El Dorado Fire 2020

Picture of the Oak Glen Area

Date of Report: October 6, 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: El Dorado

B. Fire Number: CA-BDU-012925

C. State: California

D. County: San Bernardino

E. Region: 05 Pacific Southwest

F. Forest: San Bernardino

G. District: Front Country and Mountaintop

H. Fire Incident Job Code: 1502 PNNJ4B

I. Date Fire Started: 9/5/2020

J. Date Fire Contained: 12/31/2020 (expected)

K. Suppression Cost: $60,000,000 (projected)

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

1. **Fireline repaired (miles): 0 (No suppression repair has occurred as of this report)**
2. **Other (identify):**

M. Watershed Numbers:

Table 1: Acres Burned by Watershed

HUC #	Watershed Name	Total Acres	Acres Burned	% of Watershed Burned
180702030202	Deer Creek-Santa Ana River	31,504	4,925	15.6%
180702030401	Little San Gorgonio Creek	18,070	3,319	18.4%
180702030402	Yucaipa Creek	29,266	5,106	17.4%
180702030501	Mill Creek	27,138	8,487	31.3%
180702030507	Santa Ana Wash-Santa Ana River	25,458	1,145	4.5%
181002010102	Headwaters San Gorgonio River	30,330	0.2	<0.1%

N. Total Acres Burned:

Table 2: Total Acres Burned by Ownership

OWNERSHIP	ACRES
NFS	19,163
OTHER FEDERAL (LIST AGENCY AND ACRES)	0
STATE	0
PRIVATE	3,819
TOTAL	22,982

O. Vegetation Types:

Lower elevation communities (3,200-5,5600ft) on exposed southern slopes were comprised of mature lower montane, chamise, and manzanita chaparral and scrub oak shrublands with limited recent fire history. North facing slopes and canyons at these elevations support interior live oak and black oak woodlands and Coulter pine and bigcone Douglas-fir forests. Interior live oak, scrub oak, and pine forests dominate the middle elevations from 5,500 – 6,500 ft and transition into upper montane chaparral and mixed conifer and subalpine forests growing up to San Bernardino Peak at 10,650 ft. The lowest elevations along the wildland urban interface consist of annual exotic and California buckwheat dominated communities.

P. Dominant Soils:

Most of the fire (more than 50%) is made up of very steep slopes, and soils with little development due to high natural erosion rates. 3 soils occur in these areas, all are coarse textured and formed from granitic or gneiss rocks. Lithic Xerorthents are shallow and have the highest rock content, Springdale (mid elevation) and Wapal (high elevation) are deeper, with variable rock content. Below these soils, depositional and toe slopes include Tigo and Pacifico soils, and Greenfield in Alluvium above river washes. Finally, Tollhouse occurs southeast of Oak Glen, in the only portion of the fire that formed on residual slopes (lacking frequent erosion or deposition), it formed on granitic parent material, and has dark-colored surface horizons.

Q. Geologic Types:

The San Bernardino National Forest (SBNF) includes parts of, two major geologic-geomorphic provinces of western North America - the Transverse Ranges and the Peninsular Ranges provinces. The San Gabriel and San Bernardino Mountains are part of the eastern Transverse Ranges and the San Jacinto and Santa Rosa Mountains, Thomas Mountain, and Coahuila Mountain are part of the northern Peninsular Ranges. The geology of the two provinces is vastly different one from the other (Matti & Morton, 2000).

The San Bernardino Mountains were elevated within and north of the San Andreas fault zone. They form a rectangular upland about 65 miles long east-west and about 20 miles wide. The major part of this mountain highland is designated as the north block of the San Bernardino Mountain uplift, which includes an elevated surface of low relief, or a broad plateau. The north block includes the highest peak in southern California at Mount San Gorgonio that rises to an altitude of 11,500 feet above sea level. The southernmost part of this uplift is composed of basement rocks and was elevated or partly elevated as two slices between strands of the San Andreas fault zone. This block was designated as the south block (Dibblee, 1968) and lacks the plateau surface characteristic of the north block.

The El Dorado Fire occurred on the southeast end of the San Bernardino Mountain Range in the area designated as the south block of the San Bernardino Mountain uplift. Physiography of the burned area is dominated generally by extremely steep and rugged terrain, dissected ridge lines and drainages. Major drainages in the burned area include portions of the Deer-Creek-Santa Ana River, portions of the Santa Ana Wash-Santa Ana River, portions of the Mill Creek, and portions of the Yucaipa Creek. Elevations in the burn area range from about 2,500 feet above sea level at the south end of the fire to San Bernardino Peak at 10,649 feet above sea level at the north end of the fire.

The San Gabriel as well as the San Bernardino Mountains are some of the most tectonically active and rapidly uplifting mountains in the United Status. The forces lifting the mountains are being countered by opposing forces tearing them down. Forces such as gravity, moving water, wind, earthquakes and human activities interact and combine to bring down small particles to whole hillsides at a time. The fluvial geomorphic processes which have shaped and are currently shaping these ever-changing mountains include land-sliding of various types, rock-fall, dry ravel, sheet and rill erosion by water and wind, flooding and debris flows.

Several strands of the San Andreas Fault Zone traverse the southeastern San Bernardino Mountains. These faults include: Mill Creek-North Branch San Andreas Fault and San Andreas Fault. From the geomorphology of this area it is evident that the San Bernardino Mountains were elevated unevenly in Quaternary time, with the greatest amount of uplift and disruption along the San Andreas fault zone (within the south block of the mountain range that includes the burn area of the El Dorado Fire).

Bedrock within the El Dorado Fire burned area mainly consists of crystalline basement terranes composed of distinctive **metamorphic rocks,** several different **plutonic igneous rocks**, and limited occurrences of nonmarine **sedimentary rocks**.

R. Miles of Stream Channels by Order or Class:

Table 3: Miles of Stream Channels by Order or Class

STREAM TYPE	MILES OF STREAM
PERRENIAL	76.65
INTERMITTENT	116.88
EPHEMERAL	273.29
OTHER (DEFINE)	0

S. **Transportation System:**

Trails: *National Forest (miles):* 24.46 *Other (miles):* 0

Roads: *National Forest (miles):* 10.34 *Other (miles):* 8.51 (State Hwy 38)

PART III - WATERSHED CONDITION

A. Burn Severity (acres):

Table 4: Burn Severity Acres by Ownership

Soil Burn Severity	NFS	Other Federal	State	Private	Total	% within the Fire Perimeter
Unburned	1,609	0	0	150	1,759	7.7%
Low	3,876	0	0	990	4,866	21.2%
Moderate	10,278	0	0	2,382	12,660	55.1%
High	3,400	0	0	297	3,697	16.0%
Total	19,163	0	0	3,819	22,982	100%

B. Water-Repellent Soil (11,410 acres, 50% of the fire):

Hydrophobic soil conditions were strong and widespread in high soil burn severity, ranging from 3-6 cm thick, present in 90% of high sampled areas, and repelling water for a minute or more. Within moderate burn severity, repellency was less common, present in 60% of samples, from 2-3 cm thick, and repelling water for ~30 seconds. Repellency was present in some low sbs, 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: 63% Moderate: 25% Slight: 11% Not rated: 1% (Rock outcrop and riverwash)

D. Erosion Potential:

4.3 tons/acre (2-year runoff event) – Pre-fire 0.2 tons/acre
13 tons/acre (5-year runoff event) – Pre-fire 1.5 tons/acre
Slope and burn severity are the dominant drivers of erosion rates in this fire, overriding differences in soil types. Moderate burn severity under conifer forest and some dense oak has potential for needlecast to mitigate erosion response, but moderate burn in chaparral will have high erosion potential. Erosion results by pourpoint are shown in the table below (table 5).

Table 5: Modeled Erosion Rates

		2 year runoff event		10 year runoff event	
Name	Acres	Pre Fire (t/ac)	Post fire (t/ac)	Pre Fire (t/ac)	Post fire (t/ac)
Whole Fire Average	22982.8	0.2	4.3	3.4	21.0
PP1- Forsee Creek	26181.7	0.2	6.4	6.1	23.8
PP2- JohnsMeadow	8811.9	0.0	6.8	3.7	27.7
PP3- Stetson Creek	8035.6	0.3	7.0	8.3	26.1
PP4- Schnider Creek	8281.5	0.4	7.3	8.2	23.6
PP5- University Creek	9617.7	0.5	9.1	4.1	42.9
PP6- Mountain Home Creek	12967.5	0.4	7.3	6.4	28.9
PP7- Skinner Creek	9421.9	0.4	9.7	6.3	43.4
PP8- Mill Creek	47132.9	0.4	7.1	4.7	33.1
PP9- Oak Glen Area	9526.2	0.6	12.6	6.2	71.6

E. Debris Flow Potential:

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

1. Post-fire debris flows are most often triggered by high-intensity, short-duration bursts of rain.
2. A 24 mm/h rain burst is likely to happen in most areas of the western U.S. (i.e. a 1-5-year recurrence interval).
3. A 24 mm/h rain burst is known to trigger debris flows at USGS monitoring sites in burn areas.

Based on USGS debris flow modeling it appears that under conditions of a peak 15-minute rainfall intensity storm of 24 millimeters per hour (0.95 inch/hr.), the probability of debris flows occurring is very high (80-100%) in a majority of the channels/creeks in the El Dorado fire burn area, especially in the Yucaipa Creek and San Gorgonio River watersheds. 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, a majority of creeks in the burn area appear to present a high combine hazard.

The El Dorado Fire overlapped the very recently burned Apple Fire (August 2020) in the Headwaters San Gorgonio River watershed. The USGS re-calculated the debris flow model for the Apple Fire and included it with the Eldorado Fire because of the increased burn severity in the overlapped area. This report considers the overlapped area as the El Dorado Fire but does not re-assess the debris flow for the majority of the Apple Fire which was evaluated in the Apple Fire BAER report.

F. Sediment Potential:

Rowe, Countryman, and Storey (1949) 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 19 times greater than normal with an average of 28,118 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.

G. Estimated Vegetative Recovery Period (5-40 years):

Chaparral and oak communities comprise 55% of the burned area. These communities are expected to recover in 5-40 years in moderate and high severity burned areas unless they reburn or are invaded by non-native invasive plants. Conifer forests comprise 39% of the burned area and experienced primarily moderate and low severity fire effects. Patches of higher severity stand replacing fire in the headwaters of East Fork Mountain Home Creek were intermediate in size and forest stands are likely to recover passively through natural regeneration.

G. Estimated Hydrologic Response (brief description):

Watershed Response

Annual precipitation ranges between 29 to 34 inches, primarily arriving between December and April although summer thundershowers are common in August and early fall. A significant portion of the burn area in the San Gorgonio Wilderness is located above 7,000 ft, which may result in precipitation accumulating more as snow versus rain during winter. The burn area on Yucaipa Ridge is mostly within the rain-snow transition zone (3,500-6,500 ft). 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 and have caused flooding even in pre-fire conditions (ex. February 14, 2019).

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: The last major fire in the El Dorado burn perimeter was the Mitchell Canyon Fire in 1977, in the San Gorgonio Wilderness. It’s possible snags and down wood from this fire contributed to high soil burn severity in that portion of the burn. Parts of Yucaipa Ridge haven’t had a recorded fire since 1900, which may have resulted 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 on parts of the ridge (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 moderate and high soil burn severity in the El Dorado Fire and steep slopes, watershed response will be high to extreme in some catchments (Table 6). Increases in runoff and bulking of flows across the burn area at selected pour points are expected to be 138% to 540% compared to normal. Dry ravel is pre-loading channels and existing latent sediment will be mobilized in post-fire flows increasing runoff volume.

Table 6: Modeled pre- and post-fire flows at select pour points for the 2 yr and 10 yr peak flows (normal flow is equal to 100%).

				2 yr. RI Peak Flow				10 yr. RI Peak Flow			
RCS Watershed	**PP#**	**Modeled Pour Point**	**% of Mod & High SBS**	**Pre-Fire Q (CFS)**	**Post-Fire Q (CFS)**	**Post-Fire Bulked Q (CFS)**	**Percent of Q (bulked)**	**Pre-fire Q (CFS)**	**Post-Fire Q (CFS)**	**Post-fire Bulked Q (CFS)**	**Percent of Q (bulked)**
Santa Ana River	PP1	Forsee Creek Habitat	50%	149	197	256	172%	987	1,165	1,513	153%
Santa Ana River	PP2	Johns Meadow Camping	53%	32	44	59	182%	167	200	270	161%
Santa Ana River	PP3	Stetson Creek Rec Res.	84%	37	58	85	229%	192	251	368	192%
Santa Ana River	PP4	Schnider Creek Habitat	41%	42	53	66	157%	218	249	310	142%
Santa Ana River	PP5	University Creek roads	74%	43	66	96	226%	223	295	430	193%
Mill Creek	PP6	Mountain Home Crk. Rec Res	45%	180	264	339	188%	1,210	1,562	2,004	166%
Mill Creek	PP7	Skinner Crk. Rec Res	41%	63	86	109	173%	354	433	548	155%
Mill Creek	PP8	Mill Creek Thurman Flats	21%	598	719	815	136%	5,000	5,623	6,368	127%
Potatoe Creek	PP9	Oak Glen Area FS Roads	100%	49	154	261	536%	261	621	1,055	404%
Cherry Creek	PP10	Road crossing on Noble Crk.	78%	84	227	359	430%	496	1,045	1,655	334%

Channel crossings, floodplains, and depositional fans 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) can lead to channel migration and braiding across washes 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). Alluvial fans at the base of burned slopes have evidence of past debris flows, with some drainages more active than others. In areas with defined debris flow runout paths, the existing stream channel is confined within the debris flow levees. Fan areas lacking entrenched channels or debris flow levees, have hummocky rocky surfaces where annual runoff disperses in vegetated swales. These are the depositional zones for debris flows and sediment-laden flows. Fans are depositional areas where flows can change course in large runoff events, especially as a result of debris flows or sediment laden flows. Dormant channels may be reactivated in post-fire runoff events. This makes prediction of hazardous flow paths on alluvial fans difficult and results in a hazardous zone, versus point or line.

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, 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.

PART V - SUMMARY OF ANALYSIS

Introduction/Background

The El Dorado Fire is located on the San Bernardino National Forest on the Front Country and Mountaintop Ranger Districts. The Fire was human caused and started on Saturday September 5th, 2020 north east of Yucaipa, CA. As September 30th, the El Dorado Fire was being reported as 93% contained and stable at 22,744 acres.

The final soil burn severity (SBS) shows 71.1% of the burned area experienced high and moderate effects to soils. The rest of the fire was ether low soil burn severity or unburned.

Based on historic precipitation patterns, it can be expected that fall storms have a high probablity in occuring within the weeks following the El Dorado Fire. The risk of flooding, debris flow and erosion events will increase as a result of the fire, creating hazardous conditions within and downstream of the burn area.

The fire was divided into sub-watersheds with “pourpoints” established at the bottom of the burned watersheds or where critical values are located. Watershed runoff response is referenced to these points.

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

A BAER team began assessing the area for post-fire emergencies on September 21, 2020. In that time the team has identified the following critical values and post-fire threats. The full list of critical values analyzed and risk determinations for these values is included in Appendix 3. Critical Values described in the sections below were identified by the assessment team as those with risk ratings appropriate for further evaluation and treatment recommendation.

Interim reports may be submitted as additional assessments are completed.

The risk matrix below (Table 7), Exhibit 2 of Directive No.: 2500-2020-1 was used to evaluate the Risk Level for each value identified during Assessment.

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):

General Burned Area Safety

Based on the potential for debris flows, flooding, rock falls, etc., the BAER team identified a serious risk to the public, employees, special use permittees, and cooperators in and downstream of the El Dorado Fire area. Multiple FS critical values are located on rocky, alluvial fans at the base of steep, unstable slopes or in the steep unstable headwaters that are also at risk of post-fire debris flows, rock fall, increased runoff, and hazard trees. These areas have evidence of past debris flows, rock fall, and flooding in the pre-fire environment. Risk of flooding, sediment laden flows, debris flows, and rock fall occurring will be exacerbated by the fire. These post-fire watershed responses may not threaten all infrastructure downstream and downslope of the burn area; however, it is very likely to impact ACCESS roads. Impacts to access could leave FS employees and forest users stranded, possibly exposed to poor weather, in areas with poor cell coverage, and/or areas subject to rockfall, flooding, and debris flows, especially if they try to evacuate or pass through during storms. Impacts from the post-fire environment on human life and safety is considered **VERY LIKELY** with **MAJOR** consequences. This results in a **VERY HIGH** risk to human life and safety from post-fire threats.

Roads

There is a **very high** risk to human life from travelling on roads 1N53, 1N82, 1N86 and 1N86B during rainstorms due to the **high probability** of debris flows, rockfall and flooding that could have **major** consequences associated with road washout, blocked ingress/egress, and lead to serious injury or death of road users. 1N53 is the primary access to the San Bernardino Peak trailhead. 1N82 is the main access for Camp Round Meadow organization camp and Forsee Creek trailhead. 1N86 is the main access for the Stetson Creek Recreation Residence tract. 1N86B also provides access to recreation residences.

Trails

It is **possible** (Santa Ana River Trail) to **very likely** that flooding, debris flow, sediment laden flows and/or rock fall will occur on 5 trails in and downstream of the fire area. If people are exposed to this threat while recreating or working on these trails, the consequences will be **major** because death and/or serious injury will occur. Watershed response in the fire environment is **high** (Santa Ana trail) to **very high** risk to human life and safety on trails1E16, 1E06, 1W08 and 1W20.

2. Property (P):

Roads:

The National Forest transportation system consists of approximately 14 miles of National Forest System Roads (NFSR) within the fire perimeter. Some roads are suitable for passenger cars, while others are more suited for high-clearance vehicles. Of these roads, several are utilized for administrative use only. The majority of the NFS roads in and downstream of the burned area are at a **very likely** probability of debris flows and flooding during rainstorms as a result of the changed watershed condition. Debris flows and flooding are likely to cause a **moderate to major** magnitude of damage to these roads. The resulting risk of road failures in and downstream of the burned area is **very high**.

Of the NFSR miles in the burned area, 9.7 miles of road are proposed for treatments due to their overall risk rating of **intermediate to very high**. These roads include: 1S09, 1N53, 1N86, and 1N86B. These roads exhibit an unacceptable risk to property, which constitutes a BAER emergency and treatments are recommended. The purpose of road treatments are to protect roads against loss of water control, soil erosion, flooding, debris flow, loss of road tread and total failure.

3. Natural Resources (NR):

Hydrologic Function:

Fire impacts proper functioning of hydrologic processes with the greatest and longest lasting impacts occurring from high soil burn severity and anthropogenic activities (such as failure of drainage control on roads). Fire impacts within moderate, low, and very low burn areas are recoverable and expected to diminish as vegetation reestablishes. The greatest threats to recovery are threats from mass wasting, OHV incursion, and failure of infrastructure to control drainage (including roads 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. 1S09).

Soil Productivity:

It is **likely** that soil productivity will be impacted in larger storms (5-year or greater runoff event) due to elevated surface erosion on steep slopes in high and moderate soil burn severity. The magnitude of consequence of this soil loss is **moderate** because the modeled erosion rates will temporarily exceed soil formation rates, but the loss will not cause irreversible damage. The overall risk to soil productivity is **high**.

While a threat to soil productivity exists in portions of the El Dorado 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.

Botany

It is expected that the native vegetation communities are adapted to the first order fire effects of the El Dorado Fire and would recover if weed invasions are minimized. 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. The proximity of existing invasive plant populations adjacent to the burned area creates high probability that new infestations will establish in the burned area.

Vegetation Recovery in Burned Area

Probability of damage or loss is **likely** because the burned area is vulnerable to colonization of tamarisk and other weeds. These species are within dispersal distance of species that respond rapidly in the burned environment. The magnitude of damage will be **major** because conversion of high quality native riparian communities or chaparral could type convert to tamarisk or Spanish broom and annual exotic grasslands resulting in loss of native biodiversity, altered fire regimes, and ecosystem structure and function. It is for these reasons that risk to vegetation recovery in the overall burned area is **very high**. Therefore, this is a BAER emergency and treatments are recommended.

Vegetation Recovery on Suppression Features

No equipment washing occurred during fire suppression operations and equipment intersected known invasive plant populations near the forest boundary. It is **very likely** that fire suppression resources spread existing and introduced new weed species to the burned area. Potential for type conversion of high quality native chaparral to Spanish broom or annual exotic grassland and introduction of new fuel types in conifer forests is high. The magnitude weed threats is **major** because chaparral communities outside the burned area are vulnerable to type conversion and associated degradation ecosystem structure and function, biodiversity loss, and altered fire regimes. The risk to vegetative recovery is **very high** where suppression activities occurred and within the greater burned area as a result of suppression operations. Therefore, this is a BAER emergency and treatments are recommended.

Wildlife-Threatened and Endangered Species

Federally listed wildlife species include two endangered and one threatened within and near the burned area. Endangered species are Southwestern Willow Flycatcher and Mountain Yellow-Legged Frog. Threatened species are Santa Ana Sucker. Threats to threatened and endangered species are hillslope erosion, flooding, debris flow, habitat loss and non-native invasive plants. Threatened and endangered species: Mountain Yellow-Legged Frog habitat is just outside the fire perimeter and sediment and debris flows pose a very low threat. Southwestern Willow Flycatcher habitat downstream of burn areas in the Santa Ana River and Mill Creek will experience increased debris flows and flooding; habitat may be temporarily affected. Santa Ana Sucker habitat downstream of the burn area may experience an increase in turbidity and a reduction in overall water quality but the habitat is unoccupied. Fish can be found about 20 miles downstream,

just past the Rialto Infiltration/Extraction site. Effects to fish should be minimal and temporary. With implementation of a BAER treatment to survey and treat non-native plants within the fire area, the risk of adverse impacts from non-native invasive plants will be significantly reduced (see botany section).

4. Cultural and Heritage Resources:

Heritage

The BAER archaeology team identified nine cultural resources within the El Dorado burn perimeter and a further 34 sites within a 1-mile buffer of the burn. Through mapping, discussions with specialists, and site record information, the archaeology team identified 14 sites for further BAER assessment. Most of these sites are historic and relate to recreation use on the Forest from the late 19th-century onward.

These fourteen sites were noted to be at risk from predicted storm induced watershed response and hazard tree damage that may alter or destroy their heritage values.

Since the modeled flows are so great and discussions with BAER team specialists determined that any proposed treatment, e.g., K-rails, may exacerbate the effects, a heritage treatment to protect sites from debris flows and flooding has not been proposed.

It is **possible** debris flows, flooding, rockfall and hazard trees will impact the Barton Flats Recreation Residence Tract. The magnitude of consequence is **major** because the loss of historic cabins in the tract will adversely affect the cabins that contribute to the tract's eligibility for the National Register of Historic Places. Therefore, a h**igh** risk to the tract occurred from increased hazard tree and debris flows.

It is **very likely** debris flows, flooding, rockfall and hazard trees will impact the Camp Round Meadow and Round Cienega Recreation Residence Tract. The magnitude of consequence is **major** because the loss of historic cabins, buildings and features in the tract and camp will adversely affect the contributors to the camp and tract's eligibility for the National Register of Historic Places. Therefore, a **very high** risk to the tract and camp occurred as a result of modeled hazard trees and debris flows.

B. Emergency Treatment Objectives:

- Protect life and safety within and affected by the El Dorado Fire.
- Protect and stabilize NFS roads/trails at risk of damage from loss of water control, soil erosion, flooding, debris flow, and loss of road tread.
- Mitigate public safety hazards along NFS roads from hazard trees, debris flow, flooding, and rockfall.
- Protection for critical cultural resources subject to hazard tree damage resulting from changed environmental conditions.
- Detect, eradicate and map new infestations of non-native invasive plants introduced during suppression activities to prevent degradation or loss of ecosystem structure and function.

- Detect, eradicate and map non-native invasive plant establishment and spread in the burn area to prevent loss of ecosystem structure and function.
- Coordinate post-fire response with other agencies and interested parties.

C. Probability of Completing Treatment Prior to Damaging Storm or Event:
Land: 80
Channel: N/A
Roads/Trails: 60
Protection/Safety: 80

D. Probability of Treatment Success

Table 8: Probability of Treatment Success

	1 year after treatment	***3 years after treatment***	***5 years after treatment***
Land	80	90	100
Channel	N/A	N/A	N/A
Roads/Trails	70	80	80
Protection/Safety	90	90	100

E. Cost of No-Action (Including Loss): $875,063 Potential lost market value plus assessment costs (see Cost-Risk Assessments in the BAER assessment record or the value, cost risk assessment tool summary in Appendix 2 for more information). This does not include a monetary value on loss or harm to human life.

F. Cost of Selected Alternative (Including Loss): $360,063 Potential lost market value plus assessment costs plus treatment costs (see Cost-Risk Assessments in the BAER assessment record or the value, cost risk assessment tool summary in Appendix 2 for more information). This does not include a monetary value on loss or harm to human life.

G. Skills Represented on Burned-Area Survey Team:

☒ Soils	☒ Hydrology	☒ Engineering	☒ GIS	☒ Archaeology
☒ Weeds	☒ Recreation	☐ Fisheries	☒ Wildlife	☒ Geology

☒ Other: Interagency Coordinator

Team Leader: Christopher Stewart
Email: christopher.s.stewart@usda.gov **Phone(s)**: (360) 746-4251

Forest BAER Coordinator: Kim Boss/Drew Farr
Email: kim.boss@usda.gov/drew.farr@usda.gov **Phone(s):** (909) 382-2936/909-382-2816

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

Skill	**Team Member Name**
Team Lead(s)	Chris Stewart, Carly Gibson
Soils	Curtis Kvamme
Hydrology	Emily Fudge
Engineering	Joshua Direen
GIS	Celia Yamagiwa

Skill	Team Member Name
Archaeology	Jay Marshall, Eraina Nossa
Weeds	Emma Williams, Lauren Quon
Geology	Barton Wills
Wildlife	Kirsten Winter, Rari Marks (T)
Other	Todd Ellsworth and Katie VinZant

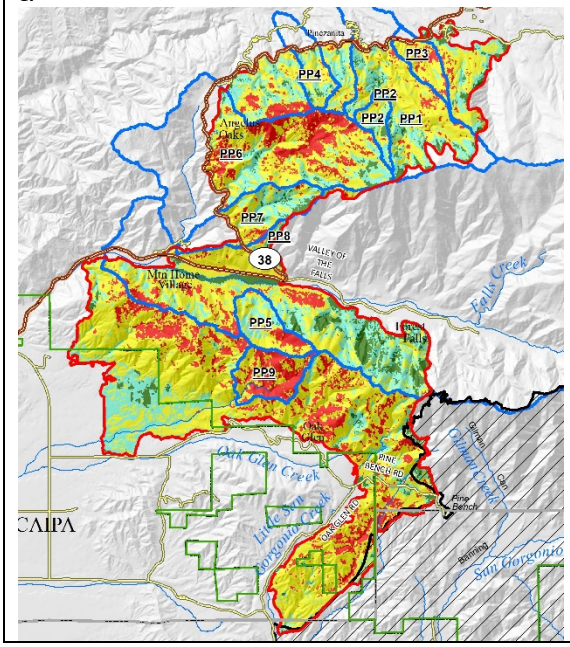
H. Treatment Narrative:

Land Treatments:

Land Treatments:

Figure 1 below shows limitations that restrict the area available to hillslope treatments, such as aerial mulching. Figure 1A shows soil burn severity within the El Dorado Fire. Low and very low burn severities are greyed out in 1B because these SBS classes typically retain ground cover and erosion rates are low. 1C blacks out slopes that are steeper than 60%, where hillslope treatments are not effective, and less than 10% where runoff energy is low and treatments are not necessary. Finally, 1D grays out non-Forest Service lands and wilderness where the forest service can not recommend treatments. The remaining areas, shown in red and yellow on 1D are slopes where hillslope treatments such as aerial mulching could technically be beneficial in reducing hillslope erosion. Remaining areas are small percentage of watershed, and broken up by steep slopes. Hillslope treatments are unlikely to be effective at reducing erosion rates.

a



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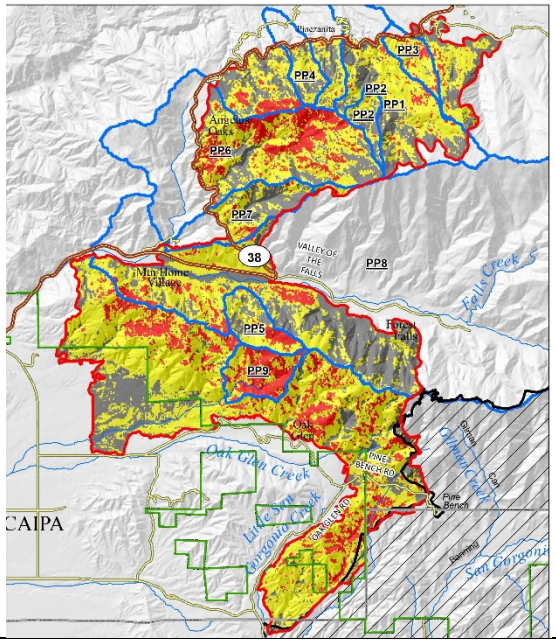


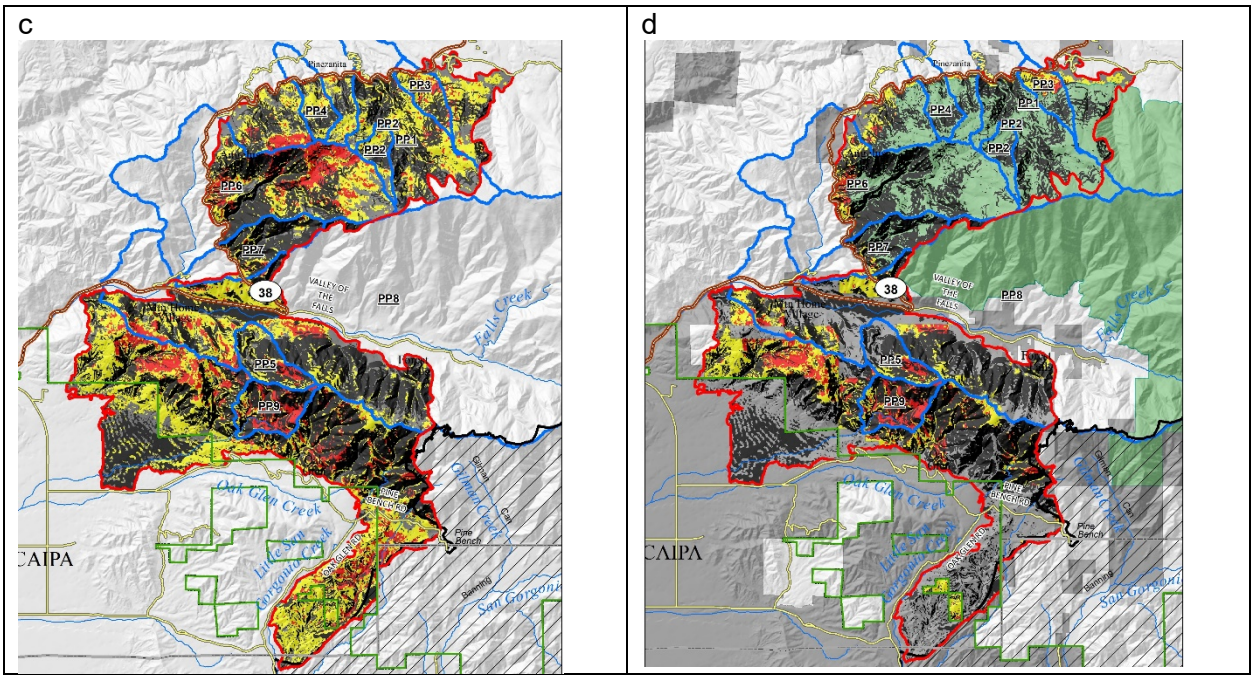


Figure 1- Limitations to hillslope treatments on Forest Service Lands

Heritage Site Protection: To mitigate the loss of heritage values within the Barton Flats Recreation Tract and the Camp Round Meadow/ Round Cienega Recreation Tract from hazard tree damage, The BAER archaeology team is proposing hazard tree felling to protect the historic cabins in these tracts. Total request is for **$19,050.**

Item	Units	Unit Cost	# of Units	Total Cost
Hazard tree mitigation	Each	500	35	$17,500
GS9 Forester	Days	350	1	$350
GS9 Archaeologist	Days	350	2	$700
Misc. supplies	Each	500	1	$500
Total				**$19,050**

EDRR

Suppression repair and burned area non-native invasive plant detection surveys are recommended to begin in early spring of 2021 during the flowering periods of invasive species. Because of differences in rainfall and flowering times for all potential species, two visits may be required. If plants are detected, and control is warranted, a supplemental request for BAER funds will be made for eradication under the existing NEPA analysis and decisions. Documentation of new infestations include mapping perimeter of new infestations, completing invasive plant occurrence forms, and entering data into USFS Natural Resource Information System (NRIS) database. If removal is performed, documentation will include mapping treatment area, filling out invasive plant eradication form, and entering data into USFS FACTS database.

Suppression Feature EDRR

Early invasive plant detection and rapid response (EDRR) are proposed to determine whether ground disturbing activities related to fire suppression have resulted in new introductions or spread of existing invasive plant infestations on approximately 43 miles of dozer lines, 6 miles of handline, 4 drop points, 5 helispots, safety zones, and a spike camp (Figure 1). The number and size of features are likely to increase as mapping continues over the course of the incident. Features created by unwashed heavy equipment, particularly dozer lines, would be prioritized. Total request is for **$37,545**.

Item	Units	Unit Cost	# of Units	Total Cost
6 Contract Weed Technicians	Days	$3,000	12	$36,000
1 GS-11 Botanist	Days	$400	1	$400
Vehicle Mileage	Miles	$0.58	250	$145
Supplies	Each	$1,000	1	$1,000
Total				**$37,545**

Burned Area EDRR

Invasive plant detection work is proposed for the first year following the fire to document post-fire invasive plant introductions or spread in the burned area. There are 12 miles of state highway, 22 miles of trails, and 18 miles of riparian corridors that are vectors for weed seed movement and are the highest likelihood for introduction of new infestations or spread of existing infestations into the burned area. Steam and highway corridors would be prioritized due to invasion potential from nearby wind disperse species. Native vegetation is expected to recover from fire if invasive plant invasions are minimized. Total request is for **$25,945**.

Item	Units	Unit Cost	# of Units	Total Cost
6 Contract Weed Technicians	Days	$3,000	8	$24,000
1 GS-11 Botanist	Days	$400	2	$800
Vehicle Mileage	Miles	$0.58	250	$145
Supplies	Each	$1,000	1	$1,000
Total				**$25,945**

Channel Treatments:

No channel treatment is prescribed.

Roads and Trail Treatments:

Roads:

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 to help protect against loss of water control, soil erosion, and loss of road tread. This work also includes post-winter inspections for 1S09 and other roads that may be too hazardous to inspect during the rainy season. This work will be accomplished through force account workforce (if available) or contractor equipment and labor. Total request is for **$19,900.**

Locations: NFSR 1N53, 1N82, 1N86, 1N86B, 1S09

Item	Units	Unit Cost	# of Units	Total Cost
Storm Response	Days	$ 3,500	3	$17,500
Storm Inspection	Days	$ 400	6	$ 2,400
Total				**$ 19,900**

Road Stormproofing: Road stormproofing involves cleaning or armoring of existing drainage structures to help ensure road drainage performs optimally and to stabilize roads at risk of damage from loss of water control, soil erosion, flooding, debris flow, and loss of road tread. A berm along this road was in place prior to suppression actions and needs treatment to improve drainage (see photo below). This work will be accomplished through contractor equipment and labor utilizing existing IDIQ contract. Total request is for **$25,800**.

Locations: NFSR 1S09

Item	Units	Unit Cost	# of Units	Total Cost
Mobilization	Lump Sum	$ 2,500	1	$2,500
Restore Drainage Function (West) – 1S09	Mile	$2,000	5.0	$ 10,000
Outslope Road, remove berm, reestablish dips (East) – 1S09	Mile	$3,000	4.0	$12,000
Cleanout and reshape low water crossing, remove berm	Each	$1,000	1	$1,000
Berm Removal, 10 ft., each location	Each	$150	2	$300
Total				**$ 25,800**

Road Drainage Structure Replacement/Improvements: Road drainage structure improvements involves replacing existing deficient structures and installation of additional drainage structures to help protect

against loss of water control, soil erosion, and loss of road tread. This work will be accomplished with contractor equipment and labor utilizing existing IDIQ contract. Contract preparation and administration using local forest staff. Total request is for **$37,050**.

Locations: NFSR 1S09, 1N86B

Item	Units	Unit Cost	# of Units	Total Cost
Mobilization	Lump Sum	$1,800	1	$1,800
Contract Preparation/Administration	Days	$400	5	$2,000
Overside drain replacement: 18" Overside Drain w/ 20' flume – 1S09	Each	$1,500	20	$ 30,000
Remove culvert at main stream crossing, – 1N86B	Each	$1,500	1	$1,500
Heritage implementation monitor	Day	$350	5	$1,750
Total				**$37,050**

Trails:

Clean existing rolling dips, install new dips in anticipation of post-fire increased runoff; remove trail berms to increase outboard drainage where possible, and armor key ephemeral drainages to prevent undercutting and loss of trail tread. This will require the placement of rock in a rip-rap fashion below drainages to dissipate the energy of off trail water flows and decrease the possibility of down bank erosion. All trail runoff work would be focused on midslope trails in areas of moderate to high burn intensity. In addition, this treatment includes felling of hazard trees in forested areas that pose a threat to crews where crews will be stationary for moderate periods of time (includes staging area at trailheads). Storm inspection and response will be done following winter season or before opening to public use to correct post-fire damages that may occur. This work is proposed on segments of four national forest system non-motorized trails. These trails include 1E16, 1E17, 1W01, and 1W07. Total request is for **$40,118**.

Item	Units	Unit Cost	# of Units	Total Cost
Trail Labor (5 Person Crew approx..22 days)	Each	$33,118	1	$33,118
Hazard tree mitigation (force account fire staff overtime)	Lump Sum	$3,500	1	$3,500
Storm Inspection	Per Trail	$750	4	$3,000
Misc supplies (e.g. tools)	Each	$500	1	$500
Total				**$40,118**

Protection/Safety Treatments:

Closure Enforcement

Closure of the burn area and at-risk downstream areas are recommended to prevent long-term exposure to risk and protect life and safety. Installation of burned area warning signs is recommended to warn users passing through the area on main roads of the potential hazard. Because of the **VERY HIGH** risk of these post-fire threats, it is recommended that the burned area closure applies to the public, all recreation residences tracts within identified hazard zones, FS staff before and during storm events, and trails and roads leading into the burn area. Anyone who attempts to access channels and

low-lying areas within the burned area prior to or during a storm is at a **VERY HIGH** risk of injury or death. Risks associated within the burned area should be re-evaluated prior to lifting the closure. Area patrol is necessary to ensure closure barriers are not compromised, warning signs remain in place and visible, and monitor closure violations to hazardous areas accessed from non-USFS controlled locations (e.g., Highway 38, Jenks Lake Road) and wilderness trails that will remain open (e.g., majority of San Bernardino Ridge Trail). All work will be accomplished by Force Account staff. Total request is for **$23,400.**

Item	Units	Unit Cost	# of Units	Total Cost
4 each GS-7 Recreation Technician	Days	$780	30	$23,400
Total				**$23,400**

Road Warning Signs

This treatment will install burned area warning signs at key road entry points to caution forest users about the potential hazards from hazard trees, debris flow, flooding, and rockfall that exist within the burned area. This work will be accomplished using contractor equipment and labor. Total request is for **$6,400.**

Locations: 1N53, 1N82, 1S09, 1N86, 1N87, 1S04, 1S08, 1N75, Jenks Lake Road

Item	Units	Unit Cost	# of Units	Total Cost
Mobilization	Lump Sum	$1,000	1	$1,000
Hazard signs (large) - Aluminum Panels and Posts	Each	$600	9	$5,400
Total				**$6,400**

Road Closure

This treatment will install road closure gates to provide public safety on roads at the highest risk of hazards along NFS roads from hazard trees, debris flow, flooding, and rockfall. This treatment will compliment existing gates that will be closed and also help with enforcement of burned area and trail closures to prevent vehicle access to popular trails. This work will be accomplished using contractor equipment and labor. Total request is for **$33,750.**

Locations: 1N53, 1N82, 1N86,

Item	Units	Unit Cost	# of Units	Total Cost
Mobilization	Lump Sum	$1,500	1	$1,500
Contract Preparation/Administration	Days	$400	3	$1,200
Medium-duty Gate	Each	$7,500	4	$30,000
GS-9 Archaeologist (site clearance)	Days	$350	3	$1,050
Total				**$ 33,750**

Trail & Recreation Warning Signs & Closure

This treatment will establish hazard warning signs at trail junctions along the San Bernardino Peak trail, Santa Ana River Trail access points, known undeveloped recreation areas (e.g., Frustration Creek Climbing area, Glen Martin Creek access to yellow post sites, old road Mountain Home Creek), and Thurman Flat Picnic Area.This work will be accomplished using a combination of contract and Force Account labor. Total treatment cost **$9,000**.

Item	Units	Unit Cost	# of Units	Total Cost
Mobilization	Lump Sum	$1,00	1	$1,000
Contract Preparation/Administration	Days	$400	1	$400
Hazard signs (small) - Aluminum Panels and Posts	Each	$100	14	$1,400
3 each GS-7 Recreation Technicians	Days	$585	10	$5,850
GS-9 Archaeologist (site clearance)	Days	$350	1	$350
Total				**$ 9,000**

Private Property and Other Jurisdictions:

Federal and private landownership are checkerboarded throughout the fire area. The fire burned in, around, and adjacent to the communities of Angelus Oaks, Oak Glen, north Yucaipa, Mountain Home Village, Barton Flats, and Forest Falls. The Round/Cienega (aka Willow Glen), Barton Flats, Camp Angelus Oaks, and Mountain Home Forest Service Recreation Residence Tracks are also within the burn area. All above listed communities/recreation tracts are down stream of the fire area.

There are several roads managed by Caltrans and San Bernardino County that traverse the fire area on National Forest lands, including Highway 38and multiple residential county roads.

The BAER Team shared information on watershed response and potential threats to non-Forest assets with affected entities and responsible agencies such as San Bernardino County, Cal Trans, Natural Resources Conservation Service, National Weather Service and U S Army Corp. of Engineers. Non-Forest assets are addressed by the respective responsible agencies. are addressed by the respective responsible agency.

This treatment will educate USFS staff who are at risk of compromised evacuation routes, serious injury and/or death due to their duty station/work center location in relation to burned area hazards. The Forest BAER coordinator will educate staff at USFS Glen Oak Station about burned area threats and assist in the develpoment of a flood/debris flow evacuation plan. The Forest BAER Coordinator will also work with USFS staff at whose life/safety and work site are at risk of direct impacts from flooding and debris flows at USFS Angelus Oaks Work Center. The Forest BAER Coordinator and Forest Public Affairs Officer will work to develop and distribute press releases and maintain current information on USFS external website, facebook page, etc. reagrding the **very high** risk to life and safety in and adjacent to the burned area. The Forest BAER Coordinator and Special Uses staff will work together to notify permmitee holders (e.g., recreation residence tracts and organizational camps) of closure and associated impacts to occupancy and access. In addition, there are numerous organizational camps and recreation resident tracts under Forest Service special use permits that will require follow-up from the Interagency coordinator and Special Use Administrator. The threat to life and property requires coordination with many agencies. The Forest Service plans on conducting meetings with permittees (including organizational camps and recreational residence cabin owners) in the very near future. The amount of coordination with the organizational camps and recreational residences cannot be overemphasized. Letters and/or follow up coordination will occur for all affected permittee holders. Recreation technicians will patrol the burned area to ensure forest visitors and permittees do not violate closure of the burned area and downstream lands.Total treatment cost **$11,500**.

Item	Unit	Unit Cost	# of Units	Cost
GS-12 BAER Coordinator/Forest Hydrologist	Days	$500	15	$7,500
GS-11 Special Uses	Days	$400	10	$4,000
Total				**$11,500**

Monitoring Narrative:

PART VI – EMERGENCY STABILIZATION TREATMENTS AND SOURCE OF FUNDS

			NFS Lands			Other Lands				All
		Unit	# of		Other	# of	Fed	# of	Non Fed	Total
Line Items	Units	Cost	Units	BAER $	$	units	$	Units	$	$
A. Land Treatments										
Heritage Site Protection	Each	19,050	1	$19,050	$0		$0		$0	$19,050
EDRR-Burned Area	Each	25,945	1	$25,945	$0		$0		$0	$25,945
EDRR-Suppresion	Each	37,545	1	$37,545	$0		$0		$0	$37,545
Insert new items above this line!				$0	$0		$0		$0	$0
Subtotal Land Treatments				$82,540	$0		$0		$0	$82,540
B. Channel Treatments										
Insert new items above this line!				$0	$0		$0		$0	$0
Subtotal Channel Treatments				$0	$0		$0		$0	$0
C. Road and Trails										
Storm Inspection/Response	Each	19,900	1	$19,900	$0		$0		$0	$19,900
Stormproofing	Each	25,800	1	$25,800	$0		$0		$0	$25,800
Drainage Replacement	Each	35,520	1	$37,050	$0		$0		$0	$37,050
Trail Stormproofing	Each	40,118	1	$40,118	$0		$0		$0	$40,118
Insert new items above this line!				$0	$0		$0		$0	$0
Subtotal Road and Trails				$122,868	$0		$0		$0	$122,868
D. Protection/Safety										
Road Warning Signs	Each	6,400	1	$6,400	$0		$0		$0	$6,400
Trail & Rec. Warning Signs	Each	9,000	1	$9,000	$0		$0		$0	$9,000
Closure Enforcement	Each	23,400	1	$23,400	$0		$0		$0	$23,400
Private Property and Other	Each	11,500	1	$11,500	$0		$0		$0	$11,500
Road Closure	Each	33,750	1	$33,750	$0		$0		$0	$33,750
Subtotal Protection/Safety				$84,050	$0		$0		$0	$84,050
E. BAER Evaluation										
Initial Assessment	Report	$50,000	1	---	$0		$0		$0	$0
Insert new items above this line!				---	$0		$0		$0	$0
Subtotal Evaluation				$0	$0		$0		$0	$0
F. Monitoring										
Insert new items above this line!				$0	$0		$0		$0	$0
Subtotal Monitoring				$0	$0		$0		$0	$0
G. Totals				**$289,458**	**$0**		**$0**		**$0**	**$289,458**
Previously approved										
Total for this request				**$289,458**						

PART VII - APPROVALS

1. JODY NOIRON Digitally signed by JODY NOIRON Date: 2020.10.07 13:48:51 -07'00'

Forest Supervisor Date

Appendix 1: Maps and Figures

Figure 1: El Dorado Soil Burn Severity Map

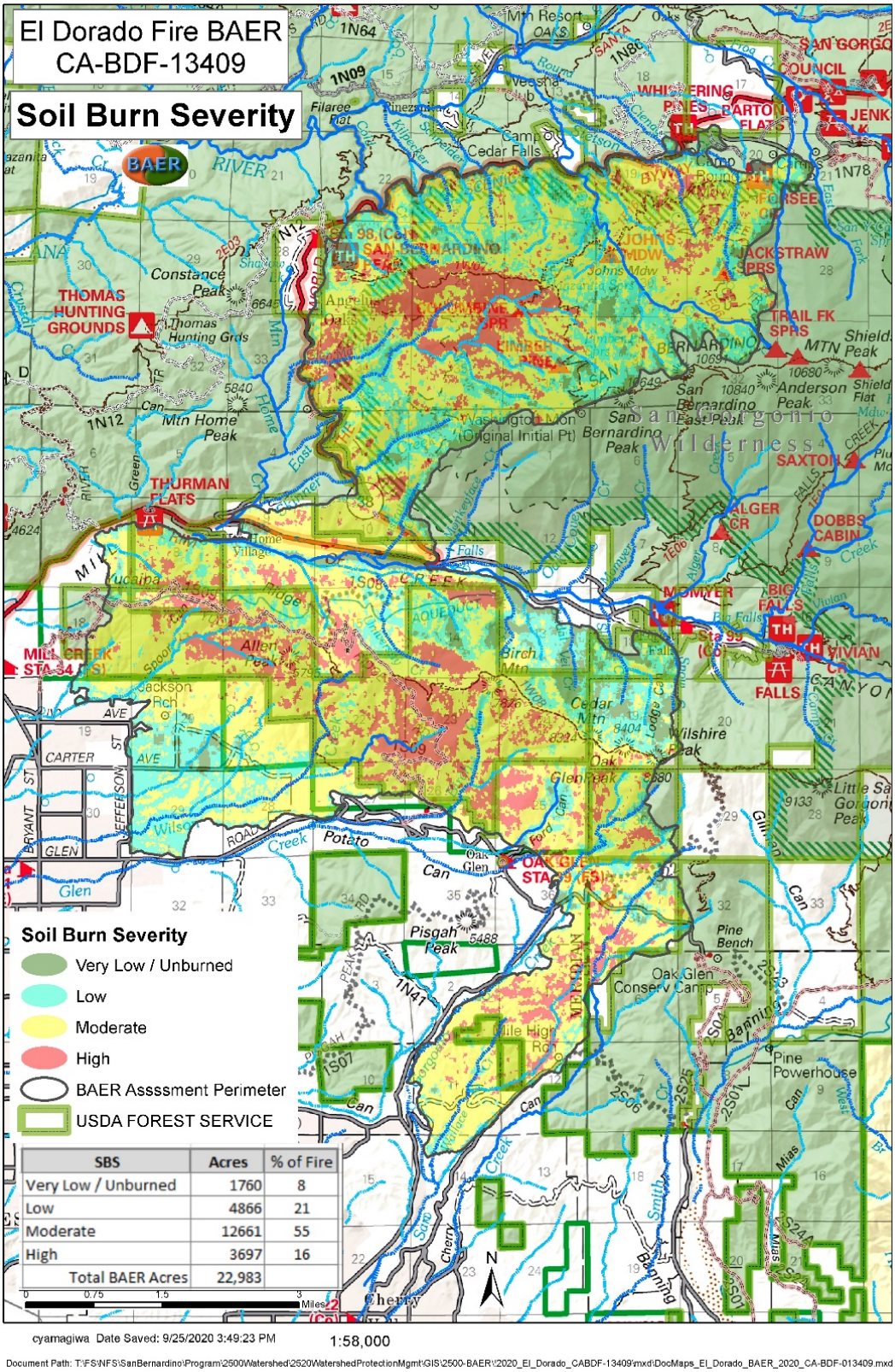
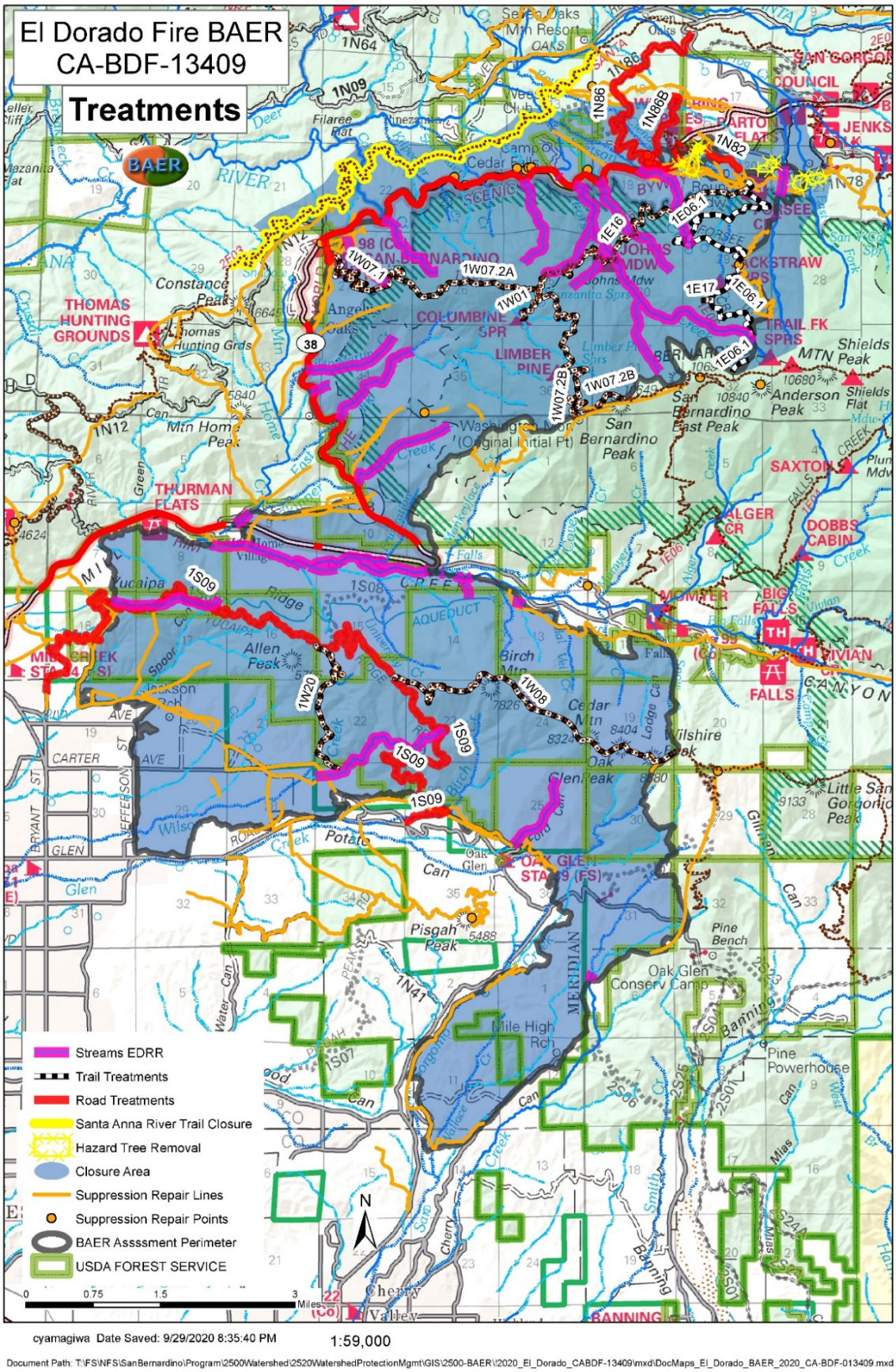


Figure 2: El Dorado Proposed Treatments



Appendix 2: El Dorado BAER Economic Summary

Snow Fire	Sep 30, 2020				
BAER Economics Summary					
Excel Workbook	Map Zone Tab	Total Cost	B/C	IMV	IMV Justification
VARWorksheet_Snow.xlsm	Map Zone A-Land Treat	$93,000	0.0		Yes
	Map Zone B-RoadsTrails	$124,383	4.1	Justified	
	Map Zone C-LifeAndSafety	$942,680	0.0		Yes
TOTAL		$310,063			

Appendix 3: Critical Values Identified within or downstream of the El Dorado Fire. (Attached)