USDA-FOREST SERVICE FS-2500-8 (7/00)

Date of Report: July 7, 2017

BURNED-AREA REPORT
(Reference FSH 2509.13)

PART I - TYPE OF REQUEST

A. Type of Report

[x] 1. Funding request for estimated WFSU-SULT funds
[ ] 2. Accomplishment Report
[ ] 3. No Treatment Recommendation

B. Type of Action

[x] 1. Initial Request (Best estimate of funds needed to complete eligible rehabilitation 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: Mart Fire

B. Fire Number: CA-BDF-9802

C. State: CA

D. County: San Bernardino

E. Region: 05

F. Forest: San Bernardino NF

G. District: 53 Front Country Ranger District

H. Date Fire Started: June 27, 2017

I. Date Fire Contained: July 3, 2017

J. Suppression Cost: ~$1,000,000

K. Fire Suppression Damages Repaired with Suppression Funds
1. Fireline waterbarred (miles):
2. Fireline seeded (miles):
3. Other (identify): 6 miles of handline and two helispots

L. Watershed Number:

- City Creek (180702030504)
- Santa Ana Wash-Santa Ana River (180702030507)

M. Total Acres Burned: **~670 acres (***690 acre perimeter used for modeling and numbers***)**
NFS Acres (**355 acres**) Other Federal ( ) State ( ) Private (**335 acres**)

N. Vegetation Types: Primarily mixed chaparral, sagebrush, grasses, and small amouts of oak scrub.

O. Dominant Soils:

Soil Type	Key	Acres
CIENEBA-ROCK OUTCROP COMPLEX	Cr	285.6
HANFORD COARSE SANDY LOAM, 9 TO 15 PERCENT SLOPES	HaD	11.7
RAMONA SANDY LOAM, 15 TO 30 PERCENT SLOPES, ERODED	RmE2	4.1
RAMONA SANDY LOAM, 9 TO 15 PERCENT SLOPES	RmD	2.0
Springdale family-Lithic Xerorthents association,dry, 50 to 75 percent slopes	FLG	6.0
Trigo family-Lithic Xerorthents, warm complex, 30 to 50 percent slopes	DnF	166.5
Trigo family-Lithic Xerorthents, warm complex, 50 to 75 percent slopes	DnG	201.6
TUJUNGA GRAVELLY LOAMY SAND, 0 TO 9 PERCENT SLOPES	TvC	16.4

P. Geologic Types:

Geology	Key	Acres
Gneiss of Devils Canyon	MzPrd	358.1
Conglomerate, sandstone, and arkose	Tsg	201.2
Monzogranite of City Creek	Kcc	35.6
Very old alluvial fan deposits	Qvof	46.1
Young alluvial fan deposits	Qylf	19.8
Old landslide deposits	Qols	6.1
Young to Very young landslide deposits	Qyls-Qls	18.3
Very young wash deposits	Qw	8.7

Q. Miles of Stream Channels by Order or Class: 2.6 miles of intermittent stream channel

R. Transportation System: no FS road miles. Unmapped number of roads and trails on private land.

Trails: No FS trail miles Roads: No FS road miles

PART III - WATERSHED CONDITION

A. Burn Severity (acres):

76 (very low to unburned) 377 (low) 237 (moderate)

B. Water-Repellent Soil (acres): ALL burned acres exhibit strong hydrophobic properties at a depth of 2mm to 1 cm, including low soil burn severity areas.

C. Soil Erosion Hazard Rating (acres):

___ (low) ___ (moderate) 670 (high)

D. Erosion Potential: 343 tons/acre (RCS model)

E. Sediment Potential: 121,800 cubic yards / square mile (RCS model)

PART IV - HYDROLOGIC DESIGN FACTORS

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

B. Design Chance of Success, (percent): No treatment

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

D. Design Storm Duration, (hours): 0.5 hour

E. Design Storm Magnitude, (inches): 0.427 inches

F. Design Flow, (cubic feet / second/ square mile): 98 cfs/sq.mi (RCS model, 2yr, 24 hour storm)

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

H. Adjusted Design Flow, (cfs per square mile): No treatment

PART V - SUMMARY OF ANALYSIS

A. Describe Watershed Emergency:

Description of Fire Burned Area:
The burn area has steep, unstable slopes (ranging between 50-80%), and inaccessible cliffs. The area is inherently unstable as exhibited by the geologic map which depicts multiple landslides (both young and old) and high erosion hazard ratings for soil loss. Pre-fire rock fall, slumping, and falling debris potential were high within the canyon.

All stream channels/drainage paths within the catchment are transport systems and very incised. Swales and headwater tributaries are charged with loose alluvium (with very little rock content). Material sliding off the hillside is contributing to the increased sediment load within the channels. The length of the stream channel is lined with riparian hardwoods and denser vegetation. The riparian area had higher soil burn severity than most of the fire, most likely due to the higher accumulation of duff and amount of fuels. However, there is still significant amount of woody debris and standing riparian vegetation to help attenuate flows. The channel banks, floodplain and toes of slopes exhibit instability and have vegetation with exposed roots.

Pre-fire vegetation in the burn area was comprised primarily of chaparral, grasslands, and small brush. Most vegetation is sparse with some clumps of denser chaparral pockets. Most of the headwaters and cliff burned in a mosaic pattern with large areas of unburned, very low, and low soil burn severity (described below). Accumulation of duff and organic matter are minimal in unburned areas. It is common to see bare mineral soil with little to no organic matter at the surface. Flatter areas with thicker pockets of vegetation tend to have some accumulation of duff. Other areas were dominated by thick grasses, which had larger accumulation of organic matter. (See attached document with photos of fire burn area.)

Soil Burn Severity:
Soil burn severity considers surface and below-ground factors that relate to soil hydrologic function, runoff and erosion potential, and vegetative recovery. Soil burn severity is described as the effect of a fire on ground surface characteristics; including char depth, organic matter loss, altered color and structure, and reduced infiltration. It is classified into one of 4 ratings (unburned, low, moderate, and high) using satellite imagery and on-the-ground monitoring to determine post-fire soil burn severity. Soil burn severity can affect vegetative recovery, hydrologic response, and erosion potential. Soil burn severity across the burn ranged primarily between low and moderate with the majority of the area rating as low SBS in a mosaic pattern.

Watershed Response and Erosion Hazard Ratings:
The hydrologic model designed by Rowe, Countryman, and Storey (RCS), 1949 (Table 55), 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.

Hydrologic design information for the RCS hydrologic model is based on the 24 hour duration storm, Table 3. The 2 year, 24 hour duration storm anticipated for these subwatersheds is 3.12 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 (used as the design storm), Table 4, especially given the date of the storm (early summer).

Two pour points were delineated for modeling erosion and hydrologic response. Peak flow increases for the 2-year storm in the burned catchments are estimated to increase 2 to 3 times higher than normal, acting more closely to a 10 to 20 year peak flow. Annual erosion rates are predicted to increase as much as 1,800-2,700% above normal, delivering approximately 28,000 cubic yards of sediment per year in pour point 2 and about 5,600 cubic yards of sediment per year in pour point 1. The trends from these pour points can be extrapolated across the fire burn area. In general, the areas affected by the fire will experience significant increases in sediment delivery and runoff. This supports the field observations of debris flow, landslide, and other mass wasting potential. Given that the stream channels in the area are predominately transport systems, sediment delivery is expected to be very high.

Water repellency was measured as deep as 1.5 cm but averaged around 2-3mm. Unburned soils were tested for hydrophobicity characteristics and no unburned soils were found to be hydrophobic. It is expected that even though much of the area burned at low SBS, the watershed and sediment delivery response will be higher than normal. The model was adjusted based on these characteristics.

Erosion hazard ratings were determined for the area using the method as described in the Forest Service Handbook. Most of the area ranks as high to very high, intensified even more by post-fire effects.

Additional Factors Affecting Post-Fire Runoff:
Most of the terrain is inaccessible but there are old road beds and trails on private land that lead to the FS slopes. Use of these trails and roads is unknown. These roads appear to have been abandoned; however, the hydrologic impact to the watershed continues as many of the roads currently concentrate flow and have large gullies at stream crossings that have eroded much of the road fill. Some of the road crossings have washed out completely. Existing impacts to watershed resources and hydrologic response accelerated by these abandoned roads will be exacerbated by the post-fire environment.

Geologic Response:

A. Mass Wasting

Risk of debris flows has been increased as a result of the fire. Debris flows can mobilize with destructive force 100-1,000,000 cubic yards of rock, sediment, organic material from hillslopes and steep stream channels and have very rapid velocities measured in miles per hour. Although debris flows were not modeled for the fire burned area, on-the-ground observations across the burn indicated that the area could be subject to debris flows, landslides, or other mass wasting events. The geologic map has several mapped old to very young landslides and the erosion hazard ratings are very high. Many tributaries have sediment laden channels that burned with moderate soil burn severity, lack ground cover, and have very little rock content (>3/4 inch diameter). This material is likely to mobilize in a storm event without the vegetation left to stabilize it. The timing of the risk from debris flows is not limited to winter but will extend throughout the first three years until vegetation can re-establish. A monsoonal thunderstorm is common in the fire burn area (high intensity, short duration storm) during summer months. Given the fire occurred in early summer, a summer thunderstorm is very likely to occur and has potential to result in a debris flow.

B. Rock Fall:

The terrain is very steep, averaging over 50 percent slope for most of the fire burned area, with slopes as steep as 75 percent and above. There are areas of cliffy rock outcrops that pose as rock fall threats. Several of the abandoned roads have unstable cutbank slopes. There are rock and boulder piles on the road bed, representative of past cutslope failures. This instability existed before the fire and will increase because of the fire.

Values At Risk, Threat, and Risk Determination

VALUES AT RISK	THREAT	PROBABILITY	MAGNITUDE	DETERMINATION
1. Life and Public Safety				
1a. Public use of Fire burn area on NFS	Debris flow, flooding, erosion, rock fall.	**Possible**	**Major**	**High Risk**
1b. Entry within the burn area on private land	Debris flow, flooding, rock fall	**Very Likely**	**Major**	**Very High Risk**
1c. Community (near Emmerton Ln and Cloverfield Dr)	Debris flow, erosion.	**Possible**	**Major**	**High Risk**
2. Property				
2a. Community (near Emmerton Ln and Cloverfield Dr)	Debris flow, erosion.	**Possible**	**Major**	**High Risk**
2b. Private Roads	Flooding, sedimentation, erosion.	**Likely**	**Moderate**	**High Risk**
3. Heritage Resources				
3a. Historic Marker	Erosion	**Unlikely**	**Minor**	**Very Low Risk**
4. Natural Resources				
4a. Natural Revegetation	Invasive weeds	**Likely**	**Moderate**	**High Risk**
4b. Water Quality	Increase in sediment and ash.	**Very Likely**	**Minor**	**Low Risk**
4c. Water Quality	Impacts from concentration of flow on old, abandonded road beds.	**Very Likely**	**Moderate**	**Very High**

Additional Site Descriptions:
Housing developments are located downslope of the burn area (site of concern are homes off Emmerton Lane and Cloverfield Drive). The channels in the area are very incised and are expected to handle the increased runoff from the fire. However, cutbanks of large channel turns are not armored and slopes could be undercut. One location is very steep (190 percent slope) and could lead to slope failure.

While the channels in the area are deep and incised, large debris flows can be unpredictable. Large accumulations of sediment can fill in channels and redirect runoff. There is some potential for nearby communities to be at risk of debris flows even though the majority of the burn only rated as low and moderate SBS.

There is a large field located north of Arroyo Vista Drive. This is naturally a depositional area where some of the post-fire sediment is likely to accumulate.

B. Emergency Treatment Objectives:

VALUES AT RISK	DETERMINATION	RECOMMENDED TREATMENT
1. Life and Public Safety		
1a. Public use of Fire burn area on NFS	**High Risk.**	**Safety:** • **Post signage of post-fire hazards in the area.** • **Post information on FS social media and public websites.**
1b. Entry within the burn area on private land	**Very High Risk.**	**Public outreach. Interagency coordination. Contact NRCS, County.**
1c. Community (near Emmerton Ln and Cloverfield Dr)	**High Risk.**	**Public outreach. Interagency coordination. Contact NRCS, East Highland Ranch HOA.**

VALUES AT RISK	DETERMINATION	RECOMMENDED TREATMENT
2. Property		
2a. Community (near Emmerton Ln and Cloverfield Dr)	**Very High Risk.**	**Public outreach. Interagency coordination. Contact NRCS, East Highland Ranch HOA.**
2b. Private roads/Property	**Very High Risk.**	**Public outreach. Interagency coordination. Contact NRCS, County.**
3. Heritage Resources		
3a. Historic Marker	**Low risk**	**No Treatment.**
4. Natural Resources		
4a. Natural Revegetation	**High Risk**	**Early Detection and Rapid Response surveys and treatment of invasives**
4b. Water Quality	**Low Risk**	**No Treatment**
4c. Water Quality	**High Risk**	**Public outreach. Interagency coordination. Contact NRCS, Santa Ana Water Board, County Flood.**

C. Probability of Completing Treatment Prior to First Major Damage-Producing Storm:

Land 80% Channel ____% Roads ____% Other____ %

D. Probability of Treatment Success

	Years after Treatment		
	1	3	5
Land	60%	90%	95%
Channel	NA	NA	NA
Roads	NA	NA	NA
Other	NA	NA	NA

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

F. Cost of Selected Alternative (Including Loss): $2,925

G. Skills Represented on Burned-Area Survey Team:

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

Team Leader: Emily C. Fudge

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

H. **Treatment Narrative:**

Land Treatments:

Early Detection, Rapid Response weed detection and treatment is proposed.
Surveys will begin in 2018 during the re-sprouting and flowering periods of non-native invasive plant species. Completion of surveys on handlines, known invasive plant populations, along riparian areas, drop points, and helispots.

Early Detection, Rapid Response Treatment				
Item	**Unit**	**Unit Cost**	**# of Units**	**Cost**
GS-11 Botanist	Days	$475	3	$1,425
Vehicle Mileage	Miles	$0.50	200	$100
			Total Cost	**$1,525**

Public and Agency Notification of Emergencies: Forest will notify the public and nearby neighborhoods via press releases and FS managed social media and websites of the post-fire effects and hazards. FS will coordinate with local agencies through direct contact. This will include notification and coordination with local HOA for neighborhoods, Public Works, NOAA, and NRCS. Intent is to pass on the information gathered in the BAER report to entities that may be affected by the fire and who may need to conduct a more detailed analysis.

Interagency Coordination				
Item	**Unit**	**Unit Cost**	**# of Units**	**Total**
GS-12 Hydrologist	Days	$500	3 days	$1,500
Signage	Lump Sum	$400	1	$400
			Total Cost	**$1,900**

Channel Treatments: NA

Roads and Trail Treatments: NA

Structures: NA

I. **Monitoring Narrative:**

Surveys will begin in 2018 during the re-sprouting and flowering periods of weed species. Completion of surveys will be conducted on handlines, known invasive plant populations, along riparian areas, drop points, and heli-spots.

Part VI – Emergency Rehabilitation Treatments and Source of Funds by Land Ownership

			NFS Lands				Other Lands			All
		Unit	# of	WFSU	Other	# of	Fed	# of	Non Fed	Total
Line Items	Units	Cost	Units	SULT $	$	units	$	Units	$	$
A. Land Treatments										
ED/RR Treatment	Day	508.3	3	$1,525	$0		$0		$0	$1,525
Interagency Coordinati	Day	500	3	$1,500	$0		$0		$0	$1,500
Signs	LS	400	1	$400	$0		$0		$0	$400
Insert new items above this line!				$0	$0		$0		$0	$0
Subtotal Land Treatments				$3,425	$0		$0		$0	$3,425
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										
Insert new items above this line!				$0	$0		$0		$0	$0
Subtotal Road & Trails				$0	$0		$0		$0	$0
D. Structures										
Insert new items above this line!				$0	$0		$0		$0	$0
Subtotal Structures				$0	$0		$0		$0	$0
E. BAER Evaluation										
Assessment	Team	4000	1	$4,000	$0		$0		$0	$4,000
				$0	$0		$0		$0	$0
Insert new items above this line!				$0	$0		$0		$0	$0
Subtotal Evaluation				$4,000	$0		$0		$0	$4,000
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				**$7,425**	**$0**		**$0**		**$0**	**$7,425**

PART VII - APPROVALS

1. /s/ Kay Wiand (for) Jody Noiron — 7/10/17
   Forest Supervisor (signature) — Date

2. _____ _____
   Regional Forester (signature) — Date

San Bernardino National Forest: Mart Fire, 2017