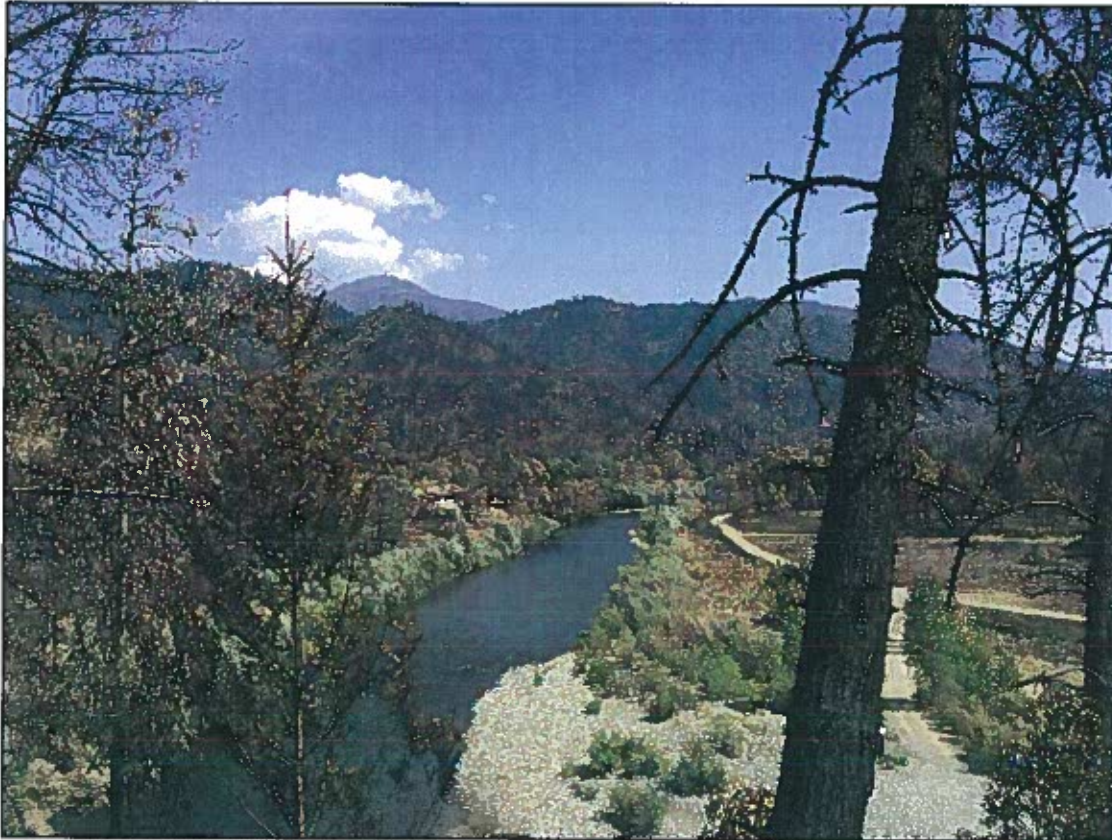


USDA-FOREST SERVICE

FS-2500-8 (7/08)  
Date of Report: 10/13/17

**HELENA/FORK BURNED-AREA REPORT**  
(Reference FSH 2509.13)

**PART I - TYPE OF REQUEST**



The Helena Fire looking down on California State Highway 299 along Trinity River on October 4<sup>th</sup> 2017.

**A. Type of Report**

- ☒ 1. Funding request for estimated emergency stabilization funds
- ☐ 2. Accomplishment Report
- ☐ 3. No Treatment Recommendation

**B. Type of Action**

- ☒ 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: Helena/ForkB. Fire Number: Helena = CA-SHF-001770; Fork= CA-SHF-001555C. State: CAD. County: TrinityE. Region: 5F. Forest: Shasta-TrinityG. Districts: Trinity RiverH. Fire Incident Job Code: Helena - P5LA7C  
Fork - P5LBJ1I. Date Fire Started: Helena= August 30, 2017; Fork = August 7, 2017J. Date Fire Contained: Helena= October ?, 2017; Fork = October ? 2017K. Suppression Cost: Helena/Fork = \$30 million

L. Fire Suppression Damages Repaired with Suppression Funds

## Dozerlines:

Helena= Dozerline repaired / waterbarred: 67 miles

Fork 2 = Dozerline repaired / waterbarred: 1 miles

## Handlines:

Helena= Handline repaired / waterbarred: 20 miles

Fork 2 = Handline repaired / waterbarred: 2 miles

M. Watershed Numbers and Names:

<u>HUC6</u>	<u>NAME Sub-Watershed Name</u>	<u>Acres</u>
<u>180102110802</u>	<u>Middle Canyon Creek</u>	<u>22640.39456420000</u>
<u>180102111101</u>	<u>Big Bar-Sailor Bar</u>	<u>21153.16461880000</u>
<u>180102110904</u>	<u>East Fork North Fork Trinity River</u>	<u>29531.97268760000</u>
<u>180102110605</u>	<u>Weaver Creek</u>	<u>31781.98273490000</u>
<u>180102110803</u>	<u>Lower Canyon Creek</u>	<u>38421.71414230000</u>

N. Total Acres Burned: 21,317

Acres Burned Row Labels	Soil Burn Severity				Grand Total
	Unburned/Very Low	Low	Moderate	High	
<b>Fork</b>	<b>1,432</b>	<b>708</b>	<b>959</b>	<b>263</b>	<b>3,362</b>
USDA Forest Service	1,432	708	959	263	3,362
<b>Helena</b>	<b>6,225</b>	<b>4,931</b>	<b>5,747</b>	<b>1,051</b>	<b>17,955</b>
Bureau of Land Management	1,551	1,105	1,510	333	4,499
Other State Lands	6				6
Private	539	315	596	44	1,494
USDA Forest Service	4,130	3,511	3,641	675	11,956
<b>Grand Total</b>	<b>7,658</b>	<b>5,639</b>	<b>6,706</b>	<b>1,314</b>	<b>21,317</b>

## O. Vegetation Types:

Helena Fire

Black oak, Oregon white oak, Pacific Douglas fir, white fir, mixed conifer, canyon live oak, lower montane mixed chaparral, gray pine, Ponderosa pine, annual grasses and forbs, upper montane mixed chaparral, huckleberry oak,

Fork Fire

Montane chaparral, mixed chaparral, montane hardwood, Douglas Fir, Montane-Hardwood-Conifer, Sierran mixed conifer, Ponderosa pine, red fir, white fir, subalpine conifer

## P. Dominant soils:

Fork:

Chawanakee are coarse sandy loam soils with 60-80% slopes comprising of about 75% of the Fork Fire. Pardaloe-Goulding are gravelly loams with 30-75% slopes and encompasses about 20% of the Fork Fire. The Brockgluch is a gravelly loam and covers about 5% of the soils with in the Fork fire area and have 50-75% slopes.

Helena:

Specific dominant soils found in the Helena fire are, Brockgulch, and Pardaloe -Dedrick Complex, Pardaloe-Goulding Chawanakee primarily resulting in mostly loam and sandy loam soil textures. Brockgluch is a gravelly loam and covers about 23% of the Helena Fire. Pardaloe -Dedrick Complex is also a gravelly loam with 50-90% slopes that covers approximately 13.4% of the fire area. Pardaloe-Goulding are gravelly loams with 30-75% slopes and encompasses about 13% of the fire area. Chawanakee are coarse sandy loam soils with 60-80% slopes comprising of approximately 11% are found in the Helena fire area.

## Q. Geology and Geomorphology:

The Helena/Fork fire lies within the Klamath Mountains Physiographic Province, and is underlain predominantly by Paleozoic and Mesozoic metavolcanic and metasedimentary rock, along with minor amounts Quaternary sediments in the valleys. Tectonic processes accreted numerous terranes to the western margin of North America and one of these occurs within the fire area: the **Central Metamorphic Terrane** (Table 1).

**Table 1: Rock Units within the Helena/Fork Fires**

Belt/Assemblage	Age	Terrane/Formation	Rock type
Western Paleozoic and Triassic	Jurassic	Central Metamorphic	Metavolcanics plus Metasediments, Hornblende Schist, Serpentinite
Plutons	Late Cretaceous	Intrude the Central Metamorphic	Intrusive igneous, Diorite, Quartz Granodiorite
Pliocene, Pleistocene and Holocene Fluvial Deposits	Tertiary, Quaternary	Weaverville Formation	Sedimentary, Fluvial, Alluvium/Colluvium

These Terranes were intruded by granitic plutons, and the largest in the fire area forms the headwater ridges of Big East Fork of Canyon Creek and Gwin Gulch in the northern part of the complex.

The **Central Metamorphic Terrane** occupies the bulk of the fire complex. This Terrane is an accretionary mélange consisting mostly of pre-silurian metavolcanics and a few highly dismembered ophiolite bodies including slabs of serpentinite and peridotite, some of which may contain naturally occurring asbestos.

**R. Miles of Stream Channels by Order or Class:**

Fork = 5.9 Miles Perennial, 9.6 Miles Intermittent, 6.1 Miles Ephemeral

Helena = 33.9 Miles Perennial, 65.2 Miles Intermittent, 22.4 Miles Ephemeral

**S. Transportation System:**

Fork - Trails: 1.73 miles      Roads: 7.0 miles

Helena — Trails 2.85 miles      Roads: 50.0 miles

### **PART III - WATERSHED CONDITION**

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

Ownership:

Acres Burned Row Labels	Soil Burn Severity				Grand Total
	Unburned/Very Low	Low	Moderate	High	
<b>Fork</b>	<b>1,432</b>	<b>708</b>	<b>959</b>	<b>263</b>	<b>3,362</b>
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<b>Grand Total</b>	<b>7,658</b>	<b>5,639</b>	<b>6,706</b>	<b>1,314</b>	<b>21,317</b>



B. Water-Repellent Soil by total and FS (acres): Water repellency is a primary element of the soils effects in this fire: severe repellency is widespread and throughout the fire area, occurring in all soil burn severity classes from the bottom of the surface-charred layer (generally 0.5 - 1 inch deep), and varying in thickness from 0.5 - 1 inches in clay loam soils to 1 to 2 inches in sandy loams in high SBS. Repellency will be largely responsible for moderate soil burn severity expected to have a watershed runoff response similar to high. Repellency also occurred naturally in unburned areas, usually beginning at about 0.5 inches depth and 1 inch thick; but repellency was greatly exacerbated by the fire in coarse-sandy soils. Without repellency, these soils have rapid infiltration rates and surface runoff and erosion would normally be localized to shallow soil areas and/or steep slopes. It is estimated that about 40% of the fire area has water repellency elevated by the fire.

C. Soil Erosion Hazard Rating by total acres:

<b>Helena/Fork EHR</b>		
<b>Erosion Hazard Rating</b>	<b>Acres</b>	<b>Percent</b>
Low	7658	36%
Moderate	5639	27%
High	6706	31%
Very High	1314	6%
<b>Total</b>	<b>21317</b>	<b>100%</b>

D. Erosion Potential:

Total fire areas: 35 tons per acre for a 5-year runoff event, as determined using WEPP-ERMiT. Stated model accuracy is +/- 50%. With water repellency levels in this fire, +50% may be more representative for this area.

Table 4. Predicted erosion rates and amounts for the Helena and Fork fires:

<b>ERMiT Results 'Post Fire'</b>			
	<b>2-Yr Storm</b>	<b>5-Yr Storm</b>	<b>10-Yr Storm</b>
<b>Untreated</b> Tons	429,488	722,939	1,278,965
<b>Untreated</b> Tons/Acre	21	35	61
<b>Mulch .5 Tons/ Acre</b>	6	15	35.5
<b>Mulch 1 Ton/Acre</b>	4.75	12.75	30
<b>ERMiT Results 'Pre Fire'</b>			
Tons	42,221	193,189	533,737
Tons/Acre	2.4	8.25	25

**E. Sediment Potential:**

ERMiT estimates (part 3D) try to account for hillslope re-deposition, and sediment production numbers are delivery to the bottom of the hillslope. Many modeled hillslopes in this fire do have streams at the base of the slope; water percolates into the soils (depending on the degree of water repellency) and sediment is delivered into creeks below. Therefore it is roughly estimated that 50% of sediment estimates above would be delivered to the fluvial system and bulk it by 10 to 30%.

**PART IV - HYDROLOGIC DESIGN FACTORS**

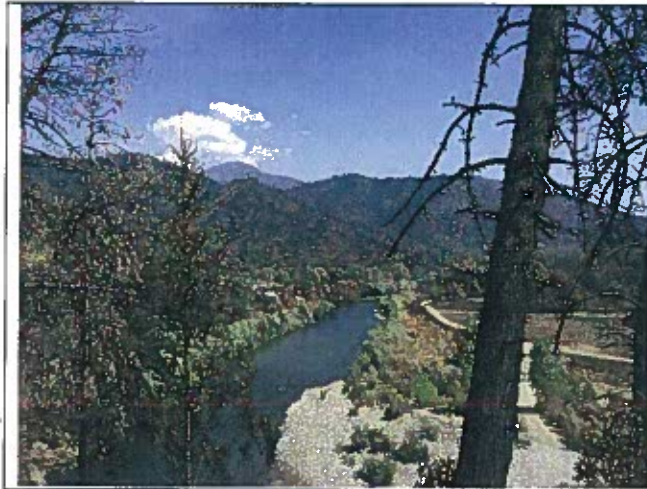
A. Estimated Vegetative Recovery Period, (years):	<b>30</b>
B. Design Chance of Success, (percent):	<b>80</b>
C. Equivalent Design Recurrence Interval, (years):	<b>2</b>
D. Design Storm Duration, (hours):	<b>6</b>
E. Design Storm Magnitude, (inches):	<b>1.95</b>
F. Design Flow, (cubic feet / second/ square mile):	<b>35.8</b>
G. Estimated Reduction in Infiltration, (percent):	<b>40</b>
H. Adjusted Design Flow, (cfs per square mile):	<b>62.4</b>

**PART V - SUMMARY OF ANALYSIS****A. Describe Critical Values/Resources and Threats:****Background:**

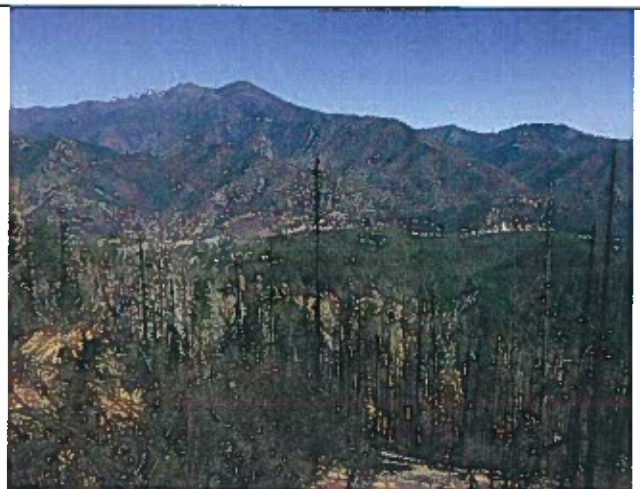
The Helena fire was human caused and is under investigation. The Fork fire started by a series of lightning strikes in early August, 2017 starting 15 new fires across the Shasta-Trinity National Forest. A few quickly grew out of control with near-record heat and strong gusty southwesterly winds. Fork fire started later as a holdover from the August lightning swarm. Fires were fueled by an abundant grass crop produced by above average rain coupled with local brush suffering from long-term drought effects, dead-and-down trees from the 2008 fires, and old growth stands of vegetation.

Approximately 38% for the Helena and 36% for the Fork burned at moderate to high soil burn severity (see soil burn severity maps below). The rest of the fire was either low or very low soil burn severity. It is very important to understand the difference between *fire intensity* or *burn severity* as discussed by fire

behavior, fuels, or vegetation specialists, and *soil burn severity* as defined for watershed condition evaluation in BAER analyses. Fire intensity or burn severity as defined by fire, fuels, or vegetation specialists may consider such parameters as flame height, rate of spread, fuel loading, thermal potential, canopy consumption, tree mortality, etc. For BAER analysis, we are not mapping simply vegetation mortality or above-ground effects of the fire. Soil burn severity considers additional surface and below-ground factors that relate to soil hydrologic function, runoff and erosion potential, and vegetative recovery.



Trinity River burn severity from the Helena Fire



Valdor Canyon high soil burn severity in the Helena Fire

General trends are mixed conifer forested areas were moderate to high soil burn severity with 40 to 90 percent timber mortality. Open rocky mixed conifer with brush/grass areas had moderate to low soil burn severities and with 30 to 70 percent mortality (see pics above and below).



High soil burn severity with 1 in char in clay loam soil.



High soil burn severity with strong repellency in clay loam.





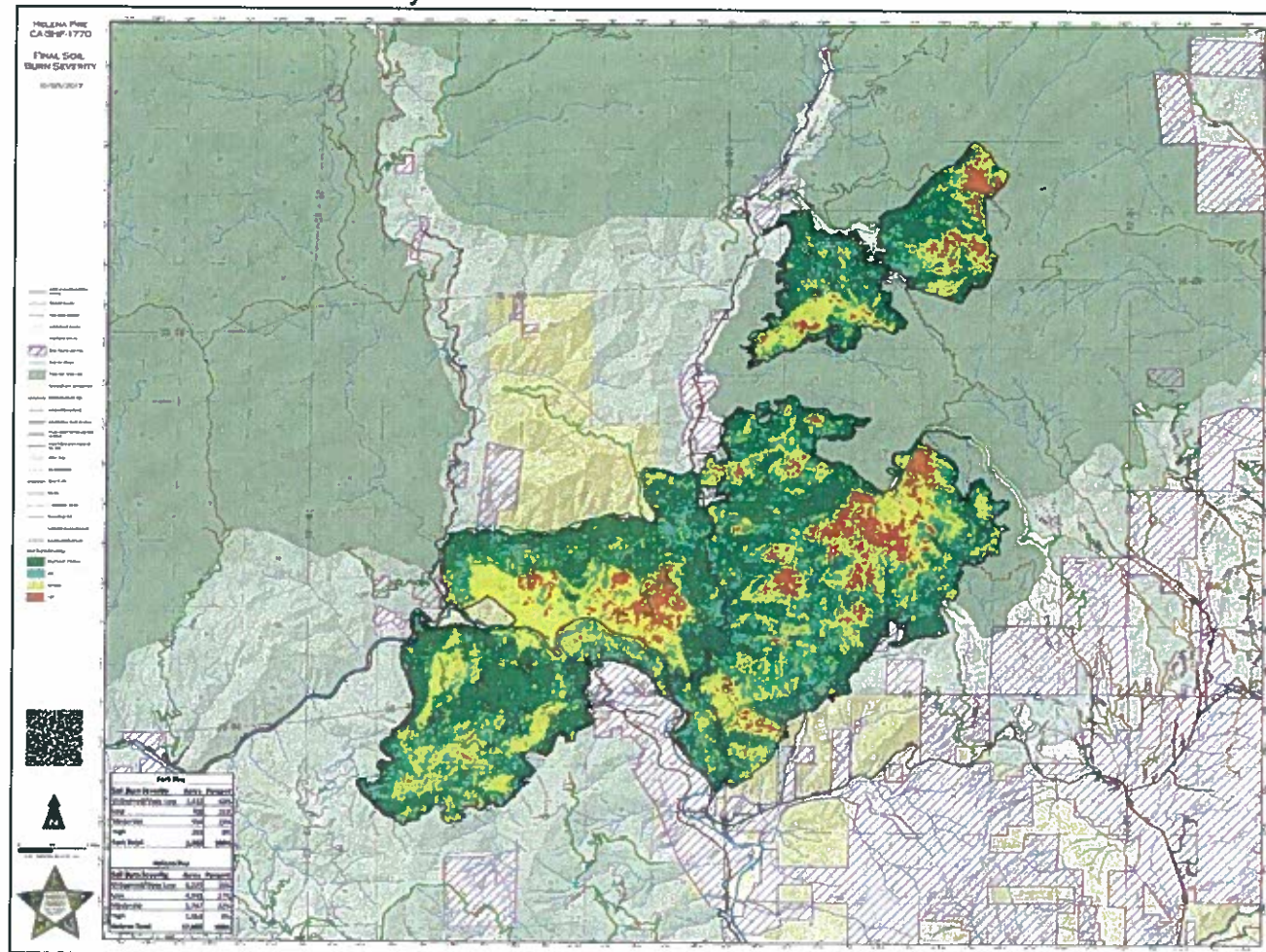
High soil burn severity landscape in mixed conifer with oak.



High soil burn looking up Wheel Gulch above Hwy 299.

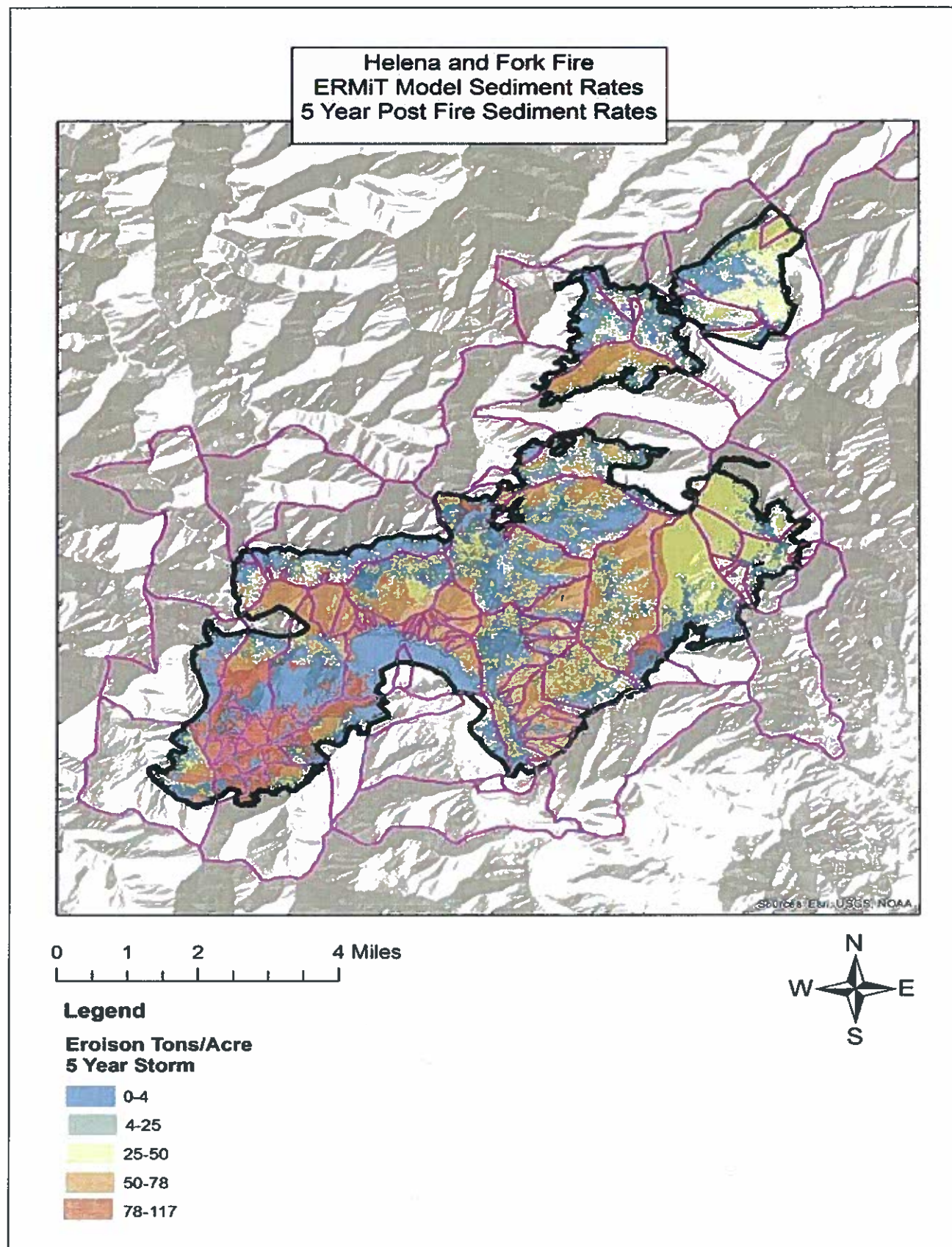
Looking at the soil burn severity maps below shows multiple areas that have the majority of moderate and high soil burn severity. These areas are Weaver Bally, Monument Peak, Clear Canyon, Valdor Canyon, Conner Creek, and Hocker Meadow area being at risk due to flooding and sedimentation affecting roads, water quality, and fish habitat.



**Soil Burn Severity Map:****Helena/Fork Soil Burn Severity:****Resource Condition Assessment Sections:****Soils**

Severe soil heating was mostly restricted to forested areas. Soil water repellency was common within moderate and high burn severity, and even in low burn severity areas. Hydrophobic strength was often high in the top 0.5 to 2 inches in burned areas. Based on soil burn severity an increase in hydrophobicity will occur on 40% of the Helena/Fork fires. Roughly half of the moderate severity class resulted in near complete vegetation canopy and organic horizon removal, leaving surface rock as the only effective ground cover. A 5-Year storm was modeled in ERMiT to determine if the estimated soil erosion for the fire area would affect soil productivity. For the 5-year event (20% probability); an estimated average 722,939 tons of sediment may be produced (35 tons/acre). Increased hillslope erosion is expected to occur throughout the fire area, especially within those areas in the high soil burn severity (see map below).





Thus, erosion rates are elevated high enough to constitute an emergency situation to soil productivity, and targeted hillslope treatments are proposed on slopes above critical Coho habitat (*see soils report for maps and details*). Point treatments on roads and trails are also recommended along with protection of localized homes.

## Hydrology

### Pre and Post Fire Peak Flow Model Results:

Soil burn severity information was used to model post-fire runoff response for each watershed of concern. Stream Gage data from the Trinity River at Burnt Ranch was used in a flood frequency analysis using the new USGS 2017 Bulletin 17c draft to determine pre-fire flows for the 2, and 5 year flows. The flood frequency was then applied to the USGS gaged to ungaged relationship appropriate for the North Coast region. Turn severity data was used to modify the post fire response including a bulking factor for areas with instability and soils with very high erosion hazard ratings.

		Normal		Post Fire Flows		Increase x Normal
Watershed	HU SQ MI	Q2	Q5	Q2	Q5	Q2
West Weaver Creek	14	437	528	674	815	1.54
Big EF Cyn Cr	7	241	294	389	473	1.61
Canyon Creek	64	1666	1983	1742	2073	1.05
Clear Gulch	6	212	258	372	453	1.76
Wheel Gulch	0.1	4	6	9	12	2.08
Conner Creek	4	150	184	234	287	1.56
Trinity At Burnt Ranch	1438	27400	31610	27500	31726	1.00

Stream crossings at risk were identified by overlaying roads and trails over streams within the burn area. A subsection of crossings was selected if they were within high or moderate burn severity areas or if the watershed area above them had a significant portion of high and moderate severity. After the "pour point" watersheds were delineated above these points the final burn severity totals were calculated for each point. The following table shows each road or trail that had at least one crossing at risk. Crossings that are identified as critical have at least 90% of the watershed area burned at a combined high and moderate soil burn severity. The stream crossings are also shown on the map following the table, see below.

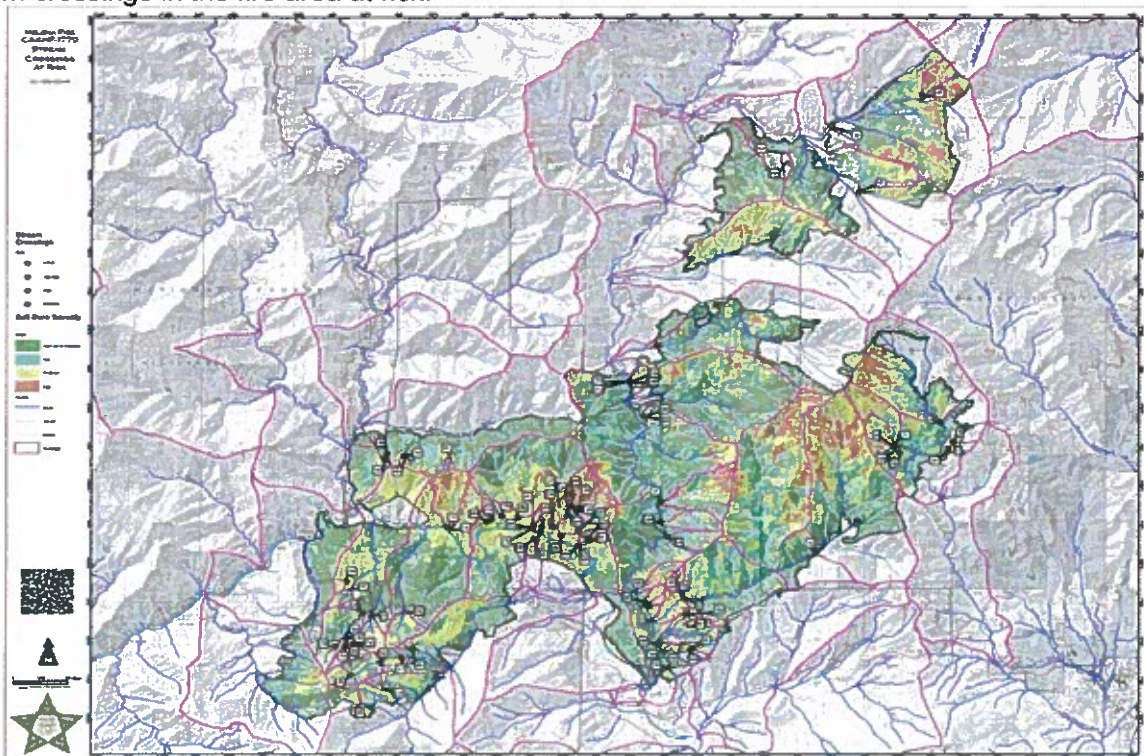
Stream crossing locations by road and risk rating:

Location	Critical	High	Moderate	Considered	Total
Canyon Cr Rd 401	2	6	3	2	13
299TRI	10	1	1		12
33N30C		2			2
33N31			1	1	2
33N31A				1	1
33N41		5	2		7
33N41C	1	1			2
33N41G		3			3



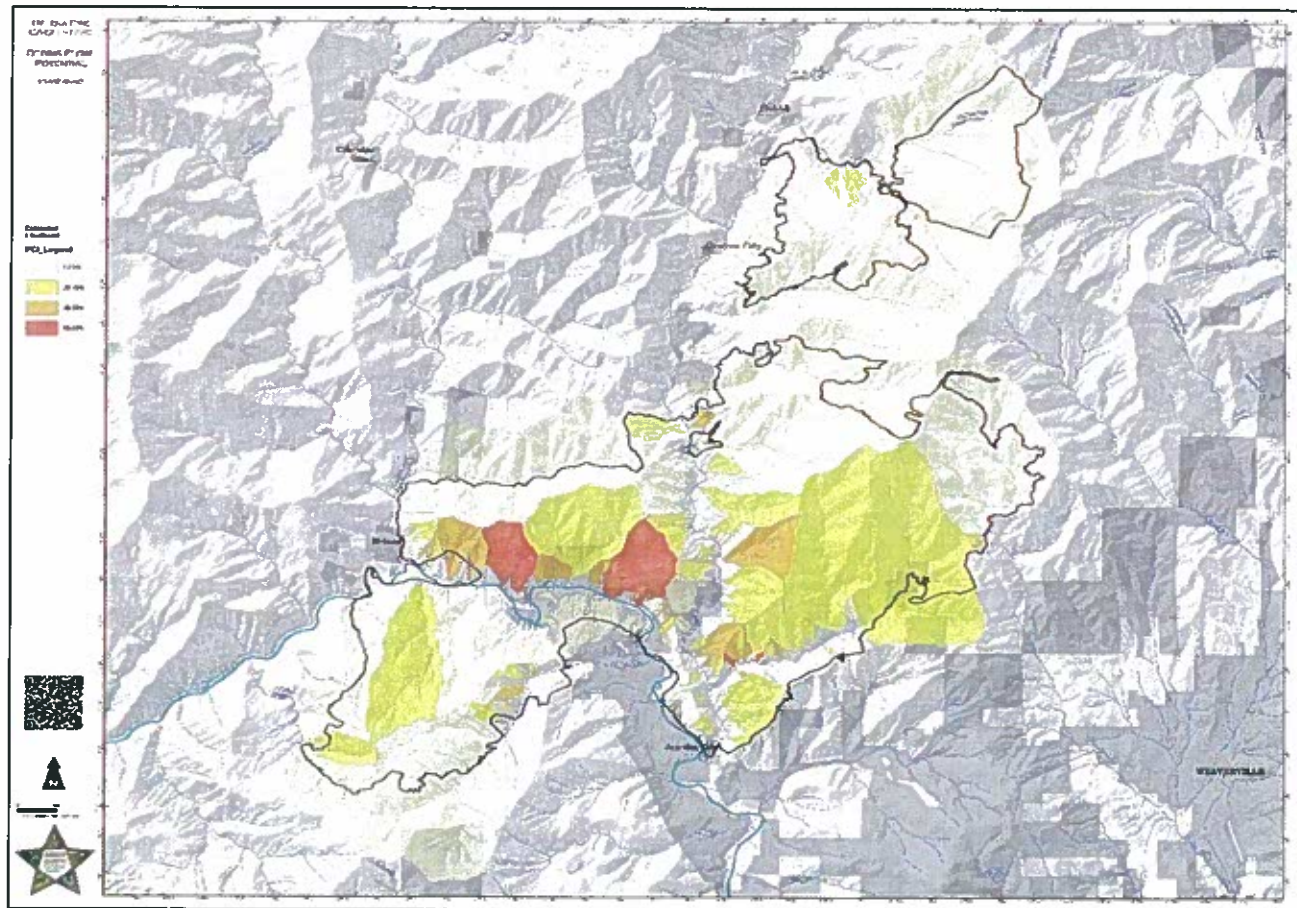
35N47Y				1	1
35N48Y		1			1
35N49Y		1			1
Bear Gulch Trail - 09W23A				1	1
BLM Trinity tributary	4				4
BLM Brock Gulch tributary		1	1		2
Clear Gulch - Log Xing			1		1
Dolly Ditch Trail - 10W12		3	1	4	8
East Fork Trail	1				1
Pvt Rd Clear Gulch tributary		1	1		2
Pvt Rd Brock Gulch tributary		2	1		3
Pvt Rd Canyon Cr Tributary	2	2	1		5
Pvt Rd Clear Gulch				1	1
Pvt Rd Coopers Bar				1	1
Pvt Rd tributary near Coopers Bar	2				2
Pvt Rd tributary near Wheel Gulch	4				4
Pvt Rd Wheel Gulch	2				2

Stream crossings in the fire area at risk:



### Debris Flow Potential:

There is a moderate potential for the occurrence of earth flows/debris flows within the burned area (Figure 3 Soil Burn Severity). Most of the streams and stream segments at risk for earth flows/debris flows are located within West Weaver Creek, Wheel Gulch, and Manzanita Creek watersheds that may have moderate to major impact on values at risk. Values that are at risk include channel crossing along multiple road segments of SR 299 (*see map below and Figures 4 and 5 in the geology report for debris flow potential maps*). Flow consistency will mostly be mud flows, but debris flows are possible.



### Rock Fall Potential:

Rockfall hazards occur along SR 299, County Road 401 and Valdor Gulch road. All are existing conditions that may be worsened by the fire which caused the burning of vegetation that was stabilizing material on the steep slopes. There is a large amount of cobbles and boulders and loose material susceptible to rock falls observed in the portion of the fire along County Road 401.

### Values at Risk: (see Appendix B)

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

### **Forest Service Roads and Trails:**

#### **Roads - Helena Fire:**

**Life: High Risk** (Likely, Moderate) – It is likely that storms would provide increased runoff and sediment delivery to various roads within the Helena Fire due to the moderate to high burn severity in the area. If not mitigated, runoff and sediment delivery to the road prism would cause a safety issue to road users and increase the chance of injury. In the Helena Fire, National Forest System Road (NFSR) 33N30C, 33N31, 33N41, 33N41C, 33N41G are at risk. Potential rock fall could also occur on County Rd. 401 along Canyon Creek.

**Property: High Risk** (Likely, Moderate) – It is likely that storms would provide increased runoff, sediment delivery, and mudflow to 33N30C, 33N31, 33N41, 33N41C, and 33N41G due to the moderate to high burn severity in the area. Protection of the cross-drain culvert inlets and road prism is necessary to handle the increased runoff and sediment delivery. In addition, these roads lack the amount of drainage structure to handle the increased runoff and sediment delivery. If not mitigated, the cross-drain culverts would not function as intended and cause damage to the road prism. Potential washouts could occur on road segments where there is a lack of drainage structures for the increased runoff and sediment delivery. NFSR 33N31 and 33N41 are operational maintenance level 3 roads while NFSR 33N30C, 33N41C, and 33N41G are operational maintenance level 2 roads. Road-fill burn-outs have occurred on 33N31 (4 ea), 33N41 (2 ea), and 33N41G (1 ea) where logs in fill have burned out compromising the road prism.

#### **Trails – Helena/Fork Fire:**

**Property: High Risk** (Likely, Moderate) – It is likely that storms would provide increased runoff, sediment delivery, and mudflow to the East Fork and Dolly Ditch Trails due to the moderate to high burn severity in the area. Protection of the crossings and trail prism is necessary to handle the increased runoff and sediment delivery. If not mitigated, the crossings would not function as intended and cause damage to the trail prism. Potential washouts could occur on trail segments where there is a lack of drainage structures for the increased runoff and sediment delivery.

#### **Soil Productivity:**

*Values at Risk – Threats to Soil Productivity and Hydrologic Function (Fire-Wide)*

Probability of Damage or Loss: Very likely

Magnitude of Consequences: Moderate

Risk Level: Very High



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. Many of the slopes with the highest predicted erosion are too steep to effectively treat with mulch. The risk matrix used for determining the level of risk to soil productivity.

Based on the low ground cover and conditions in moderate and high severity burn, it is very likely that erosion and sedimentation will occur in the Helena and Fork fires fire in the first year. The ERMiT modeled results show with the most likely scenario (a 2-year runoff event) that the amount of soil lost will be relatively moderate, this leads to a conclusion that the magnitude of consequences of soil loss is moderate. This leads to an overall risk rating of very high.

Highest amount of soil erosion expected in Hocker Meadows area and Upper Connor Canyon Watershed (Southwest corner of Fire area).

### **Water Quality and Quantity:**

#### **Potential Critical Values at Risk (VARs)**

##### *A. Human Life and Safety, Property and Infrastructure*

- People using the roads and trails within and downslope of the burn area (in particular, State Highway 299, County Road 401--Canyon Creek, and FS Routes 33N41 & 33N41G) could be at risk due to the threat of rock fall, tree fall, debris and sediment flows, and road washouts. These same roads and trails could be at risk of damage due to plugged culverts washing out and loss of road surface and fill, and damage to paved road surfaces.
- Roads and stream crossings are more susceptible to plugging and damage from increased sediment loads as well as from floatable debris (ash and burned wood).
- Water systems in the small rural communities near Junction City and the Weaverville Community Services District are at increased risk. Many Junction City residences rely upon a series of ditches that could be damaged by increased erosion and sedimentation and minor slope failures on steep slopes that burned relatively hot. West Weaver Creek intakes, fish screens, and filters could also be affected by heavy debris flows and increased turbidity due to heavy sedimentation from large storm events.

##### *B. Beneficial Uses of Water: Water Quality/Aquatic Habitat/Hydrologic Function*

- Domestic and agricultural water supplies for the Junction City small water systems and the Weaverville Community Services District may be affected by increased turbidity and sediment loads of incoming water as well increased erosion and sedimentation if transmission pipes and/or ditches are compromised.
- Water quality will also be degraded due to accelerated surface runoff and various erosion processes including mass wasting, debris flows, hillslope sheet and rill erosion as well as from failure of roads at stream crossings resulting in delivery of sediment to stream channels.
- Fisheries habitat, the "Outstanding Remarkable Value" of the Wild & Scenic Trinity River is likely to be negatively affected in areas where tributaries carry large amounts of fine sediment, from accelerated hillslope erosion, that will be delivered to streams and can cause elevated nutrients, suspended sediment, turbidity, and accumulation of fines in pool habitat and spawning beds.

- Recreation from contact recreation (fishing/swimming/rafting) would be impacted following storms when waters are likely to become turbid or transport floating debris.

### **Natural Resource Values at Risk - Threatened and Endangered Fisheries**

The values at risk considered were federally threatened Coho salmon (*Oncorhynchus kisutch*) and associated impacts to designated critical habitat that exist inside the Helena/Fork Fire perimeter. Impacts to Designated Critical Habitat from excessive sedimentation and habitat degradation. Impaired habitat could lead to impacts to emergence, feeding and growth of young Coho salmon.

This rapid aquatic analysis is based on aerial reconnaissance, ground investigation and GIS between October 4 – 8, 2017. Due to time constraints, streams designated by the National Marine Fisheries Service (NMFS) as critical habitat for federally threatened Coho salmon were given highest priority for field assessments. Areas with moderate to high burn severity were the areas of focus for this assessment on stream systems within the Shasta Trinity National Forest impacted by the Helena/Fork Fire.

There were 5 watersheds (HU10) affected by the Helena/Fork Fire, and all have Coho salmon designated critical habitat impacted by the Helena/Fork Fire. An average of only 7% of these watersheds (i.e., having designated Critical Habitat within them) were burned by the Helena/Fork Fire. Impacts to these watersheds were also evaluated as part of the hydrology, and other BAER specialist reports. See hydrology report for pre and post discharge predictions to watersheds inside the Helena/Fork Fire.

Areas of moderate to high burn severity have the greatest potential to mobilize sediment into stream systems, reduce productivity and benthic macroinvertebrate populations and reduce the availability of spawning and rearing habitat, all impacting fisheries. Stream ecosystem impacts include changes in geomorphology (e.g., sediment filled pools and riffles), decreased pool depth, loss of habitat, increased solar radiation owing to losses in riparian cover, changes in water quality, increased dissolved nutrients and pH, and changes in pool:riffle ratios (Dunham et al. 2003, Earl and Blinn 2007, Aha et al. 2014). For fish, habitat loss, reduced riparian cover, changes in water quality, increased temperature, and reduced prey availability all affect fish population responses to fire including increased mortality and extirpation. However, these effects may be pronounced or muted depending on the fire burn severity, timing of subsequent rainfalls, intensity and duration of ensuing rains, and volume of debris and sediment entering streams.

**Canyon Creek** – Headwaters of Canyon Creek begin on the south face of Thompson Peak (9,002 ft.) and drain in a southerly direction for approximately 22 miles before joining the Trinity River near Junction City, California (1,497 ft.). The upper 11 miles are completely within the Trinity Alps Wilderness Area. Anadromous fish have access to approximately 15 miles of the creek before a large water fall prevents upstream migration. Along Canyon Creek 6 miles of designated critical habitat were burned by the Helena Fire. 5.2 miles were either unburned or had very low burn severity, 0.70 miles of low burn severity and only 0.10 miles of moderate burn severity.

Site reconnaissance on Canyon Creek October 5<sup>th</sup> revealed a significant amount of material had come down Big East Fork Canyon Creek inside the Fork Fire. This combination of ash and mud was a result of a high intensity storm event on September 19<sup>th</sup> and 20<sup>th</sup> near Monument Peak. Based on data from the Backbone RAWS station (just north of the fire area) the storm event recorded 0.62 inches of rain fell in a 12 hour time period. The RAWS station revealed that most of the precipitation dropped between 9pm and 7am. Sediment and ash was deposited throughout Big East Fork Canyon Creek and significant amounts of ash and sediment was observed at the confluence with Canyon Creek.

No fish mortality was observed along Canyon Creek. However anecdotal evidence from private land owners indicated that some mortality was observed of juvenile fish. The entire reach inside the Helena/Fork Fire is designated critical habitat for Coho salmon. One adult foothill yellow-legged frog was observed at 40°46'03.3"N, 123°03'04.5" along Canyon Creek. Just downstream a river otter was also observed actively pursuing prey beneath the surface.

**Conner Creek** – Conner Creek is a tributary to the Trinity River in the Junction City area of Trinity County, California. The entire reach inside the Helena/Fork Fire is designated critical habitat for Coho salmon. Surface flows were observed along the entire reach inside the Helena/Fork Fire. Conner Creek was recently the recipient of two fish passage removal projects. The project consisted of the removal of two migration barriers structures on county roads in the Conner Creek watershed. The projects are located in Section 2, T33N, R11W, MDBM on the USGS 7.5 Dedrick Quadrangle and are accessible by taking Highway 299 west out of Weaverville 8 miles, turn left at Dutch Creek Road and cross the Trinity River, turn right on Red Hill Rd. The downstream project, on Conner Creek Road is accessed by turning right onto Conner Creek Road from Red Hill Road at approximately road mile 2.2. The upstream project site is located on Red Hill Road approximately 500' past the Conner Creek Road turnoff. The purpose of the Conner Creek projects were to provide full passage for all life stages of Coho salmon and steelhead to the natural limits of anadromy by removing two County road culverts that were migration barriers to salmonids.

There was a total of 90 miles of surface water burned inside the Helena Fire, of those miles 70 miles were either unburned or very low and 20 miles burned at low burn severity. However, given the acres of moderate burn severity on the upland hillslopes (2008 Eagle Fire burn scar) it is likely that significant sediment will mobilize into the stream during ensuing rain events. No fish mortality was observed during field reconnaissance. Some riparian vegetation was burned by pockets of low burn severity but this is not expected to result in increased stream temperature.

An assessment of fisheries Values at Risk (VAR) in relation to potentials for, soil erosion/sedimentation, decreased water quality and loss of cover indicated that federally threatened Coho salmon (*Oncorhynchus kisutch*) populations and habitats (designated critical habitat) are likely to be adversely affected by post-fire impacts. BAER treatment opportunities across the landscape are limited due to slope steepness (>60 percent) and inner gorge areas. Treatable acres for fisheries were limited to the Conner Creek drainage due to its importance as a domestic water source, designated critical habitat for Coho salmon, access roads, presence of dormant landslides and the inflow to the Trinity River which is designated as a Wild and Scenic River. In all other affected burn areas, too few treatable acres were identified to make a significant or cost effective difference in post-fire projected sediment yields. Emergency BAER treatments were identified for roads in the Helena and Fork Fires. No in channel treatments were prescribed for affected Helena Fire and Fork Fire streams due to the steepness of side slopes (>60 percent) and instability of inner gorge areas.

### **Threatened, Endangered, Sensitive and Invasive Plants:**

#### **Potential Values at Risk**

The health of the ecosystem is at risk of post-fire noxious weed introduction which could result in the following issues: increased erosion, increased fire frequency intervals, decreased native plant communities, reduced terrestrial and aquatic sensitive plant and fisheries habitat, and altered nutrient cycles.

The Forest Service is obligated by law, and regulations such as Executive Order 13112, to respond to invasive species that threaten terrestrial and aquatic resources of the National Forest System and to



collaborate with federal, state, and local partners to address invasive species that can spread from adjacent lands. Forest Service policy for invasive species management and research has recently been updated in 2013 by direction provided in Forest Service Manual (FSM) 2900 and by directions provided in FSMs 3400 and 4000.

Information on weed presence and abundance was documented with information from Natural Resources Information Systems (NRIS), California Invasive Plant Council (Cal-IPC), California Department of Food and Agriculture (CDFA), GIS analysis, and field surveys during the BAER assessment.

### Threatened, Endangered, or Proposed Species

The most recent list of endangered, threatened, or proposed species for Trinity County from the US Fish and Wildlife Service website (<https://ecos.fws.gov/ipac>), was accessed on October 8, 2017 by forest botanist, Lusetta Sims. White bark pine, *Pinus albicaulis*, is a candidate species and does not require consideration under this analysis. White bark pine is, however, analyzed as a sensitive species and although only threatened and endangered plants are considered for treatments under BAER.

Flowering plant species included on the report of Listed/Proposed Threatened and Endangered Species for Trinity County are:

Scientific name	Common name	Endangered Species Act status
<i>Chamaesyce hooveri</i>	Hoover's spurge	Threatened
<i>Arabis macdonaldiana</i>	McDonald's rock cress	Endangered
<i>Orcuttia tenuis</i>	Slender Orcutt grass	Threatened

None of these species occurs or has suitable habitat in the project area. Critical Habitat has been designated for Hoover's spurge and slender Orcutt grass; in neither case does Critical Habitat extend to Trinity County.

### Noxious Weeds

The weed populations within and near to the fire perimeter are concentrated along the roadsides, particularly the Canyon Creek road. The 3 dominant noxious weeds found during the assessment are scotch broom, Dalmatian toadflax, and starthistle. Other invasive and noxious weed species known to occur within or adjacent to the burn include the following:

Scotch broom (*Cytisus scoparius*), moth mullein (*Verbascum blattaria*), Dyer's woad (*Isatis tinctoria*), spotted knapweed (*Centaurea stoebe* ssp. *Micranthos*), diffuse knapweed (*Centaurea diffusa*), Dalmatian toadflax (*Linaria dalmatica*), starthistle (*Centaurea solstitialis*), Canada thistle (*Cirsium arvense*), tree of heaven (*Ailanthus altissima*), bull thistle (*Cirsium vulgare*), lenspod whitetop (*Cardaria chalapensis*), sweet fennel (*Foeniculum vulgare*), puncturevine (*Tribulus terrestris*), cheatgrass (*Bromus tectorum*), St. Johnswort (*Hypericum perforatum*), and sweet clover (*Melilotus albus*). See Appendix C for a map of known infestations. The weed profiles can be found in Appendix B and at the CAL-IPC website: [www.cal-ipc.org](http://www.cal-ipc.org). Noxious weed ratings (CDFA, 2015).

Advantageously, the majority of the areas along roadsides that were burned have had needle cast drop over the burned soil, creating a buffer to help prevent the spread of invasives into the interior of the fire,

along with pine cones dropping as a future seed source. There are exposed dozer lines that intersect roads within and adjacent to the fire that provide a prime habitat for invasives to establish in the newly disturbed soil.

Areas within and surrounding the Helena and Fork fire have had a history of fires within the last 30 years. See map in Appendix D. Burn scars are visible on the southwestern portion of the fire that surround Conner Creek and Hocker Creek, where the fire burned moderate to high burn severity. It is reasonable to assume the recovery process of this fire will be similar to these past fires. These areas that have had repeated burns, are particularly susceptible to establishment of annual grasses and invasive weeds due to the lack of ground cover, organic material, high slope, and increased erosion potential.

### **Didymo**

During suppression activities, water samples were taken from the main stem Trinity River and the bridge in Junction City near Evans Bar and submitted to a lab in Eureka tested positive for Didymo (*Didymoplenia geminata*). Didymo, also referred to as "rock snot" is an aquatic invasive species of diatom that generally grows in colder, low nutrient, high clarity streams. Didymo can alter the entire stream ecosystem. It can form extensive blooms that result in large mats on the bottom of lakes, rivers and streams.

Didymo cells secrete a mucus-like substance to create a firm hold on substrates and to help keep the alga moist. Changes in the stream can be extensive and can include an increase in suspended organic material, fluctuating pH levels, and a change in macroinvertebrate population structures. Fish populations may suffer as the habitat (interstitial spaces between rocks) for macroinvertebrates (especially the pollution-sensitive taxa—caddisfly, stonefly and mayfly) is covered by the algal colonies, reducing preferred food supplies. The resulting loss of quality habitat can also lead to a shift to pollution-tolerant macroinvertebrates like midges, leeches, etc. Once Didymo is established in an area, wading is hazardous due to slippery, algae-covered rocks. The spread of Didymo can also affect the fishing industry by clogging water intakes of boat motors and interfering with fishing gear and lines. Excessive blooms of Didymo can render fishing impossible, with devastating economic consequences.

Water drafting occurred from Evans Bar to Bagdad campground along the main stem of Trinity River. It is reasonable to assume those same fire engines moved around to draft out of local tributaries and helicopter water bucket drops occurred throughout the fires and adjacent to fire perimeter that potentially contaminated previous tributaries that had not been infected with Didymo. Once Didymo presence was confirmed, those confirmed infested locations were no longer used, but not all drafting locations were tested and sampling didn't occur until approximately 2 weeks post initial attack. Given this information, there is a possibility of Didymo spreading to the tributaries that run into the Trinity River.

*Threats to ecosystem stability from the introduction and spread of noxious weeds and Didymo:* An emergency exists in the form of soil erosion, increased exposed soil surfaces, decreased native vegetation to compete with the noxious weeds, noxious weeds competing with sensitive species for sensitive habitat, potential increased fire frequency return interval, decreased salmonid spawning habitat and potential reduction in aquatic organism food sources.

*Probability of Damage or Loss:* **Likely** for both noxious weed spread and spread of Didymo. This determination is due to the newly exposed soil surfaces created, the high amount of vehicle traffic, the presence of Didymo from water drafting locations during suppression activities and the ease of spread.

**Magnitude of Consequence:** **Moderate** for both weed spread and spread of Didymo. This determination is due to the noxious weed's ability to compete with sensitive species habitat and in areas that are at risk of having a vegetative type conversion which could cause long term negative impacts. For Didymo, a moderate determination is due to the impacts to critical spawning habitat to the Coho salmon, decreased food sources for aquatic species, reduced enjoyment to recreationists and fishermen.

**Risk Level:** **High** for both noxious weed spread and spread of Didymo.

**Threats to Cultural Resources:** Post-fire effects on cultural resources result from two types of disturbances. The first is natural; the degradation of sites from burned hazard trees falling and increased erosion within the burn area which causes an increase in sediment deposition, debris flows, and scouring of the landscape. The second is cultural; increased access to the resource as a result of a denuded landscape that leads to a greater risk of looting, vandalism, and unauthorized OHV use. Each of these effects can also cause or exacerbate the other.

Critical Values for Heritage include all cultural resources which are listed on or potentially eligible for the National Register of Historic Places, Traditional Cultural Properties and Indian Sacred sites on National Forest lands. There are 12 known sites within the Helena and the Fork burn perimeters that are in or in proximity of burned moderate to high intensity areas, some of which are prehistoric locations.

Field assessment of historic and prehistoric properties for the Helena/Fork Fire BAER was conducted over the span of two days. The fire areas are rich in cultural resources that represent Native American use of the area, as well as historic homesteading, ranching, and logging. It was necessary to prioritize sites as this is a large assessment in a relatively short amount of time. Three sites (out of 12 sites) that were identified as most "at risk" from post-fire effects were visited for assessment, although it should be noted that all sites that burned are at increased risk of vandalism and looting. Of the 3 visited, 1 was prehistoric, 2 were historic.

Of these, only 1 has been identified as at particular risk from an increase in public access along highway 299 due to the loss of vegetative barriers resulting from the fire. This makes this site particularly vulnerable to increased disturbance and looting.

- For the site, the probability of damage or loss is "**Likely**," there is clear and recent use of these area.
- The magnitude of consequences is "**Moderate**" for the site and the risk is "**High**".

### **Threats to Public Safety:**

Geologic Values-at-Risk (VARs) all involve public safety and property damage (rockfall, debris flow).

**Rock falls** - Rockfall hazards occur along SR 299, County Road 401 and Valdor Gulch road. All are existing conditions that may be worsened by the fire which caused the burning of vegetation that was stabilizing material on the steep slopes. There is a large amount of cobbles and boulders and loose material susceptible to rock falls observed in the portion of the fire along County Road 401.



**Earth flow/debris flow** – There is a moderate potential for the occurrence of earth flows/debris flows within the burned area (Figure 3 Soil Burn Severity). Most of the streams and stream segments at risk for earth flows/debris flows are located within West Weaver Creek, Wheel Gulch, and Manzanita Creek watersheds that may have moderate to major impact on values at risk. Values that are at risk include channel crossing along multiple road segments of SR 299 (*see Figures 4 and 5 in the geology report for debris flow potential maps*). Flow consistency will mostly be mud flows, but debris flows are possible.

**Threats to Wildlife:** There are no wildlife concerns for the Helena and Fork due to limited impacts on T&E species.

**Emergency Treatment Objectives:** To allow safe passage of water to protect infrastructures and watersheds from accelerated sheet and rill erosion. To protect watersheds from the spread of noxious weeds and unfettered OHV access.

Risk determination is dependent on the design storm selected and downstream values at risk. By using an average storm (2-year event) emergency planning measures can be designed to mitigate and minimize anticipated risks. Using a 2-year design storm the values at risk can be evaluated to determine if an emergency exists.

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

Land 90 % Channel - % Roads/Trails 85 % Protection/Safety 90 %

**D. Probability of Treatment Success:**

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

**E. Cost of No-Action (Including Loss): \$11,572,000**

**F. Cost of Selected Alternative (Including Loss): \$273,380**

**G. Skills Represented on Burned-Area Survey Team:**

<input checked="" type="checkbox"/> Hydrology	<input checked="" type="checkbox"/> Soils	<input checked="" type="checkbox"/> Geology	<input checked="" type="checkbox"/> Range	<input type="checkbox"/> Administration
<input type="checkbox"/> Forestry	<input type="checkbox"/> Wildlife	<input type="checkbox"/> Fire Mgmt.	<input checked="" type="checkbox"/> Engineering	<input type="checkbox"/>
<input type="checkbox"/> Contracting	<input checked="" type="checkbox"/> Aquatics	<input checked="" type="checkbox"/> Botany	<input checked="" type="checkbox"/> Archaeology	<input type="checkbox"/>

☒ Fisheries    ☐ Research    ☐ Landscape Arch    ☒ GIS

Team Leader: Brad Rust

Email: brust@fs.fed.us

Phone: 530-226-2427

FAX: 530-226-2485

### **Summary of Shasta-Trinity Fork 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, landslides, debris flows and hazardous trees along road and trails
- Domestic and municipal water sources

#### **Property**

- USFS and BLM system roads
- USFS trails
- USFS campgrounds
- Private homes

#### **Natural Resources**

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

#### **Cultural Resources**

- Prehistoric sites
- Historic sites

### **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 Appendix C below summarizes values at risk, post wildfire threats and risk ratings for forest service lands. Other lands that are not forest service (BLM, State, County, and Private) were noted and evaluated for risk. 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 (except in the case for life).

**H. Treatment Narrative for Forest Service:**

(Describe the emergency treatments, where and how they will be applied, and what they are intended to do. This information helps to determine qualifying treatments for the appropriate funding authorities.)

**Land Treatments:**

The proposed treatments on National Forest System lands can help to reduce the impacts of the fire, but treatments will not completely mitigate the effects of the fire. The treatments listed below are those that are considered to be the most effective on National Forest System lands given the local setting including topography and access.

**Natural Recovery:** Vegetation in the mixed conifer and fir forests 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 Jeffrey, sugar, western, or ponderosa pine 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. Meadows dominated by grasses and forbs will recover within a year, because for the most part soil temperatures were not hot enough to kill root systems. The montane chaparral shrubs were mostly killed by the fire, but fire stimulates manzanita seeds stored in the soil to germinate. In riparian areas sedges and grasses were resprouting within 10 days of the fire, and most riparian shrubs are also likely to resprout.

**Hand-Mulching:** Proposed treatment of 100 acres of hand-mulching comprises of moderate soil burned severity with no vegetation cover. The soils range from gravelly loam to clay loams. Slopes in the area range from 40% to around 65%. The predicted erosion rate for a 2 year storm event is 21 tons/acre and for a 5 year storm event is 35 tons/acre. Mulching 1.0 tons/acre will drop these predicted rates to 6 tons/acre and 15 tons/acre respectively. Wood straw is recommended since it is roughly 50% more effective than most other options but rice-straw at higher rates can be effective if triple chopped. Wood straw is heavier and has less of a tendency to blow off steeper slopes or wash downhill vs. unchopped straw.

Treatment proposal consists of seeding with native grass seed, then mulching with rice straw 1.0 tons/acre over 100 acres in the Connor Creek watershed. Hand seeding and hand mulching with 3x rice straw is recommended to be carried out by an Agreement. The recommended treatment area is directly above newly designated Critical Habitat for the Coho Salmon which is a Threatened Species. (See the Fisheries Report for more information)

The 100 acres treatment area is upstream of domestic water source. It is also approximately 2 miles from the confluence of Connor Creek and the Trinity River. The Trinity River is not only a wild and Scenic River, but is also on the 303D list due to being sediment impaired and managers are required to reduce 37% of that sediment per year until the river is back in to good standing (See Watershed Report and Fisheries Report).



Seeding with weed free native seed before mulching will allow native plant species to quickly dominate the area to reduce weeds infiltrating the area. There are dormant landslides within the watershed and seeding will assist stabilizing the hillslope. The local District (Weaverville Ranger Station) has an estimated 500-1500lbs of native seed already available. This seed is stationed at Big Bar and in Weaverville, and more seed is on hand being cleaned at the in Bend Seed Extractory in Oregon. (See Botany Report)

There is a Special Use Permit for the U33N41K road, which intersects the treatment area, but is located mostly directly below the 100 acre recommended treatment area.

Lastly, the *Time Factor* is the most critical reason why hand seeding, hand mulching, and using agreements is recommended. Effective treatments will need to be implemented before the first big storms of the wet season. There are local available crews (Fire Crews, Resource Conservation District (RDC), California Conservation Corps (CCC), Inmate Crews etc.) to assist in application operations, which will reduce the time it takes to implement. Reducing the time line for implement is imperative since the wet season will be starting within approximately 3-5 weeks. The Forest Service already has agreements in place with all listed local available crews and would be able to start approximately within 2-3 weeks upon an approval of the recommended treatment.

#### Noxious Weed Detection and Eradication Treatments:

Treatments proposed for this fire include weed detection surveys, noxious weed removal within year one, native seeding and mulching with straw on hillslopes above Conner Creek, testing for Didymo and posting informative signs to prevent the spread of Didymo. There could be effects of BAER treatments on special status plant species, habitats, and with the use of the weed free rice straw, some associated risk of noxious weed introduction or spread during these treatments is expected therefor monitoring will be required to last up to 3 years.

Weed detection surveys will occur during the flowering season in 2018. Because of differences in flowering times for all potential species, two visits may be required during the growing season. Completion of inventory and treatments along roads, dozer lines, drop points, road and dozer line intersections, and known invasive plant populations will be the primary focus. See Appendix E for treatment location and Appendix B (in Botany report) for list of weed species will be mapped, using the west side Shasta-Trinity NF Invasive Weed List. Surveys will be completed using the NRIS protocol available at the national website: [http://fsweb.nris.fs.fed.us/products/TESP\\_Invasive\\_Species/documentation.shtml](http://fsweb.nris.fs.fed.us/products/TESP_Invasive_Species/documentation.shtml).

Results will 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 3 mm plastic bags, and properly disposed.

Documentation of new infestations will include:

- Mapping perimeter of new infestations
- Filling out Weed Element Occurrence Form
- Treatment method
- Dates of treatment
- Incorporating data into local GIS spatial database
- Entering data into National Resource Information System (NRIS) database
- Entering data into FACTS database
- Evaluating success of treatment in subsequent inspections

A Weed Detection Survey Report will be submitted to the Regional and Forest BAER Coordinators, Invasive Weed Coordinator and Forest Botanists. If weed introduction and spread has occurred, an

interim BAER report will be completed to request eradication funding. Reporting costs are included in figures below.

#### Seeding and Mulching

Hand application of native seed and wood straw mulch on 100 acres of the hillslopes above Conner Creek. Seeding rate is prescribed at 6lbs of seed per acre, half of which is *Elymus glaucus*, the other as *Bromus carinatus*. Atop the layer of seed will be a layer of rice straw mulch applied at a rate of 1.0 tons per acre by hand. See soils report for information on the mulching treatment.

#### Didymo Testing and Signage

Determine presence/absence of Didymo through monitoring samples along the Trinity River and tributaries surrounding the Helena/Fork Fires that have Coho Critical Habitat: Conner Creek, Eagle Creek, Big East Fork of Canyon Creek, North Fork, West Weaver and East Weaver Creek.

#### Testing Methods:

- Collect samples from June to September along accessible streams prioritized in the fire perimeter and representative sites in the upper reaches. See Appendix E for Treatment Map for recommended sites.
- Sample containers will be labeled with date, tributary name, and collector name.
- Fill Nalgene 8 oz. sample containers with any observable algae material. If larger substrates of algae are found they can be placed in a plastic bag.
- Photos of collection sites labeled with site name and date along with GPS points. If no algae is observed a photo and GPS point will be taken.
- Verification of presence/absence will be done by forest botanist in Weaverville using a compound microscope.

Results of verification will be entered into the Northern California Aquatic Invasive Database.

- Gear and equipment that may have touched water from the sampling site will be cleaned with 2% bleach solution or Quat 128, dried in the sun or frozen for 48 hours.
- Informative signs that describe what Didymo is, the impacts that Didymo can cause, and ways to prevent the spread will be designed and posted for the public who would likely visit the Trinity River. Locations where Didymo is present and high use water recreation areas will be the priority locations to post informative signs.

#### Treatment Cost

Total Treatment Costs						
Treatment Type	Item	UOM (Unit of Measure)	Rate (\$)/UOM	# of Units	Totals	Sum of Treatment Cost
Noxious Weed	Road	Mile	700-1000	34.5	24,150-34,500	\$27,650- \$39,500
Survey and Removal	Dozer line	Mile	700-1000	5	3,500-5,000	
Native Seeding	<i>Elymus glaucus</i> seed	Lbs	24	300	7200	\$13,200
	<i>Bromus carinatus</i> seed	Lbs	20	300	6000	
Didymo Testing and Signage	GS 11 Botanist	Day	378.21	2	756.42	2,821.42
	GS 6-1 Biological Technician	Day	125	5	625	
	GS7-1 Biological Technician	Day	155	5	775	
	FS Vehicle	Mile	0.05	5	375	
	Supplies (Bottles (\$5 ea), cooler)	Each	175	1	175	
	Drift net	Each	115	1	115	
	Sign Materials (paper, printing, lamination, etc.)	Each	3,000	1	3,000	
Grand Total						\$46,671.42 to \$58,521.42

**Road Treatments:****Helena Fire:**

**Safety** – Within the Helena Fire, warning signs would need to be installed to warn road users of the fire area. In addition, on county road 401, warnings about rock fall would need to be installed due to the potential of rock fall on the road. In addition to warning signs, several roads within the Helena Fire would need a temporary closure for the winter due to potential runoff and sediment delivery that would likely be a safety issue to road users. Temporary road closures would include a forest order, barricades, and warning signs to warn the public.

**Storm Proofing** – NFSR 33N41, 33N41C, 33N41G, and the U33N41K are expected to see an increase in runoff and sediment delivery to the road prism due to the moderate to high burn severity and steep terrain of the Helena Fire. On NFSR 33N41, 33N41C, 33N41G, and 40N11, all the cross-drain culverts don't have pipe risers in place and would need them to mitigate against the higher runoff and sediment delivery. In addition, several culverts would need to be cleaned to prepare for the upcoming storms.

On NFSR 33N31, 33N41, and 33N41G, are areas of road fill burn-outs of buried logs compromising the integrity of the roads. To mitigate against erosion and failure these areas will to be dug out to remove partially burned logs, fill with compacted soil, and regrade.

On BLM Valdor road at Wheel Gulch will need a low water crossings. This area has an undersized culvert that is not armored and the increased runoff and sediment delivery could compromised the road infrastructure. To mitigate against the increased runoff and sediment delivery, it is recommended that the low water crossings be armored to protect the road infrastructure.

**Storm Patrols** – NFSR 33N31, 33N41, 33N41C, and 33N41G are within a moderate to high burn severity. There is a future threat to travelers along the roads due to the increased runoff and sediment delivery and the potential for culverts to be plugged with sediments. Storm patrol would allow the forest to monitor the road drainage structure treatments to ensure the treatments are functioning, clean the area to ensure they continue to function in the future, and maintain and/or repair any damage to the road surface to the sediment delivery.

**Road Treatments Cost Estimate for the Helena Fire:****Treatment Objectives**

<b>Treatment Type</b>	<b>Treatment Objective</b>	<b>Treatment Description</b>	<b>Treatment Cost</b>
Storm proofing and storm-patrol	To protect the road infrastructure, by reducing likelihood of culverts plugging up and road washouts due to increased runoff and sediment delivery.	Clean culverts, install risers where recommended, construct armored dips, install low water crossings. The forest will send out a storm patrol after rain events to monitor and/or repair treatments as needed to prevent further damage to infrastructure.	\$63,200



Safety	To protect the lives of people by making them aware of the hazards they may encounter in the burned areas.	Install warning signs that describe hazards that can be encountered such as hazardous trees, falling rocks, and road debris. Install barricades and signs for temporary road closures for upcoming winter storms.	\$1000
<b>Total Cost</b>			<b>\$64,200</b>

## Treatment Costs

Road Costs	Spot Rocking			Rolling Dips (RD) /Armored Dips (AD)			Risers				Fill Burn-out Repair			Culvert Cleaning			
	Length	cost/ mi	Total Cost	Qty (each)	Each (\$)	Total Cost	Size	Qty (Each)	Cost Each	Total Cost	Qty (each)	Cost Each	Total Cost	Each	cost/each	Total Cost	Overall Total
33N31							36	1	\$ 2,250	\$ 2,250	5	\$ 1,800	\$ 9,000	10	\$ 750	\$ 7,500	\$ 18,750
																	\$ -
33N41							36	1	\$ 2,250	\$ 2,250	2	\$ 1,800	\$ 3,600	13	\$ 750	\$ 9,750	\$ 15,600
33N41C				2	\$ 2,250	\$ 4,500								4	\$ 750	\$ 3,000	\$ 7,500
																	\$ -
33N41G											1	\$ 1,800	\$ 1,800	3	\$ 750	\$ 2,250	\$ 8,550
U33N41K	0.06	\$ 10,000	\$ 600	6	\$ 1,000	\$ 6,000											\$ 6,600
Storm patrol																	\$ 6,200
Warning Signs																	\$ 1,000
			\$ 600			\$ 10,500				\$ 4,500			\$ 14,400			\$ 22,500	\$ 64,200

The average value of the road and the cost of repairing these road segments without BAER treatment if damage occurs is approximately \$50,000/mile with the average cost to of the BAER treatment of approximately \$5,500/mile.

## Trail Treatments Cost Estimate (Fork and Helena Fires):

## Treatment Objectives:

Recommendations are being made in this assessment to address erosion potential within the Fork Fire and Helena Fire. Since the forest has made the decision not to close the forest to the public, measures must be taken to protect the infrastructure and the public. These measures, if employed, will effectively protect the trail from anticipated erosion and trail use by the public.

## Treatment Costs:

Treatment	Unit	Amount	Cost
Trail erosion control	miles	4.6	9,500
Stumphole repair	ea.	46	2,300
Warning & trail signs	ea.	4	1,500
Hazard tree removal	ea.	52	5,200
Re-treading sections that have already blown out	miles	1.3	6,000
Per diem for crew 12 person crew 10 days	\$46 per day per person	84	4,830
		<b>Total</b>	<b>29,330</b>

**Natural Resource Values at Risk - Threatened and Endangered Fisheries****Treatment Recommendation:**

Treatment proposal consists of seeding with native grass seed, then mulching .5 tons/acre over 100 acres in the Connor Creek watershed. Hand seeding and hand mulching with wood straw is recommended to be carried out by an Agreement.

The 100 acres of proposed ground to be treated comprises of Moderate soil burned severity with no vegetation cover. The Soils range from gravelly loam to clay loams. Slopes in the area range from 40% to around 65%. The predicted erosion rate for a 2 year storm event is 21 tons/acre and for a 5 year storm event is 35 tons/acre. Mulching .5 tons/acre it will drop these predicted rates to 6 tons/acre and 15 tons/acre respectively. Wood straw is recommended since it is roughly 50% more effective than most other options. Wood straw is heavier and has less of a tendency to blow off steeper slopes or wash downhill.

The recommended treatment area is directly above newly designated Critical Habitat for the Coho salmon which is a Threatened species under the Endangered Species Act. Fine sediments such as clay and loam soils are damaging for Coho and spawning gravels. Even moderate silt loads can damage the gills of small Coho and reduce growth rates; likewise, even short periods of high turbidity or silt loads can be detrimental to emergence, feeding, and growth of young Coho. Again, Connor Creek was the recipient of a few fish passage efforts several years ago at road crossings that collectively cost a couple million dollars. Given these restoration activities and newly designated critical habitat there is a strong interest to avoid degrading habitat conditions in the Connor Creek watershed.

The 100 acres treatment area is upstream of domestic water source. It is also approximately 2 miles from the confluence of Connor Creek and the Trinity River. The Trinity River is not only a wild and Scenic River, but is also on the 303D list due to being sediment impaired and managers are required to reduce 37% of that sediment per year until the river is back in to good standing (See Watershed Report).

Based on the above assessment, it is my determination that an emergency does exist for federally threatened Coho salmon designated critical habitat and water quality in Connor and Canyon Creek. Specific treatments that minimize ash, mud and sedimentation will reduce the chances of adversely modifying designated critical habitat. These steps include road treatment packages and hillslope stabilization treatments. Emergencies also exist for designated critical habitat and water quality for North Fork Trinity and mainstem Trinity River; however, no specific treatments are recommended. A total of 4.1 miles of designated critical habitat burned along the Trinity River and 0.30 miles of designated critical habitat burned along the North Fork Trinity River. However, road treatments to improve infrastructure such as culvert cleaning, rolling dips, culvert risers and armoring will reduce sediment and ash input into the stream channels.

It is also recommended that the following work/monitoring be pursued by local, state and federal agencies (e.g., CDFW, NOAA) using non-BAER funding:

- Monitor Coho salmon habitat in Connor Creek and Canyon Creek.
- Water quality samples in Connor Creek, Canyon Creek and mainstem Trinity should be collected to detect chemical changes post-fire with potential consequences for all aquatic biota.

**Protection/Safety Treatments:**

Burned area road signs:

Safety: Posting of areas burned will alert the public to potential dangers of falling trees and rolling rocks. Repair of road signs burned will insure public safety (see treatment map). Closure and safety signs for roads that have potential for flooding and debris-flows with a 2yr-6hr storms.

Heritage Resource Prescriptions:

Treatments being proposed are for the historical Dolly Ditch Trail listed in the trails section. Rest of the 10 sites identified in and adjacent to moderate to high burn severity areas are not at risk and no treatments are recommended.

**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 and mulch monitoring.



## Part VI – Emergency Stabilization Treatments and Source of Funds

Interim #1

HelenaFork BAER Costs		NFS Lands				Other Lands				Money Left
Line Items	Units	Unit Cost	# of Units	BAER \$	Spent \$	Units	Fed \$	Units	Non Fed \$	Total \$
<b>A. Land Treatments (L)</b>										
NX Weed Det. Survey	miles	\$700	58	\$40,600	\$0		\$0		\$0	\$0
NX Weed Treatment	acres	\$1,000	5	\$5,000	\$0		\$0		\$0	\$0
Handmulching (ricestraw) with seeding	acres	\$1,200	100	\$120,000	\$0		\$0		\$0	\$0
Subtotal Land Treatments				\$165,600	\$0		\$0		\$0	\$0
<b>B. Channel Treatments (L)</b>										
Subtotal Channel Treatments				\$0	\$0		\$0		\$0	\$0
<b>C. Road and Trails (R&amp;T)</b>										
Helena Fire Roads - Stormproofing	project	\$64,200	1	\$64,200	\$0		\$0		\$0	\$0
HelenaFork Trails - Stormproofing	project	\$29,330	1	\$29,330	\$0		\$0		\$0	\$0
Subtotal Road & Trails				\$93,530	\$0		\$0		\$0	\$0
<b>D. Protection/Safety (P&amp;S)</b>										
Didymo Detection and Containment	project	\$3,000	1	\$3,000	\$0		\$0		\$0	\$0
HelenaFork Fires - Safety (hazard and warning signs)	each	\$350	15	\$5,250	\$0		\$0		\$0	\$0
Interagency Coordination	each	\$2,000	1	\$2,000	\$0		\$0		\$0	\$0
Subtotal Protection				\$10,250	\$0		\$0		\$0	\$0
<b>E. BAER Evaluation</b>										
Assessment Team	0520	H5BAER	---	---	\$80,516	---	\$0	---	\$0	\$0
Subtotal Evaluation				---	\$80,516	---	\$0	---	\$0	\$0
<b>F. Monitoring (M)</b>										
Road & Trail Treatment Monitoring	ea	\$1,000	1	\$1,000	\$0		\$0		\$0	\$0
Mulch Treatment Monitoring	ea	\$3,000	1	\$3,000	\$0		\$0		\$0	\$0
Subtotal Monitoring				\$4,000	\$0		\$0		\$0	\$0
<b>G. Totals</b>										
				\$273,380	\$0		\$0		\$0	\$0
Previously approved						Comments:				
Total for this request					\$273,380					

**PART VII - APPROVALS**

1. David R. Myers  
Forest Supervisor (signature)

10/13/17  
Date

2. Barnie T. Dyant  
Regional Forester (signature)

10/19/2017  
Date

**APPENDICES: Supporting Information:**

Appendix A: Helena/Fork BAER Team

Appendix B: Monitoring for Roads and Handmulch

Appendix C: Values at Risk Spreadsheet

Appendix D: Summary of Cost-Risk Analysis

Appendix E: Treatment Map

**Appendix A: Helena and Fork BAER Team:**

<u>NAME</u>	<u>AGENCY</u>	<u>FUNCTION</u>	<u>OFFICE PHONE</u>	<u>CELL PHONE</u>	<u>E-MAIL</u>
Brad Rust	USFS	Team Leader	530 226 2427	530 917 0434	<a href="mailto:brust@fs.fed.us">brust@fs.fed.us</a>
Anna Courtney	USFS	Soil Scientist	530	630 632 5589	<a href="mailto:annacourtney@fs.fed.us">annacourtney@fs.fed.us</a>
Galen Anderson	USFS	Hydrologist	530	707 330 8038	<a href="mailto:galenanderson@fs.fed.us">galenanderson@fs.fed.us</a>
Dennis Veich	USFS	Geologist	530	530-515-7414	<a href="mailto:dennisveiche@fs.fed.us">dennisveiche@fs.fed.us</a>
Christine Mai	USFS	Lead Hydrologist	530	530 949 4908	<a href="mailto:cmmai@fs.fed.us">cmmai@fs.fed.us</a>
Ashely Knight	USFS	Botany/Weeds	530	209 535 6955	<a href="mailto:ashleyknight@fs.fed.us">ashleyknight@fs.fed.us</a>
Lusetta Sims	USFS	Botany/Weeds	530	530 739 3595	<a href="mailto:lusetassims@fs.fed.us">lusetassims@fs.fed.us</a>
Dan Teater	USFS	Fisheries	530	530 613 7040	<a href="mailto:dteater@fs.fed.us">dteater@fs.fed.us</a>
Laura Broadhead	BLM	Ecologist	530	281 782 2427	<a href="mailto:lbroadhead@blm.gov">lbroadhead@blm.gov</a>
Tim Bradley	BLM	Fuels	530	530 276 3189	<a href="mailto:tbradley@blm.gov">tbradley@blm.gov</a>
Andy Kirsch	NPS	GIS	208-387-5202	208-949-4851	<a href="mailto:andy_kirsch@nps.gov">andy_kirsch@nps.gov</a>
Mike McFadin	USFS	Recreation	530 623 1760		<a href="mailto:mmcfadin@fs.fed.us">mmcfadin@fs.fed.us</a>
Jason McInteer	USFS	District Ranger	530	530 440 9334	<a href="mailto:jmcinteer@fs.fed.us">jmcinteer@fs.fed.us</a>

**Appendix B: Monitoring Protocols:**

**Helena Fire**  
**Road Effectiveness Monitoring**

The 2500-8 report requests funds to monitor the effectiveness of road treatments on Helena 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: \_\_\_\_\_  
 Time: \_\_\_\_\_

Inspector \_\_\_\_\_  
 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: \_\_\_\_\_



### Helena Fire Site Mulching Effectiveness Monitoring

The 2500-8 report requests funds to monitor the effectiveness of straw hand-mulch treatments on Helena heritage sites.

4. Monitoring Questions
  - Is the straw mulch with good cover stable?
  - Is the straw mulch 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 riling 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.

#### Mulch Protection Inspection Checklist

Date: \_\_\_\_\_ Inspector \_\_\_\_\_  
 Time: \_\_\_\_\_ Forest Road Nearby \_\_\_\_\_

Describe locations reviewed during inspection: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Was there loss of treatment effectiveness?

Was mulch covered or eroded? \_\_\_\_\_

GPS) \_\_\_\_\_

Describe damage and cost to repair? (GPS) \_\_\_\_\_

Photo taken of mulch damage \_\_\_\_\_

Recommended actions to repair: \_\_\_\_\_

## Shasta-Trinity National Forest

Helen/Fork BAER Risk Matrix																	
HAZ	Values	Type of Risk		Post-Risk Threats		Probability		Magnitude of Consequences			Risk		Treatment to Absorb Potential Risk Within				
		Loss	Gain	Loss	Gain	Loss	Gain	Loss	Gain	Loss	Gain	Loss	Gain	Loss	Gain		
1	Hydrologic function	Loss of hydrologic function		Flooding, Sediment		Likely	Likely	Low								natural recovery	FS
2	Flowing along river and tributaries	Erosion, Flooding, debris flows		Flooding, Sediment		Likely	Likely	Adverse	Moderate		High	High		early warning	erosion barriers	Pre, NRC	
3	Domestic water	Turbidity and sediment		Flooding, Sediment		Likely			Moderate			High			adverse	Natural recovery	Pre
4	Industry water	Turbidity and sediment		Flooding, Sediment		Likely			Moderate			High			adverse	Natural recovery	County
5	Soil Productivity from Off-Terrains	Off-terrains, loss of soil productivity		Erosion				Safety		Moderate			High	Closure	Barriers		FS
6	Reeds	Loss of function															
Helen	133H2	destruction of riparian, underused culverts & plugged cross-drains		Flooding, Erosion & Sediment											stormproof		FS
	133H3	infrastructure, lack of cross-drains for runoff road		Flooding, Erosion & Sediment		Likely	Likely		Moderate			High			stormproof		FS
	133H4	Protection and safety		Flooding, Erosion & Sediment		Likely			Adverse			High			stormproof		FS
	133H5	Infrastructure, underused culverts & plugged cross-drains, rock fall		Flooding, Erosion & Sediment		Likely	Likely		Adverse			High			stormproof		FS
	133H6	Infrastructure, underused culverts & plugged cross-drains		Flooding, Erosion & Sediment		Possible			Moderate			Intermediate			clean culverts		County
	133H7	Infrastructure, underused culverts & plugged cross-drains		Flooding, Erosion & Sediment		Possible			Moderate			Intermediate			clean culverts		BLM
Canyon Creek Road	Conner Creek rd or 133H4B	Infrastructure, lack of cross-drains for runoff road		Flooding, Erosion & Sediment		Highly			Moderate			High			rolling daps		FS
	133H4C	Infrastructure, lack of cross-drains for runoff road		Flooding, Erosion & Sediment		Highly			Moderate			High			dig outfall		FS
	133H4D	Infrastructure, lack of cross-drains for runoff road		Flooding, Erosion & Sediment		Highly			Moderate			High			dig outfall		FS
Trail	133H4E	Loss of function		Flooding, Erosion & Sediment		Likely			Moderate			High			stormproof		FS
	133H4F	Loss of function		Flooding, Erosion & Sediment		Likely			Moderate			High			stormproof		FS
Other Infrastructure	133H4G	Loss of function		Flooding, Erosion & Sediment		Likely			Moderate			High			stormproof		FS
	133H4H	Loss of function		Flooding, Erosion & Sediment		Likely			Moderate			High			stormproof		FS
Other Infrastructure	133H4I	Loss of function		Flooding, Erosion & Sediment		Likely			Moderate			High			stormproof		FS
	133H4J	Loss of function		Flooding, Erosion & Sediment		Likely			Moderate			High			stormproof		FS
Other Infrastructure	133H4K	Loss of function		Flooding, Erosion & Sediment		Likely			Moderate			High			stormproof		FS
	133H4L	Loss of function		Flooding, Erosion & Sediment		Likely			Moderate			High			stormproof		FS
Other Infrastructure	133H4M	Loss of function		Flooding, Erosion & Sediment		Likely			Moderate			High			stormproof		FS
	133H4N	Loss of function		Flooding, Erosion & Sediment		Likely			Moderate			High			stormproof		FS
Other Infrastructure	133H4O	Loss of function		Flooding, Erosion & Sediment		Likely			Moderate			High			stormproof		FS
	133H4P	Loss of function		Flooding, Erosion & Sediment		Likely			Moderate			High			stormproof		FS
Other Infrastructure	133H4Q	Loss of function	</														

## Appendix D: Summary of Cost-Risk Analysis For All Resources:

Helena/Fork Fires Benefit Cost Analysis:										
Total benefits of resources for whole fire FS lands:										
All Resource	Value \$									
All roads & trails (FS)	\$500,000									
Native plants	\$950,000									
Water quality	\$9,400,000									
Aquatics/fisheries	\$11,000,000									
Soil productivity	\$600,000									
Public safety	\$1,500,000									
	\$23,950,000									
Probability of loss without and with treatments:										
All Resource	Probability loss no treatments:				Probability loss w/ treatments:			Reduction in probability of loss		
All roads & trails (FS)	75%				10%			65%		
Native plants	65%				20%			45%		
Water quality	80%				20%			60%		
Aquatics/fisheries	70%				30%			40%		
Soil productivity	85%				30%			55%		
Public safety	50%				20%			30%		
Total cost of treatments on Forest Service:										
Helena/Fork BAER Costs		NFS Lands				Other Lands				Money Left Total
Line Items	Units	Unit Cost	# of Units	BAER \$	Spent \$	Units	Fed \$	Units	Non Fed \$	\$
A. Land Treatments (L)										
NX Weed Det. Survey	miles	\$700	58	\$40,600	\$0		\$0		\$0	\$0
NX Weed Treatment	acres	\$1,000	5	\$5,000	\$0		\$0		\$0	\$0
Handmulching (rice straw) with seeding	acres	\$1,200	100	\$120,000	\$0		\$0		\$0	\$0
Subtotal Land Treatments				\$165,600	\$0		\$0		\$0	\$0
B. Channel Treatments (L)										
Subtotal Channel Treatments				\$0	\$0		\$0		\$0	\$0
C. Road and Trails (R&T)										
Helena Fire Roads - Stormproofing	project	\$64,200	1	\$64,200	\$0		\$0		\$0	\$0
Helena/Fork Trails - Stormproofing	project	\$29,330	1	\$29,330	\$0		\$0		\$0	\$0
Subtotal Road & Trails				\$93,530	\$0		\$0		\$0	\$0
D. Protection/Safety (P&S)										
Didymo Detection and Containment	project	\$3,000	1	\$3,000	\$0		\$0		\$0	\$0
Helena/Fork Fires - Safety (hazard and warning signs)	each	\$350	15	\$5,250	\$0		\$0		\$0	\$0
Interagency Coordination	each	\$2,000	1	\$2,000	\$0		\$0		\$0	\$0
Subtotal Protection				\$10,250	\$0		\$0		\$0	\$0
E. BAER Evaluation										
Assessment Team	0520	HSBAER			\$80,516		\$0		\$0	\$0
Subtotal Evaluation					\$80,516		\$0		\$0	\$0
F. Monitoring (M)										
Road & Trail Treatment Monitoring	ea	\$1,000	1	\$1,000	\$0		\$0		\$0	\$0
Mulch Treatment Monitoring	ea	\$3,000	1	\$3,000	\$0		\$0		\$0	\$0
Subtotal Monitoring				\$4,000	\$0		\$0		\$0	\$0
G. Totals										
Previously approved				\$273,380	\$0		\$0		\$0	\$0
Total for this request				\$273,380		Comments:				
Benefit/cost ratio:										
All Resource	Benefit of treatment		Treatment Cost		B/C ratio		Justified			
All roads & trails (FS)	\$325,000		\$93,530		3.5		yes			
Native plants	\$427,500		\$45,600		9.4		yes			
Water quality	\$5,640,000		\$262,130		21.5		yes			
Aquatics/fisheries	\$4,400,000		\$123,000		35.8		yes			
Soil productivity	\$330,000		\$120,000		2.8		yes			
Public safety	\$450,000		\$7,250		62.1		yes			
	\$11,572,500		\$11,299,120		1.0		yes			



**Appendix E: Treatment Map:**



[http://ftp.nifc.gov/incident\\_specific\\_data/calif\\_n/!2017%20FEDERAL\\_Incidents/CA-SHF-001770\\_Helena/BAER/](http://ftp.nifc.gov/incident_specific_data/calif_n/!2017%20FEDERAL_Incidents/CA-SHF-001770_Helena/BAER/)