

Date of Report: 4 October 2017

Railroad Fire - Burned Area Report

(Reference FSH 2509.13)

Part I - Type of Request

Type of Report

- ☒ Funding request for estimated WFSU-SULT funds
- ☐ Accomplishment Report
- ☐ No Treatment Recommendation

Type of Action

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

Part II - Burned Area Description

Fire Name: Railroad Fire**Fire Number:** CA-SNF-001743**State:** CA**County:** Madera & Mariposa**Region:** 5**Forest:** Sierra National Forest**District:** Bass Lake**Fire Incident Job Code:** P5LA2M (0515)**Date Fire Started:** 30/August/2017**Date Fire Contained:** 15/September/2017**Suppression Cost (Estimated):** \$21,000,000

Fire Suppression Damages Repaired with Suppression Funds: Fireline Waterbarred (Miles): 37 miles, Fireline Seeded (Miles): 0 Miles, Other (Identity): 0 Miles

Watershed Number: 180400070101 (Nelder Creek-Lewis Fork), 180400070102 (Miami Creek), 180400080203 (Big Creek), and 180400061101 (North Fork Willow Creek)

Total Acres Burned: NFS Acres: 11,440 Acres, Other Federal: 0, State: 0, and Private: 938

Vegetation Types: Sierran Mixed Conifer (dominated by white fir, ponderosa pine, sugar pine, incense cedar, and black oak. The shrub understory is a mix of green leaf manzanita, mariposa manzanita, mountain whitethorn, deerbrush, chinquapin, cherry, Sierra gooseberry, rose, and mountain misery), Ponderosa pine (ranges from pure stands of ponderosa pine to mixed stands with a component of incense cedar, white fir, sugar pine, canyon live oak, and black oak. Main shrubs present are mariposa manzanita, buckbrush, deerbrush, poison oak, Sierra gooseberry, and mountain-misery), Montane Hardwood-Conifer (California black oak, canyon live oak, Jeffrey pine, ponderosa pine, sugar pine, incense-cedar, and localized areas of giant sequoia), Montane Hardwood (canyon live oak, California black oak with components of mixed conifer forest scattered throughout; at lower elevations within the Railroad fire area valley oak, blue oak, foothill pine, California-laurel. Associated understory vegetation includes snowberry, mariposa manzanita, poison-oak, sourberry, and mountain misery), Riparian Communities (white alder, Oregon ash, Pacific dogwood, hazelnut, big leaf maple, willows, western azalea, sierra currant, native and non-native blackberries; and wetland herbs and graminoids), and patches of montane chaparral and mixed chaparral.

Dominant Soils: Holland (5,446 Acres - 44%), Chaix (4,013 Acres - 32%), Ledford (1,875 Acres - 15%), Neuns (911 Acres - 7%), and Umpa (71 Acres - 1%)

Geologic Types: Early Cretaceous Granitic rocks (Kbl & Khm) ranging from granite to gabbro; Paleozoic Metamorphic rocks (Pzqs) consisting of Quartzite and phyllite, and Surficial deposits include lava flows (Ta), alluvial deposits, gravel and sand of varying ages and surficial scars and deposits from various types of instability features.

Miles of Stream Channels by Order or Class: Order 1: 113.5 Miles, Order 2: 43.4 Miles, Order 3: 18.6 Miles, Order 4: 8.9 Miles, Order 5: 1.7 Miles, and Order 6: 3.5 Miles

Transportation System: Trails: 8.0 Miles & Roads: 40.4 Miles

Part III - Watershed Condition

Soil Burn Severity (Acres): Unburned / Very Low: 2,287 Acres (18%), Low: 3,607 Acres (29%), Moderate: 4,762 Acres (38%), and High: 1,721 Acres (14%)

Water-Repellent Soil (Acres): 4, 179 Acres

Soil Erosion Hazard Rating (Acres): Low: 2,852 Acres (23%), Moderate: 3,460 Acres (28%), High: 3,589 Acres (29%), and Very High: 2,447 Acres (20%)

Erosion Potential (Tons/Acre): 2.12 Tons/Acre

Sediment Potential (Cubic Yards/Square Mile): 5,975.83 Cubic Yards/Square Mile

Part IV - Hydrologic Design Factors

Estimated Vegetative Recovery Period (Years): 1 - 5 Years

Design Chance of Success (Percent): 95%

Equivalent Design Recurrence Interval (Years): 2, 5, and 10 Years



Design Storm Duration (Hours): 6 Hours

Design Storm Magnitude (Inches): 2.37", 2.94", and 3.43"

Design Flow (Cubic Feet / Second / Square Mile

- Big Creek: 19.5 Cubic Feet/Second/Square Mile
- Miami Creek: 15.6 Cubic Feet/Second/Square Mile
- Nelder Creek-Lewis Fork: 17.7 Cubic Feet/Second/Square Mile

Estimated Reduction in Infiltration (Percent): 20 to 225%

Adjusted Design Flow (CFS / Square Mile)

- Big Creek: 21.75 Cubic Feet/Second/Square Mile
- Miami Creek: 16.41 Cubic Feet/Second/Square Mile
- Nelder Creek-Lewis Fork: 24.28 Cubic Feet/Second/Square Mile

Part V - Summary of Analysis

Describe Watershed Emergency

The Railroad Fire started in the afternoon of August 29th, 2017 along Highway 41 near the communities of Sugar Pine & Fish Camp. Fire activity quickly threatened the lives and property of residents residing within the communities of Cedar Valley, Sugar Pine, and Fish Camp. The fire was declared contained on September 15th burning 12,407 acres, for the analysis the September 13th fire perimeter was used 12,377 acres. Within the fire perimeter approximately 2,287 acres contained unburned/very low soil burn severity, 3,607 acres of low, 4,762 acres of moderate, and 1,721 acres of high.

Hydrology

Over 50% of the Soil burn severity for the Railroad Fire is moderate and high and thus many of the pour points modelled showed medium (50-100%) to high (>100%) increases in runoff compared to a 2 year, 6 hour design storm. The highest relative increases in runoff response were for pour points on small catchments along the 5S66 road between Westfall and Fish Camp. Values range between 195 to 225% (Table 11, pour points 18, 19 and 20). Other notable pour points include Fish Camp (pour point 21, 105%), USFS Road 5S77 near the Sugar Pine Railroad (pour point 16, 123.9%), and USFS Road 6S90 (pour point 26, 149%). Pour points in the community of Sugar Pine ranged from 76-93% (10, 11, 12, 13, and 14), and pour points in the community of Cedar Valley ranged from 21-74% (7, 8 and 9), all of which would be considered moderate runoff response with low risk potential for a 2 year, 6 hour design storm. It is important to note that, although the increases are high relative to normal Q2 discharge, none of the pour points modeled exceeded a Q10 discharge for the 2 year, 6 hour design storm. Stream channels measured in the vicinity of Values at Risk showed confinement to >Q50 and in many cases >Q100. As such, risks from flooding alone are considered low for a 2 year, 6 hour design storm (i.e., 2.36 inches/6 hours). Debris flows, on the other hand, pose a much greater threat in areas of steep terrain and moderate to high soil burn severity (for more information on debris flow potential, see geology report).

The greatest increases in runoff occur in drainages along USFS Road 5S66 between Westfall and Fish Camp, and these drainages coincide with areas of high debris flow potential (pour points, 18 19, and 20). These areas represent the greatest risk of flood and debris flow damage to property.

In general, bulking from ash, sediment, and floatable woody debris could block culverts in and downstream of the burn area causing damage to road prisms, and in extreme cases of very high runoff, cause complete road failure. This is especially true for USFS Road 5S17 near the Sugar Pine Railroad track (pour point 16) and 6S90 near Nelder Grove (pour point 26). It is recommended that storm patrols keep culverts free of debris both on Forest Service, State (i.e., Highway 41), and private roads affected by the fire. See roads report for more detail on road BAER treatments.

Although some runoff might be attenuated with large scale hillslope treatments for smaller storms thus slowing debris flow initiation, preventing debris flows with hillslope treatments alone is not effective. As such, no hillslope treatments are recommended, rather an early weather warning system (and signage) should be established to advise residents and motorists in these areas of possible flood and debris flow activity along USFS Road 5S66 and Highway 41.

Soils

Soil quality and hydrologic function throughout the fire was assessed by determining soil burn severity, soil erosion hazard, and evaluating the potential of on- and off-site effects to soil productivity, soil loss, and sedimentation. The combined effects of soil type, steep slopes, and lack of vegetative soil cover will create a watershed response with elevated erosion, sedimentation, and the potential for debris flows.

The degree of threat to the soil resource will be determined over the coming winter months and throughout the next 3-5 years as soil and vegetation recovery stabilize. Potential impacts can be categorized into both on-site and off-site effects. Unauthorized Off-Highway Vehicle (OHV) use will cause increases in soil loss and decreased recovery times as well as damage or destroy cultural heritage and other natural resources. Natural re-establishment of cover can take many years to reach natural pre-burn cover conditions resulting in excess runoff and erosion until adequate cover is achieved. If extreme rainfall events occur within a five year period, high runoff and erosional events could occur resulting in a further loss of soil productivity, affects to water quality, or an increase in the potential for damage or loss of resource values downstream on and off Forest Service lands.

Regardless of the risk level or emergency determination, topography limits the possibility for land treatments within the areas with the highest erosion potential (tons/acre) that would effectively reduce this risk (considered 'untreatable' with land treatments on slopes >60%). Thus the places where treatments would not effectively reduce the risks. For the life and safety Values At Risk (VARs), communicating and coordinating with Natural Resource Conservation Service (NRCS) is the only feasible option, to develop point-protection treatments in lieu of upslope treatments on private lands.

Geology

Within the burned area of the Railroad Fire, some drainages and slopes present evidence of past mass wasting as debris slide and debris flows that will be increased during future storms, while other drainages and slopes have little evidence of recent past slope instability, but as conditions have changed due to the fire, erosion and mass wasting might be initiated.

In watersheds that experienced moderate to high soil burn severity, as a result of the removal of vegetation by the fire, soils are exposed and have become weakened, and rocks on slopes have lost their supporting vegetation. Due to these post-fire new conditions, some sections above Hwy 41, in addition to some other FS roads are at risk from rolling rock, plugged culverts, debris slides and in some cases, debris flows. Risks to human life, roads, trails and natural resources is moderate to high in some areas of the Railroad Fire.



Base on the USGS debris flow modeling some drainages above Hwy 41 have a high probability to produce debris flows. This is confirmed by field and aerial observations which show that some drainages above the Hwy are loaded with deposits of rock and soil, which increases the threat to human life and safety.

Recommended treatments for debris flow, mass wasting and rock fall hazards include notification of the public of these hazards through an early alert system, warning signs and road closures; clearing and improvement of catch basins and ditches along the road; maintenance and up-grade of drainage structures.

The US Geological Survey (USGS) - Landslide Hazards Program, has developed empirical models for forecasting the probability and the likely volume of post-fire debris flow events. To run their models, the USGS uses geospatial data related to basin morphometry, burn severity, soil properties, and rainfall characteristics to estimate the probability and volume of debris flows that may occur in response to a design storm (Staley, 2016). Estimates of probability, volume, and combined hazard are based upon a design storm with a peak 15-minute rainfall intensity of 12 – 40 millimeters per hour (mm/h) rate. We selected a design storm of a peak 15-minute rainfall intensity of 24 millimeters per hour (0.94 inches/hr.) rate to evaluate debris flow potential and volumes since this magnitude of storm seems likely to occur in any given year.

Based on USGS debris flow modeling it appears that under conditions of a peak 15-minute rainfall intensity storm of 24 millimeters per hour (0.94 inch/hr.), the probability of debris flows occurring is 80-100% in some channel/creeks above Hwy 41. Under these same conditions, predicted volumes of these debris flows are expected to range from <1,000 m³ to 1,000-100,000 m³ in other channels.

Engineering

The transportation system consisting of approximately 40.41 miles of National Forest System Roads (NFSR) within the fire perimeter. Of the 40.41 miles of NFSR within the fire perimeter, approximately 28.6 miles are suitable for passenger cars and high-clearance vehicles (maintenance level 3-2).

The field survey was conducted over the course of 4 days. NFSR is the primary arterial road traversing through the burned area. NFSR 5S66, 5S17, 6S90 are ML-3 and ML-2 roads, and are the primary access to Forest Service recreation and administrative sites. The maintenance level 3s and 2s roads provide access across the forest and are primarily engineered road constructed aggregate base and of native surfaces composed of decomposed granite. Native surface roads composed of decomposed granite are highly susceptible to erosion degradation. The road infrastructure within the burned area is at increased risk of damage and failure due to:

- Additional erosion damage as a result of increased storm water runoff velocity and volume on and across the roads.
- Degradation of road surfaces resulting from fire suppression activities.

The potential consequences of the burned area on the roads are:

- Potential damage and localized failures to road surfaces, road fill slopes, and road drainage structures.
- Potential of high debris flow that could block culverts in and downstream of the burn area causing damage to road prisms and in extreme cases, cause complete road failure.
- Potential secondary impacts to adjacent watersheds as a result of road infrastructure damage and/or road failure.

- Reduced public safety due to increased hazards resulting from destabilized rock slopes, falling trees, potential debris flows and flooding, and damage to traffic safety structures.

Imminent hazards to the roads system vary from minor sloughing and culvert blockage to partial or total loss of road template. A risk assessment was conducted on the assessed roads and the following risk assessment was determined:

- Forest Service Road 5S66, 5S66A, and 6S90, have a likely probability of damage with a major magnitude of consequences, resulting in a risk rating of "Very High".
- Forest Service Road 5S18, 6S07, and 6S17, have a possible probability of damage with a major magnitude of consequences, resulting in a risk rating of "High".
- Other Forest Service road risk ratings within the burned area are shown in Table 1.

Table 1: Road risk ratings

Road	Risk Rating	Road	Risk Rating
5S09	High	5S79	High
4S04	High	6S07	Very High
5S17	High	6S17	Very High
5S18	High / Very High	6S24	High
5S22	High	6S41	High
5S37	Very High	6S41C	High
5S37B	Very High	6S90	High / Very High
5S66	Very High	6S90F	High
5S66A	Very High		

The base upon which the roads are built with native materials, ranging from bedrock to decomposed granite (DG) and alluvial deposits. The majority of Forest Service roads within the burned area are native surface and are maintained for high-clearance vehicles. Native surface roads are at an increased susceptibility to erosion from the changed watershed condition as a result of the fire. BAER road treatments recommendations are necessary to mitigate hazards caused by the drastically changed conditions resulting from wildfire and impose urgency for correction on high and very high risk roads. The proposed road treatments are necessary to protect and stabilize roads against increased erosion and sedimentation from post-fire storm water runoff. Additionally, several road treatments are intended to mitigate potential public safety hazards from potential rock fall and debris flows within and adjacent to FS roads.

Repairing the 5S66 and the 5S66A are the highest priority within the fire area based on their position on the landscape (steep with moderate and high soil burn severities) and the potential threat to human life and safety that could occur to Highway 41 if a road washout occurs. The highest relative increases in runoff response were for pour points on small catchments along the 5S66 road between Westfall and Fish Camp, values range between 195 to 225%. USGS debris flow modeling showed some drainages above Hwy 41 have a high probability to produce debris flows. This was confirmed by field and aerial observations which show that some drainages above the Hwy are loaded with deposits of rock and soil, which increases the threat to human life and safety.

Recreation

Threats to life and safety exist from hazard trees, a burned pit toilet, burned trail bridges, and tread destabilization. The



risk is high at all sites due to hazard trees, and at the Shadow of the Giants trailhead due to the potential for falling into the two open holes left by burning of the pit toilet. The risk is intermediate at the Graveyard of Giants, Lewis Creek, and Shadow of Giants trails due to exposed bolts and rebar left by burning of three bridges, and tread destabilization. The other threats pose a low risk to critical values.

Threats to property include burning of log waterbars, log retainers, and bridges; burning of interpretive, informational, and directional signage; erosion/destabilization of tread caused by sloughing of soil, burned-out log retainers, and stumps; and accelerated overland flow from adjacent slopes burned at high or moderate severity. The risk to property is very high at the Graveyard of Giants and Shadow of Giants trails due to the potential for tread erosion, and high at the Lewis Creek trail due to tread destabilization from burned retainer logs and the potential for wash outs at a couple drainages.

Threats to natural resources include degradation of soil and water quality. The risk to soil quality is very high on unauthorized routes and land adjacent these routes. Soil quality can be affected by accelerated erosion from increased use of unauthorized routes due to burning of natural and constructed barriers, and/or tread capture of accelerated flow from land burned at moderate and high severity and release of concentrated flow onto adjacent land. Water quality can be affected by a burned pit toilet that is capable of filling with precipitation and carrying sewage in runoff to a nearby creek, and by the potential for sedimentation due to trail use at stream crossings where bridges were burned. No unacceptable risks to water quality were found.

Botany

Native vegetation cover and diversity is identified as a Critical Value at Risk (VAR) by the BAER team. Because the native vegetation of the burn area evolved with frequent fire, and will respond positively by producing seedlings and sprouts of native herbs, shrubs, and trees; the concern for its recovery is primarily that non-native weeds could hamper this recovery. If this occurs without surveys for weeds and rapid control, invasive non-native weeds such as yellow starthistle, sulphur cinquefoil, bull thistle, Italian thistle, Spanish broom, yellow starthistle, medusahead, and others could gain a foothold and prevent re-establishment of native vegetation that provides critical soil cover after this and future fires. The reason for mentioning future fires is that without native plants replenishing the soil seed bank between fires, the landscape is much less likely to be repopulated by native plants and much more likely to be covered with non-native plants.

Invasive/noxious weeds: There is an emergency related to recovery of native vegetation and native plant diversity due to the high probability that invasive weeds were introduced or spread during fire suppression within the burned area and along 37 miles of dozer lines within and outside the fire perimeter. In addition, the invasive weeds that already existed within the burned area are poised to spread across the burned slopes even if they weren't affected by fire suppression activities.

This emergency can be mitigated by surveying within areas of high and moderate burn severity where vehicles and/or equipment concentrated. As is standard practice, botanists would survey for and promptly treat any newly established infestations or obvious fire-related spread of previously existing infestations. The objective is to dramatically limit fire-related population growth of invasive weeds that would interfere with recovery of native vegetation. The first year is the most crucial time for early detection/rapid response (EDRR), when native, fire-adapted plants have not re-established significant ground cover and the bare burned soil with abundant nutrients, sunlight, and water presents a perfect seedbed for invasive non-native weeds. If invasive weeds reduce or eliminate the presence of fire-following plants like whispering bells, golden eardrops, and bush poppy (which are cued to germinate by smoke), a unique aspect of floral and insect (pollinator) diversity may be lost, further compromising the future diversity and ability to rapidly

recover after fire within the Railroad Fire area.

No federally listed plant species nor critical habitat occur in the Railroad Fire area. Several Forest Service sensitive plant species occur in the fire area and engineering/roads and other departments conducting BAER land treatments will receive a map of their locations and check in with the Forest Botanist prior to beginning ground-disturbing BAER treatments. The species known to occur in the Railroad Fire area are: Mountain lady's slipper (*Cypripedium montanum*), Rawson's flaming trumpet (*Collomia rawsoniana*), short-leaved hulsea (*Hulsea brevifolia*), Waterfan lichen (*Peltigera gowardii*). If coordination is constant among crews doing land treatments, especially associated with streams and culverts, the determination as regards effects to Forest Service Sensitive plants is that these activities may affect individuals of the above-named species, but will not lead to a loss of viability or a trend toward federal listing.

Cultural Resources

Primary concerns about damage to significant heritage resources centers on the direct impacts of ground disturbance, and the potential of soil movement to alter the vital context. The fire may also have an indirect impact by increasing site visibility and susceptibility to vandalism. In the Railroad Fire area, the two sites with high risk will have protective measures derived from other resource areas that will minimize any potential effect and emergency. One site is found within an area proposed for public closure due to safety concerns, limiting the potential for indirect effects of exposure. Treatments to preserve Road 6S90 have been determined to have no adverse effect on the site per the stipulations of the Regional PA. The other site will be protected by treatments to preserve Road 5S88, and there will be no adverse effect to the site per the stipulations of the Regional PA. Therefore, no emergency exists for heritage resources, and no specific heritage-based treatments are needed.

Table 2: Risk assessment 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

Emergency Treatment Objectives

- **Botany:** The objective of early detection surveys and rapid response treatment (EDRR) is to reduce the potential for expansion of invasive weeds by detecting plants early in the invasion stages. Prompt eradication of new infestations allows for optimal native vegetation recovery by eliminating competition from invasive species.
- **Recreation:** Trail treatments include: storm proofing to protect trail tread integrity, patrolling, blocking, and disguising of unauthorized OHV trails, signage, and closure of trails with increased risk from rockfall and hazard trees, and decommissioning of the pit toilet located at the Shadow of the Giants trailhead.
- **Roads:** Protect and stabilize the transportation system roads at risk of damage as a result of increased sedimentation and erosion from the fire, increase protection of water quality by reducing risk of road damage and failure, and mitigate public safety hazards associated with hazard trees, rock fall, and debris flows along NFS roads.



Probability of Completing Treatment Prior to First Major Damage-Producing Storm

- Land: NX weed survey and rapid response is conducted during the spring.
- Channel: N/A
- Roads: 80%
- Trails: 80%

Table 3: Probability of treatment success

Treatment	Years After Treatment		
	1	3	5
Land	N/A	N/A	N/A
Channel	N/A	N/A	N/A
Roads	70	85	100
Trails	70	85	100

Cost of No-Action (Including Loss):); See attached VAR table.

Cost of Selected Alternative (Including Loss): See attached VAR table, costs are justified.

Skills Represented on Burned-Area Survey Team

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

Team Leader: Kellen Takenaka

Email: ktakenaka@fs.fed.us

Phone: (559) 297-0706 ext. 4936

FAX: (559) 294-4809

Treatment Narrative**Land Treatments**

The recommended treatment is to conduct early detection / rapid response surveys on 37.6 miles of dozer line, drop points, staging areas, and water drafting sources; as well as a sampling of high burn severity areas and burned stream courses. Table 4 shows the proposal for funding to complete priority EDRR surveys and control for the Railroad Fire area, totaling \$26,495.

Table 4: Priority EDRR surveys and control treatment costs

Item	Unit	Unit Cost	# of Units	# of Days	Cost
GS-11 Botanist	Each	\$388	1.0	25	\$9,700.00

GS-7 Temporary Botanist	Each	\$155	1.0	100	\$15,500.00
Vehicle Mileage	Miles	\$0.55	900	-	\$495.00
Supplies & Materials	Lump	\$800.00	-	-	\$800.00
Total:					\$26,495

Total Botany Treatments: \$26,495.00

Channel Treatments

None proposed.

Road Treatments

Treatments are focused on protecting and stabilizing the transportation system roads at risk of damage due to the increased sedimentation and erosion from the fire. Only those roads found within either the moderate or high severity areas were assessed. See treatments costs for road treatments in Table 5, storm inspection and response in Table 6, and road closure treatment in Table 7. Treatment costs for roads vary road to road based on the position on the landscape, soil burn severity the road is located on, potential hydrologic response, and downslope values.

Based on their landscape position, current road design, and the value at risk downslope, roads 5S66 and 5S66A have the highest estimated costs. Treatments on these two roads would help mitigate the potential threat to human life and safety of a potential road washout affecting Highway 41 below. Road treatments help alleviate some of the runoff/erosional issues that will occur on the roads but without additional storm inspections and response, especially in the high risk areas, washouts could still occur potentially affecting human life and safety. This is why it is crucial to not only complete road treatments in these high risk areas but to also conduct regular storm inspections and response when needed, especially after high intensity and long durations rainstorm events.

Table 5: Road treatment costs

Road	Assessment	ML	Miles	Treatment	Estimated cost
5S09	Moderate to high burn severity	4	0.5	Clean culvert (2)	\$ 350.00
5S66A	High soil burn severity.	2	0.10	Burned retaining wall repair (water tank) (1), and armor ditch (2).	\$ 7,000.00
4S04	Moderate to high burn severity	2	2.60	Clean culvert (5), armored drainage ditch, install riser (1), warning signs, storm inspection and response.	\$ 3,525.00
5S17	Moderate burn severity	2	0.30	Clean culvert (2), burned logs removal from inlet.	\$ 8,125.00
5S18	High soil burn severity.	2	4.30	Clean culvert (24), increase catch basin (13), low water crossings (2).	\$ 27,100.00
5S22	Moderate to high burn severity	2	1.80	Clean culvert (1), restore drainage functions (0.2M).	\$ 825.00
5S37	Moderate to high burn severity	2	2.30	Clean culvert (2), restore drainage functions (1.0M), increase catch basin (2), outslope road (0.9M).	\$ 10,150.00
5S37B	Moderate to high burn severity	2	0.70	Restore drainage function (0.3M).	\$ 1,050.00



Road	Assessment	ML	Miles	Treatment	Estimated cost
5S66	High soil burn severity. Steep slopes	2	2.90	Clean culvert (10), increase catch basin (7), armor catch basin/road ditch riprap (6), low water crossing (12), install riser (2), outslope road (0.5M), install gate (1), rockfall and warning signs, storm inspection and response.	\$ 138,400.00
5S79	Moderate to high burn severity	2	2.20	Clean culvert (15).	\$ 2,250.00
6S07	Moderate to high burn severity	2	3.50	Clean culvert (4), increase catch basin (3), low water crossing (1), install riser (1), restore drainage functions (1.1M).	\$ 14,750.00
6S17	Moderate to high burn severity	2	1.00	Install gate (1), restore drainage functions (0.9).	\$ 8,650.00
6S24	Moderate to high burn severity	2	1.40	Clean culvert (6), restore drainage functions (1.4), increase catch basin (3), install riser (1).	\$ 8,550.00
6S41	Moderate to high burn severity	2	0.80	Clean culvert (6).	\$ 800.00
6S41C	Moderate to high burn severity	2	0.30	Clean culvert (1).	\$ 125.00
6S90	High soil burn severity.	2	5.40	Clean culvert (26), increase catch basin (11), low water crossing (7), install riser (4), outslope road (1M), debris flow and warning signs, storm inspection and response.	\$ 91,625.00
6S90F	High soil burn severity.	2	0.50	Restore drainage function (0.3M).	\$ 1,050.00
Total:					\$ 324,325.00

Table 6: Storm inspection and response treatment

	# Units	Unit Cost	
Storm inspection and response	8	\$3,500	\$28,000

Table 7: Road closure treatment

Item	# Units	Unit Cost	Total \$
Warning signs, road closure, and information signs.	27	\$200	\$5,400.00

Total Roads Treatments: \$357,725.00

Trail Treatments

Trail Storm Proofing: Treatments would be implemented prior to the first damaging rain event within the first year following the fire to prevent erosion of the trail tread, see Table 8 for treatments costs.

Table 8: Trail storm proofing treatment costs

Item	Unit	Unit Cost	# of Units	# of Days	Cost
GS-11 Project Supervisor	each	\$400.00	1.0	1.00	\$400.00
GS-11 Archeologist	each	\$400.00	1.0	1.00	\$400.00
GS-07 Admin Support	each	\$265.00	1.0	1.00	\$265.00
GS-07 Forestry Technician (C-Faller)	each	\$265.00	1.0	5.00	\$1,325.00
GS-07 Trail Crew Leader	each	\$265.00	1.0	8.00	\$2,120.00
GS-05 Forestry Technician	each	\$150.00	2.0	8.00	\$2,400.00
GS-04 Forestry Technician	each	\$132.00	2.0	8.00	\$2,112.00
Per Diem Cost	each	\$158.00	5.0	10.00	\$7,900.00
Mileage (travel to and from home unit)	miles	\$0.55	800.0	-	\$440.00
Mileage (field work)	miles	\$0.55	500.0	-	\$275.00
Materials (chainsaw fuel, lodge poles, rebar, etc.)	lump sum	\$1,000.00	1.0	-	\$1,000.00
TOTAL:					\$18,637.00

Patrol, Blocking, and Disguising of Unauthorized Routes: Increased patrols to enforce closures and placement of

Item	Unit	Unit Cost	# of Units	# of Days	Cost
GS-11 Project Supervisor	each	\$400.00	1.0	1.00	\$400.00
GS-05 Forestry Technician	each	\$150.00	2.0	5.00	\$1,500.00
Mileage	miles	\$0.55	400.0		\$220.00
TOTAL:					\$2,120.00

Hazard Warning Signs & Closures: Inform the public of the increased risk to safety in burned areas by hazard trees and rock fall. Would occur for the duration of at least one year to allow immediate hazard trees to fall or until hazards are otherwise mitigated, assessment after each following storm season would occur to determine if the closure should be terminated or extended, see Table 10 for treatments costs. Closure signs would be replaced with hazard warning signs, if not already present, after termination of the closure.

Table 10: Hazard warning signs & closures treatment costs

ITEM	Unit	Unit Cost	# of Units	# of Days	Cost
GS-12 Public Services Officer (Forest Order)	each	\$400.00	1	1	\$400.00
GS-11 Archeologist	each	\$400.00	1	0.25	\$100.00
GS-09 Recreation Specialist	each	\$300.00	1	0.5	\$150.00
GS-05 Forest Protection Officer (patrol)	each	\$260.00	2	10	\$5,200.00
GS-05 Forestry Technician	each	\$260.00	1	6	\$1,560.00
Mileage	miles	\$0.55	1000		\$550.00
Misc. Materials	lump sum	\$200.00	1		\$200.00



Hazard Signs and Posts	each	\$200.00	15		\$3,000.00
Closure Signs	each	\$20.00	15		\$300.00
TOTAL					\$11,460.00

Pit Toilet Decommissioning: Two holes for the burned pit toilet at Shadow of the Giants Trailhead would be filled with compacted soil to prevent people from falling into the holes and the concrete blocks above the foundation would be removed to reduce the chance of injury from tripping and exposed bolts, see Table 11 for treatments costs. Would also prevent overflow of sewage from the pits into the nearby creek.

Table 11: Pit toilet decommissioning treatment costs

ITEM	Unit	Unit Cost	# of Units	# of Days	COST
GS-13 Forest Engineer (Project Lead and COR)	each	\$460.00	1	2	\$920.00
GS-11 Archeologist (monitoring of work)	each	\$400.00	1	2	\$800.00
Contract and Materials	lump sum				\$6,000.00
Mileage (site visits)	miles	\$0.55	100		\$55.00
TOTAL:					\$7,775.00

Total Trail Treatments: \$39,992.00

Structures

Numerous hazard trees would be removed around the water tanks located at the Westfall Fire Station, see Table 12 for treatment costs.

Table 12: Hazard tree removal treatment

ITEM	Unit	Unit Cost	# of Units	# of Days	COST
Hazard Tree Removal	Each	\$1,100	20		\$22,000
TOTAL:					\$22,000

Total Structure Treatments: \$22,000.00

Treatment Total Cost: \$446,212.00

Monitoring Narrative

No monitoring proposed.

Part VI - Emergency Rehabilitation Treatments and Source of Funds by Land Ownership

Table 13: Treatments and source of funds

Line Items	NFS Lands					Other Lands				Totals \$
	Units	Unit Cost	# of Units	WFSU SULT \$	Other \$	# of Units	Fed \$	# of Units	Non Fed \$	
A. Land Treatments										
EDRR Surveys & Control										
EDRR Treatment Cost	Each	26,495		26,495						
Subtotal Land Treatments				\$26,495						26,495.00
B. Channel Treatments										
None										
Subtotal Channel Treat				N/A						
C. Road and Trails										
Trails										
Trail storm proofing	Each	18,637	1	18,637						
Unauthorized routes	Each	2,120	1	2,120						
Warning sign & closures	Each	11,460	1	11,460						
Pit toilet decommissioning	Each	7,775	1	7,775						
Roads										
Road Treatments	Each	324,325	1	324,325						
Storm Inspection & Response	Each	3,500	8	28,000						
Warning Signs	Each	200.00	27	5,400						
Subtotal Roads & Trails Treatments:				\$397,717						\$397,717
D. Structures										
Hazard Tree Treatments	Each	1,100	20	22,000						
Subtotal Structures:				\$22,000						\$22,000
E. BAER Evaluation										



Part VII - Approvals



Forest Supervisor (Signature)



Date



Regional Forester (Signature)



Date



Railroad Fire - Burned Area Report

