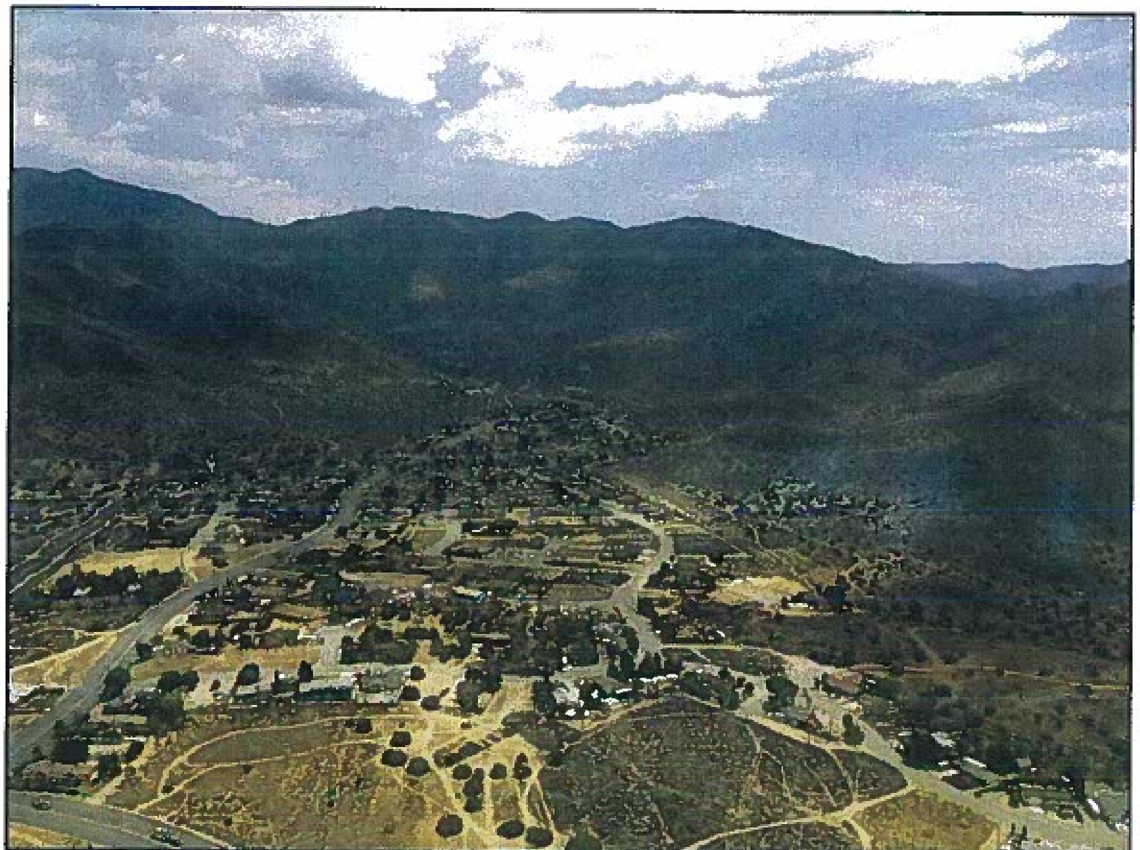
USDA-FOREST SERVICE

FS-2500-8 (7/08)
Date of Report: 7/15/16

ERSKINE FIRE BURNED-AREA REPORT
(Reference FSH 2509.13)

PART I - TYPE OF REQUEST



The Erskine Fire of 2016 looking up South Lake Subdivision towards Laura Peak along Lake Isabella.

A. Type of Report

[x] 1. Funding request for estimated emergency stabilization funds
[ ] 2. Accomplishment Report
[ ] 3. No Treatment Recommendation

B. Type of Action

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

A. Fire Name: Erskine Fire

B. Fire Number: CA-CND-001415

C. State: CA

D. County: Kern

E. Region: 5

F. Forest: Sequoia

G. Districts: Kern River Management Unit

H. Fire Incident Job Code: PDKBZ2

I. Date Fire Started: June 23, 2016

J. Date Fire Contained: July 10, 2016

K. Suppression Cost: $23 million

L. Fire Suppression Damages Repaired with Suppression Funds
   1. Dozerline repaired / waterbarred: 38 out of 45 miles as of 7/11/2016
   2. Hand line repaired: 15 out of 20 miles as of 7/11/2016

M. Watershed Number and Name:

HUC 12 watersheds affected by the Erskine Fire.

HUC 12 Watershed Name	HUC 12 Watershed Number	Acres
Isabella Lake-South Fork Kern River	180300020702	88,073
Middle Kelso Creek	180300020602	36,187
Isabella Lake-Kern River	180300010607	30,431
Upper Kelso Creek	180300020601	28,558
Erskine Creek	180300030101	23,258
Lower Kelso Creek	180300020604	18,296
Black Gulch-Kern River	180300030105	14,994

N. Total Acres Burned: Erskine Fire: 48,020
(NFS Acres 22,210; BLM 17,326; Private 8,484)

O. Vegetation Types: The dominant vegetation communities within the fire perimeter include Conifer (gray pine, Douglas-fir, incense-cedar and ponderosa pine), Hardwood (Bigleaf maple, red alder, white oak, black oak, and canyon live oak), Mixed Conifer and Hardwood Forest/Woodland and Shrub (mixed and montane chaparral).Vegetation communities were classified based on information obtained from CALVEG (USDA, 2009). A table of vegetation types within the burn area is displayed below, and a general vegetation map is displayed in Appendix A of the General Botany Report.

Feature	Name	Acres
AGR	agriculture	29
BAR	bare ground	407
CON	conifer	11667
HDW	hardwood	1314
HEB	herbaceous	6118
MIX	mixed	2028
SHB	shrub	26306
WAT	water	151
Grand Total		48020

P. The following soil map units comprise approximately 70% of the burned area in the Erskine Fire (Rock Outcrop, Siskiyou, Stineway, Livermore, Xyno, Cineba, Tollhouse, Southlake, and Tips)

Q. Geologic Types: The Erskine Fire occurred in the Piute Mountains, which are part of the Southern Sierra Nevada Mountain Range. The Piute Mountains are a long, narrow mountain range with elevations ranging from 2,500 feet above sea level (Lake Isabela) to 8,400 feet above sea level at Piute Peak. The physiography of the Piute mountains is dominated by extremely steep slopes, all associated with watersheds flowing directly or indirectly into Lake Isabela.

The Erskine Fire is underlain by granitic and metamorphic rocks consisting of Granite of Kern River (Kkr), Granite of Bodfish Canyon (Kbo), Granite of Bob Rabbit Canyon (Kbra), Granodiorite of Goat Ranch (Kgc), Granodiorite of Rabbit Island (Kri), Granodiorite of Kelso Peak (Kkp), White rock facies Granodiorite (Kcrw), Metamorphic – Metasedimentary rocks, Long Canyon Metasedimentary rocks (Jtlc), French Gulch Meta-volcanic rocks (Kfv) and Marble lenses in several metasedimentary belts. Surficial geologic rocks include surficial deposits of unconsolidated alluvial sedimentary rocks. Bounding the Piute Mountains to the west is the Kern Canyon Fault, which runs along the north-west corner of the burned area.

R. Miles of Stream Channels by Order or Class: 15 Miles Perennial, 173 Miles Intermittent, 357 Miles Ephemeral

S. Transportation System:

- Roads: 115 (3 FS, 38 BLM, 64 County, 0.47 private) miles
- Trails: 59 miles

PART III - WATERSHED CONDITION

A. Soil Burn Severity by total and FS (acres):

Soil Burn Severity	SQF	BLM	Pvt	Totals
High	295.8	22.5	17.4	**335.7**
Moderate	11,551.50	6,897.10	2,298.50	**20747.1**
Low	7,899.50	8,718.50	4,879.90	**21497.9**
V. low to unburned	2,462.30	1,688.30	1,288.50	**5439.1**
Totals	**22209.1**	**17326.4**	**8484.3**	**48019.8**

Interpreting the Soil Burn Severity Map: Fire Intensity vs Soil Burn Severity

Parameters commonly used to define fire intensity or burn severity on vegetation are flame height, rate of spread, fuel loading, thermal potential, canopy consumption or tree mortality. Soil burn severity for BAER analysis considers additional surface and below-ground factors that relate to soil hydrologic function, runoff and erosion potential, and vegetative recovery. Indicators of soil burn severity include degradation of surface structure, loss of soil organic matter, and consumption of fine roots and formation of water repellent layers. River BAER Soil Scientists followed standard soil burn severity mapping methods fully described in the Field Guide for Mapping Soil Burn Severity (http://www.fs.fed.us/rm/pubs/rmrs_gtr243.pdf).

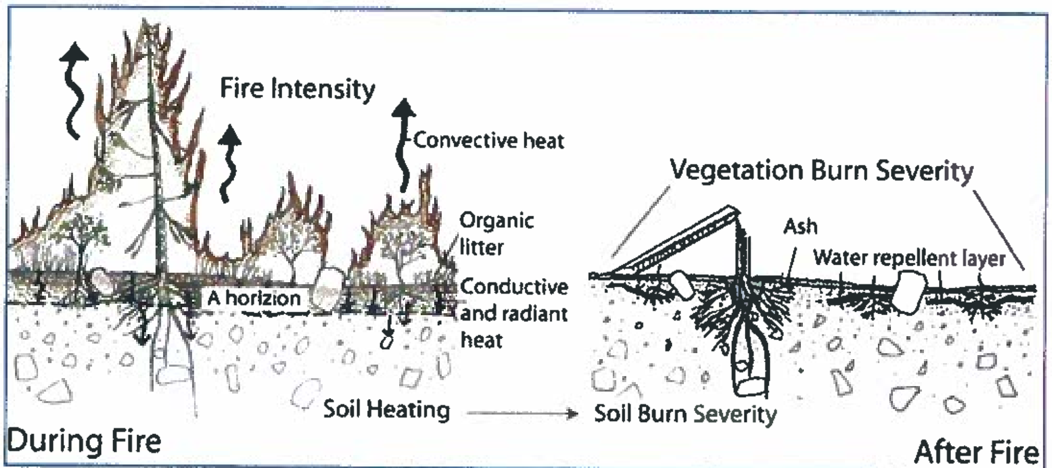
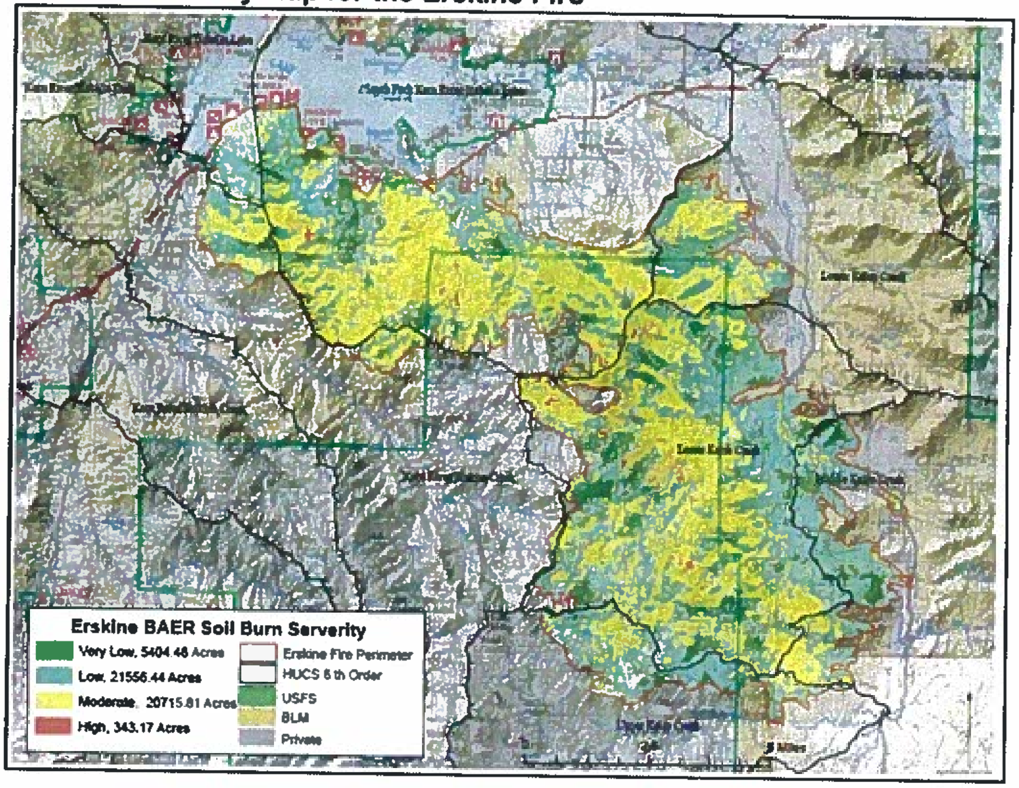


Figure 2 Illustrates the effect of fire intensity on above-ground vegetation and Below ground soil properties (Graphics by Mike Hankinson, National Park Service)

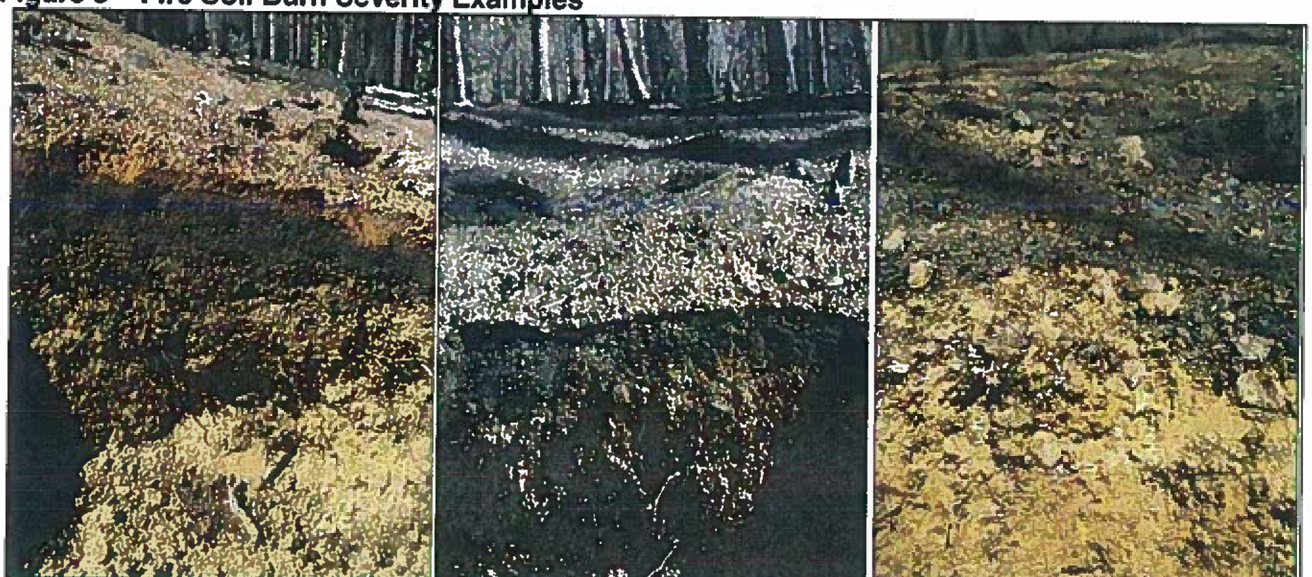
The following soil burn severity map (Figure 1) illustrates the general soil burn severity pattern on the landscape. The soil burn severity is overwhelmingly moderate (43%) and low (44.9%). In most of the moderate burn severity, and some of the low severity (particularly on south-facing slopes), there is very little vegetation or ground cover remaining except surface rock. There is only 1% high soil burn severity because of the low pre-fire ground cover, and partly because the fire was heavily wind-driven and had short residence times. Very low soil burn severity was 11% of the fire area.

Figure 1 – Soil Burn Severity Map for the Erskine Fire



The following pictures (Figures 3 & 4) are companion pictures to show typical soil burn severity and landscapes with mixed mortality due to differing vegetation types, slopes, aspect, and location.

Figure 3 – Fire Soil Burn Severity Examples



High soil burn severity effects are degradation of surface structure, consumption of soil organic material and formation of water repellent layers	**Moderate soil burn** severity with fire effects of litter and duff removal and char and water repellency to 1 inch below the surface	**Low soil burn severity** due to minimal fire effects on this soil with a clay-loam surface texture

Figure 4 – Landscape examples for soil burn severity

High soil burn severity landscape	Moderate soil burn severity landscape	Low soil burn severity landscape

General Soil Burn Severity Patterns, Selected Influencing Factors and Recovery Interpretations (based on field observations)

<u>Selected Factor Influencing Soil Burn Severity</u>: *Weather*
Weather conditions which influenced fire behavior. For example the fire progression was extreme due to strong winds and light, flashy fuels and moved east from the town of Lake Isabella to South Lake within a few hours of ignition, eventually reaching more than 35,000 acres in less than 24 hours. The fire then moved in a southerly direction, burning in the Piute Mountains parallel to and within the Kelso Creek drainage to approximately 2 miles south of Cortez Canyon.

<u>Selected Factor Influencing Soil Burn Severity</u>: *Terrain*
Steep terrain and chimney canyons played a role in fire behavior along with wind patterns. South and southwest slopes typically have lower humidity, higher fuel temperatures and are more exposed to summer winds.

<u>Selected Factor Influencing Soil Burn Severity</u>: *General Vegetation Type, Density and Fire History*
Vegetation cover type, density and fuel loading also likely influenced the soil burn severity patterns.

<u>Selected Factor Influencing Soil Burn Severity</u>: *Soil Type/Surface Layer Texture*
Soil type also influenced soil burn severity patterns. Fire effects on soils such as degradation of structure, changes in soil color, consumption of fine roots and depth of water repellent layers were strongly influenced by soil surface texture. In soils with clay loam surface textures, fire effects on soil were commonly minimal and water repellency generally occurred at the surface. In soils with sandy loam and fine-gravelly loam surface textures, fire effects on soil were common to depths of up to an inch and water repellency was observed at depths of up to 8 inches.

Initial Interpretation for Recovery of Hillslope Stability: *Ground Cover*
Very high rates of needle and leaf cast were observed in forested areas with low and moderate soil burn severity. Thin layers of scorched needles and leaves are providing effective erosion control in these areas. In forested areas that experienced high soil burn severity or areas where shrub cover was consumed, ground cover recovery will be slower. Recovery of low lying vegetation will heavily influence recovery of hill-slope stability in these areas.

B. Soil Resource Condition Assessment Sections:

The Erskine Fire burned 48,019.9 acres in the Piute Mountains south of Lake Isabella, CA near Kernville between 2,500 and 5,900 foot elevations. The average slope of the burned area is 39%. The vegetation included a mix of oak woodland, sagebrush, chaparral, and mixed forest at the highest elevations. Much of the forested area was a re-burn of the 2008 Piute fire, which had a notable component of dead & down woody debris that was consumed. The soils are mostly moderately deep, with some deep soils in the forested terrain, and 9% rock outcrop. Total surface water holding capacity of the Mod-deep soils is ~1.5 inches, while deeper soils hold ~3 inches of water. Total annual precipitation for the burned area varies drastically with elevation & from West to East because of a prominent rain shadow. Rainfall ranges from ~8 - 25 inches; and 17.1 inches was the average annual precipitation used from Rock:Clime for ERMiT modeling. The two year six hour storm is 1.1 inches.

The high and moderate soil burn severity classes have evidence of severe soil heating in a patchy distribution – increased runoff and accelerated erosion are likely. Some of these areas do have good needle-cast potential, which is expected improve groundcover. The low to very low soil burn severity classes still have good soil structure; contain intact fine roots and organic matter with hydrologic function unaltered.

C. Water Repellent Soils:

16,451 acres (34% of fire area)

Hydrophobic soil conditions were common within moderate and high burn severity (50-60% area) and rare in low burn severity (20% area). Hydrophobic strength was often moderate in the top 3 cm, and occasionally strong in the upper end (worst) of moderate burn severity. Hydrophobic conditions are expected to exist in approximately 34% of the fire area.

D. Erosion Potential (erosion hazard rating):

Soil texture, climate, slope, rock content and burn severity dictate soil EHR. These ratings are consistent with field observations made during the BAER soil assessment.

Table 1 - EHR

Erosion Hazard Rating	Acres	% of Fire
Low	5,830	12%
Moderate	8,462	18%
High	17,593	37%
Very High	9,474	20%

Unrated Rock Units	**6,660**	**14%**

Erosion and Sediment Potential is assumed to be similar in burned landscapes dominated by steep slopes and is discussed in Section E.

E. Sediment Potential:
The Erosion Risk Management Tool (ERMiT), was used to model both pre and post fire sedimentation. In areas with moderate and high burn severity, erosion potential was generally increased above natural conditions. Sedimentation was modeled for the first year post-fire with 2, 5, and 10 year runoff events.

Summary of Watershed Response

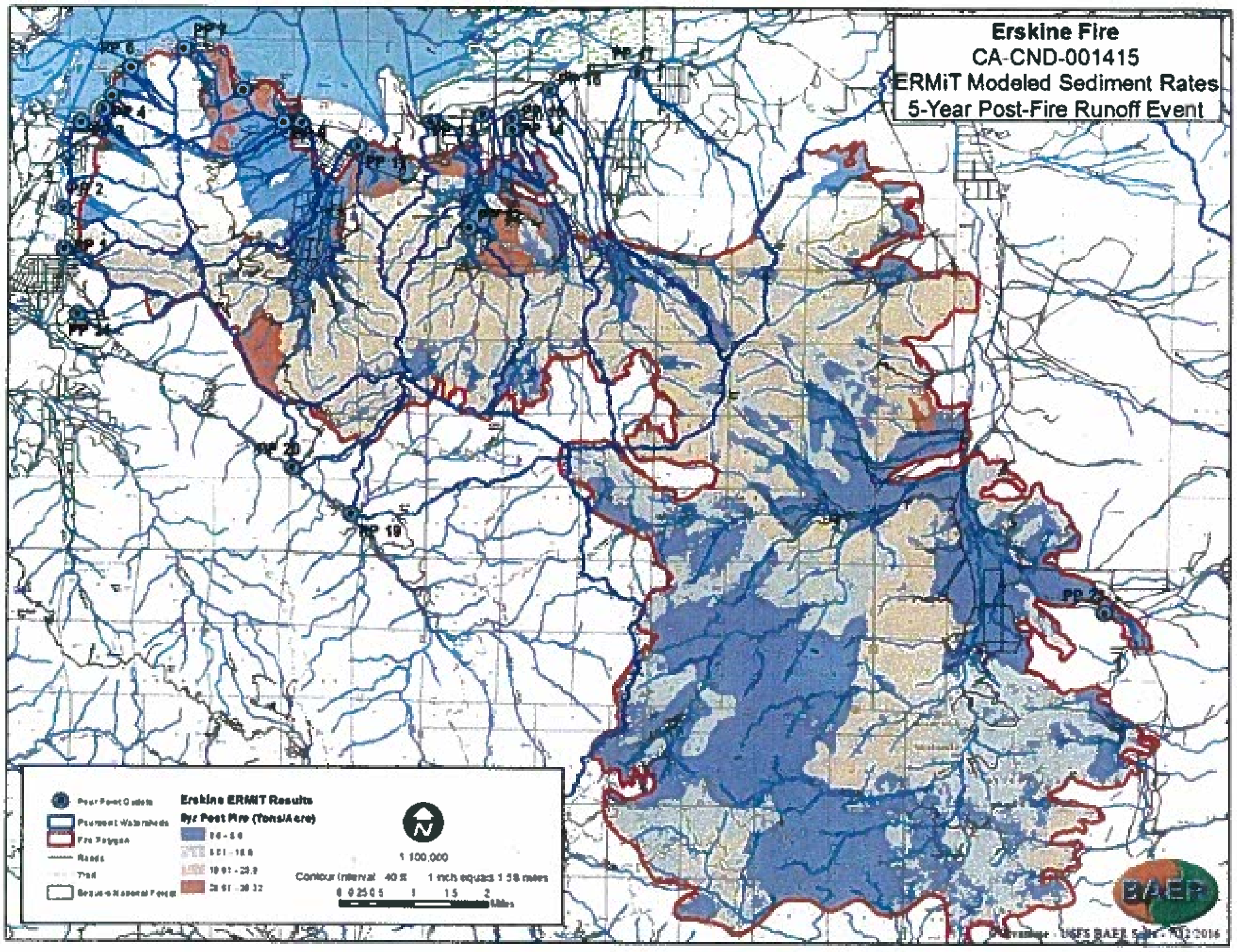
Erosion Response: In some, but not all pour-point watersheds, significant erosion and sedimentation is expected. Most of the moderate burn severity, and even some of the low burn severity areas contain extremely low ground cover levels, which could contribute to high erosion levels. 57% of the fire area has either a high or very high erosion hazard rating (Table 3).

Table 3 - Modelled Hillslope Erosion by Watershed

Pour Point ID	2 - Year: Average Sediment Delivery Rate (Tons/Acre)	2 - Year: Total Sediment (Tons)	5 - Year: Average Sediment Delivery Rate (Tons/Acre)	5 - Year: Total Sediment (Tons)	10 - Year: Average Sediment Delivery Rate (Tons/Acre)	10 - Year: Total Sediment (Tons)	2 - Year (Pre Fire): Average Sediment Delivery Rate (Tons/Acre)	2 - Year (Pre Fire): Total Sediment (Tons)
Whole Fire Pre Fire	0.1	6,725.3	0.4	30,698.9	1.7	81,538.0	-	-
Whole Fire Post-Fire	1.1	91,058.5	4.5	388,360.9	9.7	772,438.9	-	-
							Pre-Fire Data	
PP 1	1.5	1516.8	6.2	6038.5	15.9	14170.1	0.2	163.3
PP 2	1.0	2000.3	4.4	8136.1	11.2	18423.1	0.1	195.8
PP 3	1.1	1156.6	4.7	4601.4	11.7	10775.5	0.1	128.6
PP 4	1.7	375.3	6.9	1484.9	17.1	3440.8	0.2	42.1
PP 5	1.6	441.0	6.7	1766.7	16.8	4002.1	0.2	45.9
PP 6	1.6	120.9	6.7	499.9	16.8	1125.1	0.2	11.7
PP 7	2.0	1457.5	7.1	5019.6	13.5	9315.0	0.3	230.6
PP 8	6.2	704.7	16.3	1832.6	23.6	2671.2	1.4	145.9
PP 9	4.6	981.9	12.8	2662.8	20.0	4088.6	1.0	257.6
PP 10	1.3	3328.8	5.1	14409.7	11.1	29958.0	0.2	200.1
PP 11	1.3	11472.4	5.5	48185.8	11.5	90861.3	0.2	931.2
PP 12	1.5	2279.2	5.9	9336.1	11.0	17203.6	0.2	150.8
PP 13	1.4	9591.6	5.8	43241.8	12.6	85343.8	0.1	846.5
PP 14	0.9	301.3	4.3	920.8	10.0	1700.4	0.0	12.7
PP 15	0.1	2.0	0.8	14.8	1.8	28.3	0.0	0.3
PP 16	1.1	2213.0	5.5	17803.9	12.2	40632.1	0.0	35.1
PP 17	1.2	1745.6	5.8	8982.1	15.0	19941.4	0.1	104.3
PP 18	1.2	45287.6	4.8	189420.8	9.9	372557.5	0.1	2454.8
PP 19	1.5	201.7	6.6	1336.9	16.5	2996.5	0.1	7.6
PP 20	3.9	830.0	13.9	5846.0	27.4	12224.4	0.7	62.7
PP 21	2.4	146.0	9.4	570.3	24.3	1403.3	0.3	17.4
PP 22	1.6	4763.9	6.6	22856.7	13.7	46763.2	0.2	232.8

In pour-point watersheds, sedimentation rate increases range from 2.8 X to 62 X above background in a 2-year runoff event, and range from 14.9 X to over 200 X increase in a 10-year runoff event. Sediment increases are the most pronounced on the steep slopes to the west of Cook peak (Pour-points 1-6), and in the upper portions of Goat Ranch Canyon (Pour-point 16) and Lynch Canyon (Pour-point 11). However, fire-wide the erosion rates are much lower, averaging only 1.1 tons/acre in a 2-year runoff event, and 4.5 tons/acre in a 5 year runoff event (Figure 5).

Figure 5 – Predicted 5-year ERMiT Erosion Rates for the Erskine Fire



Hydrology

The overall soil burn severity showed approximately 1% high, 43% moderate, 45% low, and 11% very low to unburned. Hydrological analysis evaluated seven 6th-Field (HUC12) watersheds and 23 pour points defined at potential Values at Risk. Most HUC12 watersheds showed minimal increases (<50%) in runoff from fire effects, except Lower Kelso Creek, which showed a 112% increase in Q2 runoff for a 2 year 6 hour design storm. Of the 23 pour points modeled, seven showed increases in runoff (relative to Q2) over 100% (119% to 250%) and seven showed increases in runoff between 50-100%. It is important to note that, although the increases are high relative to normal Q2 discharge, none of the pour points modeled exceeded a Q10 discharge. Stream channels measured in the vicinity of Values at Risk showed confinement to >Q50 and in many cases >Q100. As such, risks from flooding alone are considered moderate to-low for a 2 year, 6 hour design storm.

The key Values at Risk were those residential areas below basins that showed both high increases in runoff and increased potential for debris flow. These conditions exist for basins on the west flank of Cook Peak adjacent to the town of Lake Isabella, which ranked as a "very high" on the BAER risk matrix, and the areas immediately below the steeper slopes in the Squirrel Valley and Goat Ranch area, which rated as "High" on the BAER risk matrix. For analysis purposes, the burned area was separated into 23 pour points (Figure 3a). Pour points are established in order to facilitate a more detailed analysis of stream discharge in smaller un-gaged sub-drainages. For the Erskine Fire, all 23 pour points relate to potential downstream Values at Risk.

Watershed response in the burned watersheds can change significantly as compared to pre-fire conditions. Vegetation and underlying organic matter slows runoff and protects soils from direct raindrop impact, assists with water infiltration to soil and releases runoff at slower rates. Consumption of organic material and high soil heating can promote the formation of water repellent layers, at or near the soil surface, which result in the loss of soil structural stability. The strength and depth of water repellency varies greatly by the duration and intensity of soil heating, type of organic matter consumed by the wildfire, and soil texture and moisture content (see soils report for more information).

Steep upper elevations of the drainages have the ability to generate sudden releases of storm runoff of high velocity. Rainfall intensity rates during large storm events are typically higher in these areas; rates can exceed 0.5 inches or higher per hour and is not uncommon during most winter rain seasons or rain-on-snow events.

With some of the hill slopes in the moderate to high soil burn severity areas mostly devoid of vegetation and groundcover, the first large runoff producing storms will likely create increased surface flow volumes and velocities that can transport available sediment and ash from the slopes and along the channel bottoms. This scenario, coupled with existing wet antecedent soil conditions from previous storms, could trigger a flood event and/or debris flow with higher than normal sediment yield and runoff.

Fires that burn in predominately forested areas have conifers or other trees that will shed needles and/or leaf litter in the low and moderate burn areas, providing for some degree of ground cover and erosion protection before the first runoff producing winter storms. The Erskine fire, however, burned over high desert steppe terrain, mainly burning grass and shrub with only small pockets of conifers being consumed, thus little to no ground cover in the form of needle cast or litter will be available in areas of low to moderate soil burn severity. This condition, coupled with a high percentage of rock outcrop, is expected to produce more runoff than forested areas.

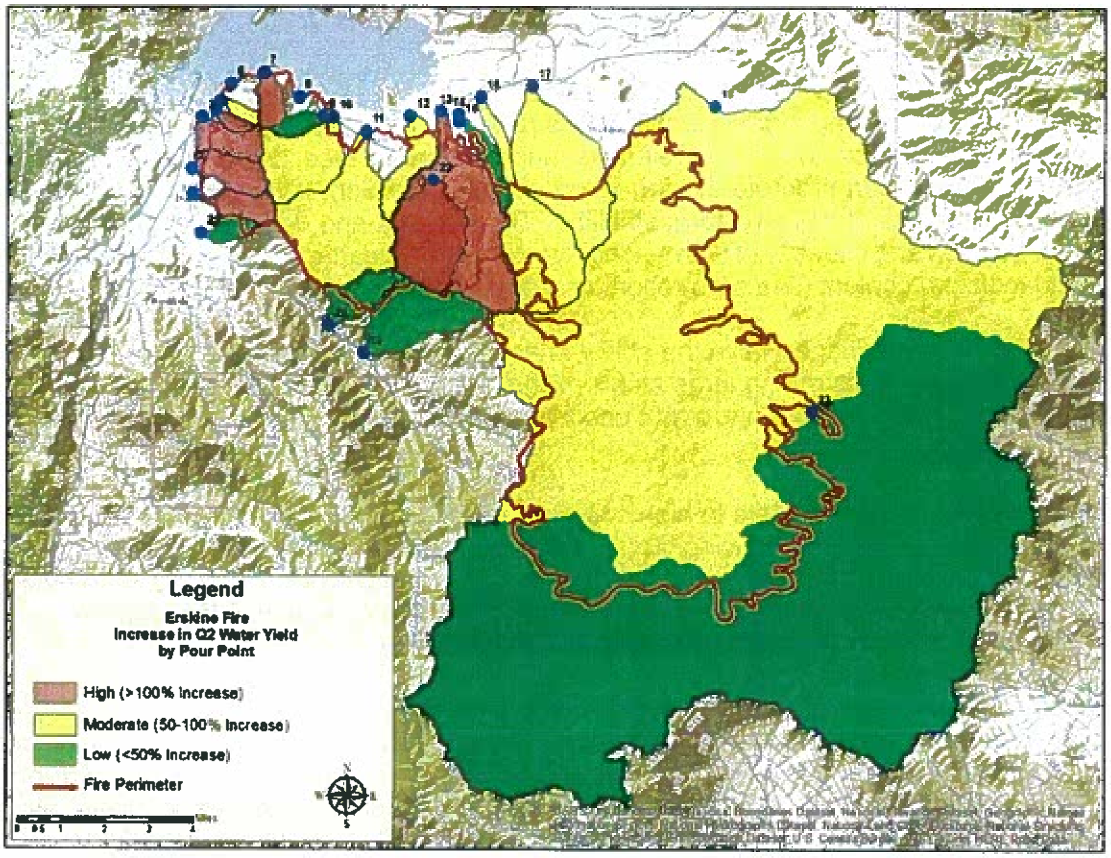


Figure 3a. Map showing the location of pour points used to model post fire runoff. Color coding denotes increase in runoff due to soil burn severity: Red (High) is greater than a 100% increase in runoff; Yellow (Moderate) is between 50-100% increased runoff; and Green (Low), which is less than 50% increased runoff.

Increases in discharge associated with predicted recurrence intervals are prorated across watersheds by soil burn severity to yield post-fire discharge or the adjusted design flow. The following assumptions were made for calculating the adjusted design flow:

- A 2 year, 6 hour storm will produce a bankfull (i.e., Q2) discharge response.
- Runoff would be commensurate with soil burn severity (Figure 1).
- Granitic terrain would produce flashier and more pronounced runoff (relative to metamorphic terrain) due to the higher percentage of rock outcrop, lack of deep soils and absence of ground cover; thus a Q2, Q5, Q10 and Q25 recurrence array was used (Table 8).
- No ground cover in the form of needle cast of leaf litter would be available to armor and mitigate rain spatter impact and runoff.

The USGS regression equations for the Sierra Nevada region underestimate Q2 by an average of 47% relative to regional curves developed for the Kern River drainage (Kaplan-Henry, 2004); as such Q2 was adjusted to reflect this change.

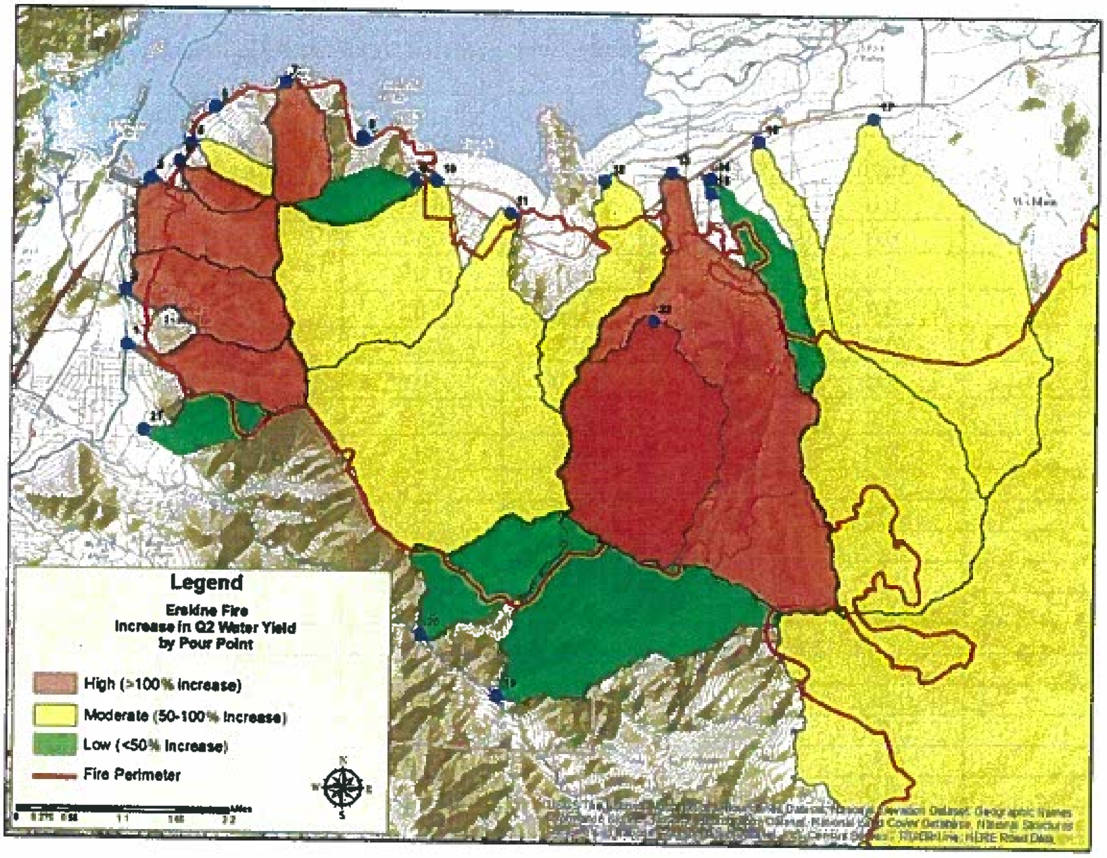


Figure 3b. Map showing the location of pour points in areas with the highest relative runoff. Color coding denotes increase in runoff due to soil burn severity: Red (High) is greater than a 100% increase in runoff; Yellow (Moderate) is between 50-100% increased runoff; and Green (Low), which is less than 50% increased runoff.

The fire has been analyzed at both the 6th field watershed (HUC12) and at a smaller sub-drainage size where VAR pour points have been defined (Figure 3a). Table 7 displays the amount of burned lands by severity for the affected 6th field HUC12 watersheds and Table 8 shows the relative burn severities for the contributing sub-drainages above pour points associated with potential Values at Risk.

Table 7 - 6th Field HUC12 Watersheds Affected by the Erskine Fire.

6th Field Watersheds (HUC12)	Burn Severity in Miles^2				Watershed Area Miles ^{2}
	High	Moderate	Low	Unburned	
Black Gulch-Kern River	0.0	0.77	1.05	21.58	23.4
Erskine Creek	0.0003	0.72	1.05	36.4	38.2
Isabella Lake-SF Kern River	0.196	12.9	8.79	115.71	137.6
Isabella Lake-Kern River	0.0	0.11	0.467	46.92	47.5
Upper Kelso Creek	0.0	1.24	2.77	40.59	44.6
Middle Kelso Creek	0.067	7.0	10.4	39.03	56.5
Lower Kelso Creek	0.26	9.62	9.11	9.61	28.6

Table 8 – Contributing subdrainages above pour points associated with potential Values at Risk. Refer to Figure 2 for pour point location.

Subdrainage (pour point)	Burn Severity in Miles²				Subdrainage Area Miles²
	High	Moderate	Low	Unburned	
1	0.0	0.21	0.5	0.09	0.80
2	0.0	0.56	0.43	0.11	1.10
3	0.0	0.11	0.53	0.364	1.00
4	0.0	0.016	0.2	0.02	0.20
5	0.0	0.04	0.19	0.003	0.20
6	ND	ND	ND	ND	ND
7	0.0	0.16	0.41	0.03	0.60
8	ND	ND	ND	ND	ND
9	0.0	0.092	0.22	0.12	0.40
10	0.024	0.99	1.2	0.386	2.60
11	0.006	3.1	1.62	0.674	5.40
12	0.0	0.67	0.32	0.31	1.30
13	0.08	3.6	1.99	2.13	7.8
14	0.0	0.079	0.097	0.527	0.70
15	ND	ND	ND	ND	ND
16	0.082	1.9	0.81	1.51	4.30
17	0.005	0.85	0.41	3.835	5.10
18	0.32	18.6	23.1	112.88	154.9
19	0.0	0.1	0.06	2.74	2.90
20	0.0	0.34	0.3	0.56	1.20
21	0.0	0.001	0.07	0.429	0.50
22	0.08	2.22	0.52	0.26	3.20
23	0.009	1.97	4.99	47.43	81.4

ND: No Data. These were preliminary pour points that were either too small for the model resolution, redundant or did not warrant further modelling.

Table 9 - 6th Field HUC12 Watersheds and their adjusted design flow by soil burn severity.

Watershed		Discharge by Severity in cfs*				Discharge by Watershed in cfs**		Discharge by Watershed in cfs/mi²**	
6th Field Watersheds	Affected WS Area Miles²	High Severity Burn	Moderate Severity	Low Severity	Unburned	Pre fire*	Post Fire	Pre-fire flow in cfs/ mi²	Post-fire flow in cfs/mi²
Black Gulch-Kern River	23.4	0.0	16.1	22.05	159.3	175.0	197.41	3.9	4.43
Erskine Creek	38.2	0.006	8.48	6.76	102.3	107.3	117.58	2.8	3.08
Isabella Lake-SF Kern River	137.6	5.09	187.3	82.7	619.3	736.5	894.5	5.4	6.5
Isabella Lake-Kern River	47.5	0.0	2.11	5.73	316.6	320.5	324.45	6.7	6.83
Upper Kelso Creek	44.6	0.0	16.1	22.05	159.3	175.0	197.41	3.9	4.43
Middle Kelso Creek	56.5	2.01	115.3	108.6	219.3	317.5	445.3	5.6	7.88
Lower Kelso Creek	28.6	8.03	160.1	93.65	49.39	147.0	311.2	5.1	10.88

Table 10 – Pour point basins and their adjusted design flow by soil burn severity.

Values at Risk		Discharge by Severity in cfs*				Discharge by Watershed in cfs		Discharge by Watershed in cfs/mi²	
Pour Points	Affected WS Area Miles²	High Severity Burn	Moderate Severity	Low Severity	Unburned	Pre fire*	Post Fire	Pre-fire flow in cfs/ mi²	Post-fire flow in cfs/ mi²
1	0.80	0.0	3.94	5.0	0.405	3.6	9.34	4.5	11.68
2	1.10	0.0	10.69	4.30	0.441	4.41	15.43	4.0	7.01
3	1.00	0.0	2.2	5.83	1.61	4.41	9.64	4.4	12.04
4	0.20	0.0	0.4	3.0	0.147	1.47	3.55	7.4	17.74
5	0.20	0.0	1.0	1.9	0.022	1.47	2.92	7.4	14.61
6	ND	ND	ND	ND	ND	ND	ND	ND	ND
7	0.60	0.0	2.9	4.1	0.147	2.94	7.18	4.9	11.97
8	ND	ND	ND	ND	ND	ND	ND	ND	ND
9	0.40	0.0	0.92	0.81	0.441	1.47	2.17	3.7	5.42
10	2.60	0.369	8.38	4.07	1.31	8.82	14.13	3.4	5.43
11	5.40	0.09	24.7	5.29	2.20	17.64	32.27	3.3	5.98
12	1.30	0.0	5.67	1.08	1.05	4.41	7.81	3.4	6.00
13	7.8	2.23	55.84	16.83	7.63	27.93	82.55	3.6	10.58
14	0.70	0.0	0.8	0.407	2.20	2.94	3.40	4.20	4.85
15	ND	ND	ND	ND	ND	ND	ND	ND	ND
16	4.30	1.39	17.7	3.32	6.18	17.64	28.58	4.1	6.65
17	5.10	0.15	14.17	3.78	15.47	20.58	33.57	4.0	6.58
18	154.9	4.72	150.6	101.2	209.9	288	466.4	1.9	1.89
19	2.90	0.0	1.76	0.559	11.11	11.76	13.43	4.1	4.63
20	1.20	0.0	3.4	1.10	2.06	4.41	6.56	3.7	5.47
21	0.50	0.0	0.022	0.84	2.52	2.94	3.38	5.9	6.77
22	3.20	2.48	37.5	4.71	1.07	13.23	45.72	4.1	14.29
23	81.4	0.137	16.2	21.9	134.4	147.0	172.63	1.8	2.12

Design Flow Runoff Response

Before an adjusted design flow can be determined, pre-fire design flow must be calculated. This is the flow expected to occur prior to the fire and the flow responsible for forming present day channel conditions. These flows are used to estimate proper performance of culverts and other drainage structures. Design flow estimates for the Erskine Fire have been based on the U.S. Geological Survey regression equations developed for the Sierra Nevada (Gotvald, et al., 2012).

Adjusted design flow is calculated using the same relationships as design flow; however, runoff response is estimated by assuming an increased runoff commensurate with soil burn severity in terms of recurrence interval. This recurrence interval estimates the response of the newly burnt landscape to the design storm of interest. The Erskine Fire is expected to respond to an average rainfall event differently for the unburned, low, moderate, and high soil severity burned areas. Table 10 shows the estimated runoff response for a 2 year, 6 hour design storm by soil burn severity.

In order to further assess potential values at risk within the fire, pour point basins were identified and mapped (Table 9). These basins are various sizes and are determined by the desired outlet or pour point above a value at risk or area of concern. These sites may be within or downstream of the burned area. The size of the watershed is dependent on the local flow patterns in addition to the need to evaluate a basin for values at risk.

Pre and Post Fire Peak Flow Model Results:

Soil burn severity information was used to model post-fire runoff response for each HUC 6 and each pour point watershed. Pour point basin pre and post-fire runoff estimates are shown in. The model developed by Gotvald, et al, 2012 was used to forecast runoff from areas that were burned in the Erskine Fire. It is a regional regression analysis utilizing stream gages on gaged streams in California to estimate water discharge on ungaged streams. The equations for the North Coast region were used which utilizes drainage area and mean annual precipitation of the desired watershed to determine peak discharge for streams in that watershed. StreamStats was used to model pre-fire runoff from each pour point basin.

Soil burn severity information was used to model post-fire runoff response for each pour point watershed. Hydrologic modelling using a 2 year, 6 hour design storm in some cases shows relatively high increases in runoff; however, it is important to note that, although the increases are high relative to normal Q2 discharge, none of the pour points modeled exceeded a Q10 discharge. Stream channels measured in the vicinity of Values at Risk showed confinement to >Q50 and in many cases >Q100. As such, risks from ***flooding*** alone are considered moderate to-low for a 2 year, 6 hour design storm. The VAR's most susceptible to flooding hazard would include the culvert at the pour point 1 outlet along Erskine Creek Road in Lake Isabella and the damaged culvert identified on a private road in the Goat Ranch (South Lake) community (pour point 22). In general, bulking from ash, sediment, and floatable woody debris could block these and other culverts in and downstream of the burn area causing damage to road prisms, and in extreme cases of very high runoff, cause complete road failure. It is recommended that storm patrols keep culverts free of debris along State Highway 178 and in the communities of Lake Isabella (Lakeview Estates), Squirrel Valley, and South Lake.

<u>Geology</u>

Rock-fall and debris slides are eminent along some steep slopes below the Cook Peak Ridge. Drainages in this same area have been identified in the field for potential debris flow hazard zones. With the aid of USGS Debris Flow Modeling, debris flow probabilities and potential volumes have been calculated.

Based on our field observations, our conclusion is that whether the primary post-fire process is rockfall, debris slides, debris flows or sediment laden flooding, the cumulative risk of various types of slope instability, sediment bulking and channel flushing is high along slopes and creeks flowing down from the Cook Peak ridge. Even though the USGS modeling presents low-moderate (20%-60%) probability of debris flows in the majority of drainages flowing down from the Cook Peak ridge, based on ground and aerial observations (quantities of rocky materials available to be transported and steepness of slopes and channels) we estimate that the majority of drainages in this area have moderate to high potential to produce debris flows. Conversely, even though other areas of the Erskine Fire present high probabilities of producing debris flows, no direct impact to Values At Risk (VAR) are expected in some of those remote drainages.

Treatments for debris flow and flooding hazards include notification of the public of these hazards through a warning system and installation of warning signs along roads in the burn area.

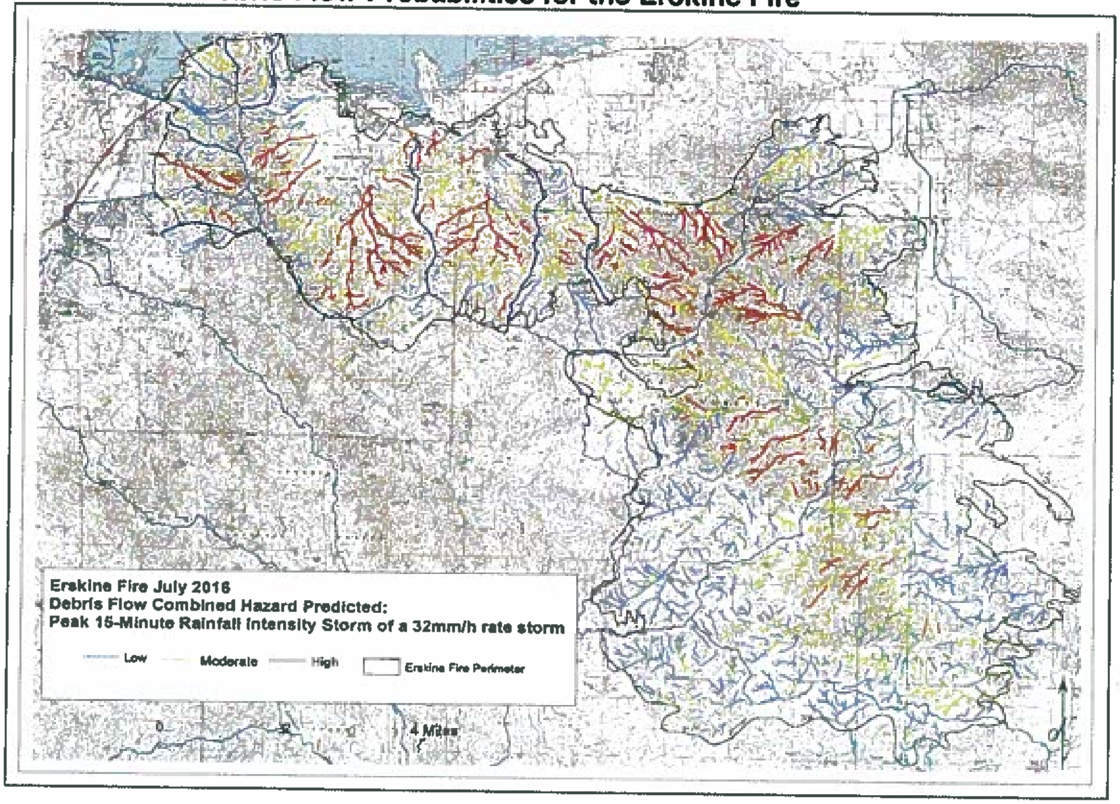
Following the Erskine Fire segments of the Cook Peak road will experience excessive rock-fall, potential debris flows and erosion. In order to prevent as much erosion and damage to the road surface as possible it is recommended to take some actions (storm proofing) before the first winter-storms arrive. Specific recommendations/treatments are described in the engineering report.

Debris Flow Potential:

The US Geological Survey (USGS) - Landslide Hazards Program, has developed empirical models for forecasting the probability and the likely volume of post-fire debris flow events. To run their models, the USGS uses geospatial data related to basin morphometry, burn severity, soil properties, and rainfall characteristics to estimate the probability and volume of debris flows that may occur in response to a design storm (Staley, 2016). Estimates of probability, volume, and combined hazard are based upon a design storm with a peak 15-minute rainfall intensity of 12 – 40 millimeters per hour (mm/h) rate. We selected a design storm of a peak 15-minute rainfall intensity of 32 millimeters per hour (mm/h) rate to evaluate debris flow potential and volumes since this magnitude of storm seems likely to occur in any given year.

Based on USGS debris flow modeling, basins / creeks in the Erskine Fire burned area have a wide range of probability (0-100%) of producing debris flows. Similarly, predicted volumes of debris flows through-out the burned area range from 1k – 100k cubic meters. From analyzing the combined hazard maps, it is clear that even though high hazard debris flows drainages exists through-out the burned areas, the concern areas are focused on the creeks and drainages flowing down from the Cook Peak range, as well as other burned slopes and drainages located directly above existing communities and private residences. Beyond these high concern areas, other drainages that have a moderate-high probability of producing debris flows, are not expected to impact directly any Values At Risks (VAR's).

Figure 6 – Predicted Debris Flow Probabilities for the Erskine Fire



Assessment of the Erskine Fire showed that susceptibility to slope instability will be associated with watersheds within the fire that have significant volumes of sediment in the channels or are likely to experience increases in sediment volume from fire-affected slopes. Sediment increases would be associated with significant areas of susceptible bedrock that were subjected to high or moderate burn severity. The basis for this assumption is a research on wildfire-generated debris flows, which can be extrapolated to other types of slope movement. Rather than being the result of infiltration-induced slope movements into the channels, wildfire-generated debris flows are a result of progressive bulking of storm flow with sediment within the channel and washed from the adjacent slopes (Cannon, 2000, 2001).

PART IV - HYDROLOGIC DESIGN FACTORS

A. Estimated Vegetative Recovery Period, (years): 2-3
B. Design Chance of Success, (percent): 95
C. Equivalent Design Recurrence Interval, (years): 2
D. Design Storm Duration, (hours): 6
E. Design Storm Magnitude, (inches): 1.09
F. Design Flow, (cubic feet / second/ square mile):

- Black Gulch-Kern River (6.8)
- Erskine Creek (2.8)
- Isabella Lake-South Fork Kern River (5.4)
- Isabella Lake-Kern River (6.7)
- Upper Kelso Creek (3.9)
- Middle Kelso Creek(5.6)
- Lower Kelso Creek (5.1)

G. Estimated Reduction in Infiltration, (percent): 10-112
H. Adjusted Design Flow, (cfs per square mile): 85

- Black Gulch-Kern River (7.53)
- Erskine Creek (3.08)
- Isabella Lake-South Fork Kern River (6.5)
- Isabella Lake-Kern River (6.8)
- Upper Kelso Creek (4.43)
- Middle Kelso Creek(7.88)
- Lower Kelso Creek (10.88)

PART V - SUMMARY OF ANALYSIS

A. Describe Critical Values/Resources and Threats:

Background:
The Erskine Fire started June 23, 2016 and burned a total of 48,019 acres south of Lake Isabella Reservoir in the Piute Mountain area and the Kelso Creek drainage. The fire started at the base of Cook Peak from unknown source (under investigation) and rapidly spread to 35,711 acres in one day. The fire burned over Private, BLM, and National Forest land ownership (Table 5), and had a devastating impact on the communities of Squirrel Valley, South Lake, and settlements in the Kelso Creek Valley. A Total of 285 homes were destroyed with two confirmed fatalities. The fire progression was extreme due to strong winds and light, flashy fuels and moved east from the town of Lake Isabella to South Lake within a few

hours of ignition, eventually reaching more than 35,000 acres in less than 24 hours. The fire then moved in a southerly direction, burning in the Piute Mountains parallel to and within the Kelso Creek drainage to approximately 2 miles south of Cortez Canyon.

Summary of Erskine Fire BAER Values at Risk

Based on field observations and assessment of burned watershed conditions and expected responses the BAER team identified potential for post wildfire impacts on the following BAER values at risk:

Human Life and Safety

- Increased risk for the general public to be impacted by rolling rocks, flooding, debris flow and hazardous trees

Property

- USFS system roads
- USFS trails
- Water diversion and conveyance infrastructure

Natural Resources

- Water for domestic and agricultural uses
- Native or naturalized plant communities
- Soil productivity and hydrologic function

Cultural/Heritage Resources:

Detailed descriptions of the type, location and spatial extent of potential impacts are summarized in the following table. Risk assessments and recommended BAER response actions (treatments) are included.

Risk Assessment Process:

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 Assessment:

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

Values at Risk Matrix:

The values at risk (VAR) matrix displayed in Table 8 below summarizes values at risk, post wildfire threats and risk ratings. Values with high or very high risk ratings are addressed, where possible, with BAER response actions (treatments). Generally, response actions are not recommended for values with low and intermediate risk ratings.

Table 8 - Erskine Fire Values at Risk Matrix, BAER Treatments and other recommended Post-Fire Response Actions

Erskine BAER Risk Matrix												
Values at Risk	Post Fire Threats		Magnitude of Consequences			Risk			Treatment to Manage Potential Post Wildfire Impacts			
		Probability	Life	Property	Other	Life	Property	Other	Life	Property	Natural Resources	Other
Human Life and Safety												
Damage to life or infrastructure to flooding and potential debris flows downstream of Yellow Gulch Estates (BLM)	Increased debris flow and flooding	Possible	Major	Moderate		High	Intermediate		Area Closures, Warning signs.			Notify NRCS, County transportation and emergency services, and local communities
Damage to communities in the city of Lake Isabella (Lakeview Estates) due to flooding and debris flow potential of 4 unnamed tributaries below Cook Peak (BLM)	Increased debris flow and flooding	Likely	Major	Moderate		High	High		Area evacuations and warning alerts			Notify NRCS, County transportation and emergency services, and local communities
Increased risk for impacts to human life and safety within burned area, particularly along burned areas and roads in Squirrel Valley and Goat Ranch (BLM and private)	Loss of ingress/egress, rolling rocks, flooding and debris flow, fire weakened trees	Possible	Moderate			Intermediate						Notify NRCS, BLM, County transportation and emergency services, and local communities
Increased risk for impacts to human life and safety within burned area, particularly along burned area trails (34E32, 34E41, 34E42) (FS)	Loss of ingress/egress, rolling rocks, flooding and debris flow, fire weakened trees	Likely	Moderate			High			Area closure and installation of closure and warning signs at trailheads of Stevens Spring, Willow Gulch, Woodchuck Meadow trails			
Open pit mines that were burned over and now are exposed posing a risk to the public (BLM)	Mine was concealed by brush and now is exposed due to the fire	Possible	Moderate			Intermediate			Fence area off and post warning signs			
Infrastructure												
NFS Roads at risk (26S24 and 26S24O), and roads access to Goat Ranch area. (BLM) road at risk to Cook Mtn infrastructure, and Lynch Canyon roads	Erosion of road prism, gullies impacting crossings and road drainage features	Likely	Major	Moderate		High	High		BAER warning signs and information signs	Install rolling dips, repair fill slopes from fireroads, install critical dips, construct earthen berms, or storm patrol		
Homes in Squirrel, Goat Ranch, and Kelso area of Cortez Canyon (pvt)	Hillside erosion, small debris flows, and flooding	Possible		Moderate			Intermediate			Inform landowners [illegible]		Notify NRCS, County transportation and emergency services, and local communities
Yellow Road (1 main creek crossing at un-named creek in sec 28 near BM 3245) county	Over topping and erosion of road by increased flows	Possible		Moderate			Intermediate			Recommend culvert cleaning and storm patrol		Provide info to County
Burned signs at trailheads and along trails (Woodchuck and Dry Ck Meadow trails) FS	Increased risk trail users could get lost	Possible	Moderate			High			Trail warning signs	Closure signs & warning signs at trailheads		
Woodchuck Meadows and Little Dry Meadow fencing FS	Burned and crushed by falling trees	Likely		Moderate			High			Remove hazard trees and fix fence		
Range improvements (BLM)	Burned fences, water trough, spring boxes, [illegible], and pipes	Likely		Moderate			High			Re-establish fencing and water development		
Water diversion and conveyance infrastructure county	Filling of sediments and flooding	Possible		Moderate			Intermediate			Notify Special Uses Coordinator		
South Fork Campground FS	Burned fences allowing unlimited OHV access	Possible		Minor			Low					
Use of Level 1 (Closed) roads FS	Unlimited OHV access	Likely		Moderate			High			Road closures and signs		
Warning signs burned along Lake Isabella power station FS	Increased risk users could get hurt	Possible	Major			High			Replace warning signs			
Cottonwood enclosure around riparian area FS	Burned fences and lack of exclosure	Likely			Moderate			High			Replace fencing to protect riparian areas	
Aquatics												
Aquatic species of Kern River county	Post-fire turbidity, ash, and sediment delivery are expected to result in fish displacement or mortality of individuals within or immediately downstream from the burned area.	Possible			Moderate			Intermediate		see road work	No treatments are proposed specifically for protection of [illegible] habitat but proposed roads treatments will [illegible]	Notify NOAA Fisheries
Water Quality												
Domestic water users (creeks and un-named springs) - Erskine creek area of Lake Isabella Pvt	Turbidity and plugging with sediments	Possible	Intermediate			Intermediate			Notify county and state water board		Water for irrigation and domestic use	Recommend water testing
Creeks streams causing turbidity & sedimentation into Kern River county	Affecting fish habitat and water quality	Likely			Minor			Low	None			Notify NOAA, NRCS, Community
Trails												
Little Dry Meadow Trail (34E32) FS	Erosion of trail tread, impacts to trail at crossings, trail blockage by eroded soil, dry ravel and/or falling burned trees.	Likely		Moderate			High			Trail storm proofing		
Dry Meadow Trail (34E21) FS	Erosion of trail tread, impacts to trail at crossings, trail blockage by eroded soil, dry ravel and/or falling burned trees.	Likely		Moderate			High			Trail crossing armoring, trail storm proofing treatments		[illegible]
Long Canyon Trail FS	Erosion of trail tread, impacts to trail at crossings, trail blockage by eroded soil, dry ravel and/or falling burned trees.	Possible		Minor			Low					
Woodchuck Meadow Trail (34E42) FS	Erosion of trail tread, impacts to trail at crossings, trail blockage by eroded soil, dry ravel and/or falling burned trees.	Likely		Moderate			High					
Stevens Spring (34E33) FS	Erosion of trail tread, impacts to trail at crossings, trail blockage by eroded soil, dry ravel and/or falling burned trees.	Possible		Minor			Low					
Willow Gulch (34E41) FS	Erosion of trail tread, impacts to trail at crossings, trail blockage by eroded soil, dry ravel and/or falling burned trees.	Possible		Moderate			Intermediate					
Cultural												
Exposed arch. sites due to fire (Goat Ranch Coyote Cave and site near South Lake) BLM	Vandalism of site and erosion	Possible		Moderate			Intermediate			Arch. site evaluation and follow-up treatments		SHPO
Rock art panel exposed due to fire killing tree covering the site BLM	Vandalism of site and rock exposure and heating due to direct sunlight	Possible		Moderate			Intermediate			Arch. site evaluation and follow-up treatments		
[illegible] cemetery BLM	Erosion of hillside affecting cemetery	Possible		Minor			Low			Replace fence and monitor		
Stevens Spring lithic scatter site BLM	Vandalism of site and erosion	Possible		Moderate			Intermediate			Arch. site evaluation and follow-up treatments		
Rocky Point arch. site displacement and lithic scatter site BLM	Vandalism of site and erosion						Intermediate			Arch. site evaluation and follow-up treatments		
Bright Star Wilderness Outside BLM [illegible] BLM	Erosion and burned fence barriers and increased OHV unauthorized access	Likely		Moderate				High		Road maintenance and reconstruct fence barriers		
Soil Productivity												
Loss of soil productivity in high to moderate SBS areas. BLM & FS	Currently the threat is limited to high soil burn severity areas	Likely			Moderate			High				None, too steep and rocky
Loss of soil due to OHV cross country riding around Nichols Peak BLM and Woodchuck Meadow FS	Closed roads are now open due to lack of vegetation blocking the roads	Likely			Moderate			High				Create earthen or boulder barriers
Botany												
Native plant communities and sensitive species habitats BLM & FS	Establishment or spread of invasive weeds such as Bull thistle and Yellow Star thistle along access roads, dozer lines. [illegible] in burned areas	Likely			Moderate			High				[illegible] detection survey FS, Treat 35 acres with [illegible] for 3 years and [illegible] for 3 years and monitor for 3 years BLM

Life and Safety Values at Risk: Forest Users and Personnel: The BAER team identified increased risk for potential impacts to life and/or safety of Forest visitors and personnel entering the burned area. Potential threats include rolling rocks, flooding, debris flows and/or landslides, sediment or debris delivery to hazardous trees, loss of road or trail tread, and loss of ingress/egress. Generally, increased risk occurs within or directly down-slope from high and moderate burn severity areas.

The proposed installation of warning signs outreach efforts to share key information from the BAER report will also lower the probability that life and/or safety could be impacted by post wildfire processes.

- Probability of Damage or Loss: Possible
- Magnitude of Consequence: Major
- Risk Level: High

Private Property (Property and Life Safety): Private Homes and Structures: The BAER team did identify private residences and structures at increased risk from post wildfire processes. However, extensive inventory of structures and other values on private land was not conducted. Information sharing and outreach efforts with NRCS, Kern county departments of transportation and emergency services and potentially affected communities are proposed to increase awareness of burned area conditions and potential impacts to private values.

Property Values at Risk: Forest Service Roads

As described in the BAER roads, hydrology, and geology reports there is potential for damage to occur on roads within the fire perimeter. In addition to impacts to Forest Service roads, this report also describes increased risk for the safety of road users.

Potential impacts to roads include erosion of road tread, damage to road drainage features, sediment or debris deposition on roads and impacts to road crossings. For complete details see engineering report in project folder.

A. Findings on the Ground Surveyed

The field survey was conducted over July 7 – July 9 (3 days) by the road engineer along with field coordination with the Hydrologist, Geologist, and Archeologist. Dominate Forest Service road within the fire perimeter;

28S24 Woolstaff Meadow: Provides access to Wooolstaff Meadow, private property, grazing allotments, hunting, disperse camping along the road, and varies OHV trails.

Other secondary roads were also surveyed in the burned area for the purposes of this report; these roads are in the moderate burn severity. Approximately 4.22 miles of Forest Service roads are proposed for treatments.

B. Consequences of the Fire on Values at Risk

- **Life and Safety (28S24 & 28S24D):** As a result of the burned watershed, it has been determined through the BAER risk assessment process/matrix, that the risk to road users along the Woolstaff Meadow Road is considered High with major consequence due to the burned slopes above the road creating the potential for debris flows, and washouts during the first winter season or until the post burn watershed stabilizes.

- **Property (28S24 & 28S24D):** As a result of the burned watersheds, it has been determined through the BAER risk assessment process/matrix, that the risk to Forest Service Roads is considered High with moderate consequences. Damage to the invested road improvements, loss of road functions, and forest users' access to recreation opportunities.

C. Emergency Determination

This assessment determines an emergency and high risk related to life-safety and property related to the Forests developed road system.

- **Life and Safety (28S24 & 28S24D)** - Risk to road users is determined to be high with major consequences on Forest Service Roads. Potential for debris flows, and washouts are considered to be possible the first winter due to the burned watershed on slopes above road segments on these roads. Based on Travel Management, these roads are open year round for wheel traffic and over snow vehicles. It is recommended to post BAER warning signs and information signs on the road to caution road users of potential debris flow and washouts in the area.

- **Property (28S24 & 28S24D)** - Risk to road improvements and loss of road functions is considered to be possible with major consequences on segments of these roads. Diversion of uncontrolled water from road drainage courses on to the road surface results in degradation and unacceptable erosion, gullies, loss of road functions, and denial of access to road users.

Risk Assessment – Forest Service roads

- Probability of Damage or Loss: Likely. This determination is based on the expectation that increased erosion and sediment will occur and could plug drainage structures along roads.
- Magnitude of Consequence: Moderate. This determination was made based on the amount of damage that would occur if culverts were temporarily plugged.
- Risk Level: High

Property Values at Risk: Forest Service Trails

The risk to critical values associated with recreation was determined using the BAER Risk Assessment Matrix (FSH 2323.1, Exhibit 2), and emergency conditions were found to exist for the following BAER critical values: human life and safety, property, and natural resources.

Threats to the life and safety exist from hazard trees, debris flow, rock fall, and tread destabilization. The cumulative risk to life and safety is high along the following trails: Steve's Spring (34E32), Willow Gulch (34E41), and Woolstalf Meadow (34E42). The potential for intermediate risk from hazard trees and tread destabilization exists along the Dry Meadow (34E31) and Little Dry Meadow (32E52). There is also risk to life and safety on the BLM Long Canyon trail and the BLM portions of the Woolstalf Meadow and Willow Gulch trails.

Threats to FS property include loss of functionality of fencing and signs due to fire-damage, damage to tread due to debris flow and falling rocks, and erosion of trail infrastructure caused by capture of accelerated flow from upslope areas subject to moderate burn severity. Table 1 in Appendix B outlines the Soil Burn Severity Class for each affected trail. The cumulative risk to property is high at the Little Dry Meadow and Woolstalf Meadow Trail. The risk is intermediate at the Dry Meadow. The risk is low at the

Dry Meadow and Woolstalf Meadow. There is also a risk to property on BLM Long Canyon Trail and the BLM portions of the Woolstalf Meadow and Willow Gulch trails.

Threats to natural resources include degradation of soil quality caused by accelerated erosion from trails due to the fire, and disruption of hydrologic function at the Woolstalf Meadow caused by erosion due to unauthorized OHV access off the Woolstalf Meadow trail and 28S24D road. The risk to soil quality is high and the risk to Woolstalf Meadow is intermediate. There is also an intermediate risk to soil quality due to unauthorized routes.

Water Quality – Human Use Values at Risk: Impacts to Domestic water users

Numerous small water systems are scattered throughout the Erskine Fire area. The majority of these water systems are associated with private property and are located on mid to lower slopes of the Kern River and other drainages. Burn severity mapping indicates that these systems were not directly impacted by high severity fire, however many of the systems are located below hillslopes that burned at in the Erskine Fire. Systems that take water from streams in burned watershed will likely experience issues with turbidity and potential damage to system infrastructure during fall and winter storms. Systems that take water from springs will have a lower potential for impacts.

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

Treatments: Share assessment information with water users and NRCS. Increase maintenance at water intake facilities. Monitor system during storm events. Consider adding storage to ensure a clean water sources during high turbidity events.

Natural Resource Values at Risk – Water Quality and Aquatic/Riparian Habitats

The Erskine Fire burned a total of 563 miles of perennial, intermittent and ephemeral streams in 10 HUC 6 watersheds. There are about 15 miles of perennial streams, 173 miles of intermittent streams and 375 miles of ephemeral streams within the fire perimeter. Many of these channels have burned previously in the numerous fires that have occurred over the past 16 years. Field reviews suggest that stream channels that were located in previous burn areas did not burn as hot as those that located in areas that had not burned within the past 30 years.

Based on burn severity mapping the Erskine Fire has had similar effects to the previous fires. High and moderate severity burn areas have mostly occurred in headwater drainages burning though ephemeral and dry intermittent draws. Field observations by BAER personnel indicate that perennial channels in the Erskine Fire generally experienced low severity burns that affected understory vegetation but left most overstory vegetation intact. The field observations agree with a GIS analysis that looked at channel types and burn severity within the Erskine Fire. The analysis indicates that the vast majority of the stream miles that were affected by the burn were located within low to moderate soil burn severity areas.

The probability of damage to some aquatic and riparian habitats is likely particularly for aquatic/riparian channel networks that are located within and downstream of high and moderate severity burn areas, but the overall risk to the entire channel network is low. The potential for impacts is greatest in the headwater channel network where ephemeral and intermittent channels burned at higher severities. These channels will likely see an influx of fine and course sediments that will be routed to downstream perennial channels. Water temperature could also be affected in areas where the majority of the channel canopy (understory and/or overstory) has been removed. Recovery of channel canopy cover will be variable and take years to decades depending on the vegetation types that were lost in the fire.

- Magnitude of Consequences: Minor
- Probability of Damage or Loss: Likely
- Risk: Low

Treatment: No channel treatments are recommended. Treatments associated with road stream crossings will effective in reducing the probability of damage or loss of aquatic and riparian habitats located downstream of the treatment areas.

Natural Resource Values at Risk – Water Quality

Surface waters in the fire area will be bulked by ash, debris, and other floatable and transportable material during storm events. It is likely that stream flows from the first post-fire runoff producing rain events will see high concentrations of ash and fine sediment that will cause considerable turbidity and degradation of water quality and the beneficial uses of water. Beneficial uses of water are identified and protected by the California State Water Quality Control Board by regulation as found in the Tulare Basin Plan. Beneficial uses are: municipal water supply, contact and non-contact recreation, wildlife habitat, warm and cold water aquatic habitat, rare species habitat, fresh water replenishment, and spawning.

Water Quality

- The most noticeable effects on water quality will be increased sediment and ash from the burned area into the North and South Fork of the Kern River, although this may largely depend on Lake Isabella's volume (elevation) at the time of runoff events. If hydrologic connectivity is indeed present, this material could increase the rate of pool filling by fines, which may affect aquatic habitat.

Treatment: Share assessment information with private property owners and NRCS. Increased post-fire flood flows may overwhelm existing NFS road crossing structures, causing washouts, and stream diversion down the road. This can result in a threat to public safety, damage to infrastructure, and increased sediment delivery to downstream channels.

- Magnitude of Consequences: Moderate
- Probability of Damage or Loss: Likely
- Risk: Intermediate

Treatment: Implement Forest Service road treatments identified in the roads report. Share assessment information with County.

- Set up early warning system for weather events that could potentially trigger debris flows.

- No channel or hillslope treatments recommended except those associated with road - stream crossing emergency measures.

- Storm patrols should be conducted by all relevant parties to ensure that blockage of crossing structures do not occur during the first runoff producing storms.

- Roads should be storm-proofed as necessary.

- Share assessment information with local communities, landowners, water users, permit holders, NRCS, and NOAA/NWS to facilitate preparation for fall and winter storm.

- Treatment: Share assessment information with water users and NRCS. Increase maintenance at water intake facilities. Consider adding storage to ensure a clean water source during high turbidity events. For complete details see Hydrology report in project folder.

Natural Resource Values at Risk: Soil Productivity

Soil productivity on steeper slopes could be compromised in the areas that have burned at high soil burn severity and contain a water repellent layer. Portions of Long Canyon, Goat Ranch, and Lynch Canyon are at risk based on a lack of soil cover, deep soil charring, and steep slopes that could erode productive topsoil. For complete details see Soils report in project folder.

Values at Risk
Threats to Soil Productivity:
Probability of Damage or Loss: Likely
Magnitude of Consequences: Minor
Risk Level: Low

An elevated level of erosion can be expected in the aftermath of the fire based on modeling of erosion and sedimentation and erosion risk analysis. However, this is a fire-adapted ecosystem that has evolved in the presence of fire, and many of the slopes with the highest predicted erosion are too steep to effectively treat with mulch. Of the ground that is treatable, erosion rates are not elevated high enough to constitute an emergency situation to soil productivity. Most pour-point watersheds have erosion rates less than 3 tons/acre. Thus, no treatments are proposed to protect soil productivity.

Natural Resource Values at Risk: Threatened and Endangered, Sensitive, and Invasive Plants

Plant Communities of the Erskine Fire Burned Area

There are no known locations of federally Threatened or Endangered plant species within the fire area. There are Forest Service Sensitive or Survey and Manage species locations within the fire area.

Forest Sensitive & Endemic Botanical Species

No federally listed Threatened or Endangered plant species or their critical habitats are known to occur within the Erskine Fire Complex. Three Forest Service Sensitive or Forest Plan Endemic plant species are documented within that same area. They are shown in the following table.

Common Name
Pygmy poppy
Kern larkspur

Recommendations: Re-visit known populations and document any damage to them. Determine if there are any measures that may be possible to aid their recovery and implement them. Monitor the recovery.

Invasive plants and Noxious Weeds

The following table refers to known invasive plant and noxious infestations along major access roads to the fire perimeter. Additional weeds populations were observed in developed and repeatedly disturbed areas adjacent to the burn. Priority infestations for treatment are those adjacent to dozer-lines, hand lines, drop points and riparian areas.

Invasive plant species known to occur in or within 1 mile of the Erskine Fire are shown in the following table.

Scientific Name	**Common Name**	**Symbol**	**CDFA Weed List**
Centaurea solstitialis	star thistle	CESO3	
Cirsium vulgare	bull thistle	CIVU	B
Bromus techtorum	Cheat grass	BRTE	

The value at risk is the ecosystem health and integrity of the native plant communities within the burned areas. The threat is the potential loss of that health and integrity due to new invasive plant introductions and invasive plant spread from existing infestations which could inhibit the return of the native plant communities and crowd out recovering native vegetation resulting in nonfunctioning or poorly functioning ecosystems. The deep taproots of these aggressive species are able to access soil water previously utilized by native vegetation, making it unavailable to the new growth of the native species. For these reasons, loss of the ecosystem health and integrity of the native plant communities from weed invasion in the burned area is an emergency requiring mitigation.

A weed washing station arrived a few days after the fire began and was used on equipment accessing the fire area. Although a weed washing station was set up for vehicles and heavy equipment to mitigate the spread of invasive/or noxious weeds it is anticipated that these existing infestations along access roads to the fire may contribute an added threat to the overall risk. Some of the individuals were burned, however significant patches of infestations persisted and seeds in the soil probably survived due to their high heat tolerance and low/moderate burn intensity. There is a high potential for these infestations to hinder the regeneration of native vegetation, especially in the early seral stages, through increased fire intervals and competition for nutrients.

Primary risk is conversion of desert shrub, Joshua tree habitat to cheat grass. Probability is likely, magnitude is moderate. Treatment is monitoring. Effectiveness of treatment if detected is uncertain. Probability of new noxious weeds (such as yellow star thistle or?) is possible with moderate to major consequences.

The value at risk ratings and treatments for the fire are as follows:

Risk Assessment – Erskine Fire Invasive Plants

- Probability of Damage or Loss: Likely. There is a likely probability of spread and introduction of non-native invasive plants into areas disturbed by the fire.

- Magnitude of Consequences: Moderate. Damage to these plant communities would be considerable and long-term. Fire suppression related activities along dozerlines, helicopter landings, drop points and hand crew activities may have introduced yellow star thistle, and bull thistle.

Risk Level: High. Weed detection surveys would occur in the priority areas of dozer lines, drop point, roads, and small, known invasive plant infestations would be conducted outside the fire. Rapid response treatments by manual removal would occur where new, small invasive plant occurrences are discovered. Where large invasive plant occurrences are discovered, additional funding for treatment of these sites may be requested.

Property Values at Risk: Heritage Sites

Fire-effects to cultural resources occur at several levels. The first, of course, are the direct effects of the fire itself—ranging from the destruction of cultural material to more subtle effects such as resetting the obsidian hydration clock or introducing modern carbon into a site's assemblage.[1] Post-fire risks to cultural resources fall into two categories: 1) degradation from erosion, soil deposition, mass wasting and other geological effects brought about by vegetation loss, and 2) increased public access stemming from loss of vegetation cover and resulting in risk for looting, vandalism, and vehicular impacts.

Although all the identified sites are potentially subject to post-fire events, based on the BAER risk matrix, emergency treatments have been prescribed for only one site. For the purposes of the BAER analysis, a major consequence to a cultural resource is one where post-fire impacts or BAER treatments result in an unmitigated adverse effect as defined in 36 CFR 800.5.[2]

Site #1 is a complex prehistoric site consisting of rock art, bedrock milling features, possible midden soil and an artifact scatter. The site is located near Lake Isabella and consequently receives a high degree of visitation. The fire has exposed the rock art panel and a number of features, making the site more susceptible to weathering, looting and vandalism. Post-fire erosion has the potential to impact surficial and subsurface archaeological deposits and erode the site's potential NRHP eligibility. Perhaps of more concern for this site is the lack of vegetative screening to the public, resulting in an increased risk of vandalism and looting, both of which could adversely affect the resource.

Site # 2 is a complex of prehistoric sites located between Pine Point and the Old Isabella Campground that burned at low to moderate intensity. Resources range from rock art to bedrock milling features to artifact scatters. The complex was likely part of a larger resource that has been largely erased by construction of Lake Isabella. As with Site #1 the fire exposed a number of archaeological features, making them more susceptible to looting or vandalism.

Site #3 is a complex of prehistoric sites located along Woolstaff Creek immediately north of Woolstaff Meadow. Although burn severity is low, the fire opened much of the terrain to potential OHV use and unauthorized route proliferation (a pattern that was observed following the 2008 Piute Fire). OHV impacts could pose an adverse effect to these resources, both in terms of direct impacts to the features and artifacts as well as the potential for looting or vandalism.

Implementation of potential emergency rehabilitation treatments will be conducted in compliance with the provisions of the *Programmatic Agreement Among the U.S.D.A. Forest Service, Pacific Southwest Region (Region 5),California State Historic Preservation Officer, Nevada State Historic Preservation Officer, and the Advisory Council on Historic Preservation Regarding the Process for Compliance with*

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[1] Obsidian hydration is a dating method that uses the rate of water absorption (all glasses absorb water at a very slow rate) to assign a date to obsidian artifacts. Modern carbon contains high rates of radioactive carbon isotopes which can impact the radiocarbon dating of archaeological resources.

[2] 36 CFR 800.5 defines an adverse effect to historic properties as an impact that "may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the National Register in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association."

Section 106 of the National Historic Preservation Act for Management of Historic Properties by the National Forests of the Pacific Southwest Region (Regional PA 2013).

The Sequoia National Forest has initiated emergency consultation with the California Office of Historic Preservation per the provisions within 36 CFR 800.12, 36 CFR Part 78 & Stipulation 7.11 of the Regional PA.

B. Emergency Treatment Objectives:

To allow safe passage of water to protect infrastructures, watersheds, cultural sites, and fish habitat from accelerated sheet and rill erosion. Also, to protect watersheds from the spread of noxious weeds. Risk determination is dependent on the design storm selected and downstream values at risk. By using a set of average storms (2, 5, and 10-year events) emergency planning measures can be designed to mitigate and minumize anticipated risks. Using a 2-year design storm the values at risk can be evaluated to determine if an emergency exists for a typical winter storm.

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

Land 80 % Channel n/a % Roads/Trails 95 % Protection/Safety 90 %

D. Probability of Treatment Success

	Years after Treatment		
	1	3	5
Land	90%	85%	80%
Channel	n/a	n/a	n/a
Roads/Trails	95%	90%	85%
Protection/Safety	95%	90%	85%

E and F. Summary of VARTool Calculations (see Appendix D):

- Market Resource Values (direct losses and loss of use): $1,700,000
- Erskine Fire Treatment Cost: $99,154
- Expected benefit of treatment $741,500
- Benefit/cost ratio = 2.3

As described in this report, threats to life/safety and non-market cultural and ecological values exist throughout the burned area. These values were decribed in the VARTool Assessment but not considered in the benefit/cost ratio. Although not represented in the calculations, all proposed treatments reduced risk for multiple market and non-market values at risk. These important indirect benefits are not represented in the calculations.

G. Skills Represented on Burned-Area Survey Team:

Hydrology	Soils	Geology	Engineering
Range	GIS	Botany	Recreation

Heritage	Wildlife		

Team Leader: Brad Rust	Email: brust@fs.fed.us	Phone: 530-226-2427
Al Watson	District Ranger	awatson@fs.fed.us
Fletcher Linton	BAER Team Coordinator	flinton@fs.fed.us

H. Treatment Narrative for Forest Service:

Land Treatments:

Early Detection Rapid Response (**Table 10**)
Completion of weed inventory and treatments along access roads, dozer lines, staging areas, known sensitive and invasive plant populations and rare plant suitable habitat will be the primary focus. The secondary survey priorities will be handlines, drop points and helispots. All locations of weed species will be mapped, using the Sequoia NF invasive weed List. Surveys would be completed using the NRIS protocol available at the national website: http://fsweb.nris.fs.fed.us/products/TESP Invasive_Species/documentation.shtml. Results would be entered into the NRIS database.

Surveying will include documentation and hand pulling new weed occurrences at the time of inspection, where practical. New weed occurrences will be pulled to root depth, placed in sealed plastic bags, and properly disposed. All dozer lines on Forest Service land that are associated with this fire should be surveyed in 2016, with new infestations mapped and all infestations hand treated.

Table 20 – Early Detection Rapid Response (EDRR)

Noxious Weed Survey and Hand Pulling				
Item	**Unit**	**Unit Cost**	**# of Units**	**Cost**
1 GS-11 botanist	Days	$385	2	$770
2 GS-7 weed technicians	Days	$440	14	$6,160
Supplies	Each	$1,000	1	$1,000
Vehicle gas mileage	Miles	$0.22	1,000	$220
Vehicle FOR	Month	$5.00	25	$125
			Total Cost	**$8,275**

Natural Recovery
Vegetation in the mixed conifer will recover slowly. Even in areas of moderate soil burn severity, the canopy was mostly killed and the seed source removed. Stands with an element of Ponderosa pine and Douglas fir will likely recover more quickly, since at least a few mature trees are likely to have survived to produce seed into newly exposed mineral soil. The montane chaparral shrubs were mostly killed by the fire, but fire stimulates manzanita seeds stored in the soil to germinate along with other re-sprouting species.

Hillslope mulching
Hillslope mulching was considered but not recommended since slopes were too steep and values at risk were not great enough to justify treatments.

Road and Trail Treatments:

Roads Treatments

The base upon which the roads are built varies from bed rock to sub-surface soils and alluvial deposits. Lack of maintenance of some of the roads has resulted in significant surface and template degradation in a few locations. Although it is recognized that BAER is not intended to correct past maintenance deficiencies, the drastically changed conditions resulting from wildfire impose urgency for correction on some of those situations. The work proposed herein is intended to stabilize the identified roads and structures in preparation for the anticipated increase in erosion potental from storm water runoff. Additionally, several work elements involve public safety hazards or protection of other resources.
The specific recommendations are noted in the Appendices.

Recommended road treatments include installation, improvement or cleaning of culvert inlet structures, relief culverts, overside drains, dips and low water crossings. Debris removal from channels above culverts, out-sloping, storm patrol and closures are also proposed. Treatments would be implemented on high risk sections of roads downstream from moderate and high soil burn severity burned areas. These treatments were identified as the most cost effective solutions with the highest probability of success to mitigate damage from the post fire stormwater events to the transportation system.

Proposed BAER Treatments

- Install Information and BAER Warning Signs on (28S24).
- Install Road Closure and Information signs on (28S24D).
- Boulder Barriers on (28S24D).
- Install Drainage Armor (class 2).
- Install Critical Dips.
- Remove and Salvage of Existing Culvert (selected locations).
- Install Low Water Crossing w/ Drainage Armor (class 2).
- Restore Drainage Functions (culvert inlets and outlets, roadway ditch lines rolling dips and water bars w/ run-off-ditch, maintain cross slopes of roads in-slope & out-slope).
- Storm Patrol (pickup).

Road #	Name	Miles Treated	Treatment Cost	Cost/Mile
28S24	WOOLSTAFF MEADOW	3.92	$27,037	$6,897
28S24D	WOOLSTAFF MEADOW	0.30	$1,469	$4,896

County Road 543: The BAER team recommends outreach and information sharing with the Kern County departments of transportation and emergency services to discuss burned area conditions and potential post fire impacts on County Road 543 (Kelso Ck. Road) and on road users.

Road Storm Patrol

General Description: The patrols are used to identify road problems such as plugged culverts and washed out roads, and to clear, clean, and/or close roads that are or have received damage. Those conducting storm patrols shall have rapid access to a backhoe and dump truck that can be used when a drainage culvert is plugged or soon to be plugged, to repair any road having severe surface erosion, or to clean debris from roadside drainage ditches. Patrols will also monitor the movement of large woody debris and make a determination of whether or not the material should be removed before it contacts the structures.

Locations (Suitable Sites): Patrols are based on the areas expected to have or that did have localized precipitation events. Secondly, patrols should then focus on those roads that receive the most traffic and are of more value to the transportation system.

Design/Construction Specifications:

1. FS personnel will direct the work.
2. Immediately upon receiving heavy rain and spring snowmelt the FS will send out patrols to identify road hazard conditions. Observations of rocks and sediment causing washouts and plugged culverts are identified and corrected before they worsen or jeopardize motor vehicle users.
3. The road patrol personnel bring heavy equipment necessary to mechanically remove any obstructions from the roads and culvert inlets and catch basins where necessary.
4. All excess material and debris removed from the drainage system shall be placed outside of bank-full channel where it cannot re-enter stream channels.

Purpose of Treatment: Roads within the Erskine Fire contain drainage structures that cross streams located in watersheds having areas of high to moderate soil burn severity. These flood source areas have a greater potential for increased runoff and debris flows. These increases in flows pose a threat to the existing crossings which may result in plugging culverts or exceeding their maximum flow capacity. With the loss of stabilizing vegetation, normal storm frequencies and magnitudes can more easily initiate rill and gully erosion on the slopes and it is likely this runoff will cover the roads or cause washouts. These events make for hazardous access along steep slopes and put the safety of users at risk.

Treatment Effectiveness Monitoring: Engineering and District personnel will survey the roads within the fire perimeter after high-intensity winter storms in 2015 and spring 2016 runoff. Survey will inspect road surface condition, ditch erosion, and culverts/inlet basins for capacity to accommodate runoff flows.

Trails Treatments

1. Road and Trail Treatments- *Trail Storm Proofing*

Storm proofing would occur prior to the first damaging rain event and within the first year following the fire. Treatments would be implemented with hand tools and would include outsloping, berm removal, replacement of burned log waterbars, maintenance and construction of drainage dips and waterbars, and armoring water outlets where necessary to prevent erosion of the trail infrastructure. Treatment would also include filling of stump holes to prevent destabilization of the tread.

Storm Proofing Treatment Details

Storm Proofing	
Trail	**Treatment Description**
Dry Meadow Trail (34E31)	Armor water outlets on north end Restore/maintain drainage function on the south end and entire section north of Dry Meadow Creek Remove down and hazard trees where necessary to protect worker safety
Little Dry Meadow (32E52)	Restore/maintain drainage function at drainage crossings on entire length Remove down and hazard trees where necessary
Long Canyon (BLM)	Restore/maintain drainage function at drainage crossings

Steve's Spring (34E32)	Addressed in BAER Roads Report
Willow Gulch (34E41)	Restore/maintain drainage function at crossings on entire length Remove down and hazard trees where necessary
Woolstalf Meadow Trail (34E42)	Fill burned-out stump holes Maintain drainage structures at drainage crossings on entire length Replace burned OHV barricades in Bright Star Wilderness and install where necessary Remove down and hazard trees where necessary to protect worker safety

2. Protection and Safety Treatments- *Hazard Warning Signs and Closure*
Hazard warning signs would be posted to inform the public of the increased risk to safety in burned areas posed by hazard trees and rock fall. Warning signs would be installed at access points to all authorized trail segments that have been burned and should remain in place for up to 3 years or until potential hazards are mitigated.

Costs may be reduced by coordinating with crews implementing sign installation on roads and BLM lands. The locations recommended for sign installation were chosen as a stand-alone treatment. Some locations, such as those mid-trail at the Forest boundary and at trail junctions near Woolstalf Meadows, may be redundant and unnecessary if BLM posts hazard signs at trail junctions and a hazard sign is installed on the Woolstalf Meadow Road (28S24) south of the Steve's Spring Trail junction on the fire perimeter.

Locations of hazard sign installations would be approved by an Archeologist prior to implementation. Closure by Forest Order would occur on all trails within the fire perimeter for the duration of one winter to allow immediate hazard trees to fall and treatment implementation to be completed.

All treatments are consistent with the Burned Area Emergency Response Treatments Catalog (Napper, 2006).

1. Trail Storm Proofing: Costs were calculated using Forest Service staff. See Appendix C for Treatment Cost Details.

ITEM	Unit	# of	Unit	# of	Cost
GS-11 Project Supervisor	EACH	1.0	$400.00	3.0	$1,200.00
GS-09 Archeologist	EACH	1.0	$400.00	3.0	$1,200.00
GS-07 Admin Support	EACH	1.0	$265.00	3.0	$795.00
GS-07 Forestry Technician (C-Faller)	EACH	1.0	$265.00	3.0	$795.00
GS-07 Trail Crew Leader	EACH	1.0	$265.00	20.0	$5,300.00
GS-05 Forestry Technician	EACH	2.0	$150.00	20.0	$6,000.00
GS-04 Forestry Technician	EACH	2.0	$132.00	20.0	$5,280.00
Per Diem Cost	LUMP	1.0			$6,850.00
Mileage	MILES	1940.0	$0.55		$1,067.00
Materials	LUMP	1.0			$1,800.00
TOTAL COST					**$30,287.00**

2. Hazard Warning Sign and Closure: See Appendix C for Treatment Cost Details.

Treatment Cost

Hazard Warning Sign and Closure Treatment Cost					Cost
ITEM	Unit	# of Units	Unit Cost	# of Days	Cost
GS-09 Recreation Specialist	EACH	1	$300.00	2.50	$750.00
GS-05 Forest Protection Officer	EACH	1	$150.00	8	$1,200.00
GS-05 Forestry Technician	EACH	2	$150.00	5.00	$1,050.00
Mileage	EACH	500	$0.55		$220.00
Closure Signs	EACH	11	$20.00		$220.00
Hazard Signs and Posts	EACH	11	$200.00		$2,200.00
Misc. Materials	EACH	1	$200.00		$200.00
				TOTAL COST	$5,840.00

Protection/Safety Treatments

Burned Area Closure and Warning Signs

Posting of areas burned will alert the public to potential dangers of falling trees and rolling rocks. For roads, the recommended treatment is installation of seasonal closure and warning signs at major points of entry. Roads requiring such signage are Forest Roads 28S24 and 28S24D (see roads report). For trails, the recommended treatment is installation of seasonal closure and warning signs at all trailheads within or leading to the burn area. Trailheads requiring signage are Dry Meadow (34E31), Little Dry Meadow (32E52), Long Canyon- BLM, Steve's Spring (34E32), Willow Gulch (34E41)- FS & BLM, Woolstalf Meadow (34E42)- FS & BLM (see trails report).

Heritage Site Protections

Proposed mitigation includes planting native seeds (e.g. native grass) and a program of archaeological monitoring. The objective of the treatment would be to stabilize archaeological deposits within the site boundary and to generally obscure those deposits from public view. Closure is not proposed as such action would likely direct unwanted attention to the resources. Further archival/data base research may reveal other locations in need of assessment.

Site #1

A) Treatment Type: Native grass seeding, lop-scattering down woody debris and archaeological monitoring.

B) Treatment Objective: Protect cultural features of the site from erosion effects and potential impacts from public visitation (e.g. looting and vandalism).

C) Treatment Description: In conjunction with the YCC program and local fire resources, members of the KRRD archaeology crew will gently re-contour soils disturbed by falling trees and rake in native seeds. A fire crew will lop-scatter woody debris to protect loose soils within the site. Over the next year the site will be periodically monitored by the KRRD heritage staff for post-fire effects and to determine needs for future mitigation measures.

D) Treatment Cost: $2,500

E) Probability of completing treatment in first year prior to damaging storms or events: High – the YCC crew is tentatively scheduled for July 21, 2016.

F) Probability of treatment success: Good - the proposed treatment is designed to respond to and forestall post-fire effects as they happen.

Boundry Fencing OHV Protections
Boundary fencing between USFS and BLM properties was burned up and in various locations needs replacing to protect areas from OHV damage. The BAER team did not have the time nor resources to survey this need. It is mentioned so further evaluations can be made and if it is deemed that values are at risk due to OHV unauthorized travel then necessary funds will be requested in an interim BAER report.

Implementation Team Leadership and Coordination

Interagency Coordination:
Interagency coordination started during the fire and continued throughout the BAER Assessment. Continuing this coordination by providing the BAER Assessment Report, specialist reports and attending meetings is anticipated. In addition, letters detailing potential physical responses and impacts from the fire that may influence safety in and downstream of the fire area will need to be composed and sent to all public and private stakeholders at risk from increased sediment and flooding. Funding is requested for agency coordination, Implementation team lead, and for the Forest BAER Coordinator to ensure continued coordination with cooperating agencies, prompt implementation, and tracking of BAER treatments, and installation of burn area warning signs. The facilitation may include: phone calls, meetings, and field trips to the affected areas.

Implementation Team Leadership:
This effort involves communication and coordination with other federal, state, and local agencies with jurisdiction over adjacent lands and inholdings where life and property are at risk from post-fire conditions. Actions include but are not limited to working and coordinating with other agencies on hazard notification systems; permitting the siting of rain gages and soil moisture instruments to monitor conditions within the burn area (in support of National Weather Service forecasts); and exchanging information and coordinating the BAER implementation plan with subsequent recovery plans developed by other agencies.

The initial cost request for this effort includes the management structure as identified below for implementation of the 2500-8. Additional coordination needs may ensue, costs for which will need to be requested on an interim 2500-8.

Over the next 6 months it is critical that appropriate agencies maintain due diligence and continue to inform the public of the potential hazards resulting from post-fire watershed response.

Table – BAER Implementation/Interagency Coordination

Item	Unit	Unit Cost	# of Units	Cost
BAER Implementation Team Leader	Days	$400	8	$3,200
COR	Days	$380	5	$1,900
Inspector	Days	$285	10	$2,850
				$7,950

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.) See Appendix B below for road, trail, and heritage monitoring.

Part VI – Emergency Stabilization Treatments & Source of Funds, Sequoia NF Initial Request

Erskine BAER Treatment Costs - Sequoia	NFS Lands					Other Lands				Money Left Total $
Line Items	Units	Unit Cost	# of Units	BAER $	Spent $	Units	Fed $	Units	Non Fed $	
A. Land Treatments										
NX Weed Det. Survey	project	$8,275	1	$8,275	$0		$0		$0	$0
Subtotal Land Treatments				$8,275	$0		$0		$0	$0
B. Channel Treatments - none										
Subtotal Channel Treatments				$0	$0		$0		$0	$0
C. Road and Trails										
Road Stormproofing and Patrol (rolling-dips, critical-dips, drainage, etc)	project	$28,506	1	$28,506	$0		$0		$0	$0
Trail Stormproofing (restore drainage, fill-in stump-holes, restore lost tread)	project	$30,287	1	$30,287	$0		$0		$0	$0
Subtotal Road & Trails				$58,793	$0		$0		$0	$0
D. Protection/Safety										
Heritage Protection	project	$2,500	1	$2,500	$0		$0		$0	$0
Burned Area Road Warning Signs (large)	project	$2,438	1	$2,438	$0		$0		$0	$0
Burned Area Trail Warning Signs (small)	project	$5,840	1	$5,840	$0		$0		$0	$0
Flood Warning Signs (small)	project	$1,500	1	$1,500	$0		$0		$0	$0
Subtotal Protection				$12,278	$0		$0		$0	$0
E. BAER Evaluation										
Assessment Team	ea	H5BAER	---	---	$80,000	---	$0	---	$0	$0
Subtotal Evaluation				---	$80,000	---	$0	---	$0	$0
F. BAER Coordination & ImplementationTeam										
Implementation Team Leader	day	$400	6	$2,400	$0		$0		$0	$0
COR	day	$380	8	$3,040	$0		$0		$0	$0
Inspector	day	$285	10	$2,850	$0		$0		$0	$0
Subtotal Coordination				$8,290	$0		$0		$0	$0
G. Monitoring										
Road Treatment Monitoring	ea	$500	2	$1,000	$0		$0		$0	$0
Trail Treatment Monitoring	ea	$500	3	$1,500	$0		$0		$0	$0
Heritage Treatment Monitoring	ea	$500	1	$500	$0		$0		$0	$0
Subtotal Monitoring				$3,000	$0		$0		$0	$0
H. Totals				$90,636	$0		$0		$0	$0
Previously approved						Comments:				
Total for this request				$90,636						

PART VII - APPROVALS

1. ______________________ 25 JULY 2016

Sequoia N.F. Forest Supervisor (signature) Date

2. Barnie T Gyant 7/29/2016

Regional Forester (signature) Date

APPENDICES: Supporting Information:

Appendix A: Erskine Fire Fire BAER Team:

	District Ranger	awatson@fs.fed.us			
	BAER Coordinator	flinton@fs.fed.us			
NAME	**POSITION**	**EMAIL**	**HOME FOREST**	**CELL PHONE**	**WORK PHONE**
Brad Rust	Team Leader	brust@fs.fed.us	Shasta-Trinity	(530) 917-0434	530 226-2427
Curtis Kavamme	Soil Scientist	curtiskvamme@fs.fed.us	Stanislaus	(208) 596-5369	209 962-7825x542
Andy Stone	Hydrologist	kstone@fs.fed.us	Sequoia	(760) 301-4799	760 760-376
Hannah Stone	Recreation	hannahstone@fs.fed.us	El Dorado	(530) 368-0429	530 333 5567
Yonnie Schwartz	Geology	jonathanschwartz@fs.fed.us	Los Padres	(805) 698-9752	(805) 646-4348 x311
Marcos Rios	Engineering	mdrios@fs.fed.us	Sequoia	(559) 859-3026	559 784 1500x1141
Tim Kelly	Archeology	tkelly@fs.fed.us	Sequoia	(760) 223-0257	760 376 3781x616
Steve Anderson	Range	swanderson@fs.fed.us	Sequoia	(760) 413-8478	760 376-3781x680
Wendy Rannals	GIS	wrannals@fs.fed.us	Sequoia	(760) 223-0618	761 376-3781
Amy Girado	Archeology	agirado@blm.gov	BLM	(661) 204-8196	661 391 6123
Carly Summers	Wildlife	csummers@blm.gov	BLM	661 369-0608	661 391-6146
Rebecca Brooke	Agency Rep		BLM	760 920-8812	661 391-6079
Alex Neibergs	Agency Rep	aneibergs@blm.gov	BLM	760 608-2479	760 384 5796
Ryan Lausch	Ecologist		BLM	661 401-0825	661 391 6162
Cathleen Thompson	BAER PIO	clthompson01@fs.fed.us	USFS	415-823-4207	707-853-4243

Appendix B: Monitoring Protocols:

Erskine Fire
Road Effectiveness Monitoring

The 2500-8 report requests funds to monitor the effectiveness of road treatments on Erskine Fire Fire roads.

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

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

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

4. Analysis, evaluation, and reporting techniques

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

Road Inspection Checklist

Date:__________________ Inspector__________________
Time:__________________ Forest Road__________________

Describe locations reviewed during inspection:____________________________

Was there road damage?

Was culvert plugged?____________________.

GPS ____

Describe damage and cost to repair? (GPS)____________________________

Photo taken of road damage________________________________

Recommended actions to repair:____

Erskine Fire
Trail Effectiveness Monitoring

The 2500-8 report requests funds to monitor the effectiveness of trail treatments on Forest Trails in the Erskine Fire.

1. Monitoring Questions
   - Is the trail tread stable?
   - Is the trail leading to concentrating runoff leading to unacceptable off-site consequences?

2. Measurable Indicators
   - Rills and/or gullies forming on the trail
   - Loss of trail bed

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

4. Analysis, evaluation, and reporting techniques

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

Trail Inspection Checklist

Date:____________________ Inspector____________________
Time:____________________ Forest Trail__________________

Describe locations reviewed during inspection:______________________________

____

____

Was there trail damage?
Did the trail crossing fail?______________________.
GPS)____

Describe damage and cost to repair? (GPS)__________________________

Photo taken of trail damage____________________________________

Recommended actions to repair:____

Erskine Fire
Cultural Site Seeding Effectiveness Monitoring

The 2500-8 report requests funds to monitor the effectiveness of native grass treatment on Erskine heritage sites.

4. Monitoring Questions
   - Is the grass with good cover stable?
   - Is the grass being undercut by concentrated runoff leading to unacceptable on-site erosion?

2. Measurable Indicators
   - Rills and/or gullies forming around the artifacts
   - Loss of artifacts

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

4. Analysis, evaluation, and reporting techniques

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

Heritage Protection Inspection Checklist

Date:__________________ Inspector__________________
Time:__________________ Forest Road Nearby________________

Describe locations reviewed during inspection:____________________________

____

____

Was there artifact damage?

Was artifacts covered or eroded?____________________.

GPS)____

Describe damage and cost to repair? (GPS)______________________________

Photo taken of artifact damage_______________________________________

Recommended actions to repair:______________________________________

Appendix C: Road Summaries and Treatments

Types of Treatments	Estimate BAER Cost*
Install BAER Warning Signs	$625.00
Install Information Sign	$343.75
Install Closure and Information Sign	$531.25
Boulder Barriers	$937.50
Install Drainage Armor (Class 2)	$5,070.00
Install Critical Dip	$2,362.50
Remove and Salvage Culvert 18"	$1,125.00
Install Dip for Low Water Crossing	$1,137.50
Storm Patrol	$7,188.75
Overhead (contract prep, administration, implementation)	$9,184.00
TOTAL Estimate	**$28,505.25**

Appendix D: Summary of Cost-Risk Analysis

Erskine Fire Benefit Cost Analysis:

Total benefits of resources for whole fire FS lands:

All Resource	Value $	
Roads at risk(FS)	$150,000	
Trails FS	$200,000	
Native plants	$100,000	
Water quality/Aquatics/fisheries	$50,000	
Soil productivity	$80,000	
Public safety	$1,000,000	Human life and/or safety is not a market value. Estimated cost of injury accident.
Heritage sites	$120,000	

Probability of loss without and with treatments:

All Resource	Probability loss no treatments:	Probability loss w/ treatments:	Reduction in probability of loss
Roads at risk(FS)	50%	15%	35%
Trails FS	60%	10%	50%
Native plants	50%	20%	30%
Water quality/Aquatics/fisheries	40%	35%	5%
Soil productivity	45%	35%	10%
Public safety	70%	20%	50%
Heritage sites	50%	20%	30%

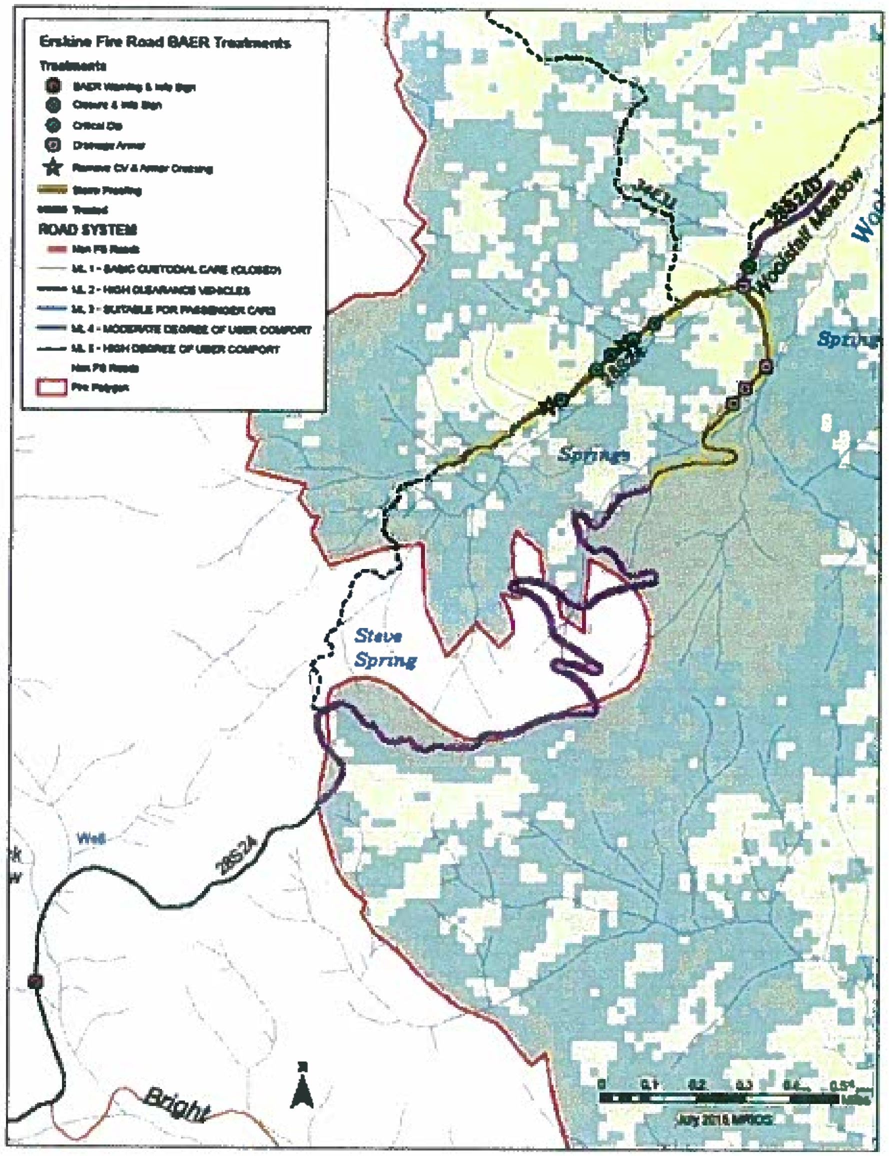
Total cost of treatments on Forest Service:

Erskine BAER Treatment Costs - Sequoia	NFS Lands					Other Lands				Money Left
Line Items	Units	Unit Cost	# of Units	BAER $	Spent $	Units	Fed $	Units	Non Fed $	Total $
A. Land Treatments										
NX Weed Det. Survey	project	$8,275	1	$8,275	$0		$0		$0	$0
Subtotal Land Treatments				$8,275	$0		$0		$0	$0
B. Channel Treatments - none										
Subtotal Channel Treatments				$0	$0		$0		$0	$0
C. Road and Trails										
Road Stormproofing and Patrol (rolling-dips, critical-dips, drainage, etc)	project	$28,506	1	$28,506	$0		$0		$0	$0
Trail Stormproofing (restore drainage, fill-in stump-holes, restore lost tread)	project	$30,287	1	$30,287	$0		$0		$0	$0
Subtotal Road & Trails				$58,793	$0		$0		$0	$0
D. Protection/Safety										
Heritage Protection	project	$2,500	1	$2,500	$0		$0		$0	$0
Burned Area Road Warning Signs (large)	project	$2,438	1	$2,438	$0		$0		$0	$0
Burned Area Trail Warning Signs (small)	project	$5,840	1	$5,840	$0		$0		$0	$0
Flood Warning Signs (small)	project	$1,500	1	$1,500	$0		$0		$0	$0
Subtotal Protection				$12,278	$0		$0		$0	$0
E. BAER Evaluation										
Assessment Team	ea	HSBAER	---	---	$60,000	---	$0	---	$0	$0
Subtotal Evaluation				---	$60,000	---	$0	---	$0	$0
F. BAER Coordination & ImplementationTeam										
Implementation Team Leader	day	$400	6	$2,400	$0		$0		$0	$0
COR	day	$380	8	$3,040	$0		$0		$0	$0
Inspector	day	$285	10	$2,850	$0		$0		$0	$0
Subtotal Coordination				$8,290	$0		$0		$0	$0
G. Monitoring										
Road Treatment Monitoring	ea	$500	2	$1,000	$0		$0		$0	$0
Trail Treatment Monitoring	ea	$500	3	$1,500	$0		$0		$0	$0
Heritage Treatment Monitoring	ea	$500	1	$500	$0		$0		$0	$0
Subtotal Monitoring				$3,000	$0		$0		$0	$0
H. Totals				$90,636	$0		$0		$0	$0
Previously approved						Comments:				
Total for this request				$90,636						

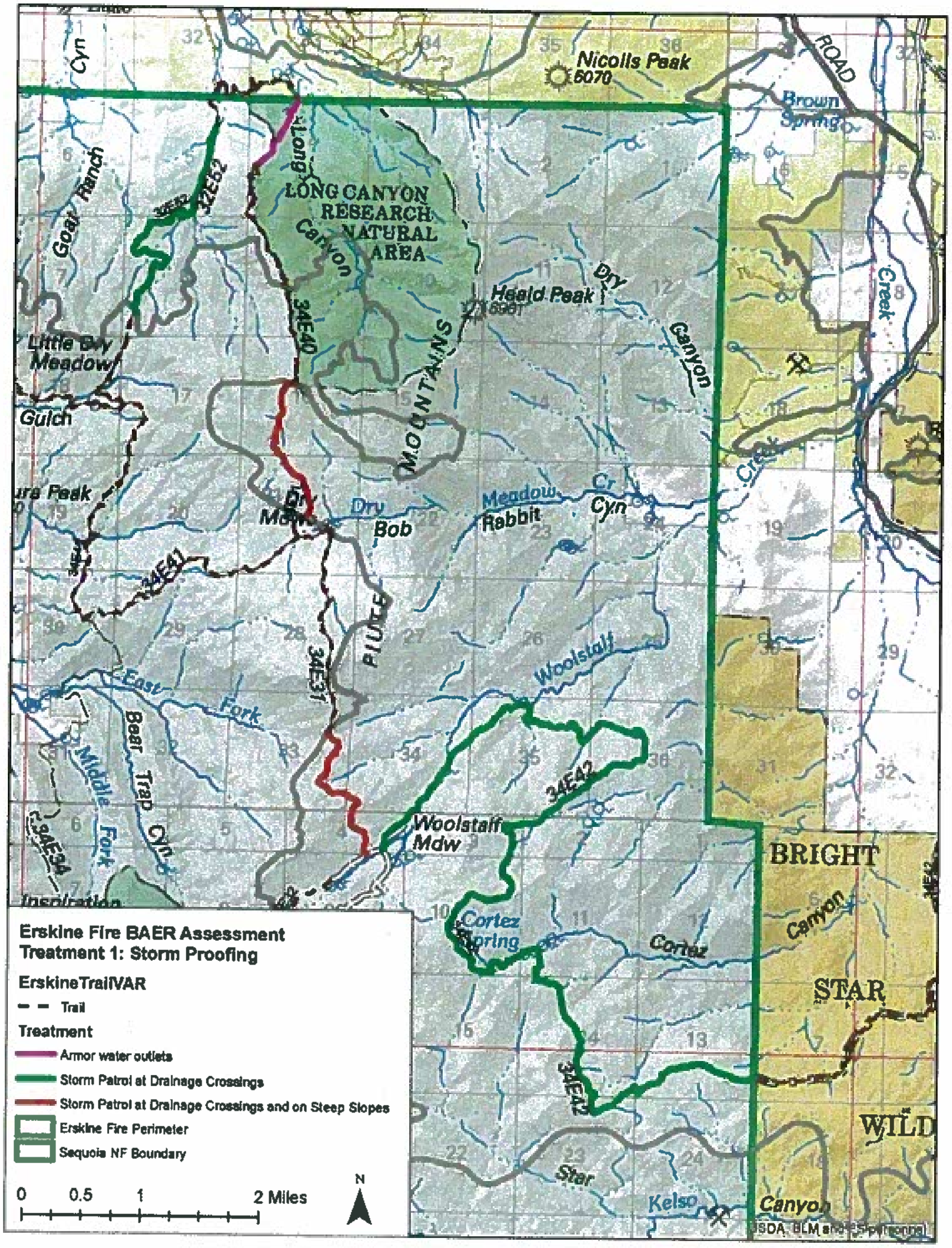
All Resource	Benefit of treatment	Treatment Cost	B/C ratio	Justified
Roads at risk(FS)	$52,500	$28,506	1.8	yes
Trails FS	$100,000	$30,287	3.3	yes
Native plants	$30,000	$8,275	3.6	yes
Water quality/Aquatics/fisheries	$15,000	natural	none	n/a
Soil productivity	$8,000	natural	none	n/a
Public safety	$500,000	$9,878	50.6	yes
Heritage sites	$36,000	$2,500	14.4	yes
	$741,500	$79,446	9.3	

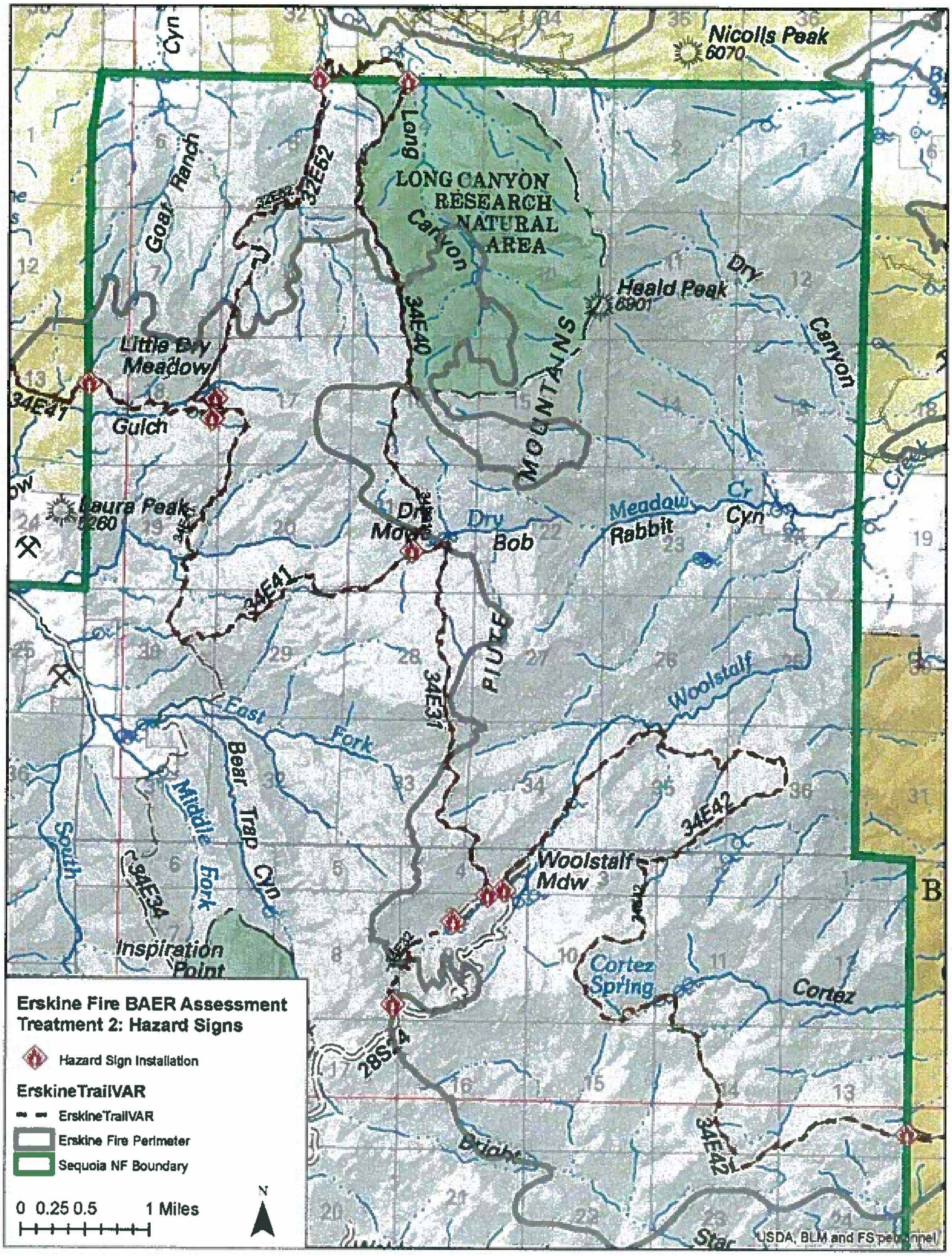
Appendix E: Treatment Maps - Erskine Fire

Roads:



Trails:


Erskine Fire BAER Assessment
Treatment 1: Storm Proofing
ErskineTrailVAR
Trail
Treatment
Armor water outlets
Storm Patrol at Drainage Crossings
Storm Patrol at Drainage Crossings and on Steep Slopes
Erskine Fire Perimeter
Sequoia NF Boundary
0 0.5 1 2 Miles
N
Nicolls Peak
LONG CANYON RESEARCH NATURAL AREA
Heald Peak
Dry Canyon
Long Canyon
34E40
32E52
Goat Ranch
Little Dry Meadow
Gulch
Dry Mdw
Bob Rabbit
Meadow Cr Cyn
PIUTE
MOUNTAINS
34E41
34E31
East Fork
Woolstaff
Woolstaff Mdw
34E42
Bear Trap Cyn
Middle Fork
Cortez Spring
Cortez
BRIGHT STAR WILD
Canyon
Star
Kelso
Brown Spring
Creek
ROAD


Erskine Fire BAER Assessment
Treatment 2: Hazard Signs
Hazard Sign Installation
ErskineTrailVAR
ErskineTrailVAR
Erskine Fire Perimeter
Sequoia NF Boundary
0 0.25 0.5 1 Miles
N
Nicolls Peak
6070
LONG CANYON RESEARCH NATURAL AREA
Long Canyon
Heald Peak
6901
Dry Canyon
Goat Ranch
Little Dry Meadow
Gulch
Laura Peak
5260
MOUNTAINS
Dry Meadow
Dry Bob
Meadow
Rabbit
Cr Cyn
PIUTE
Woolstalf
East Fork
Bear Trap Cyn
Middle Fork
South
Inspiration Point
Woolstalf Mdw
Cortez Spring
Cortez
34E40
34E41
34E31
34E42
32E62
34E34
28S14
USDA, BLM and FS personnel