

**Date of Report and Type:** 12/4/2017 Initial**BURNED-AREA REPORT**

(Reference FSH 2509.13)

**PART I - TYPE OF REQUEST****A. Type of Report**

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

**B. Type of Action**

- ☒ 1. Initial Request (Best estimate of funds needed to complete eligible stabilization measures)
- ☐ 2. Interim Report # \_\_\_\_\_
- ☐ Updating the initial funding request based on more accurate site data or design analysis
- ☐ Status of accomplishments to date
- ☐ 3. Final Report (Following completion of work)

**PART II - BURNED-AREA DESCRIPTION****A. Fire Name:** Liberty**B. Fire Number:** MT-FHA-000105**C. State:** Montana**D. County:** Missoula**E. Region:**01 - Northern**F. Forest:**16 – Lolo**G. District:** Missoula and Seeley Lake**H. Fire Incident Job Code:**PAK5M8 (1502)**I. Date Fire Started:**07/15/2017**J. Date Fire Contained:**10/04/2017**K. Suppression Cost:**\$20,600,000**L. Fire Suppression Damages Repaired with Suppression Funds (estimates):**

1. **Dozer Fireline repaired** (miles): 42 (Non-FS)
2. **Excavator Fireline repaired** (miles): None reported to BAER team
3. **Other** (identify): 3.5 miles of handline, 8 drop points, 3 staging areas (Non-FS)

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

HUC #	Watershed Name	Total Acres	Acres Burned	% of Watershed Burned
170102031206	Belmont Creek	18,891	361	2%
170102031003	Boles Creek	12,719	5,250	41%
170102031303	Lower Gold Creek	11,632	1,390	12%
170102031002	Lower Placid Creek	21,648	868	4%
170102120701	S Fork Jocko River	15,007	4,039	27%

HUC #	Watershed Name	Total Acres	Acres Burned	% of Watershed Burned
170102031301	Upper Gold Creek	15,614	10,570	68%
170102120703	Upper Jocko River	35,580	8,975	25%
170102031001	Upper Placid Creek	10,461	561	5%
170102031302	W Fork Gold Creek	12,860	6	<1%

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

OWNERSHIP	ACRES
TRIBAL LANDS	13,503
NFS	10,517
PRIVATE	8,001
TOTAL	32,021

**O. Vegetation Types:** Subalpine fir/beargrass habitat types are common along with lodgepole pine and varying amounts of Douglas-fir, spruce, and white bark pine. Understory vegetation is composed of the highly recognizable and native huckleberry, beargrass, grouse whortleberry, pinegrass, elk sedge, and heartleaf amica.

**P. Dominant Soils:** Dominant families are Entic Cryandepts and Andic Cryochrepts. Soils are characterized by rocky profiles on steep slopes, weathered to a depth of 60 inches or more. Soil material is dominantly loamy-skeletal, and formed from metasedimentary residuum. Surface layers are silt loam-textured and formed in volcanic ash influenced loess with an average thickness of 8 to over 40 inches.

**Q. Geologic Types:** The burn scar is underlain by a complex of glacial deposits and residual material from argillites, siltites, and quartzites of the Belt Supergroup.

**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	25
INTERMITTENT/EPHEMERAL	62

**S. Transportation System:(NFS)**

**Trails:** National Forest (miles): 7

Other (miles): 0

**Roads:** National Forest (miles): 57

Other (miles): 114 (Non-NFS Roads)

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

Soil Burn Severity	NFS	Tribal Lands	Private	Total	% within the Fire Perimeter
Low	2,748	3,173	1,413	7,334	23%
Moderate	3,454	3,905	3,649	11,008	35%
High	1,084	2,414	674	4,172	13%
Unburned	3,189	3,960	2,231	9,380	29%
Total	10,475	13,452	7,967	31,894	100%

**B. Water-Repellent Soil (acres): 4,289**

**C. Soil Erosion Hazard Rating:** Burned acreage with available data: 168 acres low; 18,681 acres moderate; 139 acres high

**D. Erosion Potential** (tons/acre): 3.5 (24-month post-fire average)

**E. Sediment Potential** (cubic yards/square mile): 1,366 (24-month post-fire average)

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

**A. Estimated Vegetative Recovery Period** (years): 1-3 grass, 10-15 shrubs, 20-50 conifers

**B. Design Chance of Success** (percent): 50-90%

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

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

**E. Design Storm Magnitude** (inches): 3.2 in

**F. Design Flow** (cubic feet / second/ square mile): 64

**G. Estimated Reduction in Infiltration** (percent): 48

**H. Adjusted Design Flow** (cfs per square mile): 235

*Table 5: Design Storm used in Flow Calculations*

<b>Liberty Fire</b>	<b>24-hour storm (in)</b>
<b>2 yr</b>	1.9
<b>5 yr</b>	2.4
<b>10 yr</b>	2.8
<b>25 yr</b>	3.2
<b>50 yr</b>	3.6
<b>100 yr</b>	4.0

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

##### **Introduction/Background:**

The Liberty Fire was a lightning caused ignition first detected on July 15, 2017. The fire perimeter used for BAER analysis was approximately 31,894 acres. Full containment was reported on October 4, 2017. The burned area is located on the Missoula and Seeley Lake Ranger Districts of the Lolo National Forest, approximately 13 Miles southwest of Seeley Lake, MT. The soil burn severity (SBS) map shows that approximately 48% of the burned area experienced high or moderate soil burn severity. The rest of the areas within the fire perimeter were either low soil burn severity or unburned. Increased post fire soil erosion and runoff are likely to occur within and downstream of the moderate and high soil burn severity areas and may result in localized flooding, scouring and/or deposition of materials.

Long duration (6+ hour), high intensity storms are the precipitation events of primary concern. Based on historic precipitation patterns, these types of events are likely to occur in the spring to summer months following the fire. The risk of flooding and erosional events has increased as a result of the fire, creating hazardous conditions within and downstream of the burned area.

Recovery of pre-fire slope stability and watershed hydrologic response is dependent on many factors and typically occurs within 3-5 years following the fire. Recovery of high burn severity areas is slower because little or no vegetative ground cover remains, the potential for needle cast is low, and soils may be impacted by fire effects.

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

A list of values important to the Lolo National Forest was compiled by the BAER team during the assessment. The BAER team subsequently evaluated this list of values through field assessment and associated analysis to determine the critical BAER values (FSM 2523.1 – Exhibit 01) that may be treated within the BAER program. The risk (FSM 2523.1 – Exhibit 02) to these critical values has been assessed by the BAER team and is described below. A list of treatment numbers has been included below each critical value description to ensure tracking between values and treatments.

Table 6: 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. (Treatments: T02, T03, T04)
- 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. (Treatments: T04)

#### 2. Property (P):

- a. Very high risk to road infrastructure within and downslope of the burn scar due to an increased post-fire watershed response to precipitation and runoff events that is expected to result in the loss of control of water, overwhelming of existing drainage features and erosion of the road prism. Approximately 36.3 miles of road are at risk. The probability of damage or loss is likely and the magnitude of consequences is major. (Treatments: T02, T06)
- b. Very high risk to trail infrastructure throughout the burn scar due to an increased post-fire watershed response to precipitation and runoff events that is expected to result in the loss of control of water, overwhelming of existing drainage features and erosion of the trail prism. The burned area contains approximately 2 miles of trails at risk. The probability of damage or loss is very likely and the magnitude of consequences is moderate. (Treatments: T03)

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

- a. Very high risk to native plant communities due to the threat from the spread of noxious weeds and invasive plant species orange hawkweed, spotted knapweed and thistles. Priority areas includes the Rattlesnake Wilderness and IRA and the Elk Meadow Botanical Area, a pristine high elevation meadow/wetland complex. The burned condition has

- advanced the competitiveness of several invasive weed species that may spread from nearby roadsides, trailheads, and fire suppression activity areas into these pristine areas (i.e. weed free). The probability of damage or loss of native plant communities is very likely and the magnitude of consequences is major. Treatments (T01)
- b. Very high risk of loss to native plant communities due to the threat from the spread of noxious weeds and invasive plant species. Known noxious weed and invasive plant populations (thistles, St. Johnswort, common tansy, houndstongue, oxeye daisy, spotted knapweed, and orange hawkweed) exist within and immediately adjacent to the burned area. The wildfire reduced the crown canopy in moderate to high intensity burned areas; as was shrub and forb cover in the understory for several of these natural communities that were relatively weedfree away from roads. These disturbed areas are now highly vulnerable to noxious weed invasion or noxious weed spread from existing infestations and adjacent sources (TNC and State lands). The probability of damage or loss of native plant communities is likely and the magnitude of consequences is major. Treatments (T01)
  - c. High risk to Bull Trout critical habitat within and downstream of the burn scar in Gold Creek due to the threat of debris flows and sedimentation resulting in a loss of spawning and rearing habitat. The probability of damage or loss is possible and the magnitude of consequences is moderate. Implementation of T02 will reduce the potential for transportation system failures and channel sedimentation effects on Bull Trout habitat, however additional survey of the currently inaccessible Gold Creek road system segments is needed to determine risks to habitat.
  - d. High risk to soil productivity and loss of hydrologic function due to the threat of increased erosion and watershed response to precipitation events on areas that experienced moderate and high soil burn severity. The loss of ground cover and presence of hydrophobic soils will result in increased soil erosion during runoff producing events. The highest threats or areas of greatest concern are within the Gold Creek and Bole Creek drainages. The probability of damage or loss is likely and the magnitude of consequences is moderate. BAER treatments are not recommended.

#### **4. Cultural and Heritage Resources:**

- a. Very high risk to NRHP eligible cultural resources located in easily accessed slope positions that are threatened by increased post-fire runoff, erosion, and loss of pre-fire ground cover. This has resulted in a risk of loss of scientific value for irreplaceable artifacts due to the threats of mobilization of artifacts following transportation system drainage feature failure and hillslope erosion events, as well as potential artifact looting. The probability of damage or loss is very likely and the magnitude of consequences is moderate. (Treatments T05)

#### **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:**

Mitigate and protect, to the extent possible, threats to personal injury or human life of forest visitors and Forest Service employees by raising awareness through posting hazard warning signs on roads and trails, improving stream crossings, and communicate hazard of flooding, debris flows, and rock fall. Provide safe access to the burned area for personnel implementing authorized BAER response actions and communicate threats to cooperating agencies.

Protect or minimize damage to NFS investments in road and trail infrastructure by installing drainage features capable of withstanding potential increased stream flows and/or debris flows. Minimize damage to key NFS travel routes.

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

Mitigate potential post-fire impacts to cultural resources to prevent irretrievable loss of archaeological assets.

Evaluate authorized BAER treatments and existing infrastructure to determine effectiveness in post-fire flow conditions. Monitor weeds for effectiveness of BAER treatments and to identify need for future treatments.

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

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

Land 80%

Roads/Trails 70%

Channel N/A

Protection/Safety 80%

#### D. Probability of Treatment Success

Table 7: Probability of Treatment Success

	1 year after treatment	3 years after treatment	5 years after treatment
<b>Land</b>	85	85	90
<b>Channel</b>	N/A	N/A	N/A
<b>Roads/Trails</b>	80	90	90
<b>Protection/Safety</b>	90	80	70

**E. Cost of No-Action (Including Loss):** (Replacement cost of Roads = \$40,000\*36.3 miles) + (Replacement cost of trails = \$15,000\*2 miles) + (Weeds non-BAER treatment cost = \$520,000) = **\$2,002,000**

**F. Cost of Selected Alternative (Including Loss):** (Roads treatment = \$82,012) + (Roads loss = .20\*\$82,012) + (Trails treatment = \$9,743) + (Trails loss = .3\*\$9,743) + (Weeds = \$42,100) + (Warning signs = \$1,756) + (Cultural Resource Protection = \$1,662) + (Implementation coordination/consultation = \$8,400) = **\$248,493.**

#### F. Skills Represented on Burned-Area Survey Team:

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

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**Forest BAER Coordinator:** Ann Hadlow

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**Core Team Members:**

*Table 8: BAER Team Members by Skill*

<b>Skill</b>	<b>Team Member Name</b>
<i>Team Lead(s)</i>	Brendan Waterman
<i>Archaeology</i>	Jen Ryan
<i>Botany/Weeds</i>	Karen Stockmann
<i>Engineering</i>	Chris Martin
<i>Fisheries</i>	Alli Russell
<i>GIS</i>	Laura Burns
<i>Hydrology</i>	Dustin Walters, Deana Dewire, Jamie Krezelok
<i>Recreation</i>	Al Hilshey, Carl Anderson
<i>Soils</i>	Alex Rozin

**H. Treatment Narrative:**

**Land Treatments:**

**T01 – Early Detection and Rapid Response**

**General Description:**

Invasive plants and weed assessments will be conducted in FY2018 for Early Detection and Rapid Response (EDRR) on any new infestation located within the fire perimeter. Treatments will occur at proper phenological stages of each species to ensure maximum control.

Because noxious weeds are scattered throughout the burn area, there is a very high risk for new infestations within the fire perimeter to become established due to the disturbance caused by the wildfire and the suppression equipment used to fight the fire. There are known infestations of thistles, spotted knapweed, and orange hawkweed that have high invasive potential from roadsides, trailheads, and where fire suppression disturbed areas could transmit these species onto otherwise weed free natural communities.

Assess NFS lands within the Liberty Fire for new infestations of noxious weeds. Spotted knapweed, orange hawkweed, and thistles are the primary species of concern to invade the burn. However, weed species houndstongue, and oxeye daisy may also invade.

The priority areas proposed for noxious weed/invasive species monitoring and EDRR are very susceptible to invasion due to fire suppression activities intersecting and potentially spreading seeds and propagules from existing populations of noxious weeds. Furthermore, weed prone roadsides and trails are vectors for weeds to move onto otherwise weed free areas that have forest canopy removed and lack groundcover from moderate and high severity burn. A program of early detection and rapid response to control new infestations is cost effective because it helps to prevent new weed and invasive species invasions from becoming large and too expensive to control.

**Location/Suitable Sites:**

Assess areas that have a high potential for noxious weed/invasive species establishment. Critical areas include roads used in fire suppression, dozer lines, trails, moderate to high soil burn severity

areas, and burned areas where suppression vehicles and equipment traveled through known noxious weed plant species populations.

Treatment will occur within weed-free native or naturalized plant communities that experienced moderate to high burn severity and along 400 acres of linear features (roads, containment lines, etc.) that were utilized or disturbed by suppression resources. The noxious weeds of highest concern in these areas are spotted knapweed, houndstongue, and oxeye daisy. These infestations have been treated in previous years and have been reduced to minor amounts within the known boundaries of the infestations.

### Design/Construction Specifications:

Conduct short-term monitoring in FY2018 using early detection and rapid response (EDRR) assessment/monitoring of noxious weed plant species infestations within the burned area. Monitoring will be done with crews able to treat infestations located during monitoring.

Inventory/assessment, map new noxious weed infestations within burned area using GPS technology and upload into the Lolo NF GIS Noxious Weeds database.

Chemical treatments using pickups, UTVs and backpack spray units will be used on any noxious weeds located within the fire on public lands.

### Purpose of Treatment:

This treatment is necessary to prevent the establishment and to control the spread of new noxious weeds species into the burned area. EDRR will be used to prevent new noxious weed infestations from becoming established and to ensure the natural recovery of the native perennial grasses and forbs is not affected by the establishment of noxious weeds. This treatment will also ensure that these natural communities recover quickly by assuring that weed species growth does not interfere with ecological functions indicated by: soil stability, hydrologic function, and biotic integrity. Chemical treatment of new and existing noxious weed infestations will reduce the likelihood of their spread to disturbed areas and help to re-establish high quality wildlife habitat within the burn.

The fire is a disturbance that provides a receptive avenue for the spread of noxious weeds. Noxious weeds and non-native invasive species are a concern for biodiversity. Weed invasion is a potentially threatening process leading to competition and habitat modification in high to moderate soil burn severity areas. Plant communities and native species likely to be at greatest risk from weed invasion are those which occupy weed-prone habitats, such as riparian zones, rangelands with naturally low vegetation cover, and disturbed areas adjacent to and near existing weed infestations. This treatment mitigates this risk by allowing for an early means of detecting new noxious weed occurrences and a quick response for control.

Table 9: T01a - Weeds Suppression EDRR Treatment Type and Cost

TREATMENT DESCRIPTION	TARGET WEED SPECIES	PRESCRIPTION	ESTIMATED ACRES	COST PER ACRE	COST	TIMING
EDRR - SUPPRESSION IMPACTS (ROADS)	Spotted knapweed, houndstongue, St. Johnswort, and oxeye daisy	Monitor roads heavily impacted by suppression resources in high to moderate SBS. Treat target weeds species upon detection.	111 <del>400</del>	\$65	\$7,215	FY18
EDRR – SUPPRESSION	Spotted knapweed, houndstong		10 <del>54</del>	\$200	\$2,000	FY18



TREATMENT DESCRIPTION	TARGET WEED SPECIES	PRESCRIPTION	ESTIMATED ACRES	COST PER ACRE	COST	TIMING
IMPACTS (DOZERLINES)	ue, and oxeye daisy					
EDRR – SUPPRESSION IMPACTS (TRAILS)	Orange hawkweed, spotted knapweed, houndstong ue, and oxeye daisy	Monitor trails heavily impacted by suppression resources in high to moderate SBS. Treat target weeds species upon detection.	5	\$200	\$1,000	FY18
EDRR – SUPPRESSION IMPACTS (DROP-POINTS AND STAGING AREAS)	Spotted knapweed, houndstong ue, and oxeye daisy	Monitor drop-points and staging areas heavily impacted by suppression resources in high to moderate SBS. Treat target weeds species upon detection.	4	\$200	\$800	FY18
<b>TOTAL</b>					<b>\$11,015</b>	

Table 9: T01b - Weeds Fire Effects EDRR Treatment Type and Cost

TREATMENT DESCRIPTION	TARGET WEED SPECIES	PRESCRIPTION	ESTIMATED DAYS	COST PER DAY	COST	TIMING
EDRR – IN HIGH PRIORITY NATURAL COMMUNITIES	Spotted knapweed, houndstong ue, and oxeye daisy	Herbicide application on new infestations by contract crew on moderate and high SBS sites where weeds are absent or known to be present in minor amounts	10	\$350	\$3,500	FY18
<b>TOTAL</b>					<b>\$3,500</b>	

**Channel Treatments:** None proposed

**Roads and Trail Treatments:**

### **T02 - Road Drainage Maintenance**

#### **General Description:**

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

The minimal treatments required to remedy these issues are:

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

Culvert 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.

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

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

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

#### **Location/Suitable Sites:**

NFSR #4346 (Approximately 3 miles to be treated)

- Culvert Cleaning: 6 Each
- Road Template Reshaping/Ditch Cleaning

NFSR #17526, ML2 (Approximately 1 mile to be treated)

- Construct/Reconstruct Drain Dip: 5 Each
- Road Template Reshaping/Ditch Cleaning

NFSR #9974, ML3 (Approximately 11 miles to be treated)

- Culvert Cleaning: 16 Each
- Road Template Reshaping/Ditch Cleaning

NFSR #16344, ML2 (Approximately 2 miles to be treated)

- Road Template Reshaping/Ditch Cleaning
- Needs further survey in Spring 2018

NFSR #16899, ML2 (Approximately 2 miles to be treated)

- Culvert Cleaning: 6 Each
- Road Template Reshaping/Ditch Cleaning

NFSR #4341. ML2&3 (Approximately 3 miles to be treated)

- Culvert Cleaning: 10 Each
- Construct/Reconstruct Drain Dip: 6 Each
- Road Template Reshaping/Ditch Cleaning

NFSR #16345 (Approximately 4 miles to be treated)

- Culvert Cleaning: 3 Each
- Construct/Reconstruct Drain Dip: 10 Each
- Road Template Reshaping/Ditch Cleaning

\*\* NFSR #4341 Lower End (ML3, 5.4 miles), #16859 (ML2, 1.2 miles), #2121 (ML2, 4.2 miles), #16141 (ML2, 2.9 miles), and #126 (ML2, 2.3 miles), were not surveyed due to inclement weather and poor/hazardous road conditions. \*\* This represents approximately sixteen miles of un-surveyed roads that may require Road Template Reshaping/Ditch cleaning where crossing or downhill of moderate and high burn severity slopes at a minimum. Additional work to ensure adequate drainage will be determined by forest specialists when access becomes available in spring of 2018.

### Design/Construction Specifications:

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

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

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

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

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

### Purpose of Treatment:

The purpose of this treatment is to mitigate additional risk to Human Life and Safety, property, emergency ingress/egress, loss of access to visitors and local residents, and impacts to water quality, riparian, and bull trout (listed species). Approximately 36.3 miles of Forest Roads with Maintenance level 2 and 3 are located within or adjacent to the fire perimeter representing a significant financial property investment. Approximately 27 miles are within or downhill of high and moderate soil burn severity areas. The road and crossings provide critical access needs and emergency ingress/egress to the public and administrative personnel for the adjacent community, Placid Lake, and numerous in-holdings located within or adjacent to the fire perimeter. Treatments will mitigate the damaging effects from post fire runoff anticipated as greatest this year and then declining annually as the watershed stabilizes with vegetation.

Table 10: T02 - Road Drainage Maintenance Treatment Cost Estimate

TREATMENT	UNIT	UNIT COST	# OF UNIT	TOTAL COST
CONTRACT PREPARATION AND ADMINISTRATION	Day	\$350	20	\$7,000
ACQUISITION MANAGEMENT	Day	\$350	5	\$1,750
COR PER DIEM	Day	\$164	8	\$1,312
COR FLEET	Mile	\$0.20	2000	\$400
CULVERT CLEANING	Each	\$100	41	\$4,100
ROAD TEMPLATE RESHAPING/DITCH CLEANING	Mile	\$2,200	27	\$59,400
SMALLER DRAIN DIPS	Each	\$300	16	\$4,800
CULVERT ASSESSMENT	Day	\$650	5	\$3,250
<b>TOTAL</b>				<b>82,012</b>

### **T03 – Trail Drainage Maintenance/Tread Stabilization**

#### **General Description:**

Treatment would provide immediate protection to the trail system. Trails may capture increased surface runoff caused by the lack of effective ground cover to inhibit excessive flow. Flows will intercept system trails and cause severe tread erosion and initiation of soil rutting adjacent to the trails. The trail system would be improved to withstand increased runoff, protecting property, workers and users.

Treatment costs associated with Wilderness trail work are significantly higher than costs for stabilization outside of Wilderness areas due to the restrictions on use of mechanized equipment and tools. This additional cost is reflected in the overall cost per mile required to stabilize these trails.

#### **Location/Suitable Sites:**

There are 2 miles of NFS trails located within the Rattlesnake Wilderness that are within the moderate to high burn severity and require drainage restoration and stabilization treatments. The managed uses for these trail systems are Hiker and Pack and Saddle. Priority trails to be worked on include those that are within or below moderate to high soil burn severity slopes and those with sustained steep grades that have inadequate drainage. Refer to BAER Treatment Map for specific locations

#### **Design/Construction Specifications:**

Install a total of 25 treated log waterbars in locations where the fire destroyed existing waterbars. Leadoff ditches will be required at some locations. Install water bars at 45 - 60 degree angle on slopes of 7-10% to divert runoff. Logs should be a minimum of 6" diameter, 2/3 buried, extending 1 foot on the upward side of the trail (band) and a minimum of 6 inches beyond edge of trail in areas of moderate or high severity.

Reshape the trail tread to stabilize and facilitate drainage.

Construct tread retention structures where necessary and downslope, stabilizing vegetation has been consumed.

Hazards within the trail route that restrict access to work sites will be removed (rocks, trees).

Clean existing water bars.

Removal of identified hazards surrounding work site locations.

If the area poses a large safety risk then the work will be delayed until safety risk is stabilized.

#### **Purpose of Treatment:**

Trails proposed for treatment within the Liberty Fire are located within and downslope of moderate to high soil burn severity slopes. Predicted increased runoff due to water repellent soils and lack of effective ground cover will be intercepted and captured by trails, leading to severe trail tread erosion that will render the trails unusable or dangerous to use. Hikers and stock parties are the primary users. Additional hazards caused by the fire such as hazard trees and rock fall will create unsafe conditions at trail access points and worksites along the trails to workers.

The fire has burned adjacent slopes above and along the trail routes that will result in runoff that will damage the system substantially enough to prevent future use of the trails. The increased erosional risk to trails can be mitigated with drainage structures, tread stabilization, and scheduled drainage maintenance. The treatments directly mitigate these increased threats in that adequate trail tread drainage will pass accelerated erosional runoff off the tread and prevent tread erosion, and fire-generated hazards such as hazard trees and rock fall will be removed.

These treatments would prevent unacceptable erosion and loss of trail investment and minimize degradation to water quality. Treatments ensure drainage structures are sufficient to divert water effectively given increased runoff and increased sediment movement. Treatments will protect property and watershed values. Treatment will prevent injury and remove risk to workers and users.

Table 12: T03 – Trail Drainage Restoration Cost Estimate

TREATMENT	UNIT	UNIT COST	# OF UNIT	TOTAL COST
GS-9 TRAILS SPECIALIST	Day	\$351	3	\$1,053
WATER BAR INSTALLATION – 4 PERSON CREW	Day	\$550	4	\$2,200
WORK SITE HAZARD REMOVAL – 4 PERSON CREW	Day	\$550	4	\$2,200
WATER BAR SUPPLIES	Lump	\$600	1	\$600
TOOL REPAIR/REPLACEMENT	Lump	\$150	1	\$150
VEHICLES	Mile	\$0.40	600	\$240
STOCK SUPPORT	Day	\$1,100	3	\$3,300
TOTAL				<b>\$9,743</b>

### Protection/Safety Treatments:

#### T04 – Warning Signs

#### General Description:

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. They 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.

**Location/Suitable Sites:** Refer to BAER Treatment Map for the spatial locations.

Locations on FS roads for burned area warning signs on major entry points are (2 total):  
On NFSR 126 (Gold Creek) at the burn scar boundary and on NFSR 4341 (Belmont Boles) at the burn scar boundary.

Locations on FS lands for burned area warning signs or safety placards at trails (1 total)  
Gold Creek Trailhead (Tr 518)

#### Design/Construction Specifications:

Burned Area warning signs along the roads shall consist of 0.08" aluminum, sheeted in high intensity Orange with black letters. The lettering shall be a minimum of 5 inches in height and all remaining lettering shall be a minimum of 3.5 inches in height.

Burned Area warning signs at trail access points shall consist of 0.08" aluminum, Orange with black letters. The WARNING lettering shall be a minimum of 2 inches in height and all remaining lettering shall be a minimum of 1.5 inches in height.

### **Purpose of Treatment:**

The purpose of the Burned Area signs is to provide safety to the motorists, trail users and campers of upcoming dangers and/or objects. The risk to human life and safety is increased by post fire effects such as falling trees, rolling rocks, and flash floods. The need to warn the public of these hazards with which they be totally unfamiliar is a direct result of the fire.

*Table 13: T04-Warning Signs Cost Estimate*

<b>TREATMENT</b>	<b>UNIT</b>	<b>UNIT COST</b>	<b># OF UNIT</b>	<b>TOTAL COST</b>
<b>SIGN INSTALLATION</b>	Days	\$300	3	\$900
<b>BURNED AREA WARNING SIGNS, MAJOR ENTRY POINTS</b>	Each	\$300	2	\$600
<b>BURNED AREA WARNING SIGNS, DEVELOPED REC. SITES AND TRAILS</b>	Each	\$100	1	\$100
<b>VEHICLES FOR INSTALL/MONITORING</b>	Miles	\$0.355	440	\$156
<b>TOTAL</b>				<b>\$1,756</b>

## **T05 – Cultural Resource Protection**

### **General Description:**

There are a total of three previously identified cultural resources sites in the Liberty Fire, of which one (24MO0315) is at high or very high risk from post fire erosion and looting impacts. It is located above Bowles creek, about 1 mile southeast of Boles Point. Treatment includes hand mulching of the site with wood straw.

This emergency treatment is consistent with mitigation treatments used by the Forest for Heritage BAER purposes. The treatment monitoring and documenting site conditions is also consistent with FS Heritage Program direction. These treatments are less expensive and more acceptable to the Forest and local Native American Tribes than other measures such as site excavation and data recovery.

### **Location/Suitable Sites:**

Refer to the 2017 Liberty Fire\_BAER Heritage Sites Poly Map.

### **Design/Construction Specifications:**

Treatment shall consist of hand spreading of wood straw much across the site to protect from post-fire erosion, and monitoring and documentation of site conditions. Monitoring of treatment effectiveness and consultation is also necessary for the treatments. Treatment area would consist of the site polygon and potential down-hill areas to account for erosional movement of artifacts.

### **Purpose of Treatment:**

The purpose of treatments are to reduce or mitigate the risk of archeological looting, erosion, runoff, data loss on significant cultural resources in the Liberty Fire that can damage or destroy site integrity. This treatment will prevent loss of scientific and cultural value of archeological sites determined eligible for listing on the National Register of Historic Places and that are of importance

to Forest Service history. The fire burned the vegetation on these sites exposing artifacts and increasing the risk of post fire erosion. Treatments are designed to reduce the risk of looting of artifacts and erosion damage to archaeological sites and thus maintain site integrity.

Table 14: T05-Cultural Resource Protection Cost Estimate

TREATMENT	UNIT	UNIT COST	# OF UNIT	TOTAL COST
GS-11 ARCHAEOLOGIST	Day	\$398.78	3	\$1,196
WOOD STRAW MULCH	Unit	\$20.00	20	\$400
VEHICLE	Miles	\$0.22	300	\$66
<b>TOTAL</b>				<b>\$1,662</b>

## **T06 – Storm Inspection and Response**

### **General Description:**

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.

### **Location/Suitable Sites:**

The patrols will focus on those roads and bridges that receive the most traffic, are of more value to the transportation system, and/or have high-risk structures that are prone to storm damage.

### **Design/Construction Specifications:**

FS personnel will direct the work.

Immediately upon receiving heavy rain and during significant spring snowmelt the FS will send out patrols to identify road hazard conditions – obstructions such as rocks, sediment, washouts, and plugged culverts, so the problems can be corrected before they worsen or jeopardize forest road users.

The 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.

### **Purpose of Treatment:**

Human Life and Safety (Public Safety of Forest Visitors and administrative personnel), Property (Forest Roads and Bridges), Emergency ingress/egress. Indirectly, debris that is not removed immediately could cause more substantial loss of infrastructure and associated sediment/debris that in turn causes an impact to Water Quality and Riparian areas.

Roads within the Liberty Fire contain drainage structures that cross streams located in watersheds that have a moderate to high burn severity. These streams now have the potential for increased runoff and debris flows. These increases in flows pose a threat to the existing crossings which may result in plugging culverts or exceeding their maximum flow capacity. If these flows plug drainage structures, the result will likely be additional erosion and debris further down the drainage due to the failures of the fill slopes of the roads.

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

The purpose of the monitoring is to evaluate the condition of routes for motorized access and to identify and implement additional work needed to maintain and/or repair damage to road surfaces and flow conveyance structures (culverts, bridges) across roads in order to provide safe access across FS lands. Engineering and District personnel will survey the roads within the fire perimeter after high-intensity summer thunderstorms and spring snow-melt. Survey will inspect road surface condition, ditch erosion, and culverts/inlet basins for capacity to accommodate runoff flows.

Increased runoff resulting from burned slopes and stream channels which are adjacent to roads will likely cause damage to roadway surfaces, drainage structures, or block roads with debris slides. Storm patrol during post fire runoff events provides early discovery of damaging processes and the opportunity to respond with equipment to minimize damage to property and the personnel to secure the scene to protect the public.

*Table 15: T06-Storm Inspections and Response Cost Estimate*

TREATMENT	UNIT	UNIT COST	# OF UNIT	TOTAL COST
<b>GS-11 OVERHEAD</b>	Day	\$350	14	\$4,900
<b>BACKHOE</b>	Day	\$176	10	\$1,760
<b>EXCAVATOR</b>	Day	\$240	10	\$2,400
<b>DUMP TRUCK</b>	Day	\$184	10	\$1,840
<b>TOTAL</b>				<b>\$10,900</b>

## BAER Evaluation

### T07 – Implementation Coordination

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.



Table 16: T07-Coordination and Consultation Cost Estimate

TREATMENT	UNIT	UNIT COST	# OF UNIT	TOTAL COST
INTERAGENCY COORDINATION: FOREST BAER COORDINATOR (GS-12)	Days	\$450	3	\$1,350
INTERAGENCY COORDINATION: BAER IMPLEMENTATION SPECIALIST (GS-11)	Days	\$350	15	\$5,250
IMPLEMENTATION TRACKING & REPORTING FOREST BAER COORDINATOR (GS-12)	Days	\$450	4	\$1,800
TOTAL				<b>\$8,400</b>

## I. Monitoring Narrative:

**T01-Early Detection Rapid Response:** Treatment sites will be evaluated over the next year 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.

**T02-Road Drainage Maintenance:** Road drainage maintenance treatment effectiveness will be monitored during storm patrol activities (T07).

**T03-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.

**T04-Warning Signs:** District and SO personnel will monitor or check signs after events to ensure that they will be effective for the future.

**T05-Cultural Resource Protection:** Site will be mulched with wood straw and monitored by an archaeologist. Monitoring will also be used to determine if additional management action is required to protect these sites.

**T06-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.

**T07-Implementation Coordination:** Forest BAER Coordinator will file annual accomplishment report.

## **PART VI – EMERGENCY STABILIZATION TREATMENTS AND SOURCE OF FUNDS**

Line Items	Units	Unit Cost	# of Units	BAER \$	Other \$	# of units	Fed \$	# of Units	Non Fed \$	Total \$
<b>A. Land Treatments</b>										
T01a-EDRR Suppression In	Each	11,015	1	\$11,015	\$0		\$0		\$0	\$11,015
T01b-EDRR Fire Effects	Days	350	10	\$3,500			\$0		\$0	\$3,500
<i>Subtotal Land Treatments</i>				<i>\$14,515</i>	<i>\$0</i>		<i>\$0</i>		<i>\$0</i>	<i>\$14,515</i>
<b>B. Channel Treatments</b>										
None Proposed				\$0	\$0		\$0		\$0	\$0
<i>Subtotal Channel Treatments</i>				<i>\$0</i>	<i>\$0</i>		<i>\$0</i>		<i>\$0</i>	<i>\$0</i>
<b>C. Road and Trails</b>										
T02-Road Drainage Mainte	Each	82,012	1	\$82,012	\$0		\$0		\$0	\$82,012
T03-Trail Drainage Mainte	Each	9,743	1	\$9,743	\$0		\$0		\$0	\$9,743
<i>Subtotal Road and Trails</i>				<i>\$91,755</i>	<i>\$0</i>		<i>\$0</i>		<i>\$0</i>	<i>\$91,755</i>
<b>D. Protection/Safety</b>										
T04-Warning Signs	Lump	1,756	1	\$1,756	\$0		\$0		\$0	\$1,756
T05-Cultural Resouce Prot	Lump	1,662	1	\$1,662	\$0		\$0		\$0	\$1,662
T06-Strom Inspection and	Lump	10,900	1	\$10,900	\$0		\$0		\$0	\$10,900
<i>Subtotal Protection/Safety</i>				<i>\$14,318</i>	<i>\$0</i>		<i>\$0</i>		<i>\$0</i>	<i>\$14,318</i>
<b>E. BAER Evaluation</b>										
Initial Assessment	Report	\$29,272		---	\$0		\$0		\$0	\$0
T07-Implementation Coordi	Lump	\$8,400	1	\$8,400	\$0		\$0		\$0	\$8,400
<i>Subtotal Evaluation</i>				<i>\$8,400</i>	<i>\$0</i>		<i>\$0</i>		<i>\$0</i>	<i>\$8,400</i>
<b>F. Monitoring</b>										
				\$0	\$0		\$0		\$0	\$0
				\$0	\$0		\$0		\$0	\$0
<i>Subtotal Monitoring</i>				<i>\$0</i>	<i>\$0</i>		<i>\$0</i>		<i>\$0</i>	<i>\$0</i>
<b>G. Totals</b>				\$128,988	\$0		\$0		\$0	\$128,988
Previously approved										
Total for this request				<b>\$128,988</b>						

## **PART VII - APPROVALS**

1. \_\_\_\_\_ /2017  
Forest Supervisor Date

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

