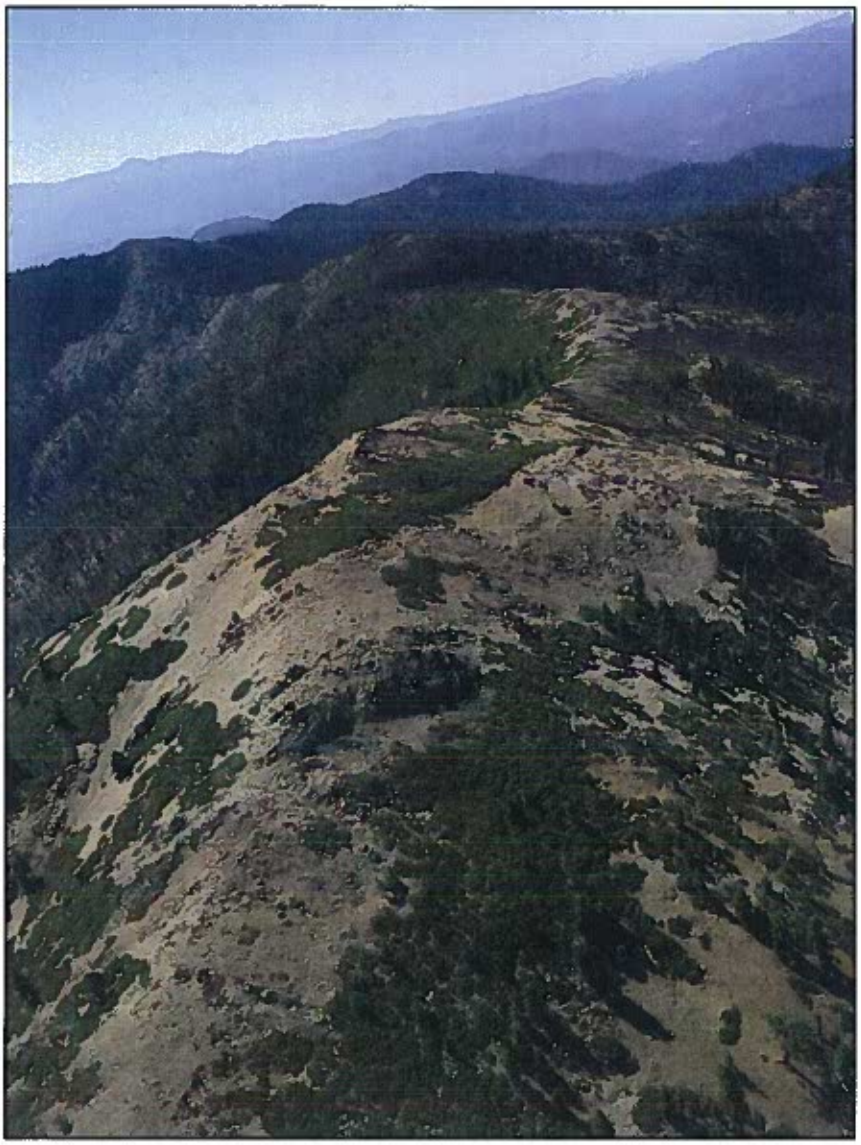
USDA-FOREST SERVICE

FS-2500-8 (7/08)
Date of Report: 9/9/15

FORK COMPLEX FIRE BURNED-AREA REPORT
(Reference FSH 2509.13)

PART I - TYPE OF REQUEST



The Fork Complex Fire of 2015 looking at Chanchelulla Peak within the Shiell Fire.

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: Fork Complex Fire

B. Fire Number: CA-SHF-002067

C. State: CA

D. County: Trinity

E. Region: 5

F. Forest: Shasta-Trinity

G. Districts: South Fork Management Unit

H. Fire Incident Job Code: P5J0HS

I. Date Fire Started: July 31, 2015

J. Date Fire Contained: September ??, 2015

K. Suppression Cost: $20?? million

L. Fire Suppression Damages Repaired with Suppression Funds

Fork Complex =
1. Dozerline repaired / waterbarred: 168 miles
2. Hand line repaired: 17 miles
3. Hand line still needing repair: 2 miles

M. Watershed Number and Name:

Fork Complex = 1801021106 – Browns Creek -	2960.2 Acres
1801021111 - Big French Creek-Trinity River -	424.9 Acres
1801021202 - Upper Hayfork Creek -	19704.5 Acres
1801021203 - Lower Hayfork Creek -	10658.8 Acres
1801021204 - Middle South Fork Trinity River	2749.6 Acres

N. Total Acres Burned:

Fork Complex: 36,498

NFS Acres (33,192), Private (3,306)

O. Vegetation Types:

Mixed conifer and woodland consisting largely of scrub oak, Douglas fir, and Ponderosa pine

P. Dominant soils: Neuns, Chaix, Dubakella, Goulding, Hohmann, and Holland

Q. Geologic Types: Bedrock within the boundaries of the Fork Complex is underlain predominantly by Paleozoic and Mesozoic metavolcanic and metasedimentary rock, along with a minor amount of Cretaceous and Tertiary sediments. The east central part of the Complex was intruded by granitic plutons, the largest of which is the Wildwood Pluton. Small outcrops of sedimentary rock occur in the center of the complex.

R. Miles of Stream Channels by Order or Class:

64 Miles Perennial, 73 Miles Intermittent, 145 Miles Ephemeral

S. Transportation System:

Fork Complex: Trails: 21 miles Roads: 125 (114 FS, 2.5 state Highways, 7 County, 1 private) miles

PART III - WATERSHED CONDITION

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

Soil Burn Severity (Acres)						
Ownership	**Very Low or Unburned**	**Low**	**Moderate**	**High**	**Grand Total**	**Percent**
NON FOREST SERVICE	105.3	1282.7	1912.4	6.0	3306.4	9.1
USDA FOREST SERVICE	549.1	11501.2	20688.1	453.2	33191.6	90.9
Grand Total	654.4	12783.9	22600.5	459.2	36498.0	100.0
Percent	1.8	35.0	61.9	1.3	100.0	

Soils

B. Soil Resource Condition Assessment Sections:

The Fork Complex fires occurred in the vicinity of Hayfork just north and south of the Hayfork Creek. NFS lands as well as private ownerships were affected. FS BAER team earth scientists assessed the incidents with a whole-watershed approach regardless of ownership. Soil burn severity patterns varied for the fires due to different topographies and fire behavior.

Specific dominant soils found in the fire were Chaix, Deadwood, Dubakella, Goulding, Hohmann, Holland, and Neuns. These dominant soil textures on the fire were sandy loams, loams and clay loams. These soils were mainly deep and were in the hydrologic groups B and C. Group B having a

moderately low runoff potential and C having a moderately high runoff potential. Average erosion hazard rating for the dominant soils are moderate (See Table 3).

The high and moderate soil burn severity classes have evidence of severe soil heating in a patchy distribution. Soil seedbank and infiltration characteristics are impacted in the areas that have burned repeatedly (China Fire, 1987 and Stafford Fire, 2013) for the high and moderate soil burn severity (SBS) areas, so natural recovery will be slow in these areas along with high runoff and erosion. The low to very low soil burn severity classes still have good surface structure, contain intact fine roots and organic matter, and should recover in the short-term once revegetation begins and the soil surface regains cover. Water repellency is common, varying from slight and surficial in all burn classes; so it is expected to exacerbate runoff production. Unburned areas had no repellency. Soils are fine-loamy (Holland) that generally have moderate infiltration rates; thus surface runoff and erosion should be significant in steep sparsely-vegetated slopes. There is high potential for sediment delivery to the fluvial system due steep burned hillslopes that lack cover, so aquatic habitat and water quality effects from sediment will be significant.

C. Water Repellent Soils:

Water repellency is common, varying from slight and surficial in in all soil burn classes on about 13,500 acres and is expected to greatly exacerbate runoff production. Unburned areas had no repellency.

D. Erosion Potential (erosion hazard rating):

Erosion hazard ratings for low, moderate, and high soil burn severity are listed in the table below. With removal of soil cover and soil burning erosion hazard rates about 64% as having high to very high erosion.

Table 3. Erosion Hazard Ratings

Erosion Hazard Rating	Acres	% of Fire
Low	1164	3
Moderate	11060	30
High	15163	42
Very High	7927	22
Unrated Rock Units	1166	3

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 have streams at the base of the slope; water will run off these fine-loamy soils and fine sediment will be deposited into Fork Complex and Noname Creeks. Looking at the table below (Table 4) shows for the whole watershed there is a 12 times increase in erosion for a 2-year storm, a 17 times increase for a 5-year storm, and a 27 times increase for a 10-year storm over background levels of 2 ton/acre. Individual watersheds are listed below the whole watershed values. These watersheds were modeled to determine the amount of erosion to a particular value at risk (culvert, bridge, stream, etc.) each with its own watershed size. In all

cases the relative increase are the same except in Fork Complex Gulch watershed burned burned complexly at moderate to high levels with unstable landslide deposits.

Table 4. Predicted erosion rates for Fork Complex fires (tons/acre)

Fork Complex Fire ERMiT erosion for 4,000 feet elevation (24 mts.)							
Fork Cx. Fire Ermit	Acres	2-year event (t/a)		5-year event (t/a)		10-year event (t/a)	
		erosion	sediment	erosion	sediment	erosion	sediment
Total Fire	36,498	33.0	21	54.0	36	106.0	69

Hydrology

Potential Values at Risk

Critical Values

In order to assess potential values at risk within the fire, pour point basins were identified and mapped. 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. Pour point basins are listed in table 2 along with acres of burn severity. They are also shown on Plate 1.

Table 2: Pour Point Basins affected by the Fork Complex.

Pour Point Basins	Total Acres	Burn Severity		
		Low/Unburned	Moderate	High
Little Barker Creek	1,328	351	688	289
32N17 Crossing	448	136	248	64
Tule Creek	13,005	11,719	1,280	6
31N42 Crossing	439	72	367	0
Bridge Gulch	2,007	827	1,180	0
County Road 302	52	0	52	0
Potato Creek	3,814	2,122	1,692	1
32N16 Crossing	888	153	707	28
Wilson Creek	1,093	246	800	47
County Road 351	886	552	333	1
Rattlesnake Creek	4,424	2,793	1,630	1

Table 3 provides predicted post-fire discharges in cubic feet per second for the watersheds affected by the fire. Watershed analysis takes into account the entire watershed size. Due to the large percentage of unburned lands in some watersheds there is a tendency to dilute the effects of the fire. Also, some of the pour point basins were completely within the fire, thus showing a greater response in post-fire peak flows.

Table 3: Peak Flows from a 2 and 5 year flood event

Pour Point Basin	Drainage Area (sq. mi.)	Peak Flows in Cubic Feet per Second (cfs)					
		Pre fire Q2	Post fire Q2	Increase in Q2	Pre fire Q5	Post fire Q5	Increase in Q5
Little Barker Creek	2.08	141	300	112%	281	439	56%
32N17 Crossing	0.70	49	102	108%	101	153	52%
Tule Creek	20.32	1542	1761	14%	2756	2987	8%
31N42 Crossing	0.69	54	103	92%	108	149	37%
Bridge Gulch	3.14	208	349	68%	410	536	31%
County Road 302	0.08	7	16	111%	16	22	40%
Potato Creek	5.96	420	636	51%	798	999	25%
32N16 Crossing	1.39	117	222	91%	225	316	40%
Wilson Creek	1.71	126	243	92%	249	353	42%
County Road 351	1.38	146	209	43%	269	329	22%
Rattlesnake Creek	6.9	720	992	38%	1251	1508	21%

Geology

Within the Fork Complex burned area, some watersheds show a great deal of past mass wasting as debris slide/rockfall activity that will be increased during future storms. Other areas have little evidence of recent past slope instability, but conditions have changed due to the fire. As a result of the removal of vegetation by the fire, excessive sediment and available transported material in channels and potential high runoff as a result of moderate to high rainstorms, debris-flow probabilities are high in some watershed basins. Soils are exposed and have become weakened, and rocks on slopes have lost their supporting vegetation. Roads are at risk from rolling rock, plugged culverts, debris slides and debris flows. Stream channels and mountainside ephemeral channels will be flushed of the sediment that in some places is loose and deep, in other places shallow. That sediment will deposit in some channels, choking flow, raising flood levels, then covering roads or eroding road prisms. Risks to human life, roads, trails and natural resources are high.

Field and aerial observations in the Little Barker drainage showed numerous channels loaded with large deposits of rock and soil, and many slopes burned at moderate and high soil burn severity at risk for contributing large quantities of soil, rock and organic debris to the main channel. USGS debris flow modeling estimates that within the Little Barker watershed basin potential debris flows with volumes of 10K to 100K cubic meters with probability of 60-80% might occur. The entire rest of the Fork Complex (Southern Section) has only two relatively small watershed basins that are estimated to have a high combination hazard class of debris flows. One of these two basins is within the Gardner Gulch watershed basin, located in the southeast corner of the Peak fire and is estimated to produce a debris flow of 10K-100K cubic meters with a probability of 60-80%. The second basin is a small basin on the west end of the Rail fire, just below the Kingsbury Range and above Hwy 3. This basin is estimated to produce a debris flow of 1K to 10K cubic meters with a probability of 80-100%. Based on field observations it seems that these two last basins do not have as much unconsolidated materials/rocks available to be transported as the Little Barker watershed basin, but both are considered as high concern since they are located above private properties adjacent to the National Forest boundary.

Treatments for debris flow and rock fall hazards include notification of the public of these hazards through warning signs and road closures; clearing and improvement of catch basins and ditches along the road; maintenance and up-grade of drainage structures; construction of rolling dips in critical locations along the road.

PART IV - HYDROLOGIC DESIGN FACTORS

A. Estimated Vegetative Recovery Period, (years):	3-5
B. Design Chance of Success, (percent):	80
C. Equivalent Design Recurrence Interval, (years):	2
D. Design Storm Duration, (hours):	6
E. Design Storm Magnitude, (inches):	1.47 - 2.34
F. Design Flow, (cubic feet / second/ square mile):	81
G. Estimated Reduction in Infiltration, (percent):	73
H. Adjusted Design Flow, (cfs per square mile):	140

PART V - SUMMARY OF ANALYSIS

A. Describe Critical Values/Resources and Threats:

Background:

A dry lightning system moved from south to north across the Shasta-Trinity NF in the late afternoon and early evening today on July 30th, 2015. The number of fires initially reported was around 8-10 sometime around 5:00pm, and by 7 pm the number grew to over 60 new starts. Due to extremely dry conditions and little to no rain with this event, the probability of fire ignition was very high with every

lightning strike. This story also created starts on the north end of Mendocino NF, and the east side of the Six Rivers NF. The lightning event seemed to lose power as it approached the north end of the Trinity Alps Wilderness.

The Fork Complex Fires consist of 5 large fires ranging from about 4,000 to 15,000 acres on steep terrains surrounding Hayfork with large dead snags in thick brush left over from several past fires or unthinned conifer plantations. As a result the fire was driven by heavy fuel loads along with initial windy conditions. BAER specialists concluded that the amount of high soil severity burn was low given time of year in comparison to other fires due heavy smoke inversion that set in and the lack of wind driven events. This cooled the fire and moderated fire behavior to create slow ground fires with occasional torching and crown fires only in the afternoon when the inversion would lift at higher elevations. The exception to this was the first two days when the fires grew rapidly due to winds, crowning, and lack of inversion. These conditions caused the moderate and low soil burn severity observed in the following maps and pictures (Figures 1 and 2).

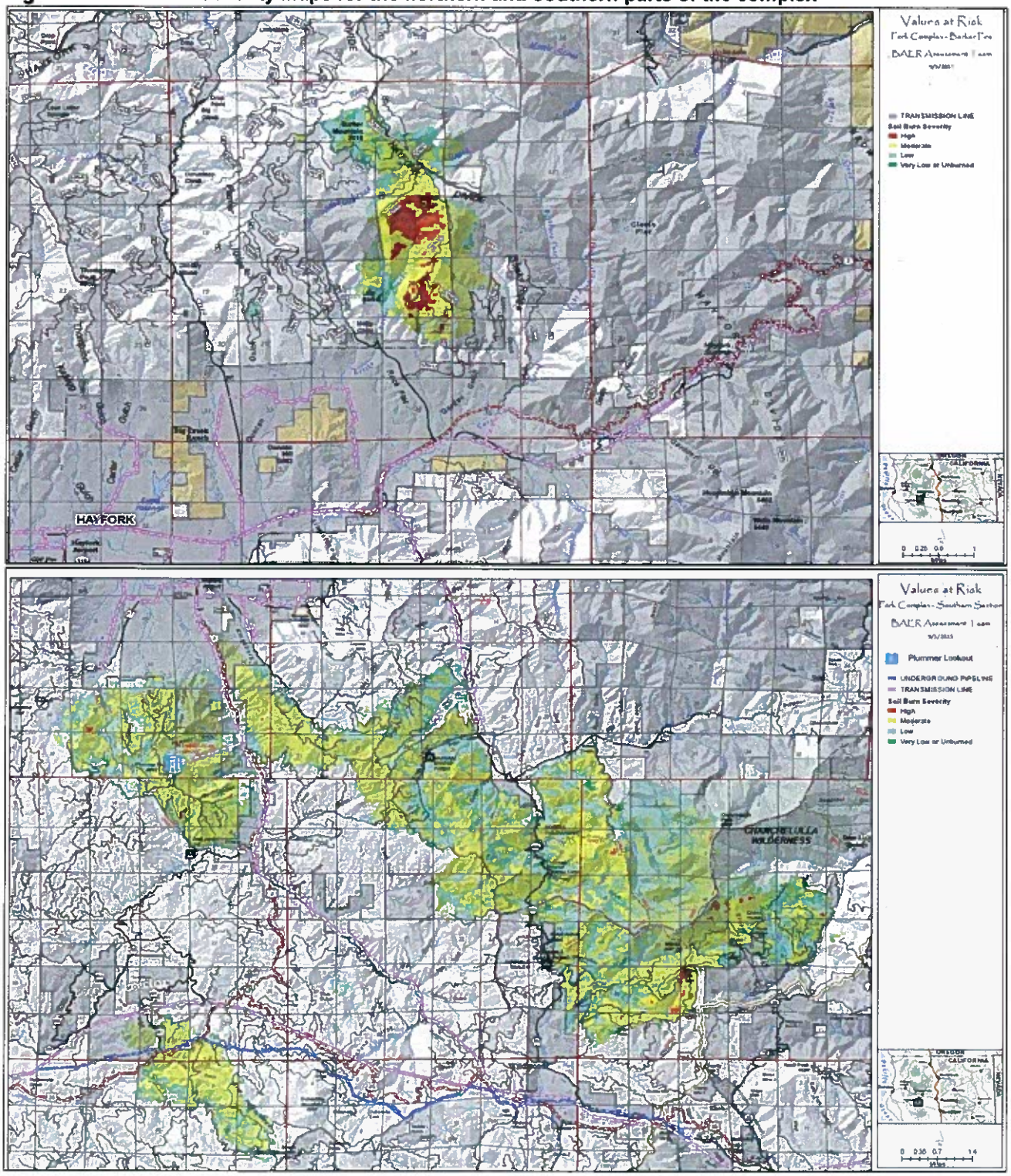
Only one percent of the fire burned at a high soil burn severity, 62% was moderate soil burn severity and the remaining 37% was low to very low soil burn severity. The fire burned into the Chanchelulla wilderness slowed and was stopped in Chanchelulla Creek by suppression. A few small spot fires occurred just to the south of Browns Creek but were quickly contained. A total of 36,498 acres was burned with 33,192 acres being FS land and the rest private.

Figure 1 – Fork Complex soil burn severities in the Sheill and Blue fires

High soil burn severity in Midas Gulch above Browns Ck in the Sheill fire area	Moderate soil burn severity with soil destruction to 1 inch in the Sheill fire	Moderately low soil burn severity due to wind-driven Blue fire in serpentine

Approximately 63% burned at high and moderate soil burn severity. The rest of the fire was either low or very low soil burn severity (see Figure 2 soil burn severity maps). Looking at the maps below shows little Barker creek, Wilson, and Stone creek headwaters burned hot. These areas in particular had large old growth timber stands with heavy accumulation of down woody material thus producing hot fires with long residence time.

Figure 2 – Soil Burn Severity Maps for the northern and southern parts of the complex



It is very important to understand the difference between *fire intensity* or *burn severity* as discussed by fire behaviorist, 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. Companion pictures to figure 1 pictures are shown below (Figure 3) showing the landscape with mixed mortality due to differing vegetation types, slopes, aspect, and location.

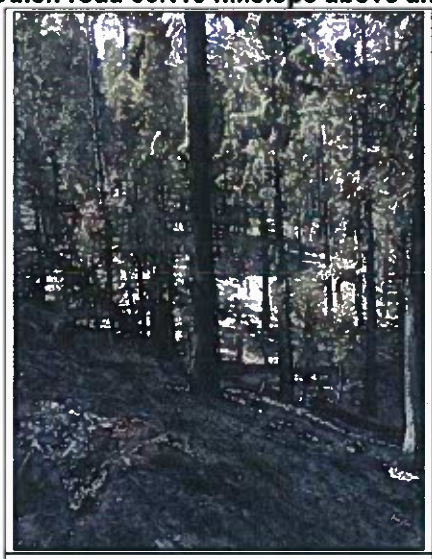
Figure 3 – Landscapes for soil burn severity in Sheill and Blue fires

Midas Gulch high soil burn severity landscape (across draw) Sheill fire	Wilson Creek moderate soil burn severity within the Sheill fire	Road Gulch moderately low soil burn severity landscape in Blue fire

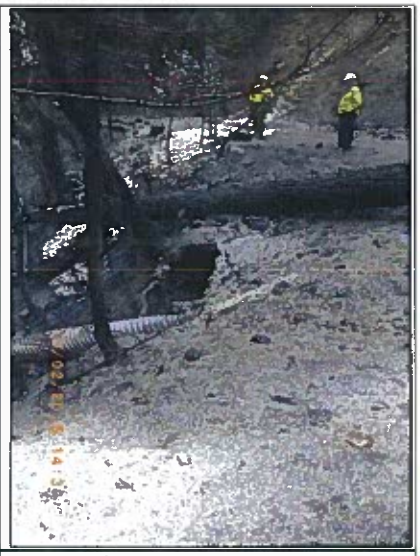
Based on the observations and fire area conditions described above, an emergency exists for the following: 1) Roads that are down from high and moderate soil burn severity areas 2) fish habitat for Coho salmon critical habitat in Phillpot, Tule, and Browns creek 3) The potential for spread of noxious weeds by the use of heavy equipment for fire line construction 4) Exposed archeological sites are at risk to vandalism and erosion 5) Severely burned soils lost litter and duff and have deep soil charring compromising their structure and fertility 6) Wilderness trails that have burned hillslopes above compromising trail treads especially mid-slope switchbacks.

Particular area of concern is Little Barker Creek, Upper Wilson Creek, Upper Rattlesnake Creek, and Midas Gulch which were entirely burned at moderate to high soil burn severities. These areas have Neuns or Dubakella soils (moderately deep gravelly loams) that have strong water repellency due their porous fine gravel nature. All vegetation including an existing conifer stand was 100 percent killed along with in-channel vegetation with undersized culverts that could plug and cause these roads to fail (Figure 4 below).

Figure 4 – Midas Gulch road 30N16 hillslope above and culvert below



Hillslopes above Midas Gorge



Midas gulch undersized culvert

There are known locations of federally Threatened or Endangered wildlife species (NSO) within the fire area. There are also Forest Service Sensitive or Survey and Manage species locations.

Fourty-five soil burn samples were taken in the field to confirm the soil burn severity mapping (see Appendix D). Results show that most of the fire area suffered low to moderate soil burn severity with only Little Barker, Wilson, and Midas Gulch Creeks that had high soil burn severity.

Values at Risk:

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 below shows all the ratings for the potential values at risk for the Fork Complex fires. Only ones that rated as high or very high are discussed in detail, all others that rated intermediate to low refer to table 1 below.

Table 1 – Fork Complex Values at Risk Matrix and Treatments

Fork Complex BAER Risk Matrix Critical Value	Probability	Magnitude of Consequences			Risk			Treatment			Responsibility
		Life	Property	Other	Life	Property	Other	Life	Property	Other	
Infrastructure											
NFS Roads at risk (30N04 30N04A 30N15 30N16E 30N16F 30N17 30N29 31N19 31N21 31N38 31N42 31N49 32N17 32N25 32N37)	Likely		Moderate			High			Install rolling dips repair fillslopes from burnouts install critical dips construct earthen barriers pull culverts and storm patrol		USFS
Homes below Blue Peak and Red Fens (Kingsbury Ridge)	Possible		Moderate			Intermediate		Warning signs	Inform landowners	Provide info to county	USFS and County
State and County Rds (Hwy 3 county rd 302)	Possible		Moderate			Intermediate			Recommend culvert cleaning and patrol		State and County
Trinity Pines county rd 351 (3 culverts)	Likely		Moderate			High			Recommend culvert replacements		County
Lake Eelum Ck crossing on county road 331	Possible		Moderate			Intermediate			Recommend storm patrol		State and County
Burned signs for campgrounds trails and OHV trails	Likely	Moderate			High			Replace signs for public safety	Burned area signs for safety		USFS
Trinity PUD transmission lines	Possible		Moderate			Intermediate			Hazard tree removal		State and County
PG&E transmission lines	Possible		Moderate			Intermediate			Hazard tree removal		PG&E
PG&E gas pipeline	Unlikely		Moderate			Low					
Plummer Peak Lookout Communications Towers and Transmission Line	Possible		Moderate			Intermediate			Hazard tree removal		Verizon and USFS
Aquatics											
T&E Aquatics species of Coho (Philpot Ck, Tule Ck, Browns Ck)	Likely			Moderate			High		see road work	Recommend water testing	NCWCB
Critical Habitat (temperature and sediments)	Likely			Moderate			High		see road work	Recommend water testing	NCWCB
Water Quality											
Domestic water users (Tule, Salt, Haybork, Browns creeks)	Possible	Moderate			Intermediate			None	irrigation water only	Recommend water testing	NCWCB
Barlow, Browns, Haybork, Rattlesnake Ck's erosion causing turbidity and sedimentation	Likely			Minor			Low				NCWCB
Wilderness Trails											
Chanchelulla Peak Trails (10W23 10W25)	Likely		Moderate			High			trail crossing armoring log-erosion barriers for dry ravel, trail cleaning with log-out		USFS
Other Trails (10W25, 10W27)	Likely		Minor		Low			Closure signs			
Cultural											
Exposed arch sites to vandalism and erosion	Possible		Minor			Low					USFS
Wildlife											
Habitat for NSO	Possible			Moderate			Intermediate			None share info with F&WS	USFS
Soil Productivity											
Loss of soil productivity in high to moderate SBS areas esp Barlow Stone and Haybork Creek areas	Likely			Moderate			High			None too steep and rocky to mulch	USFS
OHV incursions causing excessive erosion	Possible			Moderate			Intermediate			Closures and signs	USFS
Geology											
Debris Flow potential above Hwy 3 on Kingsberry Ridge area	Possible	Moderate			Intermediate			Warning signs	Recommend storm patrol		USFS & County
Rockfall potential above Wildcad Road	Likely	Moderate			High			Warning signs	Recommend storm patrol		USFS & County
Botany											
Native plant community invasive weeds	Likely			Moderate			High			Noxious weed detection survey	USFS

Forest Service Roads

Life: As a result of the severely burned watershed risks to life and safety of Forest visitors and personnel entering certain areas of the burn are likely and pose a moderate risk, due to burned hazard trees along roadways and flooding.

Property: Based on the watershed response, the BAER Assessment team determined that residences of private property below the fire area are not at increased risk of damaging flooding as a result their home and outbuilding locations. Most home were up out of the drainages with only access roads that could be threatened by flooding. Forest roads within the fire area were repaired as a result of suppression activity but because of the expected increase in watershed response significant damage will occur on some roads in the fire perimeter due to undersized culverts and poor drainage (see hydrology and roads report for details). There is a likelihood that post burn conditions will increase runoff and the movement of sediment into drainage features, such as culvert inlets, overside drains, roadway dips and run outs, this occurrence could cause drainage function to fail and uncontrolled water to divert, resulting in a high risk of damage to the invested road improvements, loss of road function, and the denial of access. Also highway 3 below Kingsbury Ridge could be an area of concern due to limited culvert sizes and potential of flooding.

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

Forest Service Trails

The properties at risk are segments of trail systems. As a direct consequence of the fire there is a large risk of damage to trails caused by the loss of water control. Increased flow rates can be expected following the loss of vegetation. This increased flow rate will result in mid-slope trails becoming covered by dry ravel and debris. Not only will this added material result in trail tread eroding flow patterns, but it will also obscure trail definition, causing users to wander off the established trail, especially in trails with switchbacks (first mile of 10W23, and appox. ¾ miles in from 10W26/10W25 junction). Repeated off-trail travel will eventually re-define a new trail that will most likely be non-conducive to natural water flow and subject to erosion.

Trails that follow and repeatedly cross stream channels (such as trail #12W27 running along East Tule Creek) are subject to scouring and washouts where the stream channels increased flow rate is directed toward unstable stream embankments. Trails segments which are supported by these fire weakened stream banks are in jeopardy of being washed out.

Probability of Damage or Loss: Likely.

Magnitude of Consequence: Moderate.

Risk Level: High

Water Quality, Water Quantity, and Fisheries

Risk Assessment – Water Quality

Runoff and flooding will be expected in areas that burned moderate to high with flows increasing from 40 to 110%. This will overwhelm many crossings causing accelerated erosion and sedimentation.
Access to private property in the burn area was limited; therefore, reviews included aerial reconnaissance and air photo interpretation. No buildings or other improvements appear to be at risk of flooding, due to these features being situated well away from stream channels.

Magnitude of Consequences: Moderate

Probability of Damage or Loss: Unlikely

Risk: Low

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. In order to determine whether increased post-fire flows will threaten existing crossing structures, the predicted peak-flows were compared to culvert capacity charts produced by the Federal Highway Administration (Lester, 1972).

Magnitude of Consequences: Moderate/High

Probability of Damage or Loss: Likely

Risk: High/Very High

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

Risk

Turbid water from the burned area will impact the quality of domestic and irrigation water within and downstream of the complex. This impact will be short-term and only occur during and shortly following storm events.

Magnitude of Consequences: Minor

Probability of Damage or Loss: Very likely

Risk: Low

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.

Risk Assessment – Fisheries of Hayfork Creek

The Fork Complex straddles two SONC Coho populations identified in the final recovery plan (NMFS 2014); Upper Trinity River and South Fork Trinity River. Barker Creek drains the southeast side of the Fork Complex (Shiell Fire), and is part of the Upper Trinity River population. The rest of the drainages in the Fork Complex are part of the South Fork Trinity River population. Critical habitat for SONC Coho salmon includes portions of Rattlesnake Creek, Tule Creek, Salt Creek, Hayfork Creek, Barker Creek, Little Barker Creek, Potato Creek, Chanchelulla Creek, Browns Creek, Wilson Creek and Philpot Creek within or immediately downstream from the burned area Fork Complex. Seven sub-watersheds have been impacted by the fire (Browns Creek, Hayfork Creek, Potato Creek, Rattlesnake Creek, Tule Creek, and Wilson Creek). All of them are important to the Hayfork Creek anadromous fishery since they contain listed T&E salmon and steelhead. Coho salmon and winter run steelhead are federally listed as threatened fish species and both species are known to occur in the in Hayfork Creek and within the proximity of the fire. Increased turbidity in the Browns Creek, Hayfork Creek, Potato Creek, Rattlesnake Creek, Tule Creek, and Wilson Creeks are expected during storms in winter 2015-16. However, these effects may not persist in to the following winter season (2015-16) and are they not expected to produce unacceptable degradation to natural resources.

Probability of Damage or Loss: Possible. This determination is due to the change in watershed response and increased bed-load turbidity affecting the fish habitat in Hayfork Creek.

Magnitude of Consequence: Moderate. This determination is due to the change in sediments in the water and spawning gravel embeddiness that could occur.

Risk Level: Intermediate (localized only, depending on flows)

Risk Assessment – General aquatics

Probability of Damage or Loss: Possible. This determination is due to the change in watershed response and increased bed-load turbidity and embeddiness affecting the benthic macroinvertebrates in the seven named creeks.

Magnitude of Consequence: Minor. This determination is due to the mixture in responses that to a change in sediments in the water and gravel embeddiness that could occur. Most macroinvertebrates can also recolonize areas once the response has abated.

Risk Level: Low.

Soil Productivity

Soil productivity could be compromised in the areas that have burned moderately high to high in Little Barker sub-watershed, upper Browns Creek, upper Rattlesnake Creek, and Wilson Creek due to lack of cover, deep soil charring, and steep slopes that could erode productive topsoil.

Risk Assessment – Soil Productivity

Probability of Damage or Loss: Likely.

Magnitude of Consequences: Moderate.

Risk: High

Threatened and Endangered, Sensitive, and Invasive Plants

Land Management Designations

Approximately 2806 acres of the burned area is under private ownership, primarily by Sierra Pacific Industries, which is managed for timber production. All but about 500 acres of the remainder is under National Forest management, within the Shasta Trinity National Forest, amounting to about 33182 acres. Of that, 7791 acres are designated Late Successional Reserve, 187 acres are in a Geologic Special Interest Area, 3825 Acres are in Wilderness Area and 7034 acres are in Inventoried Roadless Area, some of which overlap.

Plant Communities

Elevation range approximately 2300 - 6220 feet

Plant Communities	mixed conifer/hardwood with ponderosa pine, Douglas fir and/or white fir
	montane chaparral
	seasonal and perennial wet meadows*
	serpentine outcrops & barrens*
	non-serpentine outcrops & ridges*
	alder/willow shrubland in riparian areas *
* = special habitats	upper & lower elevation riparian*

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 Fork Fire Complex. Six Forest Service Sensitive or Forest Plan Endemic plant species are documented within that same area. They are shown in the following table.

Scientific Name	Common Name	Symbol	No. of Locations
Cypripedium fasciculatum	clustered lady's slipper	CYFA	3
Cypripedium montanum	mountain lady's slipper	CYMO2	3
Eriogonum libertini	Dubakella Mountain buckwheat	ERLI4	6
Harmonia doris-nilesiae	serpentine tarweed	HADO2	1
Minuartia rosei	peanut stitchwort	MIRO3	1
Sedum laxum ssp. flavidum	roseflower stonecrop	SELAF	1

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. These steps and the costs involved are unknown quantities until such time as the field visits can be made.

Invasive plants and Noxious Weeds

Since most of the Fork fire area is in a very remote location and difficult to access, records of known noxious weed occurrences are quite limited. The following table of the known occurrences shows fifteen sites, three of which are along a relatively major road, leaving twelve records in all of the rest of the 36,500 acres. Weeds in these areas are mostly restricted to roadsides, campgrounds and other developed sites, but some are found within openings that have been disturbed. Observations in other areas have shown that the patterns seen in the known populations can be extended in a general sense throughout the fire area.

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

Scientific Name	Common Name	Symbol	CDFA Weed List	Number of Locations
Centaurea diffusa	diffuse knapweed	CEDI3	A	1
Centaurea stoebe ssp. micranthos	spotted knapweed	CESTM	A	1
Cirsium arvense	Canada thistle	CIAR4	B	5
Cirsium vulgare	bull thistle	CIVU	B	1
Foeniculum vulgare	sweet fennel	FOVU	-	2
Isatis tinctoria	Dyer's woad	ISTI	B	4

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 at the basecamp in Hayfork on equipment being demobilized. As there was no weed washing required for incoming equipment, there is no guarantee that the equipment was free of weeds prior to working on the fire.

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

Risk Assessment – Fork Complex 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. Helicopter landings and hand crew activities may have introduced yellow star 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.

Heritage Resources

Of 12 heritage resource sites, 8 were successfully located and assessed as Values at Risk (VAR) for BAER. One site, [redacted] could not be located. Field assessments indicated that many sites located in low burn severity were actually unburned. Although fire and fire suppression has adversely affected at least two of these sites ([redacted]), GIS analysis and field assessments indicate that cultural resources within the Fork Complex Fires are not at risk from post-fire erosion, storm runoff, debris flows, or increased visibility and therefore do not qualify as VARs for BAER treatment.

Risk Assessment – These sites were burned over, but appeared to have received minimal thermal damage.

Probability of Damage or Loss: none.

Threats to Wildlife

Within the fire perimeter were [redacted] Northern spotted owl home ranges, most were in areas with a variable low to moderate burn intensities. Home ranges [redacted] occurred in a large area of high intensity burn within [redacted] home ranges are now considered to be unsuitable habitat, however there is suitable habitat, defined as critical, [redacted] of the high intensity burn areas

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. Cost of No-Action (Including Loss): REDACT

F. Cost of Selected Alternative (Including Loss): REDACT

G. Skills Represented on Burned-Area Survey Team:

[x] Hydrology	[x] Soils	[x] Geology	[ ] Range	[ ]
[x] Forestry	[x] Wildlife	[ ] Fire Mgmt.	[x] Engineering	[ ]
[ ] Contracting	[x] Aquatics	[x] Botany	[x] Archaeology	[ ]
[x] Fisheries	[ ] Research	[ ] Landscape Arch	[x] GIS	

Team Leader: Brad Rust

Email: REDACTs Phone: REDACT FAX: REDACT

H. Treatment Narrative for Forest Service:

See Appendix E for treatment map and narratives below describing treatments.

Land Treatments:

Noxious Weed Detection Surveys

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.

Dozer lines are generally mapped with varying levels of quality in different parts of the fire area, so number and length of lines in the GIS database can only be considered to be estimates. Line location and number should be validated in the field as treatments proceed. Using the GIS database, it has been calculated that there are about 85.2 miles of dozer lines on Forest Service land that are associated with the Fork fire.

Seeding and Mulching Treatments

Roadways are the primary conduit of noxious weed introduction as weed seeds and plant parts are carried on the tires and undersides of vehicles. Noxious weeds are typically introduced closest to the road and spread along disturbed or suitable habitat if left unchecked. To discourage noxious weed introduction on constructed dozer lines and the interior of fires, intersections of dozer lines and travelable roads should be seeded with native seed and mulched with weed-free straw. Seeding and mulching the first 50 feet of dozer lines where they meet travelable roads should discourage noxious weed introduction, which should discourage spread further down individual dozer lines. There are approximately 116 intersections of dozer lines with roads and it is assumed that they will average 25 feet in width and occur on both sides of the road. These figures yield 6.7 acres of dozer line treatment.

Sites would be seeded with a mix of native species. Native grasses would probably include blue wildrye (*Elymus glaucus*), California brome (*Bromus carinatus*), and Sandberg's bluegrass (*Poa secunda*), with the legume Spanish lotus (*Acmispon americanus)* (not to exceed 5% of the mixture) at a rate of 5-15 pounds per acre.

TREATMENT COSTS

Cost Summary

	Units	Unit Cost	# of Units	BAER $
Land Treat				
Seeding & Mulching Dozer Line - Road Intersections	acres	REDACT	REDACT	REDACT
Monitoring				
Noxious Weed Detection Surveys	miles	REDACT	REDACT	REDACT
TOTAL ALL LINE ITEMS				REDACT

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 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

Hillslope mulching: was not selected as a treatment since slopes were too steep and values at risk were not great enough to justify treatments.

Roads Treatments:

FS Roads goal of restoring overall drainage function along with installing culvert inlet treatments, critical dips, culvert risers and drainage armor will control water from moving off site reducing the risk to adjacent resources along some road.

A. Treatment(s) will include culvert cleaning, reconditioning, removal and replacement, along with road drainage restoration and road reconstruction. There is no anticipated need for relocation of roads. Specific treatment details for each road are noted in *Appendix D*. All roads within, and adjacent to, the fire perimeter should be monitored regularly for damage and hazards.
B. Stabilization of the transportation system and prevention of further damage resulting from:
   1. Erosion and other effects of storm water runoff as a result of fire damage on adjacent lands.
   2. Control traffic on the damaged or fragile roads.

      A. Treatment Descriptions and Costs:

Fork Complex BAER Roads Assment
Appendix B - Treatments to Mitigate Emergenct - Costs

ML	ROAD	Risk Level	Riser on 18" Pipe	Riser on 24" Pipe	Riser on 42" Pipe	Riser on 48" Pipe	Riser on 6' Pipe	Out slope road for 200 feet	Critical Dip	Rolling Dip, Aggregate	Flared End on 18" Pipe	Flared End on 24" Pipe	Flared End on 48" Pipe	Trash Rack for 18"	Trash Rack for 24"	Trash Rack for 36"	Trash Rack 60" Pipe	Guide Sign	40' Overside Drain	Armored Overflow-1½-" Agg.	Veg. Removal, Catch Basin	Removal of 18" culvert	Fill Excavation(Cubic Yard)	Class 2 Rip Rap (30 feet)	Lead Out Ditch (20 feet)	Restore ditch function(/mile)	Log-Earthern Barrier	Gate	Waterbar	Estimate
Unit Cost:			[redacted]																											
3	30N01	Very High	1		2		1																							[redacted]
2	30N04A	High		3																							1			
3	30N29	Very High	1	2		1																								
3	30N31	High						4	2		1	1																		
2	30N16	High	2						6				1			1	1	2	2	1	2									
2	30N16F	Very High																				1	750				1			
2	30N21	High												1																
2	31N18	Very High								1									1			1		1						
2	31N38	High						1																						
2	31N42	Very High		2						1					1				1	1					3	1				
2	31N49	Intermediate																										2		
1	31N21	Very High	5	2																	1							1	1	
1	31N40	Very High																						1				1		
1	32N17	Intermediate																		1										
																										Total Estimate:				
																										Overhead:				
																										Total:				

The work proposed herein is intended to stabaize the identified roads in preperation for the anticipated increase in stormwater runoff. We only identified treatments on high risk roads downstream of moderate and high 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.

County Roads: We will recommend to Trinity County that they should do a post fire condition survey of the portion of County Roads 303, 351 and Hwy 3 below Kingsbury Ridge affected by the Fork Complex Fire. We can provide the post fire hydraulic analysis for their stream culvert evaluation, which shows that the road and culverts could be at risk during a large stormwater event.

FS Trails: Close trails affected by fire and install trail erosion structures (LEBs and drainage ARMORING) to maintain natural drainage patterns and maintain trail stability during increased flows. Log erosion barriers (LEBs) will stabilize trail tread and prevent further erosion caused by the loss of vegetation and root systems previously supporting outer trail edge. LEBs are also used in conjunction with or where rock is unavailable for armoring to dissipate water flow energy in drainage areas down slope of trail to prevent down bank erosion and trail loss. Armoring key ephemeral drainages will require the placement of rock in a rip-rap fashion below trail in drainages to dissipate energy of across trail water flows and prevent erosion.

Trail Treatments				
trail	unit	unit cost	# of units	total cost
10W23	project	REDACT	REDACT	REDACT
12W27	project			
warning signs	project			

Protection/Safety Treatments: Burned area road and trail signs.

Safety:

Posting of areas burned will alert the public to potential dangers of falling trees and rolling rocks. Repair of road and trail signs burned will insure public safety. Posting of areas burned will alert the public to potential dangers of falling trees and rolling rocks. Recommend signage alerting the public to potential increased peak flows post-fire and storm patrol to assess impacts during winter 2015-16. Warning signs for potential for flooding with a 2yr-6hr storms (see Burned Area Report source of funds for costs at the end of the report).

Heritage Resource Prescriptions:

Although fire and fire suppression has adversely affected at least REDACT and REDACT, GIS analysis and field assessments indicate that cultural resources within the Fork Complex Fires are not at risk from post-fire erosion, storm runoff, debris flows, or increased visibility and therefore do not qualify as VARs for BAER treatment.

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 monitoring.