LIME COMPLEX BURNED AREA REPORT
(Reference FSH 2509.13)

PART I - TYPE OF REQUEST

Fireline on Miners Fire portion of the Lime Complex

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: Lime Complex

B. Fire Number: CA-SHF-001041

C. State: CA

D. County: Trinity

E. Region: 5

F. Forest: Shasta-Trinity

G. District: South Fork Management Unit

H. Fire Incident Job Code: P5D8HC

I. Date Fire Started: 6/14/2008

J. Date Fire Contained: 8/13/08

K. Suppression Cost: 65 million

L. Fire Suppression Damages Repaired with Suppression Funds
1. Fireline (miles): 135
2. Fireline waterbarred and seeded (miles):
3. Other (identify):

M. Watershed Numbers:

N. Total Acres Burned: 65,351
NFS Acres(62,138) Other Federal ( ) State ( ) Private (3,213)

Acres Sum	Ownership			
Fire	**USFS**	**Pvt_On_Forest**	**Pvt_Off_Forest**	**Total**
Lime	23225	1956		25181
Miners	24519	263		24783
Telephone	6967	88		7056
Noble	5950	128		6078
Deadshot	389	260	435	1084
Slide	1075	82		1157
South Fork	83			83
Oak	33			33
Total	**62,241**	**2,778**	**435**	**65,454**

O. Vegetation Types: Mixed Conifer and chappral

P. Dominant Soils:

Whole Complex: Neuns, Deadwood, Hugo, Holland, Marpa
Lime Fire: Neuns, Hugo, Marpa, Deadwood
Miners Fire: Neuns, Deadwood, Hugo, Holland
Telephone Fire: Neuns, Hohmann, Deadwood, Brader
Noble Fire: Parrish, Neuns, Henneke, Stonewell
Deadshot Fire: Deadwood, Indleton, Neuns
Slide Fire: Neuns, Secca, Dunsmuir
South Fork Fire: Deadwood
Oak Fire: Deadwood

Q. Geologic Types: Hayfork Formation, metavolcanics, granitcs

R. Miles of Stream Channels by Order or Class: Perennial – 118; Intermittent – 212; Ephemeral – 187.

S. Transportation System

Trails: 42 miles Roads: 155 miles

PART III - WATERSHED CONDITION

A. Burn Severity by total and FS (acres): 51,838 (v. low & low) 12,316 (moderate) 1,300 (high)

Sum of Acres		Soil Burn Severity				
Fire	Ownership	Unb/VL	Low	Mod	High	Total
Lime	USFS	10,669	8,967	3,321	268	23,225
	Private_On_Forest	651	818	413	74	1,956
Miners	USFS	10,619	8,409	4,639	853	24,519
	Private_On_Forest	86	107	47	24	263
Telephone	USFS	651	4,663	1,627	26	6,967
	Private_On_Forest	13	59	16	0	88
Noble	USFS	1,644	2,388	1,870	48	5,950
	Private_On_Forest	4	79	46		128
Deadshot	USFS	216	97	74	1	389
	Private_On_Forest	169	46	39	6	260
	Private_Off_Forest	165	191	79		435
Slide	USFS	369	588	118		1,075
	Private_On_Forest	33	35	13		82
South Fork	USFS	20	51	12		83
Oak	USFS	25	6	2		33
Total	USFS	24,214	25,168	11,663	1,196	62,241
Total	Private	1,120	1,335	653	104	3,212
Grand Total		**25,334**	**26,504**	**12,316**	**1,300**	**65,454**

B. Water-Repellent Soil by total and FS (acres): Water repellency is present in the high soil burn severity class, approx. 1300 acres (1200 acres NFS and 100 acres non-FS). Repellent layer is from 1 to 4 inches thick, moderate to severe, and patchy.

C. Soil Erosion Hazard Rating by total and FS (acres):
1,847 (low) 17,965 (moderate) 40,468 (high) 5,174 (Very high)

Sum of Acres		Erosion Hazard Rating				
Fire	Ownership	Low	Mod	High	Very High	Total
Lime	USFS	381	8677	13642	525	23225
	Private_On_Forest	184	471	1266	35	1956
Miners	USFS	240	5718	14812	3749	24519
	Private_On_Forest	44	48	172	0	263
Telephone	USFS		744	5507	716	6967
	Private_On_Forest		10	67	12	88
Noble	USFS	997	1560	3351	42	5950
	Private_On_Forest		1	127		128
Deadshot	USFS		134	198	56	389
	Private_On_Forest		96	126	38	260
	Private_Off_Forest		158	277	0	435
Slide	USFS	2	281	792		1075
	Private_On_Forest		21	61		82
South Fork	USFS		20	63		83
Oak	USFS		25	8		33
Total	USFS	1,619	17,161	38,373	5,088	62,241
Total	Private	228	804	2,095	86	3,212
Total		**1,847**	**17,965**	**40,468**	**5,174**	**65,454**

D. Erosion Potential: 12 to 40 tons/acre

	First Year Erosion Potential (tons/ac)		Second Year Erosion Potential (tons/ac)	
FIRE_NAME	2-Year Winter	10-Year Winter	2-Year Winter	10-Year Winter
Miners	18.67	46.67	10.49	34.38
Lime	13.05	32.26	8.25	25.15
Telephone	13.14	42.62	7.18	30.79
Slide	2.76	38.91	10.56	29.28
Average	**11.51**	**40.25**	9.12	29.50

E. Sediment Potential: 1355 cubic yards / square mile

An average winter has the potential to produce **1355** cubic yards per square mile of sediment, ranging from 620 to 1987 across the fires as a whole. Hillslope erosion was determined to have a 19% chance of sediment delivery potential.

PART IV - HYDROLOGIC DESIGN FACTORS

A. Estimated Vegetative Recovery Period, (years): 10

B. Design Chance of Success, (percent): 85

C. Equivalent Design Recurrence Interval, (years): 10

D. Design Storm Duration, (hours): 6

E. Design Storm Magnitude, (inches): 2.8

F. Design Flow, (cubic feet / second/ square mile): 188 (Wannanen & Crippen)

G. Estimated Reduction in Infiltration, (percent): 20

H. Adjusted Design Flow, (cfs per square mile): 230

PART V - SUMMARY OF ANALYSIS

A. Describe Critical Values/Resources and Threats:

Background: The Lime complex fires have burned 65,351 acres due to 5,000 lighting strikes that ignited 150 fires on June 21, 2008, in Tehama, Trinity, and Shasta Counties. On the Shasta-Trinity National Forest alone, 35 fires named fires burned or are still burning. The fires started on ridgelines and slowly backed down the ridges over time causing a mosaic burn. The Lime Complex assessment area consisted of 62,138 acres of U.S. forestland and 3,213 acres of private lands. The Lime Complex BAER assessment area includes the Telephone, Noble, Deadshot, upper Deerlick, China, Lime, Miners, Slide, and South Fork fires that occurred in Trinity County.

Approximately 21% burned at high and moderate soil burn severity (see soil burn severity map below). The rest of the fires were either low or very low soil burn severity. General trends are forested areas that were north or east-facing slopes were nice under-burns. Forested areas that were south or west-facing slopes burned hotter and had tree mortality of 20-40% with ridges burning hotter (see pictures below).

Telephone Fire under-burn

Miners Fire ridgeline

Chaparral areas that were north or east-facing slopes had moderate soil burn severity were patchy. Chaparral areas that were south and west-facing, burned moderately high to high soil burn severity removing almost all vegetation (see pics below).

Miners Fire mixed brush

Noble Fire brush fields

The BAER Watershed group stratified the fire into analysis watersheds, analyzed the amount of soil burn severity, and the predicted erosion response to determine threats to identified values. The following sub-watersheds were identified as having the greatest risk to identified values: Lower Plummer Ck., East and West Fork Miners Ck., Little Ck, and Corral Creek Camp Creek.

Critical values at risk:

1) Threats to Life, Property and Safety:

a) Facility structures and homes: The Lime Complex Fires burned on mostly USFS administered lands, placing a few structures at risk from erosion and flooding. These are listed below in outline form.

i) Lime Fire:

(1) Slopes above the Miller Place on South Fork Mountain are hydrophobic and burned hot with deep char, but have good needle-cast and rock fragments.

b) Roads and Trails: Many roads are now at risk due to increased flows from moderate to high soil burn severity with undersized culverts and numerous stream crossings.

i) Lime Fire:
(1) Cold Camp Creek in the Lime Fire which is very accessible (completely surrounded by roads) is burned quite extensively.
(2) On road 24N54, several culverts could plug. They need cleanout and low water crossings.
(3) South Fork Mtn. side of the Lime fire, road 1N24 @MP 0.00 to 5.7 dead-ends into a decommissioned road).
(4) Road 2N27 on private property, has been previously decommissioned (first section ~ 1.6) and now is opened to road 1N16. Numerous wet crossings, temporary fills and culverts have been installed and need to be re-decommissioned.
(5) Road 2N27 at upper edge of burn has 2 culverts with moderate potential for plugging.
(6) South Fork trail has several trail crossings that need work to handle anticipated increased flows to protect the trail from failure.

ii) Miners Fire:
(1) Two culvert problems on Little Creek in Miners Fire (one crushed with debris and other undersized with debris) with burned headwaters just below Hayfork Bally.
(2) Bear Creek trail has several trail crossings that need work to handle anticipated increased flows to protect the trail from failure.

iii) Noble Fire:
(1) 29N06 Beegum Campground road has burned slopes that could erode and fail with undersized culverts.

iv) Telephone Fire:
(1) Old hwy 36 (13-dips) has undersized culverts, lack of proper drainage, unstable banks, undercut water crossings, and will have increased erosion and runoff.

2) **Threats to Water Quality and Fisheries:** With Moderate to high soil burn severity water quality could be compromised due to steep burned soils on many soils that have sandy loam surface.

a) Lime Fire:
i) Limedyke Lookout Slide – Increased sedimentation to the South Fork Trinity River, with recent activity in the last 2 years. Inner gorge and toe zones positions, if they super saturate could deposit 5 to 10 cubic tons of sediments into the river below.
ii) Cold Camp Creek – Drains into Indian and then Butter Creek. Butter Creek is spawning grounds for Coho Salmon and MIS Spring Chinook. Transport of sediments to Lower South Fork due to burn severity in creek could also affect salmon spawning habitat. Higher flows are expected and head-cuts are likely if not treated.

b) Noble Fire:

i) Road 29N03 inadequate crossings and potential sediment delivery to Beegum Creek fishery below.
ii) Erosion of south-facing slopes above Beegum Creek that burned very hot.
iii) Beegum Creek (located in Beegum Gorge) has listed rare salmon fishery part of the greater Cottonwood fishery and could be impacted by accelerated erosion and sediments.

3) **Threats to Soil Productivity/Ecosystem Stability:** Areas that have moderate to high soil burn severity are at risk from accelerated erosion and loss of soil stability and soil fertility. In all geologic formations the potential for slope failure is increased by differential movement along shear and fault zones; by the introduction of water which decreases shear strength of the crushed material; and by the elimination of natural vegetation thus destroying the network of roots that bind weak soil materials together.

a) Lime Fire:
   i) The headwalls of an old debris flow that drains into the South Fork Trinity River near the Limedyke Lookout. The ground that burned here appears to be likely to continue erode, however the bulk of the sediment/erosion that this area produced is already gone.

b) Miners Fire:
   i) Kottmier Mine slide in the Miners fire could become destabilized due to burned trees above and dozer-lines above slide.
   ii) Concentrated pockets of higher burn severity that appear to be in small headwater pockets /reaches of West Fork Miners Creek, East Fork Miners Creek, Bear Creek and Little Creek all immediately below Hayfork Bally as well as another small headwater area in an unnamed tributary to Bear Creek (granitic soils), these areas are gravelly loam to sandy loam soils with water repellency down to 4 inches and deep soil char.

c) Noble Fire:
   i) Landslide potential above 29N03 due to lack of vegetation and moderately hot soil burn severity.
   ii) Debris flow potential into undersized culverts on the 29N03 road.

4) Threats to Cultural Resources: With loss of cover and erosion, cultural resources are now exposed and are vulnerable to vandalism.

a) Noble Fire:
   i) Chromium mine site just above Beegum Creek is now exposed to erosion and potential vandalism of cultural resources.

b) Lime Fire:
   i) Miller Spring prehistoric site has removal of cover by the fire and is now open and exposed subject to vandalism.

c) Miners Fire:

i) Hayfork Bally area prehistoric site burned over and has loss of cover, are now exposed and are vulnerable to vandalism.

5) Threats to Botanical Resources: With multi-agency response to these fires the likelihood of noxious weed introduction is high.

a) Dozer lines in serpentine soils have removed topsoil and need serpentine seed mix. Serpentine habitats are environmentally sensitive and recover very slowly from soil excavation or other ground disturbance. The Lime, Miners, and Slide fires all fall within the Rattlesnake Creek Terrane, a unique serpentine geologic formation that is home to a suite of endemic serpentine-adapted plant species found nowhere else in the world. Dozer line construction through these habitats caused soil disturbance that is unlikely to recover adequately without vegetative treatments.

b) Noxious weed infestation issue due to multi-agency response and dozer lines running from infestation zones to non-infested zones. There is a high risk of noxious weed introduction into the three fire areas where dozer line construction created suitable bare soil. 145 miles of dozer lines were constructed throughout the three fires. High priority noxious weeds include yellow starthistle, tansy ragwort, brooms, tree-of-heaven, and diffuse knapweed.

c) Diffuse knapweed infestation on east side of Lime could spread due to open exposed sites from dozer-lines and open burned areas. There is an existing, limited infestation of diffuse knapweed on top of South Fork Mountain, on the west edge of the Lime fire. The fire didn't burn through the infestation, but dozer line was constructed from the ridgetop down to midslope on the mountain. There is a very urgent need to closely monitor all dozer line within proximity of the current infestation and treat new individuals to prevent spread of the weed.

6) Threats to Wildlife Resources: Burned areas are a loss of habitat and could impact wildlife populations.

B. Emergency Treatment Objectives:

The purpose of emergency treatments is to mitigate erosion, sedimentation, and flooding that threatens life and property.

- Stabilize hillslopes that are likely to experience unacceptable accelerated erosion
- Stabilize roads to prevent loss of road prism due to increased watershed response
- Reduce the risk of degradation to ecosystem function and for T&E species

Risk determination is dependent on the design storm selected and downstream values at risk. By using an above average storm (10-year event) emergency planning measures can be designed to mitigate and minumize anticipated risks (see hydrologist report). Using a 10-year design storm the values at risk can be evaluated to determine if an emergency exists. Emergency determination matirx displayed below shows if an emergency exists, why, and treatment proposed to mitigate the emergency.

Lime Complex Fires Values at Risk Emergency Determination Matrix

Value at Risk	Emergency U%(yes/no)T%	Reason	Treatment
Slopes above Miller Place	No	Hillslope erosion	None
Cold Camp Creek area	90%/Yes/25%	Hillslope erosion	Mulch
Road 2N54 – Lime east	75%/Yes/25%	Culverts plugging	Cleaning and critical dips
Road 4N08 - Miners	75%/Yes/25%	Culverts plugging	Road stormproofing
Hayfork Bally LO area	95%/Yes/35%	Hillslope erosion	Heli-mulch
Limedyke Lookout Slide	Maybe	Sedimentation issue	Non-treatable
Kottmeir Mine slide	50%/Yes/25%	Destabilization - road	Mulch and divert water
West Fork Miners Creek	60%/Yes/30%	HSBS hillslope erosion	Heli-mulch
Bear Creek headwall	60%/Yes/30%	HSBS hillslope erosion	Heli-mulch
Little Creek headwall	No	MSBS hillslope erosion	None
Plants in serpentine soils	50%/Yes/25%	Dozer lines - erosion	Seed with native seed mix
Noxious weed spread	70%/Yes/35%	Multiple dozer lines	Seed and mulch 50’ into road
Knapweed invasion	80%/Yes/25%	Multiple dozer lines	Nx. weed detection survey
Bear Creek Trail	80%/Yes/25%	Rock fall hazard	Burned area warning signs
South Fork Trail	80%/Yes/35%	Crossing failure	Crossing armoring
Road 1N24 – Lime west	No	Road decommissioned	None
Road 2N27 – Lime west	Yes/re-decommiss.	Culverts plugging	Re-decommissioned s-repair
Ridgeline erosion E. Miner	90%/Yes/20%	Large dozer lines	Mulch and woody debris cover
Decommission crossings	90%/Yes/35%	Large unstable temp cx	Re-decommissioned s-repair
Heritage exposure	95%/Yes/20%	Open exposed sites	Cover with natural vegetation

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

Land **90** % Channel **95** % Roads/Trails **95** % Protection/Safety **95** %

D. Probability of Treatment Success

	Years after Treatment		
	1	3	5
Land	95	80	70
Channel	95	90	80
Roads/Trails	95	90	90
Protection/Safety	95	90	85

E. Cost of No-Action (Including Loss):$ 4,000,000

F. Cost of Selected Alternative (Including Loss):$1,500,000

G. Skills Represented on Burned-Area Survey Team:

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

Team Leader:Brad Rust

Email: brust@fs.fed.us Phone: 530-226-2427 FAX: 530-226-2485

H. Treatment Narrative:

(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. For seeding treatments, include species, application rates and species selection rationale.)

1. **Land Treatments:** Most moderate to severely burned slopes occurred on upper slopes and ridges and burnout areas. Most fires have designated roadless areas with critical fisheries habitat values, so land treatments are proposed in specific sediment source areas to protect these values. Treatments are intended to reduce off-site sediment-laden

runoff, not for on-site soil productivity concerns directly. Treatments will also address landslide potentials and noxious weed introduction and infestations.

Miners Fire:

- Approximately 800 acres of severely burned hillslopes need cover to reduce erosion and sediments from entering critical Coho and Spring Chinook spawning habitat in Hayfork Creek and the South Fork of the Trinity River. Areas selected have direct approximity and conectivity to main salmon spawning areas. Treatments will consist of heli-mulching weed-free rice straw on slopes less than 60 percent. Areas with shallow water repellant coarse textured soils near spawning grounds will be give highest priority. Soils that are not shallow, have high rock fragment content, are not coarse textured will not have as high of priority (see Soils specialist report for details).

- A previously active landslide was identified near Little Creek in section 9 proximate to the Kottmeier Mine. A high intensity burn above the slide and road located immediately below this landslide has created a situation that could pose a threat**.** Two roads are identified above this slide and any road drainage must be directed away from this slope area and the area planted with native conifers to pull moisture out of the slide headwall.

- Throughout the Miners Fire are numerous firelines that have been cut through noxious weed infestation areas of Tansey Ragwort that has potential to spread into open exposed firelines, safety zones, and staging areas. Treatment proposed is to seed native grass and mulch the last 50 feet of firelines before they enter main roads. Noxious weed detection surveys will be conducted and if any noxious weeds are found they will be pulled and bagged. If larger outbreaks are detected then subsequent funding will be sought to treat the infestation.

Lime Fire:

- Cold Camp Creek area burned in the 1987 event. This creek has since then experienced head-cutting and small inner gorge slides along its length. It is expected that increased flows will accelerate this process if slope treatment are not initiated. Values at risk are fisheries in Butter Creek below. Heilmulching is being proposed for a total of 200 acres. (If no heli-mulch staging area is located and since the area is surrounded by roads, roadside machine mulching could be employed to cover burned landscapes above and below roads. Straw-bale dams could be constructed in draws below mulched areas to curb head-cutting and additionally trap sediments).

- A large nested, in echelon slide complex of Pleistocene age has been identified immediately north of Limedyke Mountain (figures 1 and 2 below). The Bear Wallow fault runs through this area. This area first burned extensively in August of 1987. Since then active creep movement has occurred along the toe of the two lowermost slides. Recent tension cracks have been observed in this area. Potential slope stability hazards will increase as time progresses and peak in five to seven years time as root systems deteriorate. Native conifers should be planted on this site to pull moisture out of the slide headwall and surface flow dispersed from concentrating on the toe of the landslide.

- Two colluvial filled hollows are located below road 2N10 within a hot burn area. Runoff from the road should be dispersed along the slope and not allowed to concentrate that could produce debris flows into Plummer Creek below.

- Throughout the Lime Fire are numerous firelines that have been cut through noxious weed infestation areas of Spotted Knapweed that has potential to spread into open exposed firelines, safety zones, and staging areas. Treatment proposed is to seed native grass and mulch the last 50 feet of firelines before they enter main roads. Noxious weed detection surveys will be conducted and if any noxious weeds are found they will be pulled and bagged. If larger outbreaks are detected then subsequent funding will be sought to treat the infestation.

Telephone, Noble, Slide Fires:

- Throughout these fires are numerous firelines that have been cut through and are potential areas for noxious weeds that have the potential to spread into open exposed firelines, safety zones, and stagging areas. Noxious weed detection surveys will be conducted and if any noxious weeds are found they will be pulled and bagged.

- Mulching treatments were only proposed for the Noble Fire and were covered in the SHU-Lighting 2500-8 request. No mulching treatments are proposed for the Slide or Telephone fires.

2. **Channel Treatments:** Some work is planned to reduce headcutting and meter out sediments in areas that are high in the watershed in intermitten and ephemeral sections. Along with mulching hillslopes efforts will be made to trap sediments before they can reach critical salmon and steelhead spawning grounds. Only the Telephone fires will have any channel treatments.

Telephone Fire:

- Energy dissapators will be installed in gullies below road to reduce sediment into tributaries of Salt Creek from high flows that will happen following the fire.

3. **Roads and Trail Treatments:** Roads and trails are at risk at crossings due to expected increased flows. Several roads need bigger culverts to pass expected flows due to burned out hillslopes above. Several trail crossings are at risk from failure due to indequate crossings for expected flows. Road 2N54 within the Cold Camp Creek of the Lime Fire could pose a risk due to the high intensity burn above. Little Creek in the Miners Fire with the high burn intensity above road 4N08 could exacerbate the problems with two existing culverts. A large 66 inch culvert with crushed outlet and an undersized 18 inch culvert with a plus 20 foot fill are in jeopardy of loss without remedial action. Road 4N08 also has many cross drains, for ditch relief, that threaten increased soil erosion at outlets (see engineering specialist report for details).

Miners Fire:

- Road 4N08 – Miners Creek Road – existing:
  - Existing 66 inch culvert, 20 foot height at centerline, crushed outlet, heavy woody debris at inlet and outlet.

- Undersized 18 inch culvert, 25 foot plus high fill with woody debris.
- Slide at head of Little Creek with 48 inch culvert, has underdrains, rocked critical dip and armored overflow.
- Multiple 18 inch ditch relief culverts with increase erosion potential at outlets.

- Road 4N08 (4.7 miles) – treatments:
  - Repair crushed 66 inch culvert outlet, armor toe of embankment and outfall, and remove wood debris from inlet and outlet. This will consist of mostly hand labor due to inaccessibility of area.
  - Upsize 18 inch culvert, reduce amount of embankment, construct critical dip with armor outlet. Remove approx. 2000 cubic yards material, install 60" x 120' culvert, replace compacted embankment, construct rocked critical dip and armor fill slope.
  - Installation of energy dissipaters at ditch relief culvert outlets with rip rap material.

- Bear Creek trail – has several stream crossings that could pose a problem with increased flows and need armoring to protect the trail. Four crossings are at risk and need rip-rap armoring @ $300 per corssing.

Lime Fire:

- Road 2N54 – Cold Camp Creek – existing:
  - 30" culvert with risk of plugging from increased runoff and debris flow.
  - 36" culvert with high risk of plugging from increased runoff and debris flow.

- Road 2N54 (1.1 mile), Cold Camp Creek – treatments:
  - Road outslope and dips to be maintained for water sheetflow to prevent concentration of waters.
  - Clean inlet and outlets of woody debris.
  - Construct rocked critical dip with armored outlet, to accommodate overtopping of culverts and protect embankments.
  - Maintain outsloped roadways and construct dips (5 total) to reduce surface rilling and erosion.

Telephone:

- Old highway 36 (13-dips road) has numerous areas that are suscepible to erosion and failure due to anticipated increased flows. Old Highway 36 will have high flows following the fire, and without treatment life and safety could be at risk.

- Removing undersized culverts, replacing with Q100 culverts, constructing critical and rolling dips, outsloping, grading, reconstruction of ditches, clearing trees and woody debris, rip-rapping inlets, outlets and installing rock dissapator. Install 2 trash racks (2*$200 = $400) at inlets of pipes. Straw dam installation and energy dissapators installed in gullies below road to reduce sediment into tributaties of Salt Creek from high flows that will happen following the fire.Hazard tree removal will be necessary to protect road crew working in the area (6 days for a crew of two sawyers (WG-3) 16/hr, 120 hours, gravel (40 tons at 32/ton = 1280) + rip-rap (22 tons of rip-rap @ 30/ton) = 660, 2 Seasonal closure gates, Installed on 30N19, and reconstruct road closure berms on 30N24, closure sign installation $200/gate *2 =

$400, three culverts; one 42" ($2167) , one 24" ($1360) and 1 24" ($1567), all 30 feet).

- Road Crew costs are ($1,000/day for 10 days. Excavator $3100, Water Truck at $1,000/day for 4 days. This will be done by hand with 5 days of GS-9 ($875), and 2 GS-5s ($1350) + materials (20 Bales at $8/bale = $160), plus woody debris on site).

4. **Protection/Safety Treatments**: Many areas are at risk to the public safety, OHV incrusion and erosion, and vadalism of protected cultural sites.

    - Recommend a 1-year forest closure till damaging storms have passed for roads, trails, and public camping areas, to allow adequate time for treatment and safety of visitation. OHV incrusion, erosion and vadalism of cultural sites will need to be controlled with gates and signing.

    - Two prehistoric sites are open and exposed from fire damage and need restored cover (one site on Lime Fire and other is on the Miners fire). Recommended treatment for these resources consists of using a four-person hand crew to spread slash piles over exposed areas of the site in order to stabilize the soils and disguise the surface artifacts that have been exposed. Logs should be used to line existing roads in the area to prevent campers, hikers and 4 x 4 road users from causing further damage to exposed areas of the site. Slash piles and logs are available on each site (see specialist report for details).

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, straw/rock dams and hillslope monitoring.

APPENDICES: Supporting Information

Appendix A: Lime Complex BAER Team

Appendix B: Monitoring for Roads, OHV, and Hillslope Mulching

Appendix C: Vicinity and Administered lands Map

Appendix D: Summary of Hydrology Findings

Appendix E: Summary of Geology Findings

Appendix F: Summary of Soils Findings

Appendix G: Summary of Fisheries Findings

Appendix H: Summary of Cultural Resource Findings

Appendix I: Summary of Engineering Findings

Appendix J: Summary of Botany Findings

Appendix K: Summary of Cost-Risk Analysis

Appendix L: Reccommendations For Futher Detailed Investigations

Appendix A: BAER Team and Agencies Consulted

Lime Complex BAER Team:

NAME	UNIT	FUNCTION	CELL PHONE	OFFICE PHON
Brad Rust	Shasta-Trinity N.F.	Team Leader	530-917-0434	530-226-2427
Annetta Mankins	Shasta-Trinity N.F.	Co-Team Leader	530-604-4272	530-628-126
Christine Mai	Shasta-Trinity N.F.	Hydrologist	916-708-0272	530-226-242
Angela Coleman	Tongass National Forest	Hydrologist	608-991-8737	907-228-414
Dave Young	North Province N.F.	Area Soil Scientist	530-227-9050	530-226-254
Abel Jasso	Shasta-Trinity N.F.	Geologist	-	530-226-242
John Lang	Tongass National Forest	Fisheries Biologist	-	907-225-214
Susan Erwin	Shasta-Trinity N.F.	Botanist	-	530-623-175
Lori Jackson	Shasta-Trinity N.F.	Engineering Technician	530-598-0421	530-638-1226
Patty Aberg	Shasta-Trinity N.F.	Engineering Technician	530-945-6150	530-226-2332
Crystal West	Inyo National Forest	Archeologist	760-920-1464	760-647-3021
Karol McGuire	Shasta-Trinity N.F.	GIS	530-925-6071	530-926-9673

Agencies Consulted:

Tim Veil 530-242-3441	Natural Resource Cons. Service	Conservationist
Tiffany Reese 530-623-3991	Natural Resource Cons. Service	District Conservationist

Appendix B: Monitoring Protocol

Lime Complex
Road Effectiveness Monitoring

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

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

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

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

4. Analysis, evaluation, and reporting techniques

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

Road Inspection Checklist

Date:_____ Inspector_____
Time:_____ Forest Road_____

Describe locations reviewed during inspection:_____

_____

_____

Was there road damage?
Was Culvert plugged?_____.
GPS)_____

Describe damage and cost to repair? (GPS)_____

Photo taken of road damage_____

Recommended actions to repair:_____

Lime Complex
Hillslope Treatment Effectiveness Monitoring

1. Monitoring Questions
    - Is there sufficient ground cover to retard accelerated erosion?
    - Is natural vegetation recovery?
    - Did the mulch/slash stay on site?
    - Was the Treatment tested by a design storm?

2. Measurable Indicators
    - The amount of ground cover that exists in early summer in treated areas and areas of high burn severity.
    - Rills, gullies or evidence of sheet wash erosion on the hillslopes.

3. Data Collection Techniques
    - Photo documentation of sites
    - Inspection checklist (see attached)

4. Analysis, evaluation, and reporting techniques
    - Monitoring will be conducted in early summer after vegetation has greened-up for the season. An evaluation as to whether any of the proposed hillslope treatments should be implemented will be made. If the monitoring shows that vegetative recovery is ineffective at preventing unacceptable accelerated erosion the 2nd winter an interim report will be prepared and submitted. A several page report should be completed after the site visit. The report would include photographs and a recommendation on whether additional treatments are necessary.

Hillslope Inspection Checklist

Date:_____ Inspector:_____

Time:_____ Watershed:_____

Describe Location of inspected site:

_____
_____
_____

Ground Cover: _____ (Complete at least 2 transects in inspection area of 10 points each)

Is there evidence of rill, gullies or sheet wash (describe extent and severity)? _____

Photo taken of site? _____

Recommended Actions: _____

Lime Complex
Straw and Rock Dam Effectiveness Monitoring

The 2500-8 report requests funds to monitor the effectiveness of straw and rock dam treatments on Lime Complex

1. Monitoring Questions
   - Is the straw or rock dam stable?
   - Is the straw or rock dam being undercut by concentrated runoff leading to unacceptable off-site consequences?

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

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 headcutting or infrastructure failure 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.

Straw/Rock Dam Inspection Checklist

Date:_____ Inspector_____
Time:_____ Forest Road_____

Describe locations reviewed during inspection:_____

_____

_____

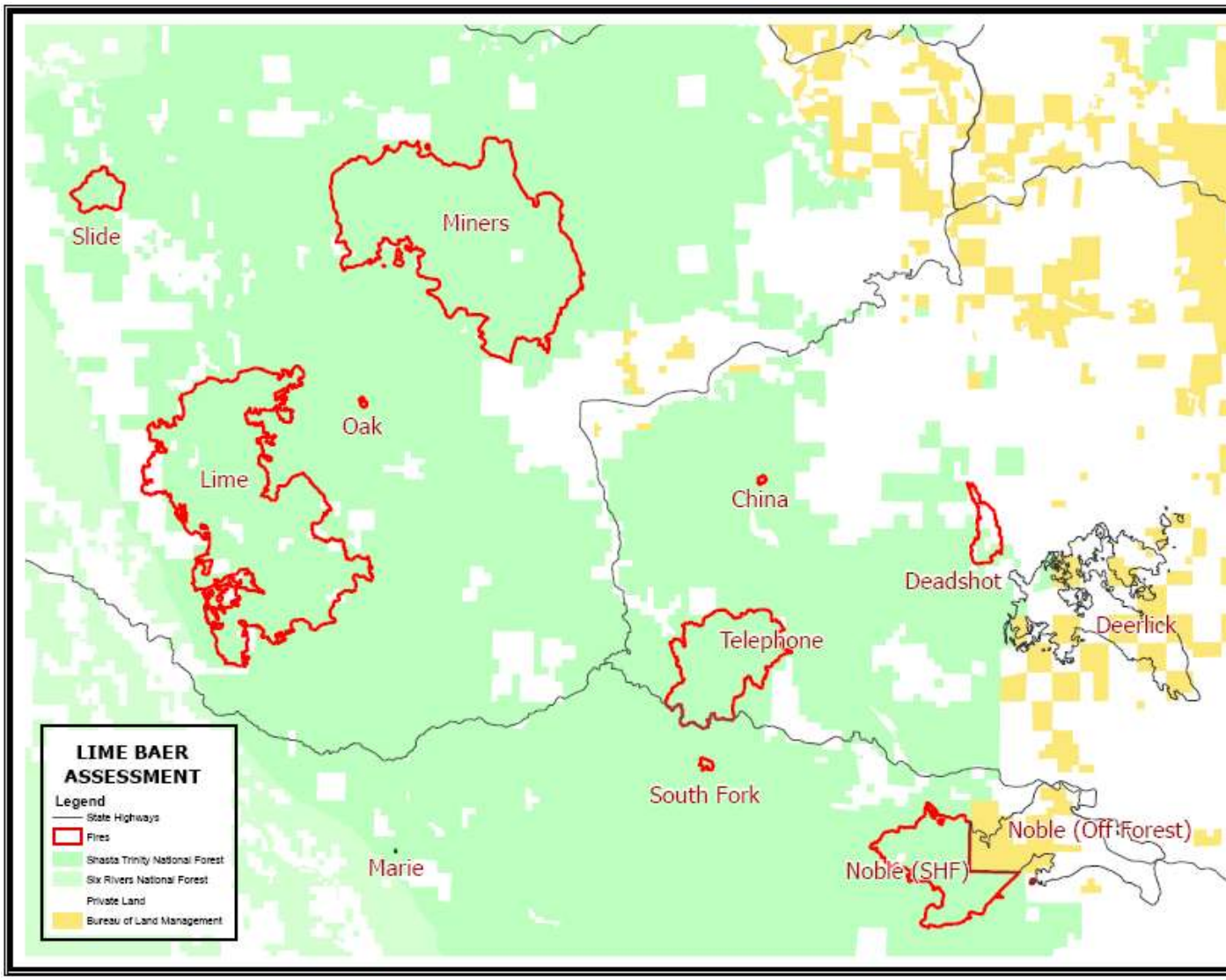
Was there structure damage?
Was structure undercut?_____.
GPS)_____

Describe damage and cost to repair? (GPS)_____

Photo taken of structure damage_____

Recommended actions to repair: _____

Appendix C: Vicinity and Administered lands Map



Appendix D: Summary of Hydrology Findings:

Lime Complex Interagency BAER TEAM
Hydrologist Report
Shasta Trinity National Forest

I. OBJECTIVES

The objective of this report is to provide a rapid assessment of the area affected by the Lime Fire Complex. High severity wildfires and suppression efforts can increase runoff and erosion rates by orders of magnitude, possibly threatening life, property, roads and trails as well as severely degrading water quality and aquatic ecosystems. This report provides a brief overview of the hydrologic resource issues of the Lime, Miners and Slide Fires of the Lime complex including burn severity, watershed response, values at risk, focused inventory of high risk watersheds, changes in runoff and suggested treatments and recommendations.

II. ISSUES/ VALUES AT RISK

The limiting factors for values at risk below the burned area are water quality in relation to fish habitat and road stability.

a. Water Quality and Fish Habitat

The South Fork of the Trinity River watershed basin (SFTR) 4th Field Hydrologic Code (HUC) has historically been recognized as a major producer of Chinook and Coho salmon (a listed species), and steelhead trout (PWA, 1994). The (SFTR) currently is included in the California's Clean Water Act (CWA) 303(d) as water quality limited due to sediment. The level of sedimentation in the SFTR was judged to exceed the existing water quality standards (WQS) necessary to support the beneficial uses of the basin, particularly the cold water fisheries. Accelerated erosion from the high burn severity and suppression of the Lime, Miners and Slide fires could adversely affect the ability of the stream system to support cold water fish such as Chinook salmon and steelhead trout (EPA, 1998).

b. Road Stability

High severity burns and fire suppression efforts can increase water yield, runoff and erosion rates by several orders of magnitude. These increased water yields and erosion rates increase the risk of culvert plugging, stream diversion, and road washouts and failures. Several of the roads below severely burned areas are likely at risk because of increased runoff and sediment yield.

III. OBSERVATIONS

a. Affected Environment

The Lime, Slide and Miners Fires, of the Lime Complex, burned approximately 25,181, 1157, and 24,782 acres of the Shasta Trinity National Forest and adjacent lands (burn area perimeter). The Miners fire was dominantly located in the headwater tributaries of Lower Hayfork Creek (5^{th} field HUC), the Lime Fire in the headwater tributaries of the Middle South Fork of the Trinity River (5^{th} field HUC) and the Slide Fire in the headwaters of the Lower South Fork of the Trinity River (5^{th} field HUC). The vegetation types consumed by the fire were mixed coniferous forest lesser area extents of brush and oak. The terrain is steep with elevational ranges from approximately 1200 to 4400 feet above mean sea level (i.e. 3200 foot difference).

The average annual precipitation ranges from 50 to 60 inches per year with 90 percent falling during the winter months. A snow pack (i.e. 2 to 4 feet) is common above 3500 feet. Rain is common below 2500 feet. Rain on snow events are common down to 1500 feet. The majority of the severely burned area is below 4400 feet. Hydrologic features found within the fire area include perennial, intermittent and ephemeral streams as well as number of smaller ponds.

b. Reconnaissance Method

Reconnaissance of the burned area was conducted using a rapid approach described as a burned area emergency assessment. The burned area emergency assessment is an immediate and rapid assessment of the burned area that is conducted in order to identify post-fire threats, critical values at risk, and need for emergency stabilization measures. The burned area emergency assessment is not a comprehensive evaluation of all fire damages or long-term rehabilitation or restoration needs (FSM 2500, 2004).

Reconnaissance of the burned area was conducted by helicopter overviews, driving roads, and hiking on trails and cross-country through the burn. Specialists included soil scientists, fisheries biologists, geologists, botanists, archaeologists, and road engineers.

c. Watershed Conditions

Peak flows within the fire area are predicted to increase as a result of the fire. However, due to the limited hydrophobic soils (approximately 2% of the fire area with moderate hydrophobicity of 2-5 cm depth); increases in runoff are assumed to be strictly due to loss of vegetation and ground cover (i.e. interception, evapotranspiration, ground cover storage). Elevated stream flows can be expected to occur in the burned watersheds, with greater flow increases in those drainages having higher percentages of high burn severity and the limited areas with the hydrophobic soils. Table 1 displays the acres of burn severity by 6^{th} and 7^{th} – Field Hydrologic Codes (HUC). All 6^{th} fields have less than 12% burned in high and moderate severities. Analysis of all 7^{th} fields shows increased burn percentages in the high and moderate severities with the Little Creek-Hayfork Creek the highest at 33%.

Fire	HUC 7 no	6th Field HUC Subwatershed	7th Field HUC Subwatershed	Wshed Area (ac)	Area Burned (ac)	% High	% Mod	% Low	% Burned by BI
	18010212000000	South Fork Trinity River (HUC 4)		596164	86,071	0%	1%	3%	4.5%
Lime	18010212020000	Middle Fork Trinity River (HUC 5)		118626	22,722	0%	3%	7%	10.1%
Lime	18010212020200	Cave Creek-Miller Springs		26327	2,082	0%	2%	6%	7.9%
Lime	18010212020202	Cave Creek-Miller Springs	Little Bear Wallow Creek-Hidden Valley	9794	278	0%	1%	3%	3.5%
Lime	18010212020203	Cave Creek-Miller Springs	Miller Springs	6994	1,804	1%	5%	17%	22.8%
Lime	18010212020300	Plummer Creek		16223	5,832	1%	11%	24%	36.0%
Lime	18010212020301	Plummer Creek	Upper Plummer Creek	7954	985	0%	2%	10%	12.4%
Lime	18010212020302	Plummer Creek	Lower Plummer Creek	8269	4,847	3%	19%	37%	58.6%
Lime	18010212020400	Butter Creek		23459	1,698	0%	3%	4%	7.2%
Lime	18010212020402	Butter Creek	Lower Indian Valley	5926	1,540	0%	11%	15%	26.0%
Lime	18010212020403	Butter Creek	Butter Creek Meadows	9854	158	0%	0%	1%	1.6%
Lime	18010212020500	Sulphur Glade Creek-Waldorf Flat		22781	2,325	0%	2%	8%	10.2%
Lime	18010212020501	Sulphur Glade Creek-Waldorf Flat	McClellen-South Fork Trinity River	6955	2,325	0%	7%	27%	33.4%
Lime	18010212020502	Sulphur Glade Creek-Waldorf Flat	Hitchcock Creek-Oak Flat	11793	1,920	0%	3%	13%	24%
Miners	18010212040000	Lower Hayfork River (HUC 5)		142015	14,037	1%	3%	6%	9.9%
Miners	18010212040300	Rusch Creek-Little Creek		32139	4,586	1%	6%	7%	14.4%
Miners	18010212040302	Rusch Creek-Little Creek	Hayfork Valley	8087	418	0%	3%	1%	5.2%
Miners	18010212040303	Rusch Creek-Little Creek	Little Creek-Hayfork Creek	5818	3,750	7%	26%	32%	64.5%
Miners	18010212040304	Rusch Creek-Little Creek	Rusch Creek	8404	417.7	0%	3%	1%	5.2%
Miners	18010212040404	Corral Creek		23120	942	0%	1%	3%	4.1%
Miners	18010212040401	Corral Creek	Upper Corral Creek	8634	119	0%	1%	1%	1.4%
Miners	18010212040403	Corral Creek	Lower Corral Creek	5976	823	0%	3%	10%	13.8%
Miners	18010212040500	Grassy Flat-Miners Creek		34935	8,509	1%	7%	16%	24.4%
Miners	18010212040501	Grassy Flat-Miners Creek	Bear Creek	4882	2,938	3%	20%	38%	60.2%
Miners	18010212040502	Grassy Flat-Miners Creek	Miners Creek	8296	4,305	3%	12%	38%	51.9%
Miners	18010212040503	Grassy Flat-Miners Creek	Upper Hayfork Creek Canyon	8565	1,267	0.5%	0.054	0.089	14.8%
Slide	18010212050000	Lower South Fork Trinity River (HUC 5)		129183.4	754.2	0.0	0.0	0.0	0.0
Slide	18010212050200	Hyampom		36657.7	754.2	0.0	0.0	0.0	0.0
Slide	18010212050203	Hyampom	Big Creek-Hyampom	5292.0	145.0	0.0	0.0	0.0	0.0
Slide	18010212050204	Hyampom	Big Slide Creek-South Fork Trinity River	10173.5	609.2	0.0	0.0	0.0	0.0

Table 1: Approximate burn severity by 6th and 7th field Hydrologic Unit Code (HUC) subwatersheds and fires.

Present management direction states that culverts should be designed to accommodate the 100-yr stream flow event. Table 2 presents the peak flow analyses pre and post fire for the Lime, Miners and Slide fires by 6th and 7th field HUC. Pre-fire and post-fire flow estimates were derived using Waananen and Crippen (1977) regional stream flow equations modified using the gauge verses ungaged relationship for neighboring stream gauges and fire severity. Table 3 presents additional peak flow analyses for 8th field HUC or smaller subwatersheds in higher severity burn areas of concern.

The risk of degrading water quality and road stability is dependant on the nature, timing, and duration of winter storms. Post-burn rainfall/runoff patterns will likely alter the hydrologic regime of the severely burned subwatersheds and increase the risk of storm generated debris flows in stream channels.

Lime Fire

Aerial and ground reconnaissance showed that overall the majority of the Lime fire burned in a low severity mosaic that should not have major negative impacts to the watershed. However, two main areas within the Lime fire that were of concern are listed below.

- Cold Camp Creek
  - Burned extensively (~ 55% moderate to severe burn severity).
  - Cold Camp creek (8th field HUC) is a transport headwater stream to Butter Creek (6th filed HUC) an important Coho salmon and steelhead trout stream.

- Modeling estimates show that Cold Camp Creek stream flows post-fire may increases by a magnitude 2.5x the current flows. These estimates will increase the likelihood of debris flows and sediment transport in drainages and increase the potential for culvert plugging and road washouts on the 2N54 road (Table 3).

- Limedyke Lookout Area
  - The headwaters of an old debris flow that drains directly into a small steep tributary of the South Fork of the Trinity River. See Geology Resource Report for additional information.

Miners Fire

Aerial and ground reconnaissance showed that the Miners fire burned in higher severity than the Lime fire in several subwatersheds (Table 2). Subwatersheds of more concern are listed below.

- Miners and Bear Creek
  - Concentrated pockets of high and moderate burn severity are present in the headwaters reaches of the East and West Forks of Miners Creek and Bear Creek.
  - The headwaters of the East and West Miners Creek forks (8^{th} field HUC) and Bear Creek are transport streams to Miners and Bear Creeks (7^{th} field HUC), important Steelhead and resident trout streams.
  - Modeling estimates show that Miners Creek and Bear Creek stream flows post-fire may increase by magnitudes of 1.8x and 2.0x the current flows increasing the likelihood of debris flows and sediment transport in drainages of erosive soils and rain-on-snow regimes.
- Little Creek
  - Concentrated pockets of high and moderate burn severity in the headwater reaches of Little Creek and immediately below Hayfork Bally.
  - The headwaters immediately below Hayfork Bally are transport streams to Little Creek and Hayfork Creek (8^{th}-7^{th} field HUC), important Steelhead and Coho streams.
  - Modeling estimates show that Little Creek stream flows post-fire may increase by a magnitude of 2.5x the present flows. These estimates will increase the likelihood of water generated debris flows and sediment transport in drainages with erosive soils and increase the potential for culvert plugging and road washouts on the 4N08 road (Table 3).
  - Field reconnaissance already revealed rilling and sediment transport in the highly erosive dioritic soil regimes along the dozer lines and in the high severity burn pockets in the headwaters of Little Creek.
  - There may be private land residences and water resources at risk above Hayfork Creek and county road 301 (SE1/4, SW1/4 Sec. 30, T3N, R12W and NE1/4, NE1/4, Sec. 31, T3N, R12W) due to estimated increased flows and sediment delivery, and runoff drainage modification caused by uphill dozer lines and cleared safety zones above DP 21. Further evaluation and monitoring may be necessary.

Fire	HUC no	6th Field HUC Subwatershed	7th Field HUC Subwatershed	Wshed Area (ac)	% High	% Mod	% Low	Stream Gage for calcs	Pre '2-yr Qp (cfs)	Pre 5-yr Q (cfs)	Pre '10-yr Qp (cfs)	Pre '25-yr Qp (cfs)	Pre '50-yr Qp (cfs)	Pre 100-yr Qp (cfs)	Post 2-yr Qp (cfs)	Post '10-yr Qp (cfs)	Post '2-yr Peak Increase x normal	Post '10-yr Peak Increase x normal
	18010212	South Fork Trinity River (HUC 4)		596164	0%	1%	3%	147	25151	42416	54,949	71,877	85,499	99,747	26,906	58,305	1.1	1.1
Lime	1801021202	Middle Fork Trinity River (HUC 5)		118626	0%	3%	7%	147	5882	10080	13,271	17,642	20,986	24,483	6,762	15,034	1.1	1.1
Lime	180102120202	Cave Creek-Miller Springs		26327	0%	2%	6%	146	1211	2070	2,667	3,459	4,162	4,919	1,349	2,939	1.1	1.1
Lime	18010212020202	Cave Creek-Miller Springs	Little Bear Wallow Creek-Hidden Valley	9794	0%	1%	3%	146	497	859	1,117	1,464	1,761	2,081	521	1,166	1.0	1.0
Lime	18010212020203	Cave Creek-Miller Springs	Miller Springs	6994	1%	5%	17%	146	367	636	831	1,092	1,314	1,553	499	1,078	1.3	1.3
Lime	180102120203	Plummer Creek		16223	1%	11%	24%	146	783	1345	1,742	2,270	2,731	3,228	1,214	2,584	1.5	1.5
Lime	18010212020301	Plummer Creek	Upper Plummer Creek	7954	0%	2%	10%	146	412	713	930	1,221	1,469	1,736	479	1,070	1.2	1.2
Lime	18010212020302	Plummer Creek	Lower Plummer Creek	8269	3%	19%	37%	146	427	738	962	1,263	1,520	1,796	822	1,737	1.9	1.8
Lime	180102120204	Butter Creek		23459	0%	3%	4%	146	1092	1868	2,409	3,129	3,765	4,449	1,219	2,660	1.1	1.1
Lime	18010212020402	Butter Creek	Lower Indian Valley	5926	0%	11%	15%	146	316	549	716	945	1,137	1,344	450	978	1.4	1.4
Lime	18010212020403	Butter Creek	Butter Creek Meadows	9854	0%	0%	1%	146	500	863	1,123	1,471	1,770	2,092	511	1,146	1.0	1.0
Lime	180102120205	Sulphur Glade Creek-Waldorf Flat		22701	0%	2%	8%	146	1063	1820	2,348	3,060	3,670	4,337	1,209	2,644	1.1	1.1
Lime	18010212020501	Sulphur Glade Creek-Waldorf Flat	McClellen-South Fork Trinity River	6965	0%	7%	27%	146	366	633	826	1,087	1,307	1,545	629	1,167	1.4	1.4
Lime	18010212020502	Sulphur Glade Creek-Waldorf Flat	Hitchcock Creek-Oak Flat	11793	0%	3%	13%	146	588	1013	1,315	1,720	2,070	2,446	718	1,582	1.2	1.2
Miners	1801021204	Lower Hayfork River (HUC 5)		142015	1%	3%	6%	146	5520	9277	11,751	14,989	18,034	21,313	6,409	13,384	1.2	1.1
Miners	180102120403	Rusch Creek-Little Creek		32139	1%	6%	7%	146	1449	2472	3,178	4,115	4,951	5,851	1,830	3,874	1.3	1.2
Miners	18010212040302	Rusch Creek-Little Creek	Hayfork Valley	8087	0%	3%	1%	146	419	724	944	1,239	1,491	1,762	462	1,022	1.1	1.1
Miners	18010212040303	Rusch Creek-Little Creek	Little Creek-Hayfork Creek	5818	7%	26%	32%	146	311	540	706	930	1,119	1,323	674	1,396	2.2	2.0
Miners	18010212040304	Rusch Creek-Little Creek	Rusch Creek	8404	0%	3%	1%	146	433	749	976	1,281	1,541	1,822	478	1,058	1.1	1.1
Miners	180102120404	Corral Creek		23120	0%	1%	3%	146	1078	1844	2,379	3,090	3,717	4,393	1,142	2,505	1.1	1.1
Miners	18010212040401	Corral Creek	Upper Corral Creek	8634	0%	1%	1%	146	444	767	1,000	1,312	1,578	1,865	454	1,019	1.0	1.0
Miners	18010212040403	Corral Creek	Lower Corral Creek	5976	0%	3%	10%	146	319	553	723	952	1,146	1,354	382	851	1.2	1.2
Miners	180102120405	Grassy Flat-Miners Creek		34936	1%	7%	16%	146	1562	2663	3,421	4,425	5,324	6,291	2,146	4,544	1.4	1.3
Miners	18010212040501	Grassy Flat-Miners Creek	Bear Creek	4882	3%	20%	38%	146	286	462	605	799	961	1,135	519	1,107	2.0	1.8
Miners	18010212040502	Grassy Flat-Miners Creek	Miners Creek	8296	3%	12%	36%	146	428	741	965	1,267	1,524	1,801	758	1,625	1.8	1.7
Miners	18010212040503	Grassy Flat-Miners Creek	Upper Hayfork Creek Canyon	8565	0.5%	0.054	0.089	146	441	762	993	1,302	1,567	1,852	546	1,196	1.2	1.2
Slide	1801021205	Lower South Fork Trinity River (HUC 5)		129183.4	0.0	0.0	0.0	146.0	5089.3	8526.7	10811.4	13803.9	16607.9	19627.5	5107.9	10888.0	1.0	1.0
Slide	180102120502	Hyampom		36657.7	0.0	0.0	0.0	146.0	1631.6	2779.2	3568.5	4614.0	5551.2	6560.5	1675.4	3657.6	1.0	1.0
Slide	18010212050203	Hyampom	Big Creek-Hyampom	5292.0	0.0	0.0	0.0	146.0	265.8	496.4	649.8	856.6	1030.7	1218.0	295.8	671.1	1.0	1.0
Slide	18010212050204	Hyampom	Big Slide Creek-South Fork Trinity River	10173.5	0.0	0.0	0.0	146.0	514.7	886.1	1156.0	1512.7	1820.0	2150.9	565.2	1239.3	1.1	1.1

Table 2: Peak Flow Analyses for 7th Field Subwatersheds in the Lime, Miners and Slide Fires. Watersheds of concern or showing the highest increases in stream flow post-fire are highlighted in yellow, orange and red in increasing risk severity.

Fire	HUC 7 No	HUC 7	HUC 8	HUC 8a	Wshed Area (ac)	Area Burned (ac)	% High	% Mod	% Low	Stream Gage for calcs	Pre 2-yr Qp (cfs)	Pre 5-yr Q (cfs)	Pre 10-yr Qp (cfs)	Pre 25-yr Qp (cfs)	Pre 50-yr Qp (cfs)	Pre 100-yr Qp (cfs)	Post 2-yr Qp (cfs)	Post 10-yr Qp (cfs)	Post 2-yr Peak Increase x normal	Post 10-yr Peak Increase x normal
Lime	18010212020402	Lower Indian Valley	Cold Camp Creek		1005	704	5%	50%	15%	146	64	113	151	202	243	287	158	326	2.5	2.2
Lime	18010212020402	Lower Indian Valley	Cold Camp Creek	2N54 culvert	26	24	5%	80%	10%	146	2	4	6	8	10	12	7	16	3.1	2.6
Lime	18010212020502	Hitchcock Creek-Oak Flat	Limedyke Lookout Slide Creek		2212	1,172	3%	15%	35%	146	130	228	302	401	482	570	238	519	1.8	1.7
Lime	18010212020502	Hitchcock Creek-Oak Flat	Limedyke Lookout Slide Creek	Limedyke Lookout Slide	32	32	30%	65%	5%	146	3	5	7	10	12	14	10	21	3.5	2.9
Miners	18010212040303	Little Creek-Hayfork Creek	Little Creek		2180	1,744	20%	20%	40%	146	129	225	298	396	476	563	327	682	2.5	2.3
Miners	18010212040303	Little Creek-Hayfork Creek	Little Creek	4N88 Culvert	90	85	60%	20%	25%	146	7	13	18	25	30	35	24	62	3.4	2.9
Miners	18010212040502	Miners Creek	East Fork Miners Creek		2127	1,127	3%	12%	38%	146	126	221	291	388	466	551	225	496	1.8	1.7
Miners	18010212040502	Miners Creek	West Fork Miners Creek		6099	3,287	3%	11%	40%	146	325	563	736	969	1,166	1,378	579	1,254	1.8	1.7

Table 3: Areas of Concern (for more detail see Appendix). Watersheds of concern or showing the highest increases in stream flow post-fire are highlighted in yellow, orange and red in increasing risk severity.

IV. TREATMENT RECOMMENDATIONS

Based on the assessment of subwatershed response, emergency determinations, and values at risk, the following treatment recommendations have been identified. Implementation of the following treatment recommendations should help in protecting the water quality and road stability values at risk.

- Upgrade culvert sizes or build critical dips on the 2N54 road in Cold Camp Creek, the 4N08 road in Little Creek roads to minimize road failure. See Tables 2 and 3 for subwatershed increased flow magnitude estimations.
- Clean all ditches, cross drains, and cross drain inlets, and remove constructed road berms.
- Increase vegetation and soil recovery rates by treating suitable moderate and high severity burned areas with mulching in the Cold Camp Creek (good accessibility), Little Creek, and Miners Creek Subwatersheds.
- Create in-stream sediment storage areas in the Cold Camp Creek subwatershed.
- Ensure that all dozer lines and safety zones established during fire suppression have been waterbarred and mulched, particularly in areas of highly erodable soils, and near drainages and private land.

V. MONITORING RECOMMENDATIONS

Based on the assessment of subwatershed response, emergency determinations, and values at risk, the following recommendations have been identified.

- Monitor effectiveness of road storm proofing, maintenance and culvert upgrades using California's Best Management Practices (USDA, 2000).
- Monitor vegetation and soil recovery rates in the mulched subwatersheds.
- Monitor the effectiveness of the in-stream sediment storage structures in the Cold Camp Creek subwatershed to benefit future BAER assessment and "proven effective" treatment options.
- Monitor the effectiveness of dozer line waterbars and mulching.

VI. REFERENCES

Environmental Protection Agency (USEPA, Region 9), 1998. South Fork Trinity River Sediment Total Maximum Daily Load. 109 p.

Forest Service Manual 2500, Watershed and Air Management, 2004. National Headquarters, Washington, DC. 44 p.

Pacific Watershed Associates (PWA). 1994. Action plan for restoration of the South Fork Trinity River watershed and its fisheries, prepared for US Bureau of Reclamation and the Trinity River Task Force, February.

USDA Forest Service, 2000. Water Quality Management for Forest System Lands in California, Best Management Practices. Pacific Southwest Region.

Waananen, A. & Crippen, J., 1977. Magnitude and Frequency of Floods in California, US Geological Survey, Water- Resources Investigations 77-21. 96 p.

APPENDIX:

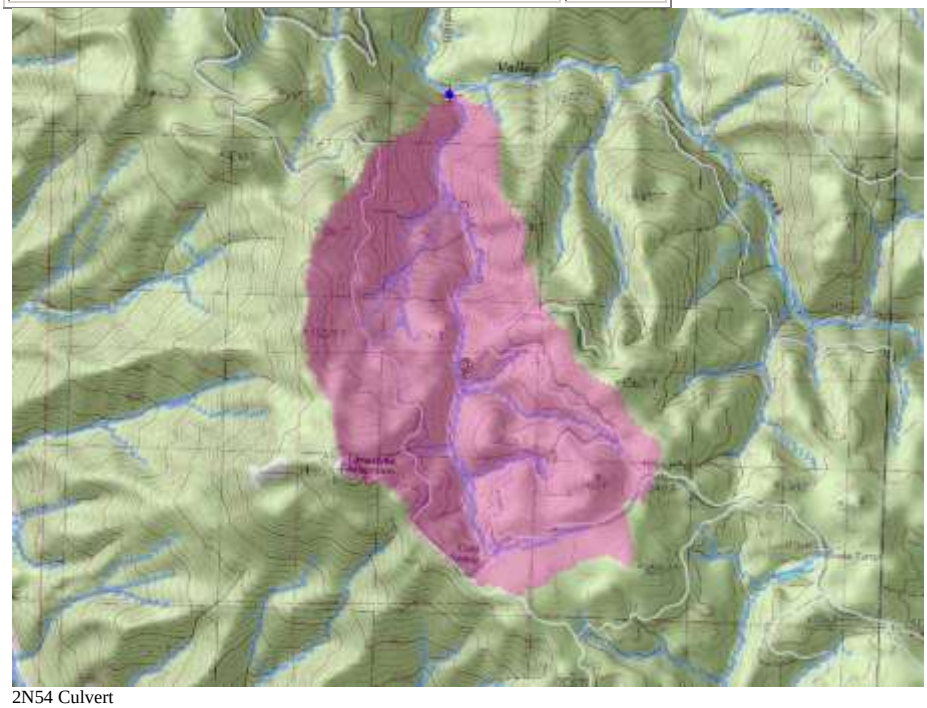
Characteristics and maps of Specific Watersheds of Interest

Cold Camp Creek

Date: Wed Aug 20 2008 14:46:58
NAD83 Latitude: 40.5465 (40 32 47)
NAD83 Longitude: -123.4101 (-123 24 36)
NAD27 Latitude: 40.5467 (40 32 48)
NAD27 Longitude: -123.4089 (-123 24 32)

Parameter	**Value**
Average basin slope, in percent	29.7
Average basin elevation, in feet	4100
Minimum elevation, in feet	2690
X coordinate of the outlet, in map coordinates	-2270070.0
Perimeter, in miles	7.01
Relief, in feet	1990
Maximum elevation, in feet	4680
Average minimum January temperature, in Fahrenheit	31.7
Percentage of basin covered by forest	17.8
Area, in square miles	1.63
Percentage of basin covered by impervious surface	0.11
Distance in miles from basin centroid to the coast	40.9
Elevation at outlet, in feet	2690
Y coordinate of the centroid, in map coordinates	2276162.9
X coordinate of the centroid, in map coordinates	-2270404.8
Relative relief, in feet per mile	284
Percent of area covered by lakes and ponds	0

Average maximum January temperature, in Fahrenheit	48.2
Mean annual precipitation, in inches	69.4
High Elevation Index - Percent of area with elevation > 6000 feet	0
Y coordinate of the outlet, in map coordinates	2277870.0



2N54 Culvert

Date: Wed Aug 20 2008 14:54:30
NAD83 Latitude: 40.5262 (40 31 34)
NAD83 Longitude: -123.4113 (-123 24 40)
NAD27 Latitude: 40.5263 (40 31 34)
NAD27 Longitude: -123.4102 (-123 24 36)

Parameter	**Value**
Average basin slope, in percent	30.1
Average basin elevation, in feet	4450
Minimum elevation, in feet	4200
X coordinate of the outlet, in map coordinates	-2270820.0
Perimeter, in miles	1.01
Relief, in feet	477
Maximum elevation, in feet	4680
Average minimum January temperature, in Fahrenheit	31.3
Percentage of basin covered by forest	24.6
Area, in square miles	0.0361
Percentage of basin covered by impervious surface	0.21
Distance in miles from basin centroid to the coast	40.8

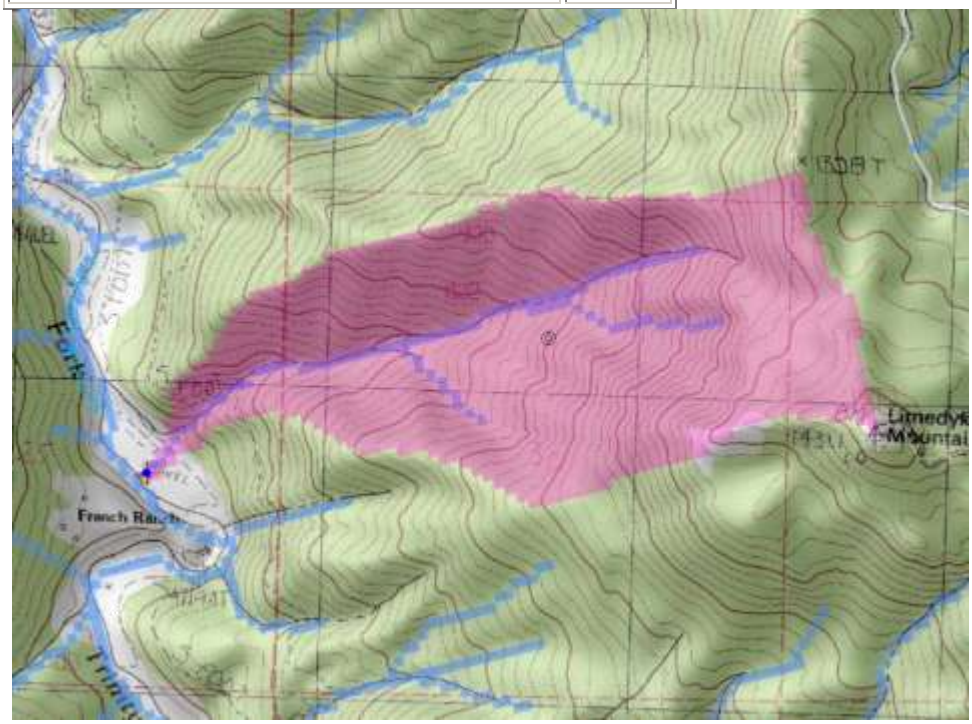
Elevation at outlet, in feet	4200
Y coordinate of the centroid, in map coordinates	2275719.8
X coordinate of the centroid, in map coordinates	-2271043.8
Relative relief, in feet per mile	474
Percent of area covered by lakes and ponds	0
Average maximum January temperature, in Fahrenheit	47.9
Mean annual precipitation, in inches	68.5
High Elevation Index - Percent of area with elevation > 6000 feet	0
Y coordinate of the outlet, in map coordinates	2275710.0

Limedyke Lookout Slide Basin

Date: Wed Aug 20 2008 15:10:49
NAD83 Latitude: 40.5229 (40 31 22)
NAD83 Longitude: -123.4447 (-123 26 40)
NAD27 Latitude: 40.5231 (40 31 22)
NAD27 Longitude: -123.4435 (-123 26 36)

Parameter	**Value**
Average basin slope, in percent	56
Average basin elevation, in feet	3170
Minimum elevation, in feet	1530
X coordinate of the outlet, in map coordinates	-2273610.0
Perimeter, in miles	4.51
Relief, in feet	3150

Maximum elevation, in feet	4680
Average minimum January temperature, in Fahrenheit	30.3
Percentage of basin covered by forest	58.6
Area, in square miles	0.6
Percentage of basin covered by impervious surface	0
Distance in miles from basin centroid to the coast	40.1
Elevation at outlet, in feet	1530
Y coordinate of the centroid, in map coordinates	2276270.9
X coordinate of the centroid, in map coordinates	-2272258.6
Relative relief, in feet per mile	698
Percent of area covered by lakes and ponds	0
Average maximum January temperature, in Fahrenheit	48.3
Mean annual precipitation, in inches	60
High Elevation Index - Percent of area with elevation > 6000 feet	0
Y coordinate of the outlet, in map coordinates	2276160.0

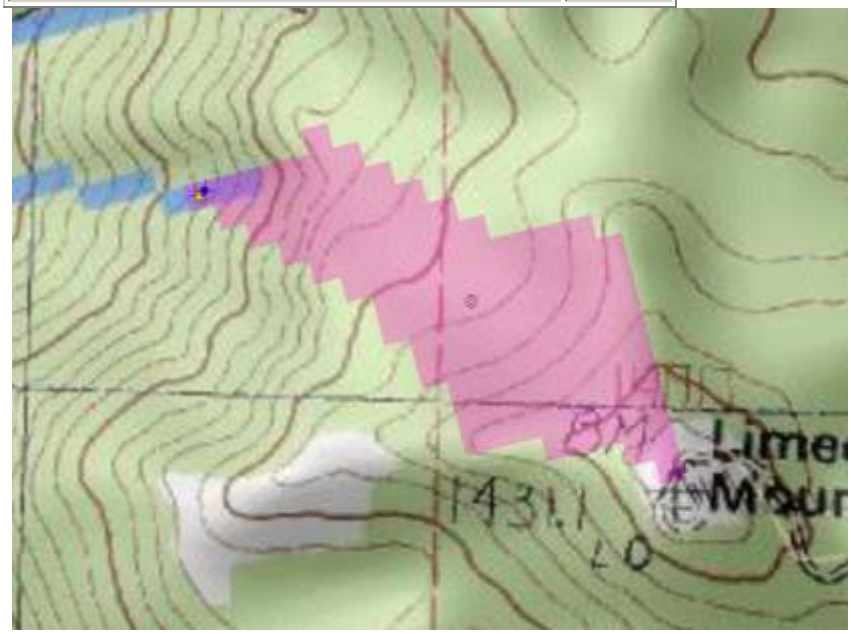


Limedyke Lookout Slide

Date: Wed Aug 20 2008 15:01:52
NAD83 Latitude: 40.5278 (40 31 40)
NAD83 Longitude: -123.4239 (-123 25 26)
NAD27 Latitude: 40.5280 (40 31 40)
NAD27 Longitude: -123.4228 (-123 25 21)

Parameter	**Value**

Average basin slope, in percent	40.8
Average basin elevation, in feet	4330
Minimum elevation, in feet	3720
X coordinate of the outlet, in map coordinates	-2271780.0
Perimeter, in miles	1.23
Relief, in feet	959
Maximum elevation, in feet	4680
Average minimum January temperature, in Fahrenheit	30.8
Percentage of basin covered by forest	34.2
Area, in square miles	0.0403
Percentage of basin covered by impervious surface	0
Distance in miles from basin centroid to the coast	40.5
Elevation at outlet, in feet	3720
Y coordinate of the centroid, in map coordinates	2275989.8
X coordinate of the centroid, in map coordinates	-2271503.8
Relative relief, in feet per mile	779
Percent of area covered by lakes and ponds	0
Average maximum January temperature, in Fahrenheit	47.9
Mean annual precipitation, in inches	66
High Elevation Index - Percent of area with elevation > 6000 feet	0
Y coordinate of the outlet, in map coordinates	2276190.0



East Fork Miners Creek

Date: Wed Aug 20 2008 16:34:54
NAD83 Latitude: 40.6388 (40 38 19)
NAD83 Longitude: -123.3228 (-123 19 22)
NAD27 Latitude: 40.6390 (40 38 20)
NAD27 Longitude: -123.3216 (-123 19 17)

Parameter	Value
Average basin slope, in percent	
Average basin elevation, in feet	
Minimum elevation, in feet	1940
X coordinate of the outlet, in map coordinates	
Perimeter, in miles	11
Relief, in feet	3000
Maximum elevation, in feet	4940
Average minimum January temperature, in Fahrenheit	
Percentage of basin covered by forest	
Area, in square miles	3.36
Percentage of basin covered by impervious surface	
Distance in miles from basin centroid to the coast	
Elevation at outlet, in feet	
Y coordinate of the centroid, in map coordinates	2288212.8
X coordinate of the centroid, in map coordinates	-2259329.3
Relative relief, in feet per mile	272
Percent of area covered by lakes and ponds	0
Average maximum January temperature, in Fahrenheit	
Mean annual precipitation, in inches	
High Elevation Index - Percent of area with elevation > 6000 feet	0
Y coordinate of the outlet, in map coordinates	

West Fork Miners Creek

Date: Wed Aug 20 2008 16:56:30
NAD83 Latitude: 40.6390 (40 38 20)
NAD83 Longitude: -123.3221 (-123 19 19)
NAD27 Latitude: 40.6391 (40 38 20)
NAD27 Longitude: -123.3210 (-123 19 15)

Parameter	Value
Average basin slope, in percent	
Average basin elevation, in feet	
Minimum elevation, in feet	1940
X coordinate of the outlet, in map coordinates	
Perimeter, in miles	19.9
Relief, in feet	3910
Maximum elevation, in feet	5850
Average minimum January temperature, in Fahrenheit	
Percentage of basin covered by forest	
Area, in square miles	9.53
Percentage of basin covered by impervious surface	
Distance in miles from basin centroid to the coast	
Elevation at outlet, in feet	
Y coordinate of the centroid, in map coordinates	2286844.9
X coordinate of the centroid, in map coordinates	-2255474.3

Relief, in feet per mile	197
Percent of area covered by lakes and ponds	0
Average maximum January temperature, in Fahrenheit	
Mean annual precipitation, in inches	
High Elevation Index - Percent of area with elevation > 6000 feet	0
Y coordinate of the outlet, in map coordinates	

Indian Creek (into Butter Creek)

NAD83 Latitude: 40.5676 (40 34 03)
NAD83 Longitude: -123.4210 (-123 25 15)
NAD27 Latitude: 40.5677 (40 34 03)
NAD27 Longitude: -123.4199 (-123 25 11)

Parameter	**Value**
Average basin slope, in percent	27.2
Average basin elevation, in feet	3920
Minimum elevation, in feet	1580
X coordinate of the outlet, in map coordinates	-2270280.0
Perimeter, in miles	36.2
Relief, in feet	3310
Maximum elevation, in feet	4890
Average minimum January temperature, in Fahrenheit	30.8
Percentage of basin covered by forest	46.6

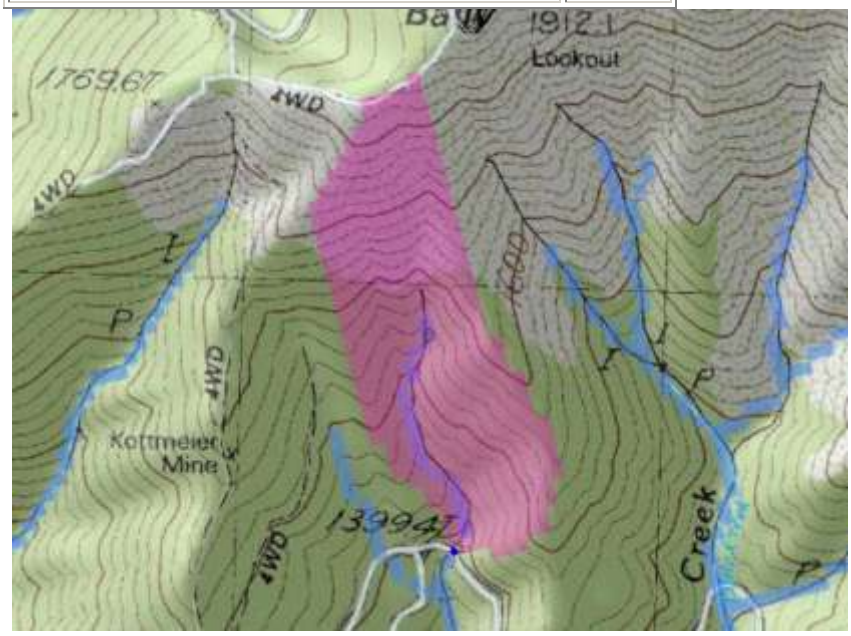
Area, in square miles	34.6
Percentage of basin covered by impervious surface	0.092
Distance in miles from basin centroid to the coast	42.7
Elevation at outlet, in feet	1580
Y coordinate of the centroid, in map coordinates	2276403.2
X coordinate of the centroid, in map coordinates	-2265881.8
Relative relief, in feet per mile	91.5
Percent of area covered by lakes and ponds	0
Average maximum January temperature, in Fahrenheit	48.3
Mean annual precipitation, in inches	67.1
High Elevation Index - Percent of area with elevation > 6000 feet	0
Y coordinate of the outlet, in map coordinates	2280390.0

4N08 Culvert Crossings

Date: Wed Aug 20 2008 15:47:13
NAD83 Latitude: 40.6468 (40 38 48)
NAD83 Longitude: -123.2196 (-123 13 10)
NAD27 Latitude: 40.6470 (40 38 49)
NAD27 Longitude: -123.2185 (-123 13 06)

Parameter	Value
Average basin slope, in percent	51.6
Average basin elevation, in feet	5220
Minimum elevation, in feet	4570
X coordinate of the outlet, in map coordinates	-2251560.0
Perimeter, in miles	1.98

Relief, in feet	1500
Maximum elevation, in feet	6070
Average minimum January temperature, in Fahrenheit	26.3
Percentage of basin covered by forest	38.4
Area, in square miles	0.14
Percentage of basin covered by impervious surface	0
Distance in miles from basin centroid to the coast	46.6
Elevation at outlet, in feet	4570
Y coordinate of the centroid, in map coordinates	2284617.8
X coordinate of the centroid, in map coordinates	-2251497.9
Relative relief, in feet per mile	758
Percent of area covered by lakes and ponds	0
Average maximum January temperature, in Fahrenheit	44.1
Mean annual precipitation, in inches	61.1
High Elevation Index - Percent of area with elevation > 6000 feet	1.8
Y coordinate of the outlet, in map coordinates	2284110.0



Appendix E: Summary of Geology Findings:

Lime –Miners Fire
BAER Geologic Assessment

Purpose

The geologic survey focused on identification of risks posed by landslides and rock debris flows. This was based on landslide activity being a common feature of the landscape evolution within the burned areas. **Determining if and how the fire modified the existing geologic hazards and potential effects during the first subsequent winter was the guide in the investigation**. The observations made during on-the-ground surveys were analyzed with information provided by previous geologic and geomorphic mapping, the BARC burn severity maps, and aerial photography.

Areas of Investigation

The fires of Lime and Miners comprise an area of distinctly diverse geologic terrain which *act to produce individual geomorphic processes and stability hazards*. Due to the nature of the rocks within this area, mass wasting has played a dominant role in shaping the geomorphology. A short review of the geologic composition and morphology is thusly warranted.

Lime

Geology/Geomorphology

The Lime fire area is located within highly diverse geologic landscapes. From west to east these are: the South Fork Mountain Schist, Galice formation, Glen Creek Gabbro/Ultramafic complex, Bear Wallow Diorite complex, and the Rattlesnake Creek terrane.

Identified Potential Hazards

In majority only a few areas of the Lime fire burned with high intensity. These are generally located in the Limedyke Mountain, Bear Wallow Mountain, Cold Spring, Friend Lake, Oak Ridge, and area northwest of Miller Place.

Limedyke Mountain Area

A large nested, in echelon slide complex of Pleistocene age has been identified immediately north of Limedyke Mountain. The Bear Wallow fault runs through this area.

This area first burned extensively in August of 1987. Since then active creep movement has occurred along the toe of the two lowermost slides. Recent tension cracks have been observed in this area. A gutted debris flow channel extends below this area. If the current toe area should fail a potential five to ten-thousand cubic yards of material could enter the channel and eventually into the South Fork of the Trinity River approximately 2,500 feet below.

Values at risk are fisheries within the South Fork drainage. No structures are located below and any flow mass would discharge upon a large river terrace located at this location on the South Fork.

Potential slope stability hazards will increase as time progresses and peak in five to seven years time as root systems deteriorate. Native conifers should be planted on this site and surface flow dispersed from concentrating on the toe of the landslide.

Cold Creek

This area also burned in the 1987 event. This creek has since then down and head. Small inner gorge slides are found along its length. It is expected that increased flows will accelerate this process if slope treatment are not initiated. **Values at risk** are fisheries. A combination of techniques can be employed to stabilize soil movements. Reference in this regards should be made to the Soil report.

Area Northwest of Miller Place

This area burned hot. Large active, nested, wet rotational landslides are located at this location. Some movement can be expected at this location peaking in five to seven years time. Miller Place should not be impacted by potential downslope movements. This area should be replanted with native conifers. A fire line is located above this area. Care must be taken to drain surface flow from a fire line above away from this slope.

Area South of Oak Ridge

Two colluvial filled hollows are located below road 2N10 within a hot burn area.

Runoff from the road should be dispersed along the slope and not allowed to concentrate. The slope should be planted with native conifers. **Values at risk** are fisheries. No structures are located below.

Miners

The Miners fire is located north of Hayfork Creek and consists (from west to east) of the Ironside Mountain Batholith and the Hayfork terrane.

The Ironside Mountain Batholith is a large, northwest-southeast trending elongate intrusive body immediately to the west of the Hayfork terrane and forms the western portion of the area. Typically these rocks are composed of diorites.

The Hayfork Bally Meta-andesite is composed chiefly of volcaniclastic rocks, with subordinate lava flows and chert. Basaltic lithic fragments tend to be as common as andesitic however.

By far the most common geomorphic feature within the area are *headwall basins*. These are steep, amphitheater-shaped areas that typically extend to ridges at the heads of incised tributaries and are formed by prolonged shallow mass wasting as well as rock slide, ravel and sheetwash erosion.

Slopes are generally greater than sixty-five percent and are typically covered by thin coarse regolith and colluvium, with rock outcrops common. These basins usually include *inner gorges* along the dissecting stream(s). Locally headwall basins may also grade into dormant debris slide features which may compose parts of these but represent discrete slope failure areas.

Identified Potential Hazards

The vast majority of this area burned with light to moderate intensity. Areas that burned with high intensity include the area immediately east of Gates Creek in section 14; the headwaters of Miners Creek in section 32; and the area immediately south of Hayfork Bally. Due to the morphology of the area **no mass wasting effects due to the fire is anticipated in these areas.** Increased sheet wash is anticipated and reference is made to the Soil report for an analysis of this issue.

A previously active landslide was identified near Little Creek in section 9 proximate to the Kottmeier Mine.

A high intensity burn area and road is located immediately above this landslide**. Any road drainage must be redirected away from this slope area and the area planted with native conifers.**

Abel Jasso
Geologist
Shasta-Trinity National Forests
8/19/2008

Appendix F: Summary of Soils Findings:

SHF Lime Complex – Burned Area Emergency Response

Soil Resource Assessment

David Young, Soil Scientist, Lime Complex BAER Team
USDA Forest Service, Region 5, Redding CA
530-226-2545; daveyoung@fs.fed.us

August 25, 2008

Miners Fire, Little Creek Drainage

Executive Summary – Soil Resource Condition Assessment:

The SHF Lime Complex burned nearly 65,500 acres from south of Platina in Shasta and Tehama Counties to northwest of Hyampom in Trinity County, with 4 Class G (>5000 ac), 2 Class F (1000-5000 ac), and 2 Class C (10-100 ac) fires. Overall soil burn severity was found to be 39% unburned & very low, 40% low, 19% moderate, and 2% high. The high severity class has evidence of severe soil heating, evidenced by deep char, considerable destruction of structure and organic matter, and moderate to severe water repellency; these areas have long-term soil damage and high to very high erosion hazards. The moderate areas have extensive vegetative mortality, but less soil heating and potential soil cover in most places; these are source areas of sediment and increased flows in the near term (2-4 years). The remaining 79% of soils still have good surface structure, contain intact fine roots and organic matter, and are not significantly impacted from the fires. Vegetation is a mix of chaparral and forested ecotypes, and burn intensity patterns were observed with vegetation/aspect/topography interactions. Most moderate to severely burned slopes occurred on upper slopes and ridges and burnout areas. Most fires have designated roadless areas with critical fisheries habitat values, so land treatments are proposed in specific sediment source areas to protect these values. Treatments are intended to reduce off-site sediment-laden runoff, not for on-site soil productivity concerns directly. Recommendations are made regarding further evaluation needs, particularly for the extensive firebreak networks necessary for suppression operations, as they have long-term soil damage and will be chronic sediment sources.

Appendix G: Summary of Fisheries Findings:

BURNED AREA EMERGENCY RESPONSE
FRONT COUNTRY FIRES
FISHERIES ASSESSMENT

Prepared by: John Lang[1]
22 August 2008

SUMMERY

Fish resource values at risk in the South Fork Trinity River (SFTR) are linked to sediment loads and water temperatures. The at-risk fish species in the SFTR are spring-run Chinook salmon, summer-run steelhead, and coho salmon. These populations declined severely following the flood of 1963 and currently remain significantly below pre-flood levels. The continued high rates of erosion and sedimentation are considered a major contributor to the depressed anadromous fish runs in the river basin. The high sediment loads have been attributed to unstable geology, management activities, and storm activity.

Approximately 80 percent of the affected acres were unburned or suffered only low-to-moderate burn intensity. Only 2 percent of burned acres suffered high intensity burns. These occurred primarily in isolated headwall areas (bowls) and along ridge lines. The BAER team utilized BARC maps to identify high severity burn areas, then considered underlying geology, existing slides, soil properties, and calculated increased run off potential and sediment yields for 2-year and 10-years post fire rain events. High priority areas were identified and screened for treatment suitability, i.e. slopes <60 percent, culvert size and condition, and the cost/benefit ratio to downstream fishery resources.

1 Fishery Biologist. 2005 to present Tongass National Forest, Ketchikan-Misty Fiords RD.
2001-2005 Shasta-Trinity NF. Hayfork RD.

Appendix H: Summary of Cultural Resource Findings:

Heritage Summary for 2500-8: BAER Assessment
Lime Complex, Shasta-Trinity National Forest

Prepared by
Crystal West
North Zone Archeologist
Inyo National Forest
August 21, 2008

Objectives

* Identify all recorded heritage resource sites located within the area of potential effect (APE) of the Lime Complex.
* Analyze direct/indirect effects and potential future effects to heritage resources.
* Propose specific BAER treatments and estimate monetary costs to prohibit future damage to Class I Heritage Resource properties (historic and prehistoric resources determined as eligible to the National Register of Historic Places (NRHP), per criteria in 36 Code of Federal Regulations (CFR) 60.4. Per Forest Service Manual (FSM) 2361 direction, Class II sites (defined as heritage resources with either unknown or not yet evaluated NRHP significance) are afforded the same consideration and protection as Class I sites.

Definition of Heritage Resources

Heritage resources include prehistoric resources, historic resources and Native American resources. Prehistoric sites are the remains from human activities that predate written records and include village sites, temporary camps, lithic (stone tool) scatters, milling features related to subsistence procurement, rock features and burials. Historic sites are dominated by the physical properties or built items that remain from human activities that occurred after written records. In North America this time period is generally considered to be when Europeans made contact with the North American continent in AD 1492. On the Forest approximately AD 1850 is considered the time of Historic Contact when non-Indians from European decent, North and South America, Australia and Asia invaded the area in search of gold. Historic archaeological sites and structures may include town sites, homesteads, agricultural or ranching features, mining-related features, refuse concentrations, cabins, houses, churches, etc. Many areas have been used throughout time in prehistory and historic times and therefore contain both prehistoric and historic remains. These are referred to as multi-component sites.

Area of Potential Effect

In accordance with standards established for heritage resource investigations related to BAER projects in Region 5, California National Forest lands, the APE for the Lime Complex Fire is identified as encompassing: (1) all areas within the perimeter of the burned area; (2) all areas of ground disturbance created by fire suppression; (3) locations with potential for fire-related soil erosion, flooding, debris flows, etc; (4) locations where looting and vandalism will be increased due to increased visibility of sites because of the fire and (5) locations of proposed ground-disturbing watershed rehabilitation-related treatments.

Values Potentially at Risk

- LIME FIRE: 17 HERITAGE RESOURCES

  8 within burn area, 7 near dozer lines and 2 both
- MINERS FIRE: 11 HERITAGE RESOURCES

  3 within burn area, 7 near dozer lines and 1 both
- SLIDE FIRE: 0 HERITAGE RESOURCES

All of these resources were assessed for whether their historic and research value would be at risk from post-fire processes such as erosion or vandalism and need treatment in order to protect that value.

Treatments Needed Under BAER for Identified Values at Risk
Lime and Miners Fires:
Two heritage resources have been identified as values at risk in the Miners and Lime Fire. Both resources are either eligible for listing on the National Register of Historic Places or are potentially eligible for listing. These types of heritage resources are non- renewable resources that hold important historical and research value that contribute to the understanding of our national and cultural heritage. Once these resources have been destroyed the information lost cannot be restored.
One heritage resource on each fire has been identified as a value at risk because it has been damaged by dozer operations during fire suppression and is now at risk from increased soil erosion and looting. It is assumed that both these resources still retain historical integrity despite the damage they have incurred. Both sites are located in areas that are easily accessible and visible by the public due to their proximity to roads and camping areas. Treatment will focus on stabilizing the current site condition and preventing any further damage that may result from increased exposure to the elements and the public.
Recommended treatment for these resources consists of using a four-person hand crew to spread slash piles over exposed areas of the site in order to stabilize the soils and disguise the surface artifacts that have been exposed. Logs should be used to line existing roads in the area to prevent campers, hikers and 4 x 4 road users from causing further damage to exposed areas of the site. Slash piles and logs are available on each site. A location map and sketch map of the proposed treatment area will be been provided to the BAER implementation team, and should be distributed to the work crew prior to implementation.
The condition of these sites should be monitored annually for the next two years to test whether the treatment is effectively protecting the integrity of the site.

Cost of Implementation:

- Proposed Area of Treatment: 2 - ¼ acre sites
- Time needed to complete work: 5 days (2.5 days for each site)

COST BREAKDOWN FOR EACH TREATMENT SITE:

What	**Duration of Time**	**Total Cost**
4-person contract crew @ $35/ hour/ person/eight hour day = **$1120/ day** (cost includes medical, housing and food)	2.5 days	**$ 2800**
Vehicle= **$130/ day** ($50 vehicle cost + $ 80 gas)	2.5 days	**$ 325**
Supplies = $75/ project (loppers, gloves, etc.)		**$ 75**
TOTAL COST / SITE		**$ 3200**
TOTAL COST FOR ENTIRE PROJECT = $3200 x 2 =		**$ 6400**

Appendix I: Summary of Engineering Findings:

LIME COMPLEX FIRES
Burned Area Emergency Response
Engineering Report

Patti Aberg, Eng. Tech. Shasta-Trinity National Forest

Objectives: The purpose of this assessment is to evaluate the effects of the fire on the transportation system within the burned areas of the fires. The emphasis is to protect existing infrastructure, surrounding watersheds, native habitat, and provide safe travel.

Issues: Due to recent fires, anticipated higher amounts of water runoff and debris flow are expected to occur. As a result, culvert failure, increased surface rilling and eroded roadbeds and trails could severely impact associated streams.

Observations:
A). Background information: There is nearly 80 miles of existing system roads and an additional 20 miles of previously decommissioned or unclassified roads. The majority of the system roads have been previously well maintained with adequate drainage systems. The South Fork Mountain road 2N27 should not have an adverse effect on resources providing adequate measures are taken to re-decommission it. Road 2N54 within the Cold Camp Creek could pose a risk due to the high intensity burn. Little Creek in the Miners Fire with the high burn intensity above road 4N08 could exacerbate the problems with two existing culverts. A large 66 inch culvert with crushed outlet and an undersized 18 inch culvert with a plus 20 foot fill are in jeopardy of loss without remedial action. Road 4N08 also has many cross drains, for ditch relief, that threaten increased soil erosion at outlets. Future reconnaissance will be needed to determine correct culvert and stream channel sizing.

Miles of Road by Maintenance Level

OPERATIONAL_MAINTENANCE_LEVEL	Lime	Miners
0 - NOT MAINTAINED	8.5	3.3
1 - BASIC CUSTODIAL CARE (CLOSED)	17.6	8.6
2 - HIGH CLEARANCE VEHICLES	11.1	15.6
3 - SUITABLE FOR PASSENGER CARS	11.2	4.8
4 - MODERATE DEGREE OF USER COMFORT		
(blank)	5.2	2.4
Grand Total	53.6	34.7

Level 0 and (blank) are unknown road types – Decommissioned or Unclassified

B). Reconnaissance Method:
All reconnaissance was completed by vehicle and foot access. Areas of high/moderate burn severity and specific values were the priority for the field survey.

C). Findings/Description of Emergency:
General observations for roads inspected and identified are as follows:

Road 2N54 – Cold Camp Creek

- 30” culvert with risk of plugging from increased runoff and debris flow.
- 36” culvert with high risk of plugging from increased runoff and debris flow.

- Road outslope and dips to be maintained for water sheetflow to prevent concentration of waters.

Road 4N08 – Miners Creek Road

- Existing 66 inch culvert, 20 foot height at centerline, crushed outlet, heavy woody debris at inlet and outlet.
- Undersized 18 inch culvert, 25 foot plus high fill with woody debris.
- Slide at head of Little Creek with 48 inch culvert, has underdrains, rocked critical dip and armored overflow.
- Multiple 18 inch ditch relief culverts with increase erosion potential at outlets.

Treatment recommendations:

A). Management treatments:

Road 2N54 1.1 miles

- Clean inlet and outlets of woody debris.
- Construct rocked critical dip with armored outlet, to accommodate overtopping of culverts and protect embankments.
- Maintain outsloped roadways and construct dips (5 total) to reduce surface rilling and erosion.

Cost of repair - $4900

Road 4N08 4.7 miles

- Repair crushed 66 inch culvert outlet, armor toe of embankment and outfall, and remove wood debris from inlet and outlet. This will consist of mostly hand labor due to inaccessibility of area. Clear inlet of vegetation.

Cost of repair - $4500

- Upsize 18 inch culvert, reduce amount of embankment, construct critical dip with armor outlet. Remove approx. 2000 cubic yards material, install 60" x 120' culvert, replace compacted embankment, and construct rocked critical dip and armor fill slope.

Cost of repair - $40000

- Installation of energy dissipaters at ditch relief culvert outlets with rip rap material.

Cost of repair - $5200

B).Monitoring:

Monitor or storm patrol of roads the first 1-3 years after fire. Monitor large culverts on road 4N08 during storm events until vegetation recovers.

C). National Fire plan proposals, long term project proposals:

Reduce the number of unclassified roads. In the Lime Fire Complex, 20 percent of the roads are unclassified or non-maintained roads. Many of these roads were opened up and used as fire lines or access routes. Establishing guidelines for opening and closing these roads to insure there status is maintained to resolve responsibilities.

Consultations:

Members of the BAER Assessment Team and Lori Jackson, Local Road Manager.

References: Best Management Practices booklet by the USDA Forest Service. (Author unknown at this time)

Appendix J: Summary of Botany Findings:

Lime 2 BAER 2500-8 Summary
Vegetation Summary
Susan Erwin, Botanist

Threats to Ecosystem Stability:

- Unique Serpentine Habitats. Serpentine habitats are environmentally sensitive and recover very slowly from soil excavation or other ground disturbance. The Lime, Miners, and Slide fires all fall within the Rattlesnake Creek Terrane, a unique serpentine geologic formation that is home to a suite of endemic serpentine-adapted plant species found nowhere else in the world. Dozer line construction through these habitats caused soil disturbance that is unlikely to recover adequately without vegetative treatments.

- Noxious/Invasive Weeds: 1. There is a high risk of noxious weed introduction into the three fire areas where dozer line construction created suitable bare soil. 145 miles of dozer lines were constructed throughout the three fires. High priority noxious weeds include yellow starthistle, tansy ragwort, brooms, tree-of-heaven, and diffuse knapweed. 2. There is a restricted infestation of diffuse knapweed on top of South Fork Mountain, on the west edge of the Lime fire. Diffuse knapweed is a California Invasive Plant Council List and California Department of Food and Agriculture List A species, meaning it is of very high ecological concern. The fire didn't burn through the infestation, but dozer line was constructed from the ridgetop down to midslope on the mountain. There is a very urgent need to closely monitor all dozer line within proximity of the current infestation and treat new individuals to prevent spread of the weed.

Appendix K: Summary of Cost-Risk Analysis: (pending)

Appendix L: Reccommendations For Futher Detailed Investigations:

Other Issues That Need Futher Investigations:

- Road fill burn-outs throughout and who fixes them
- Opened decommissioned roads are many and susceptible to downcutting and blowing out
- Burn out issue and resource damage from this practice
- Steep large extensive firelines and resource damage from this practice

Part VI – Emergency Stabilization Treatments and Source of Funds **Interim # 1**

Click red icons for notes.	NFS Lands					Other Lands				All
Line Items	Units	Unit Cost	# of Units	BAER $	Other $	# of Uni	Fed $	# of Unit	Non Fed	Total $
A. Land Treatments										
Helimulching	ac	$1,000	1000	$1,000,000						$1,000,000
Handmulching	ac	$725	42	$30,450						$30,450
Grass seeding	ac	$860	36	$30,960			$0		$0	$30,960
Nx weed treatment	ac	$170	100	$17,000			$0		$0	$17,000
Nx weed detection	mi	$205	44	$9,020			$0		$0	$9,020
Subtotal Land Treatments				$1,087,430	$0		$0		$0	$1,087,430
B. Channel Treatments										
Straw dams	ea	$780	8	$6,240			$0		$0	$6,240
				$0			$0		$0	$0
Subtotal Channel Treatments				$6,240	$0		$0		$0	$6,240
C. Road and Trails										
Road stormproofing	mi	$4,455	1	$4,901			$0		$0	$4,901
Storm Patrol	project	$7,500	1	$7,500						$7,500
Culvert Upsizing	ea	$22,250	2	$44,500			$0		$0	$44,500
Energy dissipaters	project	$5,200	1	$5,200			$0		$0	$5,200
Slide water diversion	ea	$500	2	$1,000			$0		$0	$1,000
Subtotal Road & Trails				$63,101	$0		$0		$0	$63,101
D. Protection/Safety										
Gates	ea	$5,000	6	$30,000			$0		$0	$30,000
Warning signs	ea	$150	6	$900			$0		$0	$30,000
trail crossing armor	ea	$300	4	$1,200			$0		$0	$1,200
Heritage site protect	ea	$3,200	2	$6,400			$0		$0	$6,400
Closure signs	ea	$175	25	$4,375			$0		$0	$4,375
Subtotal Protection				$42,875	$0		$0		$0	$71,975
E. BAER Evaluation										
	---	---	---	---	$38,000	---		---		$38,000
	---	---	---	---	$0	---		---		$0
Subtotal Evaluation				---	$38,000	---	$0	---	$0	$38,000
F. Monitoring										
Hillslope treat. Monito	ea	$2,000	1	$2,000			$0		$0	$2,000
Road Treat. Monitorin	ea	$2,000	1	$2,000						$2,000
Straw/rock dam moni	ea	$2,000	1	$2,000			$0		$0	$2,000
Subtotal Monitoring				$6,000	$0		$0		$0	$6,000
G. Totals				**$1,205,646**	**$38,000**		**$0**		**$0**	**$1,272,746**
Previously approved						Comments:* will do these treatments if no				
Total for this request				**$1,205,646**		staging area is found for helimulching. If				

PART VII - APPROVALS

1. */s/ J. Sharon Heywood* *10 Sep 08*
   Forest Supervisor (signature) Date

2. _____ _____
   Regional Forester (signature) Date