

October 11, 2022**MOSQUITO FIRE BURNED-AREA REPORT****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:** Mosquito
- B. Fire Number:** CA-TNF-001371
- C. State:** CA
- D. County:** Placer and El Dorado County
- E. Region:** 05 – Pacific Southwest
- F. Forest:** Tahoe and El Dorado National Forest
- G. District:** American River and Georgetown Ranger Districts
- H. Fire Incident Job Code:** P5P1W8 (0517)
- I. Date Fire Started:** September 6, 2022
- J. Date Fire Contained:** 90% (as of 10/04/2022)
- K. Suppression Cost:** 137 million (as of 10/04/2022)

L. Fire Suppression Damages Repaired with Suppression Funds (estimates):

Item	Unit	Amount Identified	Amount Repaired	No Repair Needed	Remaining
Mapped Dozer Line	Miles	924.5	61	0.51	863
Road as Control Line	Miles	89.3	22.3	0	67
Mapped Hand Line	Miles	44.8	10.7	0.2	34
Hand/Dozer Line	Miles	8	1.8	0	6
Spike Camps	Count	1	0	0	1
Drop Points	Count	32	31	1	31
Helispots	Count	4	0	0	4

M. Watershed Numbers:

HUC #	Watershed Name	Total Acres	Acres Burned	% of Watershed Burned
180201280402	Eldorado Creek	13,154	12,726	97%
180201280403	Peavine Creek-North Fork Middle Fork American River	21,619	14,446	67%
180201280303	Brushy Creek-Middle Fork American River	18,445	11,560	63%
180201280503	Volcano Canyon-Middle Fork American River	21,549	9,960	46%
180201280209	Little Grizzly Canyon-Rubicon River	28,657	13,082	46%
180201280208	Long Canyon	31,301	9,903	32%
180201280207	Pilot Creek	19,425	3,982	20%
180201280501	Otter Creek	11,490	514	4%
180201280401	Secret Canyon-North Fork Middle Fork American River	24,348	937	4%
180201290403	One Eye Creek-Rock Creek	22,318	90	<1%
180201280106	Humbug Creek-North Fork American River	23,303	6	<1%

N. Total Acres Burned: Based on September 24, 2022 BARC Perimeter

Soil Burn Severity	Acres	Land Ownership					
		Tahoe NF	Eldorado NF	BLM	BOR	Other Fed. Lands	Private
<i>GRAND TOTAL</i>	77,207	28,655	23,678	1,206	518	48	23,102

O. Vegetation Types:

Dominant vegetation communities within the burn perimeter are as follows: Sierran Montane Hardwood Forest, Sierran Montane Hardwood-Conifer Forest, Ponderosa Pine Forest, Jeffery Pine Forest, Sierran Mixed Conifer Forest, and Douglas Fir Forest.

P. Dominant Soils:

The soils are derived primarily from metasedimentary parent rock that was carved by the ancestral tertiary American River. The dominant soils from the metasediments are the Deadwood, Mariposa, and Maymen soil series. During the Tertiary period, very large volcanic eruptions deposited volcanic ash and mud filled the channels. These ash and mudflows produce the McCarthy soil series and dominate the ridges and form a soil that is rocky and shallow with high runoff potential. The soil textures of most the soils within the fire are sandy loams and loams. For a more detailed (and accurate) description of the bedrock geology, see the Geology Report.

Q. Geologic Types:

The Mosquito Fire area is within the Sierra Nevada geologic province, which is locally characterized by Paleozoic metamorphic, sedimentary, and volcanic rocks of the Western metamorphic belt, with many of the ridges capped by Tertiary volcanic rocks (ancestral American River).

R. Miles of Stream Channels by Order or Class:

Stream Type	Miles of Stream
Perennial	188
Intermittent	79
Ephemeral	655
Canal/Ditch	33

S. Transportation System:

Trails: *National Forest (miles):*

Eldorado NF		Tahoe NF	
Trail Name	Total	Trail Name	Total
Buckeye Flat	2.21	Bake Oven Trail	2.02
Clydesdale	2.18	Codfish (Loop 6) Trail	15.32
Donaldson	1.61	Forks House Natural Trail	0.31
Nevada Point	5.56	Grouse Creek OHV Trail	2.66
Tillotson	4.71	Grouse Falls Overlook Trail	0.43
Volcanoville Tie	2.97	Humbug (Loop 5) Trail	2.22
		Mitchell (Tie 5-6) Trail	1.52
		Mosquito Ridge Trail	0.93
		N.Fork American River Trail	1.01
		Stairway Trail	0.02
		Western States Trail	12.11
Total	19.25		38.54
Grand Total			57.78

Roads: *National Forest (miles):*

MVUM Category	Eldorado NF	Tahoe NF	Grand Total
Roads Open to All Vehicles,	24.4	36.0	60.4
Roads Open to Highway Legal Vehicles Only, Seasonal	1.7	25.0	26.7
Roads Open to Highway Legal Vehicles Only, Yearlong	25.6	6.3	31.8
Other Public Roads	1.6	22.6	24.2
Grand Total	53.3	89.9	143.2

PART III - WATERSHED CONDITION

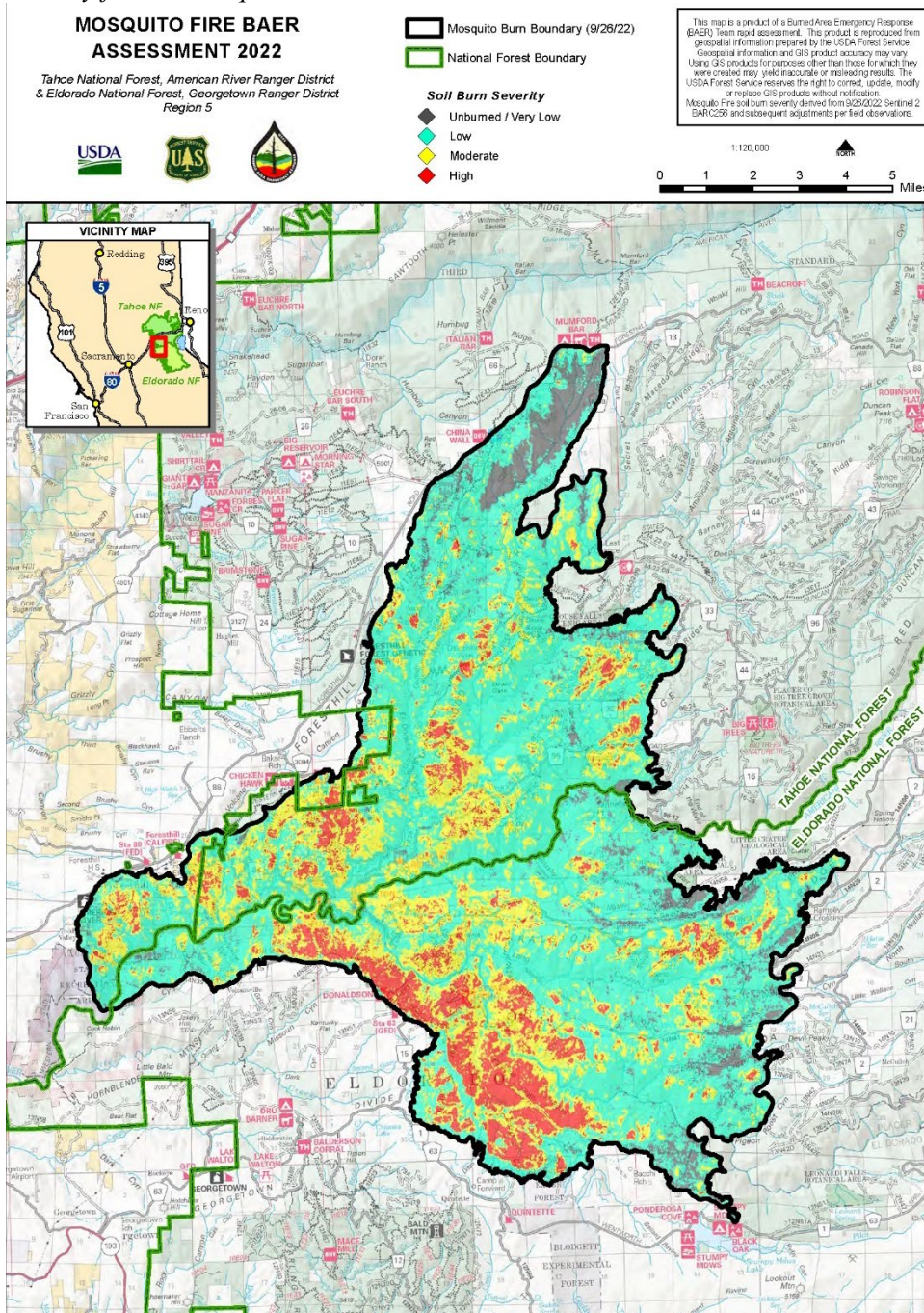
A. Burn Severity (acres):

The analysis boundary used by the watershed group differs slightly from the incident data, by approximately 419 acres. The burn boundary used for the SBS calculations was derived from the BARC satellite imagery. As such, it may include very low burn signatures perhaps not identified by incident mappers. The intention of the BAER analysis boundary is for watershed analysis, not for public acreage reporting.

Soil Burn Severity: Based on September 24, 2022 BARC Perimeter

Soil Burn Severity	Acres	Percentage	Land Ownership					
			Tahoe NF	Eldorado NF	BLM	BOR	Other Fed. Lands	Private
Unburned / Very Low	5,691	7.4%	1,297	1,848	24	27	8	2,419
Low	45,077	58.4%	18,280	13,393	600	261	39	12,573
Moderate	19,292	25%	7,438	5,589	455	193	1	5,616
High	7,147	9.3%	1,640	2,848	127	37	0	2,494
GRAND TOTAL	77,207	100.0%	28,655	23,678	1,206	518	48	23,102

Soil Burn Severity for the Mosquito Fire.



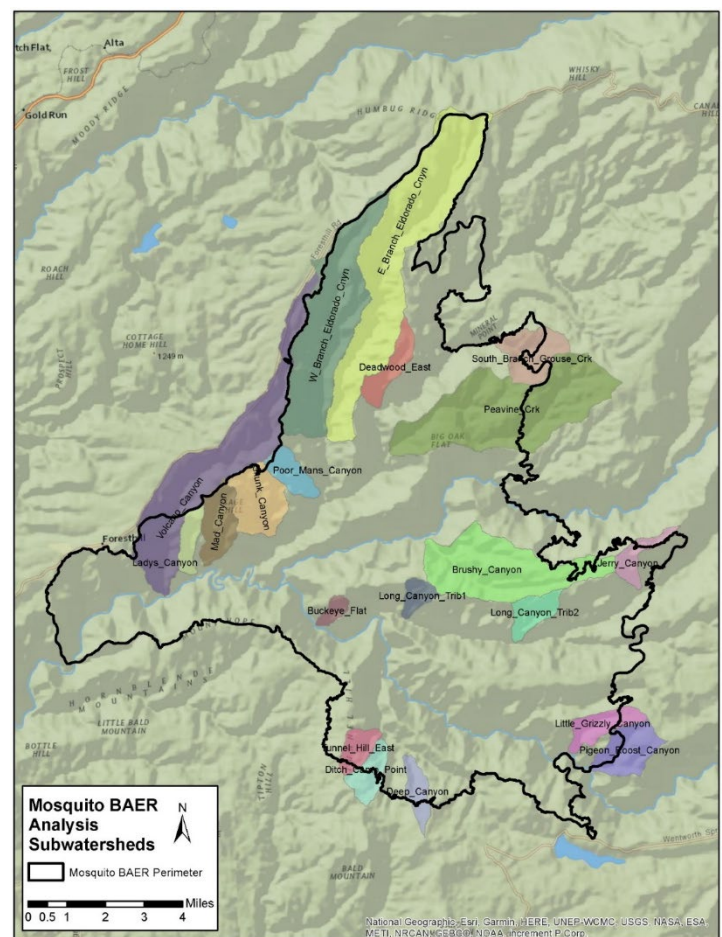
- B. Water-Repellent Soil (acres):** Approximately 27,000 acres. All Moderate and High Soil Burn Severity had strong water repellency. Although water repellency is a natural soil property, those soils with strong water repellency and little soil cover will result in rapid runoff and higher erosion at the soil surface.
- C. Soil Erosion Hazard Rating:** ERMiT erosion modelling was used to analyze the risk of soil erosion hazards (See E).
- D. Erosion Potential:** Erosion rates were modeled for a 2, 5 and 10 year erosion event. Even though combined High and Moderate Soil Burn Severity was only erosion rates were relatively high and this reflects the very steep slopes of the Rubicon River and the forks of the Middle Fork of the American River. Average annual precipitation is estimated at approximately 50 inches per year which drives higher erosion rates.
- 2 year erosion event: 4.75 tons/acre,
 - 5 year erosion event: 9.9 tons/acre
 - 10 year erosion event: 13.7 tons/acre
- E. Sediment Potential:** Modelling for this fire does not accurately measure sediment potential however a conservative estimate is that there is at least a 75% delivery ratio compared to the erosion rates.
- F. Estimated Vegetative Recovery Period (years):** 1-5 years for grass and forb components, 5-10 years for shrub components, much longer for tree species.

G. Estimated Hydrologic Response (brief description):

The primary watershed responses of the Mosquito fire are expected to include: 1) an initial flush of ash and debris, 2) rill and gully erosion on steep slopes within the burned area, and 3) potential flash floods and debris flows in tributary drainages to the main stem rivers during short duration high intensity summer monsoonal precipitation events and during long duration winter atmospheric river precipitation events. These responses are 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.

For hydrologic response modeling, the burned area was separated into 20 analysis watersheds. Pour points were established at the mouth of each basin to facilitate a more detailed analysis of stream discharge. The watershed above each pour point was delineated, and pre-fire and post-fire flows were modeled and compared. The risk of threats such as flooding can be determined by using modeling results in combination with field review of floodplain elevation, channel morphology, and flood history.

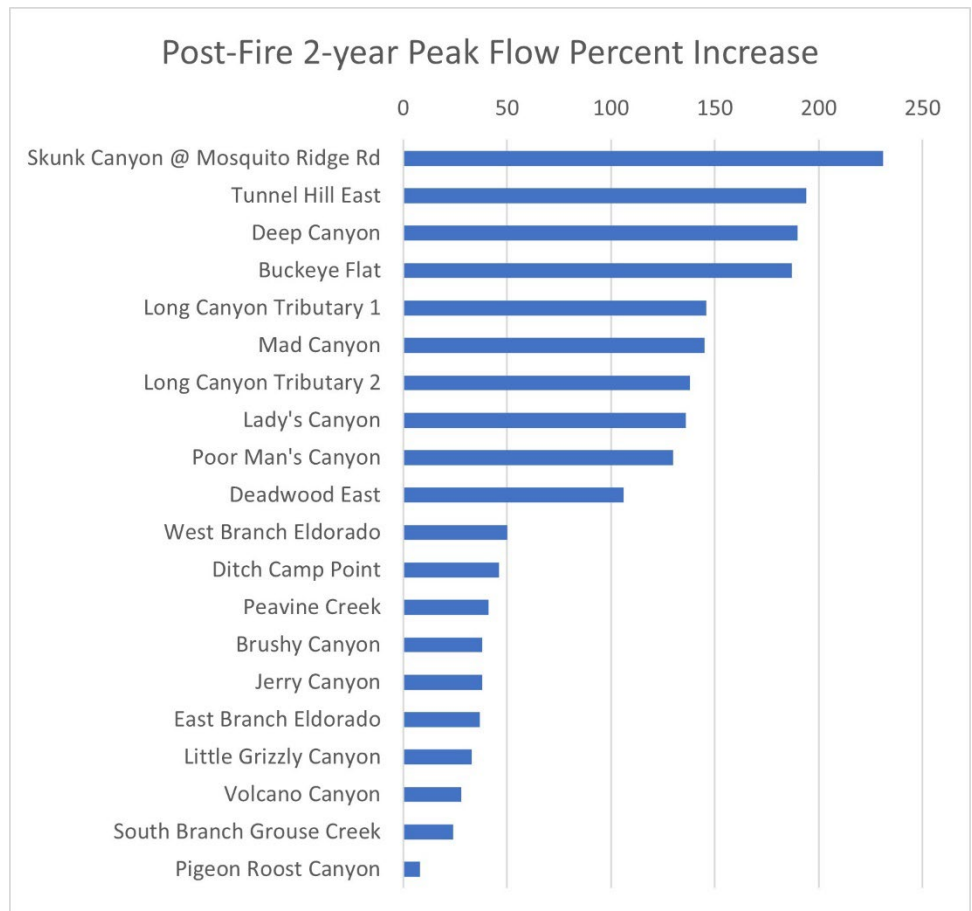
A 2-year return interval peak flow (Q2) can be used as a conservative estimate of a peak flow magnitude that could be potentially damaging and has a high likelihood of occurrence within the next 1-4 years, when the watersheds are most susceptible to elevated peak flows and erosion. A 2-year peak flow event has a 50% probability



Subwatersheds Modeled for Peak Flow Analysis

of occurrence in any given year and a 94% probability of occurring at least once over the next 4 consecutive years. Modeling pre- and post-fire peak flow involves uncertainty; modeled flows should be considered estimates of the relative expected change in post-fire hydrologic response which are used to help identify areas of concern and prioritize treatment. Design flow estimates for the Mosquito Fire have been based on the U.S. Geological Survey regression equations developed for the Sierra Nevada (Gotvald, et al., 2012).

Post-fire peak flow was calculated using the same relationships as the pre-fire peak flow however, runoff response was estimated by assuming an increased runoff commensurate with soil burn severity in terms of recurrence interval. The burned watersheds will respond to an average rainfall event differently for the unburned, low, moderate, and high soil severity burned areas. Post fire Q2 hydrologic modeling was conducted based on the assumption that areas of low SBS would remain unchanged, areas of moderate SBS would respond according to the pre-fire Q5, and areas of high SBS would responding according to pre-fire Q10. The cfs/sq mi for each flood event was aggregated based on observed burn severity in the modeled drainage, with the end result being an expected percent increase in post-fire Q2 discharge.



These elevated post-fire flows and bulking could lead to plugged culverts, damage to road infrastructure, damage to utility infrastructure, impacts to water quality, decreased soil productivity and hydrologic function, as well as threats to human life and safety.

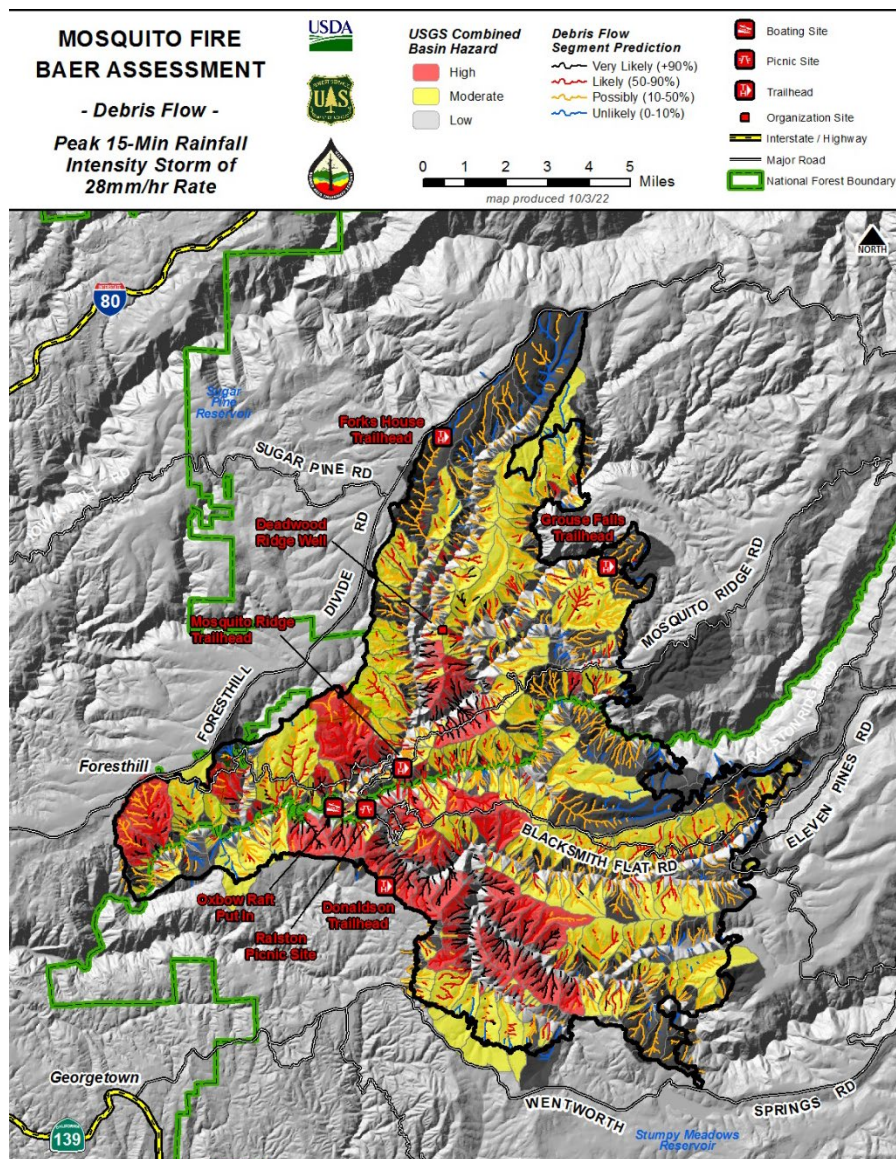
Geologic Response

For the Mosquito Fire we selected a peak 15-minute rainfall intensity of 28 millimeters per hour (mm/h) rate to visually present the design storm for debris flow potential and volume, for the following reasons: 1) this storm intensity is consistent with the NOAA Atlas 14, Point Precipitation Frequency Data, which is a mid-elevation point on Mosquito Ridge Road within the fire area (USGS / NOAA Atlas 14, 2021); and is generally representative of the Atlas 14 value for a 2-year average recurrence interval; 2) and the modeled output at this storm intensity indicates a geologic response that is generally consistent with observed evidence of past debris flows and sedimentation-prone drainages identified during the ground assessment.

Values at risk were evaluated for debris flow hazards in the field and with the aid of USGS debris flow modeling, and for landslides and rockfall hazards in the field and with the aid of ArcGIS modeling. The risk for debris flows (see map on next page) ranges from possible to very likely within (1) a significant number of sub-basins above the Middle Fork of the American River (impacting Mosquito Ridge Road and Gorman Ranch Road), and (2) many drainages above the Rubicon River (impacting Blacksmith Flat Road). We identified the general burned areas at risk for post-fire rockfall as very likely. We identified key areas (Values at Risk), within or below steep slopes with a moderate to high soil burn severity, that will benefit by installing rockfall hazard signs (Mosquito Ridge Road, Blacksmith Flat

Road, Ralston Day Use Area). Slope stability issues were identified predominantly in areas around: Mosquito Ridge Road (entire length within burned area), Gorman Ranch Road, and Blacksmith Flat Road. Seasonal closure and warning signs are recommended for Forest Service Roads and Trails in order to mitigate hazards to human life and safety where the potential for debris flows, rockfall, and/or landslides constitute a BAER Risk Assessment of Intermediate to Very High (e.g. Mosquito Ridge Road, Blacksmith Flat Road). We did not make any recommendation for Gorman Ranch Road because it is a Placer County Road. Probability of flooding and debris flows at Skunk canyon crossing of Mosquito Ridge Rd ranges from Likely to Very Likely in the modeled design storm, 28 mm/hr 15-minute intensity. Coordination between the Forest Service, WERT, and Placer County is recommended to effectively manage cumulative post-fire geologic hazards along Gorman Ranch Road and its major crossings that drain beneath Mosquito Ridge Road.

Off forest values and private property (e.g. Gorman Ranch Road) within the forests were assessed and analyzed by the State of California WERT Team (State Watershed Emergency Response Team). It is recommended the National Weather Service coordinate with the USGS to identify a site-specific storm threshold value for their warning notifications system.



PART V - SUMMARY OF ANALYSIS

Introduction/Background

The Mosquito Fire started on September 9, 2022 near Oxbox Reservoir and Mosquito Road in Placer County. The fire quickly spread into El Dorado County. As of September 29, 2022, the fire is 85% contained at 76,788 acres. A BAER assessment team began field reconnaissance of the burned area on September 26 to begin burn severity mapping, hydrologic response, and to identify geologic hazards. The fire destroyed 78 structures. Forest Service BAER closely collaborated with the California WERT team. In addition, interagency coordination began with interested representatives from PCWA, mining interest, and from County, State, and Federal Agencies.

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

Critical Value Matrix

Probability of Damage or Loss: *The following descriptions provide a framework to estimate the relative probability that damage or loss would occur within 1 to 3 years (depending on the resource):*
Very likely. *Nearly certain occurrences (90% - 100%)*
Likely. *Likely occurrence (50% - 89%)*
Possible. *Possible occurrence (10% - 49%)*
Unlikely. *Unlikely occurrence (0% - 9%)*

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

Magnitude of Consequences:

Major. *Loss of life or injury to humans; substantial property damage; damage to critical natural or cultural resources*

Moderate. *Injury or illness to humans; moderate property damage; damage to critical natural or cultural resources resulting in considerable or long-term effects.*

Minor. *Property damage is limited in economic value and/or too few investments; damage to critical natural or cultural resources resulting in minimal, recoverable or localized effects.*

1. Human Life and Safety:

- *Forest Visitors Safety:*

The BAER team identified potential threats to Forest visitors/recreating public, and agency personnel (visiting or post-fire treatments) that are within or downstream/downslope of burned slopes, especially those with a moderate-high burn severity, from flooding and debris flows, hazard trees, loss of ingress and egress along/at roads, trails, and permitted sites. The probability of damage or loss is **possible or likely**, resulting from hazard trees along travel routes within the burn area have not been mitigated. Likewise, there are numerous road-stream crossings within the burn area or directly below moderate/high burn severity that are now at risk from flooding, debris flows, and rockfall. The magnitude of consequences is **major**, as a tree strike or entrapment could lead to serious injury or loss of life. As such, the risk is considered **high/very high**.

- BAER funds are requested to treat these risks (*Treatments LS-1, LS-2, LS-3, and LS-4*).

BAER recommends that human health and safety concerns on adjacent lands within or below the footprint of the fire also be evaluated for risk from flooding and debris flows, hazard trees.

- *Hazardous Mines Openings*

Hazardous Mine Openings: Numerous abandoned mine shaft (vertical openings) and adits (horizontal openings), that were closed pre-fire to deny entry, were assessed by the BAER Team. Previous mine safety closure (10 mine features and 1 water well) were modified or destroyed by the fire. Pre-fire closures included bat culverts and PUF plugs. The polyurethane foam and HDPR/E culverts melted and burned away resulting in reopened shafts and adits that are now a hazard to wildlife and a serious threat to human health and safety as forest visitors could fall into them, causing serious injury and/or death. Post-fire vegetation conditions enhance public visitation and pose a significant threat as unstable conditions enhance vulnerabilities. Unsuspecting visitor or curious staff member who approaches a mine opening in this condition, particularly a shaft, could be caught in an “hourglass” collapse of the unconsolidated surface material. The probability of damage or loss is **likely** as forest visitors may encounter open abandoned mines, adits, and wells. These areas are highly unstable and accidental falls into these structures are common. The magnitude of consequences is **major**. Impacts to this threat could lead to loss of life, entrapment, or severe injury. The resulting risk is **very high**.

- BAER funds are requested to treat these risks (*Treatments LS-3, and LS-4*).

- *Hazardous Materials at Eagle Nest Mine*

The Eagle Nest Mine is situated mid-slope in a moderate and high soil burn severity. Various mine infrastructure were consumed during the fire. Uncontrolled hazardous materials and ash/soil/debris contaminated with hazardous materials exist at this site. There is a human health and safety risk to

through inhalation of dust and particulates and contamination of downslope surface water (Mad Creek and the Middle Fork American River). Thus, there is the potential for hazardous materials, ash and debris generated by burned debris to impact human health, contaminate soil, and impact air and water quality. The probability of damage or loss is **possible** for this site because increased post-fire runoff from areas of moderate and high SBS could mobilize hazardous materials. The magnitude of consequences is **moderate**. The size of potential spill is localized and limited to volume contained within the equipment. The resulting risk is **Intermediate**.

- No BAER funds are requested to treat these risks. The Forest Service will notify permittee to remove hazardous materials from sites that are authorized under a mining plan of operations.

2. Property:

- *NFS Roads on Tahoe (Blacksmith Flat Spur, Ralston Picnic Area, Peavine, Mosquito Ridge Road and Lookout Spur, Three Queens Mine, and Turkey Hill Road), Eldorado (Zuver, Peavine Point, South Peavine Point, Rubicon, Blacksmith Flat, Buckeye Flat, Ralston Crater, Middle Jerry, and 14N25R and S).*

There is a threat to the NFS road prisms from increased runoff, erosion, and debris flows. Undersized and inadequate drainage structures are not expected to convey the expected increase in post-fire runoff and erosion and may damage Forest Service Road infrastructure. The probability of damage or loss is **likely**, because the identified NFS road prisms are expected to receive increased overland flow and accelerated erosion concentrating on route segments downslope from areas burned at moderate and high severity. The magnitude of consequences is **major**. Increased runoff could lead to failure of these road segments, which could constitute a loss of Forest Service infrastructure and increased sediment delivery to streams downslope. Due to the relatively steep burned slopes and frequent long slope lengths, the magnitude is expected to be considerable. The resulting risk is **very high**.

- BAER funds are requested to treat these risks (*Treatment RD-1, RD-2, RD-3 and RD-4*).

BAER recommends that roads on adjacent lands managed by private and counties also be evaluated for risk from flooding and debris flows, and hazard trees.

- *NFS Trails*
Approximately 19 miles of trails within the Eldorado National Forest (NF) and 38.5 miles of trails within the Tahoe National Forest are located within the burn area. The priority Tahoe NF trails are two motorized trails that total 27.45 miles within the Mosquito Fire burn area on the TNF. This includes 12.11 miles of the historic Western States Trail and 15.32 miles of the Codfish Trail (loop 6 motorcycle trail). The Mosquito burned a major portion of the Western State Trail: a prestigious trail that hosts two annual internationally acclaimed 100 mile endurance events: the Western States Endurance Run and the Western States Endurance Ride or Tevis Cup. Approximately 12 miles of the trail are in the burn area. BAER treatments are warranted on approximately 4 miles that are affected by high and moderate severity and projected high runoff. All of these treatments also protect the historic nature of this trail which is on the National Register of Historic Places. Features on the trail include historic rock walls of significant historic importance that are critical structures for maintaining trail tread. Loop 6 (Codfish Trail) of the OHV system is a singletrack motorcycle only trail. It is one of California's premier motorcycle trails, providing advanced black diamond, motorcycling. Over 15 miles of Loop 6 burned during the Mosquito Fire. Treatments are limited to small sections that are influenced by post-fire runoff in the high and moderate burn severity.

The Eldorado NF has several valuable trail systems, including Tillotson, Donaldson, Nevada Point, Volcanoville Tie Trail, and Buckeye Flat trails. With the exception of the Volcanoville Tie Trail, the non-motorized trails are either in low soil burn severity classes or are located in very steep hillslopes that burned at high and moderate soil burn severity and exhibit a high likelihood of sedimentation and erosion. Trail treatments on these trails would not be successful until sedimentation and erosion rates stabilize. The Volcanoville Tie Trail is an approximate one-mile connector trail that runs adjacent to

the Volcanoville Elementary School and the town proper. The interconnectivity with the urban interface coupled with high use and high burn severity warranted priority designation for this trail.

The probability of damage or loss is **very likely**, as modeled increases in erosion and run off below these slopes and onto the trail are expected to be considerable from moderate and high SBS, which could damage trail prisms from debris flows, erosion and sedimentation, and loss of drainage function. The magnitude of consequences is **moderate**. The trail systems are maintained on a yearly basis, contributing to a substantial investment. The Western States Trail is very important to these events, forest partners, and the local communities and economies of Auburn and Foresthill. The Tahoe National Forest has partnered California State Park's Green Sticker program for several decades for construction, and maintenance of the popular trail. Thus, there is a significant investment in the trails and trail drainage structures. Increased runoff could lead to erosion of the trail prism. Due to the relatively high angle of the burned slopes and long slope lengths, the magnitude is expected to be considerable. The resulting risk is **very high**.

- BAER funds are requested to treat these risks (*Treatment TR-1, TR-2*).

The BAER Team recommends that trails too unstable for stabilization actions are reevaluated once the landscape has stabilized and revegetated.

- *Developed Recreation Sites*

Direct fire effects to recreation sites include destroyed signs, fire-killed trees, burned signs, loss of natural barriers in parking areas, and debris from upslope rolling into sites. There are no campgrounds within the burn area, but there are several day-use and trailheads. Crews will be staging at the Donaldson trailhead, Ralston Picnic area and the Deadwood Ridge Trail for trail stabilization actions. As such, existing hazardous trees are also a Human Health and Safety Critical Value, addressed above, for Forest Service workers. The potential of damage to small infrastructure can be addressed in the Burned Area Rehabilitation program. There are threats to large infrastructure from fire weakened trees at the Donaldson trailhead, Ralston Picnic area, and the Deadwood Ridge Well. Fire weakened trees may fall in whole, or branches may fall onto existing vault (Donaldson Trailhead, and Ralston Day use) and a well at the Deadwood Ridge Well. The probability of damage or loss is **likely**, as fire compromised trees are within falling distance from the infrastructure. The magnitude of consequences is **moderate**. The facilities are maintained on a yearly basis, contributing to a substantial investment. Tree strikes could result in the destruction of infrastructure, requiring replacement. Facilities replacement could exceed \$50,000. The resulting risk is **high**.

- BAER funds are requested to treat these risks (*Treatment TR-1 and TR-2*).

3. Natural Resources:

- *Recovery of Native Vegetation - Fire Suppression Activities*

During fire suppression, 98.5 miles of dozer line and 30.3 miles of hand line were constructed on National Forest System lands alone (totals for the entire incident are much higher). These constructed areas serve as weed seed dispersal corridors for spread via the firelines as well as into the burned areas away from suppression activities (via wind, water, birds, etc.). Numerous event points such as camps, staging areas, drop points, safety zones and more were also placed throughout the Forest. Dispersal of weeds from boots, fire engines, vehicles, heavy equipment, and firefighter gear likely occurred during the incident, especially given the muddy conditions on the fire and the lack of equipment cleaning during much of the incident. In addition to dozers, other heavy equipment such as feller-bunchers, loaders, masticators, chippers, and excavators were used at a variety of locations throughout the fire. The fire also burned through existing invasive weed infestations that are now poised to rapidly spread in the absence of native vegetation.

There is a high likelihood of spread and introduction of invasive and noxious weeds into areas disturbed by suppression impacts (dozer lines, hand lines, drop points, helispots, etc.) which pose a threat to native and naturalized plant communities. The probability of damage or loss is **very likely**,

- because areas of exposed soil due to fire suppression activities are susceptible to weed invasion and spread. The introduction and dispersal via heavy equipment of invasive weeds into areas disturbed by fire suppression and suppression repair activities will result in the establishment of large and persistent weed populations. Where firelines were constructed through existing weed infestations there is little doubt that infestations were spread beyond their pre-fire footprint. Because invasive plants are opportunistic, without treatment they will rapidly increase in the burn area due to mechanical soil disturbance and their release from competition with native plant species along freshly cleared firelines. The magnitude of consequences is **moderate**. Introduction and expansion of weeds can suppress native vegetation recovery and lead to a loss of native and naturalized plant communities. Vegetation type conversion and expansion of weeds into areas disturbed by fire suppression and within the burned area are likely; potentially increasing fire frequency. The resulting risk is **very high**.
- BAER funds are requested to treat these risks (*Treatments LD-1 and LD-2*).
- *Recovery of Native Vegetation - Non-Suppression Activities (BAER-Specific)*
There is a threat of spread of weeds due to fire especially in high and moderate soil burn severity areas near known infestations and adjacent to transportation system within the burned area. There are approximately 347 mapped acres of existing weed populations. The spread of existing populations is a direct threat to the recovery of native vegetation at risk of recovery. Recovering areas such as vulnerable riparian, serpentine and hard slate outcrops, lava cap habitat types, and recently burned areas have challenging recovery rates if known infestations of invasive species are allowed to establish and spread. The probability of damage or loss is considered **likely**, as the known presence of invasive populations in the burn and because the 34% of the fire area burned at moderate or high soil burn severity, which is extremely vulnerable to colonization of invasives. The magnitude of consequences is **moderate**, because spread and establishment of invasive weeds could have long term negative effects on re-establishment of native vegetation that protects the extremely steep slopes of the Mosquito Fire. Forest Service direction seeks to minimize the establishment of non-native invasive species to prevent unacceptable habitat degradation of burned areas, while allowing for the recovery of the native plant community. The resulting risk is **high**.
 - BAER funds are requested to treat these risks (*Treatments LD-3 and LD-4*).
 - *Natural Resources Soil and Water*
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 considered **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 consequences 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 resulting risk is **intermediate**.
 - BAER funds are NOT requested to treat these risks. Natural Recovery is recommended.
 - *Threatened and Endangered Species – Layne’s butterweed*
Layne’s butterweed, a federally listed plant, occurs within the fire area. Approximately 44 acres of mapped Layne’s butterweed populations were either burned or dozed during suppression activities on the Tahoe NF. A potential threat to Layne’s butterweed is the establishment and spread of aggressive invasive plant species in potential and occupied habitat. The probability of damage or loss is **likely**, due to fire suppression resources spreading existing and introduced new weed species to the dozed and burned areas occupied by Layne’s butterweed. Increased fire traffic during suppression may have

brought vehicles and equipment in contact with known weed infestations and spread them into the occupied habitat. The magnitude of consequences is **moderate**. Introduction and expansion of weeds can suppress native vegetation recovery and lead to a loss of native and naturalized plant communities. Layne's butterweed is vulnerable to type conversion and associated degradation of ecosystem structure and function, biodiversity loss, and potential competition with non-native species. The resulting risk is **high**.

- BAER funds are requested to treat these risks (*Treatments TE-1*).
- *Threatened and Endangered Species, (California Red-legged frog)*
The California red-legged frog (CRLF) is federally listed as Threatened under the Endangered Species Act. The designated Critical Habitat unit affected by the Mosquito Fire is PLA-1. The PLA-1 unit is 1,245 acres and is considered essential for the conservation of the species because it contains aquatic habitat for breeding and non-breeding activities, contains upland habitat for foraging and dispersal activities, and is occupied by the species. Inside the designated Critical Habitat, the American River Ranger District recently constructed 18 natural appearing and functioning wetlands to benefit California red-legged frogs. The wetland locations are all within one mile from an isolated California red-legged frog population occurring on private lands managed by Westervelt Ecological Services. This is the only known California red-legged frog population in close proximity to the Tahoe National Forest and is managed as a mitigation bank.

Ground cover vegetation, canopy cover and large woody material used for habitat complexity were denuded by the fire. Post fire watershed response is expected to include increased surface flow, pool sedimentation and filling, and water turbidity. This impacted habitat is all within one mile of a known breeding population of California red-legged frogs, a federally listed Threatened species. The primary risk of increased fines, ash and sediment into suitable wetland habitat is pool filling and aggradation. This will result in a shortened hydroperiod and could eliminate California red-legged frog breeding habitat. All 18 wetlands were directly impacted by the Mosquito Fire. CRLF and designated Critical Habitat PLA-1. The probability of damage or loss is **likely**. The Mosquito Fire directly impacted 92 percent of the CRLF designated Critical Habitat (PLA-1). The magnitude of consequence is **moderate**, as over 57 percent of the designated Critical Habitat burned at moderate and high soil burn severity. This constitutes a substantial amount and long-term duration potential loss of habitat for the species. The resulting risk is **high**.

- BAER funds are requested to treat these risks (*Treatments TE-2*).

4. Cultural and Heritage Resources:

- *Damage to sites from Hazardous Trees.*
Approximately 112 eligible or unevaluated archaeological sites for listing on the National Register of Historic Places (NRHP) were identified in high or moderate soil burn severity in the fire area (98 on the Tahoe NF and 14 on Eldorado NF). A total of 10 sites (5 on Tahoe NF (TNF) and 5 on Eldorado NF (ENF)) were visited for field assessments. There is a threat of damage, loss of historic context and contents due to hazardous trees falling on cultural resources on two sites: the Western States Trail (TNF) and the Deadwood Townsite (TNF). The probability of damage or loss is **possible** for both sites. There are approximately 30 burned or dead trees in the Deadwood Cemetery that could uproot human remains or damage grave markers. Along the Western States Trail, there is approximately a 2-mile section of trail in moderate and high soil burn severity that contains historic venacular architecture (stone walls) that are the defining aspects of the NRHP eligibility. Hazardous trees greater than 11-inch dbh (diameter at breast height) exists may fall on these historic features and destroy their historic context. The magnitude of consequences is **major**. In most cases, damage to cultural resource sites represents an irretrievable loss of traces of the past. Cultural resources are non-renewable. Damaged infrastructure degrades the meaning of historic sites and features and their potential to provide important information about the past to this and future generations. A major

consequence rating appropriately addresses the likelihood of these types of damage based on their nature and potential for significant impact. The resulting risk is **high**.

- BAER funds are requested to treat these risks (*Treatments CR-1*).

B. Emergency Treatment Objectives:

- Mitigate and protect, to the extent possible, threats to personal injury or human life of forest visitors and Forest Service employees by raising awareness through posting hazard warning signs on roads and trails, reinforcing road and trail tread, improving road and trail drainage and stream crossings, and communicate hazard of flooding, and debris flows. Communicate to cooperating agencies and community groups.
- Protect Forest Service employees and the public from exposure to hazardous material contamination created or exposed by the fire and minimize environmental impacts to downstream surface water which may require emergency stabilization treatment measures.
- Mitigate and protect, to the extent possible, threats to personal injury or human life of forest visitors and Forest Service employees of open AML adits and mines, by preventing direct access to AMLs, and by communicating hazards of falling and entrapment.
- Protect or minimize damage to NFS investments in roads and trail infrastructure by installing drainage features capable of withstanding potential increased stream flows and/or debris flows. Minimize damage to key NFS travel routes.
- Protect or mitigate potential post-fire impacts to critical cultural resources within the burned area.
- Treat invasive plants that are a threat to native and naturalized ecosystems by minimizing the expansion of existing populations in the burned area and control of expected invasion of noxious weeds within and adjacent to the area where soils/vegetation was disturbed as a result of the fire and fire suppression activities.
- Assist cooperators, other local, State, and Federal agencies with the interpretation of the assessment findings to identify potential post-fire impacts to communities and residences, domestic water supplies, public utilities and other infrastructure.

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

*Land n/a % Channel na % Roads/Trails 90 % Protection/Safety 100 %

*EDRR treatments would be conducted in the spring/summer 2022.

D. Probability of Treatment Success

Probability of Treatment Success

	1 year after treatment	3 years after treatment	5 years after treatment
Land	80	50	35
Channel	N/A	N/A	N/A
Roads/Trails	75	90	100
Protection/Safety	85	95	100

E. Cost of No-Action (Including Loss):

Human Health and Safety: Human Life and Safety do not have a market value, but an injury would exceed \$1,000,000, providing a substantial benefit/cost ratio.

Property: The cost to rebuild sections of the road after they are washed out, eroded, or buried includes estimates to bring in material to build up the damaged roads. The cost of not restoring the proposed 21.1 miles of road is

affected is approximately \$5,746,583, which provides at least a 4.3 benefit/cost ratio, assuming a 35% probability of loss. This does not include the lost value to project management, fire suppression, and recreation, or access to PCWA infrastructure.

Likewise, there has been substantial investment into the trail network damaged by the Fire. The Forest maintains the trail network annually, and the recreation economy is a big driver for both Eldorado and Placer County. The Western States Trail is not only a National Register of Historic Places trail, but large events boost the economy of Placer County annually. The cost of replacing the at-risk areas would exceed \$2 million, not accounting for the economic loss to the communities. Likewise, Loop 6 trail is highly sought by motorcycle enthusiasts and has significant investment of California State Parks Green Sticker Grant program of the past several decades. The cost of reconstructing at risk areas would also exceed \$2 million. Considering a modest 50% loss, the cost/benefit of treating these trails still exceeds 15%. Likewise, the Volcanoville Tie trail is positioned to receive increased use, as panoramic views have been renewed. The cost of replacing at risk sections of this trail exceed \$50,000, exceeding a 7.8 cost/benefit ratio.

Infrastructure would be protected at 3 developed recreation sites, including 2 vault toilets and one well. The replacement or repair of the toilets and well, if damaged, would exceed \$100,000. Even assuming a 50% loss, implementing hazard tree removal would still yield a 18% saving by implementing actions. In addition, proposed actions could save Forest Service crews from injuries, as these developed sites would be used as staging areas for field operations.

Land Treatments - Native and Naturalized Plant Communities: Treating invasive plants once they become established would exceed approximately \$2.8 million in ecological and economic damage. As such, the benefit/cost ratio exceeds 17%, (considering loss).

Threatened and Endangered Species. The loss of biodiversity and native species does not have a market value. Once a species has been extirpated, reintroduction or restoration efforts have low success rates. Treatment costs for these two species may go far in eliminating post-fire stressors and recovering the species.

Cultural and Heritage Resources: Economic values can not be placed on the loss of cultural and heritage resources. The cultural or historic resource at risk is eligible, or potentially eligible, for listing on the National Register of Historic Places (NRHP). Delaying emergency treatment could permanently remove the cultural significance of sites.

F. Skills Represented on Burned-Area Survey Team:

- Soils
- Weeds
- Mines & Hazmat
- Hydrology
- Recreation/Trails
- Engineering
- Fisheries
- GIS
- Wildlife
- Archaeology

Team Leader(s): Kendal Young & Dan Teater
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Forest BAER Coordinator(s): Jason Jimenez & Eric Nicita
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Team Members: *BAER Team Members by Skill*

Skill	Team Member Name
<i>Team Lead(s)</i>	Kendal Young

Skill	Team Member Name
	Dan Teater
<i>Soils</i>	Eric Nicita
<i>Hydrology</i>	Brendan Waterman
	Tori Stempniewicz
<i>Geology</i>	David Annis
<i>Engineering</i>	Alvin Sarmiento
	Nicole Thompson
<i>GIS</i>	Matt House
	Jim Schmidt
<i>Archaeology</i>	Jacob Batisky
<i>Botany/Weeds</i>	Matt Brown
<i>Recreation</i>	Mary Sullivan
	Tyler Segura
<i>Aquatics</i>	Dan Teater
<i>Hazmat & Mines</i>	Rick Weaver
	Jeremy Olson
<i>Logistics/Admin/PIO</i>	Kathy Murphy
	Cathleen Thompson

Treatment Narrative:

Human Health and Safety:

Entering Burn Area Warning Signs

“Entering Burned Area” and rockfall hazard signs are needed to alert the public of possible threats to their life and safety that exist within or downstream of a burned area. The signs contain language specifying items to be aware of when entering a burn area such as falling trees and limbs, rolling rocks, and flash floods. Signs are placed in entry points that are expected to receive high use, either around residential areas or popular roads used for recreation. Signs will be removed once hazards are mitigated. Costs include installation.

Hazard Trees Mitigation

For trail treatments, directionally fall hazard trees/logs within treatment work areas associated with erosion stabilization and at trailheads or developed recreation areas where Forest Crews would be using the restroom facilities or staging.

Property:

Roads Treatments:

Treatments considered for the transportation system include natural recovery, road closures, road drainage structures, reshaping the crown of the road, preparing ditches for increased runoff, culvert cleaning, and fillslope armoring. Implementation of road packages (see engineering report) may exceed Forest resource capacity. As such, funding is provided to provide off-forest support for engineers or CORs.

Trail Treatments: Storm proof trail system in high and moderate burn severity classes where slopes can concentrate runoff onto the trail prism. Storm proofing includes creating run off ditches, water bars and removing side bars where needed (see Recreation report for implementation strategies).

Land Treatments:

Native and Naturalized Plant Communities: Invasive plant surveys will begin in 2023 during the flowering periods of weed species. Because of differences in flowering times for all potential species, two visits during the growing season are normally required, although the funding requested does not support this. Early detection/Rapid Response (EDRR) surveys along suppression lines, suppression disturbance sites, and 25.6 miles along areas disturbed by roadside hazard tree removal where soil disturbance occurred and/or people concentrated.

EDRR surveys would occur within moderate and high soil burn severity in close proximity to known invasive plant populations, as described in the critical value. The goal is to restrict known populations from expanding. The weed risk to native plant community recovery can be mitigated at low cost by implementing EDRR within the first year after the fire. New, small weed infestations located during EDRR surveys will be manually treated upon discovery. Existing infestations found to be expanding due to the fire or fire suppression activities would be re-mapped and evaluated for treatment. Same treatment type will occur for the Layne's Butterweed

Cultural Resource Stabilization: Fire compromised trees that are likely to fall and damage cultural resources would be directionally felled to reduce the risk of the loss of cultural site integrity.

Threatened and Endangered Species, (California Red-legged frog): Only 1 (#17) of the 18 wetlands is proposed for treatment. The treatments prescribed include: (1) Drainage excavation, including up to 6 water bars and (2) deploying wood mulch to minimize sediment from the denuded banks and surrounding slopes. The work needed is the use of a grader and a water truck with an operator. Equipment and personnel would need to be mobilized to the site, including the hauling of approximately fifteen (15) cubic yards of wood mulch. The operator would construct the water bars with a grader. A crew would be needed to deploy wood mulch around the wetland of concern. A biologist qualified to work with CRLF will be onsite during work to ensure CRLF are protected during construction

Channel Treatments: None

I. Monitoring Narrative: N/A