

## PART I - TYPE OF REQUEST

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

☐ 1. Initial Request (Best estimate of funds needed to complete eligible stabilization measures)

☒ 2. Interim Report (#1)

☒ Updating the initial funding request based on more accurate site data or design analysis

☐ Status of accomplishments to date

☐ 3. Final Report (following completion of work)

A. Fire Name: **Brianhead**

B. Fire Number: **UT-SWS-000218**

C. State: **Utah**

D. County: **Iron and Garfield**

E. Region: **04 - Intermountain**

F. Forest: **07 - Dixie**

G. District: **Cedar City**

H. Fire Incident Job Code: **PNK2BV**

I. Date Fire Started: **June 17, 2017 (Human)**

J. Date Fire Contained: **97% as of 7/19/17**

K. Suppression Cost: **\$36,000,000** as of 7/18/17

L. Fire Suppression Damages Repaired with Suppression Funds

1. Fireline waterbarred (miles): Dozer 54.4; Handline 180.1
2. Fireline seeded (miles): Dozer 54.4; Handline 50.0
3. Other (identify):

HUC 6 Subwatershed Name	Total Acres	Acres in Fire Perimeter	% High	% Mod	% Low	% Unburned
Bear Creek	33,684	1,275	1%	2%	1%	96%
Blue Spring Creek	12,729	8,668	8%	36%	15%	41%

Butler Creek	13,826	5,124	3%	15%	9%	73%
Center Creek-Parowan Creek	16,572	10,254	20%	25%	9%	46%
Dry Lakes Creek	14,208	4,178	8%	11%	5%	75%
Fivemile Hollow-Panguitch Creek	16,088	1,278	0%	1%	3%	95%
Haycock Creek	12,900	7,004	1%	19%	19%	61%
Ipson Creek	16,261	13,406	14%	41%	15%	30%
Little Creek	14,546	3,471	6%	12%	5%	78%
Middle Mammoth Creek	16,102	1,667	0%	4%	2%	93%
Red Creek	31,803	4,407	3%	8%	2%	87%
Sandy Creek	15,262	1,592	2%	3%	5%	90%
Threemile Creek	13,208	5,427	8%	18%	9%	65%
Upper Mammoth Creek	25,906	3,922	1%	6%	4%	89%

N. Total Acres Burned:

NFS (63,648)    Other Federal (749)    State (761)    Private (6,514)

O. Vegetation Types: The area burned area had many pre fire vegetative plant communities. These included; spruce-fir (Engelmann spruce and sub-alpine fir), mixed conifer (Douglas-fir, white fir, ponderosa pine), mixed conifer/aspen, aspen, pockets of ponderosa pine, pinyon-juniper, mountain mahogany, oakbrush, mountain big sagebrush, silver sagebrush, black sagebrush, grass and forb-dominated montane meadows, and riparian communities. The riparian communities were primarily comprised of woody plants such as willow, blue spruce, river alder, narrow-leaf cottonwood, aspen, sedges, and rushes. The area ranged in elevation from approximately 7,000 feet to over 10,000 feet.

P. Dominant Soils: There are 51 soil types within the Brian Head fire perimeter. Two are over 10,000 acres: 238 - Scandard cool/Scout, gravelly loam; and 709 - Scandard, warm, Scout, warm, and Cowood, warm, gravelly to very boulder loam. Other dominant soil types, each over 2,000 acres include 224 - Tolman, cool, very cobbly loam; 233 - Davtone/ Cundiyo, cobbly clay loam to extremely boulder loam; 262A - Rock outcrop (Tertiary Volcanics); 280 - Zillion, gravelly loam; 281 - Ricot, Zillman, Tolman, very cobbly loam; 543 - Scandard, extremely stony loam; and 645 - Redbird, Arrowpeak warm, Rock outcrop (Tertiary Volcanics), very boulder loam.

Q. Geologic Types: Approximately 90% of the geology within the fire perimeter is volcanic in origin of Tertiary (Tvu), Miocene (Tmv), and Oligocene age (Tov).

Other geology of the fire area includes the Claron Formation (T1) which is calcareous sedimentary in origin. The soils formed from this formation are highly erosive.

rRecent surficial alluvium and colluvium deposits (Qa) occur in a small percentage of the fire area. Alluvium is loose, unconsolidated (not cemented together into a solid rock) soil or sediments, which has been eroded, reshaped by water in some form, and redeposited in a non-marine setting. Colluvium is general name for loose, unconsolidated sediments that have been deposited at the base of hillslopes by either rain-wash, sheet wash, or slow continuous downslope creep.

R. Miles of Stream Channels by Order or Class:

Perennial: 60    Intermittent: 19    Ephemeral: 122

S. Transportation System (miles)

Roads: 20 miles Maintenance Level 3  
74 miles Maintenance Level 2  
29 miles Maintenance Level 1

Trails: 4 Miles Motorized  
55 Miles Non-Motorized

### PART III - WATERSHED CONDITION

A. Burn Severity (acres): 16,013 low    31,819 moderate    11,639 high    12,202 unburned

B. Water-Repellent Soil (acres): 27,549

C. Soil Erosion Hazard Rating on NFS Lands (acres):

Table 2

Erosion Hazard Class	Pre-fire Erosion Hazard
Low	3,808
Moderate	3,811
High	54,275
Not Rated	1,754

D. Erosion Potential:                      Ranges from 0.39 to 1.13 tons/acre avg within perimeter

E. Sediment Potential:                      250 to 723 cubic yards/square mile

### PART IV - HYDROLOGIC DESIGN FACTORS

A. Estimated Vegetative Recovery Period (years):    5-10

B. Design Chance of Success (percent):    60%

C. Equivalent Design Recurrence Interval (years):    25

D. Design Storm Duration (hours):    0.5, 1, 6 hours

E. Design Storm Magnitude (inches):    1.74, 2.15, 2.76 inches

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

Table 3

Pre/Post Fire estimates of storm flow for the 25 yr, 30 min storm				
Drainage	Basin Size (miles <sup>2</sup> )	Q <sub>pre</sub> cfs	Q <sub>post</sub> cfs	% Increase
Center Creek	12.1	171	427	250%
Bowery Creek	7.5	136	534	393%

Clear Creek	8.9	117	562	480%
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G. Estimated Reduction in Infiltration (percent): 149 to 380%

H. Adjusted Design Flow (cfs per square mile): refer to Table 3

## PART V - SUMMARY OF ANALYSIS

### Introduction/Background:

The Brianhead Fire was a human-caused ignition that started on June 17, 2017. The fire has burned approximately 71,673 acres to date and was 97% contained on July 19, 2017. The burned area encompasses a large portion of the Cedar City Ranger District on the Dixie National Forest, east of the town of Parowan, west of the town of Panguitch, and north of the town of Brian Head. The soil burn severity (SBS) map shows approximately 60% of the area burned at high and moderate soil burn severity. The rest of the fire was either low soil burn severity or unburned. Large contiguous areas of high and moderate soil burn severity occur throughout the burned area. Increased post fire soil erosion, runoff and debris flows within and downstream from these areas is likely to cause flooding, scouring and/or deposition of materials.

High intensity monsoonal thunderstorms are the precipitation events of primary concern. Based on historic precipitation patterns, thunderstorms are likely to occur in the weeks and months following the Brianhead 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.

The duration, volume, and location of debris flows and stream channel processes are highly influenced by rainstorm patterns and intensities. The predictive values represented in this report are based on rapid assessment models for specific high intensity/short duration storms.

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 Dixie National Forest was compiled by the BAER team during the assessment kickoff meeting. 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.

#### 1. Human Life and Safety (HLS)

- a. Very High risk to **travelers** along routes 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. Probability of damage or loss is likely, magnitude of consequences is major. (Treatments: T01, T03, T05, T09)

- b. Very high risk to **travelers** along routes within and downslope from hillslopes burned at a moderate to high severity due to an increased threat of falling trees, rocks, and other debris. Probability of damage or loss is likely, magnitude of consequences is major. (*Treatments: T01, T05*)
- c. Very high risk to **forest visitors and workers** at the Yankee Meadows Campground, Five Mile Day Use site, Blue Springs Admin site, and designated dispersed campsites throughout the burn and due to the increased threat of debris flows, flash flooding, falling trees, rocks, and other debris. Probability of damage or loss is very likely, magnitude of consequences is moderate. (*Treatments: T01, T03, T05*)
- d. High risk to **forest visitors** in areas downstream of the Yankee Meadows Reservoir, Panguitch Lake, and Red Creek Reservoir. The dams on these reservoirs are operated under special use permit on NFS lands, and are downstream of areas that have large contiguous areas of high and moderate burn severity. Specific threats include overtopping and/or breaching during flood events which could result in catastrophic flooding of areas downstream. Probability of damage or loss is possible, magnitude of consequences is major. (*Treatments: T01, T05, T08*)

## 2. Property (P):

- a. Very high risk to **road infrastructure** throughout the burn scar due to an increased threat of damage expected to this Forest investment because flooding, debris flows, and erosion is imminent. Probability of damage or loss is likely, magnitude of consequences is major. (*Treatments: T01, T03, T09*)
- b. Very High risk to the **Yankee Meadows Campground water supply and distribution system** due to an increased threat from loss of vegetation upslope from the spring collection area and subsequent risk of debris flow and source contamination. Probability of damage or loss is likely, magnitude of consequences is major. (*Treatments: T01, T06*)
- c. Very High risk to the **Panguitch municipal water supply spring boxes** due to an increased threat from loss of vegetation upslope from the spring collection area and subsequent risk of debris flow and source contamination. Probability of damage or loss is very likely, magnitude of consequences is major. (*T01, T08*)
- d. High risk to **trail infrastructure** throughout the burn scar due to an increased threat of damage expected to this Forest investment because flooding, debris flows, and erosion is imminent. The burned area contains approximately 33 miles of trails at risk. Probability of damage or loss is likely, magnitude of consequences is moderate. (*Treatments: T01, T04*)
- e. High risk to **the dams on** Yankee Meadows Reservoir, Panguitch Lake, and Red Creek Reservoir. The dams on these reservoirs are operated under special use permit on NFS lands, and are downstream of areas that have large contiguous areas of high and moderate burn severity. Specific threats include inflow of debris, loss of capacity, and overtopping and/or breaching during flood events which could result in damage to the impoundment structures. Probability of damage or loss is possible, magnitude of consequences is major. (*Treatments: T01, T05, T08*)
- f. High risk to the infrastructure at the **Five Mile day use site**. Property includes the access road, stream crossing, a CCC-built pavilion, CCC-built restrooms, a water system, and picnic facilities. Threats include flash flooding and debris flow damage, Probability of damage or loss is likely, magnitude of consequences is moderate. (*Treatments: T01, T03, T05*)
- g. Low risk to the **fish barrier structures on Castle Creek** due to an increased threat of flooding and debris flows compromising the structures. Probability of damage or loss is possible, magnitude of consequences is minor. No treatments proposed.

- h. Low risk to the **Parowan secondary water system** source adjacent to Bowery Creek due to the threat of damage from flash flooding and debris flow. Probability of damage or loss is possible, magnitude of consequences is minor. No treatments proposed.
- i. Low risk to the **secondary water system** pipeline in the Upper Center Creek and Bowery Creek drainages due to the threat of damage from hillslope failure and debris flows which could result in damage to the lines. Probability of damage or loss is possible, magnitude of consequences is minor. No treatments proposed.
- j. Very Low risk to the **fish barrier structures on Mammoth Creek** due to an increased threat of flooding and debris flows compromising the structures. Probability of damage or loss is unlikely, magnitude of consequences is minor. No treatments proposed.

### 3. Natural Resources (NR):

- a. Very high risk to **soil productivity and hydrologic function** due to the threat of increased soil erosion within those areas that burned at moderate to high severity. A USGS debris flow model run was conducted for this fire. High and moderate probabilities (40-80%) for debris flows exist within the fire perimeter where high and moderate soil burn severity occurred. Impacts to soil productivity would be due to: 1) increased accelerated soil erosion, overland flow, and sedimentation, which removes the soil layer (possibly to bedrock) causing a loss of the available mineral soil for nutrient storage and availability, loss of the seedbank, and loss of remaining organic matter; 2) a change in species composition that affects soil development and biological community; and 3) increased invasive species competition into areas causing soil carbon levels to diminish and nutrient cycling to be reduced. Hydrologic function of those watersheds that sustained moderate to high burn severity is expected to be impacted by reduced infiltration, accelerated runoff and the increased threat of mass erosion and debris flows that scour channels below the existing root structure of riparian plants. Probability of damage or loss is likely, magnitude of consequences is major. (*Treatments: T01, T03, T04, T09*)
- b. Very high risk to the **Municipal Water Supply** for Panguitch due to the increased threat of debris flows across the spring collection areas from the burned area during precipitation events and subsequent contamination of the spring source. The loss of vegetative cover above spring #1 has the potential to re-activate a historic landslide that had stabilized prior the fire. Probability of damage or loss is very likely, magnitude of consequences is major. (*Treatments: T01, T08 additional point protection and system inspection will be recommended to SUP holder.*)
- c. Very High risk to **native plant communities** due to the threat from the spread of noxious weeds and invasive plant species. Known noxious weed populations (White Top, Spotted Knapweed, and Bull Thistle) exist within and immediately adjacent to the burned area. Known populations occur along dozer lines, hand lines, and drop points created during suppression activities. Probability of damage or loss is likely, magnitude of consequences is major. (*Treatments: T02*)
- d. Very high risk to **water quality** due to the increased runoff and threat of sediment and nutrient delivery from the burned area during precipitation events. (*Treatments: T01, T03, T04, T08, T09*)
- e. High risk to **agricultural supply water** in tributaries to Yankee Meadows Reservoir and Panguitch Lake from expected inflows of ash, sediment, and debris. Probability of damage or loss is possible, magnitude of consequences is major. (*Treatments: T01, T03, T04, T08, T09*)

- f. Low risk to **Mexican Spotted Owl habitat** in Parowan Canyon due to the loss of foraging habitat and decreased available forage. Probability of damage or loss is possible, magnitude of consequences is minor. Restoration of the habitat is expected to occur through natural regeneration in the coming years. No treatments are recommended.

4. Cultural and Heritage Resources (CHR):

- a. High risk to known **cultural sites** that are **potentially eligible** for the NRHP due to the increased threat of erosion from upslope burned areas and looting due to loss of pre-fire ground cover. There are numerous eligible historic/cultural sites within the burned area that were located during suppression operations. Probability of damage or loss is possible, magnitude of consequences is major. (T07)

B. Emergency Treatment Objectives:

The goal of the burned area emergency response treatments is to:

- Reduce threats to personal injury and/or human life of visitors using select system roads or trails.
- Protect or minimize damage to National Forest System investments within the burned area. Minimize damage to key system travel routes within and downslope of the areas that experience moderate to high soil burn severity.
- Protect or mitigate potential post-fire impacts to critical natural resources and significant cultural resources within or downstream from the burned area.
- Control expected invasion of noxious weeds within and adjacent to the area where soils/vegetation was disturbed as a result of suppression activities.
- Warn users of Forest roads and trails of hazards present in the burned area. Consider temporary closure to protect public users of NFS lands.
- Decrease erosion and overland flow from high soil burn severity areas upslope of roads, trails, and recreation facilities reduces the risks to human life and safety, property, and important natural resources.
- Protect the native seedbed, increase infiltration, and retain moisture on the burned slopes to facilitate vegetative recovery.
- Continue to work with affected parties and stakeholders through ongoing interagency coordination

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

Land 70 %    Channel -- %    Roads/Trails 80 %    Protection/Safety 90 %

D. Probability of Treatment Success

Treatment	Years after Treatment		
	1	3	5
Land	80	90	100
Channel	--	--	--
Roads/Trails	70	80	90
Protection/Safety	90	90	90

E. Cost of No-Action (Including Loss): \$6,023,475

F. Cost of Selected Alternative (Including Loss): \$4,994,658

G. Skills Represented on Burned-Area Survey Team:

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

Team Leader: Brendan Waterman

Email: bwaterman@fs.fed.us

Phone: 801-999-2175

FAX:

Team Members:

Brooke Shakespeare	Zach Smith	Jessie Warner	David Lowe
Cathleen Thompson	Robby Stevenson	Mike Golden	Steven O'Neil
Bob Davidson	Chesley Gale	Kat Joerger	Jake Dodds
Stacey Weems	Del Orme	Mark Carrara	Laurie Parry
Chris Butler	Jess Hancock	Ron Rodriguez	Mark Madsen
Adam Howes	Clayton Collins	Maia London	

H. Treatment Narrative:

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

Land Treatments:

**T01 - Aerial Mulch & Seed**

**General Description of Treatment:** Apply sterile Triticale Hybrid (*Triticum aestivum* x *Secale cereal*) seed to ground surface by fixed wing aircraft prior to applying agricultural straw mulch. Next, agricultural straw mulch will be applied to the ground surface by helicopter (and spread with hand crews as necessary) to achieve a continuous cover of uniform thickness, as specified below, to replace ground cover consumed by the fire. Ground cover is needed to maintain soil moisture, accelerate recovery of native vegetation, and to protect any seed remaining onsite. Seeding will also reduce the potential for establishment of new noxious weed infestations in native or naturalized communities. In addition, the organic mulch will protect soil from solar heating and drying, thereby improving the ability of seeds to germinate.

Seeding and mulching have proven successful on the Dixie NF as valid BAER treatments. Previous use of the seeding-mulching treatment combination on the Dixie NF, and subsequent effectiveness monitoring, has demonstrated that seeded grasses protects the value of the mulch application by inhibiting wind dispersion of the applied mulch. The seeded grasses (i.e., triticale) help inhibit wind dispersion of the mulch during the late spring and summer prior to late summer monsoonal rain events. Seeded grasses help maximize the coverage of straw by keeping the straw in place during the year of application and the 2nd year following application. Clearly, as would be expected, covering seed with mulch improves seed germination and establishment of the grass plants. Covering the seeding with mulch helps improve germination and plant



establishment. An additional benefit of seeded grasses helps to initiate the soil biota processes for reestablishing soil productivity.

The mulching treatments are predicted to lower the estimated soil erosion and subsequent sediment delivery to the streams up to 92% on treated slopes. This reduction was modeled using historical weather data applied to a 100 year modeling period within the ERMiT and WEPP PEP models (see BAER Soils Resource Assessment Report, Table 5: Hillslope Sediment Delivery Based on WEPP Model Runs). Mulching will also reduce downstream peak flows by absorbing and slowly releasing overland runoff which is likely to be increased due to reduced soil cover and hydrophobic soil conditions. Mulching treatments in the headwaters of the streams can protect a much larger downstream area from cumulative runoff and sedimentation.

**Suitable Sites:** Initial request: 23 treatment units totaling 3,228 acres. Interim 1 request includes 14 units totaling 1,477 acres. The proposed treatment units have direct sediment delivery potential to Parowan Municipal Watershed, Paragonah Reservoir (interim 1), Red Creek (interim 1), Little Creek (interim 1), Panguitch Municipal Watershed, Yankee Meadow Reservoir, Panguitch Lake, Parowan Creek, Bowery Creek, Center Creek, DeLong Creek, and Three Mile Creek. Refer to BAER Treatment Maps for exact locations. Treatment units have been identified using the following criteria in areas identified to be the highest contributors to water and sediment delivery:

1. Primarily high burn severity
2. Treatable Slopes (up to 40%) where rill initiation is expected.
3. Typically, on upper half to upper third to upper two-thirds of hillslopes.
4. Typically on areas that are not likely to have aspen regeneration.

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

1. Treat areas in designated units with "High" soil burn intensity that are less than 40% slope.
2. Seed application rate will be 35 pounds PLS per acre (9 – 16 seeds per square foot).
3. Straw application rate: Apply mulch to achieve a continuous cover of uniform thickness over 70% of treatment area at a depth of less than 2.0 inches. Application rate will be approximately 1.0 ton/acre (2,000 pounds). This is about 0.25 inches or 3 straw shafts deep. Aerial application may not achieve desired ground cover, therefore ground crews will likely be needed to spread straw clumps by hand in select locations in each treatment unit.
4. Use straw that conforms to Utah Department of Agriculture (UDAF) certified noxious weed free standards. Suitable sources include wheat straw which is required to be dry for application.
5. All straw will be free of all prohibited and restricted noxious weed species. Testing for prohibited and noxious weed species will be completed by the Forest Service prior to shipping and applying straw mulch material on National Forest Lands. Noxious weed species to be tested for can be obtained from the "State Noxious – Weed Seed Requirements Recognized in the Administration of the Federal Seed Act". Also refer to the "North American Weed Free Forage Program" for the noxious weed and undesirable

plant species list. Specific mulch sources will be rejected when tested samples produce a positive response to noxious weed species. In addition to the noxious weed species criteria, *Bromus tectorum* commonly referred to as "cheatgrass", will also be part of the testing procedure.

6. The Forest Service testing and mulch material acceptance procedure for noxious weed species and cheatgrass:

- a. All testing of agricultural mulch material will be completed by a third party and current member of the Association of Official Seed Analysts (AOSA). Testing procedures will follow AOSA protocol with samples mailed or hand delivered to lab.
- b. In addition to providing the documentation proving compliance with the UDAF-NWFFS criteria above, the Contractor will provide the location(s) for the stacks or lots where the mulch material to be used is currently stored. Forest Service personnel will go to the storage sites to verify bale tag numbers match the associated Inspection Certificates and to collect samples for testing.
- c. Forest Service personnel will obtain samples for noxious weed testing from each agricultural straw vendor prior to loading and shipping.
- d. Acceptance: No agricultural mulch material will be accepted at staging areas until test results have been accounted for by the Forest Service. The straw must be applied dry (less than 12 percent internal moisture content) to ensure proper dispersal during aerial applications. The Forest Service will randomly test bales using a moisture probe.

7. The straw must be applied dry (less than 12 percent internal moisture content) to ensure proper dispersal during aerial applications. The Forest Service will randomly test bales using a moisture probe.

**Purpose of Treatment:** Straw mulch provides immediate ground cover and protects the soil from erosion and loss of nutrients. Mulch can reduce downstream peak flows by absorbing rainfall and allows pre-wetting of water repellant soil. Straw help secure seeds that are stored in the soil, or applied as an emergency treatment. Straw mulch on burned areas helps maintain a favorable moisture and temperature regime for seed germination and growth. The BAER team considered this treatment the minimum necessary to achieve a reduction in risk to the accumulated critical BAER values of:

1. Human life and safety to forest visitors and employees along travel routes and trails within the Yankee Meadows and Center Creek basins, and along FSR-048 up Center Creek and FSR-049 up Bowery Creek.
2. Human life and safety to forest visitors and employees along travel routes and trails within the Clear Creek watershed, and along FSR-050 which crosses private land above Panguitch Lake and provides access to the private cabin development.
3. Human life and safety to forest visitors and employees along travel routes and trails within the 3-Mile watershed, and along access trails to Panguitch City municipal water developments and wells.

4. Interim 1. Human life and safety to forest visitors and employees along travel routes and trails within the Red Creek, Little Creek basins, and along FSR-078, FSR-076 and 077. These routes also provide access to private property.

4. Soil productivity

5. Hydrologic function

6. Water used for municipal, domestic, and agricultural supply.

7. Native or naturalized communities on NFS lands where invasive species or noxious weeds are absent or present in only minor amounts.

8. Cultural Resources

This treatment is intended to achieve three sequential objectives:

1. Improve conditions to protect soil productivity by replacing ground cover burned in the fire. Replacing ground cover will: a) decrease erosion by interrupting raindrop impact and surface soil detachment; and b) increase hillslope obstructions to decrease slope lengths which mitigate accelerated overland flow, thereby decreasing sediment delivery. Mulching also helps to protect the native seedbed and retain moisture on the burned slopes to facilitate vegetative recovery of the treatment areas.

2. Decrease overland flow and erosion from high soil burn severity areas upslope of roads and trails, which can intercept surface runoff and result in damage and/or loss of the infrastructure.

3. Decrease sedimentation from burned areas upslope of streams that contribute to important habitat for Bonneville cutthroat trout, a regional sensitive species.

Seeding and mulching will reduce the potential for establishment of new noxious weed infestations from existing infestations in the identified highly susceptible burned areas. Reduce the potential for establishment of new noxious weed infestation in native or naturalized communities.

**Describe Treatment Effectiveness Monitoring:** Visually inspect randomly selected mulch treatment units for proper application rate and uniform thickness during/immediately after treatment. In each unit, measure percent ground cover using a 100ft pace transect method once after treatment, and again in the spring of 2018. Visually inspect aerial seeding to ensure approximately 9 – 16 seeds per square foot is applied. Monitor units for seed germination in the spring of 2018.

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## **T02 - Early Detection & Rapid Response**

**General Description of Treatment:** Use personnel to monitor the Brian Head fire area on NFS lands for new invasive weed sites. Upon location, document the site, treat it and return within two weeks and determine the effectiveness of the treatment and retreat if required.

**Suitable Sites:** Brian Head Fire burned area with special focus areas adjacent to known point locations of White Top, Spotted Knapweed, Dalmatian Toadflax, Bull Thistle, and Scotch Cotton Thistle. Also, focused attention will be given to disturbance corridors such as bulldozer lines, drop points, safety zones, and fire travel corridors.

**Design/Construction Specifications:** Early Detection/Rapid Response Monitoring System will provide early detection of new infestations. Regular monitoring of the Brian Head burned area on NFS lands will take place. When new invasive species infestations are detected, a prompt and coordinated containment and eradication response will occur to eliminate the proliferation of these noxious weeds on NFS lands. Upon location, document the site, treat it and return within two weeks and determine the effectiveness of the treatment. Repeat the treatment and effectiveness monitoring until new noxious weed sites are eradicated.

**Purpose of Treatment:** There are very few invasive weed sites on the Cedar City ranger district. In the area of the fire suppression efforts, there are only eight documented invasive sites. The purpose of this treatment is to eliminate the spread of noxious weeds into the Brian Head fire area on NFS lands. Preserving the weed free nature of the Cedar City Ranger district retains a high level of priority.

**Describe Treatment Effectiveness Monitoring:** Early Detection/Rapid Response monitoring system will be set up within the Brian Head Fire area on NFS lands.

#### Road and Trail Treatments:

##### **T03 - Road Drainage Reconstruction**

**See attached documents showing grouping of road treatments by type of road and priority for treatment. Group 1 roads are roads that are needed for implementation of the Mulch and seed treatments as well as roads that have the highest value to protect for human health and safety.**

##### **General Description:**

1. Out sloping – Out sloped road templates disperse water and reduce erosion. Out sloping is useful in most locations, particularly for dispersing surface drainage on flat road grades. Out sloping is often combined with other road treatments, including rolling dips and armored crossings to control water.
2. Drain Dips (Cross Drains) – 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 riprap is placed where runoff could possibly cause erosion to the road surface and fill slope.
3. Culvert Replacement and Installation – New culverts will be installed in ditch lines on in-sloped roads that have insufficient relief culverts to prevent scouring of the ditch bottoms and resultant sediment delivery to streams.
4. 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.

5. 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.

6. Roadside Streambank Stabilization – Placement of riprap to protect road fill slope from increased stream flows that leads to the loss of the road itself and to decrease the risk of washing road fill into adjacent streams.

7. 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 in-sloping and removal of berm where water will drain off the road surface.

**Suitable Sites:** *Refer to BAER Treatment Map.*

**Design/Construction Specifications:**

1. Outsloping – Reshape roadbed to provide drainage of surface water as directed by the Engineer.

2. Drain Dips (with or without armor) – Construct rolling dips per Forest Service and/or BLM standards. Place riprap 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.

3. Culvert replacement and Installation – Install culverts in locations as directed by the Engineer. Culverts shall have sufficient slope to allow water to flow while keeping the velocities to a minimum.

4. 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.

5. 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.

6. Roadside Streambank Stabilization – In areas of fill slope erosion that have occurred as a result of stream encroachment, armor fill slopes using riprap and geotextile material to secure slope and prevent fines from washing out of fill slope.

7. 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.

**Describe Purpose of Treatment:**

I. What value(s) is mitigated by this treatment?

- Human Life and Safety
- Property
- Emergency Ingress/Egress
- Impacts to Water Quality

The purpose of this treatment is to mitigate additional risk to Human Life and Safety, property, emergency ingress/egress, and impacts to water quality. Approx. 124 miles of Forest Roads are located within the fire perimeter, representing a significant financial property investment. Adjacent communities and numerous in-holdings are located within or adjacent to the fire perimeter. The roads provide critical access needs and emergency ingress/egress to the public and administrative personnel.

II. How does the treatment relate to damage or changes caused by the fire?

Increased runoff resulting from burned slopes and stream channels which are adjacent to roads will cause damage to roadway surfaces, drainage structures, and debris flows and threats to Human Life and Safety unless treatments are implemented to handle or minimize the effects from the post fire flows.

**Describe Treatment Effectiveness Monitoring:** Monitor the storm-patrol response time to ensure objectives are being met. Identify the type of storm event that mobilizes material.

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**T04 - Trail Drainage Improvement**

**General Description:** Treatment would provide immediate protection to the trail system. Trails may capture increased surface runoff caused by the presence of water repellent soils and 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, and workers and users.

**Suitable Sites:** 59 Miles of National Forest System Trail (NFST) are within the Brianhead Fire perimeter. 26 miles of non-motorized and 7 miles of motorized trail are within the moderate to high burn severity. The managed use for these systems are non-motorized and OHV. 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.

**Design/Construction Specifications:** According to USFS Trails Handbook 2309.18. Installation should be designed to last no more than 3 years. Permanent structures are not part of this treatment.

1. Install water-bars depending on steepness of trail (18 per mile) in areas of moderate or high severity.
  - a. Install waterbars in sections of trail that have continuous gradient for a length of greater than 50 feet and are either insloped (cupped) or show evidence of routing water (rills, gullies).

2. Construct tread retention structures where necessary and downslope, stabilizing vegetation has been consumed.
3. Hazards within the trail route that restrict access to work sites will be removed (rocks, trees).
4. Clean existing water bars.
5. Removal of identified hazards surrounding work site locations.
6. If the area has to large a safety risk then the work will be delayed until safety risk is stabilized

**Purpose of Treatment:**

- i. What value(s) is (are) mitigated by this treatment?

Human life and safety, Property

Trails within the Brain Head fire are located within and downslope of moderate to high soil burn severity slopes. Predicted increased runoff due to water repellant 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. Additional hazards caused by the fire such as hazard trees and rockfall will create unsafe conditions at trail access points and worksites along the trails to workers. Accelerated erosion that is channelized downslope and into streams may cause damage water quality.

- ii. How does the treatment relate to damage or changes caused by the fire? 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 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.

In sum:

- 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 high value watershed values.
- Treatment will prevent injury and remove risk to workers and users.

**Describe Treatment Effectiveness Monitoring:** The drainage improvements will be inspected throughout the year and in the spring of 2018 to monitor the effectiveness of water run-off and the trail drainage condition.

Protection/Safety Treatments:

## **T05 – Warning Signs**

**General Description:** This treatment is for the installation of roadway warning signs and burned area warning signs.

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

**Description of Suitable Sites:** Refer to BAER Treatment Map for the spatial locations. Locations on FS lands for burned area warning signs on major entry points are (25 total). Locations on FS lands for burned area warning signs or safety placards at developed and dispersed recreation sites and/or trails are (52 total).

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

1. Traffic Warning and Road Closure Signs shall conform to the Manual on Uniform Traffic Control Devices (MUTCD) and shall be installed per Federal Highway Safety Standards.
2. Directional Signs shall match what was on the sign prior to the fire and shall be installed per Forest Service standards. These signs are to be placed on any roads and trails that are to remain open to use within the fire perimeter.
3. Burned Area warning signs along the roads shall consist of 0.08" aluminum, sheeted in high intensity Orange with black letters. The WARNING lettering shall be a minimum of 5 inches in height and all remaining lettering shall be a minimum of 3.5 inches in height.

### **Purpose of Treatment:**

- i. What value(s) is mitigated by this treatment?

Human Life and Safety, Emergency Ingress and Egress, Unauthorized travel and impacts to riparian, water quality, and wildlife.

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 purpose of replacing the Directional Signs is also to provide safety to the motorist by directing them to their destination without taking a wrong turn, especially during emergency or severe weather conditions.

- ii. How does the treatment relate to damage or changes caused by the fire?

The risk to human and 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.



**Describe Treatment Effectiveness Monitoring:** District personnel will monitor or check signs after events to ensure that they will be effective for the future.

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#### **T06 - Water Facility Protection**

**General Description:** This proposed treatment is to protect the Forest Service drinking water facility at Yankee Meadow Campground. Post-fire sedimentation, debris flows, and damaged infrastructure can lead to contamination and/or loss of the water system. The water facility consists of a spring source, storage tank and distribution system. Protection will consist of protecting the spring collection area.

**Description of Suitable Sites:** Refer to treatment map. The proposed treatment is located in the Yankee Meadow Campground.

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

Design and construction specifications shall be in accordance the current state and federal standards. Final drawings and specifications shall be certified by a professional engineer licensed in the State of Utah.

Spring Collection Area – Work shall be completed in the spring collection area to minimize damage to the spring from debris flow and potential contamination. Reconstruct ditches, replace fence, riprap adjacent to drainage and stabilize the access road to the spring collection area.

**Purpose of Treatment:** The purpose of this treatment is to reduce / mitigate the risk to the following values:

1. Property: Spring collection and distribution system infrastructure in Yankee Meadow Campground.
2. Natural Resources: Spring collection source.

The largest investment needing protection is the spring source and spring collection infrastructure.

**Describe Treatment Effectiveness Monitoring:** Inspect spring collection site after major storm events and make necessary adjustments to improve protection of structures.

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#### **T07-Cultural Resource Protection Monitoring Patrols**

**General Description:** There are many cultural resources on the Cedar City Ranger District. The general area encompasses the lands on and north of the Markagunt Plateau.

**Suitable Sites:** Cultural resources of particular concern are Native American sites on NFS lands in the Brian Head Fire perimeter. Treatment units have been identified using the following criteria: the Forest Service Manual (2523.02, 2523.1 Exhibit 01) identifies cultural resources as a critical value for the purposes of BAER.

**Detailed Design/Construction Specifications:** N/A

**Purpose of Treatment:** The purpose of resource protection monitoring patrols is to reduce or mitigate the risk of archeological looting on significant cultural resources in the Brian Head Fire that can damage or destroy site integrity.

*i. What value(s) is (are) mitigated by this treatment?* Archeological sites determined eligible for listing on the National Register of Historic Places that are at risk of having characteristics impacted.

These sites are of special concern because little inventory and research has been performed in the area, which makes it imperative to protect these NRHP eligible resources.

*ii. How does the treatment relate to damage or changes caused by the fire?* Exposure of previously hidden artifacts and features due to vegetation loss and increased ground surface visibility increase the potential for looting and/or erosion that affect site integrity. Patrols will prevent possible looting to sites by establishing a regular presence in the area.

**Describe Treatment Effectiveness Monitoring:** The patrols will be used to determine if additional BAER treatments are needed to protect cultural resource sites and if additional future management action is required to protect these sites.

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**T08 – Interagency Coordination/Team Leader Implementation**

**General Description:** There is a need to continue the interagency coordination initiated during the BAER assessment. This involves communication and coordination with other federal, state and local agencies with jurisdiction over lands where life and property and water quality are at risk from post-fire conditions. Actions include but are not limited to cooperating with other agencies on hazard notification systems, exchanging information and coordinating the BAER implementation plan as needed when subsequent recovery plans are developed by other agencies. Threats to life, property and water quality requires coordination with many agencies. The Forest Service plans on continuing to collaborate and communicate with partnering agencies, other entities and organizations and the public.

**Description of Suitable Sites:** Refer to BAER Treatment Map. The communities of Parowan, Parowan Canyon, and Panguitch Lake area are at risk and coordination with other federal, state and local agencies will be for the benefit of these communities as well as other State and private lands found within the burn scar that are at risk from post-fire conditions.

**Design/Construction Specifications:** Coordination with other federal, state and local agencies with jurisdiction over lands where life and property and water quality are at risk from post-fire conditions. Lead implementation of BAER treatments (implementation of mulching and seeding is calculated into those costs and can be found in that spec sheet, but there will be other BAER treatments that will require some time from the Team Leader for implementation).

**Purpose of Treatment:** See description in section A.

**Describe Treatment Effectiveness Monitoring:** N/A

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## **T09 – Road Storm Patrols 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.

**Description of Suitable Sites:** The patrols should first 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:**

1. FS personnel will direct the work.
2. 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.
3. 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:**

- i. What value(s) is mitigated by this 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 Brian Head Fire contain drainage structures that cross primarily intermittent streams located in watersheds that have a moderate and 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 roads and culverts 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.

ii. How does the treatment relate to damage or changes caused by the fire?

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.

**Describe Treatment Effectiveness Monitoring:** Monitor the storm-patrol response time to ensure objectives are being met. Identify the type of storm event that mobilizes material.

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I. Monitoring Narrative:

Monitoring for individual treatments is described in above treatment narratives.

Date of Report: August 10, 2017

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

Interim # 1

Line Items	Units	Unit Cost	NFS Lands		Other \$	Other Lands				All Total \$
			# of Units	BAER \$		# of units	Fed \$	# of Units	Non Fed \$	
<b>A. Land Treatments</b>										
T01-Aerial Mulch	acre	499	3228	\$1,610,772	\$0		\$0		\$0	\$1,610,772
T01a-Seed Purchase	lbs	2	112980	\$187,547			\$0		\$0	\$187,547
T01b-Seed Application	acre	27	3228	\$87,156			\$0		\$0	\$87,156
Interim 1 T01-Aerial Mulch	acre	499	1477	\$737,023			\$0		\$0	\$737,023
Interim 1 T01a-Seed Purchase	lbs	2	51693	\$90,494			\$0		\$0	\$90,494
Interim 1 T01b-Seed Application	acre	27	1477	\$39,879			\$0		\$0	\$39,879
T02-Early Detection & Rapid	acre	175	97.1	\$17,000	\$0		\$0		\$0	\$17,000
Insert new items above this line!				\$0	\$0		\$0		\$0	\$0
Subtotal Land Treatments				\$2,769,871	\$0		\$0		\$0	\$2,769,871
<b>B. Channel Treatments</b>										
				\$0	\$0		\$0		\$0	\$0
Insert new items above this line!				\$0	\$0		\$0		\$0	\$0
Subtotal Channel Treatments				\$0	\$0		\$0		\$0	\$0
<b>C. Road and Trails</b>										
RF Approved T03-Road Drain	miles	21,818	23	\$493,960	\$0		\$0		\$0	\$493,960
T03-Road Drainage Group 2	miles	11,100	18	\$205,017						\$205,017
T03-Road Drainage Group 3	miles	23,777	8	\$199,726						\$199,726
T04-Trail Drainage Rehabilitation	miles	2,328	33	\$76,815	\$0		\$0		\$0	\$76,815
Insert new items above this line!				\$0	\$0		\$0		\$0	\$0
Subtotal Road and Trails				\$975,517	\$0		\$0		\$0	\$975,517
<b>D. Protection/Safety</b>										
T05-Warning Signs	each	257	77	\$19,760	\$0		\$0		\$0	\$19,760
T06-Water Facility Protection	each	42,000	1	\$42,000	\$0		\$0		\$0	\$42,000
T07-Cultural Resource Protection	each	6,550	1	\$6,550	\$0		\$0		\$0	\$6,550
T08-Interagency Coordination	each	11,510	1	\$11,510	\$0		\$0		\$0	\$11,510
T09-Storm Patrol	each	28,540	1	\$28,540			\$0		\$0	\$28,540
Insert new items above this line!				\$0	\$0		\$0		\$0	\$0
Subtotal Protection/Safety				\$108,360	\$0		\$0		\$0	\$108,360
<b>E. BAER Evaluation</b>										
Initial Assessment	Report	\$130,000	1	---	\$0		\$0		\$0	\$130,000
Insert new items above this line!				---	\$0		\$0		\$0	\$0
Subtotal Evaluation				---	\$0		\$0		\$0	\$130,000
<b>F. Monitoring</b>										
				\$0	\$0		\$0		\$0	\$0
Insert new items above this line!				\$0	\$0		\$0		\$0	\$0
Subtotal Monitoring				\$0	\$0		\$0		\$0	\$0
<b>G. Totals</b>				\$3,853,748	\$0		\$0		\$0	\$3,983,748
Previously approved				\$493,960						

**PART VII - APPROVALS**

1.

1. /s/ Amanda D. Bullock  
Forest Supervisor (signature)

8/10/2017

Date

2.

2. /s/ Raice R. Rasmussen  
for Regional Forester (signature)

8/14/2017  
Date