rock	Cryocrepts	Cobbly silt loam	Poorly to well-drained
Basins	20-45	Metasedimentary rock	Cryandepts	Cobbly silt/sandy loam	Moderate to Well Drained
Glacial valley train	35-45	Glacial till	Cryandepts	Cobbly silt loam	Moderate to Well Drained

Landform	Slope Range (%)	Parent Material Group	Soil Family	Soil Surface Texture	Drainage
Glaciated mountain slopes	55-75	Metasedimentary rock	Cryochrepts	Rock outcrop/ gravelly loam	Excessively well drained
Stream breaklands	65-100	Weakly weathered metasedimentary rock	Eutrochrepts	Gravelly loam	Excessively well drained
Dissected stream breaklands	65-100	Weakly weathered metasedimentary rock	Eutrochrepts/ Xerochrepts	Gravelly silt loam	Well drained
Steep mountain slopes	55-74	Weakly weathered metasedimentary rock	Eutrochrepts	Gravelly silt loam	Excessively drained

R. Miles of Stream Channels by Order:

Stream Order	Length (Miles)
1	57.3
2	23.3
3	3.2
4	0.8
5	2.0
Total	86.6

S. Transportation System (NFS):

Trails: 8.1 miles (FS ownership) Roads: 192 miles (67 miles of cost-share)

**PART III - WATERSHED CONDITION**

**A Table 1. Copper King Fire Burned Area Reflectance Classification data.**

Burn Severity	Acres	Percent
High	8542	29.9
Moderate	8731	30.6
Low	8137	28.5
None	3099	10.8
<b>Total Fire Perimeter Acres</b>	<b>28,511</b>	
<b>Total NF Acres</b>	<b>18,715</b>	

B. Water-Repellent Soil (acres): ~12,908, soils in the area tend to be naturally hydrophobic when dry; hydrophobicity was attributed to fire effects in all of the high severity areas and south facing slopes within moderate severity areas.

C. Soil Erosion Hazard Rating (NF acres): 8433 (low); 5380 (moderate); 4903 (high)

D. Erosion Potential: 6.1 tons/acre \*\*

E. Sediment Potential: 5.0 tons/acre \*\*

\*\* Mean annual average for 10 years was used to estimate erosion and sediment potentials using Disturbed Wepp. Probability of erosion occurrence the first year following the Copper King fire is 80%, probability of sediment delivery is 90%.

#### **PART IV - HYDROLOGIC DESIGN FACTORS**

A. Estimated Vegetative Recovery Period, (years): 10

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

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

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

E. Design Storm Magnitude, (inches): 1.4 inches

F. Design Flow, (cubic feet / second/ square mile): 15 cfs/mi<sup>2</sup>\*

G. Estimated Reduction in Infiltration, (percent): 30

H. Adjusted Design Flow, (cfs per square mile): 57 cfs/mi<sup>2</sup>\*

\*The Bay State watershed is used as a representative watershed for design flow and adjusted design flow. The Q10 for undisturbed forest conditions is estimated using the Parret and Johnson equations for Western Montana. The Q10 for burned conditions is estimated using the Wildcat model.

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

**A. Critical Values/Resources and Threats:** The primary values at risk resulting from the Copper King Fire are: life and safety, transportation infrastructure (roads and culverts), trails, campgrounds, heritage sites, water quality, bull trout, and native vegetation communities. The primary threat to values at risk is from increased runoff which is expected to intensify in the first few years following the fire. Erosion will increase in the fire area as a result of amplified runoff and decreased infiltration rates. High intensity, short duration rainfall may result in mass wasting, flooding, and debris flows.

## Summary of BAER Risk Assessment

Forest Service Value at Risk	Probability of Loss	Magnitude of Consequences	BAER Risk
Roads (Property)	Very Likely	Moderate to Major	Intermediate to Very High (depending on location)
Trails and Recreation (Property)	Very Likely	Major	Very High
Forest Users (Life and Safety)	Possible	Major	High
TES fish habitat	Likely	Moderate	High
Invasive Species	Very Likely	Major	Very High
Cultural Resources	Very Likely	Major	Very High

**Human Life/Safety:** Threats to human life and safety exist within the fire perimeter due to increased risk of flooding, debris flow, mass wasting, falling rock, and falling trees. Area residents and forest users will be exposed to an increased risk of debris flow in valley bottoms and potential failure of water diversion infrastructure on roads and trails. Falling rock and trees will continue to be a threat in the fire area for all forest users. Notification, signage, and improvements to water diversion infrastructure will reduce the threat of injury or death.

An emergency exists for area residents and forest users. Probability of loss is possible, and consequences would be major resulting in a determination of high risk for human life and safety.

**Transportation Infrastructure:** 192 miles of Forest Service road is located within the fire perimeter. Of this 192 miles of road, 67 miles share cost, easements, or both with private and state ownership. Additional miles of undertermined roads are located on private (Weyerhaeuser) and state land within the fire perimeter. 40 miles of road has been identified as being at risk for damage and failure. Roads at risk are located in areas that burned with high to moderate severity and are located midslope or at the bottom of drainages. Roads identified include 9991 (ACM road), 875 (Calico Road), 894, 7572, 9987, 17335, 18393, 18808, 18812, and 18813. In these areas there is a very likely risk of road drainage function failing due to anticipated increased flow and sediment moving into established roadway drainage features. Current drainage features including catch basins, ditches, culverts, and surface dips are at risk of being overwhelmed by increased movement of sediment and debris. Culvert upgrades were limited to roads 9991, 875, 894, 7572, and 7575 because these roads are a critical part of the current transportation plan, are located in drainages that experienced high severity fire, and are proximal to bull trout critical habitat or cross perennial tributaries that drain directly into bull trout critical habitat. Roads 9987, 17335, 18393, 18808, 18812, and 18813 are planned for stormproofing and/or pulling culverts but were not planned for upgrade of culverts. These six roads were not considered critical for access, or are currently stored. Road 9991 is a major access road that runs along the Thompson River. It provides access to forest, state, and private land, and is a major thoroughfare connecting highway 200 with highway 2. The 875 and 894 roads provide the only access into the fire area and

receive frequent use from anglers, hunters, outfitters, and Forest Service recreation and fire crews. These two roads also access private and state land because ownership in the area is “checkerboard” in nature. The 875 road provides the only vehicle access to the Teepee-Springs roadless area which is frequently used by hunters, hikers, and backpackers. It also crosses the mainstem of both the Big Hole and Bay State drainages, which are perennial streams that drain directly into bull trout critical habitat. Increases in sediment in these tributaries could have negative effects on bull trout and other fish species (see water quality section). Roads 7572 and 7575 both access sections of FS property that are surrounded by private and state ownership and are otherwise inaccessible for management activities. Road 7572 crosses the mainstem of Calico Creek, which is also a tributary to the Thompson River. Proposed treatments to reduce risks include:

- Culvert removal or replacement for those that are undersized for anticipated flows (for specific culvert and road information refer to the “Copper King BAER Culverts” spreadsheet)
  - Upsizing of 8 perennial stream crossing culverts located on major cost-share roads that access Forest Service, state, and private land. In addition, these culverts are located in 3 perennial tributaries to the Thompson River which is considered important habitat for multiple fish species including bull trout (see “water quality” section below for more detailed information). All three of these drainages (Calico, Bay State, and Big Hole) experienced high burn severity through a majority of the drainage. Post-fire flows are expected to increase substantially in these drainages as a result (see culvert spreadsheet and hydrology report for specific modeled flow information).
  - Upsizing of 6 culverts located in major intermittent draws along cost-share roads that access Forest Service, state, and private land. Culverts are located in major draws in the Calico, Bay State, and Big hole drainages.
  - Upsizing of 8 culverts in minor draws on Forest Service and cost-share roads.
  - Removal of culverts or fill in 12 draws on roads that do not access mixed ownership lands.
- Road treatments for 40 miles of road to include stormproofing and drainage maintenance
- Administrative closures
- Warning signs

Land ownership within the fire perimeter is “checkerboard” in nature, and many of the roads identified at risk access lands with state or private ownership. In addition to providing access for management purposes, the transportation system provides access for day hikers, backpackers, anglers, horseback riders, hunters, outfitters and Forest Service recreation and fire crews. These roads also provide the only vehicle access to the Teepee-Spring Creek roadless area. Failure of current road drainage structures could result in major damage to road structure and allow uncontrolled water to divert, potentially impacting life and property, access, adjacent water quality, soil productivity, and recreation infrastructure.

An emergency was determined for roads because of potential impacts to human life, safety, property and natural resources. The probability of loss overall is very likely and the magnitude of consequences is high, resulting in a determination of very high risk.

### **Recreation Resources**

**Trails:** Approximately 8 miles of trail within the fire perimeter are located within moderate and

high burn severity areas. This includes 4.5 miles of the Bay State trail (#1268) and 3.6 miles of the West Koo-Koo-Sint trail (#445). The Bay State trail is part of a larger system of trails and provides access to the Big Hole Lookout, a forest service proposed rental property which has no road access. The Koo-Koo-Sint trail provides access to a roadless area utilized by bighorn sheep hunters and recreationists. On both trails drainage features were damaged by high intensity fire and will not support increased runoff, which will likely result in damage to trail structure and increased soil erosion. The Bay State trail is directly adjacent to a perennial stream that is a tributary to the Thompson River. Failures in trail drainage have the potential to increase sedimentation into adjacent streams and damage fisheries habitat. Increase in flows associated with the fire effects will cause trail rilling and erosion, as well as trail tread failures. In addition to the resource degradation, the trails are likely to become difficult or dangerous for travel, or in some cases impassable due to failures and hazard trees.

**Campgrounds:** The Copper King campground and Clark Memorial campgrounds are located adjacent to the west perimeter of the fire along the Thompson River. Both campgrounds are located in the river corridor and at risk for flooding and debris flow that could threaten infrastructure, human life, and safety. It is recommended that the campgrounds remain closed during the spring until the risk of high intensity rains and snowmelt has subsided. Campers should be notified of risk prior to expected high intensity rain events when the campground is open.

An emergency for recreation was determined for human life, safety, and property. The probability of loss overall is very likely and the magnitude of consequences is high, resulting in a determination of very high risk.

**Water quality:** Increased sediment and nutrient yield will occur from portions of watersheds that burned at moderate or greater severity. Major portions of the Calico, Bay State, and Big Hole drainages experienced moderate to high soil burn severities, and are at risk for increased post-fire flows and sedimentation. These drainages are major tributaries to the Thompson River. The mainstem Thompson River provides a key recreational fishery for Northwest Montana with over 10,000 angler days fished in 2009 (MFWP, MFISH waterbody report). Recreational species include westslope cutthroat trout, rainbow trout, and brown trout. Rainbow and brown trout are known to spawn downstream of the 9991 road (ACM) culverts. Additional sediment resulting from these culverts failing and depositing directly into the Thompson River could greatly impact redd success, especially with rainbows during the spring. In addition to the recreational fishery importance Thompson River is designated foraging, migrating, and overwintering (FMO) critical habitat for bull trout. Culvert failures would create large pulse events of sediment that would displace adult bull trout for a short period of time. Greater impacts would occur to smaller juvenile outmigrating bull trout that are found to utilize the mainstem habitat from the late summer through spring high flows. Recent graduate student work in the Thompson River drainage has pointed out the importance of the mainstem where both adult bull trout and outmigrating juveniles are spending considerable time (J. Glaid personal communication). Culvert failures would add sediment to a system already not properly functioning, and would likely impact invertebrate survival and outmigrating juveniles within ½ mile of any failures. Recommendations from Lolo National Forest fish biologists include actions to control sediment delivery from roads and trails that are adjacent to any of the above mentioned creek segments.

An emergency for water quality was determined for fisheries habitat. The probability of loss is likely and the magnitude of consequences is moderate, resulting in a determination of high risk.

**Native vegetation:** Native vegetation communities and soil productivity are at risk from rapid expansion of noxious weeds from existing populations in the burn area vicinity. Road inventories prior to the Copper King Fire indicated the presence of spotted knapweed, St. Johnswort, yellow hawkweed complex, oxeye daisy, and common tansy. Populations were limited to road corridors and were not found on undisturbed areas above or below roads. Areas with high and moderate burn severity have altered soil structure and reduced organic matter content creating a more favorable germination substrate for weed seeds. It is likely that these weeds that were limited to the road corridor before the fire, will now spread to slopes above and below the road. Weed infestation in the fire area has the potential to decrease soil cover and native vegetation, which would increase erosion and limit soil productivity. Of the 192 miles of Forest Service road within the fire perimeter, 94 miles within moderate and high burn intensity areas was identified for weed treatment.

An emergency for recovery of native vegetation was determined due to threats from noxious weed establishment. The probability of loss is very likely and the magnitude of consequences is major, resulting in a determination of very high risk.

**Cultural Resources:** Eight known heritage sites are located within or adjacent to the Copper King fire perimeter. The Forest Archaeologist assessed all sites except one, which was inaccessible due to fire activity. Of the seven sites visited during BAER assessments, one was found to be at risk from fire effects. The Silver King Mine (site 24SA0666) consists of four cabins, and two outbuildings. The buildings are at risk from fire injured trees that could fall on structures within the site. It is recommended that the damaged trees be cut to protect the site. It is unknown at this time if the inaccessible site was damaged by the fire. It is recommended that the site be monitored by an archaeologist to record status and determine if treatments are needed.

An emergency for the Silver King mine was determined due to the major damage that would occur to the site from falling trees. The probability of fire damaged trees falling on the site is very likely, resulting in a determination of very high risk.

**Non-FS Values at Risk:**

**Private Property:** Private property is located adjacent to the the fire perimeter along the Thompson River along the west flank of the fire, and adjacent to Highway 200 along the south flank of the fire. Most properties have structures located on them including private residences, several outbuildings, and guest ranches. Properties along the Thompson River are at risk of flooding from increased post fire flow and debris torrents. All of these properties are located well above the river corridor, and although flooding of these homes is possible it is unlikely. Houses along Highway 200, especially those located on alluvial fans at the base of drainages are at risk for debris flow and falling rock. Generally fire burn severity was low on the south flank of the fire and remained high on the ridge, so risk to these homes is low. Private commercial property (Weyerhaeuser) is found throughout the fire area. Road and water diversion infrastructure are at risk where this property has burned with high or moderate severity.

No emergency was determined for private property. Probability of loss is unlikely, however consequences to private property in the event that flooding occurs would be major.

**B. Emergency Treatment Objectives:**

As noted above, threats to forest users, transportation infrastructure (roads and culverts), trails and campgrounds, heritage sites, water quality, fisheries, and native vegetation communities exist as a result of the Copper King fire. These threats include: failure of road and trail drainage structures, increased sediment delivery, reduction of soil productivity, loss of aquatic species and habitat, damage to cultural resources, and spread of noxious weeds. For these reasons the primary treatment objectives are:

- Protect forest users through early notification, signage, and temporary and permanent administrative closures of roads, trails, and campgrounds.
- Mitigate effects under changed post-fire watershed response, particularly where forest roads and trails cross drainages or drainage features unlikely to support post-fire flows.
- Minimize the increased potential for the spread of invasive and noxious weeds.
- Mitigate potential damage to cultural resources and assess cultural sites that were inaccessible prior to fire containment in order to prevent irretrievable loss of archaeological information.
- Provide safe access to fire area for personnel implementing road, trail, and weed mitigations.
- Monitor implemented BAER treatments and existing infrastructure to determine effectiveness in post-fire flow conditions. Monitor weeds to determine effectiveness of BAER treatments and determine need for future treatments.

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

Land: 80 % Channel: N/A % Roads/Trails 75 % Protection/Safety 90

**D. Probability of Treatment Success**

Table 6. Treatment succession prediction

	Years after Treatment		
	1	3	5
Road/Trails	90	85	80
Channel	-	-	-
Land/Weeds	80	60	50
Protection/Safety	90	90	90

**E. Cost of No-Action (Including Loss): >2,456,800**

The majority of the roads within the fire perimeter are built on steep slopes and have been constructed using full bench construction techniques with large cut and fill slopes and significant drainage features. The average value of the roads and the cost of repairing the road segments without BAER treatment if damage, and loss of function occurs is approximately \$60,000 per mile (total cost \$2,400,000). The cost to implement all proposed BAER road treatments is approximately \$10,000 per mile.

The cost of repairing trail segments without BAER treatment if failures to drainage structures occur is approximately \$8,000 per mile (total cost \$56,800). Large sections of these trails navigate steep slopes and have extensive infrastructure that would have to be replaced if drainage failure occurs. Cost to implement proposed trail treatments is \$2,571 per mile.

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 was not quantified. Similarly the loss of cultural resources was not quantified, but likely exceeds the requested \$1595. The value of protecting Critical Bull Trout Habitat was considered but also not quantified.

Mitigation of potential loss of life or injury was also a consideration for many treatments including road and recreation treatments. This was an important driver in determining treatment needs, and while it is acknowledged that treatments will reduce hazards to life in the project area, it is impossible to factor this potential loss into the cost of no-action.

**F. Cost of Selected Alternative (Including Loss):** There remains a 25% chance that the proposed treatments for this initial work may not succeed. Total cost of the action alternative plus this 25% chance of failure (( $\$496,799 * 0.25$ ) + 496,799) is **\$620,998**.

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

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

**Team Leader:** Ann Hadlow, Lolo NF Soil Scientist

**Email:** ahadlow@fs.fed.us    **Phone:** (406) 822-3915

**H. Treatment Narrative:** The proposed treatments on National Forest System lands can help to reduce the impacts of the fire from storm events, but treatments cannot fully mitigate the effects of the fire on the watershed. Detailed information of the treatments summarized below can be found in the specialist reports prepared in support of this funding request. Hill slope treatments (such as hydromulching, aerial seeding, and straw application) were not proposed because they are infeasible and/or would not significantly reduce the probability of damage to assets. The treatments listed below are those that are considered to be the most effective on National Forest System lands to protect identified values at risk.

## Proposed Road Treatments

Treatment/Work Item	Treatment Narrative – Work Requirements - Rational
Culvert Removal/Fill Removal	12 culverts with deep fills will be removed to eliminate the substantial risk of culvert plugging, overtopping, breaching, and channel scour. The work will consist of fill removal, removing existing culverts, and re-creating the natural contour of the drainage. Excavated fill material will be placed in compacted lifts against existing road cut faces and existing roadside ditches rerouted around the base of compacted spoil slopes. A maximum 1.5:1 (horizontal:vertical) slope will be stabilized with large wood debris scattered horizontally in continuous rows. The slopes will then be seeded. The channel bottom will be stabilized by arranging bed material to create a step pool type channel. Weed-free straw bales will be countersunk and staked to provide sediment filtration between the channel and overlying earthen slopes. The resulting BAER treatments will leave the drainage channel unencumbered to handle post fire runoff events.
Minor Intermittent Draw Culvert Upsizing (less than 48" diameter)	8 minor intermittent draw culverts will be upsized to eliminate the substantial risk of culvert plugging, overtopping, and breaching. Upsizing the current culvert will allow it to handle post fire runoff events combined with a moderate amount of debris flow.
Major Intermittent Draw Culvert Upsizing (greater than 48" diameter)	6 major intermittent draw culverts will be upsized to eliminate the substantial risk of culvert plugging, overtopping, and breaching. Upsizing the current culvert will allow these areas to handle post fire runoff events combined with a moderate amount of debris flow.
Perennial Stream Crossing Culvert Upsize	Eight culvert perennial stream crossings will be replaced to eliminate the substantial risk of culvert plugging, overtopping, breaching, and channel scour. The work will consist of removing and replacing the existing culvert that will accommodate Q100 flows and also meet bankfull width of the existing channel. The proper soil erosion control measures will be taken during construction including diverting the stream around the construction site. The resulting BAER treatment will allow for Q100 flow conditions to handle post fire runoff events.
Road Storm-proofing/Drainage Maintenance	Road drainage and Storm proofing would be addressed by cleaning and shaping all road drainage features such as drain dips, culvert inlets and outlets, and ditch cleaning. Cross drainage or additional ditch relief may be necessary to handle the additional movement of water. Culvert removal, water bars, stream rehabilitation, seeding, and weed treatment would also be appropriate.
Hazard Signs	Two signs would be installed at major portals to the fire area to warn public of potential hazards resulting from fire effects.

**Proposed Weed Treatments:**

Treatment/Work Item	Treatment Narrative – Work Requirements - Rational
Herbicide Application	Ground treatments of spotted knapweed, St. Johnswort, Meadow Hawkweed, and oxeye daisy with herbicide will occur along 94 miles of road within the fire perimeter. Treatments will extend a minimum of 50 feet on each side of the road, for a total treatment area of approximately 450 acres.
Survey and Monitoring	Monitoring would be completed to determine success of treatments, determine need for future treatments, and inventory weed populations.

**Proposed Recreation Treatments:**

Treatment/Work Item	Treatment Narrative – Work Requirements - Rational
Drainage Structures	Drainage structures will be installed and repaired on 3.5 miles of the Bay State trail, and 3.6 miles of the Koo-Koo-Sint trail. Damaged water drainage structures will be repaired, additional drainage structures will be installed as necessary to manage expected increases in runoff.
Tread Storm proofing	Tread would be reshaped to facilitate drainage on 4.5 miles of the Bay State Trail and 2 miles of the Koo-Koo-Sint trail. Tread work includes stabilizing cut and fill surfaces, ditching, and reshaping tread to limit trail erosion from expected storm flows.
Hazard Tree Removal	Hazard trees will be removed to protect personnel during implementation of erosion control work.
Administrative Closures	Bay State and Koo-Koo-Sint trails will be closed until threats to human life are mitigated. Copper King and Clark Memorial Campgrounds will be closed in the spring until flooding risk from spring runoff and high intensity rain has dissipated.

**Proposed Cultural Resource Treatments:**

Treatment/Work Item	Treatment Narrative – Work Requirements - Rational
Site Protection	Fire damaged trees surrounding the Silver King Mine site (#24SA0666) that threaten historical structures will be removed. Trees will be felled by hand utilizing qualified sawyers.

**I. Monitoring Narrative:**

Monitoring of weeds will occur in 2017 to target areas where treatments were applied. Monitoring will be done to evaluate effectiveness of herbicide treatments and identify needs for additional weed treatments.

**Part VI – Emergency Stabilization Treatments and Source of Funds**

Line Items	Units	Cost	Units	BAER \$	\$
<b>A. Land Treatments</b>					
Herbicide-Ground Treatment	Acres	90	450	\$40,500	\$0
Weed Monitoring	Acres	5	450	\$2,250	
<i>Subtotal Land Treatments</i>				<b>\$42,750</b>	<b>\$0</b>
<b>B. Channel Treatments</b>					
<i>Subtotal Channel Treat.</i>				<b>\$0</b>	<b>\$0</b>
<b>C. Road and Trails</b>					
Road Stormproofing and Drainage Maintenance	Miles	2,030	40	\$81,200	\$0
Warning Signs	Each	300	2	\$600	\$0
Culvert Removal/ Fill Removal	Each	1,000	12	\$12,000	\$0
Minor Draw Culvert Upsize	Each	2,000	8	\$16,000	
Major Draw Culvert Upsize	Each	10,000	6	\$60,000	
Stream Crossing Culvert Upsize	Each	20,000	8	\$160,000	\$0
Contract Administration and Preparation	Days	360	70	\$25,200	
Contracting Officer	Days	430	10	\$4,300	
Storm Patrol Contract	Days	360	5	\$1,800	
Storm Patrol Hourly Equipment	Days	1,500	5	\$7,500	
Trail Tread Stormproofing	Miles	1,500	6.5	\$9,750	
Trail Hazard Tree Removal	Miles	300	8.1	\$2,430	
Trail Drainage Structures	Miles	771	7.1	\$5,474	
Trail Supply Costs	Lump	1,000	1	\$1,000	
<i>Subtotal Road &amp; Trails</i>				<b>\$387,254</b>	<b>\$0</b>
<b>D. Protection/Safety</b>					
Heritage Site Protection	Lump	950	1	950	
<i>Subtotal Structures</i>				<b>\$950</b>	<b>\$0</b>
<b>E. BAER Evaluation</b>					
Lump	Lump	24,487	1	\$26,795	\$0
<b>Interim Assessment</b>	Lump	927	1	\$927	
<i>Subtotal Evaluation</i>				<b>\$26,795</b>	<b>\$0</b>
<b>F. Monitoring</b>					
<i>Subtotal Monitoring</i>					<b>\$0</b>
G. Totals				<b>\$430,954</b>	<b>\$0</b>
Previously approved				<b>\$153,474</b> <b>(\$153,454)</b>	
<b>Total for this request</b>				<b>\$277,480</b> <b>(\$277,500)</b>	

**PART VII - APPROVALS**

1. \_\_\_\_\_  
Forest Supervisor

\_\_\_\_\_ Date

2. \_\_\_\_\_  
Regional Forester

\_\_\_\_\_ Date

Date of Report: 10/03/2016  
Interim Report: 10/14/2016

**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: Copper King
- B. Fire Number: MT-LNF-005092
- C. State: MT
- D. County: Sanders
- E. Region: Northern (01)
- F. Forest: Lolo (16)
- G. District: Plains (05)
- H. Fire Incident Job Code: P1KJ37 (0116)
- I. Date Fire Started: July 31, 2016
- J. Date Fire Contained: 80 % (as of 10/14/2016)
- K. Suppression Cost: \$27,500,000
- L. Fire Suppression Damages Repaired with Suppression Funds (as of 10/03/2016)
  - 1. Handline rehabbed: 8 miles (of 8 miles constructed)
  - 2. Dozer line rehabbed: 24 miles (of 24 miles constructed)
  - 3. Opened Roads and Dozerline seeded: 72 miles (25 FS ownership, 47 DNRC ownership)
- M. Watershed Numbers: 170102130406, 170102130305, 170102130304, 170102130508, 170102130512, 170102130407
- N. Total Acres Burned: 28,511 (As of 9/26/2016)  
 NFS Acres 18,715(63%) State 1,360 (5%) Private 9,569 (32%)

O. Vegetation Types: Ridges primarily consist of mixed conifer including lodgepole, subalpine fir, and spruce, with occasional whitebark pine and are dominated by subalpine fir/beargrass (ABLA/XETE) and Douglas-fir/huckleberry-beargrass (PSME/VAGL-XETE) habitat types. North and east aspect hillslopes support primarily Douglas-fir, larch, lodgepole, and grand fir (ABGR/CLUN), and ponderosa pine/ Douglas fir with larch inclusions (PSME/PHMA). South facing slopes consist of open grown ponderosa pine and Douglas-fir with a primary habitat type of Douglas-fir/rough fescue (PSME/FESC). Valley bottoms support grand fir and western red cedar with a habitat type of western red cedar/queencup beadlily (THPL/CLUN).

P, Q. Dominant Soils and Geologic Type (Lolo National Forest Land Systems Inventory, 1988):

Landform	Slope Range (%)	Parent Material Group	Soil Family	Soil Surface Texture	Drainage
Stream Bottoms	1-10	Alluvium	Orthents/ Aquepts	Sandy loam	Well drained
Terraces	1-45	Alluvium	Ustochrepts	Silt loam	Well drained
Toeslopes/ Alluvial Fans	5-35	Valley fill deposits	Eutroboralfs	Silt loam to Sandy loam	Well drained
Rolling foothills	4-45	Alluvium	Xerothents/Udrothents	Sandy loam to Silt Loam	Well drained
Flood scoured footslopes	20-45	Weakly weathered metasedimentary rock	Udorthents/Ustochrepts	Silt loam to gravelly loam	Well drained
Stream breaklands	55-100	Undifferentiated metasedimentary rock	Ochrepts	Silty with ash over boulders	Excessively well drained
Moderate relief mountain slopes	35-55	Weakly weathered metasedimentary rock	Eutrochrepts	Silt to sandy loam	Well drained
Broadly convex ridges	10-35	Weakly weathered metasedimentary rock	Cryochrepts/Eutrochrepts	Silt loam to Sandy loam	Well drained
Glacial cirque headwalls	55-85	Metasedimentary rock	Cryandepts	Mostly rock, silt loam	Well- drained
Steep subalpine ridges	50-100	Metasedimentary rock	Cryochrepts/Cryanchrepts	Silt loam	Excessively drained
Glacial cirque bottoms	10-30	Metasedimentary rock	Cryocrepts	Cobbly silt loam	Poorly to well-drained
Basins	20-45	Metasedimentary rock	Cryandepts	Cobbly silt/sandy loam	Moderate to Well Drained
Glacial valley train	35-45	Glacial till	Cryandepts	Cobbly silt loam	Moderate to Well Drained

Landform	Slope Range (%)	Parent Material Group	Soil Family	Soil Surface Texture	Drainage
Glaciated mountain slopes	55-75	Metasedimentary rock	Cryochrepts	Rock outcrop/ gravelly loam	Excessively well drained
Stream breaklands	65-100	Weakly weathered metasedimentary rock	Eutrochrepts	Gravelly loam	Excessively well drained
Dissected stream breaklands	65-100	Weakly weathered metasedimentary rock	Eutrochrepts/ Xerochrepts	Gravelly silt loam	Well drained
Steep mountain slopes	55-74	Weakly weathered metasedimentary rock	Eutrochrepts	Gravelly silt loam	Excessively drained

R. Miles of Stream Channels by Order:

Stream Order	Length (Miles)
1	57.3
2	23.3
3	3.2
4	0.8
5	2.0
Total	86.6

S. Transportation System (NFS):

Trails: 8.1 miles (FS ownership)    Roads: 192 miles (67 miles of cost-share)

**PART III - WATERSHED CONDITION**

**A Table 1. Copper King Fire Burned Area Reflectance Classification data.**

Burn Severity	Acres	Percent
High	8542	29.9
Moderate	8731	30.6
Low	8137	28.5
None	3099	10.8
<b>Total Fire Perimeter Acres</b>	<b>28,511</b>	
<b>Total NF Acres</b>	<b>18,715</b>	

B. Water-Repellent Soil (acres): ~12,908, soils in the area tend to be naturally hydrophobic when dry; hydrophobicity was attributed to fire effects in all of the high severity areas and south facing slopes within moderate severity areas.

C. Soil Erosion Hazard Rating (NF acres): 8433 (low); 5380 (moderate); 4903 (high)

D. Erosion Potential: 6.1 tons/acre \*\*

E. Sediment Potential: 5.0 tons/acre \*\*

\*\* Mean annual average for 10 years was used to estimate erosion and sediment potentials using Disturbed Wepp. Probability of erosion occurrence the first year following the Copper King fire is 80%, probability of sediment delivery is 90%.

#### PART IV - HYDROLOGIC DESIGN FACTORS

A. Estimated Vegetative Recovery Period, (years): 10

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

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

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

E. Design Storm Magnitude, (inches): 1.4 inches

F. Design Flow, (cubic feet / second/ square mile: 15 cfs/mi<sup>2</sup>\*

G. Estimated Reduction in Infiltration, (percent): 30

H. Adjusted Design Flow, (cfs per square mile): 57 cfs/mi<sup>2</sup>\*

\*The Bay State watershed is used as a representative watershed for design flow and adjusted design flow. The Q10 for undisturbed forest conditions is estimated using the Parret and Johnson equations for Western Montana. The Q10 for burned conditions is estimated using the Wildcat model.

#### PART V - SUMMARY OF ANALYSIS

A. **Critical Values/Resources and Threats:** The primary values at risk resulting from the Copper King Fire are: life and safety, transportation infrastructure (roads and culverts), trails, campgrounds, heritage sites, water quality, bull trout, and native vegetation communities. The primary threat to values at risk is from increased runoff which is expected to intensify in the first few years following the fire. Erosion will increase in the fire area as a result of amplified runoff and decreased infiltration rates. High intensity, short duration rainfall may result in mass wasting, flooding, and debris flows.

## Summary of BAER Risk Assessment

Forest Service Value at Risk	Probability of Loss	Magnitude of Consequences	BAER Risk
Roads (Property)	Very Likely	Moderate to Major	Intermediate to Very High (depending on location)
Trails and Recreation (Property)	Very Likely	Major	Very High
Forest Users (Life and Safety)	Possible	Major	High
TES fish habitat	Likely	Moderate	High
Invasive Species	Very Likely	Major	Very High
Cultural Resources	Very Likely	Major	Very High

**Human Life/Safety:** Threats to human life and safety exist within the fire perimeter due to increased risk of flooding, debris flow, mass wasting, falling rock, and falling trees. Area residents and forest users will be exposed to an increased risk of debris flow in valley bottoms and potential failure of water diversion infrastructure on roads and trails. Falling rock and trees will continue to be a threat in the fire area for all forest users. Notification, signage, and improvements to water diversion infrastructure will reduce the threat of injury or death.

An emergency exists for area residents and forest users. Probability of loss is possible, and consequences would be major resulting in a determination of high risk for human life and safety.

**Transportation Infrastructure:** 192 miles of Forest Service road is located within the fire perimeter. Of this 192 miles of road, 67 miles share cost, easements, or both with private and state ownership. Additional miles of underdetermined roads are located on private (Weyerhaeuser) and state land within the fire perimeter. 40 miles of road has been identified as being at risk for damage and failure. Roads at risk are located in areas that burned with high to moderate severity and are located midslope or at the bottom of drainages. Roads identified include 9991 (ACM road), 875 (Calico Road), 894, 7572, 9987, 17335, 18393, 18808, 18812, and 18813. In these areas there is a very likely risk of road drainage function failing due to anticipated increased flow and sediment moving into established roadway drainage features. Current drainage features including catch basins, ditches, culverts, and surface dips are at risk of being overwhelmed by increased movement of sediment and debris. Culvert upgrades were limited to roads 9991, 875, 894, 7572, and 7575 because these roads are a critical part of the current transportation plan, are located in drainages that experienced high severity fire, and are proximal to bull trout critical habitat or cross perennial tributaries that drain directly into bull trout critical habitat. Roads 9987, 17335, 18393, 18808, 18812, and 18813 are planned for stormproofing and/or pulling culverts but were not planned for upgrade of culverts. These six roads were not considered critical for access, or are currently stored. Road 9991 is a major access road that runs along the Thompson River. It provides access to forest, state, and private land, and is a major thoroughfare connecting highway 200 with highway 2. The 875 and 894 roads provide the only access into the fire area and

receive frequent use from anglers, hunters, outfitters, and Forest Service recreation and fire crews. These two roads also access private and state land because ownership in the area is "checkerboard" in nature. The 875 road provides the only vehicle access to the Teepee-Springs roadless area which is frequently used by hunters, hikers, and backpackers. It also crosses the mainstem of both the Big Hole and Bay State drainages, which are perennial streams that drain directly into bull trout critical habitat. Increases in sediment in these tributaries could have negative effects on bull trout and other fish species (see water quality section). Roads 7572 and 7575 both access sections of FS property that are surrounded by private and state ownership and are otherwise inaccessible for management activities. Road 7572 crosses the mainstem of Calico Creek, which is also a tributary to the Thompson River. Proposed treatments to reduce risks include:

- Culvert removal or replacement for those that are undersized for anticipated flows (for specific culvert and road information refer to the "Copper King BAER Culverts" spreadsheet)
  - Upsizing of 8 perennial stream crossing culverts located on major cost-share roads that access Forest Service, state, and private land. In addition, these culverts are located in 3 perennial tributaries to the Thompson River which is considered important habitat for multiple fish species including bull trout (see "water quality" section below for more detailed information). All three of these drainages (Calico, Bay State, and Big Hole) experienced high burn severity through a majority of the drainage. Post-fire flows are expected to increase substantially in these drainages as a result (see culvert spreadsheet and hydrology report for specific modeled flow information).
  - Upsizing of 6 culverts located in major intermittent draws along cost-share roads that access Forest Service, state, and private land. Culverts are located in major draws in the Calico, Bay State, and Big hole drainages.
  - Upsizing of 8 culverts in minor draws on Forest Service and cost-share roads.
  - Removal of culverts or fill in 12 draws on roads that do not access mixed ownership lands.
- Road treatments for 40 miles of road to include stormproofing and drainage maintenance
- Administrative closures
- Warning signs

Land ownership within the fire perimeter is "checkerboard" in nature, and many of the roads identified at risk access lands with state or private ownership. In addition to providing access for management purposes, the transportation system provides access for day hikers, backpackers, anglers, horseback riders, hunters, outfitters and Forest Service recreation and fire crews. These roads also provide the only vehicle access to the Teepee-Spring Creek roadless area. Failure of current road drainage structures could result in major damage to road structure and allow uncontrolled water to divert, potentially impacting life and property, access, adjacent water quality, soil productivity, and recreation infrastructure.

An emergency was determined for roads because of potential impacts to human life, safety, property and natural resources. The probability of loss overall is very likely and the magnitude of consequences is high, resulting in a determination of very high risk.

#### **Recreation Resources**

**Trails:** Approximately 8 miles of trail within the fire perimeter are located within moderate and

high burn severity areas. This includes 4.5 miles of the Bay State trail (#1268) and 3.6 miles of the West Koo-Koo-Sint trail (#445). The Bay State trail is part of a larger system of trails and provides access to the Big Hole Lookout, a forest service proposed rental property which has no road access. The Koo-Koo-Sint trail provides access to a roadless area utilized by bighorn sheep hunters and recreationists. On both trails drainage features were damaged by high intensity fire and will not support increased runoff, which will likely result in damage to trail structure and increased soil erosion. The Bay State trail is directly adjacent to a perennial stream that is a tributary to the Thompson River. Failures in trail drainage have the potential to increase sedimentation into adjacent streams and damage fisheries habitat. Increase in flows associated with the fire effects will cause trail rilling and erosion, as well as trail tread failures. In addition to the resource degradation, the trails are likely to become difficult or dangerous for travel, or in some cases impassable due to failures and hazard trees.

**Campgrounds:** The Copper King campground and Clark Memorial campgrounds are located adjacent to the west perimeter of the fire along the Thompson River. Both campgrounds are located in the river corridor and at risk for flooding and debris flow that could threaten infrastructure, human life, and safety. It is recommended that the campgrounds remain closed during the spring until the risk of high intensity rains and snowmelt has subsided. Campers should be notified of risk prior to expected high intensity rain events when the campground is open.

An emergency for recreation was determined for human life, safety, and property. The probability of loss overall is very likely and the magnitude of consequences is high, resulting in a determination of very high risk.

**Water quality:** Increased sediment and nutrient yield will occur from portions of watersheds that burned at moderate or greater severity. Major portions of the Calico, Bay State, and Big Hole drainages experienced moderate to high soil burn severities, and are at risk for increased post-fire flows and sedimentation. These drainages are major tributaries to the Thompson River. The mainstem Thompson River provides a key recreational fishery for Northwest Montana with over 10,000 angler days fished in 2009 (MFWP, MFISH waterbody report). Recreational species include westslope cutthroat trout, rainbow trout, and brown trout. Rainbow and brown trout are known to spawn downstream of the 9991 road (ACM) culverts. Additional sediment resulting from these culverts failing and depositing directly into the Thompson River could greatly impact redd success, especially with rainbows during the spring. In addition to the recreational fishery importance Thompson River is designated foraging, migrating, and overwintering (FMO) critical habitat for bull trout. Culvert failures would create large pulse events of sediment that would displace adult bull trout for a short period of time. Greater impacts would occur to smaller juvenile outmigrating bull trout that are found to utilize the mainstem habitat from the late summer through spring high flows. Recent graduate student work in the Thompson River drainage has pointed out the importance of the mainstem where both adult bull trout and outmigrating juveniles are spending considerable time (J. Glaid personal communication). Culvert failures would add sediment to a system already not properly functioning, and would likely impact invertebrate survival and outmigrating juveniles within ½ mile of any failures. Recommendations from Lolo National Forest fish biologists include actions to control sediment delivery from roads and trails that are adjacent to any of the above mentioned creek segments.

An emergency for water quality was determined for fisheries habitat. The probability of loss is likely and the magnitude of consequences is moderate, resulting in a determination of high risk.

**Native vegetation:** Native vegetation communities and soil productivity are at risk from rapid expansion of noxious weeds from existing populations in the burn area vicinity. Road inventories prior to the Copper King Fire indicated the presence of spotted knapweed, St. Johnswort, yellow hawkweed complex, oxeye daisy, and common tansy. Populations were limited to road corridors and were not found on undisturbed areas above or below roads. Areas with high and moderate burn severity have altered soil structure and reduced organic matter content creating a more favorable germination substrate for weed seeds. It is likely that these weeds that were limited to the road corridor before the fire, will now spread to slopes above and below the road. Weed infestation in the fire area has the potential to decrease soil cover and native vegetation, which would increase erosion and limit soil productivity. Of the 192 miles of Forest Service road within the fire perimeter, 94 miles within moderate and high burn intensity areas was identified for weed treatment.

An emergency for recovery of native vegetation was determined due to threats from noxious weed establishment. The probability of loss is very likely and the magnitude of consequences is major, resulting in a determination of very high risk.

**Cultural Resources:** Eight known heritage sites are located within or adjacent to the Copper King fire perimeter. The Forest Archaeologist assessed all sites except one, which was inaccessible due to fire activity. Of the seven sites visited during BAER assessments, one was found to be at risk from fire effects. The Silver King Mine (site 24SA0666) consists of four cabins, and two outbuildings. The buildings are at risk from fire injured trees that could fall on structures within the site. It is recommended that the damaged trees be cut to protect the site. It is unknown at this time if the inaccessible site was damaged by the fire. It is recommended that the site be monitored by an archaeologist to record status and determine if treatments are needed.

An emergency for the Silver King mine was determined due to the major damage that would occur to the site from falling trees. The probability of fire damaged trees falling on the site is very likely, resulting in a determination of very high risk.

**Non-FS Values at Risk:**

**Private Property:** Private property is located adjacent to the the fire perimeter along the Thompson River along the west flank of the fire, and adjacent to Highway 200 along the south flank of the fire. Most properties have structures located on them including private residences, several outbuildings, and guest ranches. Properties along the Thompson River are at risk of flooding from increased post fire flow and debris torrents. All of these properties are located well above the river corridor, and although flooding of these homes is possible it is unlikely. Houses along Highway 200, especially those located on alluvial fans at the base of drainages are at risk for debris flow and falling rock. Generally fire burn severity was low on the south flank of the fire and remained high on the ridge, so risk to these homes is low. Private commercial property (Weyerhaeuser) is found throughout the fire area. Road and water diversion infrastructure are at risk where this property has burned with high or moderate severity.

No emergency was determined for private property. Probability of loss is unlikely, however consequences to private property in the event that flooding occurs would be major.

## B. Emergency Treatment Objectives:

As noted above, threats to forest users, transportation infrastructure (roads and culverts), trails and campgrounds, heritage sites, water quality, fisheries, and native vegetation communities exist as a result of the Copper King fire. These threats include: failure of road and trail drainage structures, increased sediment delivery, reduction of soil productivity, loss of aquatic species and habitat, damage to cultural resources, and spread of noxious weeds. For these reasons the primary treatment objectives are:

- Protect forest users through early notification, signage, and temporary and permanent administrative closures of roads, trails, and campgrounds.
- Mitigate effects under changed post-fire watershed response, particularly where forest roads and trails cross drainages or drainage features unlikely to support post-fire flows.
- Minimize the increased potential for the spread of invasive and noxious weeds.
- Mitigate potential damage to cultural resources and assess cultural sites that were inaccessible prior to fire containment in order to prevent irretrievable loss of archaeological information.
- Provide safe access to fire area for personnel implementing road, trail, and weed mitigations.
- Monitor implemented BAER treatments and existing infrastructure to determine effectiveness in post-fire flow conditions. Monitor weeds to determine effectiveness of BAER treatments and determine need for future treatments.

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

Land: 80 % Channel: N/A % Roads/Trails 75 % Protection/Safety 90

## D. Probability of Treatment Success

Table 6. Treatment succession prediction

	Years after Treatment		
	1	3	5
Road/Trails	90	85	80
Channel	-	-	-
Land/Weeds	80	60	50
Protection/Safety	90	90	90

**E. Cost of No-Action (Including Loss): >2,456,800**

The majority of the roads within the fire perimeter are built on steep slopes and have been constructed using full bench construction techniques with large cut and fill slopes and significant drainage features. The average value of the roads and the cost of repairing the road segments without BAER treatment if damage, and loss of function occurs is approximately \$60,000 per mile (total cost \$2,400,000). The cost to implement all proposed BAER road treatments is approximately \$10,000 per mile.

The cost of repairing trail segments without BAER treatment if failures to drainage structures occur is approximately \$8,000 per mile (total cost \$56,800). Large sections of these trails navigate steep slopes and have extensive infrastructure that would have to be replaced if drainage failure occurs. Cost to implement proposed trail treatments is \$2,571 per mile.

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 was not quantified. Similarly the loss of cultural resources was not quantified, but likely exceeds the requested \$1595. The value of protecting Critical Bull Trout Habitat was considered but also not quantified.

Mitigation of potential loss of life or injury was also a consideration for many treatments including road and recreation treatments. This was an important driver in determining treatment needs, and while it is acknowledged that treatments will reduce hazards to life in the project area, it is impossible to factor this potential loss into the cost of no-action.

**F. Cost of Selected Alternative (Including Loss):** There remains a 25% chance that the proposed treatments for this initial work may not succeed. Total cost of the action alternative plus this 25% chance of failure (( $\$496,799 * 0.25$ )+ 496,799) is **\$620,998**.

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

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

**Team Leader:** Ann Hadlow, Lolo NF Soil Scientist

**Email:** ahadlow@fs.fed.us    **Phone:** (406) 822-3915

**H. Treatment Narrative:** The proposed treatments on National Forest System lands can help to reduce the impacts of the fire from storm events, but treatments cannot fully mitigate the effects of the fire on the watershed. Detailed information of the treatments summarized below can be found in the specialist reports prepared in support of this funding request. Hill slope treatments (such as hydromulching, aerial seeding, and straw application) were not proposed because they are infeasible and/or would not significantly reduce the probability of damage to assets. The treatments listed below are those that are considered to be the most effective on National Forest System lands to protect identified values at risk.

**Proposed Road Treatments**

<b>Treatment/Work Item</b>	<b>Treatment Narrative – Work Requirements - Rational</b>
Culvert Removal/Fill Removal	12 culverts with deep fills will be removed to eliminate the substantial risk of culvert plugging, overtopping, breaching, and channel scour. The work will consist of fill removal, removing existing culverts, and re-creating the natural contour of the drainage. Excavated fill material will be placed in compacted lifts against existing road cut faces and existing roadside ditches rerouted around the base of compacted spoil slopes. A maximum 1.5:1 (horizontal:vertical) slope will be stabilized with large wood debris scattered horizontally in continuous rows. The slopes will then be seeded. The channel bottom will be stabilized by arranging bed material to create a step pool type channel. Weed-free straw bales will be countersunk and staked to provide sediment filtration between the channel and overlying earthen slopes. The resulting BAER treatments will leave the drainage channel unencumbered to handle post fire runoff events.
Minor Intermittent Draw Culvert Upsizing (less than 48" diameter)	8 minor intermittent draw culverts will be upsized to eliminate the substantial risk of culvert plugging, overtopping, and breaching. Upsizing the current culvert will allow it to handle post fire runoff events combined with a moderate amount of debris flow.
Major Intermittent Draw Culvert Upsizing (greater than 48" diameter)	6 major intermittent draw culverts will be upsized to eliminate the substantial risk of culvert plugging, overtopping, and breaching. Upsizing the current culvert will allow these areas to handle post fire runoff events combined with a moderate amount of debris flow.
Perennial Stream Crossing Culvert Upsize	Eight culvert perennial stream crossings will be replaced to eliminate the substantial risk of culvert plugging, overtopping, breaching, and channel scour. The work will consist of removing and replacing the existing culvert that will accommodate Q100 flows and also meet bankfull width of the existing channel. The proper soil erosion control measures will be taken during construction including diverting the stream around the construction site. The resulting BAER treatment will allow for Q100 flow conditions to handle post fire runoff events.
Road Storm-proofing/Drainage Maintenance	Road drainage and Storm proofing would be addressed by cleaning and shaping all road drainage features such as drain dips, culvert inlets and outlets, and ditch cleaning. Cross drainage or additional ditch relief may be necessary to handle the additional movement of water. Culvert removal, water bars, stream rehabilitation, seeding, and weed treatment would also be appropriate.
Hazard Signs	Two signs would be installed at major portals to the fire area to warn public of potential hazards resulting from fire effects.

**Proposed Weed Treatments:**

Treatment/Work Item	Treatment Narrative – Work Requirements - Rational
Herbicide Application	Ground treatments of spotted knapweed, St. Johnswort, Meadow Hawkweed, and oxeye daisy with herbicide will occur along 94 miles of road within the fire perimeter. Treatments will extend a minimum of 50 feet on each side of the road, for a total treatment area of approximately 450 acres.
Survey and Monitoring	Monitoring would be completed to determine success of treatments, determine need for future treatments, and inventory weed populations.

**Proposed Recreation Treatments:**

Treatment/Work Item	Treatment Narrative – Work Requirements - Rational
Drainage Structures	Drainage structures will be installed and repaired on 3.5 miles of the Bay State trail, and 3.6 miles of the Koo-Koo-Sint trail. Damaged water drainage structures will be repaired, additional drainage structures will be installed as necessary to manage expected increases in runoff.
Tread Storm proofing	Tread would be reshaped to facilitate drainage on 4.5 miles of the Bay State Trail and 2 miles of the Koo-Koo-Sint trail. Tread work includes stabilizing cut and fill surfaces, ditching, and reshaping tread to limit trail erosion from expected storm flows.
Hazard Tree Removal	Hazard trees will be removed to protect personnel during implementation of erosion control work.
Administrative Closures	Bay State and Koo-Koo-Sint trails will be closed until threats to human life are mitigated. Copper King and Clark Memorial Campgrounds will be closed in the spring until flooding risk from spring runoff and high intensity rain has dissipated.

**Proposed Cultural Resource Treatments:**

Treatment/Work Item	Treatment Narrative – Work Requirements - Rational
Site Protection	Fire damaged trees surrounding the Silver King Mine site (#24SA0666) that threaten historical structures will be removed. Trees will be felled by hand utilizing qualified sawyers.

**I. Monitoring Narrative:**

Monitoring of weeds will occur in 2017 to target areas where treatments were applied. Monitoring will be done to evaluate effectiveness of herbicide treatments and identify needs for additional weed treatments.

Part VI – Emergency Stabilization Treatments and Source of Funds

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PART VII - APPROVALS

1.   
\_\_\_\_\_  
Forest Supervisor
- 10.24.16  
\_\_\_\_\_  
Date
2. \_\_\_\_\_  
Regional Forester
- \_\_\_\_\_  
Date