USDA-FOREST SERVICE

FS-2500-8 (7/00)

Date of Report: 9/6/2016 Initial Request

Blue Cut Fire – San Bernardino National Forest,

Front Country Ranger District

BURNED-AREA REPORT
(Reference FSH 2509.13)

PART I - TYPE OF REQUEST

Part I – A. Type of Report

[x] 1. Funding request for estimated WFSU-SULT funds
[ ] 2. Accomplishment Report
[ ] 3. No Treatment Recommendation

Part I – B. Type of Action

[x] 1. Initial Request (Best estimate of funds needed to complete eligible rehabilitation measures)

[ ] 2. Interim Report
[ ] Updating the initial funding request based on more accurate site data or design analysis
[ ] Status of accomplishments to date

[ ] 3. Final Report (Following completion of work)

PART II - BURNED-AREA DESCRIPTION

Part II – A. Fire Name: Blue Cut

Part II – B. Fire Number: CA-BDF-010468

Part II – C. State: CA

Part II – D. County: San Bernardino

Part II – E. Region: 05

Part II – F. Forest: San Bernardino NF

Part II – G. District: 53

Part II – H. Date Fire Started: 8/16/2016

Part II – I. Date Fire Contained: 8/23/2016

PartII – J. Suppression Cost: $18 Million (P5KL99)

Part II – K. Fire Suppression Damages Repaired with Suppression Funds

1. Fireline waterbarred (miles): 31.5 miles (dozer); 4.7 miles (hand)
2. Fireline seeded (miles): 0
3. Other (identify): n/a

Part II – L. Watershed Number:

- 180702030301 (Upper Cajon Wash)
- 180702030302 (North Fork Lytle Creek)
- 180702030303 (Lower Cajon Wash)
- 180902080503 (Manzanita Wash)
- 180902080401 (Sheep Creek)
- 180902080502 (Unnamed)
- 180902080704 (Oro Grande Wash)
- 180902080504 (Horse Canyon-Fremont Wash)
- 180902080202 (Grass Valley Creek-West Fork Mojave River)

Part II – M. Total Acres Burned: 36,240 acres

NFS Acres (28,980) Other Federal (448) State (n/a) Private/Undetermined (6,811)

Part II – N. Vegetation Types: chamise chaparral, mixed chaparral, big cone douglas fir forest, singleleaf pinyon woodland, Joshua tree woodland, canyon live oak woodland, desert transition scrub oak, alluvial scrub, cottonwood/willow/sycamore riparian scrub

Part II – O. Dominant Soils: Typic Xerothents (7,518 acres; 20% fire area); Soboba (5,846 acres; 16% fire area); Springdale (4,049 acres; 11% fire area); Olete (3,622 acres; 10% fire area)

Part II – P. Geologic Types: **Qyfg** - young alluvial fan deposits, gravel (4,420 ac; 12% fire area), **Qvof** - very old alluvial fan deposits (3,581 ac; 10% fire area), **MzPrd** - Gneiss of Devils Canyon (2,961 ac; 8% fire area), **Qyfgb** - young alluvial fan deposits, gravel & boulder gravel (2,694 ac; 7% fire area), and **Qyls** - young landslide deposits (2,575 acre; 7% fire area)

Part II – Q. Miles of Stream Channels by Order or Class: (On NFS lands) Perennial: 3 miles; Intermittent: 63 miles; and Artificial: 3 miles

Part II – R. Transportation System:

Trails: 10 miles (motorized) and 19 miles (non-motorized) Roads: 70 miles

PART III - WATERSHED CONDITION

Part III – A. Burn Severity (acres): 36,240

6,205 (17%) (unburned/very low) 12,505 (35%) (low) 15,678 (43%) (moderate)

1,852 (5%) (high)

Part III – B. Water-Repellent Soil (acres): 9,211

Part III – C. Soil Erosion Hazard Rating (acres):

10,882 (low) 5,576 (moderate) 7,236 (high) 12,546 very high

Part III – D. Erosion Potential: 4.7 tons/acre

Part III – E. Sediment Potential: 2,522 cubic yards / square mile

PART IV - HYDROLOGIC DESIGN FACTORS

Part IV – 1.0 Hydrologic and Annual Erosion Modeling using Rowe, Countryman, Storey (RCS), 1949.

The primary model used for the burned area was the model designed by Rowe, Countryman, and Storey (RCS), 1949, which was designed to estimate pre- and post-fire discharges and erosion rates in southern California watersheds. Kinoshita, Hogue, and Napper, 2014 validated continued use and applicability of this model for Southern California. On the ground observations were integrated into the model to adjust for local basin and burn pattern characteristics. Hydrologic design information for the RCS hydrologic model is based on the 24

hour duration storm; however, a damaging storm expected to occur within the fire burned area is a short duration, high intensity storm.

Table 1: Hydrologic Design Factors for Design Storm			
A. Estimated Vegetative Recovery Period	3 to 10 years	3 to 10 years	3 to 10 years
B. Design Chance of Success	80%	75%	70%
C. Equivalent Design Recurrence Interval	2-yr and 5-yr	5-yr	10-yr
D. Design Storm Duration	30 min.	2 hrs.	6 hrs.
E. Design Storm Magnitude	0.54 in	2.05 in.	4.88 in.
F. Design Flow	83.2 cfs/sq.mi.	161 cfs/sq.mi.	250 cfs/sq.mi.
G. Estimated Reduction in Infiltration	57%	57%	57%
H. Adjusted Design Flow	159 cfs/sq.mi.	308 cfs/sq.mi.	478 cfs/sq.mi.

The analysis for pre- and post- fire hydrologic response and probability of flows is based on the probability of a 2-year storm occurring in the fire area. The 2-year design storm has a 50% chance of occurring in any given year, and a 97% chance of occurring in the next five years. Conversely, there is a 3% chance that the 2 year storm event will not occur in the next 5 years (during the recovery period). A damaging storm expected to occur within the fire burned area is a short duration, high intensity storm, such as the 2 year recurrence interval, 30 minute duration storm with approximately 0.54 inches of precipitation (NOAA, 2014).

It is important to note that any VAR found to be at risk during the 2 year event will still be at risk during greater events. Several locations within the analyzed area have an inherent risk of flooding and debris flows in greater recurrence interval storms. We have included information for recurrence interval storms for both ~5 year and ~10 year peak flows and erosion rates.

To execute the models, catchments were delineated above specific pour points. These catchments and pour points were selected to represent the **general characteristics** of the potential post-fire effects on hydrologic processes, erosion, and sediment delivery. Some pour points were selected based on locations of specific VARs; however, not all VAR locations were modeled. The modeled locations and mapped subwatersheds DO NOT represent the only locations at risk of altered hydrologic processes, and increased erosion and sediment delivery. Results of the modeling are intended to reflect **general trends** in the burned area and to highlight potential risks across the broader area or for the specific VAR selected. More analysis is required for a detailed map of all specific locations that may be at risk from post-fire effects.

PART V - SUMMARY OF ANALYSIS

Part V – 1.0 Background

The Blue Cut Fire began on August 18, 2016 in the Cajon Pass along Old Cajon Blvd. The fire quickly spotted across Cajon Creek and grew into a large wildland fire on land administered by the Front Country Ranger District, of the San Bernardino National Forest. Driven by years of drought, steep terrain, low relative humidity, and erratic winds, the fire spread quickly burning into private land, State and Bureau of Land Management jurisdictions. The Blue Cut Fire exhibited extreme fire behavior similar to Santa Ana wind conditions, but without any winds. At its height, nearly 2,684 firefighters and support personnel were assigned to the fire. The fire was considered contained on August 23, 2016, with a final acreage of 36,240.

The Blue Cut Fire burned within watersheds of Lytle Creek, Lone Pine Canyon, Sheep Creek and Cajon Creek in the San Gabriel Mountain Range near Devore, CA. The area is characterized by steep, rocky mountainous canyons and ridges to broad, alluvial valleys of the San Gabriel Range.

Part V – 2.0 Watershed Charaterization (Post-fire)

Approximately 48% of the burn area burned at a high and moderate soil burn severity (see soil burn severity map below). The rest of the fire was either low (35%) or very low/unburned (17%) soil burn severity. It is very important to understand the difference between fire intensity and burn severity as discussed by fire behavior, fuels, or vegetation specialists, and soil burn severity as defined for watershed condition evaluation in BAER analyses. Fire intensity or burn severity as defined by fire, fuels, or vegetation specialists may consider such parameters as flame height, rate of spread, fuel loading, thermal potential, canopy consumption, tree mortality, etc. For BAER analysis, we are not mapping simply vegetation mortality or above-ground effects of the fire, but soil burn severity. Soil burn severity considers additional surface and below-ground factors that relate to soil hydrologic function, runoff and erosion potential, and vegetative recovery.

Part V – 3.0 Erosion Response

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

ERMiT models erosion potential based on single hillslopes, single-storm “runoff events,” and post-fire soil burn severity. Hillslopes include soil and topography inputs. Soil inputs include texture and matrix rock content, which was based upon soil map unit information and field verified in many areas of the fire as part of the assessment. Generalized hillslope gradients and profiles were developed in GIS by soil map unit, and soil burn severity class to account for fairly site specific differences in topography. Various storm runoff-event magnitudes may be chosen in ERMiT for erosion response estimates; 2-year, 5-year, and 10-year events were run for this analysis. ERMiT uses the PRISM module to generate climatic input parameters; a customized climate interpolated for San Bernardino, CA was generated for the fire area to account for the variations in precipitation across the fire perimeter.

Results of soil erosion modeling are reported by watershed name and only references watersheds within the fire perimeter both as burned and unburned (Table 2 and Table 3). The reported values are in total tons and tons per acre for the entire fire as a whole and each individual watershed within the fire. To help picture what a 1,000 tons of sediment might look like consider roughly 120 standard 10 cubic yard dump trucks filled up.

A 2-year storm event was modeled in ERMiT to determine if the estimated soil erosion for the fire area would affect soil productivity. The modeled 2-year event (50% probability) produced 192,805 tons of sediment equivalent to 4.7 tons per acre or 2,522 cubic yards per square mile (using a conversion factor of 1.35 tons per cubic yard). Increased hillslope erosion is expected

to occur throughout the fire area. This increase in erosion is expect to be exasperated throughout the high and moderate soil burn severity areas, as soils within the fire perimeter are naturally erodible; which is reflected in the geomorphology of the area. The unburned, pre-fire conditions 2 year storm modeled a total of 2,090 tons of sediment equivalent to 0.06 tons per acre or 27 cubic yards per square mile. The stated accuracy of the model is +/- 50%.

Table 2: Blue Cut ERMiT batch unburned results

Area	50% (2 Year)		20% (5 Year)		10% (10 Year)	
	Tons/Acre	Tons	Tons/Acre	Tons	Tons/Acre	Tons
Blue Cut Fire	0.06	2,098	0.16	7,006	5.25	192,402
180902080502	0.02	9	0.10	41	1.76	70
Cajon Wash-Lytle Creek	0.10	3	0.21	6	8.10	245
Grass Valley Creek-West Fork Mojave River	0.03	47	0.14	138	1.16	1,625
Horse Canyon-Fremont Wash	0.02	53	0.12	242	2.32	5,935
Lower Cajon Wash	0.10	1,209	0.21	2,549	9.69	109,854
Manzanita Wash	0.02	10	0.09	111	1.32	821
North Fork Lytle Creek	0.06	85	0.13	169	4.55	6,461
Oro Grande Wash	0.02	22	0.10	171	1.13	1,801
Sheep Creek	0.04	19	0.14	74	3.86	1,893
Upper Cajon Wash	0.03	487	0.14	3,144	2.89	48,636

Table 3: Blue Cut Fire ERMiT batch burned results

Area	50% (2 Year)		20% (5 Year)		10% (10 Year)	
	Tons/Acre	Tons	Tons/Acre	Tons	Tons/Acre	Tons
Blue Cut Fire	4.7	192,805	11.9	537419.	19.2	862,442
180902080502	1.3	542	4.2	1,933	8.1	3,433
Cajon Wash-Lytle Creek	12.7	183	28.4	535	40.9	824
Grass Valley Creek-West Fork Mojave River	1.8	1,503	5.4	4,256	9.2	7,503
Horse Canyon-Fremont Wash	2.6	5,706	6.7	16,009	11.7	27,251
Lower Cajon Wash	8.3	93,784	20	252,477	30.6	379,260
Manzanita Wash	1.4	2,018	4.3	6,450	7.7	11,793
North Fork Lytle Creek	9.1	17,156	21.3	47,517	31.8	70,829
Oro Grande Wash	1.5	1,670	4.4	5,094	7.7	10,052
Sheep Creek	4.6	3,920	11.7	9,380	19.3	14,325

- **Low soil burn severity**: Surface organic layers are not completely consumed and are still recognizable. Structural aggregate stability is not changed from its unburned condition, and roots are generally unchanged because the heat pulse below the soil surface was not great

enough to consume or char any underlying organics. The ground surface, including any exposed mineral soil, may appear brown or black (lightly charred), and the canopy and understory vegetation will likely appear "green."

- **Moderate soil burn severity:** Up to 80 percent of the pre-fire ground cover (litter and ground fuels) may be consumed but generally not all of it. Fine roots (~0.1 inch or 0.25 cm diameter) may be scorched but are rarely completely consumed over much of the area. The color of the ash on the surface is generally blackened with possible gray patches. There may be potential for recruitment of effective ground cover from scorched needles or leaves remaining in the canopy that will soon fall to the ground. The prevailing color of the site is often "brown" due to canopy needle and other vegetation scorch. Soil structure is generally unchanged.

- **High soil burn severity**: All or nearly all of the pre-fire ground cover and surface organic matter (litter, duff, and fine roots) is generally consumed, and charring may be visible on larger roots. The prevailing color of the site is often "black" due to extensive charring. Bare soil or ash is exposed and susceptible to erosion, and aggregate structure may be less stable. White or gray ash (up to several centimeters in depth) indicates that considerable ground cover or fuels were consumed. Sometimes very large tree roots (> 3 inches or 8 cm diameter) are entirely burned extending from a charred stump hole. Soil is often gray, orange, or reddish at the ground surface where large fuels were concentrated and consumed.

Figure 1: Strong soil water repellency

Part V – 4.0 Watershed/Hydrologic Response

Part V – 4.1 Watershed Response to Post-Fire Effects

In summary, field observations and modeling of the burned area support a general trend of increased flows, sedimentation, and erosion due to post-fire effects especially in subwatersheds with the most burned acres (specifically moderate and high SBS), high erosion hazard ratings, and the steepest slopes. Areas most at risk from post-fire flooding, erosion, and sedimentation are within the burn area or within close proximity to the burn area, although some sites outside of the burn perimeter that are down slope or downstream of the burn area are still at risk from post-fire effects.

Part V – 4.2 General Field Observations of the Burn Area

Through on-the-ground surveys, the following observations were made: sediment charged swales, channels, and hillslopes; hillslope instability such as landslide scarps, debris flow scars, rock fall, and dry ravel; and braided channel systems with high sediment bed loads. Sediment will be mobilized given the expected increase in post-fire runoff and lack of vegetative

cover/stabilization. Because of these observed characteristics in the burn area, several VARs (which were identified and evaluated) are considered to be at risk from post-fire effects.

Part V – 4.3 Results of RCS Hydrologic and Annual Erosion Modeling

Small catchments containing large percentages of moderate and high soil burn severity and steep slopes reflect the greatest increases in peak flow, erosion, and sediment delivery, such as Railroad catchments 2-6. Estimated post-fire runoff in a 2 year RI storm could resemble runoff similar to peak flow discharges with recurrence intervals of 6 to 10 years (vs. 2 year RI peak flow). The modeled 5 year storm in these catchments are estimated to produce discharges similar to a 90 to 100 year storm. Modeled annual erosion rates are expected to increase 2,000% to 3,000% of normal. These catchments contain very high percentages of high SBS, steep slopes, and on the ground observations of sediment charged channels. The combination of these characteristics pose a very high risk to these areas. Again, the modeled catchments are NOT the only locations at risk but represent the trends that can be expected in catchments with similar characteristics.

Similar concerns are applicable to the recreation residences, recreation areas, and private land in Lytle Creek (modeled by pour points Lytle Resort 1&2). In these small, steep, burned basins, estimated post-fire runoff in a 2 year RI storm could resemble runoff similar to peak flow discharges with recurrence intervals of 5 years (vs. 2 year RI peak flow). Short steep slopes in the area are expected to deliver ~1300% of normal sediment delivery. The primary concern for these sites is related not only to the close proximity of the burn area but to the combination of increased runoff, erosion and sediment delivery, and on-the-ground field observations of sediment charged channels, swales and hillsides.

Some areas (homes, infrastructure, and recreation sites) along the creek or in the floodplain downstream of the burn area are susceptible to post-fire effects although they may not be located IN the burn perimeter. This also applies to communities and infrastructure located on alluvial fans below the burn area (for example pour points: West Cajon Valley wash, Cajon Wash 2, and Lone Pine Canyon). Modeling at some of these sites indicate that the typical 2 year flow event estimates a post-fire hydrologic response similar to a 5 to 10 year storm event.

Runoff during a typical 5 year storm event is estimated to respond as a 15 to 25 year storm event. Post-fire effects of increased sediment and increased flows can alter existing channel characteristics such as filling in of pools or other depositional areas, erosion of banks, braiding of channels, migration of existing channel locations, down-cutting of channels in transport sections, sedimentation, etc. Runoff channels on alluvial fans are subject to migration naturally and with the additional increase in flow and sediment, areas below the burn area can expect changes to existing runoff patterns.

Some of the alluvial fan communities have well defined braided channels leading from the steep slopes in the burned area down into the community. In some cases, once drainage channels have reached community boundaries, the channels have been altered and/or dissipate into vegetation. Due to post-fire effects, alluvial fans, streams, and floodways are expected to experience redefining of the channel, potentially channel migration, runoff in areas previously not experiencing concentrated drainage, erosion, sedimentation, and increased erosion/flooding in areas already experiencing flooding and erosion pre-fire.

Stream crossings are subject to flooding and may be hazardous during storm events. This is especially true for low water crossings. Modeled estimates of flow indicate 2 year RI storm events may respond at these locations similar to a 4 year storm. A 5 year RI storm event is expected to produce runoff similar to a 12 year storm event. Eroded material off the burn area may contain woody debris that can become lodged, trap sediment, and alter flow patterns or plug culverts.

Plugging of culverts can divert water and sediment down roads or into locations water normally does not flow. Channel diversion can result in catastrophic road failure and flooding/sedimentation in areas where flow and sediment has been diverted. On the ground observations indicated most stream channels in the fire burn area are braided channel systems subject to migration and have high sediment bedloads. It is expected that roads within the burn perimeter that have exhibited pre-fire erosion and flooding hazards will have increased risk of erosion and flooding due to the fire. Again, the modeled crossings are NOT the only locations at risk but results represent the trends that can be expected at other crossings with similar characteristics downstream of the fire burn area.

Buried infrastructure (such as buried transmission lines) could be at risk of exposure from increased flows that scour out swales, channels, and drainages (where infrastructure crosses these features). In areas where transmission lines or pipes cross above these features above ground, there may be risks associated from the combination of increased flows, post-fire sediment increases, and woody debris. It is recommended that a closer analysis is completed on buried infrastructure as the FS did not receive sufficient information to analyze risks to these features.

Pour points selected specifically for concerns to wildlife habitat include Sheep Creek Wildlife Habitat, Lost Lake, and HWY 138 Xing 1. Sheep Creek Wildlife habitat is located in a steeper, transport section of the stream channel and will most likely experience incision and down-cutting; however, most of the riparian area did not burn and will help minimize erosion potential and effects from increased flows.

Lost Lake is located in flat terrain, with soils that have high infiltration rates, and a small catchment area. The hydrologic response is expected to be minimal, with only a slight increase in discharge and low potential for erosion (low EHR). Because this site is a recreational area, there is potential for increased erosion due to trampling and soil disturbance (OHV and hikers) before vegetation can re-establish.

Habitat in Crowder Canyon will experience increases in flooding potential and sediment delivery. This section of the channel is wider, braided, and more of a depositional area, which may experience some post-fire effects such as channel migration, filling in of pools, and erosion. However, riparian vegetation is expected to respond/re-establish quickly, which will help stabilize the area. Additionally, upstream of one of the tributaries draining off the burned area is a depositional area that has sediment storage capacity and will help minimize post-fire hydrologic and sedimentation effects.

TABLE 5: Comparison of Pre and Post-Fire Discharge at Selected Sites (pour points) intended to provide general trends of flooding risk. Percent increase in discharge represents the percent above normal. All pour points exhibit increases in flows compared to pre-fire discharge.

Pour Point	Pre-Fire Discharge			Post-Fire Discharge			Post-Fire Discharge Compared to Pre-Fire Discharge			% Increase in Discharge*
	~Q2	Q5-6	Q10-12	~Q2	Q5-6	Q10-12	~Q2	Q5-6	~Q10-12	Q2
Cajon Junction (near McDonalds)	6	9	13	10	16	22	~Q10	~Q25	~Q80	67%
Cajon Wash 1 (Below fire area)	3,130	5,376	7,819	4,354	7,096	10,045	~Q4	~Q11	~Q26	39%
Cajon Wash 2 (above community)	9	16	22	18	27	37	~Q8	~Q25	~Q80	100%
Hwy 138 Xing 1 (above wildlife habitat)	46	77	110	68	109	149	~Q4	~Q12	~Q28	48%
Hwy 2 (basin near HWY)	7	13	19	11	18	24	~Q4	~Q9	~Q20	57%
Lone Pine Canyon (hillside wash)	3	6	10	8	14	21	~Q10	~Q25	~Q75	167%
LonePineCanyon at LADWP Rd Xing	407	772	1270	625	1092	1729	~Q4	~Q10	~Q25	54%
Lost Lake	2	4	7	3	6	9	~Q3	~Q8	~Q25	50%
Lytle Creek above community	875	1754	2823	900	1795	2880	~Q2	~Q5	~Q10	3%
Lytle Resort 1 (swale)	1	2	3	2	3	4	~Q5	~Q12	~Q40	100%
Lytle Resort 2 (swale)	0	1	1	1	1	2	~Q5	~Q12	~Q40	150%
Manzanita Wash	10	57	143	12	68	171	~Q3	~Q6	~Q12	20%
Middle Fk Lytle Cr Bridge	981	1966	3163	1033	2050	3282	~Q3	~Q6	~Q13	5%
PCT at RR Culvert Xing	70	119	169	117	184	251	~Q5	~Q20	~Q40	67%
Pioneer & Hwy 138 Xing	126	214	304	201	317	435	~Q4	~Q13	~Q30	60%
Railroad1	19	36	59	43	72	111	~Q8	~Q20	~Q50	126%
Railroad2	13	25	41	34	55	84	~Q10	~Q24	~Q80	162%
Railroad3	6	11	18	15	24	37	~Q10	~Q25	~Q80	150%
Railroad4	38	68	98	109	167	218	~Q13	~Q90	>Q100	187%
Railroad5	8	14	21	23	35	46	~Q15	~Q100	>Q100	188%
Railroad6	3	6	8	9	14	18	~Q25	~Q100	>Q100	200%
Railroad7	15	25	35	25	39	53	~Q5	~Q20	~Q50	67%
Sheep Creek and Lytle Cr Rd Xing	23	46	73	39	71	110	~Q4	~Q12	~Q30	70%
Sheep Creek Wildlife Habitat	9	17	29	16	27	43	~Q5	~Q12	~Q26	78%
West Cajon Valley wash	37	63	89	60	94	129	~Q5	~Q15	~Q40	62%

**All percentages are increases above normal.*

TABLE 6: Comparison of Pre and Post-Fire Erosion at Selected Sites (pour points) intended to provide general trends of post-fire erosion potential.				
Pour Point	**Erosion in Cubic Yards Per Year (RCS model)**			**Erosion Hazard Rating**
	Pre-Fire	**Post-Fire**	**% Increase**	
Cajon Junction (near McDonalds)	185	3,859	1986%	Very High
Cajon Wash 1 (Below fire area)	108,749	1,050,385	866%	Not modelled--
Cajon Wash 2 (above community)	307	6,585	2045%	Very High
Hwy 138 Xing 1 (above wildlife habitat)	2,323	36,212	1459%	High
Hwy 2 (basin near HWY)	138	1,364	888%	Very High
Lone Pine Canyon (hillside wash)	144	4,301	2887%	Very High
LonePineCanyon at LADWP Rd Xing	18,488	196,457	963%	Very High*
Lost Lake	129	2,080	1512%	Low
Lytle Creek above community	49,396	76,632	55%	Very High*
Lytle Resort 1 (swale)	53	745	1306%	Very High
Lytle Resort 2 (swale)	14	194	1286%	Very High
Manzanita Wash	--	--	--	Moderate
Middle Fk Lytle Cr Bridge	55,359	111,609	102%	Very High*
PCT at RR Culvert Xing	2,342	37,634	1507%	Very High
Pioneer & Hwy 138 Xing	4,206	60,758	1345%	High
Railroad1	850	20,720	2338%	Very High
Railroad2	584	17,437	2886%	Very High
Railroad3	258	7,686	2879%	Very High
Railroad4	1,333	29,072	2081%	Very High
Railroad5	281	6,119	2078%	Very High
Railroad6	72	1,569	2079%	Very High
Railroad7	486	8,181	1583%	High
Sheep Creek and Lytle Cr Rd Xing	1,282	18,590	1350%	Very High
Sheep Creek Wildlife Habitat	408	5,998	1370%	Very High
West Cajon Valley wash	1,237	18,225	1373%	Very High
**Primary rating for fire burned areas*				

TABLE 7: Comparison of Pre and Post-Fire Erosion at Selected Railroad crossings intended to provide general trends of post-fire erosion potential off slopes above the railroad. Table displays results from three models. RCS estimates annual erosion. ERMiT estimates erosion given a specific storm event.							
Pour Point	**Erosion in Tons Per Year (RCS)**			**Erosion Hazard Rating**	**Tons of Sediment per Event (ERMiT)**		
	Pre-Fire	**Post-Fire**	**% Increase**		**2 year RI**	**5 year RI**	**10 year RI**
Railroad1	1,530	37,297	2338%	Very High	5,019	14,072	20,094
Railroad2	1,051	31,387	2886%	Very High	5,828	15,984	23,456
Railroad3	465	13,834	2875%	Very High	2,748	8,264	12,239
Railroad4	2,400	52,330	2080%	Very High	6,826	20,023	29,828
Railroad5	506	11,014	2077%	Very High	1,642	4,474	6,534
Railroad6	130	2,825	2073%	Very High	685	2,002	3,000
Railroad7	874	14,725	1585%	High	1,502	3,904	5,498

Part V – 5.0 Water Quality

Part V – 5.1 Beneficial Uses of Water – Santa Ana River Water Quality Control Board (SARWQB), State of California

Beneficial Uses (BU's) are the natural and human uses of surface water and are defined in the State of California Water Quality Control Board Basin Plans. These beneficial uses must be maintained.

Two major watersheds within the Blue Cut Fire area fall under the Santa Ana River Water Quality Control Board's jurisdiction: Lytle Creek and Cajon Canyon Creek. Both streams fall within the same Hydrologic Unit Code (Cajon Canyon Creek – Lytle Creek HUC 1807020300305). Beneficial Uses of water of these streams, classified as inland surface waters within the Santa Ana River watershed, as referenced from the Santa Ana River Water Quality Board Basin Plan (SARWQB 1995), included on the following tables:

Table 8: Beneficial Uses of Water for Lytle Creek	
Beneficial Use Code	**Lytle Creek (HUC 1807020300305)**
MUN	Municipal and Domestic Supply
AGR	Agricultural Supply
GWR	Groundwater Recharge
IND	Industrial Service Supply
PROC	Industrial Process Supply
REC-1	Water Contact Recreation
REC-2	Non-contact Water Recreation
COLD	Cold Freshwater Habitat
WILD	Wildlife Habitat
RARE	Rare, Threatened or Endangered Species
POW	Hydropower Generation

Table 9: Beneficial Uses of Water for Cajon Canyon Creek	
Beneficial Use Code	**Cajon Canyon Creek (HUC 1807020300305)**
MUN	Municipal and Domestic Supply
GWR	Groundwater Recharge
REC-1	Water Contact Recreation
REC-2	Non-contact Water Recreation
COLD	Cold Freshwater Habitat
WILD	Wildlife Habitat
RARE	Rare, Threatened or Endangered Species

Part V – 5.2 Threats to Water Quality and Beneficial Uses of Water

Peak flow increases from the fire will also be bulked by ash, debris and other floatable and transportable material within stream channel areas of the fire. Temporary episodes of water quality degradation and fine siltation is likely during the first year after the fire to Cajon Canyon Creek and major tributaries. Less severe and localized water quality impacts to North Fork Lytle Creek below burned tributaries upstream and adjacent to the Lytle Creek residential area and downstream could occur. Beyond the first year, post-fire water quality impacts will be lessened as the burned watersheds recover. Beneficial uses listed above in Tables 1-2 could experience temporary impacts post-fire.

Part V – 5.3 Hazmat Release Potential from Burned Residential Refuse – Water Quality and Environmental Effects

The California Integrated Waste Management Board (CIWMB) has stated that ash and debris from residential structures consumed by wildfires may contain concentrated amounts of heavy metals, such as arsenic, barium, beryllium, copper, chromium, cadmium, lead and zinc (CIWMB, 2007). Further, according to the CIWMB, the occurrence of these metals in burned residential debris has been demonstrated in the “Assessment of Burned Debris Report for the Cedar and Paradise Fires, San Diego County, CA” dated December 2003. It is also known that asbestos remains are found in burned debris and poses a threat when disturbed and airborne. Common household products found in burned structures are usually present such as pesticides, fertilizers, paints and thinner, automobile products and other petroleum based products.

Up to 104 residences and outbuilding burned during the Blue Cut Fire. It is known that the fine debris of burned residential refuse contains toxic materials such as lead, mercury, arsenic and other metals, along with pesticides, petroleum products and other hazardous substances Without containment or removal of the refuse, there is a potential for off-site migration of hazardous materials to drainages caused by storm runoff, and soil and water contamination could result. Many of the ephemeral channels in the fire area could be impacted by residential refuse if not contained or removed before large storm events mobilize the waste. Several burned residences are located near drainages. Forest lands downstream may be impacted. Reaches of surface water in Lower Cajon Creek may be contaminated if refuse is not contained or disposed from nearby burned buildings and from tributary sources upstream.

Part V – 6.0 Geologic Response

Part V – 6.1 Debris Flow

Risk of debris flows has been significantly increased as a result of the fire. Debris flows can mobilize with destructive force 100-1,000,000 cubic yards of rock, sediment, organic material from hillslopes and steep stream channels and have very rapid velocities measured in miles per hour.

Debris flow likelihood, volume and the combined hazard of these was modeled by the U.S. Geological Survey for the Blue Cut Fire. Empirical spatial calculation was performed remotely by the USGS. Parameters of the model included soil burn severity, terrain, channel confinement, soil K factor, rain storm intensity and duration, and historical debris flow data. Floods, including sediment-laden flash floods are not predicted in the USGS debris flow model. Further information about the USGS debris flow modeling results is filed in the USDA Forest Service, Blue Cut Fire BAER electronic records.

Modeling results for debris flows as a result of the Blue Cut fire were generated remotely, and the field observations of soil burn severity were incorporated; however, field observations of active landslides (0.25-10 acres each) in the Keenbrook, Blue Cut, and Lower Lytle Creek areas within Cajon Canyon, in the southernmost portion of the fire were not accounted for in the USGS-generated debris flow model results. Field observations of watersheds on the west side of Cajon Canyon (labeled watersheds, Railroad 1-6) where high and moderate burn severity occurred, revealed soil and sediment accumulations around the base of stems of burned chaparral vegetation, due to a pre-fire closed-canopy, old-growth chaparral condition. This soil and sediment accumulation on hillslopes is readily available for mobilization in the first rain events after the fire. Field observations found that the USGS-debris flow model underestimates the likelihood, volume, and combined hazard of debris flows in the Keenbrook and Blue Cut areas in Cajon Canyon. The Soil Erosion Hazard Rating mapping as a product of the ERMiT model, more closely reflects the degree of hazard for debris flows to occur in modeled debris flow basins.

The risk of debris flows threatens the Union Pacific and BNSF Railroads and structures, Lytle Creek Road, Lone Pine and Swarthout Canyon Road and other county-maintained roads, LADWP access roads and towers, SCE towers, Southern California Gas and Kinder Morgan pipelines, I-15 stream crossings, and residents in West Cajon, Lytle Creek, Lone Pine and Cajon Canyon.

This link displays the USGS predictions for a 100-year storm, which is a storm event that exceeds what Forest Service BAER addresses:
http://landslides.usgs.gov/hazards/postfire_debrisflow/2016/20160816bluecut/
The USGS debris flow model was produced remotely, lacking comprehensive field observations, and is a digital geospatial process that needed further calibration in the case of the Blue Cut Fire

The BAER team's determination about the risk of debris flows is based on field examination of geologic and geomorphic conditions, soil and vegetation conditions as a result of the fire, and empirical geospatial modeling of erosion and debris flow hazard.

Part V – 6.2 Rock Fall

Rock fall will continue in these identified areas of the for the next 3-5 years due to a loss of ground cover and will increase temporarily during runoff events.

- Roads (Forest Service roads (3N06/3N49) Lytle Creek, Swarthout canyon and Lone Pine Canyon, Hwy. 66 (county), Hwy. 138 (State)): Rock fall occurred under pre-fire conditions below steep cuts and rock outcrop areas before the fire. County maintained Hwy. 66 is a 4 lane highway with the two lanes closest to the burned slopes closed. Rock fall is likely to occur in this area along the road. Rock fall will continue. The risk of rockfall and slope wash (dry ravel) along sections of these roads that burned is considered **High to Very High.**

Rock Fall – Swarthout Canyon road (county road portion)

- Railroad tracks: The Union Pacific railroad track within the fire area is along the foot and toe of slopes that burned with high and moderate severity, especially in western portions of the fire, between milepost 64 and 68, and the narrow portion of the track in the Keenbrook area by milepost 67. The risk of rockfall and slope wash (dry ravel) in this section of the tracks as a result of the fire is considered **Very High**.

- PCT: various sections of the PCT through steep slopes, especially between Lone Pine Canyon and Lytle Canyon. PCT use through this section is generally highest in late spring, rocks and debris actually impacting hikers as they travese by is possible, especially during storm events. Rock and debris are expected on the trail potentially impacting tread. This risk can be considered **High** as a result of the fire.

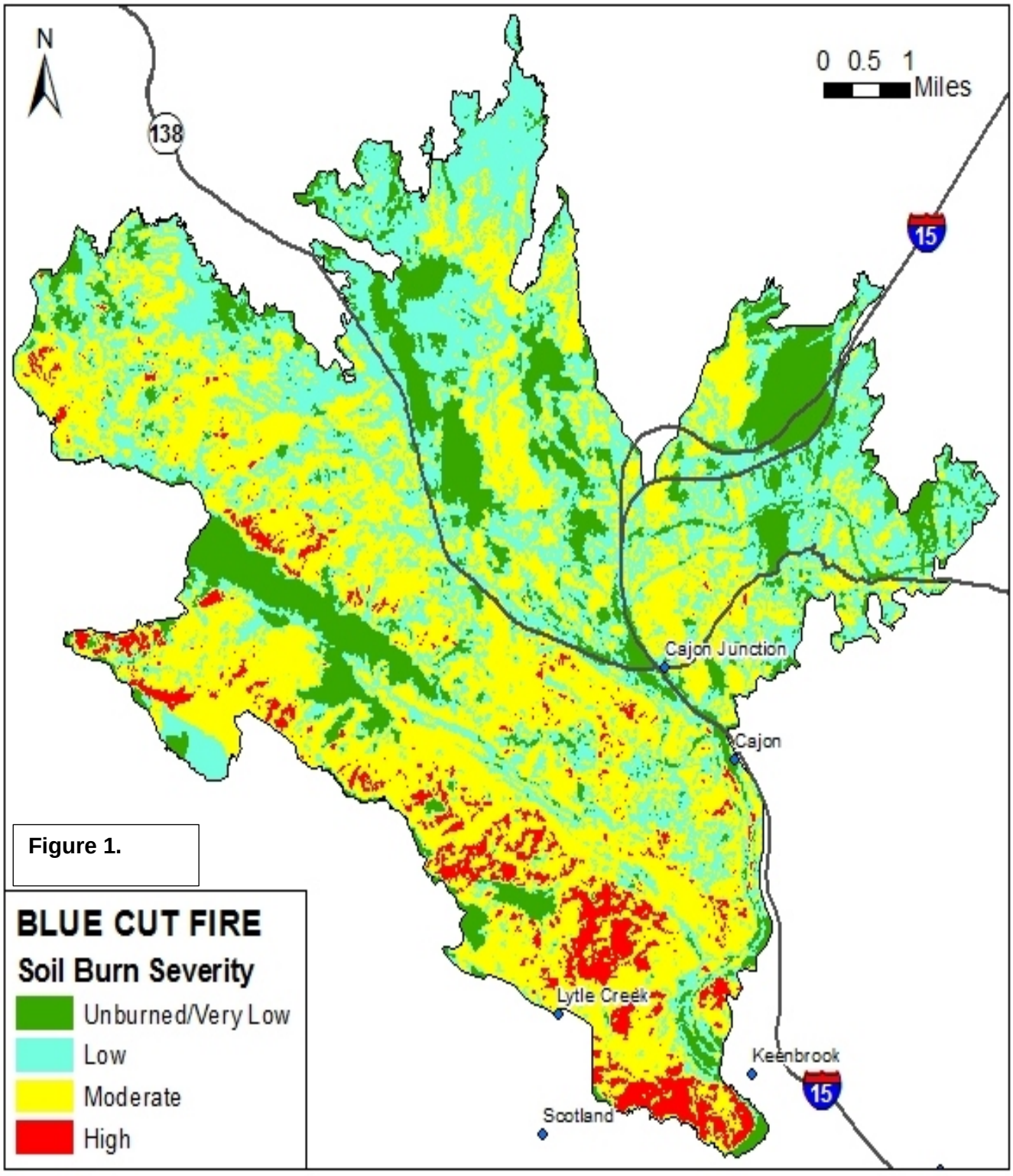
N
0 0.5 1
Miles
138
15
Cajon Junction
Cajon
Lytle Creek
Keenbrook
Scotland
15
BLUE CUT FIRE
Soil Burn Severity
Unburned/Very Low
Low
Moderate
High

Figure 1.

Part V – A. Describe Watershed Emergency:

The risk matrix below, Exhibit 2 of Interim Directive No.: **2520-2010-1**, was used to evaluate the Risk Level for each value identified during the Assessment:

Values at Risk and Risk Matrix Table

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

Note: Only values at risk greater than intermediate will be addressed below. County, private property,railroad infrastructure and utilities requires interagency coordination.

Values at Risk - Life, Safety and Property

a) Public Safety .
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 some areas of the Blue Cut fire. The BAER team has recommended a Forest closure to provide for public safety during the next year post-fire. The Forest is moving forward with a closure through a Forest Order. The need for the Order will be reviewed periodically over the next year.

Probability of Damage or Loss: **Very Likely**
Magnitude of Consequences: **Major**
Risk Level: **Very High**

b) Roads
The combined factors of severely burned watersheds directly above national forest sytem lands, private property, large volumes of loose, stored sediment in channels and on the steep slopes, moderate and high soil burn severity with water repellency, and the location of property in the floodplain directly below those watersheds indicate a high risk to life and property creating an emergency situation. Motor vehiclists and other travelers are at a high risk from debris flows, rock fall, and flooding along Forest Service, Caltrans and County roads.

The National Forest transportation system consists of approximately 77 miles of National Forest System Roads (NFSR) within the fire perimeter. **Approximately 10.5 miles of National Forest System roads (NFS) are proposed for storm proofing treatment within the fire area**. The majority of the roads proposed for treatment burned in high and moderate burn severity areas. The low severity areas are expected to have a moderate watershed response due to steep slopes and sediment bulking in the upstream channels (dry ravel and rock). Of the 77 miles of NFSR within the fire perimeter, approximately 41 miles are suitable for passenger cars (maintenance levels 3-5) and 36 miles are suitable for high-clearance vehicles and/or are administrative use only (maintenance level 1-2).

Main highways within the burned area include State highway 15 and 138 and include approximately 24 miles within the burned area. Main county roads in and near the burned

area include: Lytle Creek Road, Swarthout Canyon Road, Cajon Blvd. (old Route 66), Keenbrook Road, and Lone Pine Canyon Road. Approximately 120 miles of County and local roads exist within the burned area. Roads throughout the burned watersheds are likely to be impacted by runoff, sediment, and debris derived from burned areas.

State, County, National Forest System, local, and cooperator roads were assessed in order to determine the probability and magnitude of road damage or loss as a result of the changed watershed condition. Public safety on roads in the burned area is also an equally important consideration. Primary NFSR roads suitable for passenger cars within and adjacent to the burn area include: 2N53, 3N31, 3N31Y, 3N06, and 2N56. Main NFSR Level 2 roads within and adjacent to the burned area include: 3N33, 3N29, 3N21, and 3N24. Cooperator and other roads were also assessed because of their potential impact on water quality and other infrastructure if they were to fail. The table below shows the risk assessment for each road based on the probability of damage or loss and the magnitude of consequences.

Table 10. Roads BAER Risk Ratings

Low	Intermediate	High	Very High
2N50	2N56	3N06	2N53
2N57	2N87	3N24	3N29
2N88	Interstate 15	3N29	3N33
3N06A	Highway 138	3N31	2N52
3N21		3N31Y	2N89
3N22		3N33	
3N31YA		3N49	
3N35		3N55	
3N35A		Swarthout Cyn. Road	
3N35B		Lone Pine Cyn. Road	
3N44		Lytle Creek Road	
3N44A		SCE access spur roads	
3N45		LADWP access spur roads	
3N47		So Cal Gas access roads	
3N48			
3N51			
3N53			
3N58			
3N66			
2N61			

c) Keenbrook Dam

Other Forest Service infrastructure located within the fire perimeter include the Keenbrook Dam. The Keenbrook dam was believed to have been installed in the late 1930's or 1940's as a flood control structure and is on the Forest dam inventory. **Approximately 97%** of the watershed burned with high and moderate severity. In addition, the watershed has a very high Erosion Hazard Rating.

The Keenbrook Dam was determined to have a **very high risk** of damage or failure primarily due to the majority of the watershed above it being burned to moderate or high severity. It is very likely there will be an increased watershed response resulting in a large increase in sediment and debris moving down the channel. If the dam were to fail, it could result in major damage or loss to the downstream railroad infrastructure located just below

the spillway. Treatments are proposed for Keenbrook Dam to mitigate the level of risk to a more acceptable level.

d) Applewhite Campground – Lytle Creek
There is a likelihood of flooding, debris flow, rock fall, and sedimentation posing a safety threat to visitors. Site is located at the base of a steep, burned slope with sediment charged slopes and evidence of instability. This is described in more detail in the Watershed Characterization section above.

Probability of Damage or Loss: **Likely**
Magnitude of Consequences: **Major**
Risk Level: **Very High**

e) Applewhite Picnic Area – Lytle Creek
There is a likelihood of flooding the sites near Lytle Creek if culvert upstream plugs. This is described in more detail in the Watershed Characterization section above.

Probability of Damage or Loss: **Very Likely**
Magnitude of Consequences: **Major**
Risk Level: **Very High**

f) Mormon Rocks Fire Station
The slopes above the fire station generally burned with moderate severity with very high EHR due to steep slopes and erodible soils**.** Minor flooding and sedimentation around the buildings is expected.

Probability of Damage or Loss: **Possible**
Magnitude of Consequences: **Moderate**
Risk Level: **Intermediate**

g) Union Pacific and BNSF Railroad tracks and infrastructure
As described in the Watershed Characterization section there are serious risks of flooding, debris flows, rockfall and slope wash (dry ravel) impacting the tracks causing major property damage, and disrupting train commerce for a period of time. The highest potential for damage is from Mile Post 64 to Mile Post 68. Members of the BAER team met with representatives of the Railroad companies on Thursday September 1 to discuss preliminary results. They also "Hi-Railed" along the single track Union Pacific rail track to go over specific areas of concern with the rail company representatives. The BAER team plans to meet with the rail companies and other cooperators/partners/affected entities on Tuesday September 6 to discuss results and facilitate on-going coordination.

Probability of Damage or Loss: **Very Likely**
Magnitude of Consequences: **Major**
Risk Level: **Very High**

h) Southern California Gas Company and Kinder Morgan Pipelines
There is potential for pipeline damage in drainages from increased flooding and/or debris flows. These pipelines carry petroleum products through Cajon Pass and are buried at various depths throughout the fire area. The BAER Team was not able to visit all crossing within the fire area and was unable to get a map of the specific locations due to Homeland Security risks. We are sharing BAER results with them through email and recommending

they visit there sites to take necessary stabilization actions.

Probability of Damage or Loss: **Likely**
Magnitude of Consequences: **Major**
Risk Level: **High**

i) Mountain Lakes RV resort (Lytle Canyon)
Steep burned Forest hillslopes are directly behind this resort. The small watershed burned mostly at high and moderate severity, have a Very High EHR and we expect 100 to 150% increase in peak flows coming from the small watersheds into the facility. The watershed with an expected 150% increase has a debris basin that captures the flow and channels it to one of the lakes on the property. Several BAER team members visited the site with the NRCS on Wednesday August 31. We met with the general manager of the resort looked at drainage off the hillslopes and infrastructure throughout the resort. Ash and sediment along with rocks could spread throughout the facility, with particular concern in areas adjacent to the burned hillslopes. In addition, ash and sediment can get into the lake impacting water quality. **Recommendation**: NRCS to provide erosion control technical assistance to property owner. Forest Service road treatments on Applewhite road above the resort will address drainage off the road. .

Probability of Damage or Loss: **Very likely**
Magnitude of Consequences: **Major**
Risk Level: **Very High**

j) Private land: West Cajon, Lone Pine Canyon, Lytle Creek, Blue Cut areas
Risk of flooding, sedimentation, erosion, property damage,. See discussion of post-fire hazards to structures on alluvial fans and drainages below burned slopes in Watershed Characterization section. The BAER Team visited these sites with the NWS and San Bernardino Flood control on Monday August 29th and Wednesday August 31 with the NRCS. **Recommendation**: NRCS indicated that they are going to conduct a follow-up survey of critical areas for potential impacts and work with affected property owners, as appropriate.

Probability of Damage or Loss: **Likely**
Magnitude of Consequences: **Moderate**
Risk Level: **High**

k) Recreation Residence
Risk of minor flooding and sedimentation for three of the recreation residences (#52, #50, #48). Recreation cabin #50 is at the highest risk due to the small steep, sediment charged swale that leads from high and moderate burn severity slopes to the back of the property. The remaining recreation residences not at risk. Members of the BAER team visited this site with the National Weather Service and San Bernardino Flood Control on Monday August 29th and the NRCS on Wednesday August 31st. **Recommendation**: Special Uses administrator can work with the property owner, inform them of the hazard and suggest they place sand bags around the property. NRCS or the county could also provide technical assistance, as needed, as this is a private residence.

Probability of Damage or Loss: **Likely**
Magnitude of Consequences: **Major**
Risk Level: **Very High**


Lytle Creek Recreation Residence below burned slopes

l) OHV Systems and Trails, Developed Recreation, Pacific Crest Trail

Multiple green sticker / OHV trails, developed recreation sites, and the Pacific Crest Trail (PCT) were impacted by the Blue Cut Fire. Within the fire, there are multiple recreation impacts, including OHV incursions on off-system roads and trails which are likely to increase following the fire due to removal of vegetation. Affected systems include: 3N21, 3N22, 3N24, 2N47, 3N47x, Baldy Mesa staging area, Summit/Cleghorn staging area, 3W24, 3W25, and 3W26. Specific sections of the Baldy Mesa OHV Area within or below burned areas where post fire erosion, flooding and/or debris flows are likely to occur especially on FSR 3N24, 3N21, and 3N55. Affected developed facilities such as Applewhite Campground, Applewhite picnic area and the trails around Lost Lake and FSR 2N88 are also likely to be affected by post fire effects. The probability that expansion of OHV impacts could impact recovery of native vegetation, noxious/Invasive weed invasion, T&E species and long term soil productivity.

Emergency conditions also exist for specific sections of the Pacific Crest Trail within or below burned areas where post fire erosion, flooding and/or debris flows are likely to occur, especially at the Cajon Wash/Crowder Canyon confluence. Approximately **12.8 miles in and around the PCT burned at high and moderate severity.** These emergency conditions are based on anticipated post wildfire impacts on trails and trail users. Threats to trails and trail users, identified by a trail specialist and soils scientists include:

- •Excessive erosion of the trail tread caused by interception and diversion of runoff from steep burned hill-slopes,
- •Scouring or deposition where trails intersect with several larger drainages, numerous moderate drainages and crenulations,
- •Illegal OHV use on the Pacific Crest Trail,
- •Increased potential for falling rocks, debris and hazard trees.

Expansion of OHV impacts from trespass is very likely to occur on NFS lands adjacent to the I-15, State Highway 138, Swarthout Canyon Rd, FSR's 3N22, 3N44, 3N47, 3N49, 3N89, 3N29, 3N31Y and 3N31YA relevant to the PCT. Additionally, removal of vegetation has increased potential for illegal OHV incursion on the Pacific Crest Trail.

The probability that expansion of OHV impacts could impact recovery of native vegetation and long term soil productivity is **very likely** in selected areas along FSR 3N22, 3N24, 3N29, 3N31, 3N31y, 3N49, 2N88 (Lost Lake Day Use), 3N21 (Baldy Mesa Staging Area), 3N22 (Summit Staging Area). Based on the degree and extent of post fire OHV trespass, impacts on soil productivity, water quality and Arroyo Toad habitat and Desert Tortoise habitat in Baldy Mesa are **very likely**. The magnitude of consequences is **moderate**. Therefore, the BAER risk is **very high**. BAER treatments are recommended.

The probability that increased illegal OHV use on the Pacific Crest Trail could occur is **very likely** in selected areas where roads and the PCT have crossings, areas outside the OHV Staging areas, and along several FS roads within the burned areas. The magnitude of consequences is **moderate**. Therefore, the BAER risk is **very high**. BAER treatments proposed for recovery of native vegetation, nx/invasive weed detection and eradication and long term soil productivity serve to reduce this risk.

The probability of damage to the Pacific Crest Trail is **very likely** based on anticipated post fire scour and deposition processes (runoff, erosion, debris-flows). The magnitude of consequences is **moderate**. Therefore, the magnitude of consequences is **very high**.

The probability that Pacific Crest Trail users could be impacted by falling rocks or trail failure is **possible**. The magnitude of consequences is **major**. Therefore, the BAER risk is **high**.

The probability of damage to the Mormon Rocks Interpretive Trail is **likely** based on anticipated post fire scour and deposition processes (runoff, erosion, debris-flows). The magnitude of consequences is **moderate**. Therefore, the BAER risk is **high**.

The probability that Mormon Rocks trail users could be impacted by falling rock, debris or trail failure is **possible.** The magnitude of consequences is **major**. Therefore, the BAER risk is **high**.

The probability that expansion of OHV impacts could impact recovery of native vegetation and long term soil productivity is **very likely** in selected areas along FSRs 3N22, 3N44, 3N47, 3N49, 3N89, Swarthout Canyon Rd, 3N29, 3N31Y and 3N31YA. Based on the degree and extent of post fire OHV trespass, impacts on soil productivity, water quality and Arroyo Toad habitat are **likely**. The magnitude of consequences is **moderate**. Therefore, the BAER risk is **high**.

l) Abandoned Mines

The Blue Cut fire increased the safety hazard of three open mine adits and one vertical ventilation shaft along the Sheep Canyon Road. During the Sheep Fire (2009) BAER implementation, the mine adits were closed with bat-friendly gates and the ventilation shaft was fenced. All features were marked with warning signs.

The burning of vegetation during the Blue Cut fire has made these features clearly visible from the Sheep Canyon Road just above the community of Lytle Creek. The Blue Cut fire burned the warning signs and compromised the fence around the vertical shaft, posing an increased threat to public safety.

Probability of Damage or Loss: **Likely**
Magnitude of Consequences: **Moderate**
Risk Level: **High**

m) Developed Springs/Guzzlers

There are a number of developed springs, fiberglass guzzlers, and cement guzzlers within the fire perimeter. Function of water sources is critical to provide water for a number of wildlife species in this dry area. The water source infrastructures represent a substantial government investment over many years. Thirteen of the developed springs that were assessed are at risk of filling with sediment (losing function of providing a water source) or loss of infrastructure due to erosion.

Probability of Damage or Loss: **Likely**
Magnitude of Consequences: **Moderate**
Risk Level: **High**

n) Hazardous Waste

One fiberglass wildlife water guzzler burned in the fire. As a result of the damage, fiberglass pieces will continue to litter the area posing a threat to animals that might gather pieces for nest/den material.

Probability of Damage or Loss: **Very Likely**
Magnitude of Consequences: **Moderate**
Risk Level: **Very High**

Values at Risk – Natural Resources

a) Non-native Invasive Plants

An emergency exists with respect to vegetative recovery as a result of the threat of post-fire weed introduction and spread and unauthorized off-road vehicle (OHV) use. Localities within the burn area have a history of concentrated unauthorized OHV use. The unknowing introduction and dispersal of invasive weeds into areas disturbed by fire suppression and rehabilitation has the potential to establish large and persistent weed populations. In addition, it is highly likely that extant weed infestations along fuelbreaks will increase in the burn area due to their accelerated growth and reproduction and a release from competition with natives. These weed populations could affect the structure and habitat function of native plant communities within the burn area. It is expected that most native vegetation would recover if weed invasions are minimized. Approximately 31 miles of dozer line were constructed outside and within the burn perimeter. In addition to causing an increase in weed invasion, the disturbances caused by dozer lines are expected to create accelerated erosion and soil compaction that may also inhibit the recovery of native plant populations. Approximately 20,500 acres (57%) of the Blue Cut Fire also overlapped with eleven different fires that have occurred within the past 25 years. In this reburned area, the native vegetation has not been allowed to re-establish and was not mature enough for obligate seeders to produce necessary seed quantities to compete with aggressive non-native weeds. If weed infestations are not controlled it is expected that this short fire return interval will lead to vegetation type conversion in this 20,500 acre area.

Probability of Damage or Loss: **Very Likely**.
Magnitude of Consequence: **Major**.
Risk Level: **Very High**.

b) Wildlife Resources

There are five federally-listed endangered species are known from within and downstream of the fire area: southwestern willow flycatcher, least Bell's vireo, arroyo toad, San Bernardino kangaroo rat, and desert tortoise. Critical Habitat occurs for San Bernardino kangaroo rat and arroyo toad within and downstream of the fire area.

Table 11. Areas of Concern for Threatened/Endangered Species within the Blue Cut Fire area

Location	Species					
	ARTO		SBKR		SWWF Occupied Habitat	LBVI Occupied Habitat
	Occupied	Critical Habitat	Occupied	Critical Habitat		
Cajon Creek/Wash	X	X	X	X	X	X
Sheep Creek					X	
Lost Lake					X	X
Lytle Creek			X		X	
Little Horsethief Canyon	X					
Lone Pine Canyon					X*	
Crowder Canyon					X	

ARTO=Arroyo Toad; SBKR=San Bernardino Kangaroo Rat; SWWF=Southwestern Willow Flycatcher; LBVI=Least Bell's Vireo
** Has not had suitable riparian habitat since the early 1990s.*

The burned area has a long history of a multitude of human impacts in riparian areas and unauthorized OHV use in Threatened/Endangered species habitats. There is now potential for increased use to occur as a result of the loss of vegetative barriers. Loss of vegetative cover which has acted as a natural barrier substantially increases the threat of cross-country vehicle travel and public access.

The greatest post-fire risk to arroyo toads, San Bernardino kangaroo rat, and desert tortoise is lack of cover and forage where vegetation burned off. Lack of vegetative cover increases the off-road cross-county vehicle traffic. This will slow the recovery of habitat for this species, further degrade the habitat, increase the probability of predation and collecting by the public, and increase the risk of being killed or injured (*e.g*., vehicles driving over burrowed toads, San Bernardino kangaroo rat, and tortoise, etc.). Lack of vegetative cover and barriers also allows more access to riparian areas, slowing post-fire recovery of suitable southwestern willow flycatcher and least Bell's vireo habitat.

The following sites were addressed for post-fire threats to federally-endangered animals:

- <u>Cajon Creek/Wash:</u> Cajon Wash is occupied and Critical Habitat for arroyo toads, occupied and Cricital Habitat for San Bernardino kangaroo rats, southwestern willow flycatcher, and least Bell's vireo. Suitable habitat in Cajon Wash varies with habitat disturbance and annual fluctuations in precipitation and stream morphology. Most of the Cajon Wash habitat area did not burn or experienced a patchy low severity burn.

  Overall, Cajon Creek/Wash riparian areas will experience increased flows (a two-year storm will act like a 4-year storm; a 5-year storm will act like an 11-year storm) and localized effects from increased sediment and debris delivery. Under a two-year storm, the post-fire watershed response is not expected to scour the riparian vegetation. Deposition of sediment will be localized where side drainages come in to Cajon

Wash/Creek. Erosion Hazard Ratings (EHRs) for sites in/leading to Cajon Wash are Very High.

Effects to arroyo toads and San Bernardino kangaroo rat include death/injury due to debris flows and being buried or drowning. Over the long term, the deposition of sediment may improve habitat for them. Effects to southwestern willow flyctchers would depend on whether post-fire events result in scouring and long-term or short-term loss of mature riparian habitat suitable for nesting.

The risk determination for arroyo toad, San Bernardino kangaroo rat, southwestern willow flycatcher, and least Bell's vireo in Cajon Wash is: VERY HIGH Risk (Likely Probability and Major Magnitude of Consequences).

- Little Horsethief Canyon: The lower part of Little Horsethief Canyon has had the densest population of arroyo toad on the SBNF in the past; however recent surveys are lacking. The upper portion of the mapped habitat (the part within the Blue Cut Fire) is not suitable for breeding but is considered suitable as upland habitat. The fire just barely reached the mapped upland habitat in Little Horsethief. Burn severity was low in that area. Expected post-fire watershed response is expected to be minimal in the arroyo toad habitat. The risk determination for arroyo toad in Little Horsethief Canyon is: VERY LOW (Unlikely probability with Minor consequences).

- Lytle Creek: Lytle Creek is considered occupied and is mapped Critical Habitat for San Bernardino kangaroo rat. The suitable habitat in Lytle Creek is about 2.5 miles downstream from the fire and was not directly affected by fire. The occupied/suitable habitat for southwestern willow flycatcher in Lytle Creek is about 2 miles downstream from the fire and was not affected by the fire. Lytle Creek is also considered occupied and is mapped Critical Habitat for San Bernardino kangaroo rat.

  Lytle Creek is an alluvial stream course. The stream channel is constantly changing due to flooding events. The creek bed is comprised of primarily sand, gravel, and boulders. Overall, Lytle Creek is expected to experience localized effects where side drainages come in to Lytle Creek. During the first storms, water quality will affected as ash and sediment delivery will be higher than normal and could be substantial in areas. Due to the large portion of the watershed that is outside the fire area, those sediment deliveries will be carried downstream during flood events. Effects will be mitigated by the large amount of the watershed that is outside the fire area.

  The Risk Determination for southwestern willow flycatcher and San Bernardino kangaroo rat in Lytle Creek is: LOW (Unlikely probability and Moderate magnitude of consequences).

- Lost Lake: Lost Lake is a known nesting territory for least Bell's vireo and may also be used for nesting by southwestern willow flycatcher. Lost Lake is a linear sag pond associated with the San Andreas Fault in Lone Pine Canyon. The lake is approximately 50 feet wide by 250 feet long at full capacity; however, at the time of the Blue Cut fire it was almost completely dry. A perennial creek feeds Lost Lake. The willow habitat was confined to the eastern and about half of the northern shoreline. The surrounding uplands are covered by dense montane chaparral. Lost Lake is a developed recreation site with a parking area. The drying of Lost Lake in summer 2016 has resulted in

substantially reduced recreation use.

When water is present, Lost Lake is commonly used as a source of water for helicopters carrying buckets and using suction devices during wild fires. About ¾ of an acre of the suitable habitat for nesting at Lost Lake burned and became unsuitable during the 2014 Lost Fire. The remaining nesting habitat at Lost Lake was became completely unsuitable during the Blue Cut Fire.

Overall, Lost Lake is expected to experience an increase in flows and sediment but it is not expected to result in changes to that habitat conditions at the site. The Risk Determination for southwestern willow flycatcher and least Bell's vireo at Lost Lake is: HIGH (Likely probability and Major magnitude of consequences).

- Lone Pine Canyon: There is a record of breeding southwestern willow flycatchers in Lone Pine Canyon from 1993. The Lone Pine nesting territory site has not supported riparian habitat since the early 1990s. This site is no longer considered suitable for this species.

- Crowder Canyon: Migrant willow flycatchers of unknown subspecies have been detected in the Crowder Canyon riparian habitat, indicating suitability for southwestern willow flycatcher nesting. Nesting is not known from the site but surveys have been limited and nesting may occur in that drainage.

  The model indicates that there would be a 48% increase in flow in the southwestern willow flycatcher habitat in Crowder Canyon during a 2-year storm event. The stream channel may experience some post-fire effects that are related to increased flows and sediment delivery such as channel migration, filling in of pools, and erosion; however, riparian vegetation is expected to respond/re-establish quickly, which will help stabilize the area. The Risk Determination for southwestern willow flycatcher in Crowder Canyon is: LOW (Unlikely probability and Moderate magnitude of consequences).

- Sheep Creek: Sheep Creek is a known nesting site for southwestern willow flycatcher. The suitable habitat was about 0.75 miles long paralleling Forest Road 2N56. Most of the suitable Sheep Creek habitat burned in the 2009 Sheep Fire. The upper portion of the mapped territory did not reburn in the Blue Cut fire and there is still some suitable habitat there. The lower estimated ¾ of the territory did re-burn and is no longer suitable for nesting.

  The BAER hydrology and soil models for the Sheep Creek territory indicate that there would be a 78% increase in the southwestern willow flycatcher habitat in Sheep Creek during a 2-year storm event. Scouring of the southwestern willow flycatcher habitat in Sheep Creek is not expected. The Risk Determination for southwestern willow flycatcher in Sheep Canyon is: LOW (Unlikely probability and Moderate magnitude of consequences).

- Desert Tortoise: The northern edge of the fire area supports suitable habitat for desert tortoise. All of the area below about ~4500' in elevation with desert soil and vegetation types is considered occupied habitat if suitable soils and habitat components are present. In areas where the fire overlapped suitable habitat for tortoise, the fire behavior was very low and spotty due to the sparseness of vegetation to carry fire.

A post-fire risk to desert tortoises is lack of cover and forage plants where vegetation burned off. Lack of cover increases predation and collection by people. Additionally, lack of vegetation increases the off-road cross-county vehicle traffic that puts tortoises at more risk of collection or injury/death from being run over or crushed in burrows.

There are two primary threats to the desert tortoise and its habitat directly tied to the Blue Cut Fire. First, there is increased potential of OHV use within the burn area. Even after the faster recovering species like chamise, scrub oak and buckwheat get re-established, the open nature of the vegetation and the slow recovery of the woody species such as manzanita and *Ceanothus* species (that would serve as a barrier to OHV activity) allows for an increase in off-road vehicle travel. The second threat is increased potential for type conversion of native vegetation as a result of frequent fire and invasion of non-native plants. Changes in plant communities caused by non-native plants and recurrent fire can negatively affect the desert tortoise by altering habitat structure and species available as food plants.

The desert tortoise risk determination in the Blue Cut Fire is: HIGH (Likely Probability and Moderate Magnitude of Consequences).

c) Cultural Resources

Post-fire effects on cultural resources result from one, or both, of two types of disturbances. The first is the degradation of sites from increased erosion within the burn area which causes an increase in sediment deposition, debris flows, and scouring of the landscape. The second is increased access to the resource as a result of a denuded landscape that leads to a greater risk of looting, vandalism, and unauthorized OHV use.

Field assessment of historic properties for the Blue Cut Fire BAER was conducted over four days and included only historic properties within or possibly within Forest Service lands. Twenty-three sites that were identified as at risk from post-fire effects were visited for assessment. The majority of these sites are prehistoric. Historic sites within in the burn include the LADWP Boulder transmission line, historic route 66, and the Mormon Trail.

One property, the historic LADWP Boulder transmission line, has been identified as at risk from potential erosion, flooding, and debris. This transmission line crosses USFS land and is maintained by LAWDP.

- The probability of damage or loss to these sites is "**likely"**.
- The magnitude of consequences is considered **"major"** because of the potential for substantial property damage.
- Therefore, the risk to these sites is considered **"very high**".

Seven historic properties (6 prehistoric, 1 historic) have been identified as at risk from an increase in public access due to vegetation burn-off. The overlap of these historic properties with a heavily used recreation area (mostly off-highway-vehicle [OHV]) makes these sites particularly vulnerable to increased disturbance. Given the extent of private land adjacent to and within the fire area, the loss of vegetative barriers due to the fire, and the amount of unauthorized cross country OHV use, the protection of cultural resources from the effects of off route use in this location is a concern.

- The probability of damage or loss to these sites is **"likely**" due to the potential for increased unauthorized OHV activity through the burn area where vegetative cover once protected the area from OHV access.
- The magnitude of consequences is considered **"moderate**" because the potential for increased and continual unauthorized activity in the area of these sites could result in additional user created trails into the site areas, erosion from these trails, damage to features, and displacement of artifacts, and the potential for looting and vandalism. As long as problems are identified and corrected timely, it would not necessarily be irreversible, although it would contribute to long lasting effects to the sites.
- Therefore, the risk to these sites is considered "**high**", especially because of the heavy OHV use in this area.

Part V – B. Emergency Treatment Objectives:

• Provide for Public Safety–
• Limit Damage to Property-
• Limit loss of soil productivity and provide for natural vegetative recovery –
• Early detection of Noxious/invasive Weeds –
• Road and Trail Treatments to protect investment in infrastructor and limit post-fire watershed response –
• Conserve Threatened and Endangered Species habitat–

Part V – C. Probability of Completing Treatment Prior to First Major Damage-Producing Storm:

Land 80% Channel ___% Roads 80% Other 90%

Part V – D. Probability of Treatment Success

Type	Years after Treatment		
	1	3	5
Land	80	90	100
Channel			
Roads	80	100	100
Other	90	100	100

Part V – E. Cost of No-Action (Including Loss): See attached Economic Analysis

Part V – F. Cost of Selected Alternative (Including Loss): See attached Economic Analysis

Part V – G. Skills Represented on Burned-Area Survey Team:

[x] Hydrology	[x] Soils	[x] Geology	[ ] Range	[x] Trails
[ ] Forestry	[x] Wildlife	[ ] Fire Mgmt.	[x] Engineering	[x] Roads/ OHV
[ ] Contracting	[ ] Ecology	[x] Botany	[x] Archaeology	[x] Liason

[ ] Fisheries [ ] Research [ ] Landscape Arch [x] GIS
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Kellen Takenaka, Crystal Danheiser (Soils)
Josh Direen, Damon Romero (Engineering/Roads)
Travis Mason (OHV Trails)
Emma Williams, Jordan Zylstra (Botany)
Robin Eliason, Drew Farr (Wildlife)
Jay Marshall, Dorit Buckley, Alicia Bonskowski (Archaeology)
Joan Louie (GIS)

Adjunct Team Members:
Jeanette Granger/Tracy Carter (Recreation/Trails)
Kim Boss (Wildlife)

Part V – H. Treatment Narrative:
The proposed treatments on National Forest System lands can help to reduce the impacts of the fire from storm events, but treatments cannot fully mitigate the effects of the fire on the watershed. Detailed information of the treatments is summarized below. Hill slope treatments (such as hydromulching, aerial seeding, and straw or woodstrands application) were not proposed because they are infeasible and/or would not reduce the probability of damage to assets. The treatments listed below are those that are considered to be the most effective on National Forest System lands for the identified threats.

Wildlife Resources – Summary of Treatments
The BAER assessment team has proposed an OHV Resource Protection treatment that includes installation of barriers, gates, fencing, and vegetation barriers to try to limit the amount of illegal cross-country vehicle use that is expected due to the lack of vegetation. The OHV Resource Protection treatment will help reduce the risk of death/injury to T/E animals from vehicles driving off road. It will also help speed the rate of habitat recovery by reducing habitat degradation, effects to native vegetation, and the spreading and establishment of non-native plants.

The BAER assessment team also proposed a Weed Monitoring and Rapid Response treatment to monitor the burned area for non-native plants and immediately remove then. This treatment will help reduce further degradation of T/E habitat as a result of weed infestations.

The proposed BAER treatments of barriers, interagency coordination with partners and special use permit holders, and monitoring are critical to protecting the habitat and species from additional post-fire impacts.

Heritage Resources – Summary of Treatments
There are several treatments that are intended to help protect heritage resources. The Forest Closure treatment will help by keeping potential pot-hunters and looters out of the fire area. The sub-treatments in the Forest Closure, particularly the Baldy Mesa and decommissioning

treatments, will help disguise and protect several important known sites, including some of particular significance to the Tribe. The Interagency Coordination treatment will provide for Forest Service involvement on any actions that would involve LA Department of Water and Power's historic Hoover Dam to L.A. transmission lines as well as historic railroad features (BNSF and Union Pacific).

Protection/Safety Treatments – Summary of Treatments

The BAER team determined that post-fire watershed responses pose a very serious and significant threat to public safety and critical infrastructure during storm events over the next few years. To address that threat as well as post-fire threats to natural resources and cultural resources associated with the public use of the SBNF within the recently burned area, the BAER Team recommends temporary closure of the burned area. The SBNF implemented a Forest Closure of the entire burned area on September 3rd and it is in effect for one year.

Some developed recreation sites were included in the Forest Closure: Baldy Mesa Staging Area, Lost Lake Day Use Area, Lytle Creek Picnic Area, and Lytle Creek Campground. Additionally, the Forest Closure includes use of a number of roads and trails to public use. The Pacific Crest Trail was left open because there was not a safe alternative detour.

1a) Forest Closure Gates, Signs, and Enforcement: Gates, barricades, and signs placed at strategic locations outside and within the fire perimeter are recommended to close the burned area. A map with proposed treatment locations is included in the project record.

To implement the Forest Closure, 3 gates would be needed on Forest Roads (see table below). Pipe and cable fence, smooth-wire wing fences, or boulders would be installed to reinforce the gates.

Additionally, the SBNF would work with Cooperators to have them gate these roads.

- 2N52 (LADWP access road)

Due to impracticality of gating/closing (due to multiple access points), these roads would not be gated; the closure would be enforced through signing and patrols.

- 3N49
- 3N21 below the staging area
- 3N55 crosses the Cajon Wash
- 3N53 crosses the Cajon Wash
- 3N37
- County Keenbrook road
- 3N35

The Blue Cut BAER Team also recommended complementary land treatments that are critical to reinforce/enhance the Forest Closure in such a way as to make it effective. Without those additional treatments, the Forest Closure for public safety will be difficult/impossible to enforce and effectiveness greatly reduced.

The objective of these treatments enhance the Forest Closure Treatment where gated roads and warning signs will not be enough to keep the areas closed. This will help reduce expansion of OHV impacts and associated impacts on critical BAER values at risk.

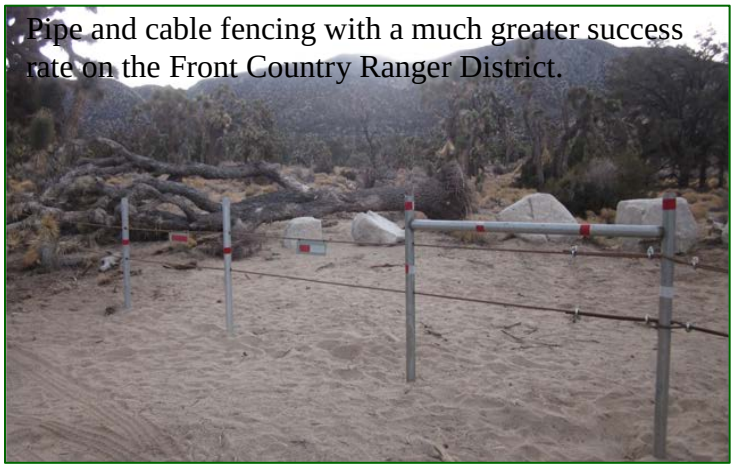
The post-fire impacts of OHV incursions to Values At Risk for the Blue Cut Fire area include:

- Loss of Forest Service investments ($500,000+) to limit damage to OHVs to vulnerable habitat, cultural resource sites, riparian conditions, T/E species, and native vegetation.
- Increased risk for establishment of noxious weeds in the burned area and chronic (long-term) soil disturbance and sedimentation.
- Loss of habitat quality and impacts to desert tortoise (federally-listed species) due to increased risk of being crushed in burrows, poaching, vandalism, and loss of forage plants due to burning of vegetative barriers/screening/cover.
- Loss of habitat quality and disturbance impacts to least Bell's vireo and southwestern willow flycatcher (federally-listed species) due to increased access into riparian nesting habitat due to burning of vegetative barriers/screening/cover.
- Loss of habitat quality and disturbance impacts to arroyo toad and San Bernardino kangaroo rat (federally-listed species) due to increased access into riparian/aquatic habitat due to burning of vegetative barriers/screening/cover.
- Impacts to water quality and aquatic organisms (including Sensitive Speckled Dace fish) due to increased access into riparian/aquatic habitat due to burning of vegetative barriers/screening/cover.
- Risks of vandalism and destruction of a number of important cultural resource sites due to burning of vegetative screening
- Increase in OHV and mountain bike incursions on to the 18 miles of PCT within the fire as a result of increased access and visibility of the trail due to loss of vegetative barriers and screening.

The Blue Cut fire area of the Front Country Ranger District has long had a management challenge of controlling unauthorized OHV use, especially in the Baldy Mesa, West Cajon Valley, Lone Pine Canyon, Lytle Creek, and Cajon Wash areas. **Through partnerships and grants, over ½ million dollars of state, federal, and grant funds have been invested in controlling OHVs and restoring habitat in those areas.**

Traditional barbed/smooth wire fencing is often ineffective and/or stolen (for scrap metal recycling profit). Previous wildfires and ecological restoration activities within the Blue Cut Fire Area have provided the Forest numerous opportunities to determine treatment methods with the highest rate of success. After the Hill Fire (2011), the Forest attempted to conduct a closure using 3-strand smooth wire and 6-foot T-posts at the Forest boundary. After installation, these fences were cut and the T-posts stolen. For a closure to succeed, a heavier duty fence and gate system is required (as occurred as a BAER treatment in the adjacent 2015 North Fire). As such, the District has found that pipe and cable fences, vegetation barriers, "chunking", and boulder placement to be the only reliable and effective treatment method in many of the higher-use areas.

In 2013, three-strand wire fence that lined both sides of 3N24 in Baldy Mesa was stolen by scrap metal salvagers.



Pipe and cable fencing with a much greater success rate on the Front Country Ranger District.

A majority of the Blue Cut fire area proposed for BAER land treatment is within the Baldy Mesa OHV Trail/Staging Area and Restoration Project Area. The SBNF and our partner, the Southern California Mountains Foundation (SCMF) acquired state OHV funds to construct OHV trail, improve the trailhead, and restore 55 miles of unauthorized routes within the project area over the next 2 years. OHV project implementation began 2 weeks prior to the Blue Cut Fire and eighty percent of the project area is within the fire area. As a result of the existing grant and partnership, the Forest and SCMF can provide several crucial items for the OHV Resource Protection Treatment proposals to enhance BAER treatment success. Contributed items are displayed under appropriate treatment descriptions below.

In order to protect VARs from the increased OHV threat that is expected due to the lack of vegetation, the BAER assessment team has proposed four complementary OHV Resource Protection treatments to protect Values At Risk by installing barriers, gates, fencing, and vegetation barrier, using “chunking” to try to limit the amount of illegal cross-country vehicle, and increasing patrol presence. These four sub-treatments go hand-in-hand and the combination of them has proven effective in these high-OHV areas on the Front Country Ranger District. **Any one of these methods without the others, has less success and requires more follow up treatments.**

1b) Forest Closure – Smooth Wire Fences: As mentioned above, there are sites within the Blue Cut Fire where smooth wire fencing has not been effective due to theft. However, the BAER

team was able to identify some sites where use is lower or where wire can be combined with pipe and cable fence to achieve the desired objectives. **Smooth wire fence is proposed in areas where pipe and cable fence is deemed not necessary in order to reinforce the Forest Closure order in order to provide for public safety and protection of Forest Service investments.** Smooth wire fences are the preferred method where they can be effective because they are less expensive in terms of materials and installation cost and it is faster to install.

1c) Forest Closure – Baldy Mesa Heritage and T/E Species Sites: In order to reduce the likelihood of Forest Closure violations in the Baldy Mesa area where flat terrain and lack of vegetation make the closure difficult to enforce, the BAER team proposes to supplement an existing and ongoing partnership project in the area (as described above). This treatment is critical for protecting several important heritage sites that were identified by the tribe as significant during the BAER process. It is also critical for protecting endangered desert tortoises and their habitat. While the Forest Closure is expected to last through the first rainy season, the desert vegetation in the Baldy Mesa area is not expected to recover enough to protect desert tortoises and heritage sites for quite a number of years after that.

The treatment would involve installation of pipe and cable fence, along with associated seeding, planting, monitoring and signing. It would help reduce erosion, prevent looting of cultural resource sites, provide protection of endangered desert tortoises, limit the spread of non-native noxious weeds, and enhance native plant recovery. This area has a long interface with private land where access is very open and difficult to control.

Two miles of pipe and cable fence would be installed at strategic locations where heritage sites are present along Forest Road 3N24. After fencing is in place, these sites would be seeded and planted to stabilize soils and to disguise sites from looting and vandalism. Container plants specifically grown for this location are available for planting immediately. Planted sites would be watered and maintained for 10 months to ensure vegetation success. The SCMF crew that would be funded to construct fence will also plant, seed and install Fire Area Recovery signs. A Participating Agreement is currently in place to accommodate this work.

Even though this site is within the boundary of the Forest Closure order, enforcement will be extremely difficult and, without this treatment, these resources are at a very high risk during the planned closure period.

1c) Forest Closure – Boundary and Access Sites: The BAER team proposes construction of pipeand cable fencing in order to reinforce the Forest Closure Treatment where simple gating and signing will not be effective to prevent access into the burned area. This treatment will also help protect vulnerable resources, T/E habitat (five federally-listed animals and one federally-listed plants), cultural resources, aquatic/riparian habitat, a highly vulnverable Forest Service Sensitive fish, and Forest assets from OHV damage.

The sites identified in this treatment are on the edges of the Forest Closure area or at some internal sites that will have access via open County roads. These sites include 3N22, 2N88 (Lost Lake Day Use), 3N21 (Baldy Mesa Staging Area), and 3N22 (Summit Staging Area) where vegetation burned and the areas are at very high risk of OHV incursions that threatened public safety and would slow natural recovery.

1d) Forest Closure – Decommissioning: In order to reinforce the Forest Closure Treatment, the Blue Cut BAER team is proposing decommissioning of unauthorized routes at two locations

(3N24 across the forest boundary and 3N22 at Summit Staging Area) where numerous unauthorized routes connect the closure area with private land and public roads. With the types of recreational use and vegetation types present in the Blue Cut Fire Area, the SBNF has had success at decommissioning to protect resources after a fire when using "chunking" with excavators. Chunking, when combined with fencing/barriers, signs, and (most importantly) increasing patrol presence has been very effective. **Any one of these methods without the others, has less success and requires more follow up treatments.**

Chunking is described as using the bucket of an excavator or articulating blade on small trail dozer to de-compact unauthorized roads/trails by digging into the compacted area and creating divots (see below). These divots act as mini-catch basins (increasing infiltration), require minimal maintenance, and provide microsites for seed catchment and germination. In addition, container plants planted within the divots have high survival rates.

Above: Chunking with an excavator along a dozer line. After chunking, then the equipment spread topsoil and slash from the dozer piles over the treated area.

Success Story – Turtle Fire: After the 1999 Turtle Fire, which occurred in the west end of Baldy Mesa, the Forest was able to control off road use with a combination of both fencing, chunking, and patrols. This was done with fire dozers, the forest sweco trail dozer and contracted excavators. The Blue Cut Fire of 2001, which burned in the same general location as the North Fire, used contracted excavators to rehabilitate dozer line and unauthorized OHV trail impacts within the burn area. The excavators were able to create bank turns on rehabbed chunked lines at road junctions to redirect the recreational public and protect the resources. These "banked turns" replaced the use of fence on many of the interfaced points.

Success Story – North Fire: The 2015 North Fire, located adjacent to the 2016 Blue Cut Fire also burned portions of an OHV trail and exposed unauthorized trails from private onto forest lands. BAER treatments that included an excavator to chunk unauthorized routes and to bank turns were effective in redirecting OHV trail and forest road recreation use away from cultural resources and out of the North burn area. Installation of the pipe and cable fence was also effective. With high levels of recreational use and the knowledge gained from past fire recovery in the Baldy Mesa area, using multiple closure methods as discussed is expected to have the greatest potential for success to promote public safety, vegetation recovery and resource protection in the Blue Cut Fire.

2) Post-Winter Forest Closure and Emergency Condition Re-Assessment: The BAER team proposes that the Forest Closure Treatment and watershed response conditions be reevaluated by an interdisciplinary team of hydrologists, soil scientists, and other specialists in early summer 2017 to determine continued threats to public safety, infrastructure, and natural/historical

resources. At that time, the Forest Order may be adjusted and/or additional treatments identified. A short findings report will be produced from this re-evaluation.

3) Interagency/Partner/Permittee Coordination: Many non-Forest Service entities, partners and permittees (*e.g.,* So. CA gas, LA DWP, Kinder-Morgan, Verizon, SCE, Union Pacific Railroad, BNSF railroad, Caltrans, County of San Bernardino, NRCS, private land owners, Recreation Residences in Lytle Canyon, etc.) that have infrastructure in the fire are actively repairing damaged infrastructure. 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. Since much of the infrastructure is in T/E animal habitat, continued coordination is critical. 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.

Land Treatments – Summary of Treatments:

1) Mormon Rocks Fire Station Protection**:** Enhance the berm to protect the main station building from expected minor flooding and sediment. There is an existing berm that will be built up approximatley 2 feet and extented by 30 feet around upslope side of the building**.** In addition an outbuilding shed is at risk of damage from sediment. Sand bags will be placed around the strucuture to protect it**.**

2) Noxious Weed Detection and Rapid Response: Weed detection surveys and rapid response eradication treatments are to determine whether ground disturbing activities related to the Blue Cut Incident and the fire itself have resulted in new or the expansion of existing noxious weed infestations. With 31.5 miles of dozer line, 6 miles of hand line, 29 miles of trail, and 69 miles of riparian corridors in the fire, it is expected that new and expanding weed infestations will proliferate in and along these vectors if left unchecked, eventually leading to vegetation type conversion. As stated under the vegetation recovery threat section above, it is also expected that the 20,500 acre area reburned within the past 25 years will also face type conversion impacts given the rapid fire return interval that is much more frequent than historic fire events. Surveys and rapid response eradication treatments will begin in 2017 during the flowering periods of weed species. Because of differences in flowering times for all potential species, two visits will be required during the growing season. If timing is such that all the target species are detectable/treatable in one visit, the actual costs would be lower than displayed below. Completion of surveys in riparian areas, dozer lines, roads, staging areas, safety zones, known invasive plant populations and critical habitat for San Bernardino Kangaroo Rat and Southwestern Arroyo Toad would be the first priority. The second survey priorities would be along hand lines and drop points. Surveys of the general habitats in the burned area would be the lowest priority.

3) Developed Spring/Guzzler Protection: A sediment deflector will be used to protect identified wildlife water structures from potential sediment flow. Treatments could include sediment deflectors (wattles, sandbags, logs, or water bars) or traps constructed by hand above the spring development infrastructure to reduce the amount of sediment entering the water tanks

and to protect the infrastructure from erosion/flooding. Volunteers will be recruited from Quail Forever to complete the work under the guidance of the GS-6 biological technician.

4) Hazardous Waste Treatment: The proposed treatment is to remove a fiberglass guzzler that burned. Removal would require a crew with hand tools and appropriate PPE to cut up the fiberglass into small enough pieces to be trucked out and disposed of at a landfill.

5) Abandoned Mine Treatments: The proposed treatment is to fix the burned fence around the vertical ventilation shaft and replace burned signs at all of the mines. The fire exposed a vertical shaft and damaged the fence. Replacement of the fence is necessary to protect employees, public who violate the closure, and animals from falling in the open shaft.

Channel Treatments: None

Roads and Trail Treatments

1) Pacific Crest and Mormon Rocks Trails - Storm Proofing: Prior to the first damaging rain events and within the first year following the fire, storm proofing is recommended to minimize erosion or removal of trail tread. Storm proofing treatments, implemented with hand-tools, would include out-sloping, de-berming, rolling dips, armored crossings at ephemeral drainages, and other suitable treatments outlined in the BAER Treatments Catalog to protect the trail from accelerated post fire flows and soil erosion.

Pre-winter projects would include 5-6 days of storm proofing treatments. Following winter storms and before spring opening, it is likely additional repairs would be needed requiring another 5-6 days of crew time. ***NOTE:*** *This schedule will ensure the trail will be in good repair for 2017 Through Hikers.*

Treatments are recommended for **12.8 miles of the Pacific Crest Trail (Sections 3-6**) and **1.04 mile of The Mormon Rocks Trail**. Treatments would only be applied where post fire scouring and/or depositional processes are likely to impact the trail.

2) PCT Storm Inspection and Response: The inspectors would repair and maintain storm proofing treatments by correcting expected problems prior to spring trail opening. Information gathered during these site visits may also be used to submit an interim funding request to the region. This treatment would be applied in the same zones of concern identified in the trail storm proofing section, above.

3) Pacific Crest Trail Warning Signs: Closure of the PCT is “to be determined”. There is strong public interest in the trail as a recreational opportunity. Some “hazard tree” risks exist for approximately one mile at the north edge of the fire. Signs to warn users of hazardous conditions will be installed as soon as practical if the trail remains open, or appropriate Forest Closure signage will be posted otherwise. Ongoing trail and watershed conditions will be evaluated, especially after the first winter following the fire. Early spring monitoring and repair of trail and watershed conditions will be scheduled to ensure the safety of heavy, annual “through hiker traffic”.

Note: *PCT Hikers using Hwy 138 or Lone Pine Canyon Rd as an alternate would risk extremely hazardous traffic conditions*.

4) Road and Dam Storm-Proofing 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**.**

Approximately 10.5 miles of National Forest System (NFS) roads are proposed for treatment. The majority of the areas proposed for treatment go through high and moderate burn severity areas. The low burn severity areas are considered to respond as moderate severity due to steep unstable slopes and sediment bulking (dry ravel and rocks) in the upper 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, additional drainage structure overside drains, culvert repairs and removal, berm removal, culvert inlet modifications, public safety warning and road closure signs, road closure gates, rolling dips, leadoff ditches, and riprap armoring of slopes and drains.

The Keenbrook Dam is at high risk of damage or failure, which has an almost entirely burned watershed of moderate to high burn severity. If the dam were to fail, it is highly likely it will contribute to the downstream railroad infrastructure failure. Certain treatment measures have been identified that will help reduce the risk of damage to the dam and other infrastructure. Proposed dam treatments include: removal of up-channel loose woody debris and earthwork clearing to redirect side and main channel away from the dam earthen embankment.

Structure Treatments: None

Treatment Implementation Leader: The SBNF does not currently have the staff to dedicate to properly guiding the implementation of the suite of treatments recommended by the Blue Cut BAER. The Team proposes detailing in or borrowing staff from another forest to take the lead for an implementation effort.

Part V – I. Monitoring Narrative:
(Describe the monitoring needs, what treatments will be monitored, how they will be monitored, and when monitoring will occur. A detailed monitoring plan must be submitted as a separate document to the Regional BAER coordinator.)

Treatment Effectiveness Monitoring

Effectiveness Monitoring: TMonitoring the effectiveness of the other BAER treatments (as described above) will be used to determine if additional treatments are needed.

Monitor closure effectiveness This treatment includes a patrol person dedicated to the closure area, working weekends, holidays, and school vacation periods when use is highest, to enforce the closure maintain the structures, and augment closure structures as needed. The patrol would also help enhance presence during storms. This is an effective way to complete effectiveness monitoring of the closure and related treatments.

Monitoring the effectiveness of the above-described BAER treatments will be used to determine if additional treatments are needed to protect the T/E habitat and species. This includes monitoring the, mine closure treatment, spring/guzzler deflection treatment, and PCT storm proofing treatments.

BAER TREATMENT DESIGN FEATURES:

Design Features were developed for BAER treatments that will be implemented in Threatened and Endangered species habitat. **These measures will also be given to cooperators (*e.g.,* utilities, railroads, special use permittees, Caltrans, SCE, S. CA gas, County of San Bernardino, Union Pacific Railroad, BNSF railroad, Kinder Morgan, LA DWP, etc.) who propose to implement emergency actions on NFS lands.** These measures were included in the Emergency Consultation with U.S. Fish and Wildlife Service initiated by the SBNF for emergency actions related to the Blue Cut fire.

Design Features for Threatened/Endangered Species/Habitat Protection – Slender-horned spineflower, arroyo toad, San Bernardino kangaroo rat, southwestern willow flycatcher, least Bell's vireo, and desert tortoise

- Where work is conducted in or near T/E habitat or Critical Habitat, a biological monitor will be present.
- A biological will be present for work planned in occupied or Critical Habitat for arroyo toad, San Bernardino kangaroo rat, and desert tortoise. To protect animals in burrows, the biologist will work with crews to avoid equipment use and walking in habitat suitable for burrowing by arroyo toad, San Bernardino kangaroo rat, and desert tortoise. Pre-work surveys will look for active burrows and mark them for avoidance. Monitors will be on site to ensure that avoidance happens and to watch for individuals.
- Where work is conducted where water is present, a biologist will survey for arroyo toad tadpoles and egg masses. If any are found, those areas will be avoided.
- Vehicles will avoid areas that have water present. If crossings are necessary, the biologist will identify a crossing with the least likelihood of affecting aquatic habitat and water quality. The number of vehicles crossing wet crossings should be limited to the greatest extent possible.
- Where work is planned in suitable habitat for southwestern willow flycatcher or least Bell's vireo, a biologist will flag suitable habitat and guide crews to minimize activities that would degrade habitat conditions (riparian vegetation).
- Following the Forest Service guidelines, all vehicles and equipment coming on to NFS lands will be washed and inspected to minimize the risk of introducing and transporting non-native species to the site.
- Project administrators, inspectors, and personnel will be provided information on rare animals, rare plants, and weeds within project areas and provided direction for what to do if those species are encountered (including notification of a district biologist or botanist).
- Observations of any sensitive species or their diagnostic signs during project activities will be conveyed to the project field supervisor the day observed. The field supervisor will convey this information to the District Biologist.
- Nighttime (after dusk and before dawn) work (and use of artificial lighting) will not be permitted unless under special permission from the Forest Service.
- No side-casting of materials is permitted.
- Temporary overburden piles would be stored in road bed or other previously-disturbed site/clearing. Exceptions would require Forest Service approval.
- Pursuant to Forest Service Manual (FSM) Section 2081.03 guidelines for weed control, all equipment, vehicles, and tools (*e.g.*, augers, chain saws, hand clippers, pruners, etc.)

will be washed with a high pressure water/air system before entering the SBNF and before moving to new project sites. A wash log will be kept with the crew at all times. If a biological monitor is present, they will also retain a copy of the wash log.

- All material from off-site sources (fill, base material, fill, rock and gravel, straw, mulch, etc.) used for erosion control, rehabilitation of temporary routes/landings, and/or route maintenance must be certified weed-free (S-6, LMP Part 3, p. 5). Fill material will be dry before transporting to the site to minimize the risk of introducing non-native aquatic plants, pathogens, and invertebrates (*e.g.,* snails, mussels, chytrid, etc.).
- Project personnel will not bring pets to the work sites.
- Feeding of all wildlife is prohibited.
- Collecting of any wildlife or plants is prohibited.
- Trash and food shall be contained in closed containers and removed from the job site daily to reduce attractiveness to opportunistic wildlife species. All construction debris will be removed at the end of the job.
- If bird nests are found during project implementation, activities will cease in the immediate area until the Project/District Biologist is notified. The biologist will determine whether activities may resume or whether to stop activities until young have fledged and the nest is vacant (as determined by the project biologist).
- Crews will not intentionally injure or kill wildlife species (including snakes). Instead, animals will be allowed to leave the work area before work resumes.
- The project manager will coordinate with the biologist to minimize disturbance of existing downed logs and rock outcrops that are suitable for rare species. If disturbance is unavoidable, a biologist may need to be present to monitor for sensitive species during disturbance of the habitat. Equipment, supplies, materials, and soil/gravel, etc. will not be stored on or against logs or rock outcrops.

RECOMMENDATIONS:

SNAG REMOVAL IN SPOTTED OWL HABITAT: Many of the bigcone Douglas fir trees in the spotted owl habitat (along 3N31Y and potentially on the western end of the PCT) had brown needles but did not appear to have had the trunks burned enough to girdle the trees. It is possible that the needles died from heat and the trees may not be dead. **It is recommended that the trees be re-assessed by a forester next spring to determine if they are alive and not assumed that they are dead.**