Date of Report: 30 August 2018

Ferguson Fire - Burned Area Report

(Reference FSH 2509.13)

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)

Burned Area Description

Fire Name: Ferguson Fire

Fire Number: CA-SNF-000745

State: CA

County: Mariposa

Region: 05

Forest: Sierra & Stanislaus

District: Bass Lake & Groveland Districts

Fire Incident Job Code: P5L0BG

Date Fire Started: July/13/2018

Date Fire Contained: August/19/2018

Suppression Cost (Estimated): 155 Million

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

Watersheds (% Burned): Ned Gulch-Merced River (89%), Devil Gulch (86%), Lower South Fork Merced River (83%), Indian Creek-Merced River (62%), Bull Creek (38%), Crane Creek-Merced River (32%), Middle South Fork Merced River (25%), Moss Creek-Merced River (24%), Middle Fork Chowchilla River (5%), Big Creek (2%), East Fork Chowchilla River (1%), West Fork Chowchilla River (1%), Upper South Fork Tuolumne River (< 1%), and Saxon Creek-Merced River (< 1%)

Total Acres Burned: NFS: 81,616 Acres (84%), NPS: 11,032 Acres (11%), Private: 4,268 Acres (4%), and BLM: 43 Acres (< 1%)

Dominant Vegetation Types: Montane Hardwood, Sierran Mixed Conifer, Montane Hardwood-Conifer, Ponderosa Pine, and Mixed Chaparral.

Dominant Soils: Typic Haploxerults, Lithic Xerumbrepts, Humic Haploxerepts, Dystric Xeropsamments, and Lithic Xerochrepts.

Geologic Types: Sierra Nevada stratified rocks comprised of granite, quartzite, phyllite, and banded chert units

Miles of Stream Channels by Order or Class: Ephemeral: 2,705 Miles (ephemeral stream data is incomplete outside Forest boundary), Intermittent: 421 Miles, and Perennial: 168 Miles

Transportation System: Trails: 12 Miles (Motorized) & 38 Miles (Non-Motorized) & Roads: 206 Miles (96 Miles of OML 2 & 3 within moderate and high severity only)

Watershed Condition

Soil Burn Severity (Acres): Unburned / Very Low: 6,358 Acres (7%), Low: 40,027 Acres (41%), Moderate: 46,314 Acres (48%), and High: 4,260 Acres (4%)

Water-Repellent Soil (Acres): 31,208 Acres (32%)

Soil Erosion Hazard Rating (Acres): Low: 11,480 Acres (12%), Moderate: 21,299 Acres (22%), High: 41,717 Acres (43%), and Very High: 21,956 Acres (23%)

Erosion Potential (Tons/Acre): 12.5 Tons/Acre

Sediment Potential (Cubic Yards/Square Mile): 8,769 Cubic Yards/Square Mile

Hydrologic Design Factors

Estimated Vegetative Recovery Period (Years): 3 to 5 Years

Design Chance of Success (Percent): 80%

Equivalent Design Recurrence Interval (Years): 2 Years

Design Storm Duration (Hours): 6 Hours

Design Storm Magnitude (Inches): 1.73

Design Flow (Cubic Feet / Second / Square Mile: 37 pour points were modeled at Values at Risk throughout the fire. The design flow was based on a 2 year, 6 hour design storm of 1.73 inches (for model results, please see hydrology specialist report). The size of the pour point watersheds ranged from 0.06 square miles to 691 square miles, with design flows ranging from 12.8 to 40.0 cfs/square mile.

Estimated Reduction in Infiltration (Percent): 25%

Adjusted Design Flow (CFS / Square Mile): Adjusted design flow for the 37 pour points ranged from 14.6 to 111.2 cfs/square mile.

Summary of Analysis

Introduction

The Ferguson Fire started on Friday night, July 13 at 9:36 PM in the South Fork Merced River drainage on Sierra National Forest in steep, rugged terrain, with scarcely any road access and a heavy presence of beetle-killed trees. By July 28, the fire grew to 42,017 acres. The fire weather transitioned from moderate to extreme pushing the flame front across Glacier Point Road and closed all access to Badger Pass. Wawona was evacuated on August 1, while El Portal was repopulated on August 2. On August 3 the residents of Yosemite Valley were evacuated and the Park Service closed it to the public due to multiple hazards from firefighters working in the area. The Highway 140 corridor was also closed that day. Fire crews at the Badger Pass camp sheltered in place on August 4, as extreme fire behavior continued.

On August 5, the National Park Service closed Yosemite National Park indefinitely. Firefighters conducted strategic firing operations off the Foresta and Big Oak Flat roads, keeping the fire from spreading into the community of Foresta and access to and from Badger was restored. As the new week began on August 6, the weather moderated which gave firefighters the opportunity to reinforce containment lines, mop-up hot spots, and complete firing operations along Wawona Road. Along the southern portions of Wawona Road, firing operations continued south of Chinquapin to prevent it from entering further into Yosemite National Park. 10 structures have been destroyed. Yosemite Valley opened to visitors on August 14 at 9:00 AM. The fire is 96,901 acres and is 100% contained as of August 19, 2018.

Jurisdictions within the Ferguson Fire include Stanislaus National Forest, Sierra National Forest, Yosemite National Park, Bureau of Land Management, private lands, and a number of small communities. The Ferguson Fire was almost entirely within Mariposa County with a small amount in Tuolumne County.

Watershed Emergency

The majority of the fire area is between 3,400' and 7,000' in elevation, with the Merced River drainage dropping down to approximately 1,200' in elevation. The majority of precipitation in the area occurs from November through April, with the bulk coming from December through March. Snowfall occurs in elevations above 5,000 feet in winter and high elevation snowpack can develop. Rain on snow events are possible several times throughout the winter months from 5,000 to 6,000 ft. elevations.

Over half of the fire burned with either a high or moderate soil burn severity (SBS) accounting for 52% of the fire area; 4,260 acres (4%) of high and 46,311 acres (48%) of moderate. The remaining 48% of the burned area was either a low or unburned/very low SBS, 40,019 acres (41%) of low and 6,355 (7%) of unburned/very low. Hydrophobic soil conditions were strong and widespread within high soil burn severity; averaging 5 cm thick and repelling water for more than 50 seconds. Within moderate soil burn severity (SBS), the hydrophobic layer was common (60% area), but not as strong or thick; averaging 2-3 cm and repelling water for ~30 seconds. The strongest repellency was found on coarse textured soils in high SBS under mixed conifer forest. Pre fire forest floor layers were observed at 5-7 inches thick.

It should be understood that soil burn severity is NOT vegetative burn severity or mortality; vegetative burn severity is but one component taken into consideration. Soil burn severity goes beyond aboveground vegetation impacts to belowground soil heating effects and associated impacts to soil. Hydrologic function, runoff, and erosion potential are

influenced by pre-fire, fire, and post-fire environments. Soil burn severity includes careful consideration of factors such as, amount and condition of residual ground cover, viability of native seed banks, condition of residual fine roots, degree of fire-induced water-repellency, soil physical factors (texture, structural stability, porosity, restricted drainage), soil chemical factors (oxidation, altered nutrient status), and topography (slope gradient, length, and profile), and the length of time heat from the fire has been in contact with the soil (residence time). This differs from above-ground vegetation impacts as it is, more related to peak temperatures and fire behavior during the fire.

Soils/Erosion Response

Soil burn severity has altered surface soil conditions and patterns in the Ferguson fire footprint to a degree that will affect post-fire soil productivity and watershed response. The pattern and severity of soil thermal impacts are given in the SBS map. Impacts varied based on pre-fire vegetation, thickness of forest litter and downed wood, and fire residence time at a given location.

The loss of soil vegetative cover presents the most acute threat to soil function through erosional losses, increased water discharge, and heightened debris flow potential (*see Hydrology and Geology specialist reports for further discussion*). This vulnerability is amplified by decreased water sorbtion from aggregate disruption or obliteration, and to a lesser extent enhanced water repellency. These soil hydrologic impacts will persist until soil vegetative cover returns and detrital organic matter re-stabilizes surface soil horizons. Gradual dispersion of the enhanced water repellant layer will begin with the first wetting rain (assuming no pronounced soil loss), and can range from a few months to 2 years. As an exception, delayed soil function recovery can be expected on high severity burns in colder (cryic) zones on coarse granitics due to low soil organic matter recruitment. Delayed soil function recovery can also be expected in areas that experienced repeated high soil burn severity in past fires.

The above postfire impacts are natural and expected, with the exception of cumulative effects of repeated soil burn severity from an anomalously frequent high intensity fire regime driven in part by anthropogenic climate forcing. As soil thermal damage recovers most of the watershed response patterns can be expected to return to a pre-fire state. The Erosion Risk Management Tool (ERMiT) was used to predict hillslope erosion and sediment production. The highest erosion rates in the fire are predicted on the high and moderate burn severities in the South Fork Merced River drainage. ERMiT erosion rates and EHR were also high on several of the small pourpoint watersheds above Highway 140, even where burn severity is mostly low (e.g. pourpoints 12, 14, 15). Partial loss of vegetation cover on these steep slopes may increase erosion risk in the first year after the fire.

ERMiT, was used to model both pre and post fire sedimentation. Pre-fire sediment potential was 237 cubic yards/ square mile. Within the steeper portions of the fire, such as the chaparral slopes in the South Fork Merced drainage, erosion and sediment potential are assumed to be similar in high and moderate severity burned areas. In other portions of the fire, the sediment inputs to streams could be mitigated by shorter hillslope length, and ground cover accumulations in mixed conifer forests, where needlecast is likely.

Predicted erosion rates (Tons/acre) are elevated one or two orders of magnitude above background erosion rates, ranging from a low of ~6 tons/acre up to 23 tons/acre in a 2 year runoff event. In the middle and low elevation portions of the fire (Merced & South Fork Merced drainages) the erosion & watershed response will be driven by the primary post fire conditions, with higher erosion and sedimentation expected on steep slopes with complete loss of vegetative cover (high or moderate SBS). In higher elevation mixed conifer, the erosion response will be more mixed. Much of the moderate burn severity has a very high potential for needle cast (>60% effective cover), potentially mitigating sediment delivery rates to upper portions of watersheds.

Watershed Response

Approximately 48% of the Ferguson Fire is comprised of unburned to low soil burn severity. As a result, hydrologic modeling showed only minor increases in post-fire runoff for most pour points. Of the 37 pour point drainages, seven showed marked increases in runoff potential over 100%, ranging from 101% – 230% (pour points 6, 7, 20, 21, 28, 30, and 33); 16 pour points showed a moderate (50-100%) increase in runoff response, with the remaining pour points showing <50% increase in runoff response. Pour points 21 and 28 showed the greatest relative increases in runoff potential. It is important to note that, although the increases are high relative to normal Q2 discharge, none of the pour points modeled reached the pre-burn Q10 discharge and only 3 of 37 reached the pre-burn Q5 discharge. Stream channels measured in the vicinity of Values at Risk during field review showed that most channels were incised and flows would stay in channels during flows >Q50 and in many cases >Q100. As such, risks from flooding alone are considered low for a 2 year, 6 hour design storm.

Erosion modeling indicated very low pre-burn erosion rates that increased substantially post-fire. Post fire erosion rates delivered to a channel in the watershed are 5-84 times higher than pre-fire rates. While not all of this sediment would be delivered to a pour point (sediment could be stored in an upstream channel and not reach pour point), it is an indication of the potential for impacts to life, property, and natural resources that could occur due to plugged culverts, washed out roads and trails, etc. The erosion modeling does not take into account ash and woody debris, which can further exacerbate problems caused by increased flows and sediment delivery. The modeling also does not take into account the role of increased runoff in initiating debris flows. See Geology Report for debris flow potential. See hydrology report for modeled results of post-fire increased runoff and sediment delivery.

Watershed responses will be the most acute during the first runoff-producing storms, which typically occur November through April, although this area can be prone to occasional monsoonal storm cells in late summer to early fall, which can produce short duration, but high intensity precipitation events. There will be a higher level of flood and erosion risk during the next three to five years until there is sufficient vegetative recovery to mitigate increased runoff. Surface waters in the fire area will be bulked by ash, debris, and other floatable and transportable material during storm events. It is likely that stream flows from the first post-fire runoff producing rain events will see high concentrations of ash and fine sediment that will cause considerable turbidity and degradation of water quality and the beneficial uses of water.

Geology/Geologic Response

The potential for the occurrence of earth flows/debris flows within the burned area ranges from possible to very likely. Most of the streams and stream segments at risk for earth flows/debris flows are located along highway 140. Debris flows within the 140 corridor have the potential to damage non-Forest Service values at risk. There are few treatable slopes above Highway 140. Parameters required to treat slopes include: slopes greater than 30 and less than 60 degrees with a moderate to high soil burn severity. Federal Values at risk include mid-slope forest service roads and trails within the burned area. Flow consistency will mostly be debris flows in the steeper portions of the burned area, and possibly mud flows or sediment laden flows in the less-steep areas.

The Ferguson Fire burned area is very steep. Thus, the rockfall query results for slopes greater than or equal to 40% in moderate to high soil burn severity is dominated by the occurrence of moderate to high soil burn severity. Rockfall hazards occur along Highway 140, Incline Road, FS Roads 4S04 and 5S25, Hite Cove and Savage Lundy Trails and Anderson Flat and Crane Flat road areas. Rockfall and debris flows along Highway 140 at the Ferguson landslide area are likely (based on BAER definition for probability).

Landslides within burned areas will likely experience renewed movement, or more likely, movement on a part (nested landslides) of the existing feature. The Ferguson landslide is not expected to experience significant movement (as

discussed previously). Post-fire movement of landslides is the result of increased groundwater infiltrations into these features due to reduced evapotranspiration and/or less intercepting foliage to rainfall events and snow accumulation.

Values at risk were evaluated for earth flow/debris flow hazards in the field and with the aid of USGS debris flow modeling, and for rockfall hazards in the field and with the aid of ArcGIS modeling. The probability for an earth flow/debris flow for drainages within South Fork Merced, Moss Creek Merced River, Ned Gulch Merced River, Lower South Fork Merced River, and Bull Creek Watersheds are POSSIBLE TO VERY LIKELY. We identified several key areas susceptible to rock falls within or below a moderate-high soil burn severity, and where Values at Risk will benefit by including rockfall hazard signs.

Areas with slope stability issues include road segments along Incline Road, Highway 140, FS Road 4S04, and FS Road 5S25. Portions of Highway 140 (Ferguson Rockfall Area), Anderson Flat and Crane Flat Roads stability issues are exacerbated by the fire. A seasonal closure is recommended for the Hite Cove and Savage Lundy Trails and Anderson Flat and Crane Flat Roads to mitigate rockfall and debris flow hazards.

Critical Values/Resources & Threats

Table 1: 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

Threats to Life/Safety and Property

National Forest System Roads

Forest roads provide various types of access such as; access to private property, various hiking trail heads, various developed campgrounds, FS look outs, grazing allotments, hunting, various OHV trails, a mine site, and disperse camping along the roads. Most of the road segments surveyed have inside ditch, rolling dips, run-off ditches, low water crossings, side-drains, and culverts ranging from 18" to 96" in diameter. Other secondary roads were also surveyed in the high to moderate burn severity for the purpose of this report. Approximately 113.89 miles of Forest Service roads are proposed for treatments that are in the High to Moderate.

Risk to road users is determined to be Very High with Major consequences on the Forest Service Roads with High and Moderate burned severity. Potential for debris flows, flooding is considered to be likely the first winter due to the burned watershed on slopes above road segments on these roads. Based on Travel Management, most of Forest Service roads are open from April 15 to December 31. There are some roads that open at an early timeframe (see Forest MVUM for details). These roads are open to wheel traffic during dry conditions and to overshow vehicles during the winter.

Although the first winter has the highest potential for risk to life and safety, it is recommended to maintain an effective and consistent closure on the identified roads for the first winter or until the post burned watershed stabilizes. Closure applies to wheel traffic and over snow vehicles. It is recommended for the home unit to assess the roads after the first winter to determine if the roads are safe for access. Proposed treatments include BAER warning signs, information signs, and gates at main entry points to caution road users of potential debris flow and flooding in the area.

Risk to road improvements and loss of road function is considered Very Likely with Major consequences on roads with High to Moderate burned severity. There are also roads in the low burned severity have been determined to have Very High Risk, due to the burned hillslopes above the road. Diversion of uncontrolled water from road drainage courses on to the road surface, results in degradation and unacceptable erosion, gullies, and loss of road functions and inability of private property owners, permittees, and forest users' access.

National Forest System Trails

As a direct consequence of the fire, the greatest risk at this time for user safety is from rolling rocks and debris slides. The loss of soil stabilizing vegetation due to the fire has resulted in loose, unsupported trail tread and uphill slopes to all trails within the fire perimeter.

The property at risk is segments of the trail system itself. As a direct consequence of the fire there is a large risk of damage to the trail caused by the loss of water control. Increased flow rates can be expected following the loss of vegetation. This increased flow rate will result in trail tread eroding flow patterns and/or midslope and drainage following trails becoming covered by dry ravel and debris. Trails that follow and repeatedly cross intermittent stream channels are subject to washouts and loss of trail segments.

Abandoned Mine Lands

Within the fire area there were four Sierra National Forest Abandoned Mine Lands (AML) sites and one Stanislaus site impacted by the fire. These sites have multiple safety issues associated to them including one or a combination of the following; open adits, previously closed adits, old buildings, unstable mine tailings piles, and unstable vertical stopes. After a field inspection no issues were identified with any of the previously closed adits, only damaged and/or destroyed AML warning signs were observed.

Threats to Natural or Cultural Resources

Aquatics & Wildlife Resources

Suitable habitat for two federally-listed species, Sierra Nevada yellow-legged frog (endangered) and Yosemite toad (threatened) species, occurs in the Ferguson fire area; however, no extant populations are currently known. Historic records for California red-legged frog also occur but this species is considered extirpated from the fire area. No designated or proposed Critical Habitat occurs within the fire area.

If Sierra Nevada yellow-legged frogs occur in the fire, frogs and their habitat could be negatively affected by the predicted flooding, loss of water quality, debris flows, and rock falls. Effects to Yosemite toads, if present, are expected to be lower due to the lower burn severity experienced in the meadow habitat and topography in/around them. If these species do occur, the risk would be considered high; however, due to the low likelihood of occurrence and the low feasibility of treatments with a high predictability of success, no treatments are proposed.

Several other species that have been petitioned for federal listing are "under review" by U.S. Fish and Wildlife Service.

While BAER only provides for treatments for federally-listed species, habitat for Forest Service Sensitive species were assessed to determine if they could be affected by proposed treatments. Several R5 sensitive species (northern goshawk, willow flycatcher, bald eagle, great gray owl, California spotted owl, Townsend's big-eared bat, Pacific marten, fisher, fringed myotis, Sierra Nevada red fox, limestone salamander, foothill yellow-legged frog, and western pond turtle), and a high public interest species (resident trout) were considered during this analysis. The Wildlife Resources Report contains recommendations for these species.

Cultural Resources

A total of 120 prehistoric and historic sites were identified for focused BAER assessments within the moderate and high soil burn severity. Archeologists observed values at risk to seven sites from large trees that had been killed by the fire and might fall, disturbing features. Dropping them away from features will reduce this risk. Four archeological sites were identified as potentially vulnerable from erosion as identified by the Erosion Risk Management Tool (ERMiT). Dropping trees along the slopes will help keep artifacts from moving off-site. In addition, many archaeological sites, both historic and prehistoric, throughout the fire perimeter are now more vulnerable to unauthorized collection. Four sites will need wood chips or other vegetation lopped and scattered to cover the artifact concentrations easily visible from a road.

One traditional cultural area, in Anderson Valley, was within the fire perimeter. Consultation with tribal partners helped identify impacts and needed treatments. The cultural area is at risk from looting due to the exposed sites. This is less likely with a proposed temporary closure of 2S02 and law enforcement patrol. One historic area, Trumbull Peak, was also within the fire perimeter. The historic camps are at risk of looting. The area was previously closed due to this risk during the Motor Fire. A gate, already present on 2S20 at the intersection with 1S12, will assist with this closure.

Ecosystem Stability and Vegetation Recovery

Botany

No federally listed Threatened, Endangered, or Candidate plant species nor critical habitat are found in the Ferguson Fire area. Seven Forest Service Sensitive plants occur in the burn area, these were mostly unaffected by the firefighting effort and are expected to benefit from the fire if anything. However, to be safe, guidelines have been provided to other disciplines to ensure that land treatments for other purposes do not inadvertently harm FSS plant species.

The BAER team determined that it was very likely that fire suppression activities introduced invasive plants into previously uninfested areas, and that the magnitude of consequences to native vegetation from invasive plants was moderate across the entire burn area (partially due to the steepness of the terrain limiting access for fire line construction). The areas that were disturbed by fire line construction or event points (e.g. staging areas, drop points) are extremely vulnerable to germination and spread of invasive weeds the first year after the burn. Therefore, the team determined that invasive plants introduced to new areas by fire suppression pose a very high risk to ecosystem stability and vegetation recovery.

Drew Meadows Camp (private land within the Stanislaus NF) and the county-owned Incident Command Post at Ahwahnee Hills Regional Park both contain widespread infestations of numerous invasive plant species, including yellow star thistle, klamathweed, tocalote, medusahead grass (Drew Meadows), Italian thistle, mullein, and bull thistle. Although weed wash stations were set up and in use for much of the incident, it is very likely that crews and equipment spread invasive plant seed during initial attack and incidentally on boots and gear. Dozers were also operated in areas infested by invasive plants. In addition, not all equipment or off road vehicles went through the weed wash, and the configuration of the weed wash at Ahwahnee ICP allowed some seeds to be carried with the muddy water as the wheels drove away. Any vehicle that traversed the low road on the one-way route at Ahwahnee ICP traversed viable, mature seeds of yellow starthistle, despite the efforts of READS to reduce this likelihood.

The abundance of serious (many State-listed Noxious) invasive weeds at both ICPs, and the numerous incidents where fire lines intercepted known (and likely unknown) invasive weed infestations during fire suppression makes the burn area vulnerable to rapid establishment of aggressive, damaging plant species that could alter the function of the ecosystem and the integrity of the vegetation if not addressed promptly. The Botany Specialist report contains further information and maps showing the locations of known weed infestations in and near the burn area as well as at both

ICPs and evaluates the risk in detail. A budget for conducting Early Detection/Rapid Response surveys and control is presented in this form for each national forest.

Emergency Treatment Objectives

- **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.

- **Trails:** 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.

- **Abandoned Mine Lands:** The only treatment recommendation at this time is to replace the damaged AML warning sites at the sites throughout the Merced River Canyon for public safety.

- **Heritage:** Protect sites from increased hillslope erosion and looting.

- **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.

- **Hazmat:** A follow-up field assessment will be completed and a secondary (interim) analysis/report will be put together for the hazmat situation at Ned's Gulch, Miller's Gulch, and Soapstone Ridge once a determination can be made.

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%

- Structures: N/A

Table 2: 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):): $3,875,000

Cost of Selected Alternative (Including Loss): $2,906,000

Skills Represented on Burned-Area Survey Team

☒ Hydrology	☒ Soils	☒ Geology	☐ Range
☐ Forestry	☒ Wildlife	☐ Fire Management	☐ Engineering
☐ Contracting	☐ Ecology	☒ Botany	☒ Archaeology
☒ Fisheries	☐ Research	☐ Landscape Architect	☒ GIS

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Treatment Narrative

Road Treatments

Proposed BAER road treatments to mitigate the emergency for roads in the High to Moderate burned severity are; Install BAER Warning signs and information signs at main entry points of roads, install gates at selected locations, install rock barriers adjacent to existing gates to discourage OHV usage, inspect road after damaging storms for rock fall, debris flows and washouts, identify problem areas and respond as needed with personnel and equipment as needed when road opens during Spring time and safe to access.

Table 3: Sierra National Forest road treatment costs

Item	Pay Unit	Unit Cost	Quantity	Cost	BAER Cost Over +Mob
Install BAER Warning Signs	EA	$500	14.00	$7,000	$9,100
Information Signs	EA	$300	11.00	$3,300	$4,290
Install Critical Dip	EA	$400	5.00	$2,000	$2,600
Install Drainage Armor (Class 3)	C.Y.	$350	505.00	$176,750	$229,775
Increase Inlet Catch Basin	EA	$400	172.00	$68,800	$89,440
Increase Inlet Catch Basin 42" CMP	EA	$600	2.00	$1,200	$1,560
Increase Inlet Catch Basin 72" CMP	EA	$800	1.00	$800	$1,040
Install 24" riser	LF	$350	6.00	$2,100	$2,730
Install 36" riser	LF	$400	5.00	$2,000	$2,600
Install 42" riser	LF	$450	5.00	$2,250	$2,925
Gate	EA	$5,000	6.00	$30,000	$39,000
Rock Barrier	EA	$1,500	5.00	$7,500	$9,750
Install Culvert Inlet Grate	EA	$2,800	2.00	$5,600	$7,280
Restore Drainage Function	Mile	$3,350	39.50	$132,325	$172,023
Hazard Tree removal	Day	$900	32.00	$28,800	$37,440
Storm Inspection and Response	Day	$1,750	15.00	$26,250	$34,125
Remove 12" CMP	EA	$800	1.00	$800	$1,040

Item	Pay Unit	Unit Cost	Quantity	Cost	BAER Cost Over +Mob
Archeological Monitoring	Day	$500	14	$7,000	$9,100
Aquatics Monitoring	Day	$500	11	$5,500	$7,150
Terrestrial Monitoring	Day	$500	11	$5,500	$7,150
Total Cost:					$670,118
Cost Per Mile:					$7,611

Table 4: Stanislaus National Forest road treatment costs

Item	Pay Item	Unit Cost	Qty	Cost	BAER Cost Over +Mob
Install BAER Warning Signs	EA	$500	6	$3,000	$3,900
Information Signs	EA	$300	1	$300	$390
Install Critical Dip	EA	$400	11	$4,400	$5,720
Dip	EA	$350	35	$12,250	$15,925
Install Drainage Armor (Class 2)	C.Y.	$350	32	$11,200	$14,560
Install Drainage Armor (Class 3)	C.Y.	$350	10	$3,500	$4,550
Install 24" CMP	LF	$1	0	$0	$0
Install 18" metal end section	EA	$1,100	2	$2,200	$2,860
Install 24" metal end section	EA	$1,300	2	$2,600	$3,380
Install 36" metal end section	EA	$1,500	0	$0	$0
Install 48" metal end section	EA	$2,100	3	$6,300	$8,190
Low water crossing	EA	$2,500	1	$2,500	$3,250
Gate	EA	$5,000	0	$0	$0
Rock Barrier	EA	$1,500	0	$0	$0
Install Culvert Inlet Grate	EA	$1,250	1	$1,250	$1,625
Restore Drainage Function	Mile	$3,350	25.84	$86,564	$112,533
Hazard Tree removal	Day	$900	9	$8,100	$10,530
Storm Inspection and Response	Day	$1,750	6	$10,500	$13,650
Clean Inlet 18"	EA	$300	19	$5,700	$7,410
Clean Inlet 24"	EA	$350	3	$1,050	$1,365
Clean Inlet 36"	EA	$400	3	$1,200	$1,560
Clean Inlet 72"	EA	$500	0	$0	$0
Increase inlet catch basin	EA	$400	10	$4,000	$5,200
Archeological Monitoring	Day	$500	6	$3,000	$3,900
Aquatics Monitoring	Day	$500	4	$2,000	$2,600
Terrestrial Monitoring	Day	$500	4	$2,000	$2,600
				Total Cost:	$225,698
				Cost Per Mile:	$8,734

Total road treatment costs: **$895,816**.

Proposed treatments of area, road, or trail closures and enforcement patrols would help with recovery of suitable habitat for Threatened, Endangered, and Sensitive animals by reducing the compounding and cumulative effects of OHV

incursions, non-native species spread/introductions, and reducing human disturbance during the period where animals are stressed and vulnerable due to lack of cover and forage.

Where ground disturbance or tree-felling activities are proposed, coordination with the appropriate district terrestrial and aquatic biologists is required.

Where work is needed on road/trail crossings or culverts, the appropriate district terrestrial and aquatic biologists need to be consulted in order to help develop designs that promote rather than hinder fisher and pond turtle passage.

Trail Treatments

Trail treatments are recommended for sections of trail deemed most at risk, when those treatments can be accomplished in a timely manner. Recommended measures include trail closure for the first winter at a minimum to provide for public safety. This could be accomplished as part of an area closure and should be accompanied by patrolling for effectiveness.

To provide for implementation crew safety, hazard trees should be removed at sites where crews need to camp. All recommended trail treatments include log outs necessary to make the work sites accessible and to allow for safe crew egress in case of emergency.

Due to intense dry raveling and immediate concern of rock fall and/or slumping damaging or closing the trail, inspectors will be needed to perform trail status monitoring. The inspections should be conducted after significant weather events. Minor post-fire related issues should be dealt with by inspectors and more severe issues should be reported in order to prepare a response strategy.

Table 5: Sierra National Forest trail treatments

Item	Unit	Unit Cost	# of Units	Cost
Trail Labor Costs (Non-motorized)	Miles	$2,074.47	23.03	$ 47,775
Trail Labor Costs (Motorized)	Miles	$3,058.82	11.05	$ 33,800
Gates & Signs (Includes Signs, labor, and mileage)	Each	$3,445.00	4.00	$ 13,780
Inspection	Miles	$ 405.99	23.03	$ 9,350
Hazard Tree (Work locations only)	Days	$ 700.00	10.50	$ 7,350
			Total:	$112,055

Table 6: Stanislaus National Forest trail treatments

Item	Unit	Unit Cost	# of Units	Cost
Trail Labor Costs (Non-motorized)	Miles	$1,834.68	1.24	$ 2,275
Gates & Signs	Each	$ -		$ -
Inspection	Miles	$ 443.55	1.24	$ 550
Hazard Tree (Work locations only)	Days	$ 700.00	1.00	$ 700
			Total:	$3,526

Total trail treatment costs: **$115,581**

Heritage Treatments

Treatment include removal of hazard trees, tree felling for use as erosion control, loping & scattering of smaller diameter trees to cover exposed artifacts, and wood chipping to cover exposed artifacts. For proposed heritage treatments, review

ahead of time for the tree-felling treatments will be needed and on site monitoring during the work will be required if it is in habitat for great gray owl, goshawk, fisher, spotted owl, pond turtle, etc.

Table 7: Sierra National Forest heritage treatments

Item	Unit	Unit Cost	# of Units	Cost
Remove hazard trees	Each	$630	3	$1,890
Drop hazard trees and use for erosion control	Each	$630	1	$630
Terrestrial/Aquatic Biologist Implementation Monitoring + Mileage	Day	$500	1	$500
			Total Cost:	$3,020

Table 8: Stanislaus National Forest heritage treatment costs

Item	Unit	Unit Cost	# of Units	Cost
Remove hazard trees	Each	$630	4	$2,520
Drop hazard trees and use for erosion control	Each	$630	3	$1,890
Removal vegetation and lop and scatter to cover exposed artifacts	Each	$630	2	$1,260
Chip wood to cover exposed artifacts	Each	$250	2	$500
Temporary closure of FS Road 2S02 and 2S20 (at 1S12, gate already present)	Each	$500	2	$1,000
Terrestrial/Aquatic Biologist Implementation Monitoring + Mileage	Day	$500	1	$500
			Total Cost:	$7,670

Total heritage treatment costs: **$10,690**.

Soil Productivity Treatments

For most of the high and moderate SBS areas within the Ferguson fire, slopes are too steep to effectively treat to protect soil productivity, or the percent treatable area is small. Thus, no hillslope treatments are proposed to protect soil productivity in the Ferguson Fire.

Channel Treatments

None proposed.

Structure Treatments

None proposed.

Safety Treatments

Replacing damaged AML warning signs at mine sites identified within the Merced River Canyon along Highway 140 and time for the interagency coordinator.

Table 9: Safety treatment costs

Item	Unit	Unit Cost	# of Units	Cost
AML Coordinator GS9-5	Days	$308	2	$616
AML Mileage	Use Rate	$0.29	400	$116
			Sierra National Forest Total Cost:	$732

Table 10: Interagency Liaison/Coordinator

Item	Unit	Unit Cost	# of Units	Cost
Interagency Liaison/Coordinator (GS11)	Days	$460	10	4,600
Interagency Liaison/Coordinator Mileage	Use Rate	$0.29	1,000	$290
			Sierra National Forest Total Cost:	$4,890

Total safety treatments costs: **$5,622.**

Botany

Priority areas on the SNF are approximately 54 miles of dozer line, 4 miles of hand line, and 41 miles of "road as completed line" (close proximity of the dozer line to the road led the road being mapped instead of the dozer line); in addition to 18 key event points.

Table 11: Sierra National Forest botany land treatment costs

Item	Unit	Unit Cost	# of Units	Cost
GS-11 Botanist (Hiring, training, survey/treatments, supervision, reporting)	Days	$395	15	$5,925
4 GS-6s Biological Technicians	Days	$170.00	240	$40,800
Vehicle Mileage (survey and treatment)	Use Rate	$0.50	2,000	$1,000
Supplies & Materials (Tools, trash bags, gloves, safety items)	Each	$1,800.00	1	$1,800.00
			Sierra National Forest Total Cost:	$49,525

Priority areas are 41 miles of dozer line, 7 miles of hand line, and 23 miles of "road as completed line" (close proximity of the dozer line to the road led the road being mapped instead of the dozer line); in addition to at least 9 key event points totaling about 2 acres.

Table 12: Stanislaus National Forest botany land treatments

Item	Unit	Unit Cost	# of Units	Cost
GS-9 (Hiring, training, survey/treatments, supervision, reporting)	Days	$350.00	20	$7,000
4 - GS-5 Weed Technicians	Days	$170.00	240	$40,800
Vehicle Mileage - 2 Vehicles (survey and treatment)	Use Rate	$0.55	1,500	$825
FOR - 2 holdovers	Each	$800.00	3	$2,400
Supplies & Materials (Tools, trash bags, gloves, safety items)	Each	$520.00	1	$520
			Sierra National Forest Total Cost:	$51,545

Total botany treatments costs: **$101,070**.

Hazmat Treatments

An additional treatment discussion and associated costs will be part of the secondary analysis done at the hazmat sites found in Ned's Gulch, Miller's Gulch, and Soapstone Ridge.

Monitoring Narrative

Monitor the effectiveness of erosion treatments next spring after snow has melted, monitoring would occur for one site on the Sierra and three sites on the Stanislaus.

Table 13: Sierra National Forest monitoring of heritage treatments costs

Item	Unit	Unit Cost	# of Units	Cost
Archaeologist GS-193-11 (Monitoring 1 site)	Each	$460.00	1	$460
			Total Cost:	$460

Table 14: Stanislaus National Forest monitoring of heritage treatment costs

Item	Unit	Unit Cost	# of Units	Cost
Archaeologist GS-193-09 (Monitoring 3 sites)	Each	$360.00	2	$720
			Total Cost:	$720

Total heritage treatment monitoring costs: **$1,180.**

Ferguson Fire BAER Team

- Team Leader – Todd Ellsworth (R5-INY)
- Co-Team Leader/Interagency Coordinator – Marc Stamer (R5-BDF)
- GIS – Tracy Tennant (R5-BDF)
- Hydrologist - Tracy Weddle (R5-STF)
- Hydrologist – Andy Stone (R5-SQNF)
- Soils Scientist – Curtis Kvamme (R5-STF)
- Soils Scientist – Sam Prentice (R5-SNF)
- Geologist – David Annis (R5-ENF)
- Engineering – Antonio Cabrera (R5-SNF)
- Engineering - Marcos Rios (R5-SQNF)
- Engineering – Gregory Cox (R5-STF)
- Trails - Erich Huebner (R5-STF)
- Botany – Joanna Clines (R5-SNF)
- Wildlife/Executive Assistant – Robin Eliason (R5-BDF)
- Archaeology – Kathy Strain (R5-STF)
- Team Leader Trainee – Kellen Takenaka (R5-SNF)
- GIS Trainee – Lisa Bonilla (R5-SNF)
- Hydrologist Trainee – Michael Wiese (R5-INF)
- Geologist Trainee – Colleen Garcia (R5-INF)
- Engineering Trainee – Pablo Gonzalez (R5-SNF)
- Botany Trainee – Mary Crawford (R5-INF)
- Archaeology Trainee - Allison Stevenot (STF)
- Archaeology Trainee – Shoshana Jennifer Rosenberg (R5- STF)
- Archaeology Trainee – Zack Moskowitz (R5-STF)
- Archaeology Trainee – Dayne Crosby (R5-STF)

Table 15: Breakdown of qualified and trainee approximate costs (time, vehicles, and per diem)

Status	Sum of Time	Sum of Vehicles	Sum of Per Diem	Total
Qualified	$ 141,434	$ 3,939	$ 23,883	$ 169,256
Trainee	$ 57,765	$ 2,111	$ 14,710	$ 74,586
Total:	$ 199,199	$ 6,050	$ 38,593	$ 243,842

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

Table 16: Sierra National Forest treatment costs total

Line Items	NFS Lands				
	Units	Unit Cost	# of Units	WFSU SULT $	Other $
A. Land Treatments					
Botany					
GS-11 Botanist (Hiring, training, survey/treatments, supervision, reporting)	Days	$395	15	$5,925	
4 GS-6s Biological Technicians	Days	$170	240	$40,800	
Vehicle Mileage (survey and treatment)	Use Rate	$1	2,000	$1,000	
Supplies & Materials (Tools, trash bags, gloves, safety items)	Each	$1,800	1	$1,800	
			Total:	$49,525	
Heritage					
Remove hazard trees	Each	$630	3	$1,890	
Drop hazard trees and use for erosion control	Each	$630	1	$630	
Terrestrial/Aquatic Biologist Implementation Monitoring + Mileage	Day	$500	1	$500	
			Total:	$3,020	
			Subtotal Land Treatments:	$52,545	
B. Channel Treatments					
None Proposed				$0	
			Total:	$0	
			Subtotal Channel Treatments:	$0	
C. Road and Trails					
Roads					
BAER sign	Each	$536	25	$13,390	
Gates	Each	$6,500	6	$39,000	
Barriers	Each	$1,950	5	$9,750	
Storm Proofing	Miles	$5,826	88.05	$513,013	
Hazard Trees	Each	$1,170	32	$37,440	
Storm Inspection	Each	$2,275	15	$34,125	
Monitoring	Each	$650	36	$23,400	
			Total:	$670,118	
Trails					
Trail Labor Costs (Non-motorized)	Miles	$2,074	23.03	$47,775	
Trail Labor Costs (Motorized)	Miles	$3,059	11.05	$33,800	
Gates & Signs (Includes Signs, labor, and mileage)	Each	$3,445	4	$13,780	
Inspection	Miles	$406	23.03	$9,350	

Hazard Tree (Work locations only)	Days	$700	10.5	$7,350	
			Total:	$112,055	
			Subtotal Roads & Trails Treatments:	$782,172	
D. Safety					
AML Safety Signs					
AML Coordinator GS9-5	Days	$308	2	$616	
AML & Interagency Mileage	Use Rate	$0	400	$116	
			Total:	$732	
Interagency Coordinator Position					
Interagency Coordinator	Days	$460	10	$4,600	
Interagency Mileage	Use	$0	1000	$290	
Total:				$4,890	
			Subtotal Safety:	$5,622	
E. BAER Evaluation					
BAER team	Each			$243,842	
			Subtotal Evaluation:	$243,842	
F. Monitoring					
Heritage Monitoring	Each	$460	1	$460	
Total:				$460	
			Subtotal Monitoring:	$460	
			Total (Excluding BAER Evaluation):	$840,799	

Table 17: Stanislaus National Forest treatment cost totals

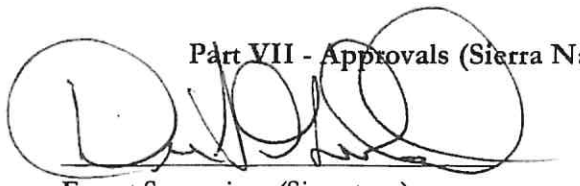
Line Items	NFS Lands				
	Units	Unit Cost	# of Units	WFSU SULT $	Other $
A. Land Treatments					
EDRR Surveys					
(BOT) GS-9 (Hiring, training, survey/treatments, supervision, reporting)	Days	$350	20	$7,000	
(BOT) 4 - GS-5 Weed Technicians	Days	$170	240	$40,800	
(BOT) Vehicle Mileage - 2 Vehicles (survey and treatment)	Use Rate	$1	1500	$825	
(BOT) FOR - 2 holdovers	Each	$800	3	$2,400	
(BOT) Supplies & Materials (Tools, trash bags, gloves, safety items)	Each	$520	1	$520	
			Total:	$51,545	
Heritage Treatments					
Remove hazard trees	Each	$630	4	$2,520	
Drop hazard trees and use for erosion control	Each	$630	3	$1,890	
Removal vegetation and lop and scatter to cover exposed artifacts	Each	$630	2	$1,260	
Chip wood to cover exposed artifacts	Each	$250	2	$500	
Temporary closure of FS Road 2S02 and 2S20 (at 1S12, gate already present)	Each	$500	2	$1,000	
Terrestrial/Aquatic Biologist Implementation Monitoring + Mileage	Day	$500	1	$500	
			Total:	$7,670	
			Subtotal Land Treatments:	$59,215	
B. Channel Treatments					
None Proposed				$0	
			Total:	$0	
			Subtotal Channel Treatments:	$0	
C. Road and Trails					
Roads					
BAER sign	Each	$613	7	$4,290	
Gates	Each	$0	0	$0	
Barriers	Each	$0	0	$0	
Storm Proofing	Miles	$7,281	26	$188,128	
Hazard Trees	Each	$1,170	9	$10,530	
Storm Inspection	Each	$2,275	6	$13,650	
Monitoring	Each	$650	14	$9,100	

			Total:	$225,698	
Trails					
Trail Labor Costs	Miles	$1,835	1.24	$2,275	
Gates & Signs	Each				
Inspection	Miles	$444	1.24	$551	
Hazard Tree (Work locations only)	Days	$700	1	$700	
			Total:	$3,526	
			Subtotal Roads & Trails Treatments:	$229,224	
D. Safety/Structures					
None Proposed (Interagency Coordinator costs can be found under the Sierra costs)				$0	
			Total:	$0	
			Subtotal Structures:	$0	
E. BAER Evaluation					
BAER team	Each			$243,842	
			Subtotal Evaluation:	$243,842	
F. Monitoring					
Heritage Monitoring	Each	$720	1	$720	
			Total:	$720	
			Subtotal Monitoring:	$720	
Totals (Excluding BAER Evaluation)				$289,159	

Table 18: Ferguson Fire BAER treatment and evaluation total costs

Sierra National Forest Treatment Costs:	$840,799
Stanislaus National Forest Treatment Costs:	$289,159
BAER Team (Qualified Specialists):	$169,256
BAER Team (Trainees):	$74,586
Total Cost (Treatments Only):	$1,129,958

Part VII - Approvals (Sierra National Forest)



Forest Supervisor (Signature)

8/30/18

Date

For Regional Forester (Signature)

9/6/18

Date

Part VII - Approvals (Stanislaus National Forest)

for Forest Supervisor (Signature) — Date: 8/30/18

for Regional Forester (Signature) — Date: 9/6/18