Date of Report: 09/11/2008

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: Corner Canyon Fire

B. Fire Number: P4EH3X

C. State: UT

D. County: Salt Lake

E. Region: Intermountain

F. Forest: Uinta-Wasatch-Cache National Forest

G. District: Salt Lake Ranger District

H. Fire Incident Job Code: UT-UIF-000645

I. Date Fire Started: August 25, 2008

J. Date Fire Contained: 08/29/2008

K. Suppression Cost: $975,000

L. Fire Suppression Damages Repaired with Suppression Funds
1. Fireline waterbarred (miles): 3.5
2. Fireline seeded (miles):
3. Other (identify):

M. Watershed Number: 160202040107 (Dry Ck – Jordan River)

N. Total Acres Burned: **808**
NFS Acres(**750**) Other Federal ( ) State ( ) Private (**58**)

O. Vegetation Types: Conifer, oak brush, sagebrush

P. Dominant Soils: Van Wagoner gravelly sandy loam,, extremely sandy loam 40-70% slopes, rapid permeability; Sandy Terrace Escarpment deep, well drained sandy lake sediment; All soils in area have runoff medium, water erosion high.

Q. Geologic Types: Hillside composed of residuum and colluvium from granite rocks, and bottom of slope are lake bed sediments

R. Miles of Stream Channels by Order or Class: perennial channel order 1 is 0.2 miles; ephemeral channel, order 1 is 0.9 miles.

S. Transportation System

Trails: 1.9 miles (1 mile FS land) (Bonneville Shoreline Trail)
Roads: 1.75 miles (.6 miles FS land) (Salt Lake Aqueduct Road)
2.1 miles (.5 miles FS land) (Upper Canyon Road)

PART III - WATERSHED CONDITION

A. Burn Severity (acres): 114 (low) 554 (moderate) 140 (high)

B. Water-Repellent Soil (acres): Less than 1 %

C. Soil Erosion Hazard Rating (acres):
8 (low) 100 (moderate) 700 (high)

D. Erosion Potential: 1.5 – 8.5 tons/acre

E. Sediment Potential: .2 – 2.2 tons/acre

PART IV - HYDROLOGIC DESIGN FACTORS

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

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

C. Equivalent Design Recurrence Interval, (years): 25

D. Design Storm Duration, (hours): 1

E. Design Storm Magnitude, (inches): 1.0

F. Design Flow, (cubic feet / second/ square mile): 0.0

G. Estimated Reduction in Infiltration, (percent): N/A

H. Adjusted Design Flow, (cfs per square mile): 24.1

PART V - SUMMARY OF ANALYSIS

A. Describe Critical Values/Resources and Threats: The Corner Canyon Fire burned portions of 5 intermittent drainages, and a similar number of ephemeral draws. The burned portions of the intermittent drainages ranges from 100 to 150 acres. High intensity fire occurrence in each of these drainages ranges from 20% to 40% of the area burned. Water repellent soil occurrence is very low to non-existent in all the burned areas. Storm event modeling in the largest of the intermittent drainages (Cherry Creek) indicates that runoff potential from a 35 year return period event has increased substantially over pre-fire conditions. WEPP modeling for this same watershed indicates that similar

storms would produce between 300 and 850 tons of soil erosion from the high intensity burn areas, and yield between 21 and 225 tons of sediment to the stream channel on an average annual basis (Flood. 2008.). Because larger storm events would produce a peak discharge volume of approximately 12 CFS, some channel and bank scouring would occur and add significant amounts of debris to the sediment being delivered from the burned slopes. Based upon similar observed slope and post-fire watershed conditions in all of the watersheds affected by the fire, erosion rates, sediment yields, and storm discharges from a similar storm event are expected to occur in amounts proportional to the watershed size.

Every one of the intermittent and ephemeral drainages burned by the fire have residential home development on the alluvial fan area that occurs at the intersection of the drainage with the valley floor. Estimates of homes affected by post fire storm events range from about 20 homes impacted by a small storm event mudflow, to about 4 times that number by a large storm event debris flow. With the exception of Cherry Canyon, none of the drainages affected by the fire have any sort of flood control basins constructed between the fire and the homes at risk of flooding. The Cherry Canyon flood control structures are probably sufficient to accommodate a small storm event mudflow, but are inadequately sized to prevent the risk to life and property that would result from a large event debris flow. Sandbagging has been installed around most of the homes immediately at risk from small storm event mudflows, and a USFS weather station has been installed to provide an early warning capability to local emergency services in the event of rain occurrence with the potential to produce flooding. This station would be removed, and/or replaced by Draper City with one of their own. These measures will not be sufficient to prevent the risk to life and property that would result from a large event debris flow. In addition to the large number of homes at risk from post fire flooding, the Bonneville bench area below the fire contains an 84 inch diameter water aqueduct that supplies approximately 20% of the culinary water to about 750,000 residents of the Salt Lake Valley. This aqueduct crosses each of the previously mentioned drainages affected by the fire. The discharge from each of the five intermittent drainages is passed under the aqueduct through an assortment of undersized box and pipe culverts. The box culvert structures are probably sufficient to accommodate a small storm event mudflow, but are inadequately sized to prevent the risk of damage or breaching to the aqueduct that would result from a large event debris flow. Because the aqueduct flow can only be shut off at the diversion point (at Deer Creek Reservoir), a complete breach of the aqueduct would instantaneously deliver a very large volume of water to the drainage and the residential areas below it.

In addition to the Salt Lake City Aqueduct and road, one other system road (Upper Canyon Road) and one other trail (Bonneville Shoreline Trail) are within the burned area. As with the Aqueduct road, existing road drainage culverts and trail drainage waterbars are not adequate to handle the anticipated increase in runoff from post fire rain events.

Previous experience with wildfire in the Farmington City area of Davis County, Utah, has shown that the highest potential for large storm event debris flow occurrence is during the spring snowmelt period following the wildfire, and when soils are near or at saturation. The very sandy nature of the soils in the Corner Canyon Fire area allows for much greater infiltration of rainfall than was the case in the Farmington wildfires, however with sufficient precipitation amounts mudflows or debris flows are likely to occur from the burned areas of this fire at any time during snow free periods (Giraud. 2008.).

Currently, mapped invasive plant infestations within the fire area consist of the following:
2 infestations of Linaria dalmatica/ Dalmation toadflax ; one at 4 acres infested spread across 102 acres of land and one at 34 acres infested, and 1 infestation of Isatis tinctoria/Dyers woad - small infestations but spread out over a large expanse of land. Toadflax is likely to be top killed by fire, however its deep, extensive root system is likely to survive even severe fire and allow re-establishment of the population from vegetative buds on roots. Many root-sprouting plants, including toadflax, have high fire survival rates, regardless of burn severity. This is because even the most severe fires typically damage roots only to 4 inches (10 cm) below the soil, and toadflax roots typically penetrate the soil to a depth of several feet. Experience with and observation of the infestation increase on the 2003/2007 Farmington Fires of the Salt Lake RD indicate that Isatis tinctoria will also take tremendous advantage of burned area in both expanse and density.

B. Emergency Treatment Objectives: The main objective for USFS lands is for safety and protection of homeowners below the steep hillsides, and the integrity of the Salt Lake City Aqueduct. It is recommended that an early warning device be installed that would contact local dispatch if a rainfall event is likely to cause a debris flood or flow. This would only be left in place for a short while until Draper City could replace this with their own warning device/system. Secondary objectives include the protection of road and trail infrastructure, and preventing the spread of existing infestations of invasive weed species.

Surface treatments that are recommended are wood straw mulching in combination with seeding that would be effective in providing the minimum amount of ground cover necessary to control soil erosion and help the establishment of vegetation. Hydraulic mulching using stabilized or bonded wood fibers is not recommended because of the uncertain longevity of the materials under a heavy snowpack. Polyacrylamide (PAM) hydraulic mulching is not recommended because extremely sandy soils are not receptive to this treatment. In-channel sediment detention structures are recommended because of existing opportunities to provide small amounts of sediment storage in the lower portions of several small drainages located above and in close proximity to homes between Bear Canyon and Cherry Canyon that are at particular risk. Gully stabilization on the ridge above the East Bench Trailhead area is also recommended because of mudflows originating in the gullies have already occurred as a result of the most recent post fire storm event. The mudflows deposited on a bench immediately above residential areas, future rain events now have a greater potential of reaching these residential areas with either mud or debris flows.

Weed Treatments are recommended to control the predicted rapid spread of existing infestations.

Road and Trail Treatments are recommended to reduce the threat of damage to the Salt Lake City aqueduct from culvert failures that might occur from future debris flow/mudflow events. These treatments will also have the objective of protecting the substantial investment in the road and trail prisms themselves.

On private lands the following treatments are suggested (especially during spring when soils in the drainage may be saturated and the likelihood of flood flows is greater):

- Sand bagging around basement window wells and other entrances.
- Deflection structures installed upslope of and around homes to divert flood water around property.
- Review flood control publications such as “Homeowner’s Guide for Flood, Debirs and Erosion Control” produced by the Los Angeles County Department of Public Works and can be found at the following website: http://ladpw.org/wmd/HomeOwners/.
- Install mudfow catchment basins on the east bench area, between gully complex areas south of Cherry Canyon and above the Carolina Hills subdivision.
- Install flood control structure(s) on the alluvial fan of Cherry Canyon, in the vicinity of the easternmost subdivision, to provide more effective protection against mud and debris flows.
- Install debris trapping racks above all culvert inlet sections on the Upper Canyon and Aqueduct Roads.
- To protect the surface of the Upper Canyon Road and the Salt Lake City Aqueduct and Road, clean out all culverts, and install debris racks and/or inlet standpipes as needed to prevent the clogging of culverts with debris from rain storm debris. Draper City should coordinate this work with Salt Lake City Metro Water.
- Patrol the Upper Canyon and Aqueduct Roads during and after significant rain events to maintain drainage structures, clean out sediment and debris from storage structures, and assure culverts remian open and free flowing.

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

Land **75** % Channel **100** % Roads/Trails **100** % Protection/Safety **100** %

D. Probability of Treatment Success

	Years after Treatment		
	1	3	5
Land	80	90	100
Channel	80	80	100
Roads/Trails	80	90	100
Protection/Safety	90	100	100

E. Cost of No-Action (Including Loss): **$6,225,000** The cost of the no-action alternative includes the value of actual damages that could occur to homes below the fire as a result of a large debris flow event, loss of road crossings and culverts, increase in weed infestations, loss of trails, and loss of municipal water pipeline or damage. Estimated losses are percentages of estimated total values of resources at risk. Numbers of homes at risk range from approximately 20 to 80, depending upon the size and scope of flood events. Home values in the threatened neighborhoods range from $600,000 to $1.5 million, each. Also included in the cost of this alternative is the value of repair work that would be needed in the event of damage to the Salt Lake Aqueduct/Road, the Upper Canyon Road, and the Bonneville Shoreline Trail.

F. Cost of Selected Alternative (Including Loss): **$2,309,655** Please see attached worksheet.

G. Skills Represented on Burned-Area Survey Team:

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

Team Leader: Paul Flood

Email: pflood@fs.fed. us Phone: 801.236.3440 FAX: 801.524.3172

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:

(1) Apply helicopter mulching using wood straw at a rate of 13 large bales (50% ground coverage), on 140 acres of high and moderately high burn intensity ground across the burned area in five separate first order drainages. Specifically, this treatment is intended to reduce soil erosion losses from small thunderstorm or rapid snowmelt events in the next year by increasing effective ground cover to 50%. Aerial seed the same 140 acres with a seed mix containing cover producing perennial native grasses. Specfically, these treatments are intended to reduce erosion of burned, barren soil areas that are anticipated to have delayed natural revegetation due to severe burn effects on the pre-fire vegetation. Agricultural straw was considered as a similar least cost alternative to wood straw. However, the areas that are proposed for aerial mulching treatments are prone to high winds during the year. Past experience with agricultural straw in similar areas along the Wasatch Front has shown that the agricultural straw is very susceptible to loss by downslope winds and high pressure cross winds. The area was also mostly grass and brush prior to the fire so there are inadequate amounts of debris to

reduce surface winds on the soil surface. We are proposing to treat these areas with both seed and mulch techniques based upon monitoring results from the 2003 Farmington Fire. Monitoring and analysis of rainfall and debris flow events during the spring of 2004 found that subwatershed areas treated with these techniques did not yield debris flows, and that untreated subwatershed areas did (Flood. 2004a and Flood. 2004b). The subwatershed areas we are proposing to treat contain the lowest observed ground cover values, and the greatest amount of oakbrush consumed, within the fire area. We chose treatment areas on the 2003 Farmington Fire based upon the same characteristics (USDA Forest Service. 2003.). As important as the areas we are proposing to treat, are the areas we are choosing to not treat with seeding and mulching. The recommended no treatment areas on this fire experienced much lower burn intensities, had less oakbrush consumption by the fire, and have higher amounts of observed ground cover. Again, the 2003 Farmington Fire recommended areas for no treatment using the same criteria. Although some of the no treatment subwatersheds on this fire did yield post fire debris flows, these events were generally small in nature and did little or no damage to residences.

The seed mix consists of the following species applied at the specified rates:

Species	PLS lbs/ac	Seeds/sq ft
Indian ricegrass (Achnatherum hymenoides) 98% pls	3	9 (141,000/lb)
Bluebunch Wheatgrass (Agropyron spicatum) 80% pls	5	13 (140,000/lb)
Western wheatgrass (Pascopyrum smithii) 95% pls	5	12 (110,000/lb)
Thickspike wheatgrass (Elymus lanceolatus ssp. lanceolatus) 91% pls	2	6 (154,000/lb)
Total PLS pounds/ac	**15**	**40 seeds/sq ft**
Total acres to be seeded	140	
Total Seed Needed	2100 lbs	
Price per Lb.	7.50	
Total Cost of Seed	**$15,393**	

(2) Install approximately 50 gully relief trenches, spaced at about 150 feet, along a 1.5 mile long section of gully complexes on a ridgeline south of Cherry Canyon. Each trench will range from 75 to 125 feet long, terminating at existing grade and arranged to divert in alternating directions to opposite sides of the ridgeline. The bottoms of the trenches will be stabilized with native seed and erosion control blankets. Grade stabilization will be provided at the outlet end of each trench. Specifically, this treatment is intended to break up the existing constant grade of the gully complex into smaller, more stable, and much less erosive sections. Heritage resource and TES clearances have been obtained for these earth disturbing treatments. Total disturbed area will be less than 1 acre. Long term restoration of the gully complex would be completed by other than BAER funds.

(3) Noxious and invasive weed treatments would consist of monitoring the spread of existing weed populations, and then the treatment by herbicide spraying on 250 acres during the spring/early summer of 2009. Areas treated would be road and trail ROW areas within and immediately adjacent to existing infestations. Currently, the existing weed populations are scattered and intermixed in a complex mosaic with at risk fire areas. There is no practical way to treat the new infestations separately, without treating existing weed populations. At a minimum we can expect a doubling of the infestations and an increase in density and seed production.

Channel Treatments: Install 1,500 linear feet of temporary, wire reinforced silt fence sediment traps in three high and moderately high burn intensity first order drainages above homes located between Bear Creek and Cherry Creek Canyons in Draper City. These traps will be maintained, by FS crews, until ground cover and vegetation in the first order watersheds have recovered to the point where flood potential has returned to prefire levels. Specifically, these traps are designed to retain sediment, but not water, from thunderstorm and snowmelt events for approximately one year. Existing city storm drains will

handle desilted runoff throughflows from the traps. Removal of the structures will be done by the Forest Service and is anticipated to occur during the fall of 2010.

Roads and Trail Treatments: All treatments are designed to protect the surface and prisms of the three previously mentioned system roads/trails from potential post fire rain event damage that could result when the existing undersized drainage culverts or waterbar dips are either blocked or breached by sediment and debris. Much of the needed treatments will be contributed by either The Salt Lake City Metropolitan Water District, or Draper City using a combination of proprietary and EWP funds. Specific treatments to be funded with BAER funds include:

1) Cleanout of three (3) existing culverts and inlet basins
2) Installation of two (2) culvert inlet standpipes
3) Installation of one (1) debris rack
4) Construction of one (1) stabilized road crossing, with associated fill slope rip-rap protection, where the Upper Canyon Road crosses Cherry Canyon.
5) Draper City and Salt Lake Metro will patrol the roads after significant rain events to clean and maintain debris retention and road drainage structures.

The existing undersized Upper Canyon Road box culvert, at the Cherry Canyon crossing, can only be protected from a small storm flow event. A larger debris flow event will clog the culvert and overflow the road and fill slope surfaces. This will add considerable amounts of debris to the flow as the fill slope scours, creating a very dangerous situation for the Salt Lake City Aqueduct located immediately downslope. To lessen the risk of this situation, we are proposing to stabilize the road surface and fill slope sections of the Upper Canyon Road, at this crossing, with a combination of flowable fill (concrete) and layer fills of large boulder rip rap (see #4, above).

Existing dips and waterbars on the Bonneville Shoreline Trail will be cleaned of sediment that was deposited from the most recent post fire rain event. Additional waterbars/dips/checkdams will be added as needed to protect the trail surface from expected increased post fire runoff.

Protection/Safety Treatments: Install a temporary raingauge monitoring station at a bench location midway between Bear and Cherry Canyons within the burned area. Draper City will be encouraged to replace the station with its own rainfall monitoring system when the RAWS station is removed. Telemetric communication will be incorporated to communicate data to the National Weather Service and warnings to Central Valley Emergency Dispatch. Draper City will develop an emergency response and notification protocol for implementation as needed. Because of anticipated increased flodding risks during the 2009 snowmelt period, measures should be taken to increase rainfall monitoring and heighten public awarness next spring. This timeperiod correlates with the period of active streamflow in Bear and Cherry Canyons, or approximatley late March through mid June of 2009.

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.)

(1) Precipitation totals from significant rainfall events through the summer of 2009.
(2) Ground cover values in the treated areas to determine effectiveness of mulching and seeding, and the need for supplemental treatments, during the late summer of 2009. Methodology: step transects and ocular estimates.
(3) Spread of existing weed infestations during the spring and summer of 2009.

References:

Flood, Paul K. 2008. WEPP Erosion modeling and analysis for the Cherry Creek portion of the Corner Canyon Fire. USDA Forest Service. Wasatch Cache National Forest. Salt Lake City. Utah. September, 2008.

Flood, Paul K. 2004a. Fiscal Year 2005 Monitoring Plan for the 2003 Farmington Fire. Wasatch Cache National Forest. Salt Lake City. UT. March 22, 2005.

Flood, Paul K. 2004b. Report on Compton Bench Mudslide Event, 2003 Farmington Fire. Wasatch Cache National Forest. Salt Lake City. UT. April 25, 2004.

Giraud, Richard E. 2008. Post-fire debris-flow and flood hazard assessment for the 2008 Corner Canyon fire, Draper, Utah. Utah Geological Survey. Salt Lake City. Utah. September, 2008.

USDA Forest Service. 2003. FS-2500-8. Burned Area Report for the July 10, 2003 Farmington Fire. Wasatch Cache National Forest. Salt Lake City. UT. August 6, 2003.

Part VI – Emergency Stabilization Treatments and Source of Funds **Initial**

			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										
Aerial Mulch	acres	3500	140	$490,000	$0		$0		$0	$490,000
Aerial Seed	acres	50	140	$7,000	$0		$0		$0	$7,000
Seed Purchase	pounds	7.33	2100	$15,393	$0		$0		$0	$15,393
Gully Stabilization Relief Trenches	each	385	50	$19,250			$0		$0	$19,250
Weed Eradication	acres	100	250	$25,000			$0		$0	$25,000
Contract Prep and Oversight	days	350	28	$9,800			$0		$0	$9,800
Insert new items above this line!				$0	$0		$0		$0	$0
Subtotal Land Treatments				$566,443	$0		$0		$0	$566,443
B. Channel Treatments										
Checkdams	each	1075	20	$21,500	$0		$0		$0	$21,500
Contract Prep and Oversight	days	350	5	$1,750	$0		$0		$0	$1,750
Insert new items above this line!				$0	$0		$0		$0	$0
Subtotal Channel Treat.				$23,250	$0		$0		$0	$23,250
C. Road and Trails										
Cherry Ck. Xing Stabilize	each	32285	1	$32,285	$0		$0		$0	$32,285
Culvert Cleanout	each	350	3	$1,050	$0		$0		$0	$1,050
Culvert Inlet Standpipes	each	1750	2	$3,500	$0		$0		$0	$3,500
Debris Rack	each	5000	1	$5,000			$0		$0	$5,000
Bon. Shrln Tr. Drainage Mtce	each	7200	1	$7,200			$0		$0	$7,200
Road Patrols (contributed)	all				$24,000		$0		$0	$24,000
Culvert Treatments (contributed)	all				$61,650					$61,650
Insert new items above this line!				$0	$0		$0		$0	$0
Subtotal Road & Trails				$49,035	$85,650		$0		$0	$134,685
D. Protection/Safety										
				$0	$0		$0		$0	$0
Insert new items above this line!				$0	$0		$0		$0	$0
Subtotal Structures				$0	$0		$0		$0	$0
E. BAER Evaluation										
Initial 2500-8 Rpt				$0	$7,400		$0		$0	$7,400
Insert new items above this line!				---	$0		$0		$0	$0
Subtotal Evaluation				---	$7,400		$0		$0	$7,400
F. Monitoring										
Precip,ground cvr	days	350	5	$1,750	$0		$0		$0	$1,750
Weeds	dyas	400	3	$1,200						
Insert new items above this line!				$0	$0		$0		$0	$0
Subtotal Monitoring				$2,950	$0		$0		$0	$1,750
G. Totals				$641,678	$93,050		**$0**		**$0**	**$733,528**
Previously approved										
Total for this request				**$641,678**						

PART VII - APPROVALS

1. /s/ Brian Ferebee 09/12/08
Forest Supervisor (signature) Date

2 s/ William P. LeVere for 09/15/2008
Regional Forester (signature) Date