Fly Canyon Fire
September 2016

Photo by BAER Team Leader Brendan Waterman

Date of Report: October11, 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: Fly Canyon

B. Fire Number: UT-MLF-6344

C. State: UT

D. County: Emery and Sanpete

E. Region: 04

F. Forest: Manti-La Sal

G. District: Ferron-Price

H. Fire Incident Job Code: P4KP4M16 (0410)

I. Date Fire Started: September 8, 2016

J. Date Fire Contained: 60% Contained as of 9/30/16

K. Suppression Cost: Est. $1,480,000 as of 09/30/2016). Suppression costs likely to extend in to October, 2016.

L. Fire Suppression Damages Repaired with Suppression Funds

1. Dozerline Rehabed: 1.5 miles

M. Watershed Numbers and Percentage Burned

6th Field Sub-watershed	HUC Number	Total Acres	Acres Burned	Percent Burned
Lowry Water	140600090203	43,910	2,152	4.9%
Indian Creek	140600090202	9,971	26	0.3%

N. Total Acres Burned:

Land ownership	Acres burned	Percent of burned area
USDA Forest Service (USFS)	2,178	100%

O. Vegetation Types
Forest cover types that are present across the burn area are spruce, fir, mixed conifer, aspen, mountain brush, snowberry, rabbit brush, and sagebrush.

P. Dominant Soils
Soils in the burned area have formed from glacial processes weathering moderately fine-grained non-marine sedimentary layers. The burned area occurs across two prevailing postglacial landtypes - upland hillslopes (~2/3 burned area) and a broad depositional valley floor (~1/3 burned area). Postfire impacts on soil resources can be understood in terms of these two distinct landtypes.

Soil thickness ranges from moderately shallow to deep, and subsoils tend to increase in clay and rock content to the depth of fractured bedrock. Silty textures dominate most soil profiles lending to moderately slow permeability due to weak intrinsic aggregation. Soils in upper watershed positions are influenced by silty loess. Hillslope soils have a moderate erosion hazard rating based on slope gradients centering around 30-65% and readily eroded silty textures. Valley floor soils formed on a ground moraine of glacial fines, creating a very poorly drained topographic pattern of hummocks and small kettle pools (mapped wetlands in the forest layer). They are moister with high rock content and low hydraulic conductivity throughout.

Q. Geologic Types: The burned area lies entirely within the North Horn Frm., a non-marine sedimentary group with extensive outcrops exposed in central and eastern Utah. The formation is comprised of eight units characterized by abrupt changes in stratigraphic textures reflecting distinct alluvial, fluvial, and lacustrine depositional environments. Based on a pronounced outcrop crossing the burned area, the Fly Canyon fire occurred on a moderately fine grained, pale siltstone. Geomorphically the area comprises a postglacial graben landscape, with a broad valley flanked by moderately steep rounded bowls draining intermittent and perennial streams. Forest geophysical maps and field observations indicate an active landscape experiencing episodic localized shallow hillslope slumping, stream headcutting and incision. These disturbance process are natural, and are more likely to occur in a postfire state.

R. Miles of Stream Channels by Order or Class:

3.9 miles perennial, 1.7 miles intermittent

S. Transportation System

Trails: 0.5 miles Roads: 1.4 miles (NFS)

PART III - WATERSHED CONDITION

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

Severity	Acres Burned	Percent
High	193	9%
Moderate	999	46%
Low	745	34%
Unburned	239	11%

Soil Burn Severity for Modeled Drainage in Peak Flow Analysis

Modeled drainage	Unburned acres (%)	Low acres (%)	Moderate acres (%)	High acres (%)
Fly Canyon	161 (21%)	211 (28%)	324 (43%)	60 (8%)

B. Water Repellent Soils and Increased Runoff: Hydrophobicity (i.e., water repellency) is a natural

condition of these soils and was enhanced by the Fly Canyon 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 cm) 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 10cm 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. These conifer-dominated hydrophobic soils generally return to prefire reference levels within 6 months to 3 years following thermal alteration.

C. Soil Erosion Hazard Rating:

Erosion Hazard Rating	Acres
Low	581
Moderate	1596
High	0

D. Erosion Potential

ERMiT (RMRS) was used to predict postfire hillslope erosion using gridded climate information at the burned area location (PRISM), forested vegetation type, and silt loam soils with 20% rock content. Representative hillslope length and slopes were selected based on a 10m DEM. Erosion rates were modelled under all three soil burn severity classes to illustrate a range of potential effects.

Modelled postfire erosion estimates are lower than a reasonably expected erosion response at Fly Canyon. High intensity summer monsoon storms are characteristic of the regional climate, and are the primary agents of local erosion and regional landscape dynamics. It may be the ErMIT model incompletely accounts for the flash nature of these rain events. Regardless, modelled values likely underestimate potential erosion rates.

Soil Burn Severity	Hillslope Length (ft)	Hillslope gradient (ridge / midslope / toe)	Erosion (T/ac) through year 1
High	1000	20 / 40 / 30	11.6
		10 / 50 / 35	7.6
Mod	1000	20 / 40 / 30	8.6
		10 / 50 / 35	3.6
Low	1000	20 / 40 / 30	5.6
		10 / 50 / 35	1.9

ErMIT model inputs and predicted erosion in Fly Canyon hillslope burned areas. For each set of model inputs, there is a 20% chance of exceeding the predicted sediment yield in the first year following fire

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 Fly Canyon fire created a mosaic pattern of moderate soil burn severity. Watershed geometry dictates that the likelihood of channels receiving hillslope erosion events 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 Fly Canyon should be in the range of 616 – 1473 yd3*sq.mi.-1 (1.08 – 2.58 T * ac-1).

PART IV - HYDROLOGIC DESIGN FACTORS

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

B. Design Chance of Success, (percent): 60%

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

D. Design Storm Duration, (hours): 1

E. Design Storm Magnitude, (inches): 1.05

F. Design Flow, (cubic feet / second/ square mile): 26

G. Estimated Reduction in Infiltration, (percent): 13.5%

H. Adjusted Design Flow, (cfs per square mile): 144

A peak flow analysis was conducted for the Fly Canyon drainage. This drainage was selected due to presence of a potential values at risk within the drainage (Lowry Water road crossing). A pourpoint was established at the mouth of the drainage, just above the confluence with Lowry Water creek. Watershed runoff response is referenced to this point.

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

Modeled Drainage	Percent USFS land	10-year, 1-hour event	
		Pre-fire estimated discharge (cfs)	Post-fire estimated discharge (cfs)
Fly Canyon	100%	31	170

PART V - SUMMARY OF ANALYSIS

Introduction/Background:

The lightning caused Fly Canyon Fire started on September 8, 2016. As of September 30, the fire had burned approximately 2,178 acres and was 60% contained. Soil burn severity occurred in a mosaic fashion and was largely dependent upon vegetation type and slope. High intensity thunderstorms with a precipitation rates of approximately 1" per hour are the primary concern for drainage structures on the Lowry Water road below Fly Canyon. Rapid expansion of musk thistle populations in the Sheep Flat area, south of Potters Pond is also of concern.

A. Describe Critical Values/Resources and Threats:

The BAER team began assessing the area for post-fire emergencies on September 28, 2016. The team has identified the following values at risk and post-fire threats. Interim reports may be submitted as additional assessments are completed and/or the need to repair or maintain BAER treatments emerges.

*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.*

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) **Human Life and Safety:** There is a potential threat to Forest visitors and agency personnel traveling along the Lowry Water Road (0038) due to the presence of fire damaged trees.

   Intermediate Risk (Unlikely probability; Major consequence) that forest visitors and agency personnel could be hit by falling hazard trees when traveling on the Lowry Water Road (0038) within the burned area. Warning sign treatments have already been implemented.

2) **Property:** Potential threats to NFS roads within the burn scar exist along the Lowry Water Road (0038). The existing crossing structure at the Fly Canyon creek consists of two undersized culverts that are partially plugged.

   High Risk (Possible probability; Major consequence) that the crossing could be impacted by flash flooding and/ or debris flows during a high intensity precipitation event in the Fly Canyon drainage. If such an event were to occur, the increased watershed response from the post-fire condition is expected to result in plugging of the culverts, stream channel diversion, and fill material loss along the road prism. Treatments are recommended.

3) **Property:** Rocky Mountain Power has a transmission line that crosses the northern part of the burned area near Potters Pond. Potential threats include destabilization of the tower footings due to hillslope erosion.

   Low Risk (Unlikely probability; Moderate consequnce) that the tower footings become destabilized. All towers withtin the burned area were found to be on low gradient slopes. Treatments are not recommended.

4) **Natural Resources:** Soil productivity and hydrologic function is at risk in hillslope portions of the burned area. The primary postfire risk is thinning or compete loss of the soil mantle due to enhanced erosion, resulting in short term decreases in forest productivity and potential channel sedimentation resulting in damage or loss of a culvert on Lowery road. A culvert failure at that position would also eliminate motorized access to a hardened bridge further up road. Postfire seeding has already taken place, and will reduce the potential risk to downstream values. However, the possibility of such an event remains reasonable, and if it occurs would have Major consequences to property and watershed productivity.

   High Risk (Possible probability; Major consequence). Emergency treatments are not being requested at this time. The local unit has already aerially seeded the burn to minimize post fire erosion.

5) **Natural Resources:** Potential threats to native or naturalized communities on NFS lands where invasive species or noxious weeds are absent or present in only minor amounts exist on NFS lands within the burn perimeter.

   Noxious weeds, primarily musk thistle (Carduus nutans), are known to occur in sparsely-populated pockets in and around the Potter's Pond area. During the field survey on September 29, musk thistle was also found in an unburned pocket of Fly Canyon, thus indicating that musk thistle is also present in

small amounts in these areas.

High Risk (Likely probability; Moderate consequence) Emergency treatment funds for noxious and invasive weeds are being requested due to the high risk of invasion into uninfested burned areas adjacent to known populations.

6) **Natural Resources:** Potential threats to water quality in Lowry Water and Joe's Valley reservoir were present before the BAER assessment began. These threats included increased sedimentation, water quality degradation, and impacts to downstream beneficial uses. Prior to the BAER assessment suppression crews aerially applied approximately 1500 lbs of stabilizing seed to the burned hillslopes within the Fly Canyon fire.

   Low Risk (Unlikely probability; Moderate consequence) that water quality downslope will be impacted as a result of hillslope erosion within the Fly Canyon fire burned area. Additional treatments are not recommended.

7) **Cultural and Heritage Resources:** Three NRHP eligible sites were identified during the BAER assessment. Potential threats to these sites include loss due to post-fire erosion and deposition and looting due to loss of pre-existing ground cover.

   Low Risk (Unlikely probability; Moderate consequence). Treatments are not recommended.

B. Emergency Treatment Objectives:

1. **Roads**
   - Increase capacity of Fly Canyon crossing structure to accommodate increased post fire runoff and debris during storm events.
   - Minimize or prevent impacts on soil and water resources resulting from increased post fire runoff should the existing structure become plugged and wash out resulting in loss of fill.
   - Minimize risk for potential impacts to the life and safety of road users

2. **Ecological integrity -** Reduce the potential for impaired vegetative recovery and introduction/spread of invasive weeds by conducting detection surveys and rapid response eradication efforts where feasible.

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

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

D. Probability of Treatment Success

	Years after Treatment		
	1	*3*	*5*
Land	80	80	80
Channel	N/A	N/A	N/A
Roads/Trails	75	95	95
Protection/Safety	N/A	N/A	N/A

E. Cost of No-Action (Including Loss): $64,914

F. Cost of Selected Alternative (Including Loss): $53,914

G. Skills Represented on Burned Area Survey Team:

[x] Hydrology	[x] Soils	[ ] Geology	[x] Range	[ ] Liaison
[ ] Forestry	[x] Wildlife	[ ] PIO	[x] Engineering	[x] Trails/Recreation
[ ] Contracting	[x] Ecology	[ ] Botany	[x] Archaeology	
[ ] 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.)

1) Land Treatments

Noxious Weed Detection and Eradication Treatments

Detection and eradication treatments will occur:

- Where disturbances from suppression efforts such as bulldozer lines and staging areas created openings for noxious weeds to establish and/or spread and impede or prevent recovery of desirable vegetation
- Burned and/or disturbed areas adjacent to or downstream of existing weed infestations. Currently there are weed infestations out of the burn area that are known and/or have been historically treated throughout the area since 2009

Item	Unit	Unit Cost	# Units	Total
2 Person Crew	Days	$236.00	60	$ 14,160.00
Vehicle Rental	Month	$1,300.00	3	$ 3,900.00
Truck Mounted Sprayer	Each	$1,800.00	1	$ 1,800.00
Backpack Sprayer	Each	$110.00	2	$ 220.00
Milestone Herbicide	Gallon	$756.00	5	$ 3,780.00
Weedmaster Herbicide	Gallon	$52	15	$ 780.00
				$ 24,640.00

2) Roads Treatments

Culvert Replacement: The existing culvert structure on the Lowry Water road that crosses Fly Canyon creek is currently a double pipe structure that is partially plugged. The local unit has expressed a strong desire to keep this road open as it provides a highly valued recreational opportunity as well as livestock grazing permittee access. Bridges are in place both to the north (Lowry Water) and south (Black Canyon) of this crossing. Hydrologic modeling of the Fly Canyon drainage suggests that an upslope thunderstorm will result in a greatly increased stream discharge at this crossing structure. In order to accommodate this increased discharge and associated debris it is recommended that the existing pipes be replaced with a single 60" pipe. This treatment is expected to mitigate the existing threat to the structure, adjacent road prism, and downstream water quality and habitat.

Treatment Item	Estimated Quantity	Unit	Unit Price	Cost
60" squashed culvert x 25'	1	Each	$ 2,562.50	$ 2,562.50
Truck and Trailer for culvert transport	100	Miles	$ 1.28	$ 128.00
Service Truck	300	Miles	$ 0.60	$ 180.00
Excavator Transport Truck	100	Miles	$ 1.48	$ 148.00
Excavator	30	Hours	$ 24.20	$ 726.00
Excavator Operator	4	Days	$ 276.63	$ 1,106.52
Laborers	8	Days	$ 153.34	$ 1,226.72
		Total Culvert Replacement Cost		**$ 6,077.74**

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

Summary of Treatment/Repsonse Action Costs

Treatment Type	Funding Request
Noxious Weed Early Detection and Rapid Response	$24,640
Culvert Upsizing	$6,078
TOTAL COST	**$30,718**

Fly Canyon BAER – Initial Request and Approval

Line Items	Units	Unit Cost	# of Units	Request BAER $	Not Approved $	Approved $
A. Land Treatments						
2 Person Crew	Days	$236	60	$14,160		
Vehicle Rental	Month	$1,300	3	$3,900		
Truck Mounted Sprayer	Each	$1,800	1	$1,800		
Backpack Sprayer	Each	$110	2	$220		
Milestone Herbicide	Gallon	$756	5	$3,780		
Weedmaster Herbicide	Gallon	$52	15	$780		
Subtotal Land Treatments				**$24,640**		**$0**
B. Channel Treatments						
None Proposed						
Subtotal Channel Treat.				**$0**		**$0**
C. Road and Trails						
60” squashed culvert x 25’	Each	$2,563	1	$2,562.50		
Truck and Trailer for culvert transport	Miles	$1	100	$128.00		
Service Truck	Miles	$1	300	$180.00		
Excavator Transport Truck	Miles	$1	100	$148.00		
Excavator	Hours	$24	30	$726.00		
Excavator Operator	Days	$277	4	$1,106.52		**$0**
Laborers	Days	$153	8	$1,226.72		
Subtotal Roads and Trails				**$6,078**		**$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	$5,900	1	---		
Subtotal Evaluation				---		
G. Monitoring						
None Proposed				$0		$0
Subtotal Monitoring				**$0**		**$0**
H. Totals				**$30,718**		**$30,718**

/s/ Brian M. Pentecost

BRIAN PENTECOST
Forest Supervisor 10/14/2016

1. _____ _____
Forest Supervisor (signature) Date

2. */s/ Mary Farnsworth (for)Nora B. Rasure* *10/19/2016*
Regional Forester (signature) Date

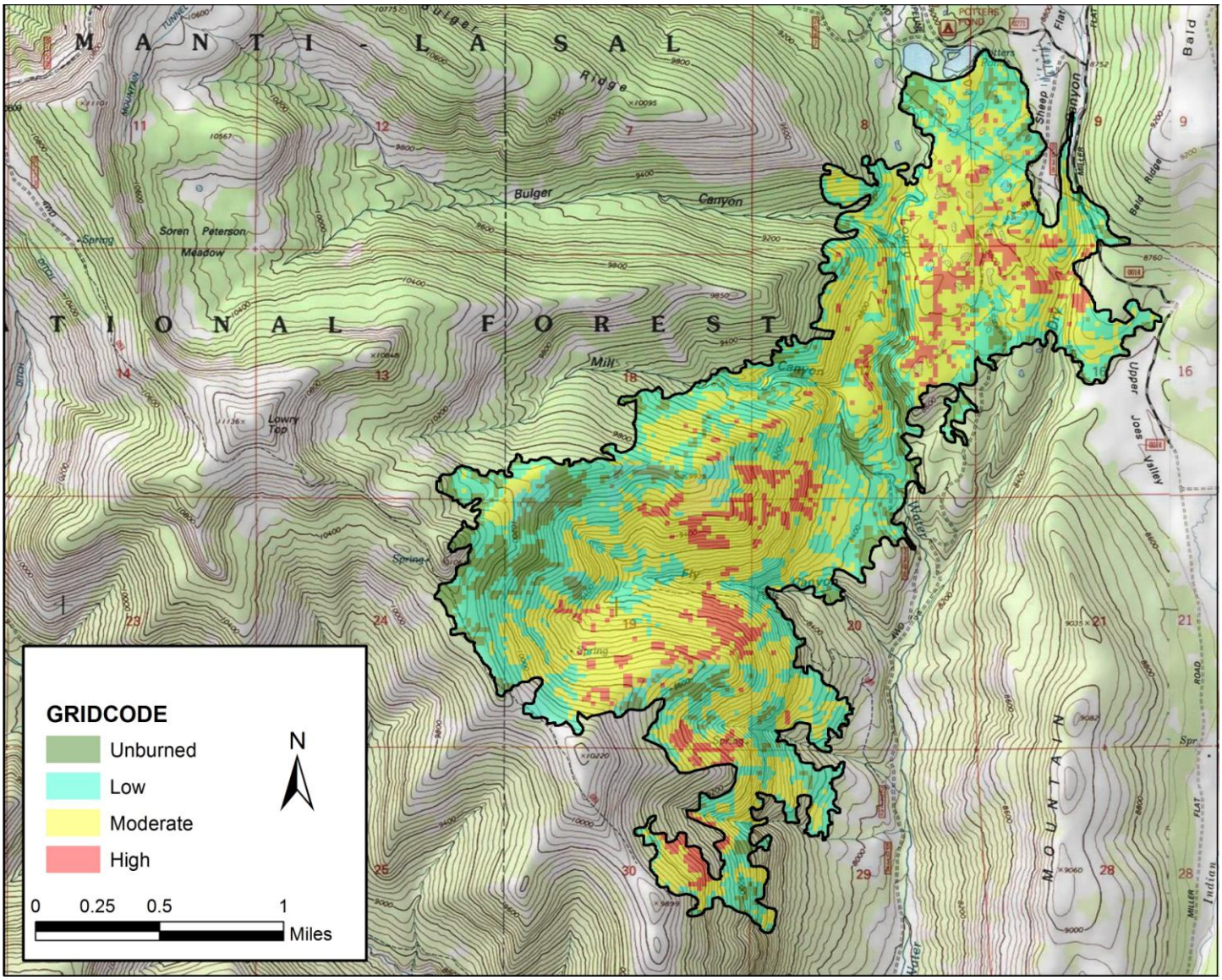

Figure 1: Soil Burn Severity Map.