Sawmill Fire
September-October 2016

Photo by BAER Team Leader, Brendan Waterman

Date of Report: October 19, 2016

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: Sawmill

B. Fire Number: UT-UWF-000857

C. State: UT

D. County: Utah

E. Region: 04

F. Forest: Uinta-Wasatch-Cache

G. District: Spanish Fork

H. Fire Incident Job Code: P4KJQT0-0419

I. **Date Fire Started:** September 16. 2016

J. Date Fire Contained: 10/12/16

K. Suppression Cost: Estimated at $50,000.

L. **Fire Suppression Damages Repaired with Suppression Funds –** No suppression damages reported.
1. Fireline waterbarred (miles): O
2. Fireline seeded (miles): O
3. Other (identify): None

M. Watershed Numbers and Percentage Burned

5th Field Sub-Watershed	HUC Number	Total Acres	Acres Burned	Percent Burned
Upper Diamond Fork	160202020304	22,967	1,506	7%
Middle Diamond Fork	160202020306	12,890	8	<1%

N. Total Acres Burned:

Land ownership	Acres burned	Percent of burned area
USDA Forest Service (USFS)	1,514	100%

0. Vegetation Types

Forest cover types that are present across the burn area include grasses and forbs, sagebrush, pinyon/juniper, oakbrush, maple, snowberry, mountain mahogany, and aspen.

P. Dominant Soils

Soils in the Sawmill fire burned area have formed from hillslope and fluvial processes weathering fine grained and elastic sandstone bedrock, creating rocky soil profiles with silty textures. Soil thicknesses are generally moderately deep. Almost all soils occur on gentle to moderately steep hillslope positions and are therefore naturally subject to soil particle creep and occasional small-scale slumping. Ninety percent of the burned area has a combined average slope gradient of 43 percent. Almost all soils are enriched in organic material to a depth of more than 18cm (i.e., Mollisol taxonomic order) indicating a geologically persistent cover of herbaceous grasses or shifting grass/shrub mosaic.

This combination of parent material, vegetation habitat, and geomorphology create rocky soils that are moderately well-developed in soil structure and horizonation. They generally have intrinsically low erodibility, offset by episodic, surface erosion events driven by loss of cover from a high frequency fire disturbance regime of the long term vegetation type. About ten percent of the soils are poorly permeable due to clayey geologic materials or poorly drained hillslope positions.

Q. Geologic Types: Geology in the Sawmill fire burned area are dominated by variable sedimentary bedrock of red conglomerate (41%), sandstone/siltstone (21%), and miscellaneous sedimentary inclusions. Alluvial landforms comprise -15% of the burned area, located in the lower reaches. The geology has weathered into soil-mantled, ridge-crested hillslopes grading downslope to an over-steepened V-shaped channel of Sawmill Creek. Few moderately large, deep-seated landslide scars are observable within and adjacent to the Sawmill burned area, coincident with abrupt changes in sedimentary bedrock lithology. These bedrock weakness play a role in landform development over very long timeframes and are unlikely to be affected by near-surface changes in soil condition from fire.

R. Miles of Stream Channels by Order or Class:

0.31 miles perennial, 5.57 miles intermittent

S. Transportation System

Trails: 0.0 miles Roads: 0.0 miles (NFS)

PART III - WATERSHED CONDITION

A. Soil Burn Severity for the Whole Burned Area (acres):

Severity	Acres Burned	Percent
High	0	0%
Moderate	392	26%
Low	1102	73%
Unburned	21	1%

B. Water Repellent Soils and Increased Runoff: Hydrophobicity (i.e., water repellency) is a natural condition of these soils and was enhanced by the Sawmill fire. The enhanced repellency will dissipate with wetting-drying cycles and physical disruptions of the soil surface from freeze-thaw, soil creep, and revegetation processes. Direct field observations confirmed the presence of a slightly enhanced laterally discontinuous hydrophobic layer very near (within 1.5 cm) of the mineral soil surface in moderate soil burn severity patches. A relatively non-erosive wetting rain preceded field observations, and soil wetting was observed up to 1Ocm into the soil profile. This wetted condition will prime the dissipation of the hydrophobic layer going into winter provided no erosion events occur before the soil becomes armored with snow.

C. Soil Erosion Hazard Rating:

Erosion Hazard Rating	Acres
Low	1
Moderate	1169
High	345

D. Erosion Potential

ERMiT (RMRS) was used to predict postfire hillslope erosion using gridded climate information at the burned area location (PRISM), range vegetation type (80% shrub, 20% grass) and silt loam soils with 40% rock content. Based on topography and direct field observations, hillslope lengths and gradients were sampled from channelized hillslopes in lower portions of the burned area. These areas cover approximately 20% of the burned area, and the most likely trigger locations for erosion events that contribute sediment to downslope stream channels.

Erosion rates were modelled under all three soil burn severity classes to illustrate a range of potential effects.

ERMiT model inputs and predicted erosion in Sawmill Fire hillslope burned areas. For each set of model inputs, there is a 20% chance of exceedin the redicted sediment ield in the first ear followin fire

Soil Burn Severity	Hillslope Length (ft}	Hi lslope gradient (ridge / midslope / toe)	Erosion (T/ac) thro1mh year 1
Mod	400	20 I 60 I 15	5.2
Low			4.3

E. Sediment Potential: Channel sedimentation depends on hillslope erosion rates. Most instances of hillslope erosion will not arrive at downslope channels, while the few that do tend to contribute disproportionate amounts of sediment relative to the watershed footprint. The Sawmill fire created a mosaic pattern of mostly moderate soil burn severity. Watershed geometry dictates that the mass of material delivered to channels from a debris flow type event decreases exponentially with distance from the channel. Accordingly, conservative estimates of channel sedimentation could be placed at thirty percent of maximum hillslope erosion rates. As such, sediment potential for Sawmill should be falls the range of 735 – 1180 yd3*sq.mi.-1 (1.3 – 2.1 T * ac-1).

PART IV - HYDROLOGIC DESIGN FACTORS

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

B. Design Chance of Success, (percent): 80%

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

D. Design Storm Duration, (hours): 1

E. Design Storm Magnitude, (inches): 0.94

F. Design Flow, (cubic feet / second/ square mile): 10

G. Estimated Reduction in Infiltration, (percent): 3%

H. Adjusted Design Flow, (cfs per square mile): 42

Pre and post-fire peak flow predictions from Wildcat Rainfall-Runoff Hydrograph Model

Drainage	Unburned/ Low	Moderate	High	Total	Pre-fire Qp (cfs)	Post Fire Qp (cfs)
North Trib	309	161	0	470	9.5	31.8
South Trib	421	83	0	504	5.8	31.1

PART V - SUMMARY OF ANALYSIS

Introduction/Background:

The lightning caused Sawmill Fire was first detected on September 16, 2016. A modified suppression strategy was taken due to the lack of values at risk, potential for resource benefit, and forecasted precipitation. The vast majority (73%) of the burn was low severity. Fire growth was contained through the use of existing roads, trails, terrain features, and a recent burn scar (2012 Red Ledges Fire). The BAER assessment began on September 24, 2016. The primary concern of the BAER team is downstream sedimentation and potential impacts to stream crossing structures in the Diamond Fork Road (70029). The Diamond Fork road is highly utlilized, paved, maintenance level 4 road. Thunderstorm induced hillslope erosion off of the adjacent Red Ledges Fire has periodically impacted this road.

A. Describe Critical Values/Resources and Threats:

The risk matrix below, Exhibit 2 of Interim Directive No.: 2520-2015-1 was *used to evaluate the Risk Level for each value identified during* Assessment. *Only critical values that had* a *risk of Intermediate or above are discussed in this report.*

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

1) Property: Potential threats to stream crossing structures on NFSR 70029, Diamond Fork Road, below the burn scar exist due to the threat of increased watershed response from short duration, high intensity precipitation events. The primary concerns are the reduced capacity of a concrete box culvert at milepost 11.66 and the potential for wingwall/embankment erosion and debris jams at the newly constructed Hawthorne Bridge at milepost 14.15.

   High Risk (Possible probability; Major consequence) to Forest Service owned stream crossing structures on the Diamond Fork Road.

B. Emergency Treatment Objectives:

1. Road Treatments

   Culvert treatment would involve removal of accumulated sediment and debris at the box culvert inlet to restore capacity for anticipated post-fire runoff and sedimentation. Bridge treatment would involve storm patrolling to ensure that debris jams are not accumulating and the newly constructed, un-vegetated embankment is not eroding due to increased post-fire watershed response after high-runoff producing rainfall events.

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

Land N/A % Channel N/A % Roads/Trails 80 % Protection/Safety N/A %

D. Probability of Treatment Success

	Years after Treatment		
	1	*3*	5
Land	N/A	N/A	N/A
Channel	N/A	N/A	N/A
Roads/Trails	80	80	80
Protection/Safety	N/A	N/A	N/A

E. Cost of No-Action (Including Loss): $200,000 – assumes bridge wingwall and embankment reconstruction cost of $80,000 and box culvert reconstruction cost of $120,000.

F. Cost of Selected Alternative (Including Loss): $44,900 – assumes $4,900 for proposed BAER treatments and 80% chance of success for bridge storm patrol and culvert cleaning treatments.

G. Skills Represented on Burned Area Survey Team:

[x] Hydrology	[x] Soils	[ ] Geology	[ ] Range	[ ] Liaison
[ ] Forestry	[ ] Wildlife	[ ] PIO	[x] Engineering	[ ] Trails/Recreation
[ ] Contracting	[ ] Ecology	[x] Botany	[x] Archaeology	[ ] NOAA/NWS
[ ] Fisheries	[ ] Research	[ ] Landscape Arch	[ ] GIS	

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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.)

Road Treatments

Concrete Box Culvert Cleaning - Prior to seasonal road closure and within the first year following the fire, it is recommended to remove sediment and debris at inlet and within the concrete box culvert restoring the structures original flow capacity and freeboard. This will protect the structure and road from accelerated post fire flows and soil erosion.

Hawthorne Bridge Storm Patrolling - Prior to seasonal road closure and within the first year following the fire, it is recommended to monitor the Sawmill Hollow drainage for sediment and debris flows. This will allow adequate time to remove debris and protect the structure and road from accelerated post fire flows and soil erosion.

Item	Unit	Unit Cost	# of Units	Cost
Box Culvert Cleaning (Equipment, mobilization/demobilization , operator, laborers)	Days	$1,750	2	$3,500
Bridge Storm Patrol (Engineer and Vehicle)	Days	$350	4	$1,400
		Total Road Treatments		**$4,900**

Sawmill Fire BAER - Initial Request and Approval

			NFS Lands				
		Unit	# of	Request	Not Approved		Approved
Line Items	**Units**	**Cost**	**Units**	**BAER $**	$		$
A. Land Treatments							
None Proposed							
Subtotal Land Treatments				**$0**			**$0**
B. Channel Treatments							
None Proposed							
Subtotal Channel Treat.				**$0**			**$0**
C. Road and Trails							
Box Culvert Cleaning	Days	$1,750	2	$3,500			
GS-11 EnQineer Storm Patrol	Days	$350	4	$1,400			
Subtotal Roads and Trails				**$4,900**			**$0**
D. Protection and Safety Treatments							
None Proposed							
Subtotal Protection and Safety				**$0**			**$0**
E. Implementation Support							
None Proposed							
Subtotal Support				**$0**			**$0**
F. BAER Evaluation							
Assessment	Team	$7,011.00	1	---			
Subtotal Evaluation				---			
G. Monitoring							
None Proposed				$0			$0
Subtotal Monitoring				**$0**			**$0**
H. Totals				**$4,900**			**$4,900**

1./s/Chad E. Hudson for DAVID

WHITTEKIEND

. Forest Supervisor (signature)

10/20/2016
Date

2. /s/ Mary Farnsworth (for)
Regional Forester (signature)

10/24/16
Date

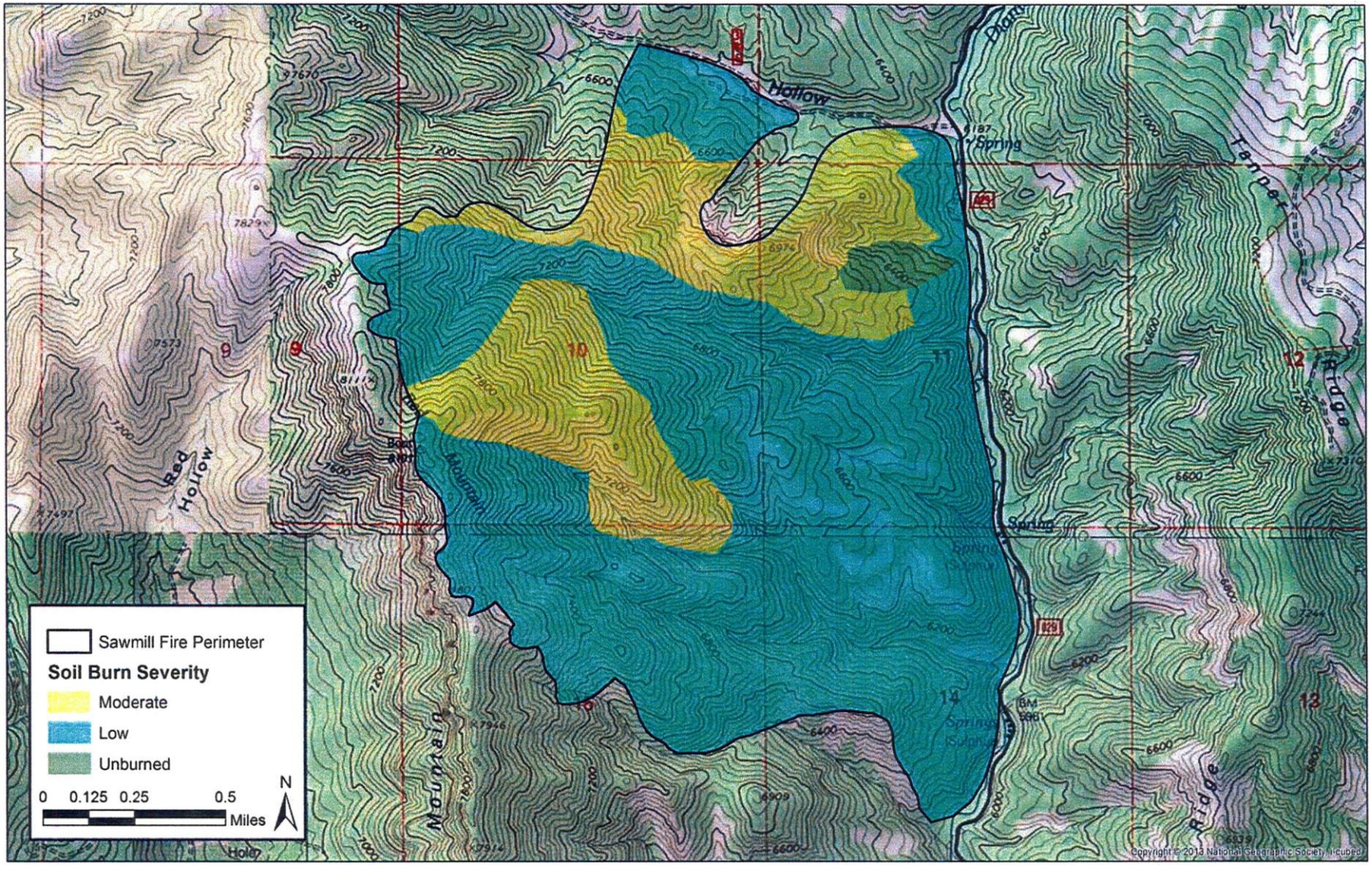

Figure 1: Soil Burn Severity Map.