USDA-FOREST SERVICE FS-2500-8 (6/06)

Date of Report:

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: Preston Fox

B. Fire Number: WA-OWF-1078

C. State: WA

D. County: Chelan

E. Region: 06

F. Forest: 17

G. District: 05

H. Fire Incident Job Code: P6E71W

I. Date Fire Started: 10/04/09

J. Date Fire Contained: unknown

K. Suppression Cost: $746,735, to date.

L. Fire Suppression Damages Repaired with Suppression Funds
1. Fireline waterbarred (miles): 1, to date
2. Fireline seeded (miles): none, to date
3. Other (identify):

M. Watershed Number: 1702001003

N. Total Acres Burned: 1,470
NFS Acres(1,470) Other Federal ( ) State ( ) Private ( )

O. Vegetation Types: Middle Elevations (below 4,500 ft. elev): Mostly Douglas fir series in early seral condition; Upper elevations (4500 + ft) : Subalpine fir series in early seral condition, shrub fields. All of the fire area was burned in 1970. *

P. Dominant Soils: Variable depths of volcanic ash/pumice over coarse textured subsoils. North facing slopes have deep ash/pumice soils (Typic Vitricryands) while south facing slopes have thin-cobbly-ashy soils (Andic

Dystrocrypts, loamy skeletal). Soils on South facing slopes have more than 25% profile rock larger than 2 inches in diameter. Some deep coarse textured stony soils on debris fans and deposits. Bedrock outcropping comprises more than 25 percent of soil units in steep catchment basins and on some south facing slopes.*

Q. Geologic Types: Igneous units (Granidiorite) and metamorphic units (Gneiss): landforms are oversteepened, scoured glacial troughs and ridges. Debris fans at stream mouths extend into the Entiat Valley bottom.*

* USDA Landtype Associations of North Central Washington, 2004

R. Miles of Stream Channels by Order or Class: I - 2.8 miles * , II – 3.5 miles

* Many of the order I stream channels are intermittent and collect colluvium from upper watershed catchment basins. These order I channels converge to form order II channels. The order I channel gradients exceed 15%.

S. Transportation System

Trails: 0 miles Roads: 6.6 miles

Unusual Fire Conditions: The Preston Fox Fire is mostly a re-burn of areas burned in the 1970 Fires. Most of the large, standing dead timber from the 1970 fire was salvaged. The burn intensity in the watersheds that were salvaged experienced moderate to high burn intensity. The large woody debris in Brennegan and McCrea Creek ranged from 15 to 30 tons/acre. Lodgepole pine, Douglas fir, and ponderosa pine reproduction grew up through this accumulation of large fuels. Resulting burn severity from the Preston Fox fires was mostly high in the upper portion of the catchment basins of Brennegan and McCrea watersheds. Little tree canopy remains and soil surfaces have little litter or large woody debris to create surface roughness.

PART III - WATERSHED CONDITION

A. Burn Severity (acres): 367 (low) 220 (moderate) 882 (high)

B. Water-Repellent Soil (acres):

C. Soil Erosion Hazard Rating (acres):
367 (low) 220 (moderate) 882 (high)

D. Erosion Potential: 161 tons/acre

E. Sediment Potential: 41,280 cubic yards / square mile

Assumptions for Erosion and Sediment Potential:

The vicinity of the Preston Fox fire has the highest percent fine sediment (21 percent fines < 1.0mm in 1995) of all sediment monitored in sub-basins of the Entiat Watershed. The sediment source is from debris slides following natural or management-caused disturbance such as wildfire or road construction (Watershed Assessment, Entiat Analysis Area version 2.0, 1996).

The erosion and sediment figures listed above reflect the contribution from reoccurring debris slides that deposit relatively fine to coarse sediment directly into stream channels. Shallow, rapid debris slides are a natural hydrologic process in the watersheds within the Preston Fox Fire. Sediment delivery from these slides has been and continues to be transported and deposited into the Entiat Valley forming debris fans at the mouth of each watershed.

These types of slides trigger pulses of sediment delivery that are episodic in nature. Normally these slides occur in response to dramatic changes in vegetation due to landscape level fires or from intense early summer

thunder storms and rain-on-snow events that occur in late fall and early winter (see Part IV). Based upon local fire history, fire induced watershed impairments will substantially elevate the risk of debris slides for at least the next 5 years. The Preston Fox Fire will have a significant effect of increasing the frequency of debris slides. The figures listed above reflect the contribution of delivered sediment from these debris slides over the design frequency (10 years). These figures are considered conservative based upon recent fire induced debris slide occurrence.

The Preston Fox fire area occurs predominately on over-steepened slopes due to glacial or glacial fluvial erosion. Consequently drainages are very steep and rocky. Natural landform sediment delivery and routing efficiency is considered very high but episodic. Runoff is routed rapidly into a series of first order ephemeral channels that form a relatively dense drainage network. Runoff from these drainages can be flashy. The major source of sediment delivery is in the form of debris slides in these tributary streams. These slides deposit debris directly into the main channels of Brennegan and McCrea Creeks. This delivered sediment has and continues to form debris fans at the mouth of each watershed.

PART IV - HYDROLOGIC DESIGN FACTORS

A. Estimated Vegetative Recovery Period, (years):	5
B. Design Chance of Success, (percent):	70
C. Equivalent Design Recurrence Interval, (years):	10
D. Design Storm Duration, (hours):	.5
E. Design Storm Magnitude, (inches):	
F. Design Flow, (cubic feet / second/ square mile):	.6
G. Estimated Reduction in Infiltration, (percent):	5 to 40 (*2)
H. Adjusted Design Flow, (cfs per square mile):	45 to 273 (*3)

Footnotes

(*1) Design flow assumptions: (a) A short duration, high intensity, convective storm event has been identified as the storm type most likely to cause damage in the burned area. (b) Storm-related flow generated from surface runoff (no significant shallow sub-surface flow), with high likelihood of hail accumulations. (c) Selected a 10 yr RI, 30 minute event--similar to those that have impacted other burns in this area (Silica, Crum Canyon, Dinkleman, Tyee, North 25, Rex). (d) Design flow estimate (item F) could vary depending on the assumptions made regarding pre-fire (but not undisturbed) infiltration conditions in the area. However, this example assumes a negligible pre-fire reduction in infiltration.

(*2) Estimated range in reduction in infiltration (item G) in the Preston Fox Fire is as follows: Low intensity (5%), moderate intensity (15%) and high intensity (40%). Estimated reduction of infiltration for this fire is due primarily to non-wettable conditions from dry, volcanic ash soils and hydrophobic conditions.

(*3) Adjusted Design Flow (item H) for the burned area varies widely based on location. Potential adjusted design flow for a small tributary in the fire interior (high severity) is 273 csm. The latter flow represents an approximation of a potential short-term flow from an intermittent channel typical of the area--given degraded infiltration conditions. The fire area has had a history of events triggering floods one to three years following wildfires.

PART V - SUMMARY OF ANALYSIS

A. Describe Critical Values/Resources and Threats:

1. *Loss of Site Productivity*

The inherent soil productivity is moderate for most of the area within the Preston Fox Fire. Soils are derived from hard crystalline igneous and metamorphic bedrock units (granitic and gneiss). These rock units typically weather into very coarse “sandy soils” with a low nutrient capitol. A layer of volcanic ash forms the surface of most soils as well as varying thickness of pumice in some locations. The areas with significant accumulations of volcanic ash are the most productive sites in the fire area (eg. toe slopes, valley bottoms, and North facing slopes). Continental climatic conditions often limit available soil moisture. Soil moisture (except in valley bottoms) is often a limiting factor on the southern exposures that predominate in the fire area.

Fire effects can directly influence the long and short-term accumulation of organic matter. Most of the Preston Fox Fire experienced high severity burns. This level of burn intensity is expected to have an adverse effect on organic matter input in the short term and long term (Everett and others, 1996).

The Preston Fox Fire likely had a profound effect in volatilization of residual nutrient capitol of nitrogen (N), phosphorus (P) and sulfur (S) in the portions of Brennegan and McCrea Creek watersheds. These areas had high and moderate intensity burns due to excessive fuel loading from the 1970 fires. The Preston Fox fire basically burned hot enough to totally consume the duff/litter layer, foliage, woody material less than 6 inches, and severely charred larger down woody debris. This level of burn intensity could severely reduce the nutrient capitol of these soils (Hungerford and others, 1990—p. 32; Baird, 1998). Furthermore, since little of the fine coniferous canopy remains (twigs, cones, and needles), there will be a long-term reduction in nutrient and organic matter input on these sites. This loss of future input of fine coniferous litter combined with the loss of the soil litter/duff layer will have a severe impact on the natural soils nutrient capital (Page-Dumroese and Harvey, 1990).

In some areas there are numerous snags still standing in much of the Preston Fox fire area that will in time fall to the forest floor. The decomposition rate of this large downed woody debris is expected to exceed 100 years before becoming incorporated into soil wood as a part of the nutrient capital (Edmonds, 1990-p. 119). Hence, this standing dead material will likely elevate burn intensity for the next cycle of fires. Hence, continuing to affect the nutrient capital of soils within the Preston Fox fire.

2. ***Loss of Water Quality***

Water quality in the Entiat River sub-basin is critical for many uses including municipal/domestic supply, agricultural uses, aquatic habitat, recreation and aesthetics. The Entiat River is a major recreation destination. The Brennegan and McCrea watersheds are tributaries of the Entiat River which supports the following listed fish species: Spring Chinook, Bull Trout, and Steehead.

Water quality parameters most affected by this fire are sediment loading, nutrient loading and water temperature. Stream sediment loading in fire-affected tributaries is expected to increase as a result of increased surface erosion (via accelerated dry raveling and rill erosion) and as a result of increased debris slide activity. Ash, fine sediment and woody debris delivery and transport will increase during snowmelt runoff and in response to storm events. Episodic delivery of larger bed materials and woody debris will be associated with the event driven debris slide-debris torrents discussed in more detail in the section on Life and Property. Increased sediment loading is expected to persist for at least the next two to three years after the fire and then decline.

Research has documented that wildfire exerts pronounced effects on the nutrient status of ecosystems (Tiedemann and others, 1978). Nutrient loss via volatilization and solution is described in the section on site productivity. For example, both nitrogen and phosphorus have been drastically reduced from the system. However, these losses begin to be offset by other processes such as N input from precipitation. Elevated nutrient concentrations in stream flow will persist for a relatively short period of time until the chemical retention

capacity of the burned area is reestablished. The rapid development of native plant (and seeded grass cover) in the burned area is critical to the re-establishment of the tight nutrient cycle in these forested watersheds. This nutrient cycling alteration and re-establishment is a natural process associated with the wildfire disturbance.

Water temperatures may increase significantly in many of the fire-affected stream reaches as a result of riparian canopy loss. Even in areas identified as having been subject to low intensity burn, denser riparian vegetation burned at a higher intensity. However, experience suggests that riparian shrubs and herbaceous plants will rapidly re-sprout in those areas as long as root systems have not been damaged. This fire-influenced shift in temperature regime will persist until sufficient riparian canopy is re-established to provide shade during the critical summer months. The planting of woody vegetation in selected riparian areas that burned at moderate-high intensities would accelerate canopy recovery.

Wildfire influences all of the above water quality parameters. At issue, are the identification and treatment of those areas that may have burned at a greater than normal intensity due to human-caused influences (e.g., elevated fuel loading from past fire suppression activities) and concern for human developments that are now part of the system (e.g., private homes on alluvial fans, recreation sites).

3. ***Threats to Human Life and Property***

The values at risk include National Forest roads, County roads, houses, Pacfic Northwest Forestry Lab installations, and listed fish. Homeowners and recreationists will continue to use the area. The private lands are located on debris fans that are at risk of flooding. The upper watersheds are administered by the Okanogan and Wenatchee NFs.

As previously described, the upper watersheds are comprised of extremely steep conditions that are at severe risk for debris slides. Increased amounts of large woody material, in upper debris tracks and stream channels, will become incorporated in the debris slides which is likely to substantially increase the scouring energy of each slide. Hence post fire debris slides are expected to accelerate the rate of scour in upper watershed channels that will deliver additional debris into lower stream reaches.

Channel debris often form debris jams in constricted channels When these dams burst they cause a surge of flood material onto the fans or cause streams to divert and form new channels on the fans. Both the Brennegan and McCrea Creek debris fans are in developed private ownership. A similar dam burst in Preston Creek (the adjacent drainage) occurred after the 1970 fire and resulted in four fatalities.

In McCrea Creek, and to a lesser extent Brennegan Creek, debris flows pose the greatest threat to homeowner safety and property values.

Channel treatments are not appropriate for these perennial stream systems. The only BAER treatments that will have some level of success at reducing the threat to life and property are the road treatments intended to reduce large surges of sediment and debris. However, the Preston Fox fire BAER treatments are not comprehensive enough to substantially reduce the risk to downstream private landowners.

B. Emergency Treatment Objectives:

The application of the BAER treatments should assist natural recovery and help reduce both on-site and downstream damage to values at risk. Proposed structural treatments (road drainage and culverts) are intended to reduce post-fire increases in accelerated erosion and sedimentation and to reduce threat to life and property.

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

Land **NA** % Channel **NA** % Roads/Trails **80** % Protection/Safety **100** %

D. Probability of Treatment Success

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

E. Cost of No-Action (Including Loss): **$6,750,000**

F. Cost of Selected Alternative (Including Loss): **$1,515,000**

G. Skills Represented on Burned-Area Survey Team:

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

Team Leader: Brigitte Ranne / Carl Davis

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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.)

Land Treatments: None

Channel Treatments: None

Roads and Trail Treatments:

Purpose:

Implement actions to: (1) reduce the potential for accelerated surface runoff and storm surges damaging Forest Service Roads within the Preston Fox Fire; (2) reduce the potential for road related surface/mass erosion and accelerated sediment delivery to downstream high value fisheries habitat, high value or “pristine” water quality rivers; (3) reduce road-related hazards to the burned area.

Special attention and emphasis is given to culverts at stream crossings because failure of these crossings would result in abnormally large amounts of sediment delivered to the proposed Wild and Scenic Entiat River. Lower water quality in this reach would affect water quality for listed fish species (bull trout, spring chinook, steelhead) and seasonal domestic water supplies. Failure of culverts within the Brennegan and McCrea drainages would impact private land directly downstream. All major culverts indentified in road treatments (R2 and 3) are located within or immediately adjacent to the perimeter of the fire, and directly downstream from high and moderate burn intensity.

The BAER team considered closing road 5504. The District Ranger determined that the road should remain open in order to fulfill planned management activites (prescribed burning, thinning, and Experimental Forest Access) and wildland fire protection. The team also considered the option of only constructing grade sags at each culvert crossing and leaving the existing pipes. However, because the pipes along road 5504 are undersized an increase in peak flow (see next paragraph) would likely cause culvert failure of three of the culverts, along with subsequent road failure (one pipe is 24" and two are 36"). With road failure the adverse affects of downstream sediment to private land and listed fish species is dramatically increased. The BAER team considered the cost of culvert and road replacement to be much higher than the proposed treatments. The team decided to remove the culvert on the 5501-210 spur – a road which is no longer needed for management activities.

Debris loading within the perimeter of the fire has been increased significantly as a result of the fire and possesses a real risk of concern to blockage of existing culvert structures. Higher peak flows are also anticipated following the Preston Fox Fire. These peak flows are aniticipated following high intensity summer convection storms or spring runoff. Given these altered watershed conditions, three of the culverts are undersized and need to be enlarged to prevent stream crossing "wash outs" and adverse down stream effects. The other treatments are intended to improve drainage following storm events.

All treatments are along the 5504 road, with the exception of the culvert removal on the 5501-210 spur. All the following treatments were evaulated by the BAER team and Zone Forest Engineers with engineering, hydrologic flows, and costs as design criteria.

Treatment #R1 – Remove Large Boulder from Culvert Inlet: Remove an estimated 10 ton rock that is restricting the culvert inlet. Rock removal will require blasting. This is on the 5504 road.

Treatment #R2 – Remove Existing Culvert: Remove existing culvert on 5501-210 spur, a closed road. Recontour the old road bed to match the existing stream dimensions and to reestablish more natural flow patterns, and remove the risk of failure of the old road bed.

Treatment #R3a – Replace/Install Culvert: Remove and replace existing culverts (one is 24" and two are 36") with larger culverts (48" diameter squash culverts). Culvert design enables much better large woody debris passage. These culverts are along the 5504 road.

Treatment #R3b – Repair Culvert: Reestablich full diameter of inlet of damaged 36" culvert. Remove a 4 foot section of road, replace with native stone headwall, and cut off portion of damage pipe. Road width would still be 14-16 feet. The team considered replacing the entire 144 ft long culvert, which would have been very costly. This fix was determined to be both effective and much more economical.

Treatment #R4a – Clean/Brush Major Culvert Inlets: Remove down woody debris from within 20 ft of the inlet of the culvert(s) at the major crossing of Brennegan and McCrea drainages to reduce the risk of culvert failure. Debris loading has been added to each of these drainages as a direct result of the fire and is a real risk to the structures' ability to handle increased flows.

Treatment #R4b – Construct and Install Trash Rack: Install trash rack to prevent future culvert blockage. This culvert is on the channel with large woody debris that is expected to move during storm events. Trash rack will be maintained via routine Forest Road maintenance.

Treatment #R5 – Construct drivable armored grade sags: Construct drivable armored grade sags at the location of each culvert installation. Armor grade sag outlet and road fill slope to ensure road integrity during anticipated storm events. Grade sags are to keep storm surges (debris slides) in existing channels.

Protection/Safety Treatments:

Treatment #R6 – In-service Warning System for Forest Service Storm Patrol: Upgrade existing weather station administrated by the Pacific Northwest Forestry Lab to include early warning system for localized storms that occurr within the Preston Fox Fire vicinity. This would enable the Entiat Ranger District to send storm patrols to inspect/maintain 5504 road facilities and reduce the risk of "washouts".

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.)

The trash rack and culverts will be monitored during routine road maintance. The weather station is intended to alert road crews of storm events and trigger on-site inspections to prevent road wash outs. No BAER montioring of proposed treatments is being requested. All montioring will be completed via Forest force account funds.

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

				$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										
R#1 Remove boulder	1	10000		$10,000	$0		$0		$0	$10,000
R#2 Remove culvert	1	4000		$4,000	$0		$0		$0	$4,000
R#3a Replace culverts	3	30000		$90,000	$0		$0		$0	$90,000
R#3b Repair culvert	1	3500		$3,500						
R#4a Clean culv. inlets	6	6000		$6,000						
R#4b Trash rack	1	9000		$9,000						
R#5 Grade sags	5	7500		$37,500						
Insert new items above this line!				$0	$0		$0		$0	$0
Subtotal Road & Trails				$160,000	$0		$0		$0	$104,000
D. Protection/Safety										
R#6 Storm warning	1	5000		$5,000	$0		$0		$0	$5,000
				$0	$0		$0		$0	$0
				$0	$0		$0		$0	$0
Insert new items above this line!				$0	$0		$0		$0	$0
Subtotal Structures				$5,000	$0		$0		$0	$5,000
E. BAER Evaluation										
Team				---	$6,500		$0		$0	$6,500
Insert new items above this line!				---	$0		$0		$0	$0
Subtotal Evaluation				---	$6,500		$0		$0	$6,500
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				$165,000	$6,500		**$0**		**$0**	**$115,500**
Previously approved										
Total for this request				**$165,000**						

PART VII - APPROVALS

1. /s/ Clint Kyhl — 10/16/2009
   Forest Supervisor (signature) — Date

2. _____ — _____
   Regional Forester (signature) — Date