

Horseshoe Fire August 2016



Date of Report:

8/18/2016

BURNED-AREA REPORT
(Reference FSH 2509.13)**PART I - TYPE OF REQUEST****A. Type of Report**

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

B. Type of Action

- ☒ 1. Initial Request (Best estimate of funds needed to complete eligible stabilization measures)
☐ 2. Interim Report # _____
☐ Updating the initial funding request based on more accurate site data or design analysis
☐ Status of accomplishments to date
☐ 3. Final Report (Following completion of work)

PART II - BURNED-AREA DESCRIPTION

- A. Fire Name: Horseshoe B. Fire Number: CA- INF-001415
C. State: CA D. County: Inyo
E. Region: R5 F. Forest: Inyo
G. District: Mt. Whitney H. Fire Incident Job Code: P5CLK6
I. Date Fire Started: 8/010/2016 J. Date Fire Contained: August 17, 2016
K. Suppression Cost: 2.7M
L. Fire Suppression Damages Repaired with Suppression Funds
1. Fireline waterbarred (miles): Approximately 4.5 miles of handline.
2. Fireline seeded (miles):
3. Other (identify):
M. Watershed Number: 180901030405 Lower Cottonwood Creek
N. Total Acres Burned: _____
NFS Acres(342) Other Federal () State () Private (27)
O. Vegetation Types: manazanita, mountain mahogany, Lodgepole pine, Limber Pine, Sage,
P. Dominant Soils: Typic Cryorthents-Rock Outcrop
Q. Geologic Types: Whitney Granodiorite

R. Miles of Stream Channels by Order or Class:

.6 Intermittent: 1 Ephemeral: ..

S. Transportation System

Trails: N/A miles Roads: 9 miles (on edge of fire) (County)

PART III - WATERSHED CONDITION

A. Burn Severity (acres): 7__ V. Low 169 (low) 125 (moderate) 72 (high)

B. Water-Repellent Soil (acres): 197

C. Soil Erosion Hazard Rating (acres):
176 (low) ____ (moderate) 197 ____ (high)

D. Erosion Potential: 2.5 tons/acre 7.2 in high severity burn areas.

ERMIT allows users to predict the probability of a given amount of sediment delivery to the base of a hillslope following variable burns on forest, rangeland, and chaparral conditions in each of five years following wildfire. The ERMIT model can be accessed at <http://forest.moscowfsl.wsu.edu/fswepp/>

ERMIT Model Assumptions and Inputs:

- Slope length was 200 feet for all ERMIT runs
- Soil surface texture was sandy loam
- Soil Rock Content was 35%/Volume
- There is a low (20%) probability the rates of erosion will exceed the amounts shown in the preceding table in the first year following the fire.

Dry ravel was observed in defined drainage "Watershed 1" on the west end of the fire. Dry ravel is common on loosely consolidated soils on steep slopes (>50%) under dry conditions immediately after a fire. It can often produce higher soil loss rates than that created by rainfall events, especially during a low rainfall year. Dry ravel is an ongoing process that increases after a fire because the vegetation that was holding the soil in place on the hillside is removed. Dry ravel in steep in-gorge areas can "super charge" sediment loading in stream channel, greatly increasing the amount of available sediments for transport.

Wind erosion in the Eastern Sierra is a major erosional process. Wind erosion mobilizes ash and fine sediment and deposits them in swalls and drainages. This was observed during the BAER assessment. This material is highly mobile and available for transport during storm events. Dust and ash can affect visibility along the Horseshoe meadow road during high wind events.

Conclusions:

- There is a high probability that rates of soil erosion and sediment delivery to stream channels will be significantly higher in moderate and high soil burn severity areas.
- High intensity, short duration summer thundershowers are storm events of concern. Additionally, longer duration medium intensity storms over the winter months are like to generate erosion and flooding within and downstream from the burned area.
- In addition to fire, existing ground disturbance (roads) influence soil erosion and watershed response

to precipitation events within the burned area.

Soil Burn Severity and ancillary characteristics:

Forested: Burned forested areas were mapped ranged from low to high soil burn severity. Extensive removal of forest floor ground cover occurred in moderate and high soil burn severity areas. Soil heating effects were noticable in high severity areas. Generally, soil heating effects were low in moderate and low burn severity areas most of the area. Observed pine needles under pumice surface in many areas, this is likely do to soil creep burying existing needles and duff. Needle cast is likely to occur in the low and moderate soil burn severity polygons and recovery of slope stability and watershed hydrologic response will be accelerated where this occurs.

Shrub: Most of the shrub vegetation within the burned area was mapped as low to high soil burn severity given that the shrub community is composed of manzanita and mountain mahogany. . Although these areas had areas of bare ground before the fire, removal of ground cover was often high and it is expected that erosion and sediment delivery to stream channels from these slopes will be high. Vegetative recovery is likely to occur through sprouting of shrubs and establishment of grasses and herbaceous vegetation Recovery of watershed hydrologic response depends on many factors and is likely to take at least 3-5 years.

Grass, Bare Ground and Rock Outcrop: Grass, bare ground and rock outcrop areas within the burn were mapped as unburned or low burn severity. Soil heating in these areas was very low and, although minimally affected by the fire, recovery of watershed response is expected to occur rapidly.

E. Sediment Potential: 1,600 cubic yards / square mile

PART IV - HYDROLOGIC DESIGN FACTORS

A. Estimated Vegetative Recovery Period, (years):	<u>3-5</u>
B. Design Chance of Success, (percent):	<u>80</u>
C. Equivalent Design Recurrence Interval, (years):	<u>5</u>
D. Design Storm Duration, (hours):	<u>.5</u>
E. Design Storm Magnitude, (inches):	<u>...54</u>
F. Design Flow, (cubic feet / second/ square mile):	<u>79</u>
G. Estimated Reduction in Infiltration, (percent):	<u>52</u>
H. Adjusted Design Flow, (cfs per square mile):	<u>205 See below for additonal info</u>

PART V - SUMMARY OF ANALYSIS

Introduction:

The Horseshoe Fire started the afternoon of August 10, 2016. The fire burned approximately 373 acres mostly within the Golden Trout Wilderness.

The soil burn severity (SBS) map shows approximately 53% burned at high and moderate soil burn severity. The rest of the fire was either very low, low soil burn severity or unburned. It is very important to understand the difference between *fire intensity* and *burn severity*, and soil burn severity as defined for watershed condition evaluation in Burned Area Emergency Response BAER analyses. Fire intensity or burn severity as defined by fire, fuels, or vegetation specialists may consider such parameters as flame height, rate of spread, fuel loading, thermal potential, canopy consumption, tree mortality, etc. For BAER analyses, mapping is not simply vegetation mortality or above-ground effects of the fire – soil burn severity considers additional surface and below-ground factors that relate to soil hydrologic function, runoff and erosion potential, and vegetative recovery. Areas of high and moderate soil burn severity are present throughout the fire. Areas of high and moderate soil burn severity (especially high) are considered “flood source” areas and can produce accelerated runoff and sedimentation affecting roads, water quality, and downstream infrastructure.

Based on historic precipitation patterns, it can be expected that late season monsoon rains or frontal storms in mid-late September are the first runoff producing events following the Horseshoe Fire. General at the first rains in September there is a drying period until mid-November. The risk of flooding and erosional events will increase as a result of the fire, creating hazardous conditions within and downstream of the burned area. These hazardous conditions may be worsened in the case of a rain-on-snow event, where long-duration rainstorms falling on a shallow snowpack can produce very high peak flows.

The fire was divided into one sub-watershed with a “pourpoint” established at the bottom of burned watersheds, or where values at risk were located. Watershed runoff response is referenced to these points.

Soils/Erosion Response

Soils in the fire area have a sandy and pumiceous non-cohesive surface texture, with various amounts of gravel and cobble. Erosion response is heavily influenced by soil burn severity, hillslope geomorphology, slope, rock outcrop and surface texture. The burn affected soil aggregate stability, canopy cover, ground cover and infiltration rates. Erosion hazard is greatest below rock outcrops, generally located mid-slope above the Horseshoe Road. These soils are susceptible to sheet, rill and gully erosion after the fire due to their low cohesive strength, though this is partially mitigated by the high surface rock content.

Before the fire, the lower elevations of the fire were dominated by manzanita and mountain mahogany. The upper elevation had protective ground cover in the form of litter, duff or ground vegetation. Shrub dominated areas had ground cover mainly within the “dripline” of the shrubs, with bare ground between the shrubs and grasses. In areas of moderate and high burn severity, it is highly likely that increased rates of soil erosion and sediment delivery to stream channels will occur, for two or three years after the fire, particularly on steep slopes that contained shrubs and are slow to recover. Many of the moderate burn severity areas in conifer stands will have large amounts of needle cast though the pine species present do not protect the soil as well as three needled pines such as Jeffrey Pine.

Pre-fire slope stability and recovery of watershed hydrologic response is dependent on many factors and typically occurs within 3-5 years following the fire. Recovery of high burn severity areas is generally slower because little or no ground cover remains, the potential for needle cast is low and soils may be impacted by fire effects.

Watershed Response:

The fire occurred within the Lower Cottonwood_(HUC 12) watersheds. . Sub watersheds in the fire area were delineated and hydrologic modeling conducted during the BAER assessment.

“Watershed 1 is an intermittent channel that drains in the Cottonwood Creek downstream of the fire and eventually into Owens Lake and the Los Angeles Aqueduct.

Hydrologic modeling was conducted for the fire area and all the watersheds modeled have an expected increase in the Q5 discharge compared to pre-fire conditions. In Watershed 1 we expect an increase in Q5 discharge by 58% more than the pre-fire conditions. This is due to the amount of high and moderate soil burn severity in the watershed.

See Table 2 for the results of the hydrologic modeling.

Table 1 displays the amount of burn severity and acres burned throughout the fire area

Watershed	Total Acres	Very Low/Unburned Acres	Low Severity Acres	Moderate Severity Acres	High Severity Acres
Watershed 1	248.23	162.91	42.29	24.33	18.7
All Fire	372.62	6.58	169.10	124.46	72.48

Table 2. Hydrologic modeling for select watershed in the Clark Fire.

Horseshoe Fire BAER

**Design Flow for 5 year storm (South Lahontan/Colorado Desert Region)

			Pre-Fire Peak Flow in cubic feet per second (cfs)				Soil Burn Severity (acres)				In Cubic Feet per Second (cfs)						
Pour Point Analysis Watersheds	Drainage Acres	Drainage Area (mi2)	Q2	Q5	Q10	Q25	Unburned	Low	Moderate	High	Pre fire Q5	Q from unburned	Q from low	Q from moderate	Q from High	Post fireTotal Q5	Change in Q5 Flow
Watershed 1	248.23	0.39	6	37	94	250	162	42	24	19	37	24	6	9	19	59	58%
All Fire	373	0.58	8	46	115	307	7	169	124	72	46	1	21	38	60	119	162%

Water Quality

It is likely that post-fire ash, fine soil, and debris will temporarily degrade water quality in Cottonwood Creek. . Table 1 above shows that there is a 58 % increase in peak flow Watershed 1 at Horseshoe Meadow road as compared to pre-fire conditions. “Watershed 1” flows directly into Cottonwood Creek and is likely degrade water quality during and shortly after storm events and snowmelt runoff. The BAER Team expects this affect to be highly localized and ephemeral in nature. The risk for adverse effects to water quality to Cottonwood Creek are consider **likely but temporary and highly localized.** .

Geology/geologic response:

Rock Fall: Rock fall occurred under pre-fire conditions along Horseshoe meadow road. Rock fall will likely continue at an increased rate for several years following the fire due to loss of groundcover and will increase temporarily during runoff events. The risk for rock fall occurrence as a result of the fire is considered to be **High**.

Debris Flow: Evidence of recent pre-fire debris flows within the burned area were not observed. "Watershed 1" could experience mudflows excavating the stored sediments found in the main channel potentially plugging the culvert crossing on Horseshoe Meadow road. The ephemeral channels and concave areas throughout the fire area are charged with sediment and rocks. An initial assessment indicates with the steep slopes and loss of groundcover, an above normal runoff event will mobilize material in the charged channel and likely result in a mud flow and deposit material on the Horseshoe meadow road potentially going down the road degrading the road bed and restricting access.

The risk for mud flow occurrence in "Watershed 1" as a result of the fire is considered to be **High** two years following the fire and will decrease in year three.

A. Describe Critical Values/Resources and Threats:

The risk matrix below, Exhibit 2 of Interim Directive No.: **2520-2010-1** was used to evaluate the Risk Level for each value identified during Assessment. Only values at risk that had a risk of Intermediate or above are discussed.

Probability of Damage or Loss	Magnitude of Consequences		
	Major	Moderate	Minor
	RISK		
Very Likely	Very High	Very High	Low
Likely	Very High	High	Low
Possible	High	Intermediate	Low
Unlikely	Intermediate	Low	Very Low

Threats to Life/safety and Property

Horseshoe Meadow Road (County): There is approximately .9 miles of the county maintained Horseshoe Meadow road within or directly adjacent to the fire area. Approximately .3 miles of the roads go through moderate severity and .4 miles go through high burn severity. High and moderate burn severity occurred above the roads also. The road is paved and provides access to the Horseshoe Meadows area and trailheads leading to the Golden Trout Wilderness.

The BAER Team met a representative of Inyo County Roads Department in the fire area on August 18th. We showed him areas of concern and discussed maintenance needs for the road. There are approximately 5 culverts or inlets that could get plugged with post-fire debris and flood the road. In addition, rock fall is likely to increase along the road within the burn area.

Emergency Determination:

Imminent hazards to the road system vary from nuisance sediment to sediment and debris overwhelming the road and current drainage structures blocking ingress and egress in the Horseshoe meadow area. In addition, large rocks can fall on the road creating hazardous driving conditions and potential a threat to life.

Probability of Damage or Loss: Likely

Magnitude of consequences: High

Risk Level: Very High

Threats to Natural and Cultural Resources

Big Horn Sheep (*Ovis canadensis sierra*)_ The Horseshoe fire occurred between two SNBS herd units (Mt. Williamson and Mt. Langley). The Horseshoe Fire was partially within SNBS Critical Habitat and almost entirely within Golden Trout Wilderness administered by INF (see table below). Elevation of the Horseshoe Fire ranged between 9,600 feet to 10,400 feet which is within SNBS summer range.

HORSESHOE FIRE				
Total Acres	Inyo NF Acres	Wilderness Acres	Private Property (DWP) Acres	Critical Habitat Acres
372.1	345.4	345.4	26.7	195.3

The entire portion of the Horseshoe Fire within Critical Habitat enhanced and created approximately 195 acres of suitable SNBS habitat. The habitat was of low quality due to extensive vegetation

Emergency Determination:

Probability of damage or loss: Unlikely

Magnitude of Consequences: Minor

Risk Level: Very Low

Ecosystem Stability and Vegetation Recovery

Invasive weeds:

Inventory: Botanical survey data is lacking for the area impacted by the Horseshoe Fire. Two botanical surveys intersect areas that were potentially disturbed by fire suppression activities. A 2006 survey includes the meadow where Drop Point 3 was located. Hand line was dug through a small portion of this survey area. A 2002 survey captured the area used by the spike camp/Drop Point 5. While no surveys capture the hillside and ridge burned in the Horseshoe Fire, an additional 13 surveys have been conducted within 1.5 miles of the fire perimeter and no nonnative invasive plants were recorded during any of these surveys. No noxious weed occurrences are recorded within 3 miles of the fire perimeter.

The fire burned primarily in lodgepole pine, limber pine, mountain mahogany, manzanita, and sagebrush. Small portions of dry meadows may have burned. In general, lower elevation areas and areas with higher fire severity are more vulnerable to invasion by nonnative plants. The majority of the Horseshoe Fire burned above 9400 feet elevation. 72 acres were mapped as high fire severity and 125 acres were mapped as moderate severity.

Horseshoe Meadows Road borders the southern edge of the fire and is the only access from Highway 395 and Owens Valley to the developed recreation sites at Horseshoe Meadow. Due to recreation traffic, this road could serve as a weed corridor for nonnative species. The fire burned almost entirely within the Golden Trout Wilderness and no dozer lines were constructed. Approximately 4.5 miles of hand line roughly one foot in width was constructed and those sections of hand line intersecting, bounding, and leading up the hillside from Horseshoe Meadows road should be surveyed after snow melt and germination next spring. As it is unlikely that equipment used in the fire was cleaned before use, weed species not present prior to fire suppression activities could have been introduced.

Emergency Determination:

Probability of damage or loss: Possible

Magnitude of Consequences: Moderate

Risk Level: Intermediate

Risk Level: High

No TES or sensitive plant species are found in the fire area therefore additional analysis or treatments are not needed.

Cultural Resources:

No threat to cultural resources exists due to the post-fire environment. Potential impacts to cultural resources will be evaluated during project implementation.

B. Emergency Treatment Objectives:

Threats to Life and Property

Protect route infrastructure and human life by minimizing runoff and debris on the Horseshoe Meadow road.

Treats to Critical Natural and Cultural Resources

Threats to Ecosystem Stability

Determine if new invasive species have been introduced due to suppression activities

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

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

D. Probability of Treatment Success

	Years after Treatment		
	1	3	5
Land	90	90	100
Channel			
Roads/Trails			
Protection/Safety	90	95	100

E. Cost of No-Action (Including Loss): 13,200

F. Cost of Selected Alternative (Including Loss): 3,702

G. Skills Represented on Burned-Area Survey Team:

<input checked="" type="checkbox"/> Hydrology	<input checked="" type="checkbox"/> Soils	<input type="checkbox"/> Geology	<input type="checkbox"/> Range	<input type="checkbox"/>
<input type="checkbox"/> Forestry	<input checked="" type="checkbox"/> Wildlife	<input type="checkbox"/> Fire Mgmt.	<input type="checkbox"/> Engineering	<input type="checkbox"/>
<input type="checkbox"/> Contracting	<input type="checkbox"/> Ecology	<input checked="" type="checkbox"/> Botany	<input checked="" type="checkbox"/> Archaeology	<input type="checkbox"/>
<input type="checkbox"/> Fisheries	<input type="checkbox"/> Research	<input type="checkbox"/> Landscape Arch	<input checked="" type="checkbox"/> GIS	

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FAX:

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.)

Land Treatments:

Noxious/invasive weed early detection and rapid response: Survey one mile of Horseshoe Meadows Road, two drop points, three Helispots, the spike camp at Horseshoe Meadow, and approximately two miles of hand line bounding and/or leading up the hill from Horseshoe Meadows Road. Small infestations will be eradicated by hand pulling and disposing of plants in garbage bags taken off site. A Forest-wide Weed EA is currently under development which would allow a broader range of treatment activities, including herbicide methods, likely outside the Wilderness Boundary.

Weed Surveys and Rapid Response Costs				
Item	Unit	Unit Cost	# of Units	Cost
1 GS-11 botanist	Days	\$355	3	\$1065
1 GS-7 weed technician	Days	\$196	3	\$588
Vehicle gas mileage	Miles	\$0.50	480	\$240
Total Cost				\$1,893

Channel Treatments:

N/a

Protection/Safety Treatments:

Fiber Rolls (straw wattles): Place 2 rows of 300 linear feet of fiber rolls in suitable area in high burn severity areas above Horseshoe Meadow road. This treatment will help keep soil in place and minimize the amount of the ash and soil deposited on the road during a storm event and/or snowmelt.

Fiber Rolls				
Item	Unit	Unit Cost	# of Units	Cost
1 GS-9 Hydro. Tech	Days	\$280	2	\$560
Fiber Rolls	Each	\$27.66	24	\$664
Stakes	bundle	\$50	1	\$50
Vehicle gas mileage	Miles	\$0.50	200	\$100
Total Cost				\$1,374

Note: The Forest has a contract crew that is already paid for and can implement this project. The Forest Hydrology Intern, who is already paid for, will assist the crew.

Hazard Signs: Install two hazard signs on either end of the fire on the Horseshoe Meadow road. Signs can read "Caution Entering Burned Watershed."

Caution signs				
Item	Unit	Unit Cost	# of Units	Cost
1 GS-9 Hydro. Tech	Days	\$280	1	\$280
Signs	Each	\$200	2	\$400
Posts	each	\$100	2	\$200
Vehicle gas mileage	Miles	\$0.50	200	\$100
Total Cost				\$980

Note: The County road crew can install the signs at no cost additional cost.

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.)

Forest personnel will conduct a Level 1 Effectiveness monitoring of the fiber Roll treatment to check that treatments are present and functioning properly. The purpose is to ensure the action is meeting site-

specific objectives or if there is a need for follow-up or re-treatment. Monitoring will be conducted after storm events. The report would include photographs and a recommendation on whether additional treatments are necessary. If the monitoring shows the treatment to be ineffective at capturing ash and sediment and minimizing sediment on the road an interim report may be submitted. A several page monitoring report would be completed after the site visit.

Part VI – Emergency Stabilization Treatments and Source of Funds

Interim #

			NFS Lands				Other Lands				All
		Unit	# of		Other		# of	Fed	# of	Non Fed	Total
Line Items	Units	Cost	Units	BAER \$	\$		units	\$	Units	\$	\$
A. Land Treatments											
Weed detection	days	631	3	\$1,893	\$0			\$0		\$0	\$1,893
				\$0	\$0			\$0		\$0	\$0
				\$0	\$0			\$0		\$0	\$0
Insert new items above this line!				\$0	\$0			\$0		\$0	\$0
Subtotal Land Treatments				\$1,893	\$0			\$0		\$0	\$1,893
B. Channel Treatments											
				\$0	\$0			\$0		\$0	\$0
				\$0	\$0			\$0		\$0	\$0
				\$0	\$0			\$0		\$0	\$0
Insert new items above this line!				\$0	\$0			\$0		\$0	\$0
Subtotal Channel Treat.				\$0	\$0			\$0		\$0	\$0
C. Road and Trails											
				\$0	\$0			\$0		\$0	\$0
				\$0	\$0			\$0		\$0	\$0
				\$0	\$0			\$0		\$0	\$0
Insert new items above this line!				\$0	\$0			\$0		\$0	\$0
Subtotal Road & Trails				\$0	\$0			\$0		\$0	\$0
D. Protection/Safety											
fiber rolls	each	57.25	24	\$1,374	\$0			\$0		\$0	\$1,374
Hazard Signs	each	490	2	\$980	\$0			\$0		\$0	\$980
				\$0	\$0			\$0		\$0	\$0
Insert new items above this line!				\$0	\$0			\$0		\$0	\$0
Subtotal Structures				\$2,354	\$0			\$0		\$0	\$2,354
E. BAER Evaluation											
BAER Team	ea	3000	1	\$3,000				\$0		\$0	\$0
BAER implementation	day	400	1	\$400							\$800
Insert new items above this line!				---	\$0			\$0		\$0	\$0
Subtotal Evaluation				\$400	\$0			\$0		\$0	\$800
F. Monitoring											
fiber rolls	day	450	1	\$450	\$0			\$0		\$0	\$450
Insert new items above this line!				\$0	\$0			\$0		\$0	\$0
Subtotal Monitoring				\$450	\$0			\$0		\$0	\$450
G. Totals				\$5,097	\$0			\$0		\$0	\$5,497
Previously approved											
Total for this request				\$5,097							

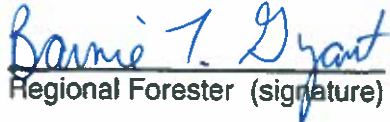
PART VII - APPROVALS

1.


Forest Supervisor (signature)

8/22/16
Date

2.


Regional Forester (signature)

8/29/2016
Date

