Date of Report: August 24, 2020

Note: Costs and certain locations have been redacted to prevent further potential damage to resources

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: Apple

B. Fire Number: CA-RRU-096640

C. State: CA

D. County: Riverside/San Bernardino

E. Region: Pacific Southwest

F. Forest: San Bernardino

G. District: Front Country

H. Fire Incident Job Code: 1502 PNNCU3

I. Date Fire Started: July 31, 2020

J. Date Fire Contained: Unknown

K. Suppression Cost: **[REDACTED]**

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

1. **Fireline repaired (miles):**

Completed Dozer Line	49.50
Completed Hand Line	3.44

2. **Other (identify):**

Road	21.27 miles
Fence Damage	3 locations
Stream Crossing	1 location

M. Watershed Numbers:

Table 1: Acres Burned by Watershed

HUC #	Watershed Name	Total Acres	Acres Burned	% of Watershed Burned
181002010102	Headwaters San Gorgonio	30,306	18,375	60.6%

HUC #	Watershed Name	Total Acres	Acres Burned	% of Watershed Burned
180702030401	Little Gorgonio Creek	18,055	3,516	19.5%
180702030501	Mill Creek	27,116	48	0.2%
181002010101	Smith Creek	20,858	1,359	6.5%
181002010301	South Fork Whitewater River	39,035	4,930	12.6%
181002010104	Upper San Gorgonio River	22,894	3,310	14.5%

N. Total Acres Burned:

Table 2: Total Acres Burned by Ownership

OWNERSHIP	ACRES
NFS	22,110
MORONGO TRIBAL LAND	7,387
NON-FEDERAL	3,713
TOTAL	33,209

O. Vegetation Types: lower and upper montane chaparral, chamise chaparral, canyon live oak, scrub oak, black oak, interior live oak, bigcone douglas-fir, Jeffrey pine forest, mixed conifer pine and fir forests, subalpine conifers, riversidean alluvial scrub, California sycamore, and baccharis riparian.

P. Dominant Soils: The highest elevation, steepest slopes include Springdale-Winthrop Families and Lithic Xerorthents, all coarse textured, generally skeletal soils with little horizon development, formed from granitic, gneiss or metamorphic rocks. Mid-slope, upland soils are commonly Crafton, found on more moderate slopes, coarse-loamy in texture, formed from similar rocks as residuum or colluvium from steeper slopes above. Lowest elevations are mostly Oak Glen or Wilshire soils formed on alluvial fans at the toe of canyon walls (of Springdale or similar soils). Fans are very broad, coarse-loamy or sandy-skeletal, and dominate the Banning Canyon bottoms above active channel washes.

Q. Geologic Types: Bedrock within the Apple Fire burned area mainly consists of crystalline basement terranes composed of fairly distinctive metamorphic gneiss rocks and several different granitic plutonic rocks. At the surface, dissecting these metamorphic and plutonic rock units are surficial deposits, mostly unconsolidated alluvium and landslide debris deposits.

R. Miles of Stream Channels by Order or Class:

Table 3: Miles of Stream Channels by Order or Class

STREAM TYPE	MILES
PERENNIAL	3.1
INTERMITTENT	24.1
EPHEMERAL	68.8
OTHER (DEFINE)	

S. Transportation System:
Trails: *National Forest (miles):* 13.45 *Other (miles):*
Roads: *National Forest (miles):* 30.7 *Other (miles):*

PART III - WATERSHED CONDITION

A. Burn Severity (acres):

Table 4: Burn Severity Acres by Ownership

Soil Burn Severity	NFS	Morongo Tribal	Non-Federal	Total	% within the Fire Perimeter
Very Low/ Unburned	1,040	290	341	1,671	5%
Low	4,035	1,381	1,212	6,628	20%
Moderate	10,558	4,027	1,903	16,488	49.6%
High	6,478	1,689	256	8,423	25.4%
Total	22,110	7,387	3,713	33,209	

B. **Water-Repellent Soil (acres):** 17,290 acres (52% of fire)
Hydrophobic soil conditions were strong and widespread in high soil burn severity, ranging from 5-10 cm thick, present in 80-100% of high sampled areas, and repelling water for a minute or more. Within moderate burn severity, repellency was less common, present in 60-70% of samples, from 2-5cm thick, and repelling water for ~30 seconds. Repellency was present in some low soil burn severity, but may be due to natural, pre-fire repellency, and probably won't contribute much to watershed response.

C. Soil Erosion Hazard Rating:

Percent of fire area:
Severe: 28% Moderate: 54% Slight: 13% Not rated (rock outcrop & scree slopes): 5%

D. Erosion Potential:

7.0 tons/acre (2 year runoff event) – Pre-fire 0.2 tons/acre
19.1 tons/acre (5 year runoff event) – Pre-fire 1.1 tons/acre

E. Sediment Potential:

Rowe, Countryman, and Storey (1948) developed estimates of annual erosion rates for watersheds in the burn area based on measurements of sedimentation in reservoirs. On average, across the burn area, annual sediment delivery is estimated to increase 27 times greater than normal with an average of 24,400 cubic yards per square mile. These estimates are in line with field observations of dry ravel, existing unstable slopes made worse by fire effects, amount of bedload in washes and tributaries, and evidence of past debris flows.

F. Estimated Vegetative Recovery Period: (0-150 years)

Chaparral and oak communities comprise 71% of the burned area. These communities are expected to recover in 5-40 years in moderate and high severity burned areas unless re-burned or non-native plants densely establish. Conifer forests comprise 21% of the burned area and large areas of high fire severity are not expected to recover to mature forest within the next 50-150 years and have potential to type convert to shrub lands. Low severity and small areas of moderate fire severity areas of conifer forest are expected to recover in 0 – 30 years.

G. Estimated Hydrologic Response (brief description):

1. Estimated Erosion Response
Combustion of vegetation and organic surface layers was remarkably uniform in all of the high and most moderate burn severity within the Apple Fire. In moderate severity, less than 20% of the sampled locations had any potential for needlecast or literfall that would increase surface cover before the first damaging storm, leaving surface rock as the only ground cover. Throughout the fire, consumption of organic layers weakened surface soil structure, and dry ravel is widespread. This effect seemed particularly pronounced on soils within pourpoint 8, Banning Canyon, on slopes below Little San

Gorgonio Peak and Galena Peak. These factors combined with the very steep slopes in this part of the fire are represented in the erosion modeling results below; showing the highest erosion rates (in tons per acre) are found in the Banning Canyon. If a storm initiates runoff in the first year after the fire, erosion rates in Banning Canyon could average 10 tons/acre (2 year runoff event), or 31.4 tons/acre (5 year runoff event); individual hillslopes could exceed these rates. The Erosion Risk Management Tool (ERMiT) was used to predict hillslope erosion.

Other portions of the fire that saw similar consumption of vegetation and surface organics have elevated erosion rates, but generally are not expected to have as high of an erosion response when compared to Banning Canyon. This is partly because slopes are less consistently steep in other parts of the fire, and some soil properties make areas outside Banning Canyon less erodible. Crafton soils dominate mountain slopes in the southern half of the fire, and Morical are found on forested benches in the upper portion of the Whitewater River drainage. Both these soil types have more developed A horizons, and seem less affected by structure loss due to soil heating. Average erosion rates for popurpoints outside Banning Canyon range from 3 to 8 tons/acre (2 year runoff event), and from 11.3 to 20.8 tons/acre in a 5 year runoff event.

Table 5: Pre and Post-fire, Predicted Erosion Rates

			2 yr. Runoff Event		5 yr. Runoff Event	
Watershed	**Modeled Pour Point**	**Acres within fire**	**Pre Fire (tons/acre)**	**Post Fire (tons/acre)**	**Pre Fire (tons/acre)**	**Post Fire (tons/acre)**
Whitewater River	P1. SF Dam Diversion	1,160.6	0.1	5.5	1.6	15.9
Whitewater River	P2. YL Frog Habitat	813.4	0.1	3.4	1.7	11.3
Whitewater River	P3. WR Preserve	5,285.5	0.1	5.0	1.3	16.1
Portrero Creek	P4. MR Dam Diversion	446.7	0.2	7.3	1.0	20.8
Portrero Creek	P5. Wood Creek	2,251.6	0.3	6.3	0.8	16.5
Hathaway Creek	P6. Fire Boundary	1,910.5	0.3	8.0	0.9	19.5
Banning Canyon	P7. Big Pine Creek Flume	582.6	0.2	10.6	1.2	31.4
Banning Canyon	P8. 2S06 Crossing	7,933.6	0.2	9.7	1.6	27.5
Millard Creek	P9. Road Crossing	3,260.7	0.3	6.8	0.9	17.7
Cherry Canyon	P10. Noble Ck.Crossing	955.6	0.2	7.1	0.9	19.4

2. Watershed Response

Because of the variability in elevation, aspect, and general topography, annual precipitation and pattern is variable across the fire area. Annual precipitation ranges between 24 to 44 inches, primarily arriving between December and March although summer thundershowers are common in August and early fall. A significant portion of the burn in Banning Canyon and Whitewater Canyon is located above 6,000 ft, which may result in precipitation accumulating more as snow versus rain during winter. Snow accumulation versus rainfall affects the magnitude of post-fire watershed response, slowing runoff and favoring infiltration. It is important to note, however, that rain-on- snow events are common in this area as well.

Damaging Storms: Although not the only types of storms that could occur, two common storm types that could cause significant damage within the burn area are monsoonal thunderstorms and storms related to atmospheric rivers. Short duration, high intensity storms (such as a monsoonal thundershowers) frequently trigger debris flows. The second storm type is a long duration storm, commonly linked to atmospheric rivers. Major flooding events have occurred across Southern California due to atmospheric rivers which contain large amounts of water vapor. One such weather system is known as the “Pineapple Express," which moves subtropical moisture from the latitudes of the Hawaiian Islands to Southern California. These types of storms are especially catastrophic if

they occur over snowpack, commonly referred to as a rain-on-snow event. Warm rains rapidly melt snowpack and can result in catastrophic runoff.

Hydrologic Processes: Most of the burn area had not burned in recorded history, resulting in the development of mature brush communities and thick duff accumulation. Availability of this fuel load contributed to the subsequent high percentage of moderate and high soil burn severity (Table 6). Fire causes impacts to several hydrologic processes including reduction in interception, transpiration, and infiltration, and increases in soil moisture and the rate of runoff (due to lack of litter and decreased surface roughness). Removal of vegetation and changes to soil such as increases in hydrophobicity, changes in soil structure, and removal of duff, organic matter, and roots alters these processes and ultimately lead to increases in runoff, peak flows and erosion. These alterations are typical of soils classified as having incurred moderate to high soil burn severity. Given the large percentage of soil burn severity in the Apple Fire, watershed response will be significant (Table 6). Increases in runoff and bulking of flows across the burn area are expected to increase approximately 38% to 234% above normal. (Two modeled sites have significantly lower estimates due to their distance from the burn area and the acreage that burned in those catchments.)

Table 6: Comparison of Pre- and Post-fire Peak Flow Related to the 2, 5, and 10 Year Return Interval

			2 yr. RI Peak Flow			5 yr. RI Peak Flow			10 yr. RI Peak Flow		
Watershed	**Modeled Pour Point**	**% of Mod & High SBS**	**Pre-Fire Q (CFS)**	**Post-Fire Bulked Q (CFS)**	**Increase above Pre-fire Q**	**Pre-fire Q (CFS)**	**Post-Fire Bulked Q (CFS)**	**Increase above Pre-fire Q**	**Pre-fire Q (CFS)**	**Post-fire Bulked Q (CFS)**	**Increase above Pre-fire Q**
Whitewater River	P1. SF Dam Diversion	53%	16	24	51%	93	137	46%	235	337	43%
Whitewater River	P2. YL Frog Habitat	3%	35	36	3%	205	212	3%	515	531	3%
Whitewater River	P3. WR Preserve	11%	75	82	10%	438	477	9%	1,100	1,193	8%
Portrero Creek	P4. MR Dam Diversion	23%	14	21	48%	81	114	41%	203	280	38%
Portrero Creek	P5. Wood Creek	51%	23	51	117%	135	270	100%	341	652	91%
Hathaway Creek	P6. Fire Boundary	97%	18	60	234%	105	310	195%	263	727	177%
Banning Canyon	P7. Big Pine Creek Flume	87%	10	28	191%	57	152	166%	143	359	151%
Banning Canyon	P8. 2S06 Crossing	82%	37	100	171%	214	534	149%	540	1,273	136%
Millard Creek	P9. Road Crossing	30%	37	64	72%	215	349	62%	542	844	56%
Cherry Canyon	P10. Noble Ck.Crossing	49%	84	201	141%	275	590	115%	496	986	99%

Channel crossings, depositional fans, and floodplains have an inherent risk of flooding which will be exacerbated by the fire. Increased runoff and sediment delivery (ex. surface erosion, sediment-laden flows, and debris flows) will cause channel migration and braiding across the wash in flood events. Lateral channel migration can erode cut banks and undercut slopes and banks. Aggradation can increase probability of channel migration and flooding. Changes in hydrologic processes can also lead to slope instability and result in post-fire debris flows, mudflows, and other mass wasting (as described under geologic response). Watershed response in the burn area will pose a very high risk to life, safety, and infrastructure. The combination of increased flows, sediment loads, and woody debris increase the volume of post-fire flows, which could negatively impact culverts, constructed channel ways, diversion infrastructure, and other infrastructure designed to pass “normal” flows. It is important to note that downstream areas that experience regular flooding or difficulty controlling drainage during small storms will be very likely to experience flooding and/or failure in post-fire storms. Bulking and increased flows may cause channels to flood, divert, or migrate to areas that do not usually flood.

Water Quality: 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, suspended material, and turbidity. Floods and debris flows can entrain large material, which can physically damage infrastructure associated with beneficial uses 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 vegetation mortality can result in increases

in floatable material such as 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.

3. Geology/Geologic Response

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

Now, as a result of the removal of vegetation by the fire, soils are exposed and have become weakened, hydrophobic conditions have changed and rocks on slopes have lost their supporting vegetation. Due to these post-fire new conditions, roads, trails and water systems 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, trails, water systems, natural and cultural resources is elevated in most areas in and downstream of the Apple Fire.

The US Geological Survey (USGS) - Landslide Hazards Program, has developed empirical models for forecasting the probability and the likely volume of post-fire debris flow events. To run their models, the USGS uses geospatial data related to basin morphometry, burn severity, soil properties, and rainfall characteristics to estimate the probability and volume of debris flows that may occur in response to a design storm (Staley, 2016). Estimates of probability, volume, and combined hazard are based upon a design storm with a peak 15-minute rainfall intensity of 12 – 40 millimeters per hour (mm/h) rate. We selected a design storm of a peak 15-minute rainfall intensity of 28 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.

Based on USGS debris flow modeling it appears that under conditions of a peak 15-minute rainfall intensity storm of 28 millimeters per hour (1.1 inch/hr.), the probability of debris flows occurring is very high (80-100%) in a majority of the channels/creeks in the Apple Fire burn area, especially in the San Gorgonio River watershed. Under these same conditions, predicted volumes in these channels are expected to range from 1K-10K cubic meters in some channels to 10K-100K cubic meters in other channels. 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 combine hazard.

PART V - SUMMARY OF ANALYSIS

Introduction/Background:

The Apple Fire started on July 31, 2020 near the communities of Oak Glen and Cherry Valley, CA. The fire grew quickly, driven by the low moisture content of the vegetation in the area combined with high temperatures and low relative humidity. Most of the fire burned in areas with no recent fire history. A Type 1 Incident Management Team took over the fire on August 2. At its height, nearly 2,900 firefighters and support personnel were assigned to the fire. Land ownership within the fire area is checkerboarded, including private lands, National Forest wilderness and non-wilderness, and the Morongo Band of Mission Indian Reservation. The fire is considered to be 95% contained as of August 19, 2020.

The Apple Fire burned within the watersheds of Whitewater River, Portrero Creek, Hathaway Creek, Banning Canyon, Millard Creek, and Cherry Canyon. The area is characterized by steep, rocky mountainous canyons and ridges, to alluvial valleys of the San Bernardino Mountain Range.

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

Table 7: 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 Apple Fire area.

2. Property (P):Roads and Trails:

Overview

The National Forest transportation system consists of approximately 31 miles of National Forest System Roads (NFSR) within the fire perimeter. All these roads are suitable for high-clearance vehicles and are administrative use only (maintenance level 1-2). Some of the NFS roads within the burned area are maintained by cooperators (SCE, City of Banning, State, Private). Other roads have shared maintenance responsibility between cooperators and the forest. The majority of the NFS Roads throughout the burned watersheds are likely to be impacted by runoff, sediment, and debris derived from burned areas.

Risk Assessment

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 table below shows the risk assessment for each road based on the probability of damage or loss and the magnitude of consequences.

Roads: BAER Risk Ratings

Low	Intermediate	High	Very High
2S25 2S07	None	None	2S24 2S06 2S04 2S01/A/B 2S23

Of the NFSR miles in the burned area, 9.7 miles of road are proposed for treatment and have a risk rating of very high. These roads include: 2S24, 2S06, 2S04, and 2S23. 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. Because an existing license/permit exists with Southern California Edison (SCE), which includes road maintenance responsibilities on 2S01/A/B, information will be shared with SCE on the very high-risk rating associated with this road and suggested treatment recommendations to help mitigate this risk.

Forest Service Property: Beyond the roads and trails, there is little Forest Service property within the fire area. There is one developed wildlife water system at [REDACTED]. The [REDACTED] drinker was the only documented wildlife water development affected by the fire. The fire burned about 5ft of pipe which stopped the flow of water from the spring. The

post-fire affects from the hillsides above the water development include increased sedimentation which may bury the drinker.

b. Private Property: The fire burned in, around, and adjacent to the communities of Oak Glen, Cherry Valley, Banning, and Banning Bench. The southern portion of the fire burned on Morongo Band of Mission Indians Reservation. Federal and private landownership are checkerboarded throughout the fire area.

The Banning Canyon Water Conveyance system is owned by SCE and is entirely within the fire perimeter in Banning Canyon and the upper South Fork Whitewater River watershed. The system spans both private and NFS lands. The system operates under a combination FERC license and FS Special Use Permit. Infrastructure includes water diversions, pipelines, flume, powerhouses, and water tanks.

SCE powerlines are present in the Banning Canyon area on both private and NFS lands. [REDACTED]. The Oak Glen Conservation Camp is on NFS lands under permit to CalFire. The camp consists of buildings, outbuildings, wells, water tanks, and access roads. The City of Banning owns and operates wells in Banning Canyon on private lands.

The BAER worked closely with State WERT and Department of Interior BAER Team sharing information on watershed response and potential threats to non-Forest assets. Non-Forest assets are addressed in their reports, respectively.

3. Natural Resources (NR): Water Quality for Municipal and Domestic Use:

Fire can negatively impact both physical and chemical constituents of water quality. Chemical impacts will be relatively short as ash is flushed through the system. Increased sediment delivery can be expected to continue until vegetation reestablishes and erosion is slowed. [REDACTED]. Hazmat resulting from burned infrastructure (on private lands or under permit on FS lands) could pose a risk to water quality if mobilized. Most observed hazmat is in low-lying areas subject to flooding. Changes to water quality will need to be considered prior to use and how increased sediment may impact treatment facilities.

b. Hydrologic Function:

Fire impacts proper functioning of hydrologic processes. These impacts are recoverable and expected to diminish as vegetation reestablishes. The greatest threats to recovery are threats from incursion of OHV and [REDACTED], and failure of infrastructure (including roads, water conveyance systems, and trails). Slope failure, increased sediment delivery, and mobilization of woody debris increase the risk of channel diversions down roads and ditches. Channel diversion could lead to complete road prism (or infrastructure) loss and irrecoverable damage to hillslopes (ex. 2S01).

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 Apple Fire, *hillslope stabilization treatments are not being proposed*. Suitable areas are very limited due to land ownership, wilderness designation, 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: Intense rainfall may be more than a 5-year rainfall event could result in severe surface erosion**. Magnitude: Moderate:** Loss of surface soil could reduce productivity or delay recovery of pre-fire vegetation types. **Risk: High**

d. Wildlife Resources:
There are four federally listed species within and downstream of the fire area; southwestern willow flycatcher, mountain yellow-legged frog, California red-legged frog and arroyo toad. In addition, mountain yellow-legged frog Critical Habitat occurs downstream of the fire area. The following watersheds were addressed for post-fire threats to federally listed wildlife:

Headwaters San Gorgonio:
Banning Canyon has suitable habitat for arroyo toad within and downstream of the fire area in federal and non-federal lands. In addition, there is a southwestern willow flycatcher territory that burned over during the fire. Modeling of this drainage shows that there will be an increase of 140-200% over normal flows. In addition, about 10 tons per acre of sediment are expected. Post-fire effects to southwestern willow flycatcher habitat may include increased flows, sediment and debris delivery that may further scour riparian vegetation. Post-fire effects to arroyo toads may include death/injury due to being buried during debris flows or drowning. In addition, water quality from fine/sediment and ash may also lead to death/injury if animals are present in the water. Over the long term, the deposition of sediment may improve habitat for the arroyo toad.

Little San Gorgonio Creek:
Mountain yellow-legged frog suitable habitat is known to occur on Sawmill Canyon and Burnt Canyon. Those areas are not known to be occupied. Modeling of this drainage shows that there will be an increase of 150-200% over normal flows. In addition, about 10.6 tons per acre of sediment are expected. Post-fire effects to mountain yellow-legged frogs may include death/injury due to being buried during debris flows and/or fine sediment/ash impacting the water quality. In addition, increased deposition may fill up pools of water with sediment which means that the pools would not hold water long enough for individuals to complete metamorphosis (2 years).

Southwestern willow flycatcher habitat is present in Noble Creek. Post-fire effects to the habitat may include increased flows, sediment and debris delivery that may further scour riparian vegetation.

South Fork Whitewater:
Designated Critical Habitat for mountain yellow-legged frog occurs downstream of the fire in Middle Fork Whitewater River. This area is not known to be occupied. The site is expected to see about a 3% increase in watershed runoff. *Post-fire effects are not expected to be detrimental to the Primary Constituent Elements for the Critical Habitat*. Normal flush watershed processes are expected to occur. Increases in floatable debris, fine sediment/ash and impacts to water quality will occur which may cause death to animals present in the water.

Occupied California red-legged frog habitat occurs in the [REDACTED] on private land [REDACTED], over [REDACTED]miles downstream of the fire. The frogs [REDACTED]not directly on the stream channel but still receive their water from [REDACTED] the river wash. The increase flow in this area is estimated to be 10%. The water chemistry may change as there will be more floatable debris and sediment despite minor increases in runoff volume. Turbidity and water quality (ash, fine sediment) may be impacted which may impact the water quality of the ponds. This may lead to injury/death of red-legged frogs present in that water.

Treatments are not recommended for T+E species or critical habitat.

e. Botanical Resources:
An emergency exists with respect to vegetative recovery as a result of the threat of post-fire weed introduction and spread. The potential introduction and dispersal of invasive weeds into areas disturbed by fire suppression and rehabilitation activities may lead to the establishment of large and persistent weed populations. There is a high probability that extant weed infestations along constructed fine lines will increase in the burn area due to mechanical soil disturbance

and their release from competition with native plant species. [REDACTED]. 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: *Probability: Likely*: Given the WUI and density of non-nonnative invasives(NNI) near boundary high potential along vectors of trails, roads, riparian, and [REDACTED]. Known extant NNI at fire camp, on access roads, and in patches within dozer lines. *Magnitude: Major*: Known occurrences of tamarisk near burned area spreading into riparian and potential inhibition of native veg community recovery. Potential type conversion of chaparral where many of the dozer lines are. **Risk: VERY HIGH**

There is a documented occurrence of the federally listed endangered plant species *Astragalus tricarinatus* approximately five miles downstream of the burn area within the [REDACTED]. Much of the population occurs on rocky slopes above the floodplain and will not be impacted by potential flooding and sedimentation. Occasionally seedlings can become established within the wash and experience flooding and displacement. Loss of these individuals in the wash is not considered a threat to the upslope populations because these small wash populations tend to be ephemeral and are not though to contribute to the long term viability of the species.

4. Cultural and Heritage Resources: [REDACTED]**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: N/A
Channel: N/A
Roads/Trails: 85%
Protection/Safety: 90%

D. Probability of Treatment Success

Table 8: Probability of Treatment Success

	1 year after treatment	*3 years after treatment*	*5 years after treatment*
Land	n/a	n/a	n/a
Channel	n/a	n/a	n/a
Roads/Trails	80	90	100
Protection/Safety	90	90	100

E. Cost of No-Action (Including Loss): [REDACTED] plus loss of value to nonmarket resources such as nonnative invasive weeds impacting vegetative recovery and potential for type conversion, additional impacts to soil loss/productivity and lack of post-fire coordination with partners and post-fire flood response preparation.

F. Cost of Selected Alternative (Including Loss): Using VAR lite tool: **[REDACTED]** Expected benefit/cost ratio for market resources; continued Interagency coordination to assist with property and life protection and benefits to nonmarket resources due to non-native invasive detection and eradication and vector prevention.

G. Skills Represented on Burned-Area Survey Team:

☒ Soils ☒ Hydrology ☒ Engineering ☒ GIS ☒ Archaeology
☒ Weeds ☐ Recreation ☒ Fisheries ☒ Wildlife
☒ Other: Geology, PIO

Team Leader: Todd Ellsworth
Email: todd.ellsworth@usda.gov **Phone(s):** [REDACTED]

Forest BAER Coordinator: Robert Taylor
Email: robert.taylor2@usda.gov **Phone(s):** [REDACTED]

Team Members: *Table 9: BAER Team Members by Skill*

Skill	Team Member Name
Team Lead(s)	Todd Ellsworth
Soils	Curtis Kvamme
Hydrology	Emily Fudge and Robert Taylor
Engineering	Josh Direen
GIS	Tracy Tennant
Archaeology	Karin Klemic
Weeds	Emma Williams and Lance Woolley (T)
Recreation	
Other	Yonni Schwartz, Cathleen Thompson, Kim Boss

H. Treatment Narrative:

Land Treatments:

1) Early Detection, Rapid Response – Related to Burned Area:

An emergency exists with respect to native vegetative community recovery as a result of the threat of post-fire weed introduction and spread and unauthorized off-road vehicle (OHV) use. Invasive plant populations may affect the structure and habitat function of native plant communities especially in arid and riparian ecosystems by aggressive colonization, reduction of water availability, and outcompeting native species causing type conversion and changes in fire regimes. Localities within the burn area have a history of concentrated unauthorized OHV use and [REDACTED] from areas with known weed infestations. Suppression repair features have a high likelihood of new weed introductions from equipment transported from out of the area or transport of seeds from existing infestations to new areas. However, native vegetation is expected to recover from fire if invasive plant invasions are minimized.

Early Detection and Rapid Response treatments are requested to prevent within the burned area with high probability for non-native invasive species introductions or expansion. Existing authorized roads (18 miles) and trails (7 miles), unauthorized routes (7 miles), and riparian areas (18 miles) are vectors for weed seed movement and are the highest likelihood for new infestations. Wind dispersed species in the vicinity have high potential for establishing in sensitive riparian areas post fire. Closing the burned area to public access is recommended, however over 90% of the burned area on FS land is within 1 mile of the San Bernardino National Forest boundary, causing a high likelihood for unauthorized off trail hiking or OHV use where previously dense vegetation prohibited these vectors of weed spread. Several awned or spined species are known to the vicinity and readily disperse on clothing or fur. Two visits would be needed to capture bloom seasons in the early spring and summer. The San Bernardino National Forest would leverage existing partnership agreements with Rancho Santa Ana Botanical Garden and Southern California Mountains Foundation to complete the weed treatments.

Land Treatment #1: Early Detection, Rapid Response – Related to Burn Area				
Item	**Unit**	**Unit Cost**	**# of Units**	**Cost**
Invasive Plant Detection & Treatment				
4 Weed Technicians	Days	[REDACTED]	25	[REDACTED]
Administration, Travel, and Materials				
1 GS-9 Botanist, Coordination	Days	[REDACTED]	5	[REDACTED]
1 GS-11 Botanist, Agreements	Days	[REDACTED]	2	[REDACTED]

Vehicle Mileage	Miles	[REDACTED]	2500	[REDACTED]
Supplies	Each	[REDACTED]	1	[REDACTED]
Total Cost				[REDACTED]

2) Early Detection, Rapid Response – Related to Fire Suppression:
Early Detection and Rapid Response treatments are requested on suppression related disturbance features including dozer lines (7 miles), hand lines (4 miles), roads bladed for containment lines (18 miles), helistops, drop points, and spike camps. Since it is impossible to know if all suppression equipment was adequately cleaned prior to entering the burn area, there is a risk that weed seed from areas outside the region was introduced via suppression equipment as vectors of weed seed dispersal. It is highly likely that introduced or existing invasive plant infestations will quickly spread and expand onto freshly disturbed ground related to fire suppression activities.

Land Treatment #2: Early Detection, Rapid Response – Related to Fire Suppression				
Item	**Unit**	**Unit Cost**	**# of Units**	**Cost**
Invasive Plant Detection & Treatment				
4 Weed Technicians	Days	[REDACTED]	30	[REDACTED]
Administration, Travel, and Materials				
1 GS-9 Botanist, Coordination	Days	[REDACTED]	5	[REDACTED]
1 GS-11 Botanist, Agreements	Days	[REDACTED]	2	[REDACTED]
Vehicle Mileage	Miles	[REDACTED]	2500	[REDACTED]
Supplies	Each	[REDACTED]	1	[REDACTED]
Total Cost				[REDACTED]

3) Vector Exclusion Fencing on Vulnerable Wilderness Boundary Locations:
[REDACTED]. Fencing is recommended in specific locations [REDACTED] The San Bernardino National Forest would leverage its partnership agreement with the Southern California Mountains Foundation to construct fencing and install gates. San Bernardino National Forest would provide all fencing and gate materials from existing inventory.

Land Treatment #3: Vector Exclusion on Vulnerable Wilderness Boundary Locations				
Item	**Unit**	**Unit Cost**	**# of Units**	**Cost**
1 GS-09 Botanist	Day	[REDACTED]	2	[REDACTED]
1 GS-09 Archeologist	Day	[REDACTED]	2	[REDACTED]
Urban Conservation Corps Crew w/ Supervisor	Day	[REDACTED]	6	[REDACTED]
Vehicle Mileage	Miles	[REDACTED]	600	[REDACTED]
Total Cost				[REDACTED]

Channel Treatments: None

Roads and Trail Treatments:
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 2S24, 2S06, 2S04, 2S23

Roads and Trail Treatments #1: Road Storm-Proofing				
Item	**Unit**	**Unit Cost**	**# of Units**	**Cost**
Mobilization – 10% standard for this area	Lump Sum	[REDACTED]	1	[REDACTED]
Restore Drainage Function- existing drainage structures - 2S04/2S06/2S23/2S24	Mile	[REDACTED]	8.6	[REDACTED]
Outslope Road, remove berm - 2S04	Mile	[REDACTED]	0.4	[REDACTED]
Installation of new drainage dips with leadout ditches -2S04/2S23	Each	[REDACTED]	50	[REDACTED]
Vegetation removal @ Noble Creek	LSQ	[REDACTED]	1	[REDACTED]
Cleanout and reshape existing grouted rock LWC - 2S06	Each	[REDACTED]	4	[REDACTED]
Reshape native LWC	Each	[REDACTED]	2	[REDACTED]
Fire Crew Overtime (Hazard Tree Felling)	LS	[REDACTED]	1	[REDACTED]
Total				[REDACTED]

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.

Locations: FSR 2S24, 2S06, 2S04, 2S23

Roads and Trail Treatments #2: Road Drainage Structure Replacements/Improvements				
Item	**Unit**	**Unit Cost**	**# of Units**	**Cost**
Mobilization – 10% - standard for this area	Lump Sum	[REDACTED]	1	[REDACTED]
Install 18” Overside Drain w/ 20' flume – 2S04/2S23/2S24	Each	[REDACTED]	11	[REDACTED]
Install 24” Overside Drain w/ 20' flume – 2S06	Each	[REDACTED]	6	[REDACTED]
24 inch culvert removal, install low water crossing @ Smith Ck. - 2S06	Each	[REDACTED]	1	[REDACTED]
12 inch and 24inch culvert removal, install LWC with rock spillway- 2S06	Each	[REDACTED]	1	[REDACTED]
Install 24 inch CMP tee with grate, culvert inlet modification - 2S06	Lump Sum	[REDACTED]	1	[REDACTED]
Riprap downstream of grouted rock LWC – large riprap to protect road and [REDACTED]	CY	[REDACTED]	20	[REDACTED]

Total	[REDACTED]

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 2S24, 2S06, 2S04, 2S23

Roads and Trail Treatments #3: Storm Inspection/Response				
Item	**Unit**	**Unit Cost**	**# of Units**	**Cost**
Storm Response	Days	[REDACTED]	5	[REDACTED]
Storm Inspection	Days	[REDACTED]	5	[REDACTED]
Total				[REDACTED]

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

Roads and Trail Treatments #4: Contract Administration				
Item	**Unit**	**Unit Cost**	**# of Units**	**Cost**
GS11 Engineer	Day	[REDACTED]	20	[REDACTED]
Total				[REDACTED]

5) [REDACTED]Cultural Monitor:
The [REDACTED] features along [REDACTED] were determined to be at risk from road treatments (#1-3 above). As such, monitoring by a qualified heritage specialist will be required for the 1-2 weeks that road work will be conducted on [REDACTED]. Due to existing workload and reduced staffing levels, the recommendation is to bring a cultural monitor from off-Forest to serve in this capacity.

Roads and Trail Treatments #5: [REDACTED]Cultural Monitor				
Item	**Unit**	**Unit Cost**	**# of Units**	**Cost**
GS12 Archaeologist	Hour	[REDACTED]	8	[REDACTED]
GS09 Archaeologist	Hour	[REDACTED]	100	[REDACTED]
Per Diem	Day	[REDACTED]	10	[REDACTED]
Mileage	Mile	[REDACTED]	1200	[REDACTED]
Total				[REDACTED]

Protection/Safety Treatments:
1) Interagency/Partner/Permittee Coordination:
Many non-Forest Service entities, partners and permittees (*e.g.,* Southern California Edison, City of Banning, Banning Heights Mutual Water Company, CalFire, County of San Bernardino, County of Riverside, BLM, BIA, Morongo Band of Mission Indians, NRCS, 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. The Forest will pursue cost recovery for large projects and proposals 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.

Protection/Safety Treatment #1: Interagency/Partner/Permittee Coordination Treatment				
Item	**Unit**	**Unit Cost**	**# of Units**	**Cost**
GS-12 BAER Coordinator/Forest Hydrologist	[REDACTED]	[REDACTED]	10	[REDACTED]
Total Cost				[REDACTED]

2) Burned Area Closure and Warning Signs:
The Forest has issued a closure area within the Apple Fire (Order No. 05-12-00-20-13) and expires September 1, 2020. It is recommended that this closure stays in place and the risk associated with the burn scar are reevaluated prior to lifting the closure. Signs placed at strategic locations outside and within the fire perimeter are recommended to close the burned area. A Forest Order will be maintained to authorize the closure. This treatment will keep Forest users out of the burn area during major storm events. As only a small portion of the Viviane Creek Trail was within the fire perimeter, the BAER team does not recommend closure of this popular trail.

NFS roads within the burn area may be impacted flooding, debris flow, hazard trees, rockfall, dry ravel, etc. Signs will be placed strategically along roads that access the fire area. In addition, a warning sign will be placed at the Viviane Creek Trailhead as well as where the trail briefly intersects with the burned area. The warning signs will identify the types of hazards to watch out for on roads and Viviane Creek Trail. The purchase and installation of signs at each of the identified locations will be consistent with Forest Engineering Standards at these locations.

Enforcing the area closure is considered essential to ensuring crirical values including human life and safety, hydrologic function, soil productivity and native plant communities. Monitoring will take place at road and trail entrances to the fire to monitor for trespass and effects to crtical values at risk within into the closure area and assess need for additional enforcement and/or implementation of barriers.

Protection/Safety Treatment #2: Burned Area Closure and Warning Signs				
Item	**Unit**	**Unit Cost**	**# of Units**	**Cost**
Contract Mobilization – Roadside Warning Signs	LS	[REDACTED]	1	[REDACTED]
Roadside Warning Signs (aluminum panels and posts)	Each	[REDACTED]	4	[REDACTED]
Replacement Roadside Warning Signs	Each	[REDACTED]	4	[REDACTED]
Trailside Warning Signs (includes installation)	Each	[REDACTED]	3	[REDACTED]
Replacement Trailside Warning Signs	Each	[REDACTED]	3	[REDACTED]
Closure Signs (includes installation)	Each	[REDACTED]	5	[REDACTED]
Replacement Closure Signs	Each	[REDACTED]	5	[REDACTED]
Recreation Technician (GS-5) sign installation and patrol	Day	[REDACTED]	20	[REDACTED]
Total Cost				[REDACTED]

3) [REDACTED]

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.

1) Vector Exclusion Effectiveness Monitoring:
Monitoring of the vector exclusion fence is considered essential to ensure that critical values are being protected.

Monitoring Treatment #1: Vector Exclusion Effectiveness Monitoring				
Item	**Unit**	**Unit Cost**	**# of Units**	**Cost**
GS-09 Botanist	Day	[REDACTED]	2	[REDACTED]
Mileage	LS	[REDACTED]	1	[REDACTED]
Total Cost				[REDACTED]

PART VI – EMERGENCY STABILIZATION TREATMENTS AND SOURCE OF FUNDS

[TABLE REDACTED]

PART VII - APPROVALS

1. Jody Noiron — 8/25/2020

Forest Supervisor — Date