Date of Report: 9/12/2020

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: Lake

B. Fire Number: CA-ANF-03273

C. State: CA

D. County: Los Angeles

E. Region: 05

F. Forest: Angeles

G. District: Los Angeles Gateway

H. Fire Incident Job Code: P5NE45 - 0501

I. Date Fire Started: 8/12/2020 @ 1540

J. Date Fire Contained: 95% 9/12/20

K. Suppression Cost: 63m

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

1. **Fireline repaired (miles):** Approximately 156 miles of dozer line constructed. Approximately 8 miles completed as of 9/11/2020. The suppression lines were closed off at access points to prevent unauthorized trespass, but final suppression repair will occur via contracts for implementation in November.
2. **Other (identify):** Approximately 7 miles of hand line constructed; unknown amount repaired.

M. Watershed Numbers

Table 1: Acres Burned by Watershed

HUC #	Watershed Name	Total Acres	Acres Burned	% of Watershed Burned
180701020301	Elizabeth Lake	11,407	3,297	28.9%
180701020302	Fish Canyon	17,353	11,840	68.2%
180701020303	Upper Castaic Creek	24,058	2,028	8.4%
180701020304	Elizabeth Lake Canyon	34,494	8,833	25.6%
180902061303	Canyon del Gato-Montes	31,137	37	0.1%
180902061308	Kings Canyon	25,293	3,411	13.5%
180902061405	Broad Canyon	22,841	605	2.6%
180902061408	Lower Amargosa Creek	28,808	938	3.3%
TOTALS		**195,390**	**28,808**	

N. Total Acres Burned

Table 2: Total Acres Burned by Ownership

OWNERSHIP	ACRES
NFS	27,045
STATE	65
NON-NFS	3,880
TOTAL	**30,990**

O. Vegetation Types: Chaparral, Oak woodland/Ponderosa pine, Coulter pine Dominant vegetation communities that were burned in the fire and damaged during suppression activities include: black oak woodlands/savannahs, mixed conifer and oak woodlands, manzanita-chamise chaparral, ceanothus chaparral and cottonwood/sycamore/alder riparian.

P. Dominant Soils

a. (CA776) 33 - Caperton-Capistrano families complex, 35 to 80 percent slopes: 14,155 Acres (46%)
b. (CA776) 36 - Trigo, granitic substratum-Exchequer families-Rock outcrop complex, 60 to 100 percent slopes: 5,086 Acres (16%)
c. (CA776) 59 - Tollhouse-Knutsen-Stukel families complex, 30 to 70 percent slopes: 3,553 Acres (11%)
d. (CA675) AmF2 - Amargosa rocky coarse sandy loam, 9 to 55 percent slopes, eroded: 2,015 Acres (7%)
e. (CA776) 50 - Trigo, granitic substratum-Pismo families complex, 20 to 60 percent slopes: 1,621 Acres (5%)

Q. Geologic Types: Peg Undivided Precambrian Gneiss (Sawmill Mnt), **Gra** Mesozoic granite and adamelline (Liebre mnt.), **Pmlc** Middle and/or lower Pliocene nonmarine

R. Miles of Stream Channels by Order or Class

Table 3: Miles of Stream Channels by Order or Class

STREAM TYPE	MILES OF STREAM
Perennial	4.57
Intermittent	4.44
Ephemeral	89.36
Other (Artificial Path And Pipeline-Surface, At Or Near)	0.97
Total	**99.34**

S. Transportation System:

Trails: *National Forest (miles):* 26.39 *Other (miles):* 0.0

Roads: *National Forest (miles):* 27.88 *Other (miles):* 18.25

PART III - WATERSHED CONDITION

A. Burn Severity (acres)

Table 4: Burn Severity Acres by Ownership

Soil Burn Severity	NFS	State	Non-FS	Total	% within the Fire Perimeter
Unburned/Very Low	1,585	11	360	1,956	6.3%
Low	5,238	54	1,327	6,619	21.4%
Moderate	14,763		1,928	16,690	53.9%
High	5,459		265	5,725	18.5%
Total	**27,045**	**65**	**3,880**	**30,990**	

B. Water-Repellent Soil (acres)

Water-Repellent Soil: 13,676 Acres

C. Soil Erosion Hazard Rating

EHR Rating	Acres	%
Low	865	3%
Moderate	901	3%
High	2,252	7%
Very High	26,973	87%

Risk ratings range from low to very high, with low ratings meaning low probability of surface erosion occurring. Moderate ratings mean that accelerated erosion is likely to occur in most years and water quality impacts may occur for the upper part of the moderate numerical range. High to very high EHR ratings mean that accelerated erosion is likely to occur in most years and that erosion control measures should be evaluated.

D. Erosion Potential

Erosion Potential: 5.45 Tons/Acre

E. Sediment Potential

Sediment Potential: 5,312 Cubic Yards / Square Mile

F. Estimated Vegetative Recovery Period (years)

5-15 years; faster in low burn severity areas.

G. Estimated Hydrologic Response (brief description)

1. Estimated Erosion Response

Quantitative erosion figures were estimated using the Erosion Risk Management Tool (ERMiT) batch model. ERMiT is a Water Erosion Prediction Project (WEPP-based application developed by USFS Rocky Mountain Research Station USFS, RMRS-GTR-188, 2007) specifically for use with post-fire erosion modeling. Model estimated erosion potential is based on single hillslopes and single storm “runoff events”. The model only accounts for sheet and rill erosion, which occurs when rainfall exceeds infiltration rates and surface runoff entrains surface soil particles. It does not account for shallow landslides, stream-bank erosion, road effects, fire-line erosion, or gullying; which could present large additional sources of sediment entering the fluvial systems.

ERMiT batch hillslopes were created to account for differences in soil map unit components, vegetation, topography inputs (gradient and horizontal slope length), and soil burn severity. Different storm runoff-event magnitudes may be chosen in ERMiT for erosion response estimates; the 50% probability (2 year),

20% probability (5 year), and 10% probability (10 year) storm events were modeled for this analysis. ERMiT uses the PRISM module to generate site specific climatic input parameters based on the latitude, longitude, and elevation. Burned and unburned modeling results are reported in tons per acre and total tons for the fire area and subwatersheds intersecting the fire area, see Tables 5 & 6.

Table 5: ERMiT Modeling Burned Results

Area	50% Probability (2 Year)		20% Probability (5 Year)		10% Probability (10 Year)	
	Average Sediment Delivery (Tons/Acre)	Total Sediment (Tons)	Average Sediment Delivery (Tons/Acre)	Total Sediment (Tons)	Average Sediment Delivery (Tons/Acre)	Total Sediment (Tons)
Lake Fire	**5.45**	**347,220**	**9.89**	**616,044**	**13.50**	**820,103**
HUC12s						
Broad Canyon	5.77	3,779	10.79	6,878	14.70	9,071
Canyon del Gato-Montes	4.30	90	8.52	198	11.66	269
Elizabeth Lake	6.06	30,820	11.12	55,277	15.16	73,776
Elizabeth Lake Canyon	5.16	118,473	10.05	207,189	13.67	275,181
Fish Canyon	6.19	143,998	11.48	256,362	15.70	341,523
Kings Canyon	5.56	23,964	10.19	44,323	13.87	59,615
Lower Amargosa Creek	5.69	6,429	10.30	11,379	13.95	15,042
Upper Castaic Creek	6.06	19,666	11.31	34,439	15.49	45,627

A 50% probability (2-year) storm event was modeled to determine if the estimated soil erosion for the fire area would affect soil productivity. The modeled 50% probability (2-year event) produced 347,220 tons of sediment equivalent to 5.45 tons per acre or 5,312 cubic yards per square mile (using a conversion factor of 1.35 tons per cubic yard). 1,000 tons of sediment equates to roughly 120 standard 10 cubic yard dump trucks. Increased hillslope erosion is expected to occur throughout the fire area, greatest increases within the high and moderate soil burn severities and within steeper topography. The unburned (pre-fire condition) modeled an estimated 2,031 tons of sediment equivalent to 0.31 tons per acre or 262 cubic yards per square mile. The stated accuracy of the model is +/- 50%.

2. Watershed Response

Hydrologic Design Factors	
A. Estimated Vegetative Recovery Period	5-15 years
B. Design Chance of Success	80 %
C. Equivalent Design Recurrence Interval	2 years
D. Design Storm Duration	3 hours
E. Design Storm Magnitude	1.44 in
F. Design Flow	11.1 cfs / mi^2
G. Estimated Reduction in Infiltration	44%
H. Adjusted Design Flow	32.13 cfs / mi^2

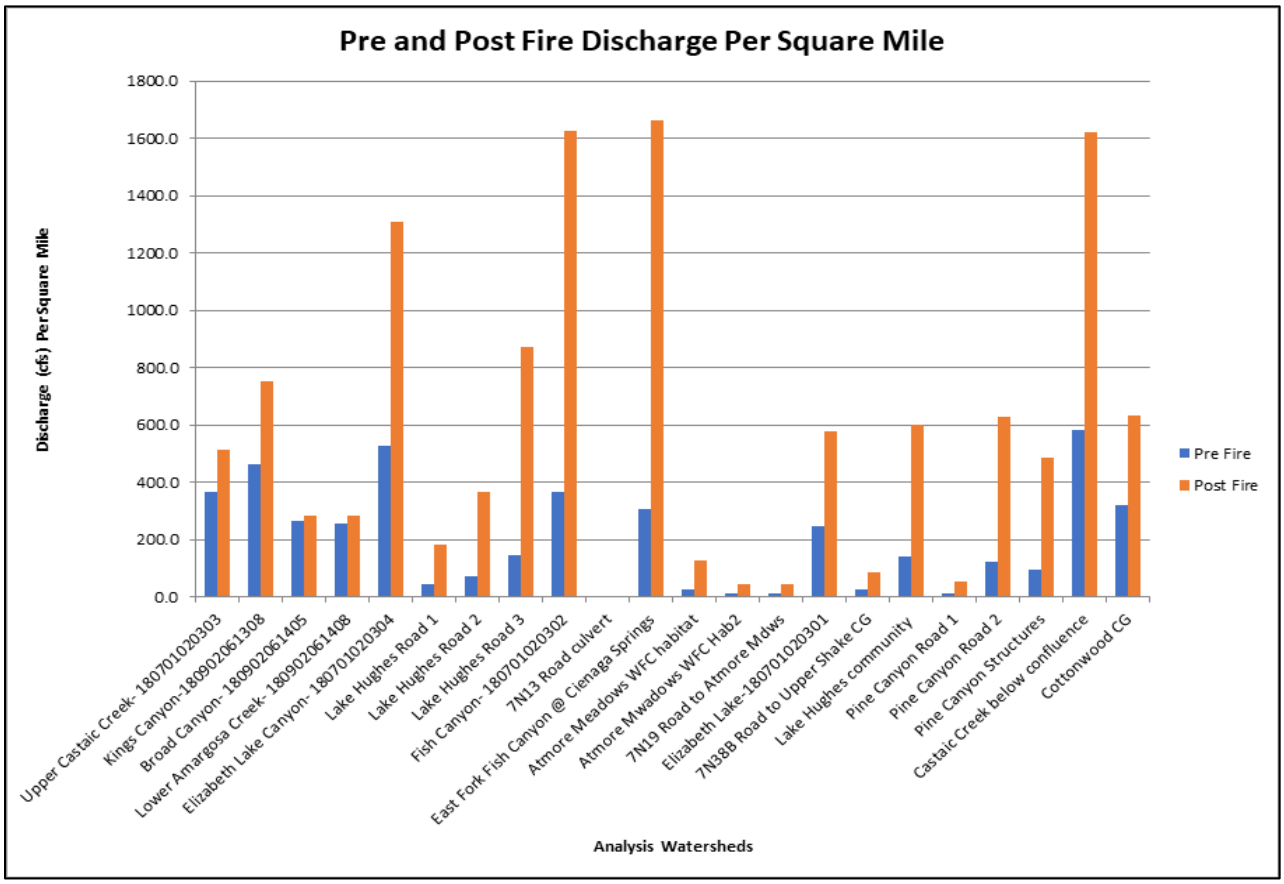
The primary watershed responses of the Lake Fire are expected to include: 1) an initial flush of ash, 2) rill and gully erosion in drainages and on steep slopes within the burned area, 3) floods with increased peak flows and sediment deposition, and 4) possible debris flows during precipitation events.

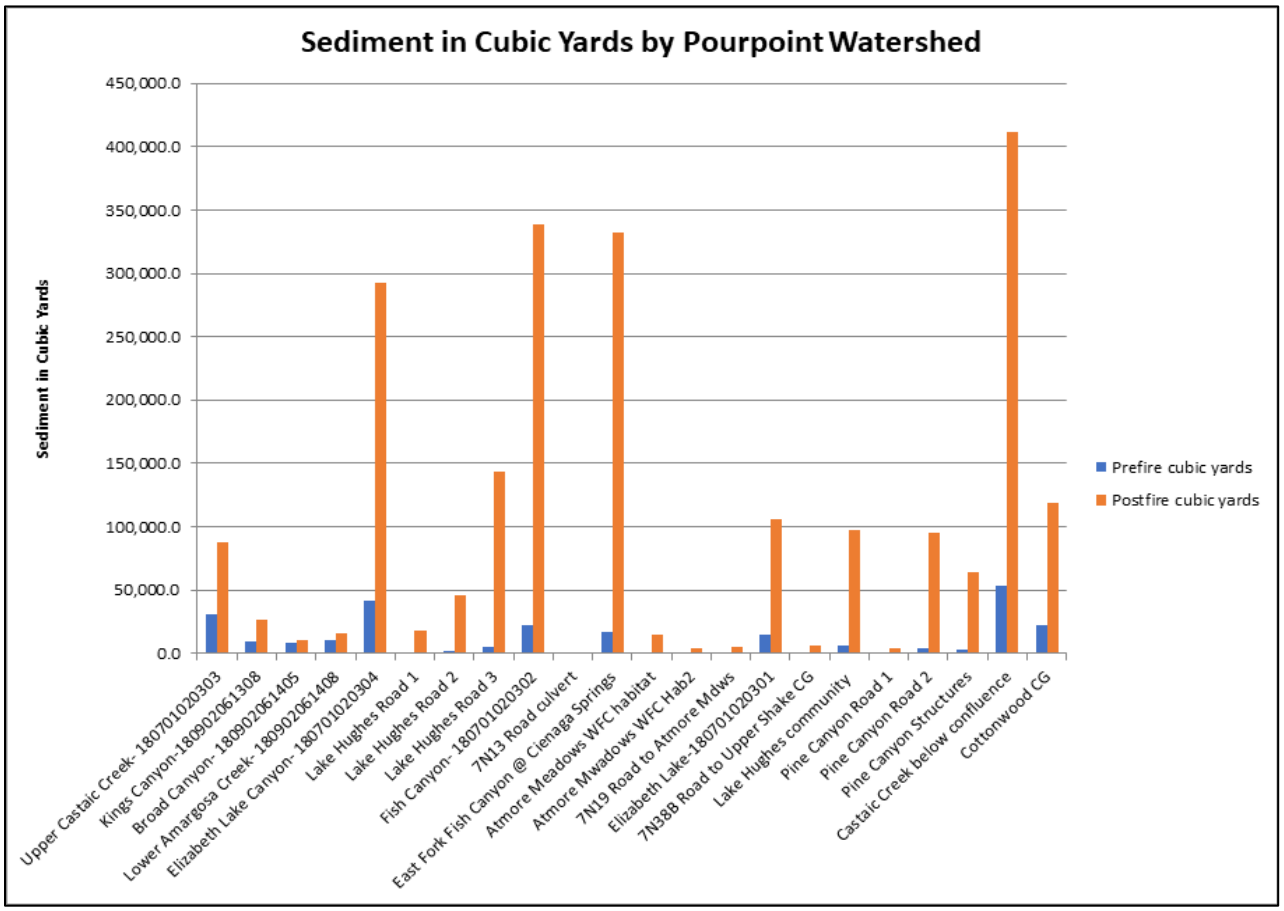
Initial erosion of ash and surface soil during the first storm events will reduce slope roughness by filling depressions above rocks, logs, and remaining vegetation. The ability of the burned slopes to detain water and sediment will be reduced accordingly. This will aid in the potential for floods and will increase the distance that eroded materials are transported. The major concern for vegetative recovery, and in turn hydrologic recovery is in the moderate and high severity burn areas. These responses are expected to be greatest in initial storm

events, and will become less evident as vegetation is reestablished, providing ground cover, increasing surface roughness, and stabilizing and improving the infiltration capacity of the soils. The estimated vegetative recovery for watersheds affected by the Lake Fire is expected within 5 to 15 years as observed in other watersheds within the Angeles National Forest.

Values at Risk identified from increased flow and sedimentation include the following: Unarmored Three-Spine Stickleback population in Fish Canyon, Arroyo Toad in Castaic Creek, southwestern willow flycatcher habitat at Atmore Meadows, roads within and downstream of fire area, and structures/home within Pine Canyon and Lake Hughes.

Watershed	Watershed Sq Miles	Flow		Sediment Yield		Times Increase	
		Pre-fire flow in cfs/m^2	Post-fire flow in cfs/m^2	Postfire cubic yards	Prefire cubic yards	x increase flow	x increase sediment
Upper Castaic Creek- 180701020303	37.60	9.7	13.63	87,340.0	31,206.9	1.41	2.80
Kings Canyon-180902061308	39.53	11.6	18.98	26,499.1	9,488.3	1.63	2.79
Broad Canyon- 180902061405	35.70	7.4	7.97	10,535.6	8,568.8	1.08	1.23
Lower Amargosa Creek- 180902061408	45.03	5.6	6.29	15,650.4	10,808.2	1.12	1.45
Elizabeth Lake Canyon- 180701020304	53.91	9.8	24.27	292,655.9	42,052.7	2.47	6.96
• Lake Hughes Road 1	1.17	37.2	155.80	17,955.9	913.7	4.19	19.65
• Lake Hughes Road 2	2.24	31.0	164.19	46,285.7	1,745.8	5.29	26.51
• Lake Hughes Road 3	6.76	21.5	129.12	143,325.9	5,272.9	6.00	27.18
Fish Canyon- 180701020302	27.12	13.5	59.95	338,544.0	22,510.2	4.43	15.04
• 7N13 Road culvert	0.00	238.9	662.18	113.1	3.7	2.77	30.17
• East Fork Fish Canyon @ Cienaga Springs	20.30	15.0	81.89	332,229.4	16,847.7	5.44	19.72
• Atmore Meadows WFC habitat	0.61	45.2	208.96	14,939.7	509.9	4.62	29.30
• Atmore Meadows WFC Hab2	0.19	65.8	245.59	3,866.9	154.3	3.73	25.06
• 7N19 Road to Atmore Mdws	0.20	58.3	224.65	4,695.6	165.3	3.85	28.41
Elizabeth Lake-180701020301	17.83	13.7	32.31	106,470.1	14,620.3	2.36	7.28
• 7N38B Road to Upper Shake CG	0.37	62.7	234.16	6,067.9	304.3	3.73	19.94
• Lake Hughes community	7.01	20.3	85.59	97,893.5	5,748.2	4.21	17.03
• Pine Canyon Road 1	0.18	70.4	290.99	4,316.8	149.3	4.13	28.91
• Pine Canyon Road 2	5.13	23.5	122.19	95,046.5	4,206.3	5.20	22.60
• Pine Canyon Structures	3.33	28.2	145.96	64,438.4	2,733.7	5.18	23.57
• Castaic Creek below confluence	64.81	9.0	25.01	411,488.4	53,143.1	2.78	7.74
• Cottonwood CG	26.72	12.0	23.72	118,575.2	22,177.9	1.98	5.35
Modeled Storm: Storm: 2 year. 3-hour (1.44 inches)							


Pre and Post Fire Discharge Per Square Mile
Discharge (cfs) Per Square Mile
1800.0
1600.0
1400.0
1200.0
1000.0
800.0
600.0
400.0
200.0
0.0
Pre Fire
Post Fire
Upper Castaic Creek- 180701020303
Kings Canyon-180902061308
Broad Canyon- 180902061405
Lower Amargosa Creek- 180902061408
Elizabeth Lake Canyon- 180701020304
Lake Hughes Road 1
Lake Hughes Road 2
Lake Hughes Road 3
Fish Canyon- 180701020302
7N13 Road culvert
East Fork Fish Canyon @ Cienaga Springs
Atmore Meadows WFC habitat
Atmore Mwadows WFC Hab2
7N19 Road to Atmore Mdws
Elizabeth Lake-180701020301
7N38B Road to Upper Shake CG
Lake Hughes community
Pine Canyon Road 1
Pine Canyon Road 2
Pine Canyon Structures
Castaic Creek below confluence
Cottonwood CG
Analysis Watersheds


Sediment in Cubic Yards by Pourpoint Watershed
Sediment in Cubic Yards
450,000.0
400,000.0
350,000.0
300,000.0
250,000.0
200,000.0
150,000.0
100,000.0
50,000.0
0.0
Prefire cubic yards
Postfire cubic yards
Upper Castaic Creek- 180701020303
Kings Canyon-180902061308
Broad Canyon- 180902061405
Lower Amargosa Creek- 180902061408
Elizabeth Lake Canyon- 180701020304
Lake Hughes Road 1
Lake Hughes Road 2
Lake Hughes Road 3
Fish Canyon- 180701020302
7N13 Road culvert
East Fork Fish Canyon @ Cienaga Springs
Atmore Meadows WFC habitat
Atmore Mwadows WFC Hab2
7N19 Road to Atmore Mdws
Elizabeth Lake-180701020301
7N38B Road to Upper Shake CG
Lake Hughes community
Pine Canyon Road 1
Pine Canyon Road 2
Pine Canyon Structures
Castaic Creek below confluence
Cottonwood CG

3. Geology/Geologic Response

Within the burned area of the Lake Fire, evidence of mass wasting such as debris slides, debris flows and rock fall are widespread. In addition, numerous slopes and drainages in the burn area have large amounts of stored material, significant drainage areas, defined channels and steep gradients. The San Andreas Fault goes through the northern part of the fire causing a small "rift" valley.

It is estimated that in case of high intensity storms (>20 mm/hr.) that tend to initiate/trigger flood flows, including summer thunder-storms, as well as rain-on-snow events, the probabilities of debris flows are very high. In addition, based on ground surveys and air recon, mass wasting, dry ravel and rock-fall are very likely along numerous steep burned slopes within the burn area of the Lake Fire

Mass Wasting features seen in the fire, which are most likely to be affected by the fire (removal of vegetation) and are likely to produce the most sediment, are the thin surface slides/debris slides. These features are prominent throughout the area and form adjacent to the steepest slopes. In many cases they are similar and difficult to distinguish from areas of dry ravel.

The removal of vegetation, especially from the steepest slopes and where fire severity was greatest, has already and will continue to cause a significant increase in dry ravel and debris sliding. Stream channels may become clogged and occasionally the saturated "gruss" from the dry ravel will flow like a mudflow during flood events. Due to these post-fire new conditions, human life and property, and roads, are at risk from numerous geological hazards as rolling rocks, debris flows, debris slides and hyper-concentrated floods. Risks to human life, infrastructure, facilities, roads and trails, and natural and cultural resources is elevated in most areas in and downstream of the Lake Fire.

The primary threat is to drainages, homes around Pine Mountain road and Lake Hughes areas, Forest Roads, Pacific Crest Trail, Pine Mountain Road, and Lake Hughes road.

Rock Fall

Rock fall along Forest roads, and Lake Hughes road will be a constant threat, especially the first few years following the fire, until vegetation gets re-established.

Debris Flow

The US Geological Survey (USGS) - Landslide Hazards Program, has developed empirical models for forecasting the probability and the likely volume of post-fire debris flow events. To run their models, the USGS uses geospatial data related to basin morphometry, burn severity, soil properties, and rainfall characteristics to estimate the probability and volume of debris flows that may occur in response to a design storm (Staley, 2016). We selected a design storm of a peak 15-minute rainfall intensity of 24 millimeters per hour (mm/h) rate to evaluate debris flow potential and volumes since based on the NOAA Atlas 14 Point Precipitation Frequency Estimates, this magnitude of storm seems likely to occur in any given year.

Most of the burn area is estimated to have a moderate to high level of debris-flow hazard. Most stream reaches and watersheds are estimated to have a greater than 50% likelihood of producing debris flows at 15-minute rainfall intensities between 20 and 24 mmh^{-1}. The highest hazards are located in the steep tributaries composing the Fish and Lake Canyons, although considerable hazard exists in other locations. Debris-flow magnitude in the larger high-hazard watersheds is typically estimated to be in excess of 10,000m^3, with smaller watersheds estimating to produce volumes in the range of 1,000 – 10,000 m^3. Estimates of rainfall intensity-duration thresholds for storm peak intensities of 15-, 30-, and 60-minute durations are included below. The model-estimated thresholds (basin-scale) are consistent with other thresholds established during previous field campaigns in the region, and are as follows:

- 15-minute: 24 mm/h, or 0.25 inches in 15 minutes
- 30-minute: 19 mm/h, or 0.4 inches in 30 minutes

60-minute: 16 mm/h, or 0.6 inches in 60 minutes

Based on the very high probabilities of debris flow initiation and high predicted volumes of debris flows, most creeks in the burn area appear to present a high combined hazard.

Responsible emergency and other agencies were contacted, and information shared from results of the BAER assessment of the threats of flooding and debris flows to downstream values.

PART V - SUMMARY OF ANALYSIS

Introduction/Background

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

Table 6: Critical Value Matrix

Probability of Damage or Loss	**Magnitude of Consequences**		
	Major	Moderate	Minor
	RISK		
Very Likely	**Very High**	**Very High**	**Low**
Likely	**Very High**	**High**	**Low**
Possible	**High**	**Intermediate**	**Low**
Unlikely	**Intermediate**	**Low**	**Very Low**

1. Human Life and Safety (HLS)

Based on the potential for debris flows, flooding, rock falls, etc., the BAER team identified a serious risk to public, employees, and cooperator staff in the Lake Fire area. Details are contained below and within the Watershed characterization in the Section III G.

2. Property (P)Campgrounds

- Sawmill: On ridge, no risk from post-fire watershed response
- Bear: on ridge, low burn severity around site and no risk from post-fire watershed response.
- Upper Shake Campground: Closed in 2005 due to storm damage on the road, currently is a funded project in the design phase to rebuild the campground. Low burn severity in and around the campground.
- Cottonwood Campground: Closed due to impacts from the Powerhouse fire in 2013, currently is a funded project on the forest to rebuild the campground in design phase.

Risk Assessment: Probability: Unlikely; Campgrounds on ridges or being re-designed Magnitude: Moderate; impacts to campground infrastructure. **Risk**: **Low**

b) Roads

Overview: There are approximately 32.6 miles of National Forest System Roads (NFSR) within the fire perimeter. All these roads are suitable for high-clearance. The majority of the NFS Roads throughout the burned watersheds are likely to be impacted by runoff, sediment, and debris derived from burned areas. Road drainage features are at risk from adjacent burned watersheds. Increased runoff and sediment from the burned areas can negatively affect the road prism, damaging the road, eroding land downslope of the road and routing flow and sediment directly to stream channels. Road failure can also contribute to failure of infrastructure downstream. Culverts associated with these roads are at risk of plugging from debris carried down channels from burned watersheds.

Risk Assessment for Roads: National Forest System roads were assessed in order to determine the probability and magnitude of road damage or loss as a result of the changed watershed condition. User

safety on roads in the burned area is also an equally important consideration. The risk assessment for each road is based on the probability of damage or loss and the magnitude of consequences.

Of the 32.6 NFSR miles in the burned area, 22.4 miles of road are proposed for treatment and have a risk rating of high. These roads traverse through moderate and high burn severity areas. These roads include: 7N08, 7N19, 7N23, 7N23A, 7N23B, 7N23C, 7N13.

Roads proposed for treatment exhibit an unacceptable risk of failure that warrant specific treatments to help mitigate this risk. The forest has a vested interest in preserving access on these roads for the administration of National Forest lands and to minimize roads contributing to additional post-fire watershed response.

c) Trails

There are approximately 27 miles of system trails within the burn perimeter. Urban areas near the fire area typically attract numbers of trail users, and especially seasonal hike-through groups following the PCT. Trail sections located within high and moderate burn severity areas in steep terrain with little to no ground cover or vegetation remaining after the fire. Trails currently have sections that are incised and conducive to channelization of runoff furthering erosion and need additional drainage features installed. After field assessments, it was determined sections of the Pacific Crest Trail (PCT) #332000 trail classes 3 and 4, and Fish Canyon Trail #3316W05 trail class 3 within the fire are subject to high watershed response and can be negatively affected by runoff, and sediment impacting trail tread. Bear Canyon trail (16W03) and Burnt peak Trails were not assessed due to limited time and extreme heat conditions during the field assessment. Trail failure can also contribute to failure of infrastructure downstream and increase soil erosion on slopes and post-fire watershed response.

Risk Assessment: National Forest System trails were assessed in order to determine the probability and magnitude of road damage or loss as a result of the changed watershed condition. Hiker safety on roads in the burned area is also an equally important consideration. The risk assessment for each trail is based on the probability of damage or loss and the magnitude of consequences.

Of the 27 miles of total miles within the burn area, 10.25 miles are proposed for treatment and have a risk rating of High. Treatment sections are within areas of mostly high and moderate burn severity with slopes where watershed response is expected to be high and trail impacts likely were selected. Trails proposed for treatment exhibit an unacceptable risk of failure that warrant specific treatments to help mitigate this risk. The forest has a vested interest in preserving access on these trails and to minimize trails contributing to additional post-fire watershed response.

d) Private Property: The fire burned in, around, and adjacent to the communities of Lake Hughes and properties on Pine Mountain road as well as scattered ranches and properties north of the fire in Antelope Valley.

- Lake Hughes neighborhood – Ellstree road and surrounding areas. A drainage following the Pine mountain road through the rift valley flows past Ellstree road in Lake Hughes. The drainage is subject to increased flows and sediment due to post-fire hydrologic response.
- Lake Hughes and Pine Mountain Road – County Maintained
    - Lake Hughes road traverses through the southwest section of the fire and contains historic drainage features built by CCC crews in the 1930's.
    - Pine Mountain Road traverses through the northern section of the fire through the San Andres fault rift valley.

Both roads could experience post-fire hydrologic responses such as rock fall, dry ravel with debris cones, rocks, mud and debris on the road from storm events. The BAER Team shared information on watershed response and potential threats to non-Forest assets with affected entities and responsible agencies such

as LA County Department of Public Works, Natural Resources Conservation Service, National Weather Service and U S Army Corp. of Engineers.

a) Natural Resources (NR) Water Quality for Municipal and Domestic Use

Wildfires primarily affect water quality through increased sedimentation. As a result, the primary water quality constituents or characteristics affected by this fire include color, sediment, settleable material, suspended material, and turbidity. Floods and debris flows can entrain large material, which can physically damage infrastructure associated with the beneficial utilization of water (e.g., water conveyance structures; hydropower structures; transportation networks). The loss of riparian shading and the sedimentation of channels by floods and debris flows may increase stream temperature. Fire-induced increases in mass wasting along with extensive tree mortality can result in increases in floating material – primarily in the form of large woody debris. Post-fire delivery of organic debris to stream channels can potentially decrease dissolved oxygen concentrations in streams. Fire-derived ash inputs can increase pH, alkalinity, conductivity, and nutrient flux (e.g. ammonium, nitrate, phosphate, and potassium), although these changes are generally short lived. Houses burned adjacent to Pine Mountain Road on Private land. Post-fire increases in runoff and sedimentation within the urban interface, and burned structures and equipment within the fire perimeter may also lead to increases in chemical constituents, oil/grease, and pesticides.

The most noticeable effects on water quality will be possible increases in sediment and ash from the burned area into Fish Canyon (thence Castaic Creek, Elderberry Forebay and Dam of DWP, and Castaic Lake), Pine Canyon, Elizabeth Lake Canyon (thence to the east arm of Castaic Lake), other waterbodies in and downstream of the fire area. Based on historic precipitation patterns, summer thunderstorms may occur during the summer season. Flash flooding and debris flows are natural watershed response for this area. There are no other municipal or domestic uses of water in or adjacent to the fire area that could be impacted by the fire. Ash and sediment are likely during storm events in stream channels for several years after the fire. Water Quality can impact T+E species. See the Wildlife report for additional information.

Risk Assessment: Probability: Possible: Ash and sediment will degrade water quality in drainages and Castaic Lake. Magnitude: Moderate Water quality can impact T+E species. Risk: Intermediate

b) Hydrologic Function

The primary watershed responses of the Lake Fire are expected to include: 1) an initial flush of ash, 2) rill and gully erosion in drainages and on steep slopes within the burned area, 3) floods with increased peak flows and sediment deposition, and 4) possible debris flows during precipitation events.

Initial erosion of ash and surface soil during the first storm events will reduce slope roughness by filling depressions above rocks, logs, and remaining vegetation. The ability of the burned slopes to detain water and sediment will be reduced accordingly. This will aid in the potential for floods and will increase the distance that eroded materials are transported. The major concern for vegetative recovery and in turn hydrologic recovery is in the high severity burn areas. These responses are expected to be greatest in initial storm events, and will become less evident as vegetation is reestablished, providing ground cover, increasing surface roughness, and stabilizing and improving the infiltration capacity of the soils. The estimated vegetative recovery for watersheds affected by the Lake Fire is expected within 5 to 15 years as observed in other watersheds within the Angeles National Forest. See the Hydrology specialist report for additional information.

Risk Assessment: Probability: Very likely: While no know municipal or domestic uses are affected by the fire, ash and sediment will degrade water quality in drainages. Magnitude: Moderate Rill and gully erosion on the hillslopes could damage critical values such as Forest Roads and Trails and affect off-Forest values. Risk: High

c) Soil Productivity

Soil productivity loss from soil erosion is likely and magnitude of consequences moderate. The risk level is high. While a threat to soil productivity exists in portions of the Lake Fire, *hillslope stabilization treatments are not being proposed*. Suitable areas are very limited due to land ownership, and steep slopes. Areas of high and moderate burn severity not limited by the above, are usually interspersed with steep slopes, or located in lower positions within the watershed, below where runoff and rill erosion would initiate. Hillslope treatments would not result in effective slope stabilization because the available areas are so small. See soil specialist report for additional details.

Risk Assessment: Probability: Likely because intense rainfall may be more than a 5-year rainfall event could result in severe surface erosion**.** Magnitude: Moderate because loss of surface soil could reduce productivity or delay recovery of pre-fire vegetation types. Risk: High

d) Wildlife Resources

There are three federally listed species within and downstream of the fire area: California condor, unarmored threespine stickleback and arroyo toad. In addition, arroyo toad Designated Critical Habitat occurs downstream of the fire area. There are also eleven wildlife guzzlers within the fire area.

Endangered Species - California Condor: The Burnt Peak Communication Site was addressed for post-fire threats to the federally endangered California condor. There are no documented nest sites, overnight roosts or designated critical habitat within the fire area. There is documented condor activity in the fire area and some of this activity has occurred within .5 miles of the Burnt Peak Communication Site. Most use of the fire area appears to be associated with flyovers.

The fire did burn vegetation around the Communication Site. When vegetation is burned, the cover that might have kept debris and microtrash concealed is removed. If a condor visits the communication site, there is potential for it to consume this microtrash. Microtrash consumption can lead to injury or death.

Risk Assessment for California condor: Probability: It is possible that condors could be affected as a result of the post-fire conditions as there is documented condor activity in the area and condors are known to be attracted to communication sites. Magnitude: Major because microtrash can lead to death or injury of condors. Risk: HIGH. *A treatment to address microtrash is recommended for the California condor.*

Endangered Species - Unarmored Threespine Stickleback and Arroyo Toad: Two watersheds, Fish Canyon and Castaic Creek, were addressed for post-fire threats to the federally endangered unarmored threespine stickleback and arroyo toad.

Fish Canyon: Fish Canyon has occupied habitat for unarmored threespine stickleback and arroyo toad downstream of the fire area in federal and non-federal lands. There is also designated critical habitat for the arroyo toad in Fish Canyon. The watershed above the occupied habitat in Fish Canyon burned at 63% high and moderate SBS, and is anticipated to have about a 5.5 times increase in flow (20 times increase in sedimentation).

Post-fire effects to unarmored threespine stickleback and arroyo toad habitat may include increased flows, sediment and debris delivery that may scour riparian vegetation and lead to aggradation of pools. Increased deposition in pools and loss of aquatic and emergent vegetation will reduce habitat suitability for unarmored threespine stickleback. Over the long term, the deposition of sediment may improve habitat for the arroyo toad.

High water flows with increases in floatable debris and fine sediment/ash will impact water quality and may lead to death or injury of animals present in the water. Events that occur during the reproductive season have potential to cover or wash away eggs. Post-fire effects to arroyo toads may include death/injury due to

being buried during debris flows or drowning. For unarmored threespine stickleback, the post-fire effects may lead to extirpation of this occurrence.

Castaic Creek: Castaic Creek has occupied and designated critical habitat for arroyo toad downstream of the fire area in non-federal lands. The watershed above the occupied habitat in Fish Canyon burned at 63% high and moderate SBS, and is anticipated to have about a 5.5 times increase in flow (20 times increase in sedimentation). Effects would be less severe in Castaic Creek since larger portions of that watershed did not burn (1.41 times increase in flow and 2.8 times increase in sediment).

Post-fire effects to arroyo toad habitat may include increased flows, sediment and debris delivery that may scour riparian vegetation and lead to aggradation of pools. Over the long term, the deposition of sediment may improve habitat for the arroyo toad.

Debris flows and high water flows with increases in floatable debris and fine sediment/ash will impact water quality and could lead to death/injury of arroyo toads. Events that occur during the reproductive season have potential to cover or wash away egg strands.

Risk Assessment for arroyo toad and unarmored threespine stickleback: Probability: Very Likely because of the high watershed response expected in the habitat for both species. Magnitude: Major, because the unarmored threespine stickleback occurrence in Fish Canyon is small and a reduction in numbers and suitable habitat could impact their viability. There is potential for the post-fire response to result in extirpation of this occurrence. Risk: VERY HIGH. *Treatments are not recommended for the unarmored threespine stickleback and arroyo toad. Other agencies with jurisdiction may choose to salvage individuals and translocate them to safe sites until the watershed conditions stabilize enough to reintroduce them back to those streams.*

Wildlife Water Developments: Wildlife water developments within the burn area were addressed to determine post-fire threats. There are eleven wildlife guzzlers within the fire area, as mapped in the ANF GIS database. Names in the ANF Guzzler GIS, from east to west: Big Game, Sawmill 4, Sawmill 3, Sawmill 2, Sawmill 1, Sawmill Parabolic, Liebre 10, Liebre 9, Liebre 8, Liebre 7 and Liebre 6. All guzzlers were inspected to assess their current condition. Big Game and Sawmill Parabolic were destroyed by the fire and are beyond repair. Sawmill 3 was damaged in the fire and is currently not functional. There is a concern that the degrading fiberglass will be spread during post-fire runoff events and eventually become airborne, posing a health risk to the public and wildlife. Additionally, fiberglass fibers that fall into the wildlife water access port could result in ingestion and illness. Contact with fiberglass fibers could also be harmful to some animal species. Sawmill 2, Sawmill 4 and Liebre 10 were not damaged by the fire, but there is high potential for overland debris flows to cause damage to these guzzlers. Overland debris flows have potential to fill the tanks and associated drinkers with sediment, ash and debris.

Risk Assessment for Wildlife Water Developments – Property: Probability: Possible because three guzzlers are located downslope of areas where the vegetation was burned and there is potential for overland debris flows to fill tanks and drinkers. Magnitude: is moderate as animals may be able to locate water sources elsewhere and no T/E species would be using those water sources. Risk is Intermediate. *Treatment is recommended for the following guzzlers: Sawmill 2, Sawmill 4, and Liebre 10 in order to protect the FS investment in the structures.*

Risk Assessment for Natural Resources (Other) from Burned Fiberglass Guzzler: The probability is Likely since burned fiberglass is already dispersing and changed watershed conditions will increase the spread. The magnitude is major due to the health risks associated with inhalation/ingestion of burned fiberglass. The risk is Very High. *A BAER treatment is proposed for Sawmill 3 to contain the burned fiberglass debris. A BAER Pilot treatment may be brought forward to remove the damaged tank and replace it with a new one.*

4. **Cultural and Heritage Resources**Critical values for Cultural Resources under a Burned Area Emergency Response assessment are defined as Cultural resources which are listed on or potentially eligible for the National Register of Historic Places (NRHP), Traditional Cultural Properties, or Indian Sacred Sites on National Forest System (NFS) lands (FSM 2353, June 2020).

   Of the nineteen (19) Cultural Resources identified within the Lake Fire perimeter: three were associated with private utilities (SCE and LA County Roads) who will be doing their own assessments to protect their assets. Due to the nature of these resources (historic transmission line routes, and historic county road), the risk to these assets can be reduced to an acceptable level by the work that will be done by the infrastructure companies. Two of the cultural resources are historic trails and two are historic roads whose risks will be assessed by Recreation and Engineering BAER team members. One of the historic roads has been determined informally of non-eligibility for inclusion within the National Register of Historic Places. Treatments designed to protect the historic infrastructure (utility line, FS roads, County roads, historic trails) pose their own risks to the historic fabric of those resources. As such, monitoring by a qualified Heritage Specialist is recommended.

   Cultural resources were assessed based on their potential eligibility for listing on the NRHP. None of the cultural resources have been determined eligible for the National Register of Historic Places, and are considered potentially eligible. Criteria for an emergency determination included susceptibility to damage based on site components, topographic location, and surrounding burn severity resulting from the Lake Fire and predicted watershed events. Treatment measures have been proposed.

   Twelve (12) resources warranted risk assessment by the BAER Archaeologist. Three of these resources were determined to be values at risk resulting from the Lake Fire and potential subsequent watershed events. The sites identified as having at risk values are (FS 05015300002), (FS 05015300025), and (FS 05015300383).

   It should be noted that the BAER assessment was limited to previously recorded heritage sites and treatment areas. Due to precautions relating to the Covid-19 pandemic, no additional survey was conducted by the Lake Fire BAER Team Archaeologists specifically for assessing risks to cultural resources. This assessment was completed both virtually and physically (six sites were not physically visited), with information from other BAER/READ team resources.

   Risk Assessment for Cultural Resources (for Three Sites): Probability=Likely due to history of artifact collection in the area and potential for burned tree to fall on one feature; Magnitude because any loss of cultural resources due to removal, or loss of context for scientific analysis is irreversible. Cultural resources are a non-renewable resource. The risk to cultural sites is considered High. A specific treatment is recommended to protect the bedrock mortar. The BAER Treatment to initiate and maintain a forest closure until vegetation has recovered enough to screen and cover cultural resources is critical for all cultural sites (recorded and unrecorded).

e) Botanical Resources/Native Plant Recovery/Ecosystem Recovery

During fire suppression activities, 30 drop points/helispots, 156.61 miles of dozerline and 7.34 miles of hand line were constructed. These constructed areas all serve as weed seed dispersal corridors. Dispersal of weeds from boots, vehicles, and heavy equipment (masticators, chippers, dozers, excavators) movement poses a significant risk to recovery of native vegetation cover post-fire regeneration. There was no weed wash station present on the incident, and all heavy equipment on the incident was not properly washed. In addition, bulldozers and road graders were not tracked throughout the incident, so it is unknown which directions they tracked and graded.

Since precautionary measures were not taken on the 2020 Lake Fire, rapid response detection and eradication of invasive and noxious weeds is in critical need for all dozerlines, handlines, drop points/helispots, and roads as completed line. Noxious weed seed (yellow starthistle) easily disperses by

getting caught in boots, tire tread, and in various nooks of machinery passing through established infestations.

An emergency exists to address the threat of post-fire weed incursion and spread and ensure the recovery of native vegetation cover within the fire perimeter and in areas where fire suppression activities occurred. The incursion and dispersal of invasive weeds into areas disturbed by fire suppression and rehabilitation has the potential to establish large and persistent weed populations. In addition, it is highly likely that existent weed infestations along dozerlines will increase in the burn area due to their accelerated growth and reproduction and lack of competition with natives. These weed populations could affect the structure and habitat function of native plant communities within the burn area. The ground disturbances caused by dozerlines are also expected to create accelerated erosion and soil compaction and may contribute to inhibiting recovery of native plant communities. Approximately 156.6 miles of dozerline were constructed within and outside of the burn perimeter. Therefore, it is critical that early and rapid detection surveys and treatment for invasive weeds is implemented within and around the burn perimeter, to improve native vegetation recovery. It is expected that most native vegetation would recover if weed invasions are minimized.

Additionally, localities within the burn area have a history of unauthorized OHV use. Prior to the fire, chaparral vegetation, blocks and fencing inhibited movement of OHVs. With the loss of this vegetative barrier, there is a potential for unauthorized dispersal of OHVs into the burned area. The introduction and expansion of weed populations could affect the structure and habitat function of native plant communities within the burn area. It is expected that most native vegetation adapted to moderate or infrequent high severity fire would recover if weed invasions are minimized.

Risk Assessment for Ecosystem/Native Plant Recovery: Probability: Very Likely due to the change in watershed response causing sheet and rill erosion of topsoil. There is also a potential for unauthorized off-highway vehicle use within the burn area and dozer lines that will be highly detrimental to vegetation recovery and encourage noxious weed invasion in native habitats and in Liebre Mountain, a special interest botanic area that experienced damage from extensive fire suppression activities. Magnitude: Major due to the high potential for vegetation type conversion to non-native annual grasslands across the burn area, most especially along dozer lines and areas affected by previous fires within the last 10 years. Recovery of native vegetation within and around Liebre Mountain botanic area may take longer than 10 years (possibly 10-20 years, with sufficient topsoil and landscape repair) due to the severity of fire suppression damage. Risk Level: Very High. *Several treatments are proposed to address the ecosystem/native plant recovery critical value. An early detection/rapid response treatment is proposed for the non-native invasive plants. A forest closure and closure patrols are proposed to limit the potential for OHV incursions.*

B. Emergency Treatment Objectives

- Provide for public safety
- Limit damage to property
- Limit loss of soil productivity and provide for natural vegetative recovery
- Early detection and rapid response of nonnative invasive plants
- Road and trail treatments to protect investment in infrastructure and limit post-fire watershed response
- Conserve threatened and endangered species habitat

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

- **Land: EDDR: N/A 85**
- **Channel: n/a**
- **Roads/Trails: 80**

D. Protection/Safety: 85

Table 7: Probability of Treatment Success

	1 year after treatment	*3 years after treatment*	*5 years after treatment*
Land	85	95	100
Channel			
Roads/Trails	85	95	100
Protection/Safety	90	100	100

E. **Cost of No-Action (Including Loss):** likely spread of invasive weeds in fire and dozer lines, likely road damage and periods of limited access to Burnt Peak communication towers, PCT damage

F. **Cost of Selected Alternative (Including Loss)** using VAR lite: implied Minimum Value of protecting non- market values, plus stabilizing FS road system, interagency coordination for downstream values and public safety, access to Burnt Peak communication towers

G. Skills Represented on Burned-Area Survey Team:

☒ Soils	☒ Hydrology	☒ Engineering	☒ GIS	☒ Archaeology
☒ Weeds/Botany	☒ Recreation	☐ Fisheries	☒ Wildlife	
☒ Other: PAO				

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Team Members ***Table 8: BAER Team Members by Skill***

Skill	Team Member Name
Team Lead(s)	Todd Ellsworth
Soils	Kellen Takenaka
Hydrology	Hilda Kwan, Casey Shannon
Engineering	
GIS	Mark Schug
Archaeology	Dorit Buckley, Mike McIntyre
Botany/Weeds	Janet Nickerman, Lauren Quon
Recreation	Ray Kidd
Wildlife	Leslie Welch, Robin Eliason
PAO	Cathleen Thompson

H. Treatment Narratives

Land Treatments

1) Early Detection and Response – Invasive and Noxious Weeds
In and along dozer lines, hand lines, drop points, safety zones, riparian areas, and adjacent to known invasive plant populations.

Proposed Treatment Areas	
Dozer lines	58.4 miles
Riparian Corridors	18.3 miles

Surveys will begin in 2021 during the flowering periods of weed species. Because of differences in flowering times for all potential species, two visits will be required during the growing season. Completion of surveys in

roads, dozerlines, riparian areas and staging areas will be the first priority. The second survey priorities will be along hand lines, and drop points. Surveys of the general habitats in the burned area will be the lowest priority. All locations of weed species will be mapped, using the Angeles NF, "Invasive Weeds" list.

Surveying will include walking the lines, documenting and hand pulling/herbiciding new weed occurrences at the time of inspection. Herbicide will be used in compliance with the Forest Wide NEPA project. New weed occurrences will be pulled to root depth, placed in sealed plastic bags, and properly disposed or sprayed with the appropriate and approved herbicide.

Priority treatment areas:

a. The Old Ridge Route Road. This is where yellow star thistle was masticated.
b. All dozer lines that crossed known populations of invasive plants
c. Upper Fish Creek and upper tributaries.

This is a large request for funding. This quote was not taken lightly. There are several reasons this amount is desperately needed to control invasives.

- The high number of dozer miles.
- The serious nature of the invasives, dozer operators sent through while conducting suppression.
- The Liebre Mountain is a botanical Special Interest Area.
- No weed wash station was ordered.
- The ANF has extremely limited staff and can't do this work internally. We've had great success in controlling invasives after fires with our partners and contractors. The ANF ecosystem would be completely different if not for EDRR BAER funding.

Weed detection surveys to determine whether ground disturbing activities related to the Lakes Fire have resulted in the expansion of noxious weeds is requested for the first year. Estimated costs assume that two visits would be necessary because of the differences in flowering times. If timing is such that all the target species are detectable in one visit, the actual costs would be lower than displayed below.

I. Removal of Microtrash at the Burnt Peak Communication Site

Removal of microtrash and debris around the facilities at the Burnt Peak Communication site will ensure that visiting condors are not put at risk. Permit holders are responsible for keeping their facilities free of garbage and debris. This treatment provides for a few days of the permit administrator's time to coordinate with the permit holders to ensure they implement the required clean-up.

Channel Treatments

No channel treatments are proposed for the Lake Fire.

Roads and Trail Treatments

Roads: Road drainage features are at risk from adjacent burned watersheds. Increased runoff and sediment from the burned areas can negatively affect the road prism, damaging the road, eroding land downslope of the road and routing flow and sediment directly to stream channels. Road failure can also contribute to failure of infrastructure downstream. Culverts associated with these roads are at risk of plugging from debris carried down channels from burned watersheds. Proposed road treatments include: drainage structure cleaning, reestablishing rolling dips and leadoff ditches, installation of overside drains, culvert removal and upsizing, reshaping low water crossings, installation of riprap armoring and spillways, culvert inlet basin cleaning, berm removal, outsloping, and riprap armoring at strategic locations.

Treatment Objectives: The primary objectives of the road and infrastructure treatments are to:

a. Protect and stabilize Forest Service infrastructure at risk of damage as a result of increased sedimentation, stream diversion, and erosion from the fire.

b. Reduce risk to water quality and other natural resources by reducing risk of infrastructure contamination, damage, and failure.
c. Mitigate public safety hazards along NFS roads.
d. Reduce risk to downstream infrastructure where possible.
e. Protect road crews from the threat of falling trees.

1. Road Storm-Proofing
Road stormproofing involves cleaning or armoring of existing drainage structures to help ensure road drainage performs optimally. This work will be accomplished through contractor equipment and labor. In addition, this treatment includes felling of hazard trees in forested areas that pose a threat to crews.
Locations: FSR 7N08, 7N19, 7N23, 7N23A, 7N23B, 7N23C, 7N13.1*
*(7N13.*1 is in Recommended Wilderness, so suppression repair would require a Forest Supervisor approval for use of mechanized equipment.)

2. Road Drainage Structure Replacements/Improvements
Road drainage structure improvements involves replacing existing deficient structures and installation of additional drainage structures to help ensure road drainage performs optimally.This work will be accomplished with contractor equipment and labor.
Note: Per conversation with Regional Office, Disposal of overside drains was removed.
Locations: FSR 7N08,7N19,7N23,7N23A,7N23B,7N23C

3. Storm Inspection/Response
Storm inspection/response will keep culvert and drainage features functional by cleaning sediment and debris from in and around features between or during storms. This work will be accomplished through contractor equipment and labor.
Locations: FSR 7N08, 7N19, 7N23, 7N23A, 7N23B, 7N23C

4. Contract Preparation and Administration
Preparation, administration and oversight of road work contracts.

5. Cultural Monitor (Archaeologist)
Oversees and ensures Cultural Resources are protected or mitigated during road treatment implementation and completes required documentation.

Trail Treatments: Trail (non-motorized trails) treatment work will include the installation of drainage features (out sloping, rolling grade dips, water bars) and snagging trees as appropriate for worker safety. This work is necessary to protect the trail asset by diverting anticipated increases in surface runoff off the trail. This request also includes felling of hazard trees along the portion of trail to be worked on in order to mitigate safety concerns as necessary. The trail work will be conducted by contract crews (ACE, CCC or other) and administered and supervised by Forest Service personnel.

After field assessments, it was determined sections of the Pacific Crest Trail (PCT) #332000 trail classes 3 and 4, and Fish Canyon Trail #3316W05 trail class 3 within the fire area need trail storm proofing and stabilization treatments. Treatment sections within areas of mostly high and moderate burn severity with slopes where watershed response is expected to be high and trail impacts likely were selected (10.25 miles selected out of 27 miles total in fire perimeter).

Urban areas near the fire area typically attract numbers of trail users, and especially seasonal hike-through groups following the PCT. The trail sections selected are located within high and moderate burn severity areas in steep terrain with little to no ground cover or vegetation remaining after the fire. Trails currently have sections that are incised and conducive to channelization of runoff furthering erosion and need additional drainage features installed. Trail storm proofing and grade stabilization of 10.25 miles of the trail has been identified to

prevent loss of trail tread, trail structure and to reduce soil erosion on slopes. Prior to implementation of treatments, trail specialists will perform specific trail surveys on identified trails. The result of the survey will dictate subsequent detailed storm proofing treatment recommendations and identification of hazard trees in need of removal for crew safety. The trails will be monitored post-implementation after winter rain season to determine effectiveness and maintenance needs, and if additional treatments are necessary.

See treatment map for specific trail treatment locations identified.

1) Trail Storm-Proofing
Trail stormproofing involves cleaning or armoring of existing drainage structures to help ensure Trail drainage performs optimally. This work will be accomplished through contractor equipment and labor. In addition, this treatment includes felling of hazard trees in forested areas that pose a threat to crews.

2) Trails Storm Inspection and Response
Storm inspection/response of treated trails will keep drainage features on trails functional by cleaning sediment and debris from in and around features between or during storms. This work will be accomplished through contractor equipment and labor.

J. Additional Trail Assessment
The Burnt Peak trail (#3316w02) and Gillette Mine trail (#3316w03) within the fire area were not surveyed on the ground to determine BAER treatment need and emergency, due to unusual weather (very hot temperatures) and lack of personnel avaialble and time. Forest Recreation staff will conduct the additional trail assessement and complete a field report.

Protection/Safety Treatments

1) Burned Debris Stabilization
The fiberglass water tank of the Sawmill 3 guzzler sustained fire damage. During inspection, it was found that burned fiberglass was already beginning to disperse. The associated refuse has the potential to move offsite and contaminate adjacent drainages and create an airborne inhalation hazard for humans and animals. Additionally, it has the potential to fall into the tank where wildlife go to access drinking water. The treatment will entail installation of straw wattles, hay bales, and/or sandbags around the guzzler, plugging the wildlife access holes to water, and covering the damaged fiberglass tank. This treatment is intended to contain the burned fiberglass and limit human and animal exposure until the tank can be removed.

2) Protection of Forest Service Property
Three guzzlers within the fire area are at risk of damage from overland debris flows that could fill the tank and drinkers with sediment, ash and debris. These three guzzlers are Sawmill 2, Sawmill 4 and Liebre 10. For the three guzzlers at risk from post-fire damage, the recommended treatment will entail installation of straw wattles, hay bales, and/or sandbags around the guzzler, to protect them from overland flood and hyperconcentrated flows.

3) Roads & Trails: Human Life and Safety (and Resource) Protection – Closure and Hazard Warning Signage
To ensure safety for Forest visitors and protection to Forest resources during the natural recovery period, area closure and hazard warning signs will be placed at trailheads and road locations adjacent to and within the fire perimeter to warn visitors of potential hazards. Given the typical amount of vandalism on the ANF, it is likely signs will need to be checked and replaced periodically within the first year; the cost estimate includes extra signs and personnel time for sign replacement. There are a number of portals or access points to these roads and trails. Forest staff will provide oversight for sign installations and implementation.

4) Level 2 Closure Patrols

The Lake fire in located in an area of the Angeles National Forest that the level two road system (7N23 & 7N08) serves as part of the Off Highway Vehicle (OHV) back country discovery system. The area receives very high use by hunters operating OHVs in the fall and PCT north bound hikers in the spring.

Unauthorized OHV access is a threat to the burned watershed due to the numerous miles of dozerlines (150) and open terrain created due to the fire including access by vehicles to the PCT. The ANF is one of the most urban Forest in the nation with one of the highest recreation use levels. The challenge for the ANF is managing the high number of users who gain unauthorized access to the Forest by driving/riding/entering through or around a locked gates and/or closure signs. This type of unmanaged OHV use can cause damage to natural and cultural resources, establish routes that may take years to rehabilitate, and provide access to the Pacific Crest Trail (PCT) by vehicles. A hard closure to vehicle users of the burn and adjaent areas is required for native vegetation to return within the burn area and on dozer lines as most of the ground cover will return with out vehicle use to compact soils and introduce non-native weeds.

Through past BAER experience, the ANF has determined that signage, barriers and other hard closures that are installed to discourage soil disturbance and assist in allowing natural vegetative recovery are not effective by themselves. Patrolling within and adjacent to the burn area is needed to enforce the closure and deter unauthorized access, vandalism, and damage to National Forest System lands. Prevention patrols are recommended in lieu of adding additional miles of barrier that may not be effective alone. Prevention patrols are considered a lower cost treatment compared to miles of barrier installation. Should patrols be found to be insufficient, the Forest may reassess and submit an interim request to install barriers at specific locations where unauthorized activity is observed.

5) Post-Winter Forest Closure and Emergency Condition Re-Assessment
The BAER team proposes that the Forest Closure Treatment and watershed response conditions be reevaluated by an interdisciplinary team of hydrologists, soil scientists, and other specialists in early summer 2021 to determine continued threats to public safety, infrastructure, and natural/historical resources. At that time, the Forest Order may be adjusted and/or additional treatments identified. A short findings report will be produced from this re-evaluation.

6) Interagency/Partner/Permittee Coordination
Many non-Forest Service entities, partners and permittees (*e.g.,* Southern California Edison, LA County Department of Public Works, NOAA NWS, NRCS, US Army Corp of Engineers private landowners, etc.) that have infrastructure in the fire area are actively repairing damaged infrastructure and/or implementing mitigations to reduce post-fire damage. The BAER team's findings will be shared with those entities so that they can plan measures to protect/prepare infrastructure from post-fire watershed response events. This cost is to get the Forest started with coordination and facilitation of emergency treatments from partners and permittees.

Above and beyond facilitating protection measures for non-Forest Service entities threats to life, property and water quality requires continued coordination with many agencies.

The Forest Service plans on continuing to collaborate and communicate with partnering agencies, other entities and organizations and the public.

7) Treatment Implementation Leader
The ANF does not currently have the staff to dedicate to properly guiding the implementation of the suite of treatments recommended by the Lake BAER. It is anticipated that this person would also assist with the Ranch 2 BAER implementation and possibly the Bobcat BAER implementation. Costs will be updated during the Bobcat BAER effort. The Team proposes detailing in or borrowing staff from another forest to take the lead for an implementation effort.

I. Monitoring Narrative

Treatment Effectiveness Monitoring

Effectiveness Monitoring: Monitoring the effectiveness of the other BAER treatments (as described above) will be used to determine if additional treatments are needed. The 2500-8 report requests funds to monitor the effectiveness of road treatments on Lake Fire roads. The following form or similar form will be filled out to assess the roads.

1) Road Treatment Effectiveness Monitoring:

a. *Monitoring Questions*
   - Is the road-tread stable?
   - Is the road leading to concentrating runoff leading to unacceptable off-site consequences?

b. *Measurable Indicators*
   - Rills and/or gullies forming of the road
   - Loss of road bed.

c. *Data Collection Techniques*
   - Photo documentation of site
   - Inspection Checklist (attached)

d. Analysis, evaluation, and reporting techniques

- Monitoring will be conducted after storm events. If the monitoring shows the treatment to be ineffective at stabilizing road and there is extensive loss of road bed or infrastructure an interim report will be submitted. A several page report would be completed after the site visit. The report would include photographs and a recommendation on whether additional treatments are necessary.

Road Inspection Checklist (Example)

Date:_____ Time:_____

Inspector_____

Forest _____ Road #_____

Portions of Road Inspected _____

Describe locations reviewed during inspection:_____

_____

Was there road damage? Yes _____ No _____

If yes, GPS coordinates of repair site_____

Describe damage and cost to repair _____

Photo taken of road
damage_____

Recommended actions to
repair:_____