

Date of Report: 08/01/2022**BURNED-AREA REPORT****Halfway Hill Fire - Fishlake National Forest Fillmore Ranger District**

Figure 1: Burned hillslopes in the Pine Creek watershed

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

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

B. Type of Action

- ☒ 1. Initial Request (Best estimate of funds needed to complete eligible stabilization measures)
- ☐ 2. Interim Request #____
 - ☐ Updating the initial funding request based on more accurate site data or design analysis

PART II - BURNED-AREA DESCRIPTION

A. Fire Name: Halfway Hill**B. Fire Number:** UT-SCS-220216**C. State:** Utah**D. County:** Millard**E. Region:** R4 Intermountain**F. Forest:** Fishlake NF**G. District:** Fillmore RD**H. Fire Incident Job Code:** PNPT4U (1522)**I. Date Fire Started:** 07/08/2022**J. Date Fire Contained:** 83% on 8/1/2022**K. Suppression Cost:** \$11,500,000 on 8/1/2022**L. Fire Suppression Damages Repaired with Suppression Funds (estimates):**

1. **Fireline repaired (miles):** 17 miles of fire line repaired to date
2. **Other (identify):** 5 cut fences repaired to date

M. Watershed Numbers:*Table 1: Acres Burned by Watershed - Unburned acres within the BAER analysis perimeter are not included in HUC analysis*

HUC #	Watershed Name	Total Acres	Acres Burned	% of Watershed Burned
160300051403	Dry Creek-Chalk Creek	12,710	1,561	12%
160300051402	North Fork Chalk Creek	17,598	3,536	20%
160300051307	Pine Creek	36,768	4,527	12%
160300051305	Meadow Creek	15,502	23	<1%

N. Total Acres Burned:*Table 2: Total Acres within the BAER analysis perimeter by Ownership*

OWNERSHIP	ACRES
NFS	10,237
BLM	108
STATE	746
PRIVATE	685
TOTAL	11,776

O. Vegetation Types: Gambel Oak (44%), Mixed conifer (36%), Aspen-Conifer (12%), Mountain Mahogany (6%) and Pinyon Juniper (1%)**P. Dominant Soils:**

- 195-Loamy-skeletal, mixed, superactive, Lithic Haplocryalfs (18%)
 177-Loamy-skeletal, mixed, Mollic Cryoboralfs (mixed conifer/seral aspen) (12%)
 178-Loamy-skeletal, mixed, Mollic Cryoboralfs (mixed conifer/seral aspen) (10%)
 170-Loamy-skeletal, mixed, superactive, Lithic Argicryolls (10%)
 160-Loamy-skeletal, mixed Argic Lithic Cryoborolls (mountainbrush) (9%)

Q. Geologic Types: C1-Tintic Quartzite (32%), Qa- Alluvium and Colluvium (24%), Glen Canyon Group Formation and Nugget Sandstone (19%), C3-Ajax Dolomite (10%)**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	4.7
INTERMITTENT/EPHEMERAL	39.5

S. Transportation System within the 11,776 acre BAER analysis fire perimeter:

Trails: *National Forest (miles):* 22.5 *Other (miles):* Not reported

Roads: *National Forest (miles):* 11.5 *Other (miles):* Not reported

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

Soil Burn Severity	NFS	BLM	State	Private	Total	% within the Fire Perimeter
Unburned	2,097	0	1	31	2,129	18%
Low	3,922	96	457	441	4,916	42%
Moderate	2,449	12	281	192	2,934	25%
High	1,769	0	7	21	1,797	15%
Total	10,237	108	685	685	11,776	100%

B. Water-Repellent Soil (acres): Water-repellency is highly variable within the burned area. Roughly half of the observation points in the moderate and high burn severities exhibit some level of hydrophobicity. Extrapolated across the burn area, an estimated 2,366 acres of water repellent soils are present.

C. Soil Erosion Hazard Rating: In the ambient Erosion Hazard Rating (EHR) analysis for the Halfway Hill fire, the Fishlake NF Soil Resource Inventory (SRI) was utilized to provide information on soils and land type characteristics. Erosion hazard in the post-fire environment was determined by modifying ambient pre-fire EHR as impacted by soil burn severity. A relative change in post-fire erosion hazard is generally a function of moderate and high burn severity as significant forest floor consumption and reductions in overstory and understory canopy expose the soil surface to erosive processes. To quantify the degree of change on the post-fire environment, pre-fire erosion hazard was scored (Low:1, Moderate: 2), and spatially intersected with SBS values (Low: 1, Mod: 2, High: 3), producing cells ranging from 1-5. Cells with scores ranging 1-2 were rated low, 3 rated moderate, and 4-5 rated high. The analysis concludes that the fire elevated EHR over 49% of the burn area, with 18% of the burn area likely to result in considerable erosion potential.

Table 5: Pre-fire Erosion Hazard

Erosion Hazard	Acres	Percent of NFS
<i>Low</i>	9,179	90%
<i>Moderate</i>	1,058	10%
<i>Total NFS</i>	10,237	100%

Table 6: Post-fire Erosion Hazard

Erosion Hazard	Acres	Percent of NFS
<i>Low</i>	5,187	51%
<i>Moderate</i>	3,176	31%
<i>High</i>	1,874	18%
<i>Total NFS</i>	10,237	100%

D. Erosion Potential: Two models were used in the Hillslope Erosion Potential (HEP) analysis. WEPPCloud Post-Fire Erosion Prediction (PEP) was used to model total potential hillslope erosion rates across fire-affected watersheds, averaging annual erosion and delivery for 100 years post-fire.

ERMiT Batch was used to model average hillslope erosion from hillslopes identified as “High” by the post-fire erosion hazard rating (see above). ERMiT produces erosion rates for the 1st year post-fire and is

reported with a 10% probability that sediment yield will be exceeded. Year one erosion rates are displayed as a percent loss of A-horizon depth (Table 8.)

Table 7: Halfway Hill hillslope erosion potential as modelled by WEPP PEP.

Erosion Potential Rating by Watershed				
Watershed	Condition	Hillslope Erosion Potential (lbs/ac/yr)	Channel Erosion Potential (lbs/ac/yr)	Total erosion potential from subcatchments (lbs/ac/yr)
Chalk Creek	Pre-burn	3.4	94	97.4
	Post-burn	162	100	262
Dry Creek	Pre-burn	1.1	50	51.1
	Post-burn	150	93	243
Pine Creek	Pre-burn	2.9	120	122.9
	Post-burn	140	170	310
Horse Hollow	Pre-burn	0	4	4
	Post-burn	4.8	7.2	12
Maple Hollow	Pre-burn	0	11	11
	Post-burn	5.5	17	22.5

Table 8: Halfway Hill ERMiT hillslope erosion potential for year 1 post-fire displayed as percent loss of A horizon. *10% probability of exceeding year 1 modelled sediment yield

Erosion Potential of High Erosion Hazard Hillslopes			
Average Soil Loss (tons/ac)*	Depth of Soil Loss (in)	Minimum A horizon Depth Within Burn Area (in) (range: 1-10in)	Percent Loss of A horizon
20.3	0.15	1.0	15%

- E. Sediment Potential:** Estimated value derived from WEPPCloud (PEP). Value represents total sediment discharge modified by sediment delivery ratios from pour points of the fire-affected watersheds.

Table 9: Modeled sediment potential in analysis subwatersheds

Sediment Potential by Watershed		
Watershed	Condition	Sediment Potential (tons/yr)
Chalk Creek	Pre-burn	680
	Post-burn	1000
Dry Creek	Pre-burn	61
	Post-burn	250
Pine Creek	Pre-burn	160
	Post-burn	410
Horse Hollow	Pre-burn	1
	Post-burn	2
Maple Hollow	Pre-burn	7
	Post-burn	13

F. Estimated Vegetative Recovery Period (years): Vegetation recovery is estimated at 3-5 years for shrubs and forest understory, 20 years for forest overstory.

G. Estimated Hydrologic Response (brief description): The primary watershed responses of the Halfway Hill fire are expected to include: 1) an initial flush of ash and small debris, 2) some rill and gully erosion on steep slopes within the burned area, and 3) potential flash floods and debris flows during summer monsoonal precipitation events (July – September). In steep areas with high soil burn severity, storms will likely create increased surface flow that could trigger floods or debris flows. In the areas that could produce some flooding, it is expected to be most pronounced during the first 1- 3 years after the fire and will become less evident as vegetation and soil-hydrologic function recover.

Post-fire runoff modeling was conducted on five analysis watersheds across the Halfway Hill fire. The wildcat5 model was used to predict post-fire flows for 2,5,10, and 25-year precipitation events of a 30-minute duration. These increases in peak-flows are expected to occur in response to short duration, high intensity thunderstorms. Each of the five analysis watersheds affected by the Halfway Hill fire show significant post-fire impact during likely precipitation events in the 2-year wildcat5 model.

Table 10: Modeled peak flow increases in analysis subwatersheds

Analysis Watershed	Percent Increase in Post-Fire Peak Flows			
	2 Year	5 Year	10 Year	25 Year
Chalk Creek	270%	98%	69%	43%
Horse Hollow	925%	344%	130%	154%
Dry Creek	530%	163%	126%	86%
Maple Hollow	564%	207%	136%	88%
Pine Creek	532%	297%	224%	151%

Although this model only predicts water runoff, some degree of flow bulking is likely to occur in the watersheds affected by the Halfway Hill Fire over the next few years. These elevated post-fire flows and bulking could lead to plugged culverts, erosion of road infrastructure, decreased soil productivity and hydrologic function, as well as threats to human life and safety. As these are short duration events, hydrologic function will likely not experience long-term negative impacts on Forest Service lands.

Analysis of post-fire debris-flows threats in response to a range of rainfall intensities was conducted by the USGS. Highest concern is where basins have high susceptibility for occurrence and high hazard associated with estimated volume of material (Figure 3). Slightly lower concern would be basins having a combination of either relatively low susceptibility and moderate to high volume hazard or high susceptibility and moderate volume hazard.

The USGS model estimated moderate to high level debris-flow hazard for most of the burned area within the Halfway Hill fire perimeter. When rainfall intensity rates of 28 mm/h are modeled, the likelihood of debris-flows in most of the modeled basins exceeds 50%. The higher hazard areas in the east and west exceed the 50% likelihood of debris flows with rainfall intensity rate between 12 and 20 mm/h. The model shows a 40% likelihood of debris-flow occurrence for most drainage basins in response to a 15-minute rainfall intensity of 24 mm/h. An increased number of areas within the Three forks, Chalk Creek, Chalk Creek Canyon Road in the east, and drainages above Pine Creek to the west have a high to very high level of debris-flow likelihood exceeding 60% to 80%. Additional information and Debris Flow Hazard modeling predictions are available at https://landslides.usgs.gov/hazards/postfire_debrisflow/

PART V - SUMMARY OF ANALYSIS

Introduction/Background

The human caused Halfway Hill Fire started on the afternoon of July 8th, southeast of Fillmore, Utah on State owned land. It quickly spread to the east, burning over 6,000 acres in the Pahvant Range during the first burn period. Significant growth continued to occur over the next four days, with the fire burning an additional 5,000 acres by July 13th. Since that time, minor growth and interior burning has continued to occur.

The USFS BAER team began its assessment of the burn scar on July 22nd. Soil Burn Severity (SBS) mapping was accomplished by ground truthing and adjusting an initial Burned Area Reflectance Classification (BARC) map using the methods outlined in RMRS-GTR-24. This resulted in a final field validated soil burn severity map (Figure 2). Additional field review and identification of threats to human life and safety, the NFS transportation system, campgrounds, soils, water quality, native vegetation communities, and cultural resources was by the BAER survey team.

The interagency Utah Post Wildfire Team was activated at the request of the Fillmore Mayor and Millard County Commissioners. An initial meeting of the Team was held on July 28th to report the findings of preliminary assessments completed by the individual agencies and to inform local leadership of the different authorities and programs that can provide technical and financial assistance for post fire recovery. The SBS data set, hydrologic modeling outputs, and the results of the USGS Post-Fire Debris Flow Hazard Assessment have been shared with the various agencies on the Team, who are currently completing an assessment of risks to the permitted municipal water supply infrastructure on NFS lands, State of Utah lands, BLM managed lands, and private lands.

Preliminary interagency response actions that are underway include: Debris basin construction in the Pine Creek and Dry Creek drainages on State lands; NOAA NWS weather station deployment; USGS rapid deployment stream gauge installation; NRCS Emergency Watershed Assessment Damage Survey Report development; Heavy equipment staging at critical infrastructure owned by Fillmore City including Watercrest Spring (the city's sole supply for culinary water) and all bridges on Chalk Creek within the city.

Ongoing coordination between the USFS, Fillmore City, and Millard County will be required to ensure timely implementation of any flood control measures that may be necessary to protect non-FS critical values from flood and debris flow threats.

The remainder of this report will focus on threats to Forest Service Critical BAER values identified in FSM 2523 – Emergency Stabilization – Burned Area Emergency Response. These risks resulting from these threats was calculated using the BAER Critical Value Matrix (Table 11).

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

Table 11: 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. Human life and safety of forest visitors at the Pistol Rock campground are threatened by rockfall and hazard tree strikes from burned hillslopes directly above the campsites as well as flash flooding in Chalk Creek that could impact the lower lying sites adjacent to the floodplain. The probability of damage or loss is **likely** due to the moderate and high severity fire impacts to the steep slope directly above the campground as well as the upstream watersheds that are expected to contribute to elevated postfire runoff events. The magnitude of consequence is **major** because rockfall or a tree strike would result in serious injury or loss of life. The risk

- rating is **very high**. Administrative closure and BAER treatments are recommended. See treatment P1b.
- b. Human life and safety of forest visitors at the Buckskin Charlie campground are threatened by rockfall and hazard tree strikes from burned hillslopes directly above the campsite. The probability of damage or loss **possible** due to the moderate and high severity fire impacts to the steep slope directly above the campground. The magnitude of consequence is **major** because rockfall or a tree strike would result in serious injury or loss of life. The risk rating is **high**. Administrative closure and BAER treatments are recommended. See treatment P1b.
 - c. Human life and safety of forest visitors at the Copley's Cove campground are threatened by flash flooding in Chalk Creek that could impact the lower lying sites adjacent to the floodplain as well as entrap visitors if the access road is damaged during a flood event. The probability of damage or loss **possible** due to the moderate and high severity fire impacts to the upstream watersheds that are expected to contribute to elevated postfire runoff events. The magnitude of consequence is **moderate** because entrapment at the site could occur if the road is damaged during a flash flood resulting in an inability to leave the site in a timely manner. The risk rating is **intermediate**. BAER treatments are recommended. See treatment P1b.
 - d. Human life and safety of forest visitors on the motorized Paiute Side Trail 03 segment above Watercrest Spring and below Copley's Cove campground is threatened by flash flooding in Chalk Creek following short duration high intensity rainfall events in the burned portions of the upper watershed. The probability of damage or loss is **likely** because the trail is in the drainage bottom and offers very few escape routes to higher ground. The magnitude of consequence is **major** because entrapment could result in serious injury or loss of life. The risk rating is **very high**. BAER treatments are recommended. See treatments P1b and P2b.
 - e. Human life and safety of forest visitors at the Pine Creek, Dry Creek, and Mountain Sheep trailheads are threatened by tree strikes from the fire killed and fire weakened trees within and adjacent to the sites. The probability of damage or loss **possible** due to the amount of hazard trees present and the extended amount of time that visitors spend utilizing the various amenities that are provided at the trailheads (picnic tables, fire rings, and parking spaces). The magnitude of consequence is **major** because a tree strike could result in serious injury or loss of life. The risk rating is **high**. BAER treatments are recommended. See treatment P3a.
 - f. Human life and safety of forest visitors utilizing the National Forest System roads and trails throughout the burned area is threatened by rockfall, hazard trees, fallen trees, debris flow, and flash floods. The probability of damage or loss is **possible** given the prevalence of burned hillslopes, fire damaged trees, and the rate of speed at which users travel on the transportation system components. The magnitude of consequence is **major** because rockfall, tree strikes, or entrapment could result in serious injury or loss of life. The risk rating is **high**. BAER treatments are recommended. See treatments RT1a, RT2, RT9, RT11, RT13a, RT13b, P1a, and P1b.
2. **Property (P):** Campground infrastructure at the Pistol Rock CG is threatened by boulders and hazard trees on the burned hillslope directly above the developed campsites. The probability of damage or loss is **likely** given the potential for falling rock and hazard trees to hit the improvements. The magnitude of consequence is **moderate** because of the potential loss in economic value of the tables, cooking shelter, and benches should a damaging event occur. The risk rating is **high**. BAER treatments are not recommended at this time due to the risk to implementation personnel cutting hazard trees on the steep slope, inability to mitigate the rockfall hazard, and damage to the amenities that may occur during removal.

- b. Campground infrastructure at the Copley's Cove CG is threatened by flash flooding in Chalk Creek. The probability of damage or loss is **possible** given the potential for floodwaters to impact improvements following a 5-year or greater storm event in the upper watershed. The magnitude of consequence is **moderate** because of the limited scope of the damage that may occur during a probable flood event. The risk rating is **intermediate**. BAER treatments are not recommended.
- c. Campground infrastructure at the Buckskin Charlie CG is threatened by boulders and hazard trees on the burned hillslope directly above the campsite. The probability of damage or loss is **possible** given the potential for falling rock and hazard trees to hit the improvements in the near term. The magnitude of consequence is **minor** because of the limited economic value of the single table and perimeter fencing. The risk rating is **low**. BAER treatments are not recommended.
- d. Road prisms, drainage control structures, and other road infrastructure within the burn perimeter and in drainages immediately downstream of the burned area are threatened by expected increases in runoff from moderate and high SBS areas. These runoff events are likely to result in road surface erosion and overwhelm existing road drainage control structures (ditches and culverts) on the threatened segments of NFS roads. The probability of damage or loss is **possible** because soil resource, watershed response, and debris flow analysis indicate a greater than 50% probability for flooding and debris flows on or above the identified road segments. The magnitude of consequence is **major** because there is a potential for substantial damage to the ML2 and ML3 NFS roads. The risk rating is **high**. BAER treatments are recommended. See treatments RT1a and RT2.
- e. Three road bridges on Chalk Creek and one 72" culvert on Copley Creek are threatened by increased runoff resulting in debris-bulked flood flows and larger scale debris flows originating from moderate and high SBS areas. Damage to bridge abutments would cause additional impacts to transportation system. The bridges are also threatened by the potential for debris jams developing in Chalk Creek from floatable material mobilized by floods that would constrict or divert stream flows. The probability of damage or loss from these threats is **likely** because watershed response modeling indicates there is a greater than 50% chance for post fire flooding and debris flows to impact these structures. The magnitude of consequence is **moderate** due to the expected cost to repair flood and debris flow damage to these high value stream crossing structures. The risk rating is **high**. BAER treatments are recommended. See treatments RT2, RT9, RT11.
- f. The Paiute Side Trail 03 ATV trail above Watercrest Spring and below Copley's Cove CG and is threatened by the potential for flash flooding in Chalk Creek. The probability of damage or loss is **very likely** based on modeled increases in post fire flood magnitude and the location of the trail, which frequently occupies on the floodplain and crosses the stream channel at multiple low water crossings. The magnitude of consequence is **moderate** due to the potential for damage to the trail that will result modest loss of the constructed trail features. The risk rating is **very high**. BAER treatments are not recommended due to the inability to reduce the risk to an acceptable level in a cost-effective manner.
- g. The Pine Creek motorized trail (NFST 322) is threatened by expected flash flooding and debris flows that may damage trail segments located in the bottom of Pine Creek Canyon. The probability of damage or loss is **very likely** because the trail is expected to be impacted by flooding and debris flow from upslope areas of moderate and high SBS on very steep slopes directly above the trail. The magnitude of consequence is **major** as the expected damage to the trail will result in substantial property damage to the NFS asset. The risk rating is **very high**. BAER treatments are recommended. See treatment RT13a.

- h. Segments of the Dry Creek and Mountain Sheep motorized trails (NFSTs 323 and 329) are threatened by increased post fire runoff and debris flows following high intensity rainfall events. Debris flow and post-fire runoff modeling indicate there is a greater than 50% chance of damaging events impacting the identified trail segments, resulting in a **likely** probability of damage or loss. The magnitude of consequence is **moderate** based on the cost to repair the threatened trail segments should the damaging event occur. The risk rating is **high**. BAER treatments are recommended. See treatment RT13a.
 - i. Numerous segments of the non-motorized trail system within and downslope of the burned area are threatened by expected increases in post fire runoff that will overwhelm the existing drainage features on the trail prisms. The probability of damage or loss was found to be **likely** because these segments are in or directly below moderate and high SBS that have slopes steep enough to generate overland flow and excessive runoff in the channel network. The magnitude of consequence is **moderate** due to potential for modest damage to these segments of the affected trail system. The risk rating is **high**. BAER treatments are recommended. See treatment RT13b.
3. **Natural Resources (NR):** There is an increased risk to native or naturalized plant communities on NFS lands from invasive species and other weeds. Specialists have identified leafy spurge, nodding plumeless thistle, whitetop as possible weed species that will likely take root in suppression activity disturbed areas. The probability of damage to native or naturalized plant communities is **likely** because suppression activities caused soil disturbances in areas where invasion of noxious plants is expected to occur. Multiple years of growth of invasives, if unchecked, can lead to more robust seedbanks for these species, which make future control much more time consuming and difficult. The lack of a weed washing station during initial fire suppression activities will likely facilitate the introduction of invasive species into these disturbed areas. The magnitude of consequence from this damage is **moderate** because there will be long-term effects of weed invasion to existing intact native plant communities. The risk is **high**. BAER treatments are recommended. See treatments L1b.
- b. Soil productivity and hydrologic function in the post fire environment are threatened by the loss of organic soil cover, elevated inherent erosion hazard, and high potential for debris flows from steep slopes having high and moderate SBS. The probability of damage or loss is **possible** based on erosion modeling, which indicates there is a potential for an average soil loss of 20.3 tons/acre on high erosion hazard hillslopes. This represents a potential 15% loss of the A horizon in the first year after the fire. Inherent erosion hazard rates have been elevated from moderate to high on soils that experienced moderate and high SBS. The magnitude of consequence is **moderate**. The impacts to the soil resource from increased post fire erosion are considerable and will persist in the long term. However modeled losses are within acceptable soil loss tolerance for dominant soil types and are not expected to result in an irreversible damage to the soil resource. The risk rating is **intermediate**. BAER treatments are not recommended due to the acceptable level of risk.
 - c. Agricultural supply water in Chalk Creek is threatened by high intensity rainfall events that will result in accelerated erosion, increased sediment delivery to the channel network, and debris flows impacting water quality. The probability of damage or loss is **likely** given the increased likelihood of debris flows, erosion, and sedimentation from areas of moderate and high SBS in the Chalk Creek watershed. The magnitude of consequence is **minor** because the water quality degradation will be a short term, recoverable that persists for minimal amounts of time immediately following high intensity precipitation events. The risk rating is **low**. BAER treatments are not recommended. Downstream irrigators are encouraged to monitor runoff conditions to ensure that appropriate response actions can be taken when sediment laden flows pass through the stream system.
4. **Cultural and Heritage Resources:** Eight NRHP eligible or potentially eligible cultural resource sites are threatened by the loss of site characteristics from erosion or unauthorized removal of artifacts.

The probability of damage or loss ranges from **unlikely** to **very likely** due to the hillslope position of the sites, with some being located on ridgelines and others located in areas with a high probability for flooding. The magnitude of consequence for the loss ranges from **minor** to **moderate** due to a lack of significant features that would be impacted resulting in minimal loss of scientific information. The highest risk rating for any of the sites is **low**. BAER treatments are not recommended.

B. Emergency Treatment Objectives: Limit loss of life or injury to forest visitors, raise awareness of postfire hazards throughout the burned area, minimize postfire damage to the NFS transportation system, minimize the establishment of invasive plants and noxious weeds.

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

Land: 90%

Channel: N/A

Roads/Trails: 80%

Protection/Safety: 95%

D. Probability of Treatment Success

Table 12: Probability of Treatment Success

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

E. Cost of No-Action (Including Loss): \$824,894. Assumes the following: 80% chance of loss of the threatened segments of the NFS transportation system which includes 5.6 miles of motorized trails valued at \$30,000/mile, 17.9 miles of non-motorized trails valued at \$4,000/mile, 4 miles of ML3 road valued at \$170,000/mile, 1 mile of ML 2 road valued at \$75,000/mile; 3 years weed management activities at suppression disturbed areas costing an estimated \$29,214.

F. Cost of Selected Alternative (Including Loss): \$290,827. Assumes the following: 20% chance of loss of the threatened segments of the NFS transportation system and 3 years of weed management activities at suppression disturbed areas costing an estimated \$14,607.

G. Skills Represented on Burned-Area Survey Team:

- ☒ Soils ☒ Hydrology ☒ Engineering ☒ GIS ☒ Archaeology
☒ Weeds ☒ Recreation ☐ Fisheries ☐ Wildlife
☐ Other:

Team Leader: Brendan Waterman

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Forest BAER Coordinator: Stan Andersen

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Phone(s): 435-896-1050

Team Members: Table 13: BAER Team Members by Skill

Skill	Team Member Name
<i>Team Lead(s)</i>	Brendan Waterman
<i>Soils</i>	Terry Hardy, Phil Schwartz
<i>Hydrology</i>	Daniel Lay, Jim Anderson
<i>Engineering</i>	Jake Dodds
<i>GIS</i>	Maggie Toone
<i>Archaeology</i>	Melissa Julien
<i>Weeds</i>	Kelly Memmott

Skill	Team Member Name
Recreation	Doug Robison
Other	

H. Treatment Narrative:

The following narratives summarize the response actions recommended to decrease risks to BAER Critical Values. It is important to note that these treatments are not designed to eliminate risk. They are designed to reduce risk to an acceptable level, per FSM 2523.1 - Exhibit 02. Detailed specifications, cost estimates, and maps identifying the spatial location for the treatments are in the BAER Assessment project record. The documents can be obtained by contacting the Forest BAER Coordinator.

All treatment costs were estimated based on the assumption that off-forest Agency personnel or contract crews would be implementing the authorized treatments without the use of local unit NFSE salary funding. If personnel from the local unit are identified for implementation, current BAER salary and expense guidance regarding the use of H-codes would be adhered to. Project budgets represent the best estimate of the BAER assessment team and may be adjusted with interim funding authorization requests to reflect current market values at the time of contracting and implementation.

Land Treatments:

L1b. Early Detection Rapid Response (EDRR) Suppression: Surveys and treatment for new or expanding invasive plant and noxious weed infestations associated with fire suppression activities will be conducted as needed during 2022 and Spring 2023. EDRR activities that extend beyond the first year will be accomplished through non-BAER funding sources. EDRR Suppression efforts will only occur on NFS lands, along areas that were disturbed by unmitigated suppression activities and suppression rehab, including areas of hand line, dozer line, mixed method (dozer except for individual arch sites), and safety zone construction. These areas were delineated by the BAER Weeds Specialist using suppression disturbance lines and points provided by the IMT GISS. If an effort to accurately capture the actual size of the on the ground disturbance including any side-cast material, the points and lines were buffered into polygons that most accurately represent the newly disturbed area. The buffer assigned to the GIS line and point features varied by feature type. The dozer lines are assumed to have a 30' total disturbance width, handlines are assumed to have a 5' total disturbance width, and safety zones are assumed to be 0.5 acres. Treatment is not proposed beyond the extent of the soil disturbance associated within the control features.

EDRR Suppression activities will be accomplished by a crew of 2 individuals on foot. The invasive species of concern in these suppression areas are Leafy Spurge, Nodding Plumeless Thistle, and Whitetop. The EDRR suppression surveys will be focused on disturbed areas that were free of weeds or only contained small, discrete populations that were disturbed during control line construction.

Item	UOM	Unit Cost	# of Units Treated	Total Treatment Cost
L1b EDRR – Suppression	acre	\$198.75	24.5	\$4,869

Channel Treatments: None Recommended

Roads and Trail Treatments:

RT1a. Road Drainage (storm proofing existing drainage features): Increased post-fire runoff and erosion from burned hillslopes above the Sand Rock Ridge Road (NFSR 0103) within and below the burnscar is expected to overwhelm the existing road drainage features and result in culvert plugging, culvert over-topping, ditch failure, erosion of fill slopes, and deposition of debris on the NFS road. This route is critical for USFS administrative access, forest recreation, and private inholding access. This route represents a significant financial investment of NFS funds.

Under the pre-fire runoff regime, the current condition and previous maintenance for the drainage structures on this road was adequate to accommodate pre-fire runoff. Ongoing maintenance has not been deferred. An emergency funding authorization is needed to support the immediate mobilization of equipment and operators who will prepare the drainage structures for the increased runoff that is a direct result of the burned watershed conditions and the increased response to precipitation events. Emergency storm proofing of high-value drainage features in combination with post-storm inspection and response are appropriate BAER treatments are recommended in lieu of more costly structural modification to the NFS road system.

Item	Units	Unit Cost	# of Units	Total Cost
RT1a. Road drainage/storm proofing	mile	\$6,600	1	\$6,600

RT2. Storm Inspection and Response: Storm inspection and response on Chalk Creek Road (NFSR 0100) and Sand Rock Ridge Road (NFSR 0103) keeps drainage features treated under RT1, RT9, and RT11 functional by removing accumulated sediment and debris between or during storm events. Following heavy rains, the inspection will involve identification of drainage hazards such as accumulated debris, sediment, and plugged culverts that are limiting functionality of the road drainage features. The response will use equipment to remove obstructions from culvert inlets, catch basins, dips, lead-off ditches, riprap armor, and other drainage features. Excess material and debris removed from the drainage features will be placed where it cannot re-enter the stream. Problems will be corrected before they worsen or jeopardize the road drainage features. This treatment is used in lieu of more costly structural upgrades, such as culvert upsizing.

Item	Units	Unit Cost	# of Units	Total Cost
RT2 Road storm inspection and response	Day	\$4,000	3	\$12,000

RT9. Channel Clearing (wood): Channel clearing of large woody debris is needed immediately upstream of three NFSR bridges on the South Fork of Chalk Creek to minimize the potential for plugging and debris jams and to minimize flood damage to roads, facilities, and natural resources. The treatment would reduce risks to the three bridges and associated road prisms. It would also significantly reduce the risk of a bridge overtopping and failing due to erosion behind the abutments. If this were to happen, the risk to public health and safety of forest visitors would increase due to potential entrapment. Additionally, the bridge on City Spring Road (NFSR 152) provides the only access to the Fillmore City's culinary water supply infrastructure at Watercrest Spring.

Item	Units	Unit Cost	# of Units	Total Cost
RT9 Channel Clearing (wood)	Job	\$2,933	3	\$8,800

RT11. Stream Crossing Protection (other): Existing bridge abutments on Chalk Creek are not protected from increased post fire flows. Where streams will erode abutments during high flows, protect with riprap. A 72" culvert on the Chalk Creek Road has a low headwall that will overtop during expected post fire runoff. Raise headwall with using riprap.

This treatment is needed to protect the FS road system from damage during and after high intensity storm events. The treatment will also help protect hydrologic function and water to users downstream. The treatment is needed to protect FS property investments.

Item	Units	Unit Cost	# of Units	Total Cost
RT11 Stream Crossing Protection (other)	Job	\$4,950	4	\$19,800

RT13. Trail Drainage: The existing trail system drainage features are insufficient to handle the anticipated increase in post-fire runoff from areas burned at moderate to high severity. Of the 22.5 miles of trails within the perimeter, approximately 16.4 miles are expected to have varying intensity of impacts from runoff, debris, and erosion from upslope/upstream burned hillslopes. Predicted increased runoff due to steep slopes 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 and/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 on trail features and into streams may further impair water quality.

Implementing this treatment will decrease the risk of unacceptable loss of trail prism, providing for continued recreation opportunities with reduced risk to human life and safety. Proper and adequate drainage for post-fire runoff will reduce flow interception and prevent the trail prism and tread from significantly eroding. Preventing the loss of trail prism is much more cost effective than rebuilding destroyed trail prisms.

The managed use for these systems is both motorized and non-motorized. Priority trails to be worked on include those that are within or below moderate to high soil burn severity slopes, have sustained steep grades, and lack inadequate drainage to effectively maintain control of the post-fire runoff originating from areas of moderate and high SBS.

The system trails are valuable resources for visitors and recreationists in the area. Large storm events will deteriorate and compromise the trail system's integrity, eventually destroying large sections if no actions are taken.

Item	Units	Unit Cost	# of Units	Total Cost
RT13a Motorized Trail Drainage	Mile	\$1,571	3.4	\$5,342

Item	Units	Unit Cost	# of Units	Total Cost
RT13b Non-motorized Trail Drainage	Mile	\$1,546	13	\$20,100

Protection/Safety Treatments:

P1. Burned Area Warning Signs: The purpose of the Burned Area Warning signs is to reduce risks to human life and safety by informing forest visitors of potential dangers and/or hazards when entering burned watersheds on NFS lands. Entering burned areas presents an intermediate to very high risk to human and life and safety, with increased threats from post-fire effects such as falling trees, rolling rocks, flash floods, and debris flows. It is necessary to inform the public of burned-area hazards that are a direct result of wildfire; hazards which are

substantially different compared to unburned forest setting and with which many forest visitors may be unfamiliar. Burned area warning signs will be installed to inform the public of the possible dangers associated with the burned area along roadways at major entry points into the burned area, at trailheads, and at developed recreation sites. Lump sum costs include signs, posts, hardware, and installation.

Item	Units	Unit Cost	# of Units	Total Cost
P1a. Road Burned Area Warning Signs	Each	\$716.67	6	\$4,300

Item	Units	Unit Cost	# of Units	Total Cost
P1b. Trail/Rec Site Burned Area Warning Signs	Each	\$485.71	7	\$3,400

P2b. Motorized Trail Closure Devices (gate, berm, boulders, etc.): Paiute Side Trail 03 from Copley's Campground to the city spring is located directly in the channel bottom and crosses the creek multiple times. The trail is located entirely within the floodplain of the stream and is subject to post fire flood and debris flow events increasing the probability of persons becoming entrapped or overrun with the runoff. The trail has one entry and one exit point with little to no opportunities to move upslope and away from a flood. Due to this unacceptable risk to human life and safety the trail should be physically closed until hillslopes have revegetated and recovered. Placing boulders at the trailhead to prevent access is recommended. Utilize a backhoe or excavator to dig a placement hole deep enough that the boulder cannot be moved by vehicles. Existing rock on site is available for the barricade and will be placed in the hole and backfilled to secure it.

Item	Units	Unit Cost	# of Units	Total Cost
P2b. Motorized Trail Closure Devices	Each	\$1,330	2	\$2,660

P3a. Hazard Tree (developed sites): Fire killed and fire weakened trees will be removed from trailheads at the Dry Creek, Pine Creek and Mountain Sheep ATV trails. These developed sites have parking areas, picnic tables, and fire rings that forest visitors spend extended amounts of time at before and after trail rides. Forest personnel will drop and leave the trees to mitigate overhead hazards to recreationists that congregate at these developed trailheads for extended periods of time.

Item	Units	Unit Cost	# of Units	Total Cost
P3a. Hazard Tree (developed sites):	Job	\$1,387	3	\$4,161

I. Monitoring Narrative: Forest personnel will periodically review safety signs and closure devices to ensure they are not being vandalized. Road and trail drainage stabilization treatments will be monitored through implementation of the storm inspection and response plan. EDRR treatments will be monitored during follow up early detection surveys to ensure new weed infestation or expansion of existing infestations is minimized.

PART VI – EMERGENCY STABILIZATION TREATMENTS AND SOURCE OF FUNDS

			NFS Lands				Other Lands			All	
		Unit	# of		Other		# of	Fed	# of	Non Fed	Total
Line Items	Units	Cost	Units	BAER \$	\$		units	\$	Units	\$	\$
A. Land Treatments											
L1b EDRR – Suppression	Acre	199	24.5	\$4,869	\$0			\$0		\$0	\$4,869
Insert new items above this line!											
				\$0	\$0			\$0		\$0	\$0
Subtotal Land Treatments											
				\$4,869	\$0			\$0		\$0	\$4,869
B. Channel Treatments											
Insert new items above this line!											
				\$0	\$0			\$0		\$0	\$0
Subtotal Channel Treatments											
				\$0	\$0			\$0		\$0	\$0
C. Road and Trails											
RT1a. Road drainage/storm	Miles	6,600	1	\$6,600	\$0			\$0		\$0	\$6,600
RT2 Road storm inspection	Day	4,000	3	\$12,000	\$0			\$0		\$0	
RT9 Channel Clearing (wood	Site	2,933	3	\$8,800	\$0			\$0		\$0	
RT11 Stream Crossing Prote	Site	4,950	4	\$19,800	\$0			\$0		\$0	
RT13a Motorized Trail Drain	miles	1,571	3	\$5,341	\$0			\$0		\$0	
RT13b Non-motorized Trail	Miles	1,546	13	\$20,100	\$0			\$0		\$0	\$20,100
Insert new items above this line!											
				\$0	\$0			\$0		\$0	\$0
Subtotal Road and Trails											
				\$72,641	\$0			\$0		\$0	\$26,700
D. Protection/Safety											
P1a. Road Safety Signs	Site	717	6	\$4,300	\$0			\$0		\$0	\$4,300
P1b. Trail/Rec Site Signs	Site	486	7	\$3,400	\$0			\$0		\$0	\$3,400
P2b. Motorized Trail Closure	job	1,330	2	\$2,660	\$0			\$0		\$0	\$2,660
P3b. Hazard Trees Develop	job	1,387	3	\$4,161	\$0			\$0		\$0	\$4,161
Insert new items above this line!											
				\$0	\$0			\$0		\$0	\$0
Subtotal Protection/Safety											
				\$14,521	\$0			\$0		\$0	\$14,521
E. BAER Evaluation											
Initial Assessment	Report	\$40,606		---	\$0			\$0		\$0	\$0
Insert new items above this line!											
				---	\$0			\$0		\$0	\$0
Subtotal Evaluation											
				\$0	\$0			\$0		\$0	\$0
F. Monitoring											
Insert new items above this line!											
				\$0	\$0			\$0		\$0	\$0
Subtotal Monitoring											
				\$0	\$0			\$0		\$0	\$0
G. Totals											
				\$92,032	\$0			\$0		\$0	\$46,090
Previously approved											
Total for this request											
				\$92,032							

PART VII - APPROVALS

1. _____
 Forest Supervisor _____ Date _____



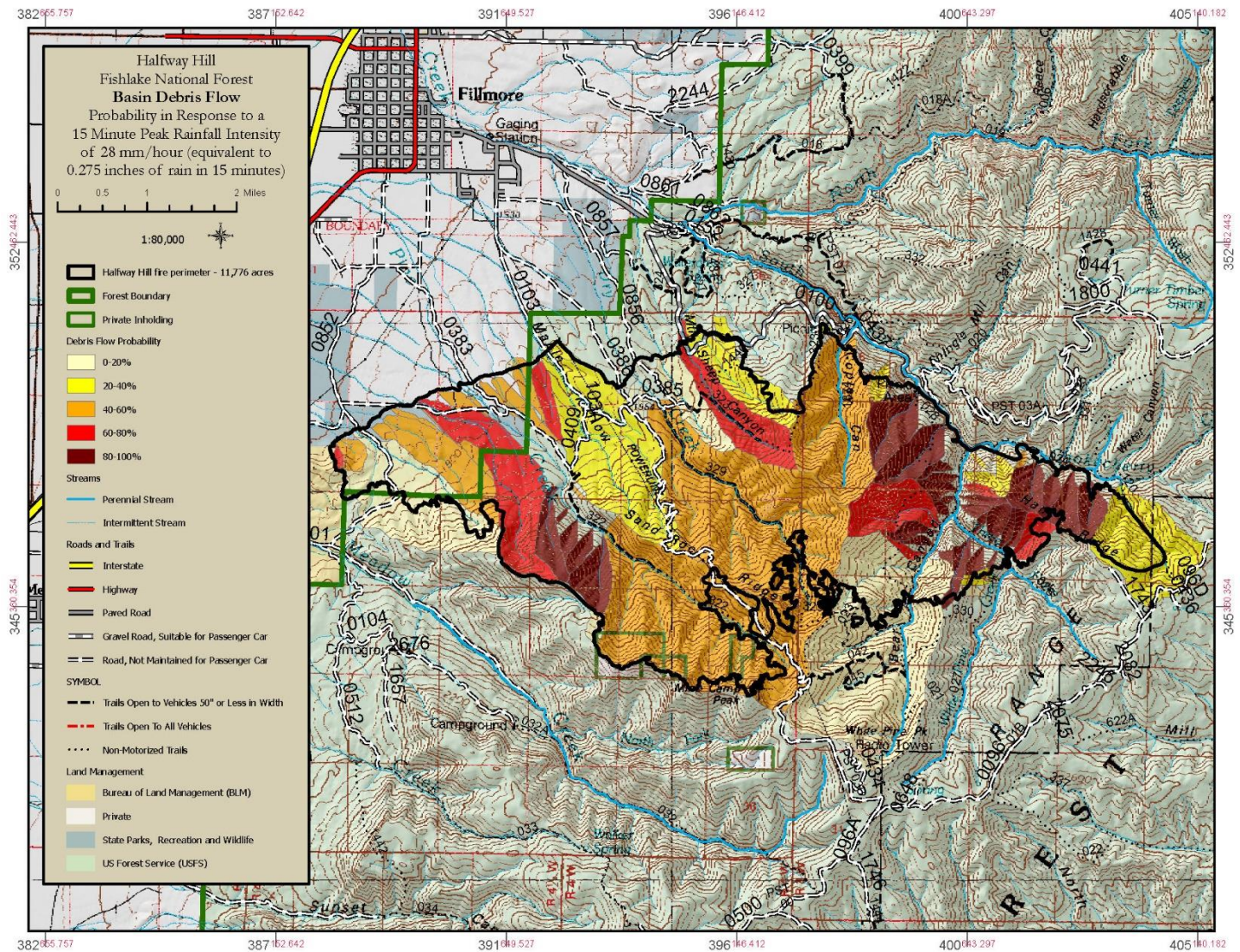


Figure 3: Halfway Hill Debris Flow Probability