USDA-FOREST SERVICE FS-2500-8 (6/06)

Date of Report: 08/01/17

**BURNED-AREA REPORT**
(Reference FSH 2509.13)

## PART I - TYPE OF REQUEST

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: Lost Fire

B. Fire Number: MVU 017587

C. State: California

D. County: San Diego

E. Region: 05

F. Forest: Cleveland NF, 02

G. District: Palomar RD

H. Fire Incident Job Code: P5K7P5

I. Date Fire Started: July 22, 2017

J. Date Fire Contained: July 26, 2017

K. Suppression Cost: Still determining final costs (negotiating final fire suppression needs).

L. Fire Suppression Damages Repaired with Suppression Funds
1. Fireline waterbarred (miles): minimal to none due to steep terrain.
2. Fireline seeded (miles): NA
3. Other (identify): damage to chip-seal on road surface.

M. Watershed Number: 180703030102—Canada Agunaga-San Luis Rey River

N. Total Acres Burned: 256 acres
NFS Acres(206 acres) Other Federal ( ) State ( ) Private (50 acres)

O. Vegetation Types: Primarily chaparral with groves of coast live oak. Lesser amounts of chamise and lower montaine mixed chaparral.

P. Dominant Soils:

| CNF Lost Fire Burn Area, California | | | |
|---|---|---|---|
| Map Unit Symbol | Map Unit Name | Acres | Percent |
| AcG | Acid igneous rock land | 147 | 57% |
| MvC | Mottsville loamy coarse sand, 2 to 9 percent slopes | 2 | 1% |
| SpG2 | Sheephead rocky fine sandy loam, 30 to 65 percent slopes, eroded | 23 | 9% |
| SvE | Stony land | 13 | 5% |
| ToE2 | Tollhouse rocky coarse sandy loam, 5 to 30 percent slopes, eroded | 31 | 12% |
| ToG | Tollhouse rocky coarse sandy loam, 30 to 65 percent slopes | 40 | 16% |

Q. Geologic Types: Mesozoic granitic rocks and Pre-Cenozoic granitic and metamorphic rocks. Site is located near the Agua Caliente fault zone.

R. Miles of Stream Channels by Order or Class:
0.2 miles of intermittent channel;
0.5 miles of ehemeral channel (main channel through campground)

S. Transportation System
Trails: 0 miles Roads: 1.30 miles within fire perimeter (1.55 miles potentially affected by burn).

## PART III - WATERSHED CONDITION

A. Burn Severity (acres): 128 (low) 115 (moderate) 13 (high)

B. Water-Repellent Soil (acres): 250 acres (all sampled sites within the burn area exhibited strong water repellency at a variable depth of 2mm to 2 cm).

C. Soil Erosion Hazard Rating (acres):
5 (low) 40 (moderate) 65 (high)
146 acres not rated because the land was considered rock land; however, these areas have depositional swales, lenses, and low areas that are holding sediment (previously stabilized by vegetation). Runoff is rapid in the rockland area and there is very little infiltration. It is estimated that the previously stabilized deposits will be eroded in post-fire storms. Erosion risk in these areas (146 acres) is estimated to be moderate to high.

D. Erosion Potential: 82 tons/acre

E. Sediment Potential: 29,036 cubic yards / square mile

## PART IV - HYDROLOGIC DESIGN FACTORS

A. Estimated Vegetative Recovery Period, (years): 3-5 years

B. Design Chance of Success, (percent): 90%

C. Equivalent Design Recurrence Interval, (years): 2 yr.

D. Design Storm Duration, (hours): 24 hour

E. Design Storm Magnitude, (inches): 2.79 inches

F. Design Flow, (cubic feet / second/ square mile): 48 cfs/sqmi

G. Estimated Reduction in Infiltration, (percent): 90%

H. Adjusted Design Flow, (cfs per square mile): 77 cfs/sqmi

## PART V - SUMMARY OF ANALYSIS

A. Describe Critical Values/Resources and Threats:

**Summary of Burn Area:**
The 256 acre fire started from a campground, jumped the main access road in the area, and spread up nearby steep slopes. Much of the burn area encompasses rocky outcrops, boulder fields, and areas with shallow bedrock. The steep, rocky outcrops have evidence of instability such as undercut cliffs, collapsed cliffs, debris flow deposits, and large boulders that have accumulated downslope of the cliffs. There is a depostitional area at the base of the steep cliffs upslope of the road. This will provide some protection to vehicles on the road from rockfall but will not removal all risk of injury.

Shallow bedrock and rocky cliffs have low infiltration rates and rapid runoff. This response is expected to be exacerbated due to the lack of remaining vegetation and strong water repellancy characteristics observed in burned areas. Hydrophobic soil characteristics were observed across the entire fire burned area from a depth ranging from 2mm to 2 cm. Peak flow increase for the 2-year storm in the burned catchment is estimated to increase 180% above normal, acting more closely to a 5 year peak flow (Appendix A). Risks of flooding and debris flows are not not limited to winter and may result from high intensity, short duration monsoonal thundershowers.

Although much of the area has boulders and exposed bedrock or may be identified as "rockland", stream channels and swales have accumulated sediment deposits. The channels are bedrock controlled but have alluvial banks that could be eroded. Thin veneers of soil have developed over the land surface and supported the vegetation that burned. Before the fire, vegetation was stabilizing some of these depositional areas and shallow soils. With removal of vegetation, sediment will be available for transport downstream. Channels now have woody debris (chaparral skeletons) that could be transported as well. Annual erosion rates are predicted to increase as much as 1,100% above normal, delivering approximately 52,265 cubic yards of sediment per square mile (Appendix A). Selected pour points estimate approximately 800-900% increase in sediment delivery.

**Values At Risk:**
The campground is heavily used and is typically open year round. An ephemeral channel that has headwaters within the burn area runs through the middle of the campground (Appendix---Map). Several campsites are located on the floodplain of the ephemeral channel and could be at risk from high flows. Exposed rock cliffs near the campground could attract users into the fire burn area now that vegetation has been removed and the cliffs are easily accessible. Exposed burned cliffs could pose a safety risk (rockfall) to forest users. Additionally, there are groves of oak trees that burned near the campground, which could also be safety hazards to recreational users exploring the burned area.

The access road within the campground has three low-water crossing that cross drainages downstream from the burn area. These and other low-water crossings may be dangerous in the post-fire environment due to increased sediment delivery and runoff in post-fire flows. There is flat terrain upstream of the campground that may help attenuate flows; however, the pre-fire channels have evidence of high sediment bedloads. Vegetation stabilizing sediment in the stream channels has been burned. Bulking of the runoff may cause flooding of these low-lying areas and make the low-water crossing impassable.

The main access road, FS road 9S04, is a level 4 road. The road is chip-sealed, has several culverts that have diversion potential or are undersized, and a large low-water crossing that drains part of the burn area. The large low-water crossing within the burn area on this road is at risk from flooding, sedimentation, and debris

flows. The headwaters of this area are easily eroded, unstable and have an accumulation of sediment not only in the flats below but on the steep slopes.

The FS recently (summer 2017) decommissioned a few non-system routes within the burn area. Some of the slash placed on the decommissioned routes was burned in the fire; however, the decommissioning work does not appear to be at risk from post-fire effects.

Besides safety risks associated with the burned area, foot-travel in the burn area may prevent vegetation from recovering, prolonging post-fire effects. The soils in the burn area are thin, have poor development, and erode easily.

| Values at Risk | Threat | Probability | Magnitude | Determination |
|---|---|---|---|---|
| **Life and Public Safety** | | | | |
| Forest use of Indian Flat Campground (camping and road access in campground | Flooding, sedimentation, erosion. | **Very Likely** | **Moderate** | **Very High Risk.** |
| Forest Use of FS road 9S04 | Debris flow, flooding, sedimentation, erosion. | **Very Likely** | **Major** | **Very High Risk.** |
| Forest use of burn area and around Indian Flat Campground | Debris flow, flooding, rock fall, unstable slopes. | **Very Likely** | **Major** | **Very High Risk.** |
| **Property** | | | | |
| L4 FS Road 9S04 | Debris flow, flooding, sedimentation, erosion, diversion potential. | **Likely** | **Major** | **Very High Risk.** |
| Indian Flat Campground infrastructure | Flooding, sedimentation, erosion. | **Possible** | **Moderate** | **Intermediate Risk.** |
| Decommissioned Routes | Erosion, increased runoff. | **Possible** | **Minor** | **Low Risk** |
| **Natural Resources** | | | | |
| Water Quality | Increase in sediment and ash. | **Very Likely** | **Minor** | **Low Risk** |
| Vegetation Recovery | Trampling by forest users around campground | **Very Likely** | **Minor** | **Low Risk** |

B. Emergency Treatment Objectives:

| Values at Risk | Determination | Recommended Treatment |
|---|---|---|
| **Life and Public Safety** | | |
| Forest use of Indian Flat Campground (camping and road access in campground | **Very High Risk.** | **<u>Close Campground for one year</u>.**<br>• **Official Closure Order.**<br>• **Closure signs.**<br>• **Enforcement patrols.** |
| Forest Use of FS road 9S04 | **Very High Risk.** | **Post signage.**<br>**Storm patrols to maintain road function and prevent flooding of road surface.** |
| Forest use of burn area and around Indian Flat Campground | **Very High Risk.** | **Close to access with Official Closure. Post signage.**<br>**Patrols to enforce closure.** |
| **Property** | | |
| L4 FS Road 9S04 | **Very High Risk.** | **Clean out culverts before and after storm events.**<br>**Storm patrol.**<br>**Patrols to enforce closure.** |
| Indian Flat Campground infrastructure | **Intermediate Risk.** | **No Treatment. Move picnic tables temporarily away from low-lying areas.** |
| Decommissioned Routes | **Low Risk** | **No Treatment** |
| **Natural Resources** | | |
| Water Quality | **Low Risk** | **No Treatment** |

| Values at Risk | Determination | Recommended Treatment |
|---|---|---|
| Vegetation Recovery | **Low Risk** | **No Treatment justified but protection would be accomplished with safety closure.** |

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

Land __ % Channel __ % Roads/Trails **80** % Protection/Safety **90** %

D. Probability of Treatment Success

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

E. Cost of No-Action (Including Loss): **Total Loss: Loss of life. Additional economic loss of $70,000.**
If no action is taken, there is potential for loss of life and major harm to individuals due to rock fall, flooding, and debris flows. The economic loss would also include potential loss of the 9S04 (a level 4 road). Should the road washout at the locations identified at risk of diversion potential, replacing the road would cost at least $40,000 to replace. Plugging of the culverts could result in road loss as well, estimated at approximately $30,000.

F. Cost of Selected Alternative (Including Loss): **Total cost for the treatment $21,100.**
There is still potential loss of life or injury to individuals if the public chooses to enter the burned area or cross the low-water crossing on 9S04 during runoff events. The main road will remain open but signage and the stream gage should help inform the public of potential risks. There is also still some potential for culverts to plug during storm events, especially at sites with undersized culverts.

G. Skills Represented on Burned-Area Survey Team:

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

Team Leader: Emily Fudge, CNF Forest Hydrologist

Email: efudge@fs.fed.us Phone: 858-674-2993 FAX:

H. **Treatment Narrative:**

Land Treatments: NA

Channel Treatments: NA

Roads and Trail Treatments:

**Stormproofing and patrol:** In order to protect infrastructure (FS road 9S04, a level 4 road), patrols will need to clean out culverts following storm events. Culverts are expected to plug due to the substantial increase in sediment delivery from the fire. There are two places on the road that have diversion potential should the culverts plug. Although these culverts have not plugged in the past, they are expected to be at risk in the post-fire environment. It is recommended to install two dips to prevent diversion potential and significant loss of the road.

| 9S04 road treatments | | | |
|---|---|---|---|
| **Item** | **Unit Cost** | **# of Units** | **Total** |
| Diversion Potential dips | $2,500 | 2 dips | $5,000 |
| Storm Patrol | $10,000 | 1 Lump | $10,000 |
| **Total** | | | **$15,000** |

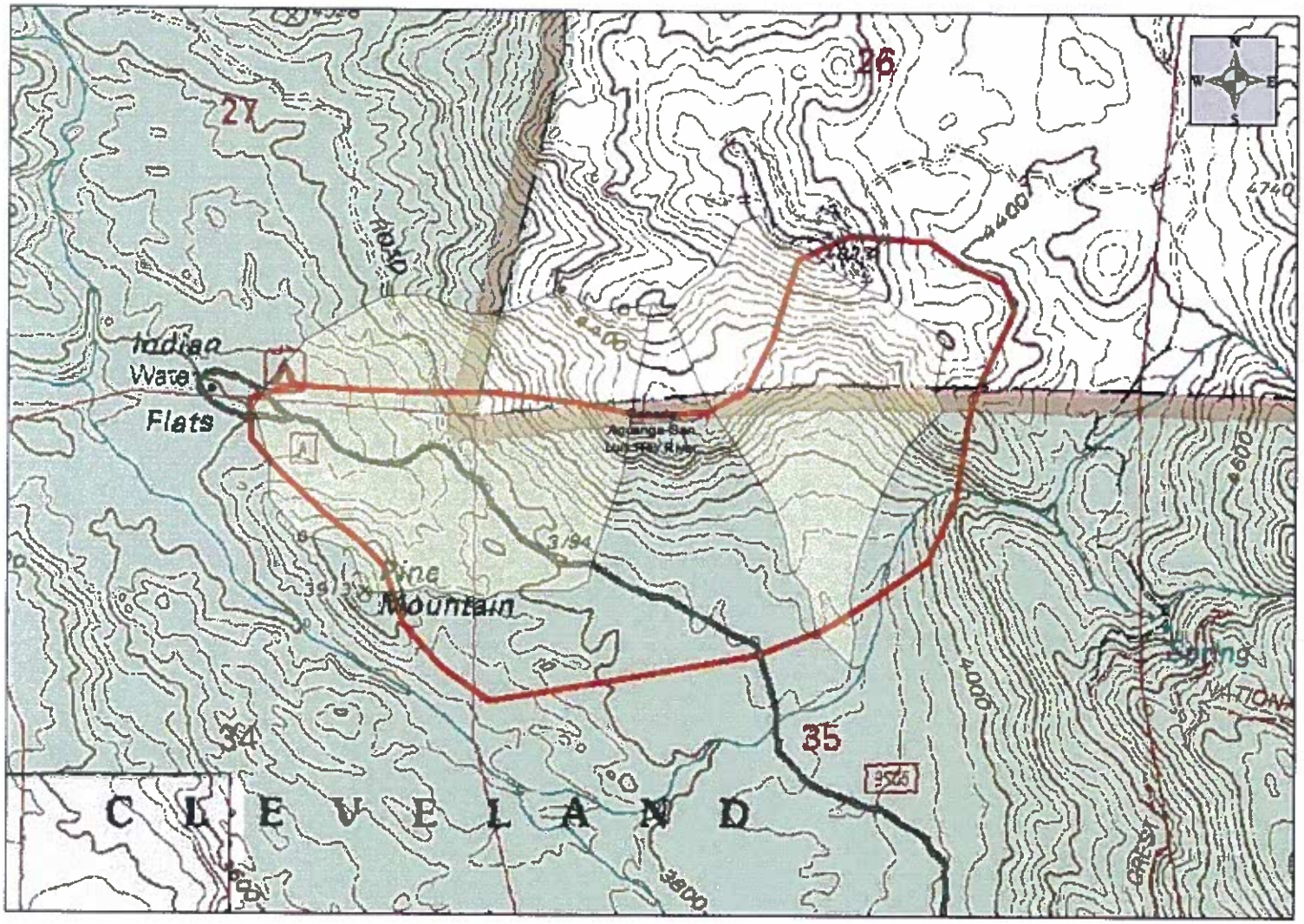
Protection/Safety Treatments:

**Closure Enforcement:** Forest will be closing the fire burned area with a Forest Order for a period of one year, at the end of which the Forest will reassess the post-fire risk to the public. There is an existing gate to close the campground. Enforcement patrols will be necessary to ensure public safety and reinforce the Order. Signs will be placed at the campground entrance and along the road at potential entrance points. Signs will be placed at the fire perimeter to warn Forest users of post-fire risks along 9S04. Additional signage and a stream gage will be installed at the low-water crossing on 9S04 to protect Forest users who may try to cross the low-water crossing during a runoff event. The stream gage will help Forest users determine whether their vehicle should attempt the crossing or not. Forest Hydrologist will assist in the installation of the gage, tracking of implementation of closure, and reassessment of closure order.

| Closure Enforcement | | | |
|---|---|---|---|
| **Item** | **Unit Cost** | **# of Units** | **Total** |
| Prevention Officer (GS-7) | $200 | 10 days | $2,000 |
| Forest Hydrologist | $400 | 3 days | $1,200 |
| Signs (including along 9S04) | $150 | 6 | $900 |
| Staff Gage and installation | $2,000 | 1 | $2,000 |
| **Total** | | | **$4,100** |

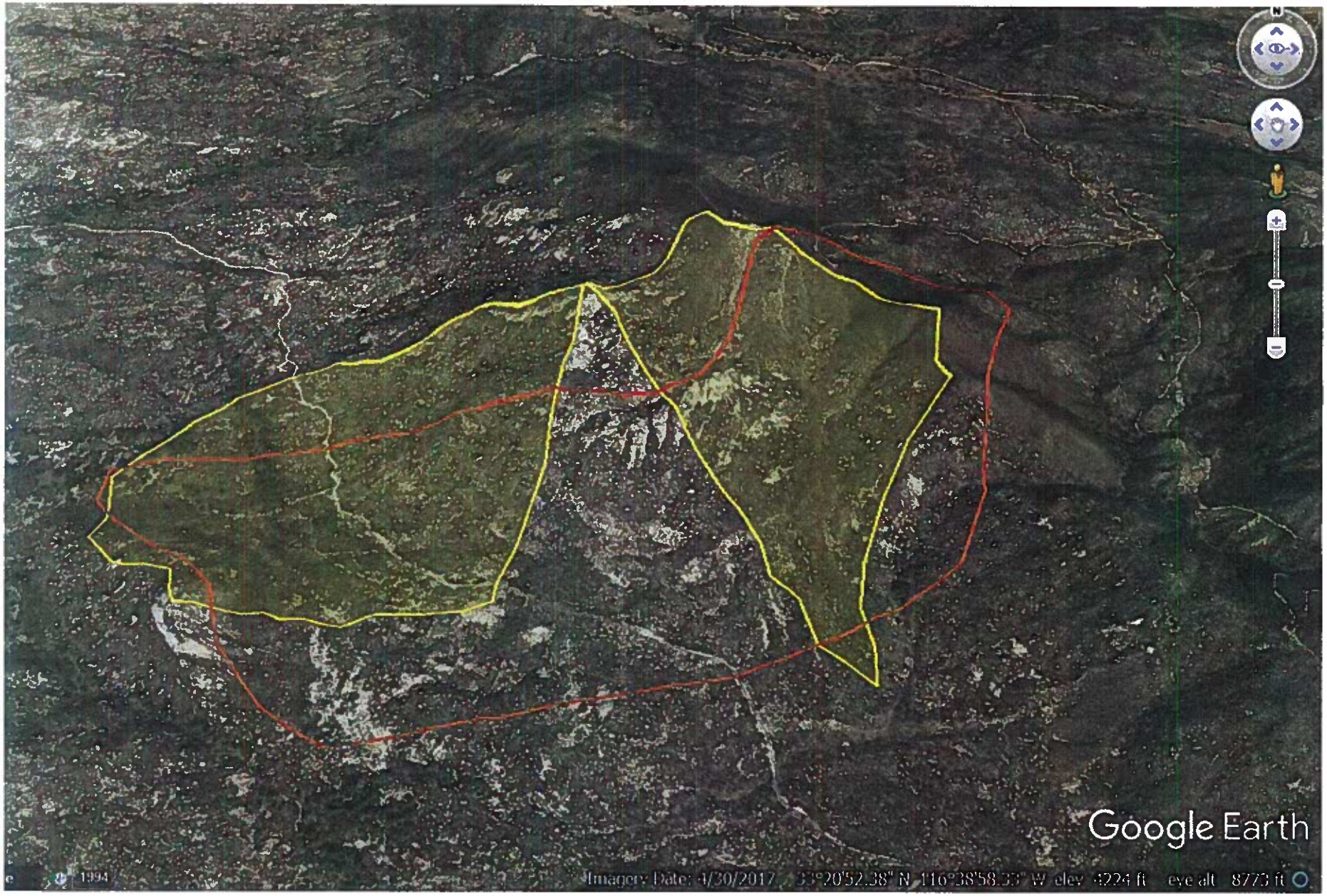
I. **Monitoring Narrative:** N/A

Appendix B. CNF 2017 Lost Fire Burned Area Perimeter Map.




Lost Fire July 22, 2017,
Cleveland National Forest, Palomar RD

**Aerial Photo from Google Maps of pre-fire conditions.**
Yellow Polygons are pour points selected for modeling. Red polygon is fire perimeter.

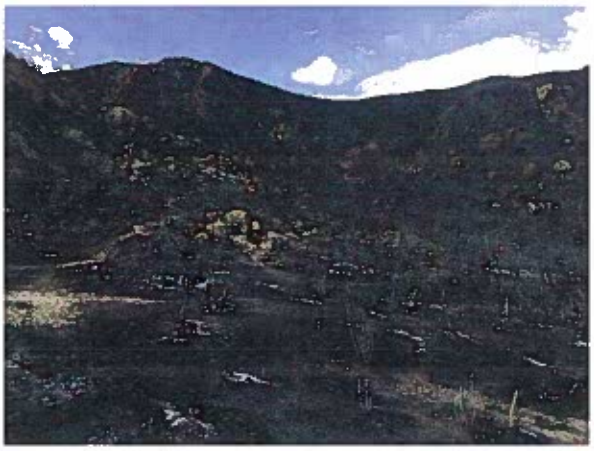


Appendix C. Photos of the Fire Burn Area

# Lost Fire July 22, 2017 Cleveland NF, Palomar RD

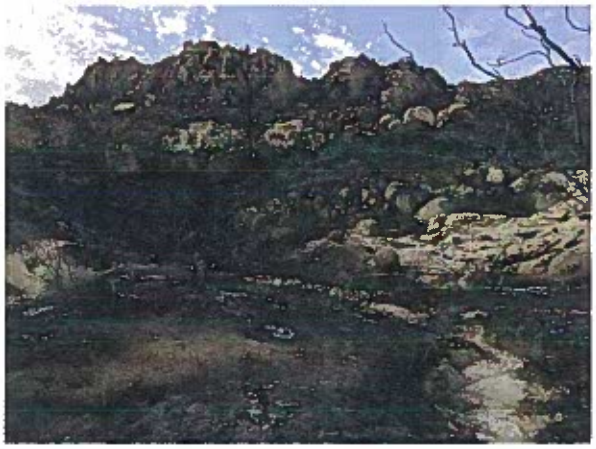
## A. Overview of the Fire burn area and Rock Fall Potential

Caption: Overview of fire burn area. Steep headwaters and rocky outcrops. Vegetation comprised of mixed chaparral and oak woodlands.



Caption: Overview of fire burn area. Steep slopes with alluvial fan below. Evidence of past rock fall. Steepest slopes are comprised of degraded metamorphic rock. Most rocky outcrops are comprised of granitic rock. Geology type has very low infiltration rates and capacity.

Caption: Rock outcrops may pose as safety hazards to Forest users accessing the burned area. Burn area has rock fall potential.



Caption: Unstable slopes have evidence of past failures. There is some distance between rocky slopes and the main road where boulders may accumulate if the slope fails. There is low potential for boulders to fall on the road.

## B. Stream channels within the Fire burn area

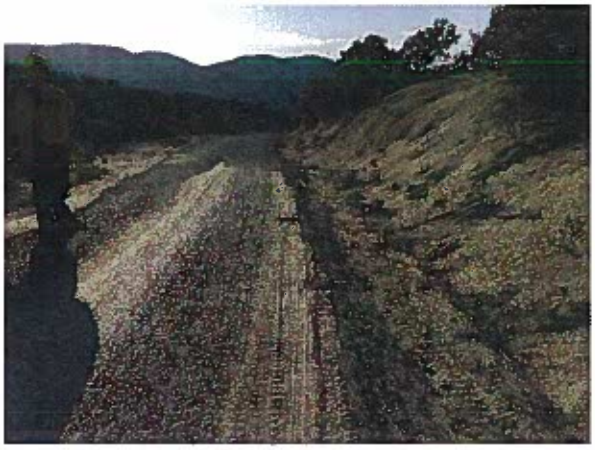
**Caption: Stream channels have accumulated sediment that will be easily mobilized during runoff events now that vegetation has been removed. Burned soils were found to have strong water repellency responses despite low to moderate soil burn severity.**

**Caption: Sediment accumulation in channels. The channels below the steep slopes are low gradient and have accumulated sediment overtime. With the increase in runoff and lack of vegetation, this sediment will be mobilized. Several low water crossings and the campground are located downstream.**

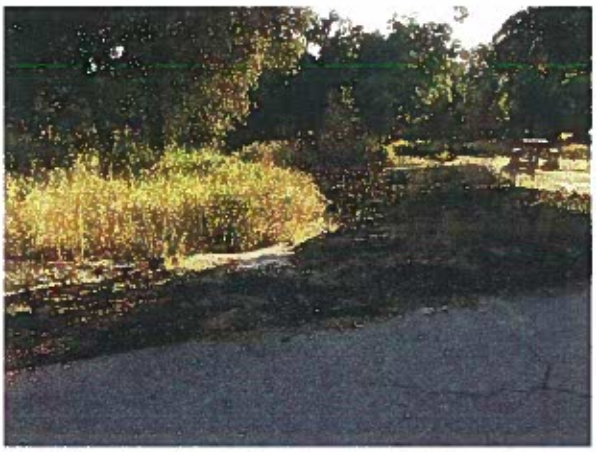
**Caption: Although much of the area is considered "igneous rockland" there are sediment laden channels and thin veneers of soil that will be easily mobilized in the post-fire environment.**

**Caption:**

## C. FS Road 9S04

| | |
|---|---|
|  |  |
| **Caption: FS road 9S04 is a level 4 road and the main access road for this part of the forest. The surface is chip-sealed. Photo depicts an undersized culvert that may be at risk of plugging due to post-fire runoff and erosion.** | **Caption: Diversion potential down road 9S04. Culvert expected to plug due to increased sediment and woody debris from the fire burned area. Installing a dip/drivable waterbar would ensure drainage is not diverted down the road surface.** |
|  | |
| **Caption: Low-water crossing is at risk of debris flow, flooding, and increased sediment delivery. The headwaters to this low-water crossing include the unstable metamorphic bedrock. In the pre-fire environment, this crossing has been impassible in high flows. This crossing could be very dangerous to Forest users during runoff events. To assist drivers in determi where or not to cross, installation of a stream gage is recommended.** | **Caption:** |

## D. Indian Flat Campground downstream of the Fire burn area

| | |
|---|---|
|  |  |
| **Caption: Photo depicts the flat depositional terrain that the campground is located in. This is downstream/slope from the fire burned area. It is expected this site will be susceptible to increased sedimentation and flooding due to post-fire runoff. There are three low-water crossings on the access road to and within the campsite. The crossings may become impassable during runoff events.** | **Caption: Campsite is located on the cutbank of a sharp turn in the channel. This area was identified as a site at risk of flooding and sedimentation.** |
| | |
| | |

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

| | | | NFS Lands | | | Other Lands | | | | All |
|---|---|---|---|---|---|---|---|---|---|---|
| Line Items | Units | Unit Cost | # of Units | BAER $ | Other $ | # of units | Fed $ | # of Units | Non Fed $ | Total $ |
| A. Land Treatments | | | | | | | | | | |
| *Insert new items above this line!* | | | | $0 | $0 | | $0 | | $0 | $0 |
| *Subtotal Land Treatments* | | | | $0 | $0 | | $0 | | $0 | $0 |
| B. Channel Treatments | | | | | | | | | | |
| *Insert new items above this line!* | | | | $0 | $0 | | $0 | | $0 | $0 |
| *Subtotal Channel Treat.* | | | | $0 | $0 | | $0 | | $0 | $0 |
| C. Road and Trails | | | | | | | | | | |
| Storm-proofing | each | $2,500 | 2 | $5,000 | $0 | | $0 | | $0 | $5,000 |
| Storm patrol | season | $10,000 | 1 | $10,000 | $0 | | $0 | | $0 | $10,000 |
| | | | | $0 | $0 | | $0 | | $0 | $0 |
| *Insert new items above this line!* | | | | $0 | $0 | | $0 | | $0 | $0 |
| *Subtotal Road & Trails* | | | | $15,000 | $0 | | $0 | | $0 | $15,000 |
| D. Protection/Safety | | | | | | | | | | |
| Enforcement | day | $200 | 10 | $2,000 | $0 | | $0 | | $0 | $2,000 |
| Staff Gage | each | $2,000 | 1 | $2,000 | $0 | | $0 | | $0 | $2,000 |
| Signs | each | 150 | 6 | $900 | $0 | | $0 | | $0 | $900 |
| FS Staff | day | $400 | 3 | $1,200 | $0 | | $0 | | $0 | $1,200 |
| *Insert new items above this line!* | | | | $0 | $0 | | $0 | | $0 | $0 |
| *Subtotal Structures* | | | | $6,100 | $0 | | $0 | | $0 | $6,100 |
| E. BAER Evaluation | | | | | | | | | | |
| FS Staff | lump | $2,000 | 1 | — | | | $0 | | $0 | $0 |
| *Insert new items above this line!* | | | | — | $0 | | $0 | | $0 | $0 |
| *Subtotal Evaluation* | | | | — | $0 | | $0 | | $0 | $0 |
| F. Monitoring | | | | | | | | | | |
| | | | | $0 | $0 | | $0 | | $0 | $0 |
| *Insert new items above this line!* | | | | $0 | $0 | | $0 | | $0 | $0 |
| *Subtotal Monitoring* | | | | $0 | $0 | | $0 | | $0 | $0 |
| | | | | | | | | | | |
| G. Totals | | | | $21,100 | $0 | | $0 | | $0 | $21,100 |
| Previously approved | | | | | | | | | | |
| Total for this request | | | | $21,100 | | | | | | |

**PART VII - APPROVALS**

1. Forest Supervisor (signature) — Date: 8/1/17

2. Regional Forester (signature) — Date: 8/7/2017

**Appendix** A. Watershed Modeling and Response

*Model Description*

The model designed by Rowe, Countryman, and Storey (RCS), 1949, was used to estimate post-fire increases in peak flows and annual sediment delivery. Kinoshita, Hogue, and Napper, 2014 validated continued use and applicability of this model for Southern California. The model designed by RCS provides data for pre- and post-fire discharges and erosion rates in southern California watersheds. Individual rates for various subwatersheds were developed over long observation periods. The analysis in this report is based on the information in Table 24, Puerta La Cruz Creek (RCS, 1949).

Hydrologic design information for the RCS hydrologic model is based on the 24 hour duration storm, Part 4 of the main report. The 2 year, 24 hour duration storm anticipated for these subwatersheds is 2.79 inches (NOAA, 2017). However, although the RCS model is based on the 24 hour duration storm, the anticipated storm expected to occur within the fire burned area that could produce damaging post-fire effects is a short duration, high intensity storm. Characteristics of this type of storm are:

| Storm Recurrence Interval | 2-yr | 5-yr | 10-yr |
|---|---|---|---|
| Storm Duration | 30 min. | 30 min. | 30 min. |
| Storm Magnitude | 0.49 in | 0.66 in. | 0.80 in. |

*Results*

The increase in peak flows is most applicable during the first year of recovery, as hydrologic response will decrease in subsequent years. The results of the hydrologic analysis find that the catchment is very likely to respond to the 2yr storm with greater runoff and sedimentation than typically seen in a 2 year peak flow (Table below). Estimated post-fire runoff in a 2 year storm could resemble runoff similar to peak flows with recurrence intervals of 5 years (vs. 2 year peak flow). Peak flows in a five year storm is expected to produce runoff similar to a 12 year recurrence interval peak flow and peak flows in a 10 year storm are expected to produce runoff similar to ~30 year recurrence interval peak flow.

| | **Modeled Discharge Estimates** | | | | | | | | | | **Modeled Annual Sediment** | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Modeled Watershed** | **Pre-Fire Q in cfs** | | | **Post-Fire Q in cfs** | | | **Post-fire Q equivalent pre-fire Q** | | | **% increase in Q above normal** | **Pre-fire** | **Post-fire** | **% increase above normal** |
| | Q2 | Q5 | Q12 | Q2 | Q5 | Q12 | Q2 | Q5 | Q12 | Q2 | Yd3/year | Yd3/year | |
| Campground | 10 | 16 | 25 | 16 | 23 | 33 | Q5 | Q12 | Q28 | ~160% | 301 | 2,741 | 801% |
| Slope above 9S04 | 6 | 10 | 16 | 11 | 15 | 22 | Q5 | Q12 | Q35 | ~183% | 190 | 3,636 | 961% |